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</tr>
<tr>
<td>rvsdrestrict Command</td>
<td>778</td>
</tr>
<tr>
<td>rwall Command</td>
<td>779</td>
</tr>
<tr>
<td>rwalld Daemon</td>
<td>780</td>
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<td>rwho Command</td>
<td>780</td>
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<tr>
<td>rwhod Daemon</td>
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</tr>
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About This Book

This book provides end users with complete detailed information about commands for the AIX® operating system. The commands are listed alphabetically and by category, and complete descriptions are given for commands and their available flags. If applicable, each command listing contains examples. This volume contains AIX commands that begin with the letters n through r. This publication is also available on the documentation CD that is shipped with the operating system.

How to Use This Book

A command is a request to perform an operation or run a program. You use commands to tell the operating system what task you want it to perform. When commands are entered, they are deciphered by a command interpreter (also known as a shell) and that task is processed.

Some commands can be entered simply by typing one word. It is also possible to combine commands so that the output from one command becomes the input for another command. This is known as pipelining.

Flags further define the actions of commands. A flag is a modifier used with the command name on the command line, usually preceded by a dash.

Commands can also be grouped together and stored in a file. These are known as shell procedures or shell scripts. Instead of executing the commands individually, you execute the file that contains the commands.

Some commands can be constructed using Web-based System Manager applications or the System Management Interface Tool (SMIT).

Highlighting

The following highlighting conventions are used in this book:

**Bold** Identifies commands, subroutines, keywords, files, structures, directories, and other items whose names are predefined by the system. Also identifies graphical objects such as buttons, labels, and icons that the user selects.

*Italics* Identifies parameters whose actual names or values are to be supplied by the user.

Monospace Identifies examples of specific data values, examples of text similar to what you might see displayed, examples of portions of program code similar to what you might write as a programmer, messages from the system, or information you should actually type.

Format

Each command may include any of the following sections:

**Purpose** A description of the major function of each command.

**Syntax** A syntax statement showing command line options.

**Description** A discussion of the command describing in detail its function and use.

**Flags** A list of command line flags and associated variables with an explanation of how the flags modify the action of the command.

**Parameters** A list of command line parameters and their descriptions.

**Subcommands** A list of subcommands (for interactive commands) that explains their use.

**Exit Status** A description of the exit values the command returns.

**Security** Specifies any permissions needed to run the command.

**Examples** Specific examples of how you can use the command.

**Files** A list of files used by the command.

**Related Information** A list of related commands in this book and related discussions in other books.
Reading Syntax Statements
Syntax statements are a way to represent command syntax and consist of symbols such as brackets ([ ]), braces ({ }), and vertical bars (|). The following is a sample of a syntax statement for the unget command:

\texttt{unget [-rSID] [-s] [-n] File ...}

The following conventions are used in the command syntax statements:
- Items that must be entered literally on the command line are in \textbf{bold}. These items include the command name, flags, and literal characters.
- Items representing variables that must be replaced by a name are in \textit{italics}. These items include parameters that follow flags and parameters that the command reads, such as Files and Directories.
- Parameters enclosed in brackets are optional.
- Parameters enclosed in braces are required.
- Parameters not enclosed in either brackets or braces are required.
- A vertical bar signifies that you choose only one parameter. For example, \{ a | b \} indicates that you can choose a, b, or nothing. Similarly, \[ a | b \] indicates that you \textit{must} choose either a or b.
- Ellipses ( \ldots{} \) signify the parameter can be repeated on the command line.
- The dash ( - ) represents standard input.

Listing of Installable Software Packages
To list the installable software package (fileset) of an individual command use the \texttt{lslpp} command with the \texttt{-w} flag. For example, to list the fileset that owns the \texttt{installp} command, enter:

\texttt{lslpp -w /usr/sbin/installp}

Output similar to the following displays:

\begin{tabular}{lll}
\textbf{File} & \textbf{Fileset} & \textbf{Type} \\
\hline
/usr/sbin/installp & bos.rte.install & File \\
\end{tabular}

To list the fileset that owns all file names that contain \texttt{installp}, enter:

\texttt{lslpp -w "*installp*"}

Output similar to the following displays:

\begin{tabular}{lll}
\textbf{File} & \textbf{Fileset} & \textbf{Type} \\
\hline
/usr/sbin/installp & bos.rte.install & File \\
/usr/clvm/sbin/linstallp & prpq.clvm & File \\
/usr/lpp/bos.sysmgmt/nim/methods/c_install & bos.sysmgmt.nim.client & File \\
\end{tabular}

Running Commands in the Background
If you are going to run a command that takes a long time to process, you can specify that the command run in the background. Background processing is a useful way to run programs that process slowly. To run a command in the background, you use the \& operator at the end of the command:

\texttt{Command&}

Once the process is running in the background, you can continue to work and enter other commands on your system.
At times, you might want to run a command at a specified time or on a specific date. Using the cron daemon, you can schedule commands to run automatically. Or, using the at and batch commands, you can run commands at a later time or when the system load level permits.

**Entering Commands**

You typically enter commands following the shell prompt on the command line. The shell prompt can vary. In the following examples, $ is the prompt.

To display a list of the contents of your current directory, you would type `ls` and press the Enter key:

```
$ ls
```

When you enter a command and it is running, the operating system does not display the shell prompt. When the command completes its action, the system displays the prompt again. This indicates that you can enter another command.

The general format for entering commands is:

```
Command Flag(s) Parameter
```

The flag alters the way a command works. Many commands have several flags. For example, if you type the `-l` (long) flag following the `ls` command, the system provides additional information about the contents of the current directory. The following example shows how to use the `-l` flag with the `ls` command:

```
$ ls -l
```

A parameter consists of a string of characters that follows a command or a flag. It specifies data, such as the name of a file or directory, or values. In the following example, the directory named `/usr/bin` is a parameter:

```
$ ls -l /usr/bin
```

When entering commands, it is important to remember the following:

- Commands are usually entered in lowercase.
- Flags are usually prefixed with a - (minus sign).
- More than one command can be typed on the command line if the commands are separated by a ; (semicolon).
- Long sequences of commands can be continued on the next line by using the \ (backslash). The backslash is placed at the end of the first line. The following example shows the placement of the backslash:

```
$ cat /usr/ust/mydir/mydata > \ /usr/usts/yourdir/yourdata
```

When certain commands are entered, the shell prompt changes. Because some commands are actually programs (such as the `telnet` command), the prompt changes when you are operating within the command. Any command that you issue within a program is known as a subcommand. When you exit the program, the prompt returns to your shell prompt.

The operating system can operate with different shells (for example, Bourne, C, or Korn) and the commands that you enter are interpreted by the shell. Therefore, you must know what shell you are using so that you can enter the commands in the correct format.

**Stopping Commands**

If you enter a command and then decide to stop that command from running, you can halt the command from processing any further. To stop a command from processing, press the Interrupt key sequence (usually Ctrl-C or Alt-Pause). When the process is stopped, your shell prompt returns and you can then enter another command.
ISO 9000

ISO 9000 registered quality systems were used in the development and manufacturing of this product.

32-Bit and 64-Bit Support for the Single UNIX Specification

Beginning with Version 5.2, the operating system is designed to support The Open Group's Single UNIX Specification Version 3 (UNIX 03) for portability of UNIX-based operating systems. Many new interfaces, and some current ones, have been added or enhanced to meet this specification, making Version 5.2 even more open and portable for applications, while remaining compatible with previous releases of AIX.

To determine the proper way to develop a UNIX 03-portable application, you may need to refer to The Open Group's UNIX 03 specification, which can be accessed online or downloaded from http://www.unix.org/.

Related Information

The following books contain information about or related to commands:

- **AIX 5L Version 5.3 Commands Reference, Volume 1**
- **AIX 5L Version 5.3 Commands Reference, Volume 2**
- **AIX 5L Version 5.3 Commands Reference, Volume 3**
- **AIX 5L Version 5.3 Commands Reference, Volume 4**
- **AIX 5L Version 5.3 Commands Reference, Volume 5**
- **AIX 5L Version 5.3 Commands Reference, Volume 6**
- **AIX 5L Version 5.3 Files Reference**
- Printers and printing
- Installation and migration
- **AIX 5L Version 5.3 AIX Installation in a Partitioned Environment**
- **AIX 5L Version 5.3 Network Information Services (NIS and NIS+) Guide**
- Performance management
- **AIX 5L Version 5.3 Performance Tools Guide and Reference**
- Security
- Operating system and device management
- Networks and communication management
- **AIX 5L Version 5.3 Technical Reference: Base Operating System and Extensions Volume 1**
- **AIX 5L Version 5.3 Technical Reference: Base Operating System and Extensions Volume 2**
- **AIX 5L Version 5.3 Technical Reference: Communications Volume 1**
- **AIX 5L Version 5.3 Technical Reference: Communications Volume 2**
- **AIX 5L Version 5.3 Technical Reference: Kernel and Subsystems Volume 1**
- **AIX 5L Version 5.3 Technical Reference: Kernel and Subsystems Volume 2**
- **AIX 5L Version 5.3 Web-based System Manager Administration Guide**
- Performance Toolbox Version 2 and 3 for AIX: Guide and Reference
Alphabetical Listing of Commands

named Daemon

Purpose
Provides the server function for the Domain Name Protocol.

Syntax
Refer to the syntax for either the named8 or the named9 daemon.

Description
AIX supports three versions of BIND: 4, 8, and 9. By default, named links to nsupdate to nsupdate4, named-xfer to named-xfer4. To use a different version of named, you must relink the symbolic links accordingly for the named and named-xfer daemons.

For example, to use named8:
ln -fs /usr/sbin/named8 /usr/sbin/named
ln -fs /usr/sbin/named8-xfer /usr/sbin/named-xfer

nsupdate4 can be used with named8, but nsupdate9 must be used with named9 because the security process is different. It does not matter what named-xfer is linked to when using named9 because the daemon does not use it.

Files

/usr/sbin/named
Contains the named daemon.

/usr/sbin/named8
Contains the named8 daemon.

/usr/sbin/named9
Contains the named9 daemon.

/etc/resolv.conf
Specifies the use of domain name services.

/etc/rc.tcpip
Initializes daemons at each system restart.

/etc/named.pid
Stores process IDs.

/etc/services
Defines socket service assignments.

/etc/sample/tcpip/named.boot
Contains the sample named.boot file with directions for its use.

/etc/sample/tcpip/named.data
Contains the sample DOMAIN data file with directions for its use.

/usr/sample/tcpip/hosts.awk
Contains the sample awk script for converting an /etc/hosts file to an /etc/named.data file. This file also contains directions for its use.

/usr/sample/tcpip/addr.sawk
Contains the sample awk script for converting an /etc/hosts file to an /etc/named.rev file. This file also contains directions for its use.

/usr/sample/tcpip/named.dynamic
Contains a dynamic database setup.

Related Information
The nslookup command, traceroute command, kill command.

The named8 and named9 daemons.

The named.conf file format, DOMAIN Cache file format, DOMAIN Data file format, DOMAIN Reverse Data file format, DOMAIN Local Data file format, resolv.conf file format.

Name server resolution and Planning for DOMAIN name resolution in Networks and communication management.
named8 Daemon

Purpose
Provides the server function for the Domain Name Protocol.

Syntax
/usr/sbin/named8 [ -d DebugLevel ] [ -p PortNumber ] [ -c ConfFile ] [ -w WorkingDirectory ] [ -t RootDirectory ] [ -q ] [ -r ] [ -f ]

Description
The /usr/sbin/named8 daemon is the server for the Domain Name Protocol (DOMAIN). The named8 daemon runs on name server hosts and controls the domain-name resolution function.

Selection of which name server daemon to use is controlled by the /usr/sbin/named and /usr/sbin/named-xfer symbolic links.

Note: The named8 daemon can be controlled using the System Resource Controller (SRC) or the System Management Interface Tool (SMIT). Use the rc.tcpip file to start the daemon with each system startup.

The named8 daemon listens for name-server requests generated by resolver routines running on foreign hosts. The daemon listens to the socket defined in the /etc/services file; the entry in the /etc/services file begins with domain. However, this socket assignment can be overridden using the -p flag on the command line.

Note: The /etc/resolv.conf file tells the local kernel and resolver routines to use the DOMAIN protocol. The /etc/resolv.conf file must exist and contain either the local host's address or the loopback address (127.0.0.1) to use the named8 daemon on the DOMAIN name server host. If the /etc/resolv.conf file does not exist, the local kernel and resolver routines use the /etc/hosts database. When this occurs, the named8 daemon does not function properly.

Manipulating the named8 Daemon with the System Resource Controller

The named8 daemon is a subsystem controlled by the System Resource Controller (SRC). The named8 daemon is a member of the tcpip system group. This daemon is disabled by default and can be manipulated by the following SRC commands:

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>startsrc</td>
<td>Starts a subsystem, group of subsystems, or a subserver.</td>
</tr>
<tr>
<td>stopsrc</td>
<td>Stops a subsystem, group of subsystems, or a subserver.</td>
</tr>
<tr>
<td>refresh</td>
<td>Causes the named8 daemon to reread the /etc/named.conf file. Depending on the contents of the file, the refresh command may or may not reload the listed databases.</td>
</tr>
<tr>
<td>traceson</td>
<td>Enables tracing of a subsystem, group of subsystems, or a subserver.</td>
</tr>
<tr>
<td>tracesoff</td>
<td>Disables tracing of a subsystem, group of subsystems, or a subserver.</td>
</tr>
<tr>
<td>lssrc</td>
<td>Gets the status of a subsystem, group of subsystems, or a subserver.</td>
</tr>
</tbody>
</table>

Flags

- -b | -c ConfFile
- -d DebugLevel
  Specifies an alternate configuration file.
  Provides a debugging option. The -d flag causes the named8 daemon to write debugging information to a file named by default /var/tmp/named.run. The DebugLevel variable determines the level of messages printed, with valid levels from 1 to 11, where level 11 supplies the most information.
-p PortNumber

Reassigns the Internet socket where the named daemon listens for domain requests. If this variable is not specified, the named daemon listens to the socket defined in the /etc/services file; the entry in the /etc/services file begins with domain.

-w WorkingDirectory

Changes the working directory of the named daemon. This option can be specified or overridden by the "directory" configuration option.

-t RootDirectory

Specifies a directory to be the new root directory for the named daemon using the chroot command.

-q

Enables logging of all name service queries.

-r

Disables the server's ability to recurse and resolve queries outside of the server's local databases.

-f

Indicates to run the name server daemon in the foreground rather than becoming a background job.

Signals

The following signals have the specified effect when sent to the named daemon process using the kill command:

SIGHUP

The named daemon rereads the /etc/named.conf file. Depending on the contents of the file, the SIGHUP signal may or may not reload the listed databases.

SIGILL

Dumps statistics data into named.stats. Statistics data is appended to the file.

SIGINT

The named daemon dumps the current database to a file named /var/tmp/named_dump.db.

In the dump file, names with the label name error indicate negative cache entries. This happens when a server responds that the specified domain name does not exist. Names labeled as data error also indicate negative cache entries. This happens when a server responds that there are no records of the specified type for the (valid) domain name.

SIGUSR1

The named daemon turns on debugging; each subsequent SIGUSR1 signal increments the debugging level. The debugging information is written to the /var/tmp/named.run file.

SIGUSR2

The named daemon turns off debugging.

Examples

1. To start the named daemon normally, enter the following:

   startsrc -s named

   This command starts the daemon. You can use this command in the rc.tcpip file or on the command line. The -s flag specifies that the subsystem that follows is to be started. The process ID of the named daemon is stored in the /etc/named.pid file upon startup.

2. To stop the named daemon normally, enter:

   stopsrc -s named

   This command stops the daemon. The -s flag specifies that the subsystem that follows is to be stopped.

3. To get short status from the named daemon, enter:

   lssrc -s named

   This command returns the name of the daemon, the process ID of the daemon, and the state of the daemon (active or inactive).

4. To enable debugging for the named daemon, enter:

   traceson -s named

   OR

   kill -30 `cat /etc/named.pid`
The named8 daemon turns on debugging in response to either of these commands; each subsequent command increments the debugging level. The debugging information is written to the /var/tmp/named.run file.

5. To turn off debugging for the named8 daemon, enter:
   `tracesoff`
   OR
   `kill -31 `cat /etc/named.pid``
   Either of these commands immediately turns off all debugging.

6. To start the named8 daemon at the highest debugging level using the startsrc command, enter the following:
   `startsrc -s named -a -d11`
   This command writes debugging messages to the /var/tmp/named.run file.

### Files

- `/usr/sbin/named8` contains the named8 daemon.
- `/usr/sbin/named8-xfer` provides the functionality of the slave name server's inbound zone transfer.
- `/etc/named.conf` specifies the configuration of the named8 daemon including some basic behaviors, logging options, and locations of the local databases.
- `/etc/resolv.conf` specifies the use of domain name services.
- `/etc/rc.tcpip` initializes daemons at each system restart.
- `/etc/named.pid` stores process ID.
- `/etc/services` defines socket service assignments.
- `/usr/samples/tcpip/named.conf` contains the sample named.conf file with directions for its use.
- `/usr/samples/tcpip/named.data` contains the sample DOMAIN data file format.
- `/usr/samples/tcpip/hosts.awk` contains the sample awk script for converting an /etc/hosts file to an /etc/named.data file. This file also contains directions for its use.
- `/usr/samples/tcpip/addrs.awk` contains the sample awk script for converting an /etc/hosts file to an /etc/named.rev file. This file also contains directions for its use.

### Related Information

The nslookup command, traceroute command, kill command, chroot command.

The named.conf file format, DOMAIN Cache file format, DOMAIN Data file format, DOMAIN Reverse Data file format, Domain Local Data file format, resolv.conf file format.

TCP/IP name resolution and TCP/IP daemons in Networks and communication management.

Name server resolution and Planning for DOMAIN name resolution in Networks and communication management.

### named9 Daemon

#### Purpose

Internet domain name server.

#### Syntax

```bash
named9 [c config-file ] [d debug-level ] [-f ] [-g ] [-n #cpus ] [p port ] [-s ] [-v ] [-x cache-file ]
```
Description

**named** is a Domain Name System (DNS) server, part of the BIND 9 distribution from ISC. For more information on the DNS, see RFCs 1033, 1034, and 1035. When invoked without arguments, named will read the default configuration file `/etc/named.conf`, read any initial data, and listen for queries.

You can use the `dhcpremove` and `dhcpaction` scripts with `nsupdate` to perform a dynamic update to `named`. To do this, perform the following steps:

- Relink `nsupdate` to `nsupdate9`:
  ```
  ln -fs /usr/sbin/nsupdate9 /usr/sbin/nsupdate
  ```

- Make the following change to the `dhcpaction` and `dhcpremove` scripts:
  ```
  Change the following line:
  /usr/sbin/nsupdate8 > /dev/null 2>&1
  to the following:
  /usr/sbin/nsupdate > /dev/null 2>&1
  ```

Flags

- `config-file`
  Use `config-file` as the configuration file instead of the default, `/etc/named.conf`. To ensure that reloading the configuration file continues to work after the server has changed its working directory due to a possible directory option in the configuration file, `config-file` should be an absolute pathname.

- `debug-level`
  Set the daemon’s debug level to `debug-level`. Debugging traces from named become more verbose as the debug level increases.

- `f`
  Run the server in the foreground (i.e. do not daemonize).

- `g`
  Run the server in the foreground and force all logging to stderr.

- `cpu`
  Create `cpu` worker threads to take advantage of multiple CPUs. If not specified, named will try to determine the number of CPUs present and create one thread per CPU. If it is unable to determine the number of CPUs, a single worker thread will be created.

- `port`
  Listen for queries on port `port`. If not specified, the default is port 53.

- `s`
  Write memory usage statistics to `stdout` on exit.
  **Note:** This option is mainly of interest to BIND 9 developers and may be removed or changed in a future release.

- `v`
  Report the version number and exit.

- `cache-file`
  Load data from `cache-file` into the cache of the default view.
  **Attention:** This option must not be used. It is only of interest to BIND 9 developers.

Signals

In routine operation, signals should not be used to control the nameserver; `rndc` should be used instead.

<table>
<thead>
<tr>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIGHUP</td>
<td>Forces a reload of the server.</td>
</tr>
<tr>
<td>SIGINT, SIGTERM</td>
<td>Shut down the server.</td>
</tr>
</tbody>
</table>

The result of sending any other signals to the server is undefined.

Configuration

A complete description of the `named` configuration file is provided in the BIND 9 Administrator Reference Manual.
Files

/usr/sbin/named9
/etc/named.conf
/etc/named.pid

Contains the named9 daemon.
The default configuration file.
The default process-id file.

Related Information

The named8 daemon.
The named.conf file format,
RFC 1033, RFC 1034, RFC 1035, mdc(8), and lwresd(8).

namerslv Command

Purpose

Directly manipulates domain name server entries for local resolver routines in the system configuration database.

Syntax

To Add a Name Server Entry
namerslv a {-i IPAddress | -D DomainName | -S SearchList}

To Delete a Name Server Entry
namerslv d {-i IPAddress | -n | -l}

To Delete All Name Server Entries
namerslv X [-]

To Change a Name Server Entry
namerslv c DomainName

To Display a Name Server Entry
namerslv s [-i | -n | -l] [Z]

To Create the Configuration Database File
namerslv b [-] IPAddress [-D DomainName | -S SearchList]

To Rename the Configuration Database File
namerslv E FileName

To Move the Configuration Database File to Prevent Name Server Use
namerslv e

To Import a File into the Configuration Database File
namerslv B FileName

To Change a Search List Entry
namerslv C Search List
Description

The `namerslv` low-level command adds or deletes domain name server entries for local resolver routines in the system configuration database. By default, the system configuration database is contained in the `/etc/resolv.conf` file.

To use a name server, do one of the following:

- Specify a file name to use as the system configuration database.
- Specify an Internet Protocol address and, optionally, a domain name.

The `namerslv` command can show one or all domain name server entries in the system configuration database. The `namerslv` command can also rename the `/etc/resolv.conf` file so that it stops using a name server.

There are three types of domain name server entries:

- A domain entry identifying the name of the local Internet domain.
- A name server entry that identifies the Internet address of a domain name server for the local domain. The address must be in dotted decimal format.
- A search list entry that lists all the domains to search when resolving hostnames. This is a space delimited list.

One domain entry and a maximum of three name server entries can exist in the system configuration database. The `MAXNS` global variable in the `/usr/include/resolv.h` file defines the maximum number of name servers. One search entry can exist.

You can use the Web-based System Manager Network application (wsm network fast path) to run this command. You could also use the System Management Interface Tool (SMIT) smit namerslv fast path to run this command.

Flags

- `-a` Adds an entry to the system configuration database. The `-a` flag must be used with either the `-i` or `-D` flag.
- `-B FileName` Restores the `/etc/resolv.conf` file from the file specified by the `FileName` variable.
- `-b` Creates the system configuration database, using the `/etc/resolv.conf.sv` file. If the `/etc/resolv.conf.sv` file does not exist, an error is returned. **Note:** The `/etc/resolv.conf.sv` file is not shipped with the system. You have to create the file before the `-b` flag will work.
- `-C` Changes the search list in the `/etc/resolv.conf` file.
- `-c DomainName` Changes the domain name in the system configuration database.
- `-D` Indicates that the command deals with the domain name entry.
- `-d` Deletes an entry in the system configuration database. It must be used with the `-i IPAddress` flag or the `-n` flag. The `-i` flag deletes a name server entry. The `-n` flag deletes the domain name entry.
- `-E FileName` Renames the system configuration database file, so you can stop using a name server. The `/etc/resolv.conf` file is moved to the file specified by the `FileName` variable.
- `-e` Moves the `/etc/resolv.conf` file to the `/etc/resolv.conf.sv` file, preventing use of a name server.
- `-I` (Uppercase i) Specifies that the `-s` flag or `-X` flag should print all name server entries.
- `-i IPAddress` Indicates that the command deals with a name server entry. Use dotted decimal format for the given IP address.
- `-l` (Lowercase L) Specifies that the operation is on the search list. Use this flag with the `-d` and `-s` flag.
- `-n` Specifies that the operation is on the domain name. Use this flag with the `-d` flag and the `-s` flag.
- `-S SearchList` Changes the search list in the system configuration database.
-s
Shows all domain and name server entries in the configuration system database. If you use the -i flag, the namerslv command shows all name server entries. If you use the -n flag, the namerslv command shows the domain name entry found in the database.

-X
Deletes all entries in the database. Use the -f flag with this flag to delete all name server entries.

-Z
Generates the output of the query in colon format. This flag is used when the namerslv command is called from the SMIT usability interface.

Examples
1. To add a domain entry with a domain name of abc.aus.century.com, type:

   namerslv -a -D abc.aus.century.com

2. To change the abc.aus.century.com domain entry to the domain name xyz.aus.century.com, type:

   namerslv xyz.aus.century.com

3. To add a name server entry with IP address 192.9.201.1, type:

   namerslv -a -i 192.9.201.1

4. To show all system configuration database entries related to domain name server information used by local resolver routines, type:

   namerslv -s

   The output is given in the following format:
   domain xyz.aus.century.com
   name server 192.9.201.1

5. To rename the /etc/resolv.conf file to stop using the name server and specify the new file name, /etc/resolv.back, type:

   namerslv -E /etc/resolv.back

Files

/usr/sbin/namerslv
Contains the namerslv command.

/etc/resolv.conf
Contains the default system configuration database.

/etc/resolv.conf.sv
Contains the old system configuration database.

Related Information

The chnamsv command, lsnamsv command, mknamsv command, nslookup command, rmnamsv command, traceroute command.

Naming and TCP/IP daemons in Networks and communication management.

For information on installing the Web-based System Manager, see Chapter 2: Installation and System Requirements in AIX 5L Version 5.3 Web-based System Manager Administration Guide.

ncheck Command

Purpose
Generates path names from i-node numbers.
Syntax

ncheck [ [[ -a ] [ -i InNumber ... ]] ] [ -s ] [ FileSystem ]

Description

The ncheck command displays the i-node number and path names for filesystem files. It uses question marks (??) displayed in the path to indicate a component that could not be found. Path names displayed with ... (ellipses) at the beginning indicate either a loop or a path name of greater than 10 entries. The ncheck command uses a simple hashing algorithm to reconstruct the path names that it displays. Because of this, it is restricted to filesystems with less than 50,000 directory entries.

Flags

- `a` Lists the . (dot) and .. (dot dot) file names.
- `i InNumber` Lists only the file or files specified by the InNumber parameter.
- `s` Lists only special files and files with set-user-ID mode.

Examples

1. To list the i-node number and path name of each file in the default file systems, enter:
   ```
   ncheck
   ```
2. To list all the files in a specified file system, enter:
   ```
   ncheck -a /
   ```
   This lists the i-node number and path name of each file in the / (root) file system, including the .(dot) and .. (dot dot) entries in each directory.
3. To list the name of a file when you know its i-node number, enter:
   ```
   ncheck -i 690 357 280 /tmp
   ```
   This lists the i-node number and path name for every file in the /tmp file system with i-node numbers of 690, 357, or 280. If a file has more than one link, all of its path names are listed.
4. To list special and set-user-ID files, enter:
   ```
   ncheck -s /
   ```
   This lists the i-node and path name for every file in the / (root) file system that is a special file (also called a device file) or that has set-user-ID mode enabled.

Related Information

The fsck command, sort command.

File systems in Operating system and device management.

nddctl Command

Purpose

Issues commands to network device drivers (NDDs).

Syntax

nddctl { -r } Device
**Description**

The `nddctl` command allows the user to control an NDD device at runtime (that is, without having to reconfigure the device driver, which usually entails disruption to the network connection).

**Flags**

- `-r` Forces the NDD device to renegotiate its link attributes (speed and duplexity) at runtime.
  
  **Note:** Forcing link renegotiation entails resetting the device; this might cause a loss of network connectivity, lasting a few seconds, while the device re-initializes itself.

**Parameters**

- `Device` Specifies the NDD device on which to perform the specified command.

**Exit Status**

- `0` The command completed successfully.
- `>0` An error occurred.

**Examples**

1. To force the device `ent0` to renegotiate its link attributes at runtime, type:
   
   ```
   nddctl -r ent0
   ```

**Location**

`/usr/sbin` `ndp` `Command`

**Purpose**

IPv6 neighbor discovery display and control.

**Syntax**

- `ndp [-n] hostname`
- `ndp [-n] -a`
- `ndp [-d] hostname`
- `ndp [-i interface_index] -s hostname addr [ temp ]`

**Description**

The `ndp` program displays and modifies the IPv6-to-Ethernet, or the IPv6-to-TokenRing address translation tables used by the IPv6 neighbor discovery protocol.

With no flags, the program displays the current `ndp` entry for `hostname`. The host may be specified by name or by number, using IPv6 textual notation.
Flags

- **a**  Displays all of the current ndp entries.
- **d**  Lets a super-user delete an entry for the host called hostname with the -d flag.
- **i**  interface_index  Specifies the index of the interface to use when an ndp entry is added with the -s flag (useful with the local-link interface).
- **n**  Shows network addresses as numbers (normally ndp attempts to display addresses symbolically).
- **s** hostname addr  Creates an ndp entry for hostname with the Hardware address addr. The Hardware address is given as six hex bytes separated by colons. The entry is permanent unless the temp is specified in the command.

Examples

This is an example output from the -a flag:

```
# ndp -a
e-crankv6 (::903:9182) at link#2 0:20:af:db:b8:cf
e-crankv6-11 (fe80:0:100::20:afdb:b8cf) at link#2 0:20:af:db:b8:cf
# ndp -d e-crankv6-11
e-crankv6-11 (fe80:0:100::20:afdb:b8cf) deleted
```

Related Information

The [ifconfig] command, ndpd-host command, ndpd-router command, autoconf6 command.

ndpd-host Daemon

Purpose

NDP daemon for an host.

Syntax

```
nndpd-host [d] [v] [t]
```

Description

The ndpd-host command manages the Neighbor Discovery Protocol (NDP) for non-kernel activities: Router Discovery, Prefix Discovery, Parameter Discovery and Redirects. The ndpd-host command deals with the default route, including default router, default interface and default interface address.

Interfaces

The ndpd-host command knows about IEEE and CTI point to point interfaces. The ndpd-host command exchanges packets on all the known interfaces UP with a Link-Local Address. Any change of status of an interface is detected. If an interface goes down or loses its Link-Local address, the NDP processing is stopped on this interface. If an interface goes up, the NDP processing is started.

The IEEE interfaces are configured using the autoconf6 command. The PPP interfaces are configured using the pppd daemon. The token negotiation defines the Link-Local addresses. In order to send Router Advertisements over a CTI configured tunnel, it must have local and distant Link-Local addresses.

**Note:** For all the up point to point interfaces, ndpd-host sets a local route via lo0 for local addresses.
Flags

- **d** Enables debugging (exceptional conditions and dump).
- **v** Logs all interesting events (daemon.info and console).
- **t** Adds a time stamp in each log.

Signals

SIGUSR1 Turns on verbose.
SIGUSR2 Turns off verbose.
SIGINT Dumps the current state of ndpd-host to syslog or stdout.
SIGTERM Cleans up ndpd-host and exits.

Related Information

The `ifconfig` command, `route` command, `autoconf6` command, and the `ndpd-router` command.

ndpd-router Daemon

Purpose

NDP and RIPng daemon for a router.

Syntax

```
```

Description

The `ndpd-router` daemon manages the Neighbor Discovery Protocol (NDP) for non-kernel activities. It receives Router Solicitations and sends Router Advertisements. It can also exchange routing information using the RIPng protocol.

The `/etc/gateway6` file provides options for `ndpd-router`. This file can be modified while the program is running. The changes are checked before any emission or reception of message, or on reception of the HUP signal. The file contains directives, one by line (with # as comment). All the IPv6 addresses and prefixes in the file must be in numeric form. No symbolic name is allowed. Except for the gateway directive, each line begins with a keyword and is made of options of the form `key=argument`.

Interfaces

The `ndpd-router` daemon knows about IEEE and CTI point to point interfaces. The `ndpd-router` daemon exchanges packets on all the known interfaces UP with a Link-Local Address. Any change of status of an interface is detected. If an interface goes down or loses its Link-Local address, the NDP and RIPng processing is stopped on this interface. If an interface goes up, the NDP and RIPng processing is started.

To send Router Advertisements or RIPng packets or both, local and remote Link-Local addresses must be configured.

Flags

- **H** Enables the system to process NDP features needed to function as a mobile IPv6 home agent
- **m** Enables the system to aid movement detection for mobile IPv6 mobile nodes.
-D max [min[/life]] Sends Unsolicited Router Advertisements at intervals from min to max seconds. Default max value is 600 seconds, valid range is 4 to 1800 seconds. Default min equals to max / 3, valid range is from 1 to 0.75 * max. The router lifetime is set with life, default value is 10 * max. Valid range is 0 to 65535 seconds.

-T [reachtim] / [retrans] / [hlim] Sets the BaseReachableTime field to reachim seconds, if reachim is not zero. If retrans is not zero, sets the RetransTime field to retrans seconds. If hlim is not zero, sets the hop limit field in Router Advertisements to hlim.

-M Sets the M flag (stateful configuration) in advertisements.
-O Sets the O flag (other stateful information) in advertisements
-p Does not offer prefixes (learned from interface configuration).
-P [invlife]/[deplife] Sets the invalid life value and the deprecated life value for announced prefixes (in seconds). The default value is 0xffffffff (infinite).
-r Does not offer to be the default router in Router Advertisements.
-s Enables the RIPng protocol (the default is: RIPng disabled).
-q Enables the RIPng protocol, but does not send RIPng packets.
-g Broadcast a default route in RIPng.
-n Does not install routes received by RIPng.
-u port Uses UDP port port for RIPng. The default is 521.
-R Uses split horizon without corrupting reverse for RIPng.
-S Does not use any split horizon for RIPng.
-d Enables debugging (exceptional conditions and dump).
-v Logs all interesting events (daemon.info and console).
-t Adds timestamps in logged messages.

Available directives

The main directives for the /etc/gateway6 file are:

option [option-directive ...] Sets per-interface/default options.

prefix [prefix-directive ...] Sets per-interface/default prefix processing options.

filter [filter-directive ...] Sets per-interface/default filters.

gateway directives Sets routes in RIPng packets or in the kernel.

Each of these directives is explained in more detail below.

The option directive

Sets different per-interface options.

Any value settings for the option directive which follow the if option must appear in a comma-separated list.

Note: At least one option (other than the if option) must be specified following the option directive. If the if option is specified, it must be the first option following the option directive. There must be a space between the if option and any comma-separated list of options which follow.

Syntax:

option [ if=n1,n2 ] ripin=(y|n),ripout=(y|n|S|R),rtadv=(y|n|min[/max]),flag=(M|O),life=Seconds,reach=Seconds,retrans=Seconds
### The prefix directive

Defines the prefixes announced in Router advertisement directives. If there is no prefix-directive for an interface, the router advertisement contains the list of prefixes deduced from the address list of the interface. If there are prefix-directives, the router advertisement contains the list of prefixes defined by the different prefix directives (in order). No prefix is installed in the kernel. If there is one directive of the form prefix=none, no prefix list is advertised.

Syntax:

```
prefix if=n prefix=xxx/PrefixLength flag=[L][A] valid=Seconds deprec=Seconds
```

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>if=</td>
<td>Interface or interface=Interface</td>
</tr>
<tr>
<td>prefix=</td>
<td>xxx/PrefixLength</td>
</tr>
<tr>
<td>flag=[L][A]</td>
<td>Set the L and/or A flag for the prefix (the default is LA).</td>
</tr>
<tr>
<td>deprec=</td>
<td>Seconds</td>
</tr>
<tr>
<td>valid=</td>
<td>Seconds</td>
</tr>
</tbody>
</table>

### The filter directive

Define a filter pattern for incoming (filter=in) or outgoing (filter=out) RIPng packets. There is one incoming and one outgoing filter per interface, and one default incoming and one default outgoing filter for interfaces without explicit filter.
Any received RIPng information is tested against the input filter of the interface, or, if there is none, against the default input filter. The static interface routes are seen as input information coming from the interface and from a gateway with the link local address of the interface. The routes set by a gateway directive with a gateway keyword are seen as input information coming from the specified interface and gateway. The default route (-g flag) and the routes set by a gateway directive without a gateway keyword are seen as input information coming from gateway :: and no interface (the default input filter applies).

Any sent RIPng information is tested against the output filter of the interface, or, if there is none, against the default output filter.

Each filter is a sequence of matching patterns. The patterns are tested in order. Each pattern can test the prefix length, the source gateway (for input filters and that the prefix (padded with zeroes) matches a fixed prefix. If a pattern contains more than one test description, the match is the conjunction of all the tests. The first matching pattern defines the action to perform. If no pattern matches, the default action is accept. The possible actions are accept, reject and truncate/\( NumberOfBits \). The truncate/\( NumberOfBits \) action means: if the pattern matches and if prefix length is greater or equal to \( NumberOfBits \), accept the prefix with new length \( NumberOfBits \). The accepted prefix is immediately accepted, that is, not checked again against the filters.

For example, the following directive inhibits sending host routes on any interface without an explicit outgoing filter:

\[
\text{filter=out length==128 action=reject}
\]

**Syntax:**

\[
\text{filter=(in|out) [if\(=n1,n2\)] prefix=xx::/\( NumberOfBits \) gateway=xxx length=}\(=|\geq|\leq|<|>\)NumberofBits action=(accept|reject|truncate/xx)
\]

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>if=list or interface=list</td>
<td>If there is no interface keyword, the filter directive is a default option. If there is an interface field, the pattern is added at the end of the filters of all specified interfaces. The list is comma-separated. For example, you can specify interface=le* to specify all the leX interfaces.</td>
</tr>
<tr>
<td>prefix=xx::/( NumberOfBits )</td>
<td>The pattern matches only if xx::/( NumberOfBits ) is a prefix of the prefix in the RIPng packet.</td>
</tr>
<tr>
<td>gateway=xxx</td>
<td>The pattern matches only if the RIPng message comes from source address xxx, only in incoming filters.</td>
</tr>
<tr>
<td>length=(=</td>
<td>\geq</td>
</tr>
<tr>
<td>action=(accept</td>
<td>reject</td>
</tr>
</tbody>
</table>

**Gateway directives**

The gateway directives allow the user to set up routes in RIPng packets and/or in the kernel. These directives must appear at the end of the /etc/gateway6 file, after the other directives.

**Syntax:**

\[
\text{xxx::/\( NumberOfBits \) metric Value gateway IPv6Address ifname}
\]
The second syntax is used to add the route to the kernel.

Examples
The following examples are of the /etc/gateway6 file.

On a site where all addresses are of the form 5f06:2200:c001:0200:xxxx, the following example means that only one route, describing all the site, is exported on all the Configured Tunnel Interface (CTI) ctiX interfaces. The keyword abbreviations shown are valid.

```
filt=out if=cti* pref=5f06:2200:c001:0200::/64 len=>=64 act=trunc/64
```

Setting a default outgoing route:

```
::/0 metric 2 gateway 5f06:2200:c102:0200::1 cti0
```

Declare that any CTI interface active with RiPng defines a default route:

```
filter=in if=cti* act=trunc/0
```

The following example defines a site with an exterior connection cti0, which aggregates other sites connected through ctiX, and which uses split horizon without poisoned reverse. The order of the lines is important, as all filter descriptions apply to cti0.

```
option if=cti* ripout=R
filt=out if=cti* prefix=5f06:2200::/24 len=>=24 act=trunc/24
filt=out if=cti* pref=5f06:2200:c001:0200::/64 len=>=64 act=trunc/64
filt=in if=cti0 act=trunc/0
filt=in if=cti* prefix=5f06:2200::/24 len=>=24 act=trunc/64
filt=in if=cti* act=reject
```

Diagnostics
All errors are logged at the daemon.err level, unless the debug option is set. This includes all the syntax errors in the /etc/gateway6 file and configuration mismatches between different routers.

Signals
ndpd-router responds to the following signals:

```
SIGINT  Dumps its current state to syslog, if syslog is defined. Otherwise, dumped to stdout.
SIGHUP  The /etc/gateway6 file is read again.
SIGUSR1 Verbosity is incremented.
SIGUSR2 Verbosity is reset.
SIGTERM Resets to a reasonable state and stops.
SIGQUIT Resets to a reasonable state and stops.
```

Files
/etc/gateway6

Related Information
The ifconfig, kmodctrl, mobip6reqd, mobip6ctrl, route, autoconf6, ndpd-host commands.

The Mobile IPv6 in Networks and communication management.
ndx Command

Purpose
Creates a subject-page index for a document.

Syntax
ndx [ SubjectFile ] "FormatterCommandLine"

Description
The ndx command, given a list of subjects (SubjectFile), searches a specified English-language document and writes a subject-page index to standard output.

The document must include formatting directives for the mm, mmt, nroff, or troff commands. The formatter command line informs the ndx command whether the troff command, nroff command, mm command, or mmt command can be used to produce the final version of the document. These commands do the following:

- troff or mmt Specifies the troff command as the formatting program.
- nroff or mm Specifies the nroff command as the formatting program.

Parameters

SubjectFile
Specifies the list of subjects that are included in the index. Each subject must begin on a new line and have the following format:

word1[word2...][,wordk...]

For example:
printed circuit boards
arrays
arrays, dynamic storage
Smith, W.P.
printed circuit boards, channel-oriented multi-layer
Aranoff
University of Illinois
PL/1

The subject must start in column one.

FormatterCommandLine
Creates the final form of the document. The syntax for this parameter is as follows:

Formatter [Flag...] File...

mm -Tlp File(s)
nroff -mm -Tlp -rW60 File(s)
troff -rB2 -Tibm3816 -r01.5i File(s)

For more information on the formatter command line, see the mm command, mmt command, nroff command, and troff command.

The flags specified by the Flag variable are those that are given to the troff, nroff, mm, or mmt command in printing the final form of the document. These flags are necessary to determine the correct page numbers for subjects as they are located in the document. The ndx command does not cause the final version of the document to be printed. The author must create the document separately. Use the indexer only after the document is complete and cannot undergo further changes.
Examples

1. The following command produces a subject-page index for the file document and takes its subjects from the subfile list:
   
   ```
   ndx subfile "nroff -mm -rw70 file" > indexfile
   ```
   
   The page numbers correspond to the document produced by:
   
   ```
   nroff -mm -rw70 file
   ```
   
2. The following command produces a subject-page index for the documents ch1, ch2, and ch3:
   
   ```
   ndx subfile "mm -rw60 -rn2 -ro0 ch1 ch2 ch3" > indexfile
   ```
   
   The page numbers would correspond to the documents produced by:
   
   ```
   mm -rw60 -rn2 -ro0 ch1 ch2 ch3
   ```
   
3. The following command produces a subject-page index for the document file:
   
   ```
   ndx Subjfile "troff -rb2 -rw5i -ro1.5i -mm file" > indexfile
   ```
   
   The page numbers correspond to the document produced by entering:
   
   ```
   troff -rb2 -rw5i -ro1.5i -mm file
   ```

Related Information

The `mm` command, `mmt` command, `nroff` command, `subj` command, `troff` command.

neqn Command

Purpose

Formats mathematical text for the `nroff` command.

Syntax

```
neqn [ -d Delimiter1Delimiter2 ] [ -f Font ] [ -p Number ] [ -s Size ] [ - ] [ File ... | ]
```

Description

The `neqn` command is an `nroff` preprocessor for formatting mathematical text on typewriter-like terminals. Pipe the output of the `neqn` command into the `nroff` command as follows:

```
neqn [Flag...] File... | nroff [Flag...] | [Printer]
```

The `neqn` command reads one or more files. If no files are specified for the `File` parameter or the - (minus sign) flag is specified as the last parameter, standard input is read by default. A line beginning with the `\EQ` macro marks the start of equation text. The end of equation text is marked by a line beginning with the `\EN` macro. These lines are not altered by the `nroff` command, so they can be defined in macro packages to provide additional formatting functions such as centering and numbering.

The — (double dash) delimiter indicates the end of flags.

Depending on the target output devices, `neqn` command output formatted by the `nroff` command may need to be post-processed by the `col` command to produce correct output.

The `eqn` command gives more information about the input format and keywords used.
Flags

-\texttt{d}Delimiter1Delimiter2

Sets two ASCII characters, Delimiter1 and Delimiter2, as delimiters of the text to be processed by the \texttt{neqn} command, in addition to input enclosed by the \texttt{.EQ} and \texttt{.EN} macros. The text between these delimiters is treated as input to the \texttt{neqn} command.

Within a file, you can also set delimiters for \texttt{neqn} text using the \texttt{delim Delimiter1Delimiter2} request. These delimiters are turned off by the \texttt{delim off} request. All text that is not between delimiters or the \texttt{.EQ} macro and \texttt{.EN} macro is passed through unprocessed.

-\texttt{f}Font

Changes font in all the \texttt{neqn} command-processed text to the value specified by the \texttt{Font} variable. The \texttt{Font} value (a font name or position) must be one or two ASCII characters.

-\texttt{p}Number

Reduces subscripts and superscripts to the specified number of points in size. The default is 3 points.

-\texttt{s}Size

Changes point size in all the \texttt{neqn} command-processed text to the value specified by the \texttt{Size} variable.

- (double dash) Marks the end of the flags.

Files

\texttt{/usr/share/lib/pub/eqnchar} Contains special character definitions.

Related Information

The \texttt{checkeq} command, \texttt{col} command, \texttt{eqn} command, \texttt{mm} command, \texttt{nroff} command, \texttt{tbl} command.

The \texttt{.EN} macro, \texttt{.EQ} macro, \texttt{mm} macro.

The \texttt{eqnchar} file format.

netpmon Command

Purpose

Monitors activity and reports statistics on network I/O and network-related CPU usage.

Syntax


Gennames_File

Description

The \texttt{netpmon} command monitors a trace of system events, and reports on network activity and performance during the monitored interval. By default, the \texttt{netpmon} command runs in the background while one or more application programs or system commands are being executed and monitored. The \texttt{netpmon} command automatically starts and monitors a trace of network-related system events in real time. By default, the trace is started immediately; optionally, tracing may be deferred until the user issues a \texttt{trcstop} command. When tracing is stopped by a \texttt{trcstop} command, the \texttt{netpmon} command generates all specified reports and exits.

The \texttt{netpmon} command can also work in offline mode, that is, on a previously generated trace file. In this mode, a file generated by the \texttt{gennames} command is also required. The gennames file should be
generated immediately after the trace has been stopped, and on the same machine. When running in offline mode, the netpmon command cannot recognize protocols used by sockets, which limits the level of detail available in the socket reports.

The netpmon command reports on the following system activities:

**CPU Usage**

The netpmon command monitors CPU usage by all threads and interrupt handlers. It estimates how much of this usage is due to network-related activities.

**Network Device-Driver I/O**

The netpmon command monitors I/O operations through Micro-Channel Ethernet, token-ring, and Fiber-Distributed Data Interface (FDDI) network device drivers. In the case of transmission I/O, the command also monitors utilizations, queue lengths, and destination hosts. For receive ID, the command also monitors time in the demux layer.

**Internet Socket Calls**

The netpmon command monitors all `send`, `recv`, `sendto`, `recvfrom`, `read`, and `write` subroutines on Internet sockets. It reports statistics on a per-process basis, for each of the following protocol types:

- Internet Control Message Protocol (ICMP)
- Transmission Control Protocol (TCP)
- User Datagram Protocol (UDP)

**NFS I/O**

The netpmon command monitors `read` and `write` subroutines on client Network File System (NFS) files, client NFS remote procedure call (RPC) requests, and NFS server read or write requests. The command reports subroutine statistics on a per-process or optional per-thread basis and on a per-file basis for each server. The netpmon command reports client RPC statistics for each server, and server read and write statistics for each client.

Any combination of the preceding report types can be specified with the command line flags. By default, all the reports are produced.

**Notes:** The reports produced by the netpmon command can be quite long. Consequently, the `-o` flag should usually be used to write the report to an output file. The netpmon command obtains performance data using the system trace facility. The trace facility only supports one output stream. Consequently, only one netpmon or trace process can be active at a time. If another netpmon or trace process is already running, the netpmon command responds with the message:

```
/dev/systrace: Device busy
```

While monitoring very network-intensive applications, the netpmon command may not be able to consume trace events as fast as they are produced in real time. When that happens, the error message:

```
Trace kernel buffers overflowed, N missed entries
```

displays on standard error, indicating how many trace events were lost while the trace buffers were full. The netpmon command continues monitoring network activity, but the accuracy of the report diminishes by some unknown degree. One way to avoid overflow is to increase the trace buffer size using the `-T` flag, to accommodate larger bursts of trace events before overflow. Another way to avoid overflow problems all together is to run netpmon in offline mode.

When running in memory-constrained environments (where demand for memory exceeds supply), the `-P` flag can be used to pin the text and data pages of the real-time netpmon process in memory so the pages cannot be swapped out. If the `-P` flag is not used, allowing the netpmon process to be swapped out, the progress of the netpmon command may be delayed such that it cannot process trace events fast enough to prevent trace buffer overflow.
If the /unix file and the running kernel are not the same, the kernel addresses will be incorrect, causing the netpmon command to exit.

Flags

- `d` Starts the netpmon command, but defers tracing until the trcon command has been executed by the user. By default, tracing is started immediately.

- `i Trace_File` Reads trace records from the file Trace_File produced with the trace command instead of a live system. The trace file must be rewritten first in raw format using the trcpt -r command. This flag cannot be used without the -n flag.

- `n Gennames_File` Reads necessary mapping information from the file Gennames_File produced by the gennames command. This flag is mandatory when the -i flag is used.

- `o File` Writes the reports to the specified File, instead of to standard output.

- `O ReportType ...` Produces the specified report types. Valid report type values are:

  - `cpu` CPU usage
  - `dd` Network device-driver I/O
  - `so` Internet socket call I/O
  - `nfs` NFS I/O (any version)
  - `nfs2` NFS Version 2 I/O
  - `nfs3` NFS Version 3 I/O
  - `nfs4` NFS Version 4 I/O
  - `all` All reports are produced. This is the default value.

- `-P` Pins monitor process in memory. This flag causes the netpmon text and data pages to be pinned in memory for the duration of the monitoring period. This flag can be used to ensure that the real-time netpmon process does not run out of memory space when running in a memory-constrained environment.

- `-r PURR` Uses PURR time instead of TimeBase in percent and CPU time calculation. Elapsed time calculations are unaffected.

- `-t` Prints CPU reports on a per-thread basis.

- `-T n` Sets the kernel’s trace buffer size to n bytes. The default size is 64000 bytes. The buffer size can be increased to accommodate larger bursts of events, if any. (A typical event record size is on the order of 30 bytes.)

  Note: The trace driver in the kernel uses double buffering, so actually two buffers of size n bytes will be allocated. These buffers are pinned in memory, so they are not subject to paging.

- `-v` Prints extra information in the report. All processes and all accessed remote files are included in the report instead of only the 20 most active processes and files.

Reports

The reports generated by the netpmon command begin with a header, which identifies the date, the machine ID, and the length of the monitoring period in seconds. This is followed by a set of summary and detailed reports for all specified report types.

CPU Usage Reports

Process CPU Usage Statistics: Each row describes the CPU usage associated with a process. Unless the verbose option is specified, only the 20 most active processes are listed. At the bottom of the report, CPU usage for all processes is totaled, and CPU idle time is reported.

Process

  - Process name

PID

  - Process ID number
CPU Time
   Total amount of CPU time used by this process

CPU %
   CPU usage for this process as a percentage of total time

Network CPU %
   Percentage of total time that this process spent executing network-related code

Thread CPU Usage Statistics
   If the -t flag is used, each process row described above is immediately followed by rows
describing the CPU usage of each thread owned by that process. The fields in these rows are
identical to those for the process, except for the name field. (Threads are not named.)

First-Level Interrupt Handler Usage Statistics: Each row describes the CPU usage associated with
a first-level interrupt handler (FLIH). At the bottom of the report, CPU usage for all FLIHs is totaled.

FLIH
   First-level interrupt handler description

CPU Time
   Total amount of CPU time used by this FLIH

CPU %
   CPU usage for this interrupt handler as a percentage of total time

Network CPU %
   Percentage of total time that this interrupt handler executed on behalf of network-related events

Second-Level Interrupt Handler Usage Statistics: Each row describes the CPU usage associated with a
second-level interrupt handler (SLIH). At the bottom of the report, CPU usage for all SLIHs is totaled.

SLIH
   Second-level interrupt handler description

CPU Time
   Total amount of CPU time used by this SLIH

CPU %
   CPU usage for this interrupt handler as a percentage of total time

Network CPU %
   Percentage of total time that this interrupt handler executed on behalf of network-related events

Summary Network Device-Driver Reports

Network Device-Driver Statistics (by Device): Each row describes the statistics associated with a
network device.

Device
   Path name of special file associated with device

Xmit Pkts/s
   Packets per second transmitted through this device

Xmit Bytes/s
   Bytes per second transmitted through this device

Xmit Util
   Busy time for this device, as a percent of total time

Xmit Qlen
   Number of requests waiting to be transmitted through this device, averaged over time, including
   any transaction currently being transmitted

Recv Pkts/s
   Packets per second received through this device

Recv Bytes/s
   Bytes per second received through this device
**Recv Demux**

Time spent in demux layer as a fraction of total time

**Network Device-Driver Transmit Statistics (by Destination Host):** Each row describes the amount of transmit traffic associated with a particular destination host, at the device-driver level.

**Host** Destination host name. An * (asterisk) is used for transmissions for which no host name can be determined.

**Pkts/s** Packets per second transmitted to this host

**Xmit Bytes/s** Bytes per second transmitted to this host

**Summary Internet Socket Reports**

- **On-line mode:** Socket Call Statistics for Each Internet Protocol (by Process): Each row describes the amount of read/write subroutine activity on sockets of this protocol type associated with a particular process. Unless the verbose option is specified, only the top 20 processes are listed. At the bottom of the report, all socket calls for this protocol are totaled.

- **Off-line mode:** Socket Call Statistics for Each Process: Each row describes the amount of read/write subroutine activity on sockets associated with a particular process. Unless the verbose option is specified, only the top 20 processes are listed. At the bottom of the report, all socket calls are totaled.

**Process** Process name

**PID** Process ID number

**Read Calls/s or Read Ops/s** Number of read, recv, and recvfrom subroutines per second made by this process on sockets of this type

**Read Bytes/s** Bytes per second requested by the above calls

**Write Calls/s or Write Ops/s** Number of write, send, and sendto subroutines per second made by this process on sockets of this type

**Write Bytes/s** Bytes per second written by this process to sockets of this protocol type

**Summary NFS Reports**

**NFS Client Statistics for Each Server (by File):** Each row describes the amount of read/write subroutine activity associated with a file mounted remotely from this server. Unless the verbose option is specified, only the top 20 files are listed. At the bottom of the report, calls for all files on this server are totaled.

**File** Simple file name

**Read Calls/s or Read Ops/s** Number of read subroutines per second on this file

**Read Bytes/s** Bytes per second requested by the above calls

**Write Calls/s or Write Ops/s** Number of write subroutines per second on this file

**Write Bytes/s** Bytes per second written to this file
NFS Client RPC Statistics (by Server): Each row describes the number of NFS remote procedure calls being made by this client to a particular NFS server. At the bottom of the report, calls for all servers are totaled.

Server
Host name of server. An * (asterisk) is used for RPC calls for which no hostname could be determined.

Calls/s or Ops/s
Number of NFS RPC calls per second being made to this server.

NFS Client Statistics (by Process): Each row describes the amount of NFS read/write subroutine activity associated with a particular process. Unless the verbose option is specified, only the top 20 processes are listed. At the bottom of the report, calls for all processes are totaled.

Process
Process name

PID
Process ID number

Read Calls/s or Read Ops/s
Number of NFS read subroutines per second made by this process

Read Bytes/s
Bytes per second requested by the above calls

Write Calls/s or Write Ops/s
Number of NFS write subroutines per second made by this process

Write Bytes/s
Bytes per second written to NFS mounted files by this process

NFS Server Statistics (by Client): Each row describes the amount of NFS activity handled by this server on behalf of particular client. At the bottom of the report, calls for all clients are totaled.

Client
Host name of client

Read Calls/s or Read Ops/s
Number of remote read requests per second processed on behalf of this client

Read Bytes/s
Bytes per second requested by this client's read calls (NFS Versions 2 and 4 only)

Write Calls/s or Write Ops/s
Number of remote write requests per second processed on behalf of this client

Write Bytes/s
Bytes per second written by this client (NFS Versions 2 and 4 only)

Other Calls/s or Ops/s
Number of other remote requests per second processed on behalf of this client

Detailed Reports
Detailed reports are generated for any of the specified report types. For these report types, a detailed report is produced for most of the summary reports. The detailed reports contain an entry for each entry in the summary reports with statistics for each type of transaction associated with the entry.

Transaction statistics consist of a count of the number of transactions of that type, followed by response time and size distribution data (where applicable). The distribution data consists of average, minimum, and

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maximum values, as well as standard deviations. Roughly two-thirds of the values are between average - standard deviation and average + standard deviation. Sizes are reported in bytes. Response times are reported in milliseconds.

**Detailed Second Level Interrupt Handler CPU Usage Statistics:**

- **SLIH**   Name of second-level interrupt handler
- **Count**  Number of interrupts of this type
- **CPU Time (Msec)**  CPU usage statistics for handling interrupts of this type

**Detailed Network Device-Driver Statistics (by Device):**

- **Device**  Path name of special file associated with device
- **Recv Packets**  Number of packets received through this device
- **Recv Sizes (Bytes)**  Size statistics for received packets
- **Recv Times (msec)**  Response time statistics for processing received packets
- **Xmit Packets**  Number of packets transmitted to this host
- **Demux Times (msec)**  Time statistics for processing received packets in the demux layer
- **Xmit Sizes (Bytes)**  Size statistics for transmitted packets
- **Xmit Times (Msec)**  Response time statistics for processing transmitted packets

**Detailed Network Device-Driver Transmit Statistics (by Host):**

- **Host**  Destination host name
- **Xmit Packets**  Number of packets transmitted through this device
- **Xmit Sizes (Bytes)**  Size statistics for transmitted packets
- **Xmit Times (Msec)**  Response time statistics for processing transmitted packets

**Detailed Socket Call Statistics for Each Internet Protocol (by Process):** *(on-line mode)*

**Detailed Socket Call Statistics for Each Process:** *(off-line mode)*

- **Process**  Process name
- **PID**  Process ID number
- **Reads**  Number of `read`, `recv`, `recvfrom`, and `recvmsg` subroutines made by this process on sockets of this type
- **Read Sizes (Bytes)**  Size statistics for `read` calls
Read Times (Msec)
Response time statistics for read calls

Writes
Number of write, send, sendto, and sendmsg subroutines made by this process on sockets of this type

Write Sizes (Bytes)
Size statistics for write calls

Write Times (Msec)
Response time statistics for write calls

Detailed NFS Client Statistics for Each Server (by File):

File File path name
Reads Number of NFS read subroutines for this file
Read Sizes (Bytes) Size statistics for read calls
Read Times (Msec) Response time statistics for read calls
Writes Number of NFS write subroutines for this file
Write Sizes (Bytes) Size statistics for write calls
Write Times (Msec) Response time statistics for write calls

Detailed NFS Client Statistics (by Process):

Process Process name
PID Process ID number
Reads Number of NFS read subroutines made by this process
Read Sizes (Bytes) Size statistics for read calls
Read Times (Msec) Response time statistics for read calls
Writes Number of NFS write subroutines made by this process

Note: In the case of NFS3 and NFS4, netpmon will report RPC calls over TCP only. RPC calls over UDP will be reported only for NFS2.
Write Sizes (Bytes)
Size statistics for write calls

Write Times (Msec)
Response time statistics for write calls

Detailed NFS Server Statistics (by Client):

Client
Client host name

Reads Number of NFS read requests received from this client

Read Sizes (Bytes)
Size statistics for read requests

Read Times (Msec)
Response time statistics for read requests

Writes
Number of NFS write requests received from this client

Write Sizes (Bytes)
Size statistics for write requests

Write Times (Msec)
Response time statistics for write requests

Other Calls
Number of other NFS requests received from this client

Other Times (Msec)
Response time statistics for other requests

Examples
1. To monitor network activity during the execution of certain application programs and generate all report types, type:
   netpmon
   <run application programs and commands here>
   trcstop
   The netpmon command automatically starts the system trace and puts itself in the background. Application programs and system commands can be run at this time. After the trcstop command is issued, all reports are displayed on standard output.

2. To generate CPU and NFS report types and write the reports to the nmon.out file, type:
   netpmon -o nmon.out -O cpu,nfs
   <run application programs and commands here>
   trcstop
   The netpmon command immediately starts the system trace. After the trcstop command is issued, the I/O activity report is written to the nmon.out file. Only the CPU and NFS reports will be generated.

3. To generate all report types and write verbose output to the nmon.out file, type:
   netpmon -v -o nmon.out
   <run application programs and commands here>
   trcstop
   With the verbose output, the netpmon command indicates the steps it is taking to start up the trace. The summary and detailed reports include all files and processes, instead of just the 20 most active files and processes.

4. To use the netpmon command in offline mode, type:
   trace -a
   run application programs and commands here
   trcoff
gennames > gen.out
trcstop
trcrpt -r /var/adm/ras/trcfile > tracefile.r
netpmon -i tracefile.r -n gen.out -o netpmon.out

Related Information
The `trcstop` command, `trace` command, and `gennames` command.

The `recv` subroutine, `recvfrom` subroutine, `send` subroutine, `sendto` subroutine, and `trcoff` subroutine.

netstat Command

Purpose
Shows network status.

Syntax

To Display Active Sockets for Each Protocol or Routing Table Information
/bin/netstat [ -n ] [ { -A | -a } | { -r | -C | -i | -I Interface } ] [ -f AddressFamily ] [ -p Protocol ] [ Interval ] [ System ]

To Display the Contents of a Network Data Structure
/bin/netstat [ -m | -M | -s | -ss | -u | -v ] [ -f AddressFamily ] [ -p Protocol ] [ Interval ] [ System ]

To Display the Packet Counts Throughout the Communications Subsystem
/bin/netstat -D

To Display the Network Buffer Cache Statistics
/bin/netstat -c

To Display the Data Link Provider Interface Statistics
/bin/netstat -P

To Clear the Associated Statistics
/bin/netstat [ -Zc | -Zl | -Zm | -Zs ]

Description
The `netstat` command symbolically displays the contents of various network-related data structures for active connections. The `Interval` parameter, specified in seconds, continuously displays information regarding packet traffic on the configured network interfaces. The `Interval` parameter takes no flags. The `System` parameter specifies the memory used by the current kernel. Unless you are looking at a dump file, the `System` parameter should be `/unix`.

Flags

- `A` Shows the address of any protocol control blocks associated with the sockets. This flag acts with the default display and is used for debugging purposes.
- `a` Shows the state of all sockets. Without this flag, sockets used by server processes are not shown.
Shows the statistics of the Network Buffer Cache.

The Network Buffer Cache is a list of network buffers that contain data objects that can be transmitted to networks. The Network Buffer Cache grows dynamically as data objects are added to or removed from it. The Network Buffer Cache is used by some network kernel interfaces for performance enhancement on the network I/O. The `netstat -c` command prints the following statistic:

Network Buffer Cache Statistics:
- Current total cache buffer size: 0
- Maximum total cache buffer size: 0
- Current total cache data size: 0
- Maximum total cache data size: 0
- Current number of cache: 0
- Maximum number of cache: 0
- Number of cache with data: 0
- Number of searches in cache: 0
- Number of cache hit: 0
- Number of cache miss: 0
- Number of cache newly added: 0
- Number of cache updated: 0
- Number of cache removed: 0
- Number of successful cache accesses: 0
- Number of unsuccessful cache accesses: 0
- Number of cache validation: 0
- Current total cache data size in private segments: 0
- Maximum total cache data size in private segments: 0
- Current total number of private segments: 0
- Maximum total number of private segments: 0
- Current number of free private segments: 0
- Current total NBC_NAMED_FILE entries: 0
- Maximum total NBC_NAMED_FILE entries: 0

Shows the routing tables, including the user-configured and current costs of each route. The user-configured cost is set using the `-hopcount` flag of the `route` command. The current cost may be different than the user-configured cost if Dead Gateway Detection has changed the cost of the route.

In addition to the costs of the route, it also shows the weight and policy information associated with each route. These fields are applicable only when the Multipath Routing Feature is used. The policy information displays the routing policy that has been currently selected to choose between the multiple routes available. The policies available are:
- Default - Weighted Round Robin (WRR)
- Hashed (HSH)
- Random (RND)
- Weighted Random (WRND)
- Lowest Utilization (LUT)

The weight field is a user-configured weight associated with the route that will be used for Weighted Round-Robin and Weighted Random Policies. For more information about these policies, see the `no` command.

Shows the number of packets received, transmitted, and dropped in the communications subsystem.

**Note:** In the statistics output, a N/A displayed in a field value indicates the count is not applicable. For the NFS/RPC statistics, the number of incoming packets that pass through RPC are the same packets that pass through NFS, so these numbers are not summed in the NFS/RPC Total field, thus the N/A. NFS has no outgoing packet or outgoing packet drop counters specific to NFS and RPC. Therefore, individual counts have a field value of N/A, and the cumulative count is stored in the NFS/RPC Total field.
-f AddressFamily  Limits reports of statistics or address control blocks to those items specified by
the AddressFamily variable. The following address families are recognized:

inet  Indicates the AF_INET address family.
inet6  Indicates the AF_INET6 address family.
unix  Indicates the AF_UNIX address family.

-i  Shows the state of all configured interfaces. See "Interface Display."

Note: The collision count for Ethernet interfaces is not supported.

-I Interface  Shows the state of the configured interface specified by the Interface variable.

-M  Shows network memory's mbuf cluster pool statistics.

-m  Shows statistics recorded by the memory management routines.

-n  Shows network addresses as numbers. When this flag is not specified, the netstat command interprets addresses where possible and displays them symbolically. This flag can be used with any of the display formats.

-o  Used in conjunction with the -a flag to display detailed data about a socket, such as socket options, flags, and buffer statistics.

-p Protocol  Shows statistics about the value specified for the Protocol variable, which is either a well-known name for a protocol or an alias for it. Some protocol names and aliases are listed in the /etc/protocols file. A null response means that there are no numbers to report. The program report of the value specified for the Protocol variable is unknown if there is no statistics routine for it.

-P  Shows the statistics of the Data Link Provider Interface (DLPI). The netstat -P command prints the following statistic:

DLPI statistics:
Number of received packets = 0
Number of transmitted packets = 0
Number of received bytes = 0
Number of transmitted bytes = 0
Number of incoming pkts discard = 0
Number of outgoing pkts discard = 0
Number of times no buffers = 0
Number of successful binds = 0
Number of unknown message types = 0
Status of phys level promisc = 0
Status of sap level promisc = 0
Status of multi level promisc = 0
Number of enab_multi addresses = 0

If DLPI is not loaded, it displays:
can't find symbol: dl_stats

-r  Shows the routing tables. When used with the -s flag, the -r flag shows routing statistics. See "Routing Table Display."

-s  Shows statistics for each protocol.

-ss  Displays all the non-zero protocol statistics and provides a concise display.

-u  Displays information about domain sockets.

-v  Shows statistics for CDLI-based communications adapters. This flag causes the netstat command to run the statistics commands for the entstat, tokstat, and fddistat commands. No flags are issued to these device driver commands. See the specific device driver statistics command to obtain descriptions of the statistical output.

-Zc  Clear network buffer cache statistics.

-Zl  Clear interface statistics.

-Zm  Clear network memory allocator statistics.

-Zs  Clear protocol statistics. To clear statistics for a specific protocol, use -p <protocol>. For example, to clear TCP statistics, type netstat -Zs -p tcp.
Default Display
The default display for active sockets shows the following items:

- Local and remote addresses
- Send and receive queue sizes (in bytes)
- Protocol
- Internal state of the protocol

Internet address formats are of the form host.port or network.port if a socket's address specifies a network but no specific host address. The host address is displayed symbolically if the address can be resolved to a symbolic host name, while network addresses are displayed symbolically according to the /etc/networks file.

If a symbolic name for a host is not known or if the -n flag is used, the address is printed numerically, according to the address family. Unspecified addresses and ports appear as an * (asterisk).

Interface Display (netstat -i)

The interface display format provides a table of cumulative statistics for the following items:

- Errors
- Collisions

  **Note:** The collision count for Ethernet interfaces is not supported.

- Packets transferred

The interface display also provides the interface name, number, and address as well as the maximum transmission units (MTUs).

Routing Table Display (netstat -r)

The routing table display indicates the available routes and their statuses. Each route consists of a destination host or network and a gateway to use in forwarding packets.

A route is given in the format A.B.C.D/XX, which presents two pieces of information, A.B.C.D indicates the destination address and XX indicates the netmask associated with the route. The netmask is represented by the number of bits set. For example, the route 9.3.252.192/26 has a netmask of 255.255.255.192, which has 26 bits set.
The routing table contains the following ten fields:

**Flags**

The **flags** field of the routing table shows the state of the route:

- **A**: An Active Dead Gateway Detection is enabled on the route. This field only applies to AIX 5.1 or later.
- **U**: Up.
- **H**: The route is to a host rather than to a network.
- **G**: The route is to a gateway.
- **D**: The route was created dynamically by a redirect.
- **M**: The route has been modified by a redirect.
- **L**: The link-level address is present in the route entry.
- **c**: Access to this route creates a cloned route.
- **W**: The route is a cloned route.
- **1**: Protocol specific routing flag #1.
- **2**: Protocol specific routing flag #2.
- **3**: Protocol specific routing flag #3.
- **b**: The route represents a broadcast address.
- **e**: Has a binding cache entry.
- **I**: The route represents a local address.
- **m**: The route represents a multicast address.
- **P**: Pinned route.
- **R**: Host or net unreachable.
- **S**: Manually added.
- **u**: Route usable.
- **s**: The Group Routing stopsearch option is enabled on the route.

Direct routes are created for each interface attached to the local host.

The **gateway** field for these entries shows the address of the outgoing interface.

Give the current number of active uses for the route. Connection-oriented protocols hold on to a single route for the duration of a connection, while connectionless protocols obtain a route while sending to the same destination.

Provides a count of the number of packets sent using that route.

Give the Path Maximum Transfer Unit (PMTU). AIX 5.3 does not display the PMTU column.

Indicates the network interfaces utilized for the route.

Displays the time (in minutes) remaining before the route expires.

Lists the group IDs associated with that route.

Lists the netmasks applied on the system.

Specifies the active address families for existing routes. Supported values for this field are:

- **1**: Specifies the UNIX address family.
- **2**: Specifies the Internet address family (for example, TCP and UDP).

For more information on other address families, refer to the `/usr/include/sys/socket.h` file.
When a value is specified for the Interval parameter, the netstat command displays a running count of statistics related to network interfaces. This display contains two columns: a column for the primary interface (the first interface found during autoconfiguration) and a column summarizing information for all interfaces.

The primary interface may be replaced with another interface by using the -I flag. The first line of each screen of information contains a summary of statistics accumulated since the system was last restarted. The subsequent lines of output show values accumulated over intervals of the specified length.

Examples

1. To display routing table information for an Internet interface, type:

   netstat -r -f inet

   This produces the following output:

   Routing tables
   Destination Gateway Flags Refs Use PMTU If Exp Groups Netmasks:
   (root node)
   (0)0 ffff f000 0
   (0)0 ffff f000 0
   (0)0 8123 262f 0 0 0 0
   (root node)

   Route Tree for Protocol Family 2:
   (root node)
   default 129.35.38.47 UG 0 564 - tr0 -
   loopback 127.0.0.1 UH 1 202 - 100 -
   129.35.32 129.35.41.172 U 4 30 - tr0 - +staff
   129.35.32.117 129.35.41.172 UGHW 0 13 1492 tr0 30
   192.100.61 192.100.61.11 U 1 195 - en0 -
   (root node)

   Route Tree for Protocol Family 6:
   (root node)
   (root node)

   The -r -f inet flags indicate a request for routing table information for all configured Internet interfaces. The network interfaces are listed in the Interface column; en designates a Standard Ethernet interface, while tr specifies a Token-Ring interface. Gateway addresses are in dotted decimal format.

   Note: AIX 5.3 does not display the PMTU column.

2. To display statistics for GRE Protocol, type:

   netstat -s -p gre

   This produces the following output:

   GRE Interface gre0
   10 number of times gre_input got called
   8 number of times gre_output got called
   0 packets received with protocol not supported
   0 packets received with checksum on
   0 packets received with routing present
   0 packets received with key present
   0 packets received with sequence number present
   0 packets received with strict source route present
   0 packets received with recursion control present
   0 packets received where reserved0 non-zero
   0 packets received where version non-zero
   0 packets discarded
   0 packets dropped due to network down
   0 packets dropped due to protocol not supported
0 packets dropped due to error in ip output routine
0 packets got by NAT
0 packets got by NAT but not TCP packet
0 packets got by NAT but with IP options

3. To display interface information for an Internet interface, type:
netstat -i -f inet

This produces the following output if you are using AIX 4.2:

<table>
<thead>
<tr>
<th>Name</th>
<th>Mtu</th>
<th>Network</th>
<th>Address</th>
<th>Ipks</th>
<th>Ierrs</th>
<th>Opkts</th>
<th>Oerrs</th>
<th>Coll</th>
</tr>
</thead>
<tbody>
<tr>
<td>lo0</td>
<td>1536</td>
<td>&lt;Link&gt;</td>
<td></td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>lo0</td>
<td>1536</td>
<td>127</td>
<td>loopback</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>en0</td>
<td>1500</td>
<td>&lt;Link&gt;</td>
<td></td>
<td>96</td>
<td>0</td>
<td>67</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>en0</td>
<td>1500</td>
<td>192.100.61</td>
<td>nullarbor</td>
<td>96</td>
<td>0</td>
<td>67</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>tr0</td>
<td>1500</td>
<td>&lt;Link&gt;</td>
<td></td>
<td>44802</td>
<td>0</td>
<td>11134</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>tr0</td>
<td>1500</td>
<td>129.35.32</td>
<td>stnullarb</td>
<td>44802</td>
<td>0</td>
<td>11134</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

This produces the following output if you are using AIX 4.3:

<table>
<thead>
<tr>
<th>Name</th>
<th>Mtu</th>
<th>Network</th>
<th>Address</th>
<th>Ipks</th>
<th>Ierrs</th>
<th>Opkts</th>
<th>Oerrs</th>
<th>Coll</th>
</tr>
</thead>
<tbody>
<tr>
<td>lo0</td>
<td>16896</td>
<td>Link#1</td>
<td></td>
<td>5161</td>
<td>0</td>
<td>5193</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>lo0</td>
<td>16896</td>
<td>127</td>
<td>localhost</td>
<td>5161</td>
<td>0</td>
<td>5193</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>lo0</td>
<td>16896</td>
<td>::1</td>
<td></td>
<td>5161</td>
<td>0</td>
<td>5193</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>en1</td>
<td>1500</td>
<td>Link#2</td>
<td>8.0.38.22.8.34</td>
<td>221240</td>
<td>0</td>
<td>100284</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>en1</td>
<td>1500</td>
<td>129.183.64</td>
<td>infoserv.frec.bul</td>
<td>221240</td>
<td>0</td>
<td>100284</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

The -i -f inet flags indicate a request for the status of all configured Internet interfaces. The network interfaces are listed in the Name column; lo designates a loopback interface, en designates a Standard Ethernet interface, while tr specifies a Token-Ring interface.

4. To display statistics for each protocol, type:
netstat -s -f inet

This produces the following output:

ip:

44485 total packets received
0 bad header checksums
0 with size smaller than minimum
0 with data size < data length
0 with header length < data size
0 with data length < header length
0 with bad options
0 with incorrect version number
0 fragments received
0 fragments dropped (dup or out of space)
0 fragments dropped after timeout
0 packets reassembled ok
44485 packets for this host
0 packets for unknown/unsupported protocol
0 packets forwarded
0 packets not forwardable
0 redirects sent
1506 packets sent from this host
0 packets sent with fabricated ip header
0 output packets dropped due to no bufs, etc.
0 output packets discarded due to no route
0 output datagrams fragmented
0 fragments created
0 datagrams that can't be fragmented
0 IP Multicast packets dropped due to no receiver
0 successful path MTU discovery cycles
0 path MTU rediscovery cycles attempted
0 path MTU discovery no-response estimates
0 path MTU discovery response timeouts
0 path MTU discovery decreases detected
0 path MTU discovery packets sent
0 path MTU discovery memory allocation failures
0 ipintrq overflows
icmp:
0 calls to icmp_error
0 errors not generated 'cuz old message was icmp
Output histogram:
  echo reply: 6
  0 messages with bad code fields
  0 messages < minimum length
  0 bad checksums
  0 messages with bad length
Input histogram:
  echo: 19
  6 message responses generated

igmp: defect
0 messages received
0 messages received with too few bytes
0 messages received with bad checksum
0 membership queries received
0 membership queries received with invalid field(s)
0 membership reports received
0 membership reports received with invalid field(s)
0 membership reports received for groups to which we belong
0 membership reports sent

tcp:
1393 packets sent
  857 data packets (135315 bytes)
  0 data packets (0 bytes) retransmitted
  367 URG only packets
  0 URG only packets
  0 window probe packets
  0 window update packets
  170 control packets
1580 packets received
  790 acks (for 135491 bytes)
  60 duplicate acks
  0 acks for unsent data
  638 packets (2064 bytes) received in-sequence
  0 completely duplicate packets (0 bytes)
  0 packets with some dup. data (0 bytes duped)
  117 out-of-order packets (0 bytes)
  0 packets (0 bytes) of data after window
  0 window probes
  60 window update packets
  0 packets received after close
  0 discarded for bad checksums
  0 discarded for bad header offset fields
0 connection request
58 connection requests
61 connection accepts
118 connections established (including accepts)
121 connections closed (including 0 drops)
0 embryonic connections dropped
845 segments updated rtt (of 847 attempts)
0 resend due to path MTU discovery
0 path MTU discovery terminations due to retransmits
0 retransmit timeouts
  0 connections dropped by rexmit timeout
0 persist timeouts
0 keepalive timeouts
  0 keepalive probes sent
  0 connections dropped by keepalive

udp:
  42886 datagrams received
To display the packet counts in the communication subsystem, type:

```
netstat -D
```

The following output will be produced:

```
Source     Ipkts  Opkts  Idrops  Odrops
----------  ------  ------  -------  -------
tok_dev0    720     542    0        0
ent_dev0    114     4      0        0
----------  ------  ------  -------  -------
Devices Total 834     546    0        0
tok_dd0     720     542    0        0
ent_dd0     114     4      0        0
----------  ------  ------  -------  -------
Drivers Total 834     546    0        0
tok_dmx0    720     N/A    0        N/A
ent_dmx0    114     N/A    0        N/A
----------  ------  ------  -------  -------
Demuxer Total 834     N/A    0        N/A
```

To display device driver statistics, type:

```
netstat -v
```

The netstat -v command displays the statistics for each CDLI-based device driver that is up. To see sample output for this command, see the tokstat command, the entstat command, or the fddistat command.

To display information regarding an interface for which multicast is enabled, and to see group membership, type:

```
netstat -a -I interface
```

For example, if an 802.3 interface was specified, the following output will be produced:

```
Name     Mtu  Network Address    Ipkts  Ierrs  Opkts  Oerrs  Coll
----------  ----  ---------------    ------  ------  ------  ------  -----
et0       1492 <Link>          0      0      2       0       0
et0       1492 9.4.37 hun-eth   0      0      2       0       0
Network Address: 224.0.0.1
          02:60:8c:0a:02:e7
          01:00:5e:00:00:01
```

If instead of -I interface the flag -i is given, then all configured interfaces will be listed. The network interfaces are listed in the Name column; lo designates a loopback interface, et designates an IEEE 802.3 interface, tr designates a Token-Ring interface, while fi specifies an FDDI interface.

The address column has the following meaning. A symbolic name for each interface is shown. Below this symbolic name, the group addresses of any multicast groups that have been joined on that interface are shown. Group address 224.0.0.1 is the special all-hosts-group to which all multicast interfaces belong. The MAC address of the interface (in colon notation) follows the group addresses, plus a list of any other MAC level addresses that are enabled on behalf of IP Multicast for the particular interface.

To display the packet counts in the communication subsystem, type:

```
netstat -D
```

The following output will be produced:

```
Source     Ipkts  Opkts  Idrops  Odrops
----------  ------  ------  -------  -------
tok_dev0    720     542    0        0
ent_dev0    114     4      0        0
----------  ------  ------  -------  -------
Devices Total 834     546    0        0
tok_dd0     720     542    0        0
ent_dd0     114     4      0        0
----------  ------  ------  -------  -------
Drivers Total 834     546    0        0
tok_dmx0    720     N/A    0        N/A
ent_dmx0    114     N/A    0        N/A
----------  ------  ------  -------  -------
Demuxer Total 834     N/A    0        N/A
```

Note: AIX 5.3 does not display the PMTU statistics for the IP protocol.
To display detailed data of active sockets, type:

```
netstat -aon
```

Output similar to the following is displayed:

```
Active Internet connections (including servers)
Proto Recv-Q Send-Q Local Address               Foreign Address         (state)
tcp4    0      0      *.13            *.*          LISTEN
        so_options: (ACCEPTCONN|REUSEADDR)
        q0len:0 qlen:0 qlimit:1000     so_state: (PRIV)
        timeo:0 uid:0
        so_special: (LOCKBALE|MEMCOMPRESS|DISABLE)
        so_special2: (PROC)
        sndbuf: hiwat:16384 lowat:4096 mbcnt:0 mbmax:65536
        rcbvbuf: hiwat:16384 lowat:1 mbcnt:0 mbmax:65536
        sb_flags: (SEL)
        TCP:
          mss:512

tcp    0      0      *.*1            *.*          LISTEN
        so_options: (ACCEPTCONN|REUSEADDR)
        q0len:0 qlen:0 qlimit:1000     so_state: (PRIV)
        timeo:0 uid:0
        so_special: (LOCKBALE|MEMCOMPRESS|DISABLE)
        so_special2: (PROC)
        sndbuf: hiwat:16384 lowat:4096 mbcnt:0 mbmax:65536
        rcbvbuf: hiwat:16384 lowat:1 mbcnt:0 mbmax:65536
        sb_flags: (SEL)
        TCP:
          mss:512
```

To display the routing table, type the following:

```
netstat -rn
```

Output similar to the following is displayed:

```
Routing tables
Destination Gateway Flags Refs Use If PMTU Exp Groups
```
Route Tree for Protocol Family 2 (Internet):
default 9.3.149.65 UG 0 24 en0 - -
9.3.149.64 9.3.149.88 UHSb 0 0 en0 - - =>
9.3.149.64/27 9.3.149.88 U 1 0 en0 - -
9.3.149.88 127.0.0.1 UGHs 0 1 lo0 - -
9.3.149.95 9.3.149.88 UHSb 0 0 en0 - -
127/8 127.0.0.1 U 11 174 lo0 - -

Route Tree for Protocol Family 24 (Internet v6):
::1 ::1 UH 0 0 lo0 - -

Note: AIX 5.3 does not display the PMTU column.
The loopback route (9.3.149.88, 127.0.0.1) and the broadcast routes (with the flags field containing b indicating broadcast) are automatically created when an interface is configured. Two broadcast routes are added: one to the subnet address and one to the broadcast address of the subnet. The presence of the loopback routes and broadcast routes improve performance.

Related Information
The atmstat command, entstat command, fddistat command, iostat command, no command, tokstat command, trpt command, vmstat command.
The hosts file format, networks file format, protocols file format, services file format.
Network performance in Performance management.
TCP/IP routing gateways, Naming, TCP/IP addressing, TCP/IP network interfaces, TCP/IP protocols, and TCP/IP routing in Networks and communication management.

newaliases Command

Purpose
Builds a new copy of the alias database from the mail aliases file.

Syntax
newaliases

Description
The newaliases command builds a new copy of the alias database from the /etc/aliases file. It must be run each time this file is changed in order for the changes to take effect. Running this command is equivalent to running the sendmail command with the -bi flag.

Exit Status
0 Exits successfully.
>0 An error occurred.

Files
/usr/sbin/newaliases Contains the newaliases command.
/etc/mail/aliases
/etc/aliasesDB directory Contains source for the mail aliases file command.
Contains the binary files created by the newaliases command.
newform Command

Purpose
Changes the format of a text file.

Syntax
```
newform [ -s ] [ -f ] [ -a [ Number ] ] [ -b [ Number ] ] [ -c [ Character ] ] [ -e [ Number ] ] [ -l [ Number ] ] [ -o [ TabSpec ] ] [ -p [ Number ] ] [ File ... ]
```

Description
The `newform` command takes lines from the files specified by the `File` parameter (standard input by default) and writes the formatted lines to standard output. Lines are reformatted in accordance with the command-line flags in effect.

Except for the `-s` flag, you can enter command-line flags in any order, repeated, and mixed with the `File` parameter. However, the system processes command-line flags in the order you specify. For example, the `-c` flag modifies the behavior of the `-a` and `-p` flags, so specify the `-c` flag before the `-p` or `-a` flag for which it is intended. The `-l` (lowercase L) flag modifies the behavior of the `-a`, `-b`, `-e`, and `-p` flags, so specify the `-l` flag before the flags for which it is intended. For example, flag sequences like `-e 15 -l 60` yield results that are different from `-l 60 -e 15`. Flags are applied to all files specified on the command line.

An exit value of 0 indicates normal execution; an exit value of 1 indicates an error.

Notes:
1. The `newform` command normally only keeps track of physical characters; however, for the `-i` and `-o` flags, the `newform` command keeps track of backspaces to line up tabs in the appropriate logical columns.
2. The `newform` command does not prompt you if the system reads a `TabSpec` variable value from standard input (by use of the `-i-` or `-o-` flag).
3. If you specify the `-f` flag, and the last `-o` flag you specified was `-o-` preceded by either an `-o-` or an `-i-`, the tab-specification format line is incorrect.
4. If the values specified for the `-p`, `-l`, `-e`, `-a`, or `-b` flag are not valid decimal numbers greater than 1, the specified value is ignored and default action is taken.

Flags

- `-a [ Number ]` Adds the specified number of characters to the end of the line when the line length is less than the effective line length. If no number is specified, the `-a` flag defaults to 0 and adds the number of characters necessary to obtain the effective line length. See also the `-c [ Character ]` and `-p [ Number ]` flags.
-b [ Number ]

Truncates the specified number of characters from the beginning of the line if the line length is greater than the effective line length. If the line also contains fewer characters than specified by the Number parameter, the entire line is deleted and a blank line is displayed in its place. See also the -l [ Number ] flag. If you specify the -b flag with no Number variable, the default action truncates the number of characters necessary to obtain the effective line length.

This flag can be used to delete the sequence numbers from a COBOL program, as follows:

```
newform -l1-b7 file-name
```

The -l1 flag must be used to set the effective line length shorter than any existing line in the file so that the -b flag is activated.

-c [ Character ]
Changes the prefix/add character to that specified by the Character variable. Default character is a space and is available when specified before the -a and -p flags.

-e [ Number ]
Truncates the specified number of characters from the end of the line. Otherwise, the flag is the same as the -b [ Number ] flag.

-f
Writes the tab-specification format line to standard output before any other lines are written. The displayed tab-specification format line corresponds to the format specified by the final -o flag. If no -o flag is specified, the line displayed contains the default specification of -8.

-i [ TabSpec ]
Replaces all tabs in the input with the number of spaces specified by the TabSpec variable.

This variable recognizes all tab specification forms described in the tabs command.

If you specify a - (minus sign) for the value of the TabSpec variable, the newform command assumes that the tab specification can be found in the first line read from standard input. The default TabSpec value is -8. A TabSpec value of -0 expects no tabs. If any are found, they are treated as having a value of -1.

-l [ Number ]
Sets the effective line length to the specified number of characters. If no Number variable is specified, the -l flag defaults to 72. The default line length without the -l flag is 80 characters. Note that tabs and backspaces are considered to be one character (use the -i flag to expand tabs to spaces). You must specify the -l flag before the -b and -e flags.

-o [ TabSpec ]
Replaces spaces in the input with a tab in the output, according to the tab specifications given. The default TabSpec value is -8. A TabSpec value of -0 means that no spaces are converted to tabs on output.

-p [ Number ]
Appends the specified number of characters to the beginning of a line when the line length is less than the effective line length. The default action is to append the number of characters that are necessary to obtain the effective line length. See also the -c flag.

-s
Removes leading characters on each line up to the first tab and places up to 8 of the removed characters at the end of the line. If more than 8 characters (not counting the first tab) are removed, the 8th character is replaced by an * (asterisk) and any characters to the right of it are discarded. The first tab is always discarded.

The characters removed are saved internally until all other specified flags are applied to that line. The characters are then added to the end of the processed line.

Note: The values for the -a, -b, -e, -l (lowercase L), and -p flags cannot be larger than LINE_MAX or 2048 bytes.

Examples
To convert from a file with:
- Leading digits
- One or more tabs
- Text on each line
to a file:

- Beginning with the text, all tabs after the first expanded to spaces
- Padded with spaces out to column 72 (or truncated to column 72)
- Leading digits placed starting at column 73

type the following:

```bash
newform -s -i -l -a -e filename
```

The `newform` command displays the following error message and stops if the `-s` flag is used on a file without a tab on each line.

```
newform: 0653-457 The file is not in a format supported by the -s flag.
```

**Related Information**

The `tabs` command, `csplit` command.

---

**newgrp Command**

**Purpose**
Changes a user's real group identification.

**Syntax**

```bash
newgrp [ -l ] [ Group ]
```

**Description**

The `newgrp` command changes a user's real group identification. When you run the command, the system places you in a new shell and changes the name of your real group to the group specified with the `Group` parameter. By default, the `newgrp` command changes your real group to the group specified in the `/etc/passwd` file.

*Note:* The `newgrp` command does not take input from standard input and cannot be run from within a script.

The `newgrp` command recognizes only group names, not group ID numbers. Your changes only last for the current session. You can only change your real group name to a group you are already a member of. If you are a root user, you can change your real group to any group regardless of whether you are a member of it or not.

*Note:* When you run the `newgrp` command, the system always replaces your shell with a new one. The command replaces your shell regardless of whether the command is successful or not. For this reason, the command does not return error codes.

**Flags**

- Changes the environment to the login environment of the new group.
- `-l` Indicates the same value as the `-s` flag.

**Security**

Access Control: This command should be installed as a program in the trusted computing base (TCB). The command should be owned by the root user with the `setuid` (SUID) bit set.
Exit Status
If the `newgrp` command succeeds in creating a new shell execution environment, regardless if the group identification was changed successfully, the exit status will be that of the current shell. Otherwise, the following exit value is returned:

\[ >0 \quad \text{An error occurred.} \]

Examples
1. To change the real group ID of the current shell session to `admin`, enter:
   
   ```
   newgrp admin
   ```
2. To change the real group ID back to your original login group, enter:
   
   ```
   newgrp
   ```

Files
- `/etc/group`
  Indicates the group file; contains group IDs.
- `/etc/passwd`
  Indicates the password file; contains user IDs.

Related Information
The `login` command, `setgroups` command.

newkey Command

Purpose
Creates a new key in the `/etc/publickey` file.

Syntax

```
/usr/sbin/newkey [ -h HostName ] [ -u UserName ]
```

Description
The `newkey` command creates a new key in the `/etc/publickey` file. This command is normally run by the network administrator on the Network Information Services (NIS) master machine to establish public keys for users and root users on the network. These keys are needed for using secure Remote Procedure Call (RPC) protocol or secure Network File System (NFS).

The `newkey` command prompts for the login password of the user specified by the `UserName` parameter. Then, the command creates a new key pair in the `/etc/publickey` file and updates the `publickey` database. The key pair consists of the user's public key and secret key and is encrypted with the login password of the given user.

Use of this program is not required. Users may create their own keys using the `chkey` command.

You can use the Network application in Web-based System Manager (wsm) to change network characteristics. You could also use the System Management Interface Tool (SMIT) `smit newkey` fast path to run this command.
Flags

- **h HostName**  Creates a new public key for the root user at the machine specified by the HostName parameter. Prompts for the root password of this parameter.

- **u UserName**  Creates a new public key for a user specified by the UserName parameter. Prompts for the NIS password of this parameter.

Examples

1. To create a new public key for a user, enter:
   ```sh
tenewkey -u john
   ``
   In this example, the `newkey` command creates a new public key for the user named `john`.

2. To create a new public key for the root user on host `zeus`, enter:
   ```sh
tenewkey -h zeus
   ``
   In this example, the `newkey` command creates a new public key for the root user on the host named `zeus`.

Files

**/etc/publickey**  Stores encrypted keys for users.

Related Information

The `chkey` command, `keylogin` command.

The `keyserv` daemon.

For information on installing the Web-based System Manager, see Chapter 2: Installation and System Requirements in AIX 5L Version 5.3 Web-based System Manager Administration Guide.

System management interface tool in Operating system and device management.

Network File System (NFS) Overview for System Management in Networks and communication management.


Network Information Service (NIS) in AIX 5L Version 5.3 Network Information Services (NIS and NIS+) Guide.

NIS Reference

news Command

Purpose

Writes system news items to standard output.

Syntax

```sh
news [ -a | -n | -s | Item ... ]
```
Description
The `news` command writes system news items to standard output. This command keeps you informed of news concerning the system. Each news item is contained in a separate file in the `/var/news` directory. Most users run the `news` command followed by the `-n` flag each time they log in by including it in their `~/.profile` file or in the system's `/etc/profile` file. Any user having write permission to this directory can create a news item. It is not necessary to have read permission to create a news item.

If you run the `news` command without any flags, it displays every current file in the `/var/news` file, showing the most recent first. This command, used with the `-a` flag, displays all news items. If you specify the `-n` flag, only the names of the unread news items are displayed. Using the `-s` flag displays the number of unread news items. You can also use the `Item` parameter to specify the files that you want displayed.

Each file is preceded by an appropriate header. To avoid reporting old news, the `news` command stores a currency time. The `news` command considers your currency time to be the date the `~/.news_time` file was last modified. Each time you read the news, the modification time of this file changes to that of the reading. Only news item files posted after this time are considered current.

Pressing the Interrupt (Ctrl-C) key sequence during the display of a news item stops the display of that item and starts the next. Pressing the Ctrl-C key sequence again ends the `news` command.

Note: News items can contain multibyte characters.

Flags
- `-a` Displays all news items, regardless of the currency time. The currency time does not change.
- `-n` Reports the names of current news items without displaying their contents. The currency time does not change.
- `-s` Reports the number of current news items without displaying their names or contents. The currency time does not change.

Examples
1. To display the items that have been posted since you last read the news, enter:
   ```
   news
   ```
2. To display all the news items, enter:
   ```
   news -a | pg
   ```
   All of the news items display a page at a time (`| pg`), regardless of whether you have read them yet.
3. To list the names of the news items that you have not read yet, enter:
   ```
   news -n
   ```
   Each name is a file in the `/var/news` directory.
4. To display specific news items, enter:
   ```
   news newusers services
   ```
   This command sequence displays news about `newusers` and `services`, which are names listed by the `news` command.
5. To display the number of news items that you have not yet read, enter:
   ```
   news -s
   ```
6. To post news for everyone to read, enter:
This copies the schedule file into the system /var/news directory to create the /var/news/schedule file. To do this, you must have write permission to the /var/news directory.

Files

`/usr/bin/news` Contains the `news` command.

`/etc/profile` Contains the system profile.

`/var/news` Contains system news item files.

`$HOME/.news_time` Indicates the date the `news` command was last invoked.

Related Information

The `pg` command.

The `/etc/security/environ` file, `profile` file.

**next Command**

**Purpose**

Shows the next message.

**Syntax**

```
next [ +Folder ][ -header | -noheader ][ -showproc CommandString | -noshowproc ]
```

**Description**

The `next` command displays the number the system will assign to the next message filed in a Message Handler (MH) folder. The `next` command is equivalent to the `show` command with the `next` value specified as the message.

The `next` command links to the `show` program and passes any switches on to the `showproc` program. If you link to the `next` value and call that link something other than `next`, your link will function like the `show` command, rather than like the `next` command.

The `show` command passes flags it does not recognize to the program performing the listing. The `next` command provides a number of flags for the listing program.

**Flags**

- `+Folder` Specifies the folder that contains the message you want to show.
- `-header` Displays a one-line description of the message being shown. The description includes the folder name and message number. This is the default.
- `-help` Lists the command syntax, available switches (toggles), and version information.
- `-noheader` Prevents display of a one-line description of each message being shown.
- `-noshowproc` Uses the `/usr/bin/cat` file to perform the listing. This is the default.
- `-showproc CommandString` Uses the specified command string to perform the listing.

*Note: For MH, the name of this flag must be fully spelled out.*
Examples

1. To see the next message in the current folder, enter:
   
   next

   The system responds with a message similar to the following:
   
   (Message schedule: 10)

   The text of the message is also displayed. In this example, message 10 in the current folder schedule is the next message.

2. To see the next message in the project folder, enter:

   next  \project

   The system responds with the text of the message and a header similar to the following:

   (Message project: 5)

Files

<table>
<thead>
<tr>
<th>File Path</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$HOME/.mh_profile</td>
<td>Specifies a user's MH profile.</td>
</tr>
<tr>
<td>/usr/bin/next</td>
<td>Contains the next command.</td>
</tr>
</tbody>
</table>

Related Information

The \prev command, \show command.

The .mh_alias file format, .mh_profile file format.

Mail applications in Networks and communication management.

nfs.clean Command

Purpose
Stops NFS and NIS operations.

Syntax

/etc/nfs.clean [-d] [-y] [-t nfs|nis]

Description
The /etc/nfs.clean command is used to shut down operations of NFS, NIS, or both. This script is used by the \shutdown command but can be used to stop operations of only NFS or NIS (NIS+). By default, all NFS and NIS daemons are stopped.

This command is recommended instead of using stopsrc -g nfs since the nfs.clean command shuts daemons down in the correct order. The stopsrc command has no notion of stopping daemons of a group in the proper order. This can cause problems if the statd and lockd daemons are running and the statd daemon is stopped before the lockd daemon.

Flags

- \d     Stops only server-specific daemons. Daemons that can run on clients are not stopped.
- \y     Stops only server-specific NIS (and NIS+) daemons. This flag is presumed if the -d flag is used.
-t  Stops only the specified system. If -t nfs is specified, only the NFS daemons are stopped. If -t nis is specified, only the NIS daemons are stopped.

Exit Status

0  Command completed successfully.
1  Argument error.

Examples
1. To stop all NFS and NIS daemons, type:
   /etc/nfs.clean
2. To stop only NFS, type:
   /etc/nfs.clean -t nfs
3. To stop only NFS service daemons, type:
   /etc/nfs.clean -d -t nfs

Location
/etc/nfs.clean

Related Information
The shutdown command

nfs4cl Command

Purpose
Displays or modifies current NFSv4 statistics and properties.

Syntax
/usr/sbin/nfs4cl [subcommand] [path] [argument]

Description
Use the nfs4cl command to display all the fsid information on the client or modify filesystem options of an fsid.

Note: The nfs4cl updates affect newly accessed files in the filesystem. An unmount and remount are required to affect all previously accessed files.

Subcommands

resetfsoptions Subcommand
This subcommand resets all the options for the fsid back to the default options.

Note: The cio and dio options can be reset with the resetfsoptions subcommand, but the cio and dio behavior is not actually turned off until the NFS filesystem is unmounted and then remounted.

setfsoptions Subcommand
This subcommand will take a path and an argument. The path specifies the target fsid structure and the argument is the file system options. It will set the internal fsid to use the options specified by the argument. Here is the list of possible arguments:
Specifies that the files or directories that bind to this path (fsid) are readable and writable.

ro
Specifies that the files or directories that bind to this path (fsid) are read only.

acdirmax
Specifies the upper limit for the directory attribute cache time out value.

acdirmin
Specifies the lower limit for the directory attribute cache time out value.

acregmax
Specifies the upper limit for the file attribute cache time out value.

acregmin
Specifies the lower limit for the file attribute cache time out value.

cio
Specifies the filesystem to be mounted for concurrent readers and writers. I/O on files in this filesystem behave as if the file was opened with O_CIO specified in the open() system call.

dio
Specifies that I/O on the filesystem behaves as if all of the files were opened with O_DIRECT specified in the open() system call.

hard
Specifies that this fsid will use hard mount semantics.

intr
Specifies that the fsid operations are interruptable.

maxpout=value
Specifies the pageout level for files on this filesystem at which threads should be slept. If maxpout is specified, minpout must also be specified. This value must be non-negative and greater than minpout. The default is the kernel maxpout level.

minpout=value
Specifies the pageout level for files on this filesystem at which threads should be readied. If minpout is specified, maxpout must also be specified. This value must be non-negative. The default is the kernel minpout level.

noac
Does not use attribute cache.

nocto
Specifies no close-to-open consistency.

nointr
Specifies that the fsid is non-interruptable.

prefer
Administratively sets the preferred server to use when data exists at multiple server locations. The server name can be in short name, long name, IPv4, or IPv6 format, but the client must be able to resolve the server name when the nfs4cl command is run.

rbr
Utilizes the release-behind-when-reading capability. When sequential reading of a file in this filesystem is detected, the real memory pages used by the file will be released once the pages are copied to internal buffers.

rsize
Specifies the read size for the RPC calls to the server.

retrans
Specifies the number of RPC retransmits to attempt with soft semantics.

soft
Specifies the fsid operation that will use soft mount semantics.

timeo
Specifies the time out value for the RPC calls to the server.

wsize
Specifies the write size for the RPC calls to the server.

nodircache
Does not use directory cache.

showfs Subcommand
This subcommand displays filesystem specific information on the server that is currently accessed by the client. The information includes server address, remote path, fsid, and local path. If path is provided, additional information, such as fs_locations and fsid options, are displayed.

showstat Subcommand
This subcommand shows information similar to what the df command prints out for each fsid that exists on the client. The information includes fields such as, Filesystem, 512-blocks, Free, %Used, lused, %lused, and Mounted on.

Exit Status

0 The command completed successfully.

>0 An error occurred.

Examples
1. To display all the fsid structure on the client, type:

   nfs4cl showfs

2. To set the file system options of /mnt/usr/sbin to include only retrans=3, type:
To reset the filesystem options for `/mnt/usb/sbin`, type:
```
nfs4cl setfsoptions /mnt/usb/sbin
```

To show `df` command output for `/mnt/usb/sbin`, type:
```
nfs4cl showstat /mnt/usb/sbin
```

To make the client failover to server `boo` when replication occurs in `/mnt/usb/sbin`, type:
```
nfs4cl prefer /mnt/usb/sbin boo
```

### Location
`/usr/sbin/nfs4cl`

### Related Information
[nfsstat Command](#) on page 73, [nfso Command](#) on page 53.

---

### nfs4smctl Command

**Purpose**
Administers revocation of NFSv4 State.

**Syntax**
```
/usr/sbin/nfs4smctl [r] hostname IP_address
```

**Description**
Administers revocation of NFS v4 State.

**Flags**
- `-r hostname IP_address`
  Specifies the client of which state is to be revoked using either the *hostname* or *IP_address* parameter.

**Files**
`/usr/sbin/nfs4smctl`
Location of the `nfs4smctl` command.

### Related Information
The `nfs4cl` command.

---

### nfsd Daemon

**Purpose**
Services client requests for file system operations.

**Syntax**
```
```

```
/usr/sbin/nfsd -getnodes
```
Description
The `nfsd` daemon runs on a server and handles client requests for file system operations.

Each daemon handles one request at a time. Assign the maximum number of threads based on the load you expect the server to handle.

The `nfsd` daemon is started and stopped with the following System Resource Controller (SRC) commands:
```
startsrc -s nfsd
stopsrc -s nfsd
```

To change the number of daemons started with the SRC commands, use the `chnfs` command. To change the parameters of an SRC controlled daemon, use the `chssys` command.

**Note:** If the number of `nfsd` daemons is not sufficient to serve the client, a nonidempotent operation error is returned to the client. For example, if the client removes a directory, an `ENOENT` error is returned even though the directory on the server is removed.

**Flags**

- `-a` Specifies UDP and TCP transport will be serviced.
- `-c max_connections` Specifies the maximum number of TCP connections allowed at the NFS server.
- `-gp on/off` Controls the NFSv4 Grace Period enablement. The possible values are on or off. If no `-gp` option is specified, the grace period is disabled by default.
- `-gp bypass` Controls the NFSv4 Grace Period bypass. When this option is specified, the grace period will be bypassed regardless of how the `-gp` option is specified.
- `-gpx count` Controls the NFSv4 Grace Period automatic extension. The `count` parameter specifies the total number of automatic extensions allowed for the grace period. If no `-gpx` option is specified, the number of allowed automatic extensions defaults to 1. A single extension cannot extend the grace period for more than the length of the NFSv4 lease period. The NFSv4 subsystem uses runtime metrics (such as the time of the last successful NFSv4 reclaim operation) to detect reclamation of the state in progress, and extends the grace period for a length of time up to the duration of the given number of iterations.

- `nservers` Specifies the maximum number of concurrent requests that the NFS server can handle. This concurrency is achieved by dynamic management of threads within the NFS server, up to the maximum. The default maximum is 3891. The `chnfs`, `chssys`, or `nfso` command is used to change the maximum. Changing the maximum setting from the default is not recommended as this may limit server performance.

- `-p tcp or -p udp` Transports both UDP and TCP to the NFS clients (default). You can only specify UDP or TCP. For example, if `-p tcp` is used, the NFS server only accepts NFS client requests using the TCP protocol.

- `-r max_read_size` Specifies for NFS Version 3, the maximum size allowed for file read requests. The default and maximum allowed is 32K.

- `-w max_write_size` Specifies for NFS Version 3, the maximum size allowed for file write requests. The default and maximum allowed is 32K.

- `-root directory` Specifies the directory which should be the root node the NFS version 4 exported filesystem. By default, the root node is `/`. If the root node is set to something other than `/`, use `chnfs -r` to reset the node to `/`. This flag may be used while `nfsd` is running to change the root node, but only if no filesystems are currently exported. This flag might be removed in a future release. Use `chnfs -r` instead.
-public directory

Specifies the directory which should be the public node of the NFS version 4 exported filesystem. By default, the public node is the same as the root node. This flag may be use while nfsd is running to change the public node. The public node must be a descendant of the root node. This flag might be removed in a future release. Use chnfs -p instead.

-getnodes

Prints the current root and public nodes for the NFS version 4 server. This option will not cause the NFS server daemon to start.

-getreplicas

Prints the current replication enablement mode. If replicas have been specified for the nfsroot, they will be displayed.

Parameter

Parameter that can be changed:

NumberOfNfsds

Specifies the number of daemons to start. This parameter does not apply to AIX 4.2.1 or later.

Examples

1. To start nfsd daemons using an src command, enter:

   startsrc -s nfsd

   In this example, the startsrc -s nfsd entry starts the number of daemons specified in the script.

2. To change the number of daemons running on your system, enter:

   chssys -s nfsd -a 6

   In this example, the chssys command changes the number of nfsd daemons running on your system to 6.

Related Information

The chnfs command, chssys command.

The biod daemon, mountd daemon.


System Resource Controller in Operating system and device management.

NFS commands in Networks and communication management.

nfshostkey Command

Purpose

Configure the host key for an nfs server.

Syntax

/usr/sbin/nfshostkey [-l | -p principal [-f file]]
Description
An nfs server (or full client) using RPCSEC_GSS RPC security must be able to acquire credentials for its host principal to accept requests. The nfshostkey command is used to configure this information; it takes the principal and the path to a keytab file for that principal. This information goes into /etc/nfs/hostkey in the format:
principal
dokey

The gssd daemon reads this file on startup.

Flags
-f file The path to a keytab file for this principal
-l Prints the existing state of the respective files on the system.
-p principal The principal for this host, which must be of the form nfs/hostname.

Related Information
The /etc/nfs/hostkey file.

nfshostmap Command

Purpose
Manage mapping from hosts to principals for an nfs client.

Syntax
/usr/sbin/nfshostmap [-a hostname alias1 alias2] [-d hostname] [-e hostname alias1 alias2] [-l]

Description
All hosts defined as aliases will be mapped to the host defined as a hostname when constructing a kerberos request to the server. This is useful if, for example, a server has interfaces wizard.sub.austin.ibm.com and wizard.austin.ibm.com; if this server’s kerberos principal is wizard.austin.ibm.com, nfshostmap -a wizard.austin.ibm.com wizard.sub.austin.ibm.com run on the client will take care of this problem.

This modifies /etc/nfs/princmap, which is read by the gssd daemon on startup.

Flags
-a hostname alias1 alias2 Adds a mapping from the aliases to hostname,
-d hostname Deletes all aliases for hostname.
-e hostname alias1 alias2 Removes all previous mappings for hostname and replaces them with the given alias list.
-l Prints the existing state of the respective files on the system.

Related Information
The /etc/nfs/princmap file.
nfso Command

Purpose
Manages Network File System (NFS) tuning parameters.

Syntax
nfso [-p | -r] [-c] {-o Tunable[ =Newvalue ]}
nfso [-p | -r] [-d Tunable}
nfso [-p | -r] -D
nfso [-p | -r] -a [-c]
nfso -h [ Tunable ]
nfso -H [ Hostname ]
nfso -L [ Tunable ]
nfso -X [ Tunable ]

Note: Multiple flags -o, -d, -x, and -L are allowed.

Description
Use the nfso command to configure Network File System tuning parameters. The nfso command sets or displays current or next boot values for Network File System tuning parameters. This command can also make permanent changes or defer changes until the next reboot. Whether the command sets or displays a parameter is determined by the accompanying flag. The -o flag performs both actions. It can either display the value of a parameter or set a new value for a parameter.

Understanding the Effect of Changing Tunable Parameters
Extreme care should be taken when using this command. If used incorrectly, the nfso command can make your system inoperable.

Before modifying any tunable parameter, you should first carefully read about all its characteristics in the Tunable Parameters section below, and follow any Refer To pointer, in order to fully understand its purpose.

You must then make sure that the Diagnosis and Tuning sections for this parameter truly apply to your situation and that changing the value of this parameter could help improve the performance of your system.

If the Diagnosis and Tuning sections both contain only "N/A", you should probably never change this parameter unless specifically directed by AIX development.

Flags
-a Displays the current, reboot (when used in conjunction with -r) or permanent (when used in conjunction with -p) value for all tunable parameters, one per line in pairs Tunable = Value. For the permanent options, a value is only displayed for a parameter if its reboot and current values are equal. Otherwise NONE displays as the value.
-c Changes the output format of the nfso command to colon-delineated format.
-d **Tunable**

Sets the **Tunable** variable back to its default value. If a **Tunable** needs to be changed that is, it is currently not set to its default value) and is of type Bosboot or Reboot, or if it is of type Incremental and has been changed from its default value, and **-r** is not used in combination, it will not be changed but a warning displays instead.

-**D**

Sets all **Tunable** variables back to their default value. If **Tunables** needing to be changed are of type Bosboot or Reboot, or are of type Incremental and have been changed from their default value, and the **-r** flag is not used in combination, they will not be changed but warnings display instead.

-**h** [**Tunable**]

Displays help about **Tunable** parameter if one is specified. Otherwise, displays the **nfso** command usage statement.

-**L** [**Tunable**]

Lists the characteristics of one or all **Tunable**, one per line, using the following format:

```
NAME DEPENDENCIES CUR DEF BOOT MIN MAX UNIT TYPE
```

where:

- **CUR** = current value
- **DEF** = default value
- **BOOT** = reboot value
- **MIN** = minimal value
- **MAX** = maximum value
- **UNIT** = tunable unit of measure
- **TYPE** = parameter type: D (for Dynamic), S (for Static), R (for Reboot), I (for Incremental), C (for Connect), and D (for Deprecated)

DEPENDENCIES = list of dependent tunable parameters, one per line

-**I** **HostName**

Allows a system administrator to release NFS file locks on an NFS server. The **HostName** variable specifies the host name of the NFS client that has file locks held at the NFS server. The **nfso** -i command makes a remote procedure call to the NFS server's **rpc.lockd** network lock manager to request the release of the file locks held by the **HostName** NFS client.

If there is an NFS client that has file locks held at the NFS server and this client has been disconnected from the network and cannot be recovered, the **nfso** -i command can be used to release those locks so that other NFS clients can obtain similar file locks.

**Note:** The **nfso** command can be used to release locks on the local NFS server only.

-**o** **Tunable**[ =**NewValue** ]

Displays the value or sets **Tunable** to **NewValue**. If a tunable needs to be changed (the specified value is different than current value), and is of type Bosboot or Reboot, or if it is of type Incremental and its current value is bigger than the specified value, and **-r** is not used in combination, it will not be changed but a warning displays instead.

When **-r** is used in combination without a new value, the nextboot value for the **Tunable** displays. When **-p** is used in combination without a **NewValue**, a value displays only if the current and next boot values for the **Tunable** are the same. Otherwise **NONE** displays as the value.

-**p**

Makes changes apply to both current and reboot values, when used in combination with **-o**, **-d** or **-D**, that is, it turns on the updating of the **/etc/tunables/nextboot** file in addition to the updating of the current value. These combinations cannot be used on Reboot and Bosboot type parameters because their current value cannot be changed.

When used with **-a** or **-o** without specifying a new value, values are displayed only if the current and next boot values for a parameter are the same. Otherwise **NONE** displays as the value.

-**r**

Makes changes apply to reboot values when used in combination with **-o**, **-d** or **-D**, that is, it turns on the updating of the **/etc/tunables/nextboot** file. If any parameter of type Bosboot is changed, the user is prompted to run bosboot.

When used with **-a** or **-o** without specifying a new value, next boot values for tunables display instead of current values.
-x [Tunable] Lists characteristics of one or all tunables, one per line, using the following (spreadsheet) format:

tunable, current, default, reboot, min, max, unit, type, {dtunable}

where:
current = current value
default = default value
reboot = reboot value
min = minimal value
max = maximum value
unit = tunable unit of measure
type = parameter type
  D (for Dynamic), S (for Static), R (for Reboot),
  B (for Bosboot), M (for Mount), I (for Incremental),
  C (for Connect), and d (for Deprecated)
dtunable = space separated list of dependent tunable parameters

Any change (with -o, -d, or -D) to a parameter of type Mount results in a message displaying to warn the user that the change is only effective for future mountings.

Any change (with -o, -d or -D flags) to a parameter of type Connect will result in inetd being restarted, and a message displaying to warn the user that the change is only effective for future socket connections.

Any attempt to change (with -o, -d, or -D) a parameter of type Bosboot or Reboot without -r, results in an error message.

Any attempt to change (with -o, -d, or -D but without -r) the current value of a parameter of type Incremental with a new value smaller than the current value, results in an error message.

**Tunable Parameters Type**

All the tunable parameters manipulated by the tuning commands (no, nfso, vmo, ioo, schedo, and raso) have been classified into these categories:

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dynamic</td>
<td>If the parameter can be changed at any time</td>
</tr>
<tr>
<td>Static</td>
<td>If the parameter can never be changed</td>
</tr>
<tr>
<td>Reboot</td>
<td>If the parameter can only be changed during reboot</td>
</tr>
<tr>
<td>Bosboot</td>
<td>If the parameter can only be changed by running bosboot and rebooting the machine</td>
</tr>
<tr>
<td>Mount</td>
<td>If changes to the parameter are only effective for future file systems or directory mounts</td>
</tr>
<tr>
<td>Incremental</td>
<td>If the parameter can only be incremented, except at boot time</td>
</tr>
<tr>
<td>Connect</td>
<td>If changes to the parameter are only effective for future socket connections</td>
</tr>
<tr>
<td>Deprecated</td>
<td>If changing this parameter is no longer supported by the current release of AIX.</td>
</tr>
</tbody>
</table>

For parameters of type Bosboot, whenever a change is performed, the tuning commands automatically prompt the user to ask if they want to execute the bosboot command. For parameters of type Connect, the tuning commands automatically restart the inetd daemon.

Note that the current set of parameters managed by the nfso command only includes Dynamic, Mount, and Incremental types.

**Compatibility Mode**

When running in pre 5.2 compatibility mode (controlled by the pre520tune attribute of sys0, see AIX 5.2 compatibility mode), reboot values for parameters, except those of type Bosboot, are not really meaningful because in this mode they are not applied at boot time.
In pre 5.2 compatibility mode, setting reboot values to tuning parameters continues to be achieved by imbedding calls to tuning commands in scripts called during the boot sequence. Parameters of type Reboot can therefore be set without the -r flag, so that existing scripts continue to work.

This mode is automatically turned ON when a machine is MIGRATED to AIX 5L™ Version 5.2. For complete installations, it is turned OFF and the reboot values for parameters are set by applying the content of the /etc/tunables/nextboot file during the reboot sequence. Only in that mode are the -r and -p flags fully functional. See Kernel Tuning in the AIX 5L Version 5.3 Performance Tools Guide and Reference for details about the new 5.2 mode.

### Tunable Parameters

- **client_delegation**
  - **Purpose:** Enables or disables NFS version 4 client delegation support.
  - **Values:**
    - Default: 1
    - Range: 0 or 1
    - Type: Dynamic
  - **Diagnosis:** N/A
  - **Tuning:** A value of 1 enables client delegation support. A value of 0 disables client delegation support.

- **lockd_debug_level**
  - **Purpose:** Sets the level of debugging for rpc.lockd.
  - **Values:**
    - Default: 0
    - Useful Range: 0 to 9
    - Type: Dynamic
  - **Diagnosis:** N/A
  - **Tuning:** N/A

- **nfs_allow_all_signals**
  - **Purpose:** Specifies that the NFS server adhere to signal handling requirements for blocked locks for the UNIX® 95/98 test suites.
  - **Values:**
    - Default: 0
    - Range: 0 or 1
    - Type: Dynamic
  - **Diagnosis:** N/A
  - **Tuning:** A value of 1 turns nfs_allow_all_signals on, and a value of 0 turns it off.
nfs_auto_rbr_trigger

**Purpose:** Specifies a threshold offset (in megabytes) beyond which a sequential read of an NFS file will result in the pages being released from memory after the read. This option is ignored when the `rbr mount` option is in effect.

**Values:**
- Default: 0 (indicates system determines the threshold)
- Range: -1 (indicates disabled), 0 to max NFS filesize (in MB)
- Type: Dynamic

**Diagnosis:** Due to large sequentially read NFS files, `vmstat` shows a high paging rate and `svmon` shows a high client page count.

**Tuning:** This value should be set to the number of megabytes that should be cached in memory when an NFS file is read sequentially. To prevent exhaustion of memory with cached file pages, the remaining memory pages beyond this threshold will be released after the memory pages are read.

nfs_device_specific_bufs (AIX 4.2.1 and later)

**Purpose:** This option allows the NFS server to use memory allocations from network devices if the network device supports such a feature.

**Values:**
- Default: 1
- Range: 0 or 1
- Type: Dynamic

**Diagnosis:** N/A

**Tuning:** Use of these special memory allocations by the NFS server can positively affect the overall performance of the NFS server. The default of 1 means the NFS server is allowed to use the special network device memory allocations. If the value of 0 is used, the NFS server uses the traditional memory allocations for its processing of NFS client requests. These are buffers managed by a network interface that result in improved performance (over regular mbufs) because no setup for DMA is required on these. Two adapters that support this include the Micro Channel® ATM adapter and the SP2 switch adapter.
**nfs_dynamic_retrans**

**Purpose:**
Specifies whether the NFS client should use a dynamic retransmission algorithm to decide when to resend NFS requests to the server.

**Values:**
- Default: 1
- Range: 0 or 1
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning:**
If this function is turned on, the timeo parameter is only used in the first retransmission. With this parameter set to 1, the NFS client attempts to adjust its timeout behavior based on past NFS server response. This allows for a floating timeout value along with adjusting the transfer sizes used. All of this is done based on an accumulative history of the NFS server’s response time. In most cases, this parameter does not need to be adjusted. There are some instances where the straightforward timeout behavior is desired for the NFS client. In these cases, the value should be set to 0 before mounting file systems.

**Refer to:**
[Unnecessary retransmits](#)

---

**nfs_gather_threshold**

**Purpose:**
Sets the minimum size of write requests for which write gathering is done.

**Values:**
- Default: 4096
- Useful Range: 512 to 8193
- Type: Dynamic

**Diagnosis:**
If either of the following two situations are observed, tuning **nfs_gather_threshold** might be appropriate:
- Delays are observed in responding to RPC requests, particularly those where the client is exclusively doing nonsequential writes or the files being written are being written with file locks held on the client.
- Clients are writing with write sizes < 4096 and write-gather is not working.

**Tuning:**
If write-gather is to be disabled, change the **nfs_gather_threshold** to a value greater than the largest possible write. For AIX Version 4 running NFS Version 2, this value is 8192. Changing the value to 8193 disables write gather. Use this for the situation described above in scenario (1). If write gather is being bypassed due to a small write size, say 1024, as in scenario (2), change the write gather parameter to gather smaller writes; for example, set to 1024.
nfs_iopace_pages (AIX 4.1)

**Purpose:**
Specifies the number of NFS file pages that are scheduled to be written back to the server through the VMM at one time. This I/O scheduling control occurs on close of a file and when the system invokes the `syncd` daemon.

**Values:**
- Default: 0 (32 before AIX 4.2.1)
- Range: 0 to 65536
- Type: Dynamic

**Tuning:**
When an application writes a large file to an NFS mounted filesystem, the file data is written to the NFS server when the file is closed. In some cases, the resources required to write the file to the server may prevent other NFS file I/O from occurring. This parameter limits the number of 4 KB pages written to the server to the value of `nfs_iopace_pages`. The NFS client will schedule `nfs_iopace_pages` for writing to the server and then waits for these pages to be written to the server before scheduling the next batch of pages. The default value will usually be sufficient for most environments. Decreased the values if there are large amounts of contention for NFS client resources. If there is low contention, the value can be increased. When this value is 0, the default number of pages written is calculated using a heuristic intended to optimize performance and prevent exhaustion of resources that might prevent other NFS file I/O from occurring.

nfs_max_connections

**Purpose:**
Specifies the maximum number of TCP connections allowed into the server.

**Values:**
- Default: 0 (indicates no limit)
- Range: 0 10 10000
- Type: Dynamic

**Tuning:**
Limits number of connections into the server in order to reduce load.
**nfs_max_read_size**

**Purpose:**
Sets the maximum and preferred read size.

**Values:**
- Default: 32768 bytes
- Useful Range: 512 to 65536 for NFS V3 over TCP
  512 to 61440 for NFS V3 over UDP
  512 to 8192 for NFS V2
- Type: Dynamic

**Diagnosis:**
Useful when all clients need to have changes in the read/write sizes, and it is impractical to change the clients. Default means to use the values used by the client mount.

**Tuning:**
Tuning may be required to reduce the V3 read/write sizes when the mounts cannot be manipulated directly on the clients, in particular during NIM installations on networks where the network is dropping packets with the default 32 KB read/write sizes. In that case, set the maximum size to a smaller size that works on the network.

It can also be useful where network devices are dropping packets and a generic change is desired for communications with the server.

---

**nfs_max_threads** (AIX 4.2.1 and later)

**Purpose:**
Specifies the maximum number of NFS server threads that are created to service incoming NFS requests.

**Values:**
- Default: 3891
- Range: 1 to 3891
- Type: Dynamic

**Diagnosis:**
With AIX 4.2.1, the NFS server is multithreaded. The NFS server threads are created as demand increases for the NFS server. When the NFS server threads become idle, they will exit. This allows the server to adapt to the needs of the NFS clients. The **nfs_max_threads** parameter is the maximum number of threads that can be created.

**Tuning:**
In general, it does not detract from overall system performance to have the maximum set to something very large because the NFS server creates threads as needed. However, this assumes that NFS-serving is the primary machine purpose. If the desire is to share the system with other activities, then the maximum number of threads may need to be set low. The maximum number can also be specified as a parameter to the nfsd daemon.

**Refer to:**
- [Number of necessary nfsd threads](#)
nfs_max_write_size

**Purpose:**
Allows the system administrator to control the NFS RPC sizes at the server.

**Values:**
Default: 32768 bytes
Useful Range: 512 to 65536 for NFS V3 over TCP
512 to 61440 for NFS V3 over UDP
512 to 8192 for NFS V2
Type: Dynamic

**Diagnosis:**
Useful when all clients need to have changes in the read/write sizes, and it is impractical to change the clients. Default means to use the values used by the client mount.

**Tuning:**
Tuning may be required to reduce the V3 read/write sizes when the mounts cannot be manipulated directly on the clients, in particular, during NIM installations on networks where the network is dropping packets with the default 32 KB read/write sizes. In that case, set the maximum size to a smaller size that works on the network. It can also be useful where network devices are dropping packets and a generic change is desired for communications with the server.

nfs_repeat_messages (AIX Version 4)

**Purpose:**
Checks for duplicate NFS messages. This option is used to avoid displaying duplicate NFS messages.

**Values:**
Default: 0 (no)
Range: 0 or 1
Type: Dynamic

**Diagnosis:**
N/A

**Tuning:**
Tuning this parameter does not affect performance.
nfs_replica_failover_timeout (AIX 5.3 with 5300-03 and later)

**Purpose:**
Specifies how long the NFS client will wait (in seconds) before switching to another server when data is replicated and the current associated server is not accessible. If the default value of 0 is set, the client dynamically determines the timeout as twice the RPC call timeout that was established at mount time or with nfs4cl. The nfs_replica_failover_timeout option is client-wide; if set, the nfs_replica_failover_timeout option overrides the default behavior on all replicated data. This option only applies to NFS version 4.

**Value:**
- Default: 0
- Range: 0-4294967295
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning:**
A value of 0 allows the client to internally determine the timeout value. A positive value overrides the default and specifies the replication fail-over timeout in seconds for all data accessed by the client.

nfs_rfc1323 (AIX 4.3)

**Purpose:**
Enables very large TCP window size negotiation (greater than 65535 bytes) to occur between systems.

**Values:**
- Default: 0
- Range: 0 or 1
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning:**
If using the TCP transport between NFS client and server, and both systems support it, this allows the systems to negotiate a TCP window size in a way that allows more data to be *in-flight* between the client and server. This increases the throughput potential between client and server. Unlike the rfc1323 option of the no command, this only affects NFS and not other applications in the system. Value of 0 means this is disabled, and value of 1 means it is enabled. If the no command parameter rfc1323 is already set, this NFS option does not need to be set.
nfs_server_base_priority

Purpose:
Sets the base priority of nfsd daemons.

Values:
- Default: 65
- Range: 31 to 125
- Type: Dynamic

Diagnosis:
N/A

Tuning:
By default, the nfsd daemons run with a floating process priority. Therefore, as they increase their cumulative CPU time, their priority changes. This parameter can be used to set a static parameter for the nfsd daemons. The value of 0 represents the floating priority (default). Other values within the acceptable range are used to set the priority of the nfsd daemon when an NFS request is received at the server. This option can be used if the NFS server is overloading the system (lowering or making the nfsd daemon less favored). It can also be used if you want the nfsd daemons be one of the most favored processes on the server. Use caution when setting the parameter because it can render the system almost unusable by other processes. This situation can occur if the NFS server is very busy and essentially locks out other processes from having run time on the server.

nfs_server_clread (AIX 4.2.1 and later)

Purpose:
This option allows the NFS server to be very aggressive about the reading of a file. The NFS server can only respond to the specific NFS-read request from the NFS client. However, the NFS server can read data in the file which exists immediately after the current read request. This is normally referred to as read-ahead. The NFS server does read-ahead by default.

Values:
- Default: 1
- Range: 0 or 1
- Type: Dynamic

Diagnosis:
In most NFS serving environments, the default value (enabled) for this parameter is appropriate. However, in some situations where the amount of NFS server memory available for file caching and/or where the access pattern of reads over NFS is primarily random, then disabling this option may be appropriate.

Tuning:
With the nfs_server_clread option enabled, the NFS server becomes very aggressive about doing read-ahead for the NFS client. If value is 1, then aggressive read-ahead is done; If value is 0, normal system default read-ahead methods are used. Normal system read-ahead is controlled by VMM. In AIX 4.2.1, the more aggressive top-half JFS read-ahead was introduced. This mechanism is less susceptible to read-ahead breaking down due to out-of-order requests (which are typical in the NFS server case). When the mechanism is activated, it will read an entire cluster (128 KB, the LVM logical track group size).
**nfs_setattr_error (AIX 4.2.1 and later)**

**Purpose:**
When enabled, NFS server ignores setattr requests that are not valid.

**Values:**
Default: 0 (disabled)
Range: 0 or 1
Type: Dynamic

**Diagnosis:**
N/A

**Tuning:**
This option is provided for certain PC applications. Tuning this parameter does not affect performance.

---

**nfs_socketsize**

**Purpose:**
Sets the queue size of the NFS server UDP socket.

**Values:**
Default: 600000
Practical Range: 60000 to \texttt{sb\_max}
Type: Dynamic

**Diagnosis:**
N/A

**Tuning:**
Increase the size of the \texttt{nfs\_socketsize} variable when netstat reports packets dropped due to socket buffer overflows for UDP, and increasing the number of nfsd daemons has not helped.

**Refer to:**
TCP/IP tuning guidelines for NFS performance section in [NFS performance monitoring and tuning](#).

---
nfs_tcp_duplicate_cache_size (AIX 4.2.1 and later)

**Purpose:**
Specifies the number of entries to store in the NFS server's duplicate cache for the TCP network transport.

**Values:**
- Default: 5000
- Range: 1000 to 100000
- Type: Incremental

**Diagnosis:**
N/A

**Tuning:**
The duplicate cache size cannot be decreased. Increase the duplicate cache size for servers that have a high throughput capability. The duplicate cache is used to allow the server to correctly respond to NFS client retransmissions. If the server flushes this cache before the client is able to retransmit, then the server may respond incorrectly. Therefore, if the server can process 1000 operations before a client retransmits, the duplicate cache size must be increased.

Calculate the number of NFS operations that are being received per second at the NFS server and multiply this by 4. The result is a duplicate cache size that should be sufficient to allow correct response from the NFS server. The operations that are affected by the duplicate cache are the following: `setattr()`, `write()`, `create()`, `remove()`, `rename()`, `link()`, `symbolic link()`, `mkdir()`, `rmdir()`.

nfs_tcp_socketsize (AIX 4.2.1 and later)

**Purpose:**
Sets the queue size of the NFS TCP socket. The queue size is specified in number of bytes. The TCP socket is used for buffering NFS RPC packets on send and receive. This option reserves, but does not allocate, memory for use by the send and receive socket buffers of the socket.

**Values:**
- Default: 600000
- Practical Range: 60000 to `sb_max`
- Type: Dynamic

**Diagnosis:**
Poor sequential read or write performance between an NFS server and client when both of the following situations exist:
- A large (32 KB or greater) RPC size is being used.
- Communication between the server and client is over a network link using a large (9000-byte or greater) MTU size.

**Tuning:**
Do not set the `nfs_tcp_socketsize` value to less than 60 000. The default value should be adequate for the vast majority of environments. This value allows enough space for the following functions:
- Buffer incoming data without limiting the TCP window size.
- Buffer outgoing data without limiting the speed at which NFS can write data to the socket.

The value of the `nfs_tcp_socketsize` option must be less than the `sb_max` option, which can be manipulated by the `no` command.

Refer to:
[NFS performance monitoring and tuning](#)
nfs_udp_duplicate_cache_size (AIX 4.2.1 and later)

**Purpose:** Specifies the number of entries to store in the NFS server’s duplicate cache for the UDP network transport.

**Values:**
- Default: 5000
- Range: 1000 to 100000
- Type: Incremental

**Diagnosis:** N/A

**Tuning:**
- The duplicate cache size cannot be decreased. Increase the duplicate cache size for servers that have a high throughput capability. The duplicate cache is used to allow the server to correctly respond to NFS client retransmissions. If the server flushes this cache before the client is able to retransmit, then the server may respond incorrectly. Therefore, if the server can process 1000 operations before a client retransmits, the duplicate cache size must be increased.
- Calculate the number of NFS operations that are being received per second at the NFS server and multiply this by 4. The result is a duplicate cache size that should be sufficient to allow correct response from the NFS server. The operations that are affected by the duplicate cache are the following: `setattr()`, `write()`, `create()`, `remove()`, `rename()`, `link()`, `symlink()`, `mkdir()`, `rmdir()`.

nfs_use_reserved_ports (AIX 4.2.1 and later)

**Purpose:** Specifies using nonreserved IP port number.

**Values:**
- Default: 0
- Range: 0 or 1
- Type: Dynamic

**Diagnosis:** N/A

**Tuning:**
- Value of 0 use a nonreserved IP port number when the NFS client communicates with the NFS server.

nfs_v2_pdts

**Purpose:** Sets the number of tables for memory pools used by the biods for NFS Version 2 mounts.

**Values:**
- Default: 1
- Range: 1 to 8
- Type: Mount

**Diagnosis:** Run `vmstat -v` to look for non-zero values in the client filesystem I/Os blocked with no fsbuf field.

**Tuning:**
- Increase number until the blocked I/O count is no longer incremented during workload. The number may need to be increased in conjunction with `nfs_v2_vm_bufs`.

**Note:** `bufs` option must be set prior to `pdts`. 

---

Commands Reference, Volume 4
nfs_v2_vm_bufs

Purpose:
Sets the number of initial free memory buffers used for each NFS
version 2 Paging Device Table (pdt) created after the first table. The
very first pdt has a set value of 1000 or 10000, depending on
memory size. This initial value is also the default value of each
newly created pdt.

Note: Prior to AIX 5.2, running nfs_v2_vm_bufs would not affect
any previously established pdt. In AIX 5.2 and any subsequent
releases, changing nfs_v2_vm_bufs will also affect the size of the
old pdt if there are no current NFS version 2 mounts.

Values:
Default: 1000
Range: 1000 to 50000
Type: Incremental

Diagnosis:
Run vmstat -v to look for non-zero values in the client filesystem
I/Os blocked with no fsbuf field.

Tuning:
Increase number until the blocked I/O count is no longer
incremented during workload. The number may need to be
increased in conjunction with nfs_v2_pdts.

Note: buf option must be set prior to pdts.

nfs_v3_pdts

Purpose:
Sets the number of tables for memory pools used by the biods for
NFS Version 3 mounts.

Values:
Default: 1
Range: 1 to 8
Type: Mount

Diagnosis:
Run vmstat -v and look for non-zero values in the client filesystem
I/Os blocked with no fsbuf field.

Tuning:
Increase number until the blocked I/O count is no longer
incremented during workload. The number may need to be
increased in conjunction with nfs_v3_vm_bufs.

Note: buf option must be set prior to pdts.
**nfs_v3_server_readdirplus (AIX 5.2 and later)**

**Purpose:**
Enables or disables the use of the NFS V3 READDIRPLUS operation on the NFS server.

**Values:**
- Default: 1 (enabled)
- Range: 0 to 1
- Type: Dynamic

**Diagnosis:**
The READDIRPLUS operation adds overhead when reading very large directories in NFS-mounted filesystems using NFS V3 mounts, which can cause excessive CPU consumption by the `nfsd` threads, and slow response times to commands such as `ls` by an NFS client.

**Tuning:**
Disabling the use of the READDIRPLUS operation will help reduce the overhead when reading very large directories over NFS V3. However, note that this is NOT compliant with the NFS Version 3 standard. Most NFS V3 clients will automatically fall back to using the READDIR operation, but if problems arise the default value of this option should be restored.

---

**nfs_v3_vm_bufs**

**Purpose:**
Sets the number of initial free memory buffers used for each NFS version 3 Paging Device Table (pdt) created after the first table. The very first pdt has a set value of 1000 or 10000, depending on memory size. This initial value is also the default value of each newly created pdt.

**Note:** Prior to AIX 5.2, running `nfs_v3_vm_bufs` would not affect any previously established pdt. In AIX 5.2 and any subsequent releases, changing `nfs_v3_vm_bufs` will also affect the size of the old pdt if there are no current NFS version 3 mounts.

**Values:**
- Default: 1000
- Range: 1000 to 50000
- Type: Incremental

**Diagnosis:**
Run `vmstat -v` to look for non-zero values in the `client filesystem I/Os blocked with no fsbuf` field.

**Tuning:**
Increase number until the blocked I/O count is no longer incremented during workload. The number may need to be increased in conjunction with `nfs_v3_pdts`.

**Note:** `bufs` option must be set prior to `pdts`.
nfs_v4_pdts

**Purpose:**
Sets the number of tables for memory pools used by the biods for NFS Version 4 mounts.

**Values:**
- Default: 1
- Range: 1 to 8
- Type: Mount

**Diagnosis:**
Run `vmstat -v` to look for non-zero values in the client filesystem I/Os blocked with no fsbuf field.

**Tuning:**
Increase number until the blocked I/O count is no longer incremented during workload. The number might need to be increased in conjunction with `nfs_v4_vm_bufs`.

**Note:** The `bufs` option must be set prior to `pdts`.

nfs_v4_vm_bufs

**Purpose:**
Sets the number of initial free memory buffers used for each NFS version 4 Paging Device Table (pdt) created after the first table. The very first pdt has a set value of 1000 or 10000, depending on memory size. This initial value is also the default value of each newly created pdt.

**Note:** Prior to AIX 5.2, running `nfs_v4_vm_bufs` would not affect any previously established pdt. In AIX 5.2 and any subsequent releases, changing `nfs_v4_vm_bufs` will also affect the size of the old pdt if there are no current NFS version 4 mounts.

**Values:**
- Default: 1000
- Range: 1000 to 50000
- Type: Incremental

**Diagnosis:**
Run `vmstat -v` and look for non-zero values in the client filesystem I/Os blocked with no fsbuf field.

**Tuning:**
Increase number until the blocked I/O count is no longer incremented during workload. The number might need to be increased in conjunction with `nfs_v4_pdts`.

**Note:** The `bufs` option must be set prior to `pdts`. 
portcheck

**Purpose:**
Checks whether an NFS request originated from a privileged port.

**Values:**
- Default: 0
- Range: 0 or 1
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning:**
Value of 0 disables the port-checking that is done by the NFS server. A value of 1 directs the NFS server to do port checking on the incoming NFS requests. This is a configuration decision with minimal performance consequences.

server_delegation

**Purpose:**
Enables or disables NFS version 4 server delegation support.

**Values:**
- Default: 1
- Range: 0 or 1
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning:**
A value of 1 enables delegation support. A value of 0 disables delegation support. Server delegation can also be controlled by using the `/etc/exports` file and `exportfs`.

statd_debug_level

**Purpose:**
Sets the level of debugging for `rpc.statd`.

**Values:**
- Default: 0
- Useless Range: 0 to 9
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning:**
N/A
statd_max_threads

**Purpose:**
Sets the maximum number of threads used by `rpc.statd`.

**Values:**
- Default: 50
- Useful Range: 1 to 1000
- Type: Dynamic

**Diagnosis:**
The `rpc.statd` is multithreaded so that it can reestablish connections with remote machines in a concurrent manner. The `rpc.statd` threads are created as demand increases, usually because `rpc.statd` is trying to reestablish a connection with a machine that it cannot contact. When the `rpc.statd` threads become idle, they will exit. The `statd_max_threads` parameter is the maximum number of threads that can be created.

**Tuning:**
N/A

udpchecksum

**Purpose:**
Turns on or off the generation of checksums on NFS UDP packets.

**Values:**
- Default: 1
- Range: 0 or 1
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning:**
Make sure this value is set to on in any network where packet corruption might occur. Slight performance gains can be realized by turning it off, but at the expense of increased chance of data corruption.

utf8 (AIX 5.3 and later)

**Purpose:**
This option allow NFS v4 to perform UTF8 checking.

**Values:**
- Default: 1
- Range: 0 or 1
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning:**
A value of 1 turns on UTF8 checking of file names. A value of 0 turns off UTF8 checking.
utf8 validation

**Purpose:**
Enables checking of file names for the NFS version 4 client and server to ensure they conform to the UTF-8 specification.

**Values:**
- Default: 1
- Range: 0 or 1
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning:**
A value of 1 turns on UTF-8 checking of file names. A value of 0 turns it off.

**Examples**
1. To set the `portcheck` tunable parameter to a value of zero, type:
   ```
   nfso -o portcheck=0
   ```
2. To set the `udpchecksum` tunable parameter to its default value of 1 at the next reboot, type:
   ```
   nfso -r -d udpchecksum
   ```
3. To print, in colon-delimited format, a list of all tunable parameters and their current values, type:
   ```
   nfso -a -c
   ```
4. To list the current and reboot value, range, unit, type and dependencies of all tunable parameters managed by the `nfso` command, type:
   ```
   nfso -L
   ```
5. To display help information on `nfs_tcp_duplicate_cache_size`, type:
   ```
   nfso -h nfs_tcp_duplicate_cache_size
   ```
6. To permanently turn off `nfs_dynamic_retrans`, type:
   ```
   nfso -p -o nfs_dynamic_retrans=0
   ```
7. To list the reboot values for all Network File System tuning parameters, type:
   ```
   nfso -r -a
   ```
8. To list (spreadsheet format) the current and reboot value, range, unit, type and dependencies of all tunable parameters managed by the `nfso` command, type:
   ```
   nfso -x
   ```

**Related Information**
The `netstat` command, `no` command, `vmo` command, `ioc` command, `raso` command, `schedo` command, `tunchange` command, `tunsave` command, `tunrestore` command, `tuncheck` command, and `tundefault` command.

- Network File System
- Transmission Control Protocol/Internet Protocol
- NFS statistics and tuning parameters
- NFS commands
- Kernel Tuning in *AIX 5L Version 5.3 Performance Tools Guide and Reference*
- AIX 5.2 compatibility mode
nfsrgyd daemon

Purpose
Services translation requests between names and ids from servers and clients using NFS V4 or RPCSEC-GSS.

Syntax
nfsrgyd [-f]

Description
The nfsrgyd daemon provides a name translation service for NFS servers and clients. This daemon must be running in order to perform translations between NFS string attributes and UNIX numeric identities.

The environment variables NFS_NOBODY_USER and NFS_NOBODY_GROUP affect the anonymous user and group owner strings used in the name translations. If these environment variables are not set, their default values of nobody will be used. They may be set in the file /etc/environment, or on the command line before nfsrgyd is started.

The local NFS domain must be set before running the nfsrgyd daemon. This may be set by using the chnfsdom command.

Note: The nfsrgyd daemon uses port 400003.

Flags
-flags
 Creates a new process to flush the name translation cache and exits.

Security
Users must have root authority.

Files
/etc/environment Contains NFS environment variables.

Related Information
The chnfsdom command, the chnsrtd command, and the chnfssec command.

nfsstat Command

Purpose
Displays statistical information about the Network File System (NFS) and Remote Procedure Call (RPC) calls.

Syntax
Description
The `nfsstat` command displays statistical information about the NFS and Remote Procedure Call (RPC) interfaces to the kernel. You can also use this command to reinitialize this information. If no flags are given, the default is the `nfsstat -csnr` command. With this option, the command displays everything, but reinitializes nothing.

RPC Server Information
The server RPC display includes the following fields:

- **calls**: Total number of RPC calls received. This number includes the NFS version 4 calls if the `-4` flag is used. Otherwise, only the version 2 and version 3 total is displayed.
- **badcalls**: Total number of calls rejected by the RPC layer. This number includes the NFS version 4 calls if the `-4` flag is used. Otherwise, only the version 2 and version 3 total is displayed.
- **nullrecv**: Number of times an RPC call was not available when it was thought to be received.
- **badlen**: Number of RPC calls with a length shorter than a minimum-sized RPC call.
- **xdrcall**: Number of RPC calls whose header could not be XDR decoded.
- **dupchecks**: Number of RPC calls that looked up in the duplicate request cache.
- **dupreqs**: Number of duplicate RPC calls found.

RPC Client Information

- **calls**: Total number of RPC calls made
- **badcalls**: Total number of calls rejected by the RPC layer
- **badxid**: Number of times a reply from a server was received that did not correspond to any outstanding call
- **timeouts**: Number of times a call timed out while waiting for a reply from the server
- **newcreds**: Number of times authentication information had to be refreshed
- **badverfs**: The number of times the call failed due to a bad verifier in the response.
- **timers**: The number of times the calculated time-out value was greater than or equal to the minimum specified timed-out value for a call.
- **cantconn**: The number of times the call failed due to a failure to make a connection to the server.
- **nomem**: The number of times the calls failed due to a failure to allocate memory.
- **interrupts**: The number of times the call was interrupted by a signal before completing.
- **retrans**: The number of times a call had to be retransmitted due to a time-out while waiting for a reply from the server. This is applicable only to RPC over connection-less transports
- **dupchecks**: The number of RPC calls that looked up in the duplicate request cache.
- **dupreqs**: The number of duplicate RPC calls found.

NFS Server Information
The NFS server displays the number of NFS calls received (**calls**) and rejected (**badcalls**), as well as the counts and percentages for the various kinds of calls made.

NFS Client Information
The NFS client information displayed shows the number of calls sent and rejected, as well as the number of times a CLIENT handle was received (**clgets**), the number of times the client handle had no unused entries (**clatoomany**), and a count of the various kinds of calls and their respective percentages.

NFS Registry Daemon Information
The NFS registry daemon display shows the number of requests from the client and server to translate between UID/GID and string names.

-m Information
The `-m` flag displays information about `mount` flags set by `mount` options, `mount` flags internal to the system, and other `mount` information. See the `mount` command for more information.
The following `mount` options are set by `mount` flags:

- **auth**
  - Provides one of the following values:
    - **none** No authentication.
    - **unix** UNIX style authentication (UID, GID).
    - **des** des style authentication (encrypted timestamps).

- **hard**
  - Hard mount.

- **soft**
  - Soft mount.

- **intr**
  - Interrupts allowed on hard mount.

- **nointr**
  - No interrupts allowed on hard mount.

- **noac**
  - Client is not catching attributes.

- **rsize**
  - Read buffer size in bytes.

- **wsize**
  - Write buffer size in bytes.

- **retrans**
  - NFS retransmissions.

- **nocto**
  - No close-to-open consistency.

- **llock**
  - Local locking being used (no lock manager.

- **grpid**
  - Group ID inheritance.

- **vers**
  - NFS version.

- **proto**
  - Protocol.

The following `mount` options are internal to the system:

- **printed**
  - Not responding message printed.

- **down**
  - Server is down.

- **dynamic**
  - Dynamic transfer size adjustment.

- **link**
  - Server supports links.

- **symlink**
  - Server supports symbolic links.

- **readdir**
  - Use `readdir` instead of `readdirplus`.

### -t Information

The -t flag displays information relating to translation requests of the NFS identity mapping subsystem.

- **ids_to_strings**
  - The number of id-to-string translation requests.

- **strings_to_ids**
  - The number of string-to-id translation requests.

- **resolve_errors**
  - The number of failed translation requests due to missing data.

- **badowners**
  - The number of failed translation requests due to invalid inputs.

- **cache_hits**
  - The number of translation requests handled by the translation cache.

- **cache_misses**
  - The number of translation requests not handled by the translation cache.

- **cache_entries**
  - The number of entries in the translation cache.

- **cache_recycles**
  - The number of entries in the translation cache that have expired.

### Flags

- **-b**
  - Displays additional statistics for the NFS version 4 server.

- **-c**
  - Displays client information. Only the client side NFS and RPC information is printed. Allows the user to limit the report to client data only. The `nfsstat` command provides information about the number of RPC and NFS calls sent and rejected by the client. To print client NFS or RPC information only, combine this flag with the `-n` or `-r` option.

- **-d**
  - Displays information related to NFS version 4 delegations.
Displays RPCSEC_GSS information. The RPCSEC_GSS information sections contain:

- **activegss**
  - Active RPCSEC_GSS contexts

- **discardgss**
  - Discarded RPCSEC_GSS messages

- **krb5est**
  - Established krb5 contexts

- **krb5iest**
  - Established krb5i contexts

- **krb5pest**
  - Established krb5p contexts

- **expgss**
  - Expired RPCSEC_GSS contexts

- **badaccept**
  - gss_accept_sec_context failures

- **badverify**
  - gss_verify_mic failures

- **badgetmic**
  - gss_get_mic failures

- **badwrap**
  - gss_wrap failures

- **badunwrap**
  - gss_unwrap failures

- **-m**
  - Displays statistics for each NFS file system mounted along with the server name and address, mount flags, current read and write sizes, retransmission count, and the timers used for dynamic retransmission. This flag only applies to AIX 4.2.1 or later.

- **-n**
  - Displays NFS information. Prints NFS information for both the client and server. To print only the NFS client or server information, combine this flag with the -c and -s options.

- **-r**
  - Displays RPC information.

- **-s**
  - Displays server information.

- **-t**
  - Displays statistics related to translation requests of the NFS identity mapping subsystem. To print only the NFS client or server information, combine with the -c and -s options.

- **-4**
  - When combined with the -c, -n, -s, or -z flags, includes information for the NFS version 4 client or server, in addition to the existing NFS version 2 and version 3 data. Without this option, output will be identical to output from the **nfsstat** command in AIX versions prior to version 5.3.

- **-z**
  - Re-initializes statistics. This flag is for use by the root user only and can be combined with any of the above flags to zero particular sets of statistics after printing them.

**Examples**

1. To display information about the number of RPC and NFS calls sent and rejected by the client, enter:
   ```
   nfsstat -c
   ```

2. To display and print the client NFS call-related information, enter:
   ```
   nfsstat -cn
   ```

3. To display statistics for each NFS mounted file system in AIX 4.2.1 or later, enter:
   ```
   nfsstat -m
   ```

4. To display and print RPC call-related information for the client and server, enter:
   ```
   nfsstat -r
   ```

5. To display information about the number of RPC and NFS calls received and rejected by the server, enter:
To reset all call-related information to zero on the client and server, enter:
```
nfsstat -z
```

**Note**: You must have root user authority to use the `-z` flag.

### Related Information
- Network File System (NFS) Overview for System Management in *Networks and communication management*.
- List of NFS commands in *Networks and communication management*.
- NFS performance in *Performance management*.

### nice Command

#### Purpose
Runs a command at a lower or higher priority.

#### Syntax
```
nice [ - Increment  n Increment ] Command [ Argument ... ]
```

#### Description
The `nice` command lets you run a command at a priority lower than the command's normal priority. The `Command` parameter is the name of any executable file on the system. If you do not specify an `Increment` value the `nice` command defaults to an increment of 10. You must have root user authority to run a command at a higher priority. The priority of a process is often called its nice value.

The nice value can range from -20 to 19, with 19 being the lowest priority. For example, if a command normally runs at a priority of 10, specifying an increment of 5 runs the command at a lower priority, 15, and the command runs slower. The `nice` command does not return an error message if you attempt to increase a command's priority without the appropriate authority. Instead, the command's priority is not changed, and the system starts the command as it normally would.

The nice value is used by the system to calculate the current priority of a running process. Use the `ps` command with the `-l` flag to view a command's nice value. The nice value appears under the `NI` heading in the `ps` command output.

**Note**: The `csh` command contains a built-in command named `nice`. The `/usr/bin/nice` command and the `csh` command's `nice` command do not necessarily work the same way. For information on the `csh` command's `nice` command, see the `csh` command.

#### Flags
- `- Increment` Increments a command's priority up or down. You can specify a positive or negative number. Positive increment values reduce priority. Negative increment values increase priority. Only users with root authority can specify a negative increment. If you specify an increment value that would cause the nice value to exceed the range of -20 to 19, the nice value is set to the value of the limit that was exceeded. This flag is equivalent to the `-n Increment` flag.
- `-n Increment` This flag is equivalent to the `- Increment` flag.
Exit Status

If the command specified by the Command parameter is started, the exit status of the nice command is the exit status of the command specified by the Command parameter. Otherwise, the nice command exits with one of the following values:

1-125  An error occurred in the nice command.
126    The command specified by the Command parameter was found but could not be invoked.
127    The command specified by the Command parameter could not be found.

Examples

1. To specify a very low priority, enter:
   ```
   nice -n 15 cc -c *.c &
   ```
   This example runs the cc command in the background at a lower priority than the default priority set by the nice command.

2. To specify a very high priority, enter:
   ```
   nice --10 wall <<end
   System shutdown in 2 minutes!
   end
   ```
   This example runs the wall command at a higher priority than all user processes, which slows down everything else running on the system. The <<end and end portions of the example define a here document, which uses the text entered before the end line as standard input for the command.
   
   **Note:** If you do not have root user authority when you run this command, the wall command runs at the normal priority.

3. To run a command at low priority, enter:
   ```
   nice cc -c *.c
   ```
   This example runs the cc command at low priority.
   
   **Note:** This does not run the command in the background. The workstation is not available for doing other things.

4. To run a low-priority command in the background, enter:
   ```
   nice cc -c *.c &
   ```
   This example runs the cc command at low priority in the background. The workstation is free to run other commands while the cc command is running. Refer to the "Shells" in Operating system and device management for more information on background (asynchronous) processing.

Files

/usr/bin/nice Contains the nice command.

Related Information

The csh command, nohup command, renice command.

The nice subroutine.

The Processes in Operating system and device management discusses what processes are and input and output redirection.
Shells in *Operating system and device management* describes what shells are, the different types, and how they affect the way commands are interpreted.

Controlling contention for the microprocessor in *Performance management*.

---

**nim Command**

**Purpose**
Performs operations on Network Installation Management (NIM) objects.

**Syntax**
```
nim { -o Operation | -F | -t Type | -a Attribute=Value . . . } {ObjectName}
```

**Description**
The `nim` command performs an operation on a NIM object. The type of operation performed is dependent on the type of object specified by the `ObjectName` parameter. Possible operations include initializing environments and managing resources. You can use the `lsnim` command to display the list of supported operations.

**Flags**
- `-a Attribute = Value . . .` Assigns the specified value to the specified attribute. Use the `lsnim -q Operation -t Type` command to get a list of valid attributes for a specific operation.
- `-F` Overrides some safety checks.
**-o Operation**

Specifies an operation to perform on a NIM object. The possible operations are:

- **allocate**
  Allocates a resource for use.

- **alt_disk_install**
  Performs an alternate disk installation.

- **bos_inst**
  Performs a BOS installation.

- **change**
  Changes an object’s attributes.

- **check**
  Checks the status of a NIM object.

- **cust**
  Performs software customization.

- **deallocate**
  Deallocates a resource.

- **define**
  Defines an object.

- **diag**
  Enables a machine to boot a diagnostic image.

- **dkls_init**
  Initializes a diskless machine’s environment.

- **dtls_init**
  Initializes a dataless machine’s environment.

- **fix_query**
  Lists the fix information for a given APAR or keyword.

- **lppchk**
  Verifies installed filesets on NIM machines and SPOTs.

- **lppmgr**
  Eliminates unnecessary software images in an **lpp_source**.

- **lslpp**
  Lists licensed program information about an object.

- **maint**
  Performs software maintenance.

- **maint_boot**
  Enables a machine to boot in maintenance mode.

- **remove**
  Removes an object.

- **reset**
  Resets an object’s NIM state.

- **restvg**
  Performs a **restvg** operation.

- **showlog**
  Displays a NIM client’s installation, boot or customization log, or a SPOT’s installation log from the NIM master.

- **showres**
  Displays the contents of a NIM resource.

- **sync_roots**
  Synchronizes root directories for diskless and dataless clients for a specific Shared Product Object Tree (SPOT).

- **unconfig**
  Unconfigures the NIM master fileset.

- **update**
  Adds software to an **lpp_source** or removes software from an **lpp_source**.

Use the **lsnim -POt Type** command to get a list of the valid operations for a specific type.
-t Type Specifies the type of the NIM object for define operations. The possible types are:

resource types:

adapter_def
Directory containing secondary adapter definition files.

bosinst_data
Config file used during base system installation.

dump
Parent directory for client dump files.

exclude_files
Contains files to be excluded from a mksysb image. This resource applies only to AIX 4.2 or later.

fix_bundle
Fix (keyword) input file for the cust or fix_query operation.

fb_script
Executable script that is run during the first reboot of a machine.

home
Parent directory for client /home directories.

image_data
Config file used during base system installation.

installp_bundle
Installp bundle file.

lpp_source
Source device for optional product images.

mksysb
mksysb image.

paging
Parent directory for client paging files.

root
Parent directory for client / (root) directories.

resolv_conf
Name-server configuration file.

savevg
A savevg image.

script
Executable file that is run on a client.

shared_home
/home directory shared by clients.

spot
Shared Product Object Tree (SPOT) - equivalent to /usr file system.

tmp
Parent directory for client /tmp directories.

vg_data
Configuration file used during volume group restoration.

machine types:

diskless
All file systems and resources remote.

dataless
Local paging, dump; remote /usr; others remote or local.

standalone
Local file systems and resources.

master
Machine that controls the NIM environment.
-t Type (Continued)

**network types:**

- **tok**  
  Token-Ring network.

- **ent**  
  Ethernet network.

- **fddi**  
  FDDI network.

- **atm**  
  ATM network. (AIX 4.3 or later.)

- **generic**  
  Other TCP/IP networks.

**group types:**

- **mac_group**  
  Group of machines.

- **res_group**  
  Group of resources.

**Security**

Access Control: You must have root authority to run the **nim** command.

**Examples**

The following examples are grouped by operation.

**allocate**

1. To allocate resources to a diskless workstation with the name of **syzygy** and SPOT attribute value of **spot1**, type:

   ```nim -o allocate -a spot=spot1 syzygy```

2. To perform a base system installation on the machine named **krakatoa**, resources must first be allocated by typing:

   ```nim -o allocate -a spot=myspot -a lpp_source=images krakatoa```

   Then the NIM environment can be initialized to support the install by performing the **bos_inst** operation, type:

   ```nim -o bos_inst krakatoa```

3. To install the software product, **adt**, into a standalone machine, **stand1**, given that the installable option, **adt**, resides in the **lpp_source**, **images**, type:

   ```nim -o allocate -a lpp_source=images stand1```

   Then type:

   ```nim -o cust -a filesets="adt" stand1```

4. To install software products into a standalone machine, **stand1**, such that the image for the installable option, **adt**, resides in the **lpp_source**, **images**, and the **installp_bundle**, **bundle1**, contains the name of the installable option, type:

   ```nim -o allocate -a lpp_source=images \ -a installp_bundle=bundle1 stand1```

   Then type:

   ```nim -o cust stand1```

5. To automatically configure a machine with name resolution services after a BOS installation, create the file `/exports/resolv.conf`, with contents similar to the following:

   ```
   nameserver 129.35.143.253
   nameserver 9.3.199.2
   domain austin.ibm.com
   ```
then type:

```
nim -o define -t resolv_conf -a location=/exports/resolv.conf \
   -a server=master rconf1
```

Prior to issuing the `bos_inst` operation, allocate this resource with other required and optional resources by typing:

```
nim -o allocate -a spot=spot1 -a lpp_source=images1 \
   -a bosinst_data=bid1 -a resolv_conf=rconf1 client1
```

6. To allocate all resources applicable to standalone machines from the NIM resource group res_grp1, to the machine mac1, type:

```
nim -o allocate -a group=res_grp1 mac1
```

### alt_disk_install

1. To install a `mksysb` resource `all_devices_mysysb` to client roundrock, on hdisk4 and hdisk5, using the `image_data` resource `image_data_shrink`, with debug turned on, type:

```
nim -o alt_disk_install -a source=mksysb\n   -a image_data=image_data_shrink\n   -a debug=yes\n   -a disk='hdisk4 hdisk5' roundrock
```

2. To clone a `rootvg` on client austin to hdisk2, but only run phase1 and phase2 (leaving the `/alt_inst` file systems mounted), type:

```
nim -o alt_disk_install -a source=rootvg\n   -a disk='hdisk2'\n   -a phase=12 austin
```

### bos_inst

1. To install the machine `blowfish`, using the resources `spot1`, `images1`, `bosinst_data1`, and `rconf1`, first allocate the resources by typing:

```
nim -o allocate -a spot=spot1 -a lpp_source=images1 \n   -a bosinst_data=bosinst_data1 -a resolv_conf=rconf1 blowfish
```

Then, perform the BOS installation by typing:

```
nim -o bos_inst blowfish
```

2. To install the machine `blowfish` while allocating the resources `spot1`, `images1`, `bosinst_data1`, and `rconf1` automatically when the `bos_inst` operation starts, type:

```
nim -o bos_inst -a spot=spot1 -a lpp_source=images1 \n   -a bosinst_data=bosinst_data1 -a resolv_conf=rconf1 blowfish
```

3. To use the default resources when installing the machine `mac1`, type:

```
nim -o bos_inst mac1
```

4. To install a machine, `deadfish`, with `spot1` and `lpp_source1` and use an `adapter_def` resource, `adapter_def1`, to configure secondary adapters, type:

```
nim -o bos_inst -a spot=spot1 -a lpp_source=lpp_source1 \n   -a adapter_def=adapter_def1 deadfish
```

5. To install the machine `blowfish` and accept software license agreements, type:

```
nim -o bos_inst -a spot=spot1 -a lpp_source=images1 \n   -a accept_licenses=yes -a resolv_conf=rconf1 blowfish
```

### change

1. Machines on the BLDG905 network use the `gateway905` gateway to reach the OZ network. Machines on the OZ network use the `gatewayOZ` gateway to reach the BLDG905 network. To add a route between two networks named BLDG905 and OZ, type:

```
nim -o change -a routing1="OZ gateway905 gatewayOZ" BLDG905
```

2. The adapter identified by the host name `sailfish2.austin.ibm.com` is attached to a token ring network. To define a secondary interface for this adapter on the NIM master and instructing NIM to
locate the NIM network representing the attached ethernet network and, if not found, have NIM define a NIM network with subnetmask 255.255.255.128, type:

```
nim -o change -a if2="find_net sailfish2.austin.ibm.com 0" \
-a net_definition="tok 255.255.255.128" -a ring_speed2=16 master
```

**Note:** A default name is generated for the network, and no routing information is specified for the new network.

3. To define default routes for the networks net1 and net2 that use default gateways gw1 and gw2 respectively, type the following two commands:

```
nim -o change -a routing1="default gw1" net1
nim -o change -a routing1="default gw2" net2
```

4. To designate the resources defined by the resource group res_grp1 as the set of resources always allocated by default during any operation in which these resources are applicable, type:

```
nim -o change -a default_res=res_grp1 master
```

**check**

1. To have NIM check on the usability of a SPOT named myspot, type:

```
nim -o check myspot
```

2. To check the status of an **lpp_source** named images, type:

```
nim -o check images
```

**cust**

1. To install a software product into a spot, spot1, such that the image for the installable option, adt, resides in the **lpp_source**, images, type:

```
nim -o cust -a lpp_source=images -a filesets=adt spot1
```

2. To install a software product into a spot, spot1, such that the image for the installable option, adt, resides in the **lpp_source**, images, and the **installp_bundle**, bundle1, contains the name of the installable option, type:

```
nim -o cust -a lpp_source=images -a installp_bundle=bundle1 spot1
```

3. To install a software product into a spot, spot1, such that the image for the installable option, adt, resides on a tape that is in the tape drive that is local to the machine where the spot resides, type:

```
nim -o cust -a lpp_source=/dev/rmt0 -a filesets=adt spot1
```

4. To install a software product into a spot, spot1, such that the image for the installable option, adt, resides on a tape that is in the tape drive that is local to the machine where the spot resides, type:

```
nim -o cust -a lpp_source=/dev/rmt0 -a filesets=adt spot1
```

5. To install all fileset updates associated with APAR IX12345, residing on the tape /dev/rmt0 into spot1 and any diskless or dataless clients to which spot1 is currently allocated, type:

```
nim -F -o cust -afixes=IX12345 -a lpp_source=/dev/rmt0 spot1
```

6. To update all software installed on the client Standalone1, with the latest updates in the **lpp_source** named updtd_images, type:

```
nim -o allocate -a lpp_source=updtd_images Standalone1
nim -o cust -afixes=update_all Standalone1
```

7. To install the machine catfish with the contents of the **installp_bundle** bundle1, first allocate the resources by typing:

```
nim -o allocate -a installp_bundle=bundle1 \
-a lpp_source=images1 catfish
```

Then, perform the cust operation by typing:

```
nim -o cust catfish
```

8. To update all software installed on the client Standalone1, with the latest updates in the **lpp_source** named updtd_images, type:
nim -o cust -a lpp_source=updt_images -a fixes=update_all 
Standalone1

9. To install the machine catfish with the contents of the installp_bundle bundle1, while allocating this resource and the lpp_source images1 when the cust operation runs, type:

   nim -o cust -a installp_bundle=bundle1 -a lpp_source=images1 
catfish

10. To configure secondary adapters on a client machine, deadfish, using the secondary adapter configuration file in the adapter_def resource, adapter_def1, type:

   nim -o cust -a adapter_def=adapter_def1 deadfish
defallocate

   To deallocate an lpp_source named images from the standalone machine client1, type:

   nim -o deallocate -a lpp_source=images client1

define

1. To define an rspc uniprocessor dataless machine for AIX 5.1 and earlier on the token-ring network called net1 and call it altoid, type:

   nim -o define -t dataless -a if1="net1 fred 10005aa88500" 
   -a ring_speed=16 -a platform=rspc -a netboot_kernel=up 
   -a comments="Dataless client altoid"

   The comments attribute is optional and may contain any user-entered notes.

   Note: The if1 attribute is required.

2. To define a resource that is a directory containing installable images that is located on server altoid and has a path name of /usr/sys/inst.images, and name that resource images, type:

   nim -o define -t lpp_source -a server=altoid 
   -a location=/usr/sys/inst.images images

3. To create a new SPOT resource named mksysb1 on the NIM master in the /export/exec directory, using an lpp_source named images, type:

   nim -o define -t spot -a server=master -a location=/export/exec 
   -a source=images mksysb1

4. To define a network object named BLDG905, with a subnetmask of 255.255.240.0 and an address of 129.35.129.0, type:

   nim -o define -t tok -a snm=255.255.240.0 
   -a net_addr=129.35.129.0 BLDG905

5. To define an lpp_source, lppsrc1, that will be located on the master from a tape selecting a specific set of software products that are on the tape, bos.INed and bos.adt, type:

   nim -o define -t lpp_source -a location=/images2/lppsrc1 
   -a server=/dev/rmt0 -a packages="bos.INed 
   bos.adt" lppsrc1

6. To define a standalone machine that is a Symmetrical Multi-Processor model for AIX 5.1 and earlier that has a BOOTP-enabled IPL ROM, its hostname is jupiter and it will also be known as jupiter in the NIM environment, using a token-ring network called net1 and a ring speed of 16, type:

   nim -o define -t standalone -a if1="net1 jupiter 0" 
   -a ring_speed=16 -a platform=rs6ksmp jupiter

7. To define a mksysb resource, mksysb1, from an existing mksysb image located in /resources/mksysb.image on the master, type:

   nim -o define -t mksysb -a server=master 
   -a location=/resources/mksysb.image mksysb1

8. To define a NIM network named ATMnet with a subnet mask of 255.255.240 and an address of 129.35.101.0 to represent an ATM network, use the generic network type as follows:

   nim -o define -t generic -a snm=255.255.240.0 
   -a net.addr=129.35.101.0 ATMnet
9. To define a PowerPC® PCI bus-based, symmetric multiprocessor computer for AIX 5.1 and earlier whose hostname is bluefish as a standalone machine on a token ring network called net1 and have the machine be known to the NIM environment as bluefish, type:

   nim -o define -t standalone -a platform=rscsmp -a if1="net1 bluefish 0" -a ring_speed=16 bluefish

10. To define a machine group named DisklsMacs1 with members that are NIM diskless machines named diskls1, diskls2, and diskls3, type:

   nim -o define -t mac_group -a add_member=diskls1 -a add_member=diskls2 -a add_member=diskls3 DisklsMacs1

11. To define a resource group named DisklsRes1 with resources spot1, root1, dump1, paging1, homel, tmp1, type:

   nim -o define -t res_group -a spot=spot1 -a root=root1 -a dump=dump1 -a paging=paging1 -a home=homel -a tmp=tmp1 DisklsRes1

12. To display the space required to define a mksysb resource, mksysb2, and create a mksysb image of the client, client1, during the resource definition where the image will be located in /resources/mksysb.image on the master, type:

   Note: This action only shows the space required for the operation, mksysb or resource creation does NOT take place.

   nim -o define -t mksysb -a server=master -a location=/resources/mksysb.image -a source=client1 -a mk_image=yes -a size_preview=yes mksysb2

13. To define a mksysb resource, mksysb2, and create the mksysb image of the client, client1, during the resource definition where the image will be located in /resources/mksysb.image on the master, type:

   nim -o define -t mksysb -a server=master -a location=/resources/mksysb.image -a source=client1 -a mk_image=yes mksysb2

14. To define a mksysb resource, mksysb2, and create the mksysb image of the client, client1, during the resource definition where the mksysb flags used to create the image are -em, and the image will be located in /resources/mksysb.image on the master, type:

   nim -o define -t mksysb -a server=master -a location=/resources/mksysb.image -a source=client1 -a mk_image=yes -a mksysb_flags=em mksysb2

15. To define an exclude_files resource, exclude_file1, located in /resources/exclude_file1 on the master, type:

   nim -o define -t exclude_files -a server=master -a location=/resources/exclude_file1 exclude_file1

16. A machine called redfish, hostname redfish_t.lab.austin.ibm.com, has its primary interface attached to a token-ring network with ring speed of 16 Megabits. To define redfish as a standalone machine in the NIM environment and instructing NIM to locate the name of the network that the machine’s primary interface is attached, type:

   nim -o define -t standalone -a if1="find_net redfish_t.lab.austin.ibm.com 0" -a ring_speed=16 redfish

17. A machine called bluefish, hostname is bluefish_e.lab.austin.ibm.com, has its primary interface attached to an ethernet network with cable_type of bnc. To define bluefish as a diskless machine in the NIM environment and instructing NIM to locate the name of the network that the machine’s primary interface is attached, and if not found, have NIM define a NIM network with the name ent_net, subnetmask of 255.255.255.128 and default route using the gateway with hostname lab_gate, type:

   nim -o define -t diskless -a if1="find_net bluefish_e.lab.austin.ibm.com 0" -a net_definition="ent 255.255.255.128 lab_gate 0 ent_net" -a cable_type=bnc bluefish
Note: Specify 0 in place of the master gateway in the net_definition attribute if a default route for the master already exists, otherwise you must specify the master gateway.

18. To define the /export/nim/adapters directory as an adapter_def resource, adapter_def1, located on the master, type:
   nim -o define -t adapter_def -a server=master \n   -a location=/export/nim/adapters adapter_def1

   To populate the adapter_def resource with secondary adapter configuration files, run the namadapters command.

19. To display the space required to define a savevg resource, savevg2, and create a savevg image of the client, client1, during the resource definition where the image will be located in /export/nim/savevg on the master and the volume_group to to backup is myvg, type:
   nim -o define -t savevg -a server=master \n   -a location=/export/nim/savevg/savevg2 -a source=client1 \n   -a mk_image=yes -a size_preview=yes -a volume_group=myvg savevg2

   Note: This action only shows the space required for the operation. savevg or resource creation does not take place.

20. To define a savevg resource, savevg2, and create the savevg image of the client, client1, during the resource definition where the image will be located in /export/nim/savevg on the master and the volume_group to backup is myvg, type:
   nim -o define -t savevg -a server=master \n   -a location=/export/nim/savevg -a source=client1 \n   -a mk_image=yes -a volume_group=myvg savevg2

21. To define a savevg resource, savevg2, and create a savevg image of the client, client1, during the resource definition where the savevg flags used to create the image are -em, and the image will be located in /export/nim/savevg on the master, type:
   nim -o define -t savevg -a server=master \n   -a location=/export/nim/savevg -a source=client1 \n   -a mk_image=yes -a volume_group=myvg -a savevg_flags=em savevg2

22. To define a vg_data resource, my_vg_data, located on the master at the location /export/nim, type:
   nim -o define -t vg_data -a server=master -a location=/export/nim/my_vg_data my_vg_data

dkls_init
1. To initialize the environment for a diskless workstation with the name of syzygy, using the resources spot1, root1, dump1, and paging1, first allocate the resources by typing:
   nim -o allocate -a spot=spot1 -a root=root1 -a dump=dump1 \n   -a paging=paging1 syzygy

   Then initialize the resources for the client machine by typing:
   nim -o dkls_init syzygy

2. To initialize the environment for a diskless workstation with the name of syzygy, type:
   nim -o dkls_init syzygy

3. To exclude the member named diskls2 from operations on the machine group DisklsMacs1, and then initialize the remaining members while allocating the diskless resources defined by the resource group named DisklsRes1, type the following two commands:
   nim -o select -a exclude=diskls2 DisklsMacs1
   nim -o dkls_init -a group=DisklsRes1 DisklsMacs1

4. To initialize the group of diskless machines defined by the machine group dtgrp1, while allocating the required and optional resources defined by the resource group dk_resgrp1, when the dkls_init operation runs, type:
   nim -o dkls_init -a group=dtgrp1 dk_resgrp1
### dtls_init

1. To initialize the environment for a dataless workstation with the name of `syzygy`, using the resources `spot1`, `root1`, and `dump1`, first allocate the resources by typing:

   ```bash
   nim -o allocate -a spot=spot1 -a root=root1 -a dump=dump1 syzygy
   ```

   Then initialize the resources for the client machine by typing:

   ```bash
   nim -o dtls_init syzygy
   ```

2. To initialize the environment for a dataless workstation with the name of `syzygy`, type:

   ```bash
   nim -o dtls_init syzygy
   ```

3. To exclude the member named `dataless1` from operations on the machine group `DatalsMacs1`, and then initialize the remaining members while allocating the dataless resources defined by the resource group named `DatalsRes1`, type the following two commands:

   ```bash
   nim -o select -a exclude=dataless2 DatalsMacs1
   nim -o dtls_init -a group=DatalsMacs1 DatalsRes1
   ```

4. To initialize the group of dataless machines defined by the machine group `DatalsMacs1`, while allocating the required and optional resources defined by the resource group `DatalsRes1`, when the `dtls_init` operation runs, type:

   ```bash
   nim -o dtls_init -a group=DatalsMacs1 DatalsRes1
   ```

### fix_query

To list information about fixes installed on client `Standalone1` for 20 APAR numbers, create the file `/tmp/apar.list` with one APAR number per line, as shown:

```
IX123435
IX54321
IX99999
...
```

then type:

```bash
nim -o define -t fix_bundle -a location=/tmp/apar.list \
   -aserver=master fix_bun
nim -o allocate -a fix_bundle=fix_bun Standalone1
nim -o fix_query Standalone1
```
nim -o lppmgr -a lppmgr_flags="-rX" lpp_source1

4. To remove all language support except 'C' from lpp_source1, type:
  nim -o lppmgr -a lppmgr_flags="-r -k C" lpp_source1

maint

1. To deinstall the software products bos.INed and adt from a spot, spot1, type:
   nim -o maint -a installp_flags="-u" \
   -a filesets="bos.INed adt" spot1

2. To deinstall the options bos.INed and adt from a spot, spot1, such that the installp_bundle, bundle2, contains the names of the installable options, type:
   nim -o maint -a installp_flags="-u" \
   -a installp_bundle=bundle2 spot1

3. To cleanup from an interrupted software installation on a spot, spot1, type:
   nim -o maint -a installp_flags="-C" spot1

4. From the master, to deinstall the software products bos.INed and adt from a standalone machine, stand1, type:
   nim -o maint -a installp_flags="-u" \
   -a filesets="bos.INed adt" stand1

5. From the master, to clean up from an interrupted software installation on a standalone machine, stand1, type:
   nim -o maint -a installp_flags="-C" stand1

6. From the master, to deinstall the software products bos.INed and adt from a standalone machine, stand1, such that installp_bundle, bundle2, contains the names of the installable options, type:
   nim -o maint -a installp_flags="-u" \
   -a installp_bundle=bundle2 stand1

maint_boot

To enable the NIM standalone client, stand1, to boot in maintenance mode, type:
nim -o maint_boot stand1

This sets up the maintenance boot operation, but you must initiate the network boot locally from stand1.

remove

To remove a resource named dump_files, type:
nim -o remove dump_files

showlog

To view the boot logs of the machines defined by the group Disk1sMacs1, type:
nim -o showlog -a log_type=boot Disk1sMacs1

showres

1. To show the contents of the config script script1, type:
   nim -o showres script1

2. To show the contents of the bosinst.data resource bosinst_data1, type:
   nim -o showres bosinst_data1

3. To list all the filesets in the lpp_source lpp_source1, type:
   nim -o showres lpp_source1

4. To list all the filesets in the lpp_source lpp_source1 relative to what is currently installed on the machine machine1, type:
   nim -o showres -a reference=machine1 lpp_source1

5. To list user instructions for the bos.INed and x1C.rte filesets on the lpp_source lpp_source1, type:
nim -o showres -a filesets="bos.INed xlC.rte" \
-a install_flags="qi" lpp_source1

6. To list all problems fixed by software on the lpp_source1, use:
   nim -o showres -a instfix_flags="T" lpp_source1

7. To show the contents of the secondary adapter configuration file in the adapter_def resource,
   adapter_def1, for client, deadfish, type:
   nim -o showres -a client=deadfish adapter_def1

8. To show the contents of every secondary adapter configuration file in the adapter_def resource,
   adapter_def1, type:
   nim -o showres adapter_def1

9. To show the contents of the savevg resource, savevg1, type:
   nim -o showres savevg1

update
1. To add all the filesets on /dev/cd0 to lpp_source1, type:
   nim -o update -a packages=all -a source=/dev/cd0 lpp_source1

2. To add the bos.games 5.2.0.0 and bos.terminfo filesets to lpp_source1, type:
   nim -o update -a packages="bos.games 5.2.0.0 bos.terminfo" \
   -a source=/dev/cd0 lpp_source1

3. To remove bos.games from lpp_source1, type:
   nim -o update -a rm_images=yes -a packages="bos.games" lpp_source1

4. To recover the missing SIMAGES for lpp_source1 from the AIX Installation CD, type:
   nim -o update -a recover=yes -a source=/dev/cd0 lpp_source1

Files
/etc/niminfo Contains variables used by NIM.

Related Information
The lsnim command, nimadapters command, nimclient command, nimconfig command, niminit

The .info file.

nim_clients_setup Command

Purpose
Define clients and initialize BOS install operation on NIM client objects.

Syntax
nim_clients_setup [-m mksysb_resource] [-n] [-c] [-r] [-v] client_object(s)

Description
The nim_clients_setup command defines new client objects and initializes the BOS install operation for
clients in the NIM environment by performing the following tasks:
• Exports the environment variable NIM_LICENSE_ACCEPT=yes.
  – Used for accepting software license agreement during network install.
• Adds variable entry NSORDER=local,bind in /etc/environment.
  – Necessary for name resolution when hosts only exist in /etc/host.
• Defines client objects using `client.defs` file (if `-c` flag specified).
  – User must edit stanzas in `/export/nim/client.defs` file prior to using `nim_clients_setup`.
• Prepares client objects for install.
  – If `-c` flag is used, defined clients are initialized for install.
  – If client objects are given, specified clients are initialized for install.
  – If `-c` or client objects are omitted, all existing NIM clients are initialized for install.
• Resources contained in the group name `basic_res_grp` are used as resources during the BOS install operation.

Note: The `basic_res_grp` resource group is populated with resources created during `nim_master_setup` command execution. If this group is not present, it must be defined with NIM install resources prior to using the `nim_clients_setup` command.

Flags

- `m mksysb_resource` Specifies an alternate backup image to restore during BOS install. The value for `mksysb_resource` may specify a NIM object name or absolute path location used for defining a new `mksysb` resource. By default, the `mksysb` resource is assigned from the `basic_res_grp` NIM resource group.
- `n` Enables native (`rte`) install and ignores restoring backup image (`mksysb`) during BOS install. By default, `mksysb restore` is performed during BOS install.
- `c` Defines client objects from the `client.defs` file. The `/export/nim/client.defs` file must exist and have valid client definition information. The `client.defs` file is created during `nim_master_setup` command execution. If the file is not present, a sample `client.defs` file may be copied from `/usr/samples/nim/client.defs` and edited by the user.
- `r` Reboots client objects after initiating BOS install operation. By default, clients are not rebooted. Resources are assigned for install and clients may be rebooted when desired.
- `v` Enables verbose debug output during command execution.

Security

Access Control: You must have root authority to run the `nim_clients_setup` command.

Location

/usr/sbin/nim_clients_setup

Examples

1. To define client objects from `/export/nim/client.defs` file, initialize the newly defined clients for BOS install using resources from the `basic_res_grp` resource group, and reboot the clients to begin install, type:

   `nim_clients_setup -c -r`

2. To initialize clients client1 and client2 for BOS install, using the backup file `/export/resource/NIM/530mach.sysb` as the restore image, type:

   `nim_clients_setup -m /export/resource/NIM/530mach.sysb \ client1 client2`

3. To initialize all clients in the NIM environment for native (`rte`) BOS install using resources from the `basic_res_grp` resource group, type:

   `nim_clients_setup -n`

Files

`/etc/niminfo` Contains variables used by NIM.
Related Information

The `nim_master_setup` command, `nim_update_all` command, `nim_master_recover` command, `nim` command, `nimconfig` command, and `nimdef` command.

nim_master_recover Command

Purpose

Restores a backup of the Network Installation Management (NIM) database to a different machine and updates the database to reflect this change.

Syntax

```
nim_master_recover [mstr_files_dir] 
[-n nimdef_file] 
[-r nimdb_file] 
[-i mstr_interface] 
[-N mstr_net_info [-t net_def]]
```

Description

The `nim_master_recover` command can restore and update the NIM database from a backup tar file or update the database from a `mksysb`. To backup the NIM database on the old master, run the `smit nim_backup_db` command. This creates a tar file named `/usr/objrepos/nimdb.backup` by default. Once the `nimdb.backup` is copied to the new master, pass the `-r` flag with the full path to the file. If the path to the tar file is `/usr/objrepos/nimdb.backup`, then pass `-r /usr/objrepos/nimdb.backup` to the `nim_master_recover` script. If you are restoring a `mksysb` of your primary NIM master, then you can update the NIM database restored from the `mksysb`, and therefore, you will not need the `nimdb.backup` tar file.

The script updates the master definition in the NIM database based on the master’s primary network interface. The `-i` flag specifies the primary interface to use for the master. To use `en0`, pass `-i en0` to the `nim_master_recover` script.

Note: A restored NIM database may be incorrect if you restore from a database that has network definitions containing static routes. The `nim_master_recover` command removes all the interfaces in the old master definition before adding the primary interface for the new master. Check that the routing information is correct after running the `nim_master_recover` command, by running `lsnim -lc networks`. If all the NIM network definitions in the restored database contain dynamic routes, then you should not run into this situation.

Along with restoring and updating the NIM database, the script performs several other optional functions. One is to install the `bos.sysmgmt.nim.master` fileset if the `-f` flag is passed with the location of the `bos.sysmgmt` package. For instance, if the `bos.sysmgmt` package is located in the `/export/latest/installp/ppc` directory, then you would pass `-f /export/latest/installp/ppc` to the `nim_master_recover` script.

The script always resets each client. If the `-u` flag is passed, the script attempts to unexport NIM resources that the database states are allocated to clients. Each client stores the hostname of its NIM master in its `/etc/niminfo` file. To update the `niminfo` file on each client, pass the `-s` flag.
Note: Any NIM client that is not running, does not have a network connection, does not allow the new master rhost permissions, or does not have at least the bos.sysmgmt.nim.client 5.1.0.10 package, will not have its niminfo updated. The nim_master_recover script will report any clients which fail to have their niminfo files updated.

New clients can be added to the environment by specifying a nimdef file with the -n flag. Consult the AIX Installation Guide for more information on nimdef files.

Finally, the script will check to see if the resources in the NIM database exist. The script deletes resources that don’t exist. For example if the new master is unable to communicate with a NIM server, then the resources defined on that server will be removed from the NIM database. Passing the -R flag prevents the script from checking resources.

Note: Resources that were defined on the master where the database was backed up, will not be available once the database is restored unless the resources were copied to the new master or a mksysb of the master including the resources was restored on the machine before running nim_master_recover.

All output will be logged to /var/adm/ras/nim.recover. Once the script is complete you should verify that no errors were logged.

The nim_master_recover command behaves differently when it is called with the -N flag. This allows the master to have its hostname, IP address, and NIM network changed in its if1 attribute. Optionally, a new NIM network may be created if the -t flag is provided with the -N flag. The command should be run with these flags before the master's network name or address is actually changed so that the NIM environment will work properly once the change actually takes place. When the master’s NIM attributes are changed, the command will attempt to update /rhosts and /etc/niminfo of each standalone client defined in the environment. Any clients for which this attempt fails must have its NIM master information updated manually. Also, after a standalone client has had its NIM master’s network name changed, it will not be able to execute any NIM operations until the master is up and running with its new network name.

**Flags**

- **-D** Deletes all client definitions from the restored database.
- **-f directory** Directory containing the bos.sysmgmt.nim.master fileset to install.
- **-i interface** Primary network interface of the machine where you are running the command.
- **-n nimdef** Optional nimdef file that will be used to define new machines.
- **-N mstr_net_info** Changes the master’s if1 attribute and attempts to update each standalone client defined in the environment with the master’s new network information. The mstr_net_info variable consists of the following: “nim_net_name [hostname] [cable_type]”; where hostname and cable_type are optional.
- **-p** Print the machine states before the script resets the machines.
- **-r nimdb.backup** The NIM database backup tar file that will be restored.
- **-R** Do not check the resources to see if each one exists. The default behavior is for the script to check each resource and if it does not exist, remove its definition from the database.
- **-S** Do not check the SPOT resources. The default behavior is for the script to check every SPOT to ensure it is ready to support an install. For example, the check ensures the boot images are created.
- **-s** Attempt to update the niminfo file on each client. Any NIM client that is not running, does not have a network connection, does not allow the new master rhost permissions, or does not have at least the bos.sysmgmt.nim.client 5.1.0.10 package installed, will not have its niminfo updated.
- **-t net_def** Creates a new NIM network if the master’s IP address changes and there is no existing NIM network that could contain the master. This flag is only valid when the -N flag is also specified. The net_def variable consists of the following: “nim_net_name net_type net_addr net_snm default_route”; where net_type can be ent, tok, atm, or fddi.
Unexport all resources that are listed as allocated in the restored database. The default behavior is for the script to delete the allocation from the NIM database without attempting to deallocate the resource.

Enables verbose debug output during command execution.

Location
/usr/sbin/nim_master_recover

Exit Status
Returns zero (0) upon success.

Security
Access Control: You must have root authority to run the nim_master_recover command.

Examples
1. To recover the NIM master using the /export/nim/nimdb.backup file and the primary interface en0, type:
   ```
   nim_master_recover -r /usr/objrepos/nimdb.backup -i en0
   ```
2. To install the bos.sysmg.t.nim.master filset from /export/lpp_source/installp/ppc before recovering the NIM master, type:
   ```
   nim_master_recover -f /export/lpp_source/installp/ppc \ 
   -r /usr/objrepos/nimdb.backup -i en0
   ```
3. To recover the NIM master without checking if each resource exists and without checking the SPOTs to rebuild boot images, type:
   ```
   nim_master_recover -R -S -r /usr/objrepos/nimdb.backup -i en0
   ```
4. To recover the NIM master while unexporting any resources that are allocated and printing the state of the clients before each one is reset, type:
   ```
   nim_master_recover -u -p -r /usr/objrepos/nimdb.backup -i en0
   ```
5. To recover the NIM master and update the /etc/niminfo file on each client, type:
   ```
   nim_master_recover -s -r /usr/objrepos/nimdb.backup -i en0
   ```
6. To recover the NIM master, delete each client from the database, and define new clients from the nimdef file /export/nim/nimdef, type:
   ```
   nim_master_recover -D -n /export/nim/nimdef -r /usr/objrepos/nimdb.backup -i en0
   ```
7. To change the master's hostname to newhost.domain.com and move it to a different existing NIM network, called net2, but preserve the value of the current cable_type attribute, type:
   ```
   nim_master_recover -N "net2 newhost.domain.com"
   ```
8. To change the master's hostname to newhost.domain.com, change its cable_type to bnc, and move it to a new NIM ethernet network called new_nim_net whose address is 192.168.1.0, subnet mask is 255.255.255.0, and default gateway is 192.168.1.1, type:
   ```
   nim_master_recover -N "new_nim_net newhost.domain.com bnc" \ 
   -t "new_nim_net ent 192.168.1.0 255.255.255.0 192.168.1.1"
   ```

Files
/etc/niminfo Contains variables used by NIM.
/var/adm/ras/nim.recover Contains log information from command execution.
nim_master_setup Command

Purpose
Initializes the Network Installation Management (NIM) master fileset, configures the NIM master, and creates the required resources for installation.

Syntax
```
nim_master_setup [ -a { mk_resource={yes|no} } [ file_system=fs_name ] [ volume_group=vg_name ] [ disk=disk_name ] [ device=device ] ] [-B] [-F] [-L] [-v]
```

Description
The `nim_master_setup` command initializes the NIM master fileset and configures the NIM environment. Once initialized, the `nim_master_setup` command configures the NIM environment by performing the following tasks:

- Determines which volume group and file system will contain the NIM resources.
- If necessary, creates the volume group and file system.
- Creates a NIM `mksysb` of the master.
  - Backup image.
- Creates a NIM `lpp_source` resource.
  - Source for product images.
- Creates a NIM spot resource.
  - Shared Product Object Tree (SPOT) - equivalent to `/usr` file system.
- Creates a NIM `bosinst_data` resource.
  - `config` file used during BOS installation.
- Creates a NIM `resolv_conf` resource.
  - Name-server configuration file.
- Defines a default resource group for use during install. The default resource group will contain all NIM resources defined during command execution.
- Copies a sample `client.defs` configuration file into the defined NIM file system.
  - Sample file which may be edited for adding clients in the NIM environment.
Flags

- Assigns the following attribute=value pairs:

  - **mk_resource={yes|no}**
    Specifies if NIM resources should be created. If set to no, NIM resources will not be created during command execution. By default, the value is yes.

  - **file_system=fs_name**
    Specifies the absolute path location for creating NIM resources. If fs_name does not exist, a logical volume will be created in the volume group defined from vg_name. By default, fs_name is /export/nim.

  - **volume_group=vg_name**
    Specifies the volume group name used for creating new logical volumes. If vg_name does not exist, a volume group will be created using the physical volume (disk) defined from disk_name. By default, vg_name is rootvg.

  - **disk=disk_name**
    Specifies the physical volume used when creating the vg_name volume group. If disk_name is not specified, the next available (empty) physical volume will be used.

  - **device=device**
    Specifies the absolute path location for install images used during NIM master fileset installation and resource creation. By default, device is /dev/cd0.

  - **-B**
    Disables the creation of the backup image.

  - **-F**
    Disables the creation of the file system.

  - **-L**
    Disables the creation of the lpp_source resource.

  - **-v**
    Enables verbose debug output during command execution.

Location

/usr/sbin/nim_master_setup

Exit Status

Returns zero (0) upon success.

Security

**Access Control:** You must have root authority to run the nim_master_setup command.

Examples

1. To install the NIM master fileset and initialize the NIM environment using install media located in device /dev/cd1, type:
   ```bash
   nim_master_setup -a device=/dev/cd1
   ```

2. To initialize the NIM environment without creating NIM install resources, type:
   ```bash
   nim_master_setup -a mk_resource=no
   ```

3. To initialize the NIM environment, create NIM install resources without creating a backup image, using install media located under mount point /cdrom, type:
   ```bash
   nim_master_setup -a device=/cdrom -B
   ```

4. To define NIM resources in an existing NIM environment, using install media located in device /dev/cd0, and create a new file system named /export/resources/NIM under volume group nimvg, type:
   ```bash
   nim_master_setup -a volume_group=nimvg
   -a file_system=/export/resources/NIM
   ```
**Note:** If the file system `/export/resources/NIM` does not currently exist, then it will be created under the volume group `nimvg`. If the `nimvg` volume group does not exist, it will be created using the next empty physical volume (disk) since the disk attribute was not specified.

**Files**

- `/etc/niminfo` Contains variables used by NIM.
- `/var/adm/ras/nim.setup` Contains log information from command execution.

**Related Information**

The `nim_clients_setup` command, `nim_update_all` command, `nim_master_recover` command, `nim` command, `nimconfig` command, and `nimdef` command.

---

**nim_move_up Command**

**Purpose**

Facilitates the enablement of new hardware (namely POWER5 or later servers) in AIX environments.

**Syntax**

```
```

**Description**

The `nim_move_up` command enables users of existing AIX environments to take advantage of the capabilities available on new hardware (namely POWER5 servers or later). The command provides an interface that migrates an existing AIX system onto an LPAR residing on a POWER5 (or later) server. The level of AIX on the original machine is raised to a level that supports operation on POWER5 hardware. The original system's hardware resources are closely replicated on the equivalent POWER5 hardware. By the end of the migration, the same system is fully running on a POWER5 LPAR.

In addition, `nim_move_up` can use the Virtual I/O capabilities of POWER5 servers by optionally migrating a client onto virtualized hardware, such as virtual disks and virtual Ethernet.

The `nim_move_up` command relies on the functionality of NIM and the NIM master's capability of remotely managing and installing NIM clients on the network. The `nim_move_up` command attempts to use the NIM master and the `nimadm` command to complete the following actions on an existing NIM client:

1. Create a system backup of the client
2. Migrate the backup's level of AIX
3. Install the backup onto an LPAR that resides on a POWER5 server, which will be represented in the NIM environment as a new standalone client

Before the POWER5 hardware is installed, the NIM master (on which the `nim_move_up` command is run) and the NIM clients on the existing hardware must be configured (see Restrictions). The clients are the starting point of the migration and eventually turn into POWER5 LPARs.

After a successful migration, the following conditions are true:

- The NIM master remains the same.
• The LPARs on the POWER5 server correspond to the original NIM clients and are controlled by the NIM master.
• An HMC controls the LPARs on the POWER5 servers by communicating with the NIM master through SSH.
• The original NIM clients remain unaffected and still in control of the NIM master.

The entire migration takes place without any downtime required on the part of the original client. The process can be completed in phases executed sequentially, which allows more control over the process, or can be executed all at once, so that no user interaction is required. The command is delivered as part of the bos.sysmgmt.nim.master fileset and requires a functional NIM environment in order to run.

**Required Flags**

- **-c NIM_client**
  Specifies either a NIM standalone client (standalone object type) or a NIM machine group (mac_group object type). The client indicated must be reachable using the network from the NIM master and must allow the NIM master to run commands on them. If a NIM machine group is specified in this argument, it must reside in the same NIM network. The client is the target machine that will be migrated onto equivalent LPARs on a POWER5 server.

- **-g gateway**
  Specifies the IP address of the default gateway that the clients will be configured with after the migration to the POWER5 server.

- **-h control_host**
  Specifies the host name or IP address of the HMC that is used for hardware control of the POWER5 server.

- **-i target_ip[-ending_ip]**
  Specifies the IP address that the new migrated client will be configured with after it is installed on the POWER5 server. If a NIM machine group is supplied to the -c option, a range of IP addresses must be supplied here and there must be enough addresses in the range to enumerate the amount of clients that are to be migrated.

- **-I img_src**
  Specifies the path to the source of the installation images used to create the NIM resources required for migration and installation. This path can be a device (such as dev/cd0 if using AIX product media) or a path to a location on the file system containing the installation images. The level of AIX present in the installation images must be AIX 5L Version 5.2 with the 5200-04 Recommended Maintenance package or later, or AIX 5.3 or later.

- **-l resource_dir**
  Specifies the path to a location on the file system that will contain any new NIM resources created through the nim_move_up command. The location must have enough space to accommodate an LPP_Source and a spot unless existing resources were provided through the -L and -U options.

- **-m managed_sys**
  Specifies the name of the managed system corresponding to the POWER5 server as tracked by the HMC.

- **-s subnet_mask**
  Specifies the subnet mask that the clients will be configured with after the migration to the POWER5 server.
Execution and Control Flags

-\texttt{d} \quad \text{Executes} \ \texttt{nim\_move\_up} \ \text{in \ the \ background \ and \ returns}\ \text{control \ of \ the \ terminal \ to \ the \ caller.} \ \text{The \ progress \ of} \ \texttt{nim\_move\_up} \ \text{can \ be \ tracked \ through \ the} \ -\texttt{S} \ \text{flag.}

-\texttt{K} \quad \text{Configures SSH keys \ on \ the \ specified \ HMC.} \ \text{This \ allows} \ \text{the \ unattended \ remote \ execution \ of \ commands \ from \ the} \ \text{NIM \ master \ without \ password \ prompts.} \ \text{This \ flag \ cannot} \ \text{be \ used \ with \ any \ other \ options \ except \ the} \ -\texttt{h} \ \text{option.}

-\texttt{n} \quad \text{Runs \ only \ the \ next \ phase \ of \ the} \ \texttt{nim\_move\_up} \ \text{migration} \ \text{process.} \ \text{The} \ \texttt{nim\_move\_up} \ \text{command \ exits \ when \ the} \ \text{phase \ completes \ or \ fails.} \ \text{If \ this \ flag \ is \ not \ provided,} \ \text{all \ the} \ \text{subsequent \ phases \ are \ run \ and} \ \texttt{nim\_move\_up} \ \text{exits} \ \text{when \ they \ have \ all \ run \ or \ one \ of \ them \ has \ failed.}

-\texttt{O} \quad \text{Saves \ only \ supplied \ values.} \ \text{Save \ values \ provided \ through} \ \text{other \ options \ and \ then \ exits \ without \ executing \ any} \ \text{phases.} \ \text{This \ flag \ cannot \ be \ used \ with \ any \ other \ of \ the} \ \text{Execution \ and \ Control \ Flags.}

-\texttt{q} \quad \text{Specifies \ quiet \ mode.} \ \text{No \ output \ is \ displayed \ to \ the} \ \text{terminal \ (but \ is \ instead \ kept \ in \ the \ logs).} \ \text{This \ flag \ has \ no} \ \text{effect \ if} \ \texttt{nim\_move\_up} \ \text{runs \ with \ the} \ -\texttt{d} \ \text{flag.}

-\texttt{r} \quad \text{Unconfigures} \ \texttt{nim\_move\_up}. \ \text{This \ resets \ all \ saved \ data,} \ \text{including \ saved \ options, \ phase-specific \ data, \ and \ current} \ \text{phase \ information.} \ \text{This \ operation \ must \ be \ run \ if \ the} \ \text{migration \ process \ is \ to \ be \ started \ over \ for \ the \ migration \ of} \ \text{a \ new \ client \ or \ set \ of \ clients.}

-\texttt{R} \quad \text{Removes \ all \ NIM \ resources \ created \ by} \ \texttt{nim\_move\_up} \ \text{in} \ \text{addition \ to \ unconfiguring \ the \ environment.} \ \text{This \ flag \ can} \ \text{only \ be \ used \ with \ the} \ -\texttt{r} \ \text{option.}

-\texttt{S} \quad \text{Displays \ the \ status \ of \ the \ current \ phase \ or \ the \ next \ phase \ to \ be \ run.} \ \text{All \ saved \ values \ are \ displayed \ as \ well.} \ \text{The} \ \texttt{nim\_move\_up} \ \text{command \ exits \ immediately \ after} \ \text{displaying \ the \ information.} \ \text{This \ flag \ cannot \ be \ used \ with} \ \text{any \ other \ options.}

Optional Flags

-\texttt{b} \ installp\_bundle \quad \text{Specifies \ an \ existing} \ \texttt{installp\_bundle} \ \text{NIM \ resource \ whose} \ \text{software \ are \ installed \ on \ each \ of \ the \ newly} \ \text{migrated \ LPARs \ in \ phase \ 10 \ (post-installation} \ \text{customization) \ if \ the \ option \ is \ provided.}

-\texttt{B} \ bosinst\_data \quad \text{Specifies \ an \ existing} \ \texttt{bosinst\_data} \ \text{NIM \ resource \ used \ by} \ \texttt{nim\_move\_up} \ \text{to \ install \ the \ new \ clients \ onto \ the} \ \text{POWER5 \ LPARs.} \ \text{If \ this \ option \ is \ not \ provided,} \ \texttt{nim\_move\_up} \ \text{generates \ a} \ \texttt{bosinst\_data} \ \text{resource \ with} \ \text{default \ unattended \ installation \ values.}

-\texttt{C} \ script\_resource \quad \text{Specifies \ an \ existing \ script \ NIM \ resource \ that, \ if \ provided,} \ \texttt{nim\_move\_up} \ \text{will \ execute \ in \ phase \ 10 \ (post-installation} \ \text{customization) \ on \ all \ of \ the \ new \ migrated \ LPARs.}

-\texttt{D} \quad \text{Forces \ the \ use \ of \ physical \ storage \ controllers \ instead \ of} \ \text{virtual \ SCSI \ adapters \ in \ creating \ the \ new \ LPAR \ on \ the} \ \text{POWER5 \ server \ when \ a \ Virtual \ I/O \ server \ LPAR \ is} \ \text{specified.} \ \text{This \ flag \ is \ only \ valid \ when \ used \ with \ the} \ -\texttt{V} \ \text{option.}
-e
Forces the use of physical network adapters instead of shared Ethernet adapters in creating the new LPAR on the POWER5 server when a Virtual I/O server LPAR is specified. This flag is only valid when used with the -V option.

-E exclude_files
Specifies an existing exclude_files NIM resource that nim_move_up uses to create a mksysb of the original clients. If this option is not provided, nim_move_up generates an exclude_files resource that excludes the contents of /tmp from the backup.

-f fix_bundle
Specifies an existing fix_bundle NIM resource whose APARs are installed on each of the newly migrated LPARs in phase 10 (post-installation customization) if the option is provided.

-j nimadm_vg
Specifies the volume group to be used by the underlying nimadm call for data caching. If this option is not provided, the default value is rootvg.

-L lpp_source
Specifies an existing LPP_Source NIM resource to whose AIX level the target clients will be migrated to. If this option is not provided, nim_move_up attempts to create a new LPP_Source from the installation image source provided through the -I option.

-p loops
Specifies the number of times to execute system analysis tools on the target NIM clients in analyzing resource utilization. The final resource usage data will be the average of the values obtained from each loop. This data will be taken into account when determining the equivalent POWER5 resources from which the migrated LPAR will be derived. If this option is not provided, the default is 1 loop.

-t seconds
Specifies the number of seconds each loop runs for. If this option is not provided, the default is 10 seconds.

-T
Transports user-defined volume groups from the original clients to the new migrated LPARs.

-u
Enables nim_move_up to completely "roll back" entire nim_move_up migration. Must be used with the -r flag.

-U spot
Specifies an existing spot NIM resource that will be used in the migration and installation of the clients. If this option is not provided, a new spot is created from the lpp_source NIM resource provided by the -L and -I options.

-V vio_server
Specifies the LPAR name of a Virtual I/O server that resides on the POWER5 server denoted by the -m flag.

Exit Status

0
Successful completion.
nonzero
An error occurred.

Security
Only the root user can run this command.

Examples
1. To run the first phase and configure all the required options (nim_move_up must not be already configured and running), type:
   nim_move_up -c client1 -i 192.168.1.100 -s 255.255.255.0 -g 192.168.1.1 -h hmcl.mydomain.com -m \my-p5 -l/big/dir -I /dev/cd0 -n
2. To display the status of the nim_move_up command’s environment, including all saved configuration input and which phase is to be executed next, type:
   
   `nim_move_up -S`

3. To change the saved host name to a new name and run the next phase while suppressing output, type:
   
   `nim_move_up -h hmc2.mydomain.com -n -q`

4. To run all remaining phases in the background, save your agreement to accept all licenses, and have the prompt returned after the phases begin running, type:
   
   `nim_move_up -Y -d`

5. To unconfigure nim_move_up, discard all saved input, and reset the command to run phase 1, type:
   
   `nim_move_up -r`

All NIM resources previously created by nim_move_up remain unaffected in the NIM environment and will be used by nim_move_up as necessary to migrate another client.

**Restrictions**

The following NIM master requirements must be met before running the nim_move_up application:

- Running AIX 5L Version 5.3 with the 5300-03 Recommended Maintenance package or later.
- Perl 5.6 or later.
- OpenSSH (from the Linux Toolbox CD)
- At least one standalone NIM client running AIX 4.3.3 update or later in the environment
- Product media version AIX 5L Version 5.2 with the 5200-04 Recommended Maintenance package or later, or product media version AIX 5.3 or later (the equivalent LPP_Source and spot NIM resources can also be used).

In addition, the following prerequisites must be available:

- A POWER5 server with sufficient hardware resources to support the target clients’ equivalent POWER5 configuration.
- An installed and configured Virtual I/O Server is, if virtual resources will be used to migrate the clients.
- An HMC controlling the POWER5 server, along with sufficient privileges to power-on, power-off, and create LPARs.

The nim_move_up command will fail to execute properly if all of the preceding requirements are not met or if the command is executed by a non-root user.

**Implementation Specifics**

The nim_move_up command takes a phased approach to migrating an existing client onto an equivalent POWER5 LPAR. The following phases make up the process:

1. **Create NIM resources.** The NIM resources required to perform the migration steps are created if they do not already exist.

2. **Assess premigration software.** An assessment of which software is installed and which software cannot be migrated is performed on each target client. Any software missing from the LPP_Source is added from the source of the installation images (such as product media) that is provided to nim_move_up.

3. **Collect client hardware and usage data.** Data about each target client’s hardware resources are gathered. Also, an attempt to assess the average use of those resources over a given amount of time is made.

4. **Collect POWER5 resource availability data and translate client resource data.** The managed system that is provided is searched for available hardware resources. The data gathered in the previous phase is used to derive an equivalent LPAR configuration that uses the managed system’s available resources. If a Virtual I/O Server LPAR was provided to work with, the derived client LPAR
is created with virtual I/O resources instead of physical I/O resources. The appropriate adapters and configuration are created on the Virtual I/O Server as needed.

5. **Create system backups of target clients.** After NIM performs a `mksysb` of each target client, the corresponding `mksysb` NIM resources are created.

6. **Migrate each system backup.** Using the NIM resources designated by `nim_move_up`, each `mksysb` resource is migrated to the new level of AIX by the `nimadm` command. The original `mksysb` NIM resources are preserved and new `mksysb` NIM resources are created for the new migrated `mksysb` resources.

7. **Allocate NIM resources to new LPARs.** NIM standalone client objects are created for each new derived LPAR created in phase 4 using the network information provided to `nim_move_up`. Appropriate NIM resources are allocated and a `bos_inst` pull operation is run on each NIM client (NIM does not attempt to boot the client).

8. **Initiate installation on LPARs.** Each LPAR is rebooted using the control host (HMC) and the installation is initiated. The phase’s execution stops after the installation has begun (that is, the progress of the installation is not monitored).

9. **Assess post-migration software.** After each installation has completed, the overall success of the migration is assessed, and a report of software problems encountered during migration is generated. If any filesets failed to migrate, the errors reported for that fileset must be corrected manually.

10. **Customize post-installation.** If an alternate LPP_Source, fileslist, or customization script was provided, a customized NIM operation is performed on each client with the values provided. This allows for the optional installation of additional software applications or for any additional customization.

In order to successfully migrate a NIM client onto an equivalent POWER5 LPAR, each of these phases (with the exception of phase 10, which is optional) must be executed completely successfully. If all phases completed successfully, a new NIM client object will be present in the NIM environment that represents the migrated LPAR, which will be running the level of AIX supplied through the `nim_move_up` source of installation resources.

After all prerequisites needed to run `nim_move_up` have been satisfied, the `nim_move_up` command runs in two phases: configuration and phase execution.

**Configuration**

Before the `nim_move_up` command can begin its phases, input must be provided to the application. The required input includes a list of the NIM clients to be migrated, TCP/IP configuration information of the new migrated LPARs, and the POWER5 server name. For a complete list of required `nim_move_up` configuration options, refer to the [Required Flags](#) (they also are denoted by a * (asterisk) in the `nim_move_up_config` SMIT menu). Optional input, such as whether a Virtual I/O Server is specified, also affects the behavior of `nim_move_up` and the end result of the migration process (if a Virtual I/O Server is specified, virtual I/O resources are used to create the migrated LPAR).

To populate the required and optional input through the SMIT interface, enter one of the following commands:

```
smitty nim_move_up_config
```

or

```
smitty nim_move_up
```

and select the **Configure nim_move_up Input Values** option.

At the menu, fill in the options with values that reflect the requirements of your environment. For further information about the `nim_move_up` command’s SMIT interface, see the SMIT usage section below.
After the `nim_move_up` command’s environment has been configured with the needed input, those values are remembered through subsequent runs of the `nim_move_up` command until the `nim_move_up` command environment is unconfigured. The values can be changed at any time through the SMIT menu interface or by providing the new values through command line flags. The command line interface can also be used to configure the `nim_move_up` command environment.

**Note:**
If you use the command line interface, the `nim_move_up` command, by default, also attempts to execute phases whenever configuration values are provided to it. To prevent phases from being executed when calling the command directly, use the `-O` flag.

**Phase Execution**

After all input is supplied, phase execution begins at phase 1 and continues sequentially. If a phase encounters an error, `nim_move_up` attempts to execute the failed phase the next time it runs. Optionally, you can specify that `nim_move_up` start only the next phase or attempt all remaining phases.

To start `nim_move_up` phases through the SMIT interface, type one of the following commands:

```
smitty nim_move_up_exec
```

or

```
smitty nim_move_up
```

and select the **Execute the `nim_move_up` Phases** option. Answer the **Execute All Remaining Phases?** option and press Enter. The phases begin executing.

To specify that `nim_move_up` execute only the next phase using the command line, type the following command:

```
nim_move_up -n
```

To specify that `nim_move_up` execute all remaining phases, type the following command:

```
nim_move_up
```

In addition to executing phases, this command can also modify saved configuration options if the appropriate flag is supplied.

**SMIT Usage**

The `nim_move_up` SMIT menus can be accessed using the `nim_move_up` fastpath. To invoke the root menu of `nim_move_up`, type the following command:

```
smitty nim_move_up
```

The following SMIT screens are accessible through the root menu:

**Display the Current Status of `nim_move_up`**
Equivalent to running `nim_move_up` with the `-S` flag. The next phase to be executed and a listing of all the saved options are displayed.

**Configure `nim_move_up` Input Values**
Through this screen, all required and optional input to `nim_move_up` can be configured. All values entered into the fields are saved and are remembered through subsequent runs of `nim_move_up` and through subsequent uses of this SMIT screen. This screen can be used at any time to modify saved values after phases have been run.

**Execute `nim_move_up` Phases**
Provides a simple interface to execute `nim_move_up` phases. The phases can be executed one at a time or all at once, depending on how the questions in this phase are answered.
Configure SSH Keys on Target HMC
Provides a simple interface for setting up SSH keys on the remote control host (HMC). This does the equivalent work of passing the -K flag on the command line. Configuring SSH keys on the remote control host enables the unattended remote execution of commands from the NIM master, which is necessary for completing all the phases (some of which remotely execute commands on this system).

Unconfigure nim_move_up
Provides an interface to unconfigure the nim_move_up command's environment. This removes all state information, including which phase to execute next, saved data files generated as a result of the execution of some phases, and all saved input values. Optionally, all NIM resources created through nim_move_up can be removed as well. This screen does the equivalent work of the -r command line option.

Advanced Usage: Understanding the mig2p5 Framework
The mig2p5 framework consists of the /var/mig2p5 directory and serves as a means for nim_move_up to remember its state between subsequent invocations. Its existence and its use by nim_move_up is completely transparent to the user: the directory is created by nim_move_up and its values are initialized if it does not exist. It is removed when nim_move_up is unconfigured. The contents of this directory are easily readable and can be very helpful in troubleshooting problems with nim_move_up; the directory contains all of the logs generated in the phases and contains editable files that affect the behavior of nim_move_up in ways that are not allowed by the command line (such as forcing nim_move_up to run a certain phase out of order).

The following list describes the purpose and contents of each file in the /var/mig2p5 directory:

config_db
Contains all of the saved configuration options passed to nim_move_up through the command line arguments or the nim_move_up_config SMIT menu. Each line in the file takes the following form:

option_name:value

current_phase
Contains the number of the phase that will be executed at the next invocation of nim_move_up. Before running this phase, nim_move_up ensures that all previous phases have run successfully. This information is also maintained elsewhere with the mig2p5 framework.

global_log
Contains the output of all phases that have been run since the last time the mig2p5 framework was initialized.

client_data/
Contains files that are generated by nim_move_up during phases 3 and 4, in which each of the original clients' system resources and utilization are monitored and quantified into configuration files. The available resources in the POWER5 server are also quantified into corresponding text files. All the data in these files will be taken into account when determining the hardware profile of the newly derived LPARs on the POWER5 server. These files are intended to be machine-readable data files for the nim_move_up command's internal use. Do not manually modify or create them.

phase/#
Contain data specific to the corresponding phase denoted by the number in its name ( # ). Every phase has a directory (for example, phase1/ , phase2/ , and so on).

phase/#/log
Contains all output displayed during a phase’s run. If a phase runs multiple times (such as after an error has been corrected), all new output is appended to any text already existing in the file. This
log is helpful in investigating failures related to this phase after they have occurred. The global_log file is composed of all the phases’ log files, and all output in that file is arranged in the order that it was originally displayed.

**phase/#/status**
Indicates whether this phase succeeded or failed when it was last run. This file is used by nim_move_up to determine whether a subsequent phase can be run. A phase can run only if all of the previous phases’ status files contain the string success. The status file contains the failure string if the phase encountered an error that caused it to fail the last time it was run.

**pid**
Contains the nim_move_up process ID number when nim_move_up is running in the background. This file and is cleaned up when the process finishes. As long as this file exists and contains a process ID, nim_move_up cannot run phases because concurrent runs of nim_move_up are not supported.

With the exception of the log files and the contents of the client_data directory, the files in /var/mig2p5 that comprise the mig2p5 framework can be read and modified so that nim_move_up performs tasks that it would not do through its command line and SMIT interfaces. Users are encouraged to manipulate the mig2p5 environment to make nim_move_up meet any specific need and to aid in the troubleshooting of any problems that might arise during the migration process.

**Note:** Customizing the mig2p5 framework is considered advanced usage and can yield unsatisfactory results if done incorrectly. The mig2p5 environment should only be directly modified by users who understand the changes being performed and their effect on the behavior of the nim_move_up application.

**Files**

/usr/sbin/nim_move_up
Contains the nim_move_up command.

**Related Information**
The [nim Command] on page 79, [nimadm Command] on page 112

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### nim_update_all Command

**Purpose**
Updates NIM resources and customizes NIM clients.

**Syntax**

**Description**
The nim_update_all command updates the install resources and clients in the NIM environment. Flags may be used for specifying which NIM resources need updating and also to disable the updating of NIM clients. The nim_update_all command updates the NIM environment by performing the following tasks:

- Exports the environment variable NIM_LICENSE_ACCEPT=yes.
  - Used for accepting software license agreement during update install.
- Adds variable entry NSORDER=local,bind in /etc/environment.
  - Necessary for name resolution when hosts only exist in /etc/host.
- Obtains the update level information from the media.
  - The default media location is /dev/cd0.
The media location may be modified by using the `-d` flag.

Updates the `lpp_source`, `spot`, and `mksysb` resources.

- The `lpp_source` resource name may be specified by using the `-l` flag.
- The `spot` resource name may be specified by using the `-s` flag.
- The `mksysb` resource name is obtained from the `mksysb` resource contained in the `basic_res_grp` resource group. Specify the `-B` flag to disable updating the `mksysb` resource.

Performs an `update_all` operation on NIM clients.

- If client objects are given, specified clients are updated.
- If client objects are omitted, all existing NIM clients are updated.
- If `-u` flag is used, no clients are updated.

Flags

- `-d device` Specifies the absolute path location for update images used during command execution. By default, `device` is `/dev/cd0`.
- `-l lpp_source resource` Specifies the object name for the `lpp_source resource` to update. By default, the resource name is obtained from `basic_res_grp`.
- `-s spot resource` Specifies the object name for the `spot resource` to update. By default, the resource name is obtained from `basic_res_grp`.
- `-B` Disables the updating of the backup image contained in `basic_res_grp`.
- `-u` Disables the updating of client objects.
- `-v` Enables verbose debug output during command execution. Security

Location

`/usr/sbin/nim_update_all`

Exit Status

Returns zero (0) upon success.

Security

Access Control: You must have root authority to run the `nim_update_all` command.

Examples

1. To update install resources 520`lpp_res` (`lpp_source`), 520`spot_res` (spot), and `master_sysb` (`mksysb`) contained in the `basic_res_grp` resource group, using update images located in device `/dev/cd2`, and update all clients in the NIM environment, type:
   
   `nim_update_all -d /dev/cd2`

2. To update install resources `lpp1` (`lpp_source`), `spot1` (spot), and disable updating the `mksysb` image, using update images located in device `/dev/cd0`, and update the client object `machine1` in the NIM environment, type:

   `nim_update_all -l lpp1 -s spot1 -B machine1`

3. To update install resources 520`lpp_res` (`lpp_source`), 520`spot_res` (spot), and disable updating the `mksysb` image contained in the `basic_res_grp` resource group, using update images located in device `/dev/cd0`, and disable updating clients in the NIM environment, type:

   `nim_update_all -B -u`

Files

`/etc/niminfo` Contains variables used by NIM.
Related Information
The `nim_master_setup` command, `nim_clients_setup` command, `nim_master_recover` command, `nim` command, and `nimconfig` command.

nimadapters Command

Purpose
Defines Network Installation Management (NIM) secondary adapter definitions from a stanza file.

Syntax
```
nimadapters [-p | -d | -r] -f SecondaryAdapterFileName adapter_def_name
```
or
```
nimadapters [-p | -d | -r] -a client=Client info=AttributeList adapter_def_name
```

Description
The `nimadapters` command parses a secondary adapters stanza file to build the files required to add NIM secondary adapter definitions to the NIM environment as part of an `adapter_def` resource. The `nimadapters` command does not configure secondary adapters. The actual configuration takes place during a `nim -o bos_inst` or `nim -o cust` operation that references the `adapter_def` resource.

Note: Before using the `nimadapters` command, you must configure the NIM master. For more information, see Configuring the NIM Master and Creating Basic Installation Resources in Installation and migration.

Secondary Adapters File Rules
The format of the secondary adapters file must comply with the following rules:
- After the stanza header, follow attribute lines of the form: `Attribute = Value`
- If you define the value of an attribute multiple times within the same stanza, only the last definition is used.
- If you use an invalid attribute keyword, that attribute definition is ignored.
- Each line of the file can have only one header or attribute definition.
- More than one stanza can exist in a definition file for each machine host name.
- Each stanza for a machine host name represents a secondary adapter definition on that NIM client. No two secondary adapter definitions for the same machine host name can have the same location or `interface_name`. There should be only one definition per adapter or interface on a given NIM client.
- If the stanza header entry is the keyword default, this specifies to use that stanza for the purpose of defining default values.
- You can specify a default value for any secondary adapter attribute. However, the `netaddr` and `secondary_hostname` attribute must be unique. Also, the location and `interface_name` must be unique on a NIM client.
- If you do not specify an attribute for a secondary adapter but define a default value, the default value is used.
- You can specify and change default values at any location in the definition file. After a default value is set, it applies to all definitions following it.
- To turn off a default value for all following machine definitions, set the attribute value to nothing in a default stanza.
To turn off a default value for a single machine definition, set the attribute value to nothing in the machine stanza.

You can include comments in a client definition file. Comments begin with the # character.

Tab characters and spaces are ignored when parsing the definition file for header and attribute keywords and values.

**Note:** During a nim -o bos_inst or nim -o cust operation, if NIM examines the configuration data on the client and determines that a secondary adapter is already configured with precisely the attributes requested in the adapter_def resource, this secondary adapter is not reconfigured.

### Secondary Adapter File Keywords

The secondary adapter file uses the following keywords to specify machine attributes:

**Required Attributes:**

- **machine_type** = secondary | etherchannel | install
  
  Specifying the machine_type attribute as secondary clearly distinguishes the nimadapters input from nimdef input. If a secondary adapters file is mistakenly passed to the nimdef command, the error can be easily detected. Stanzas with a machine_type of install will be ignored.

- **netaddr**
  
  Specifies the network address for the secondary adapter.

- **network_type** = en | et | sn | ml | vi
  
  Specifies the type of network interface, which can be one of en, et, sn, ml, or vi. This attribute replaces the deprecated network_type attribute.

- **subnet_mask**
  
  Specifies the subnet mask used by the secondary adapter.

**Optional Attributes:**

- **adapter_attributes**
  
  Blank-separated list of physical adapter attributes and values (for example, "Attribute1=Value1 Attribute2=Value2"). To see the list of attributes that can be set for the requested physical adapter, run the command `lsattr -E -l AdapterName`.

- **interface_attributes**
  
  Blank-separated list of interface attributes and values (for example, "Attribute1=Value1 Attribute2=Value2"). To see the list of attributes that can be set for the requested interface, run the command `lsattr -E -l InterfaceName`. This attribute replaces the `attributes` attribute.

- **cable_type**
  
  Specifies the cable type (optional if network_type is en or et).

- **comments**
  
  Specifies a comment to include in the secondary adapter definition. Enclose the comment string in double quotes ("').

- **interface_name**
  
  Specifies the name of the network interface for the secondary adapter (for example, en1, sn0, ml0). Do not specify both location and interface_name.

  **Note:** The interface_name must be consistent with the interface_type.

- **location**
  
  Specifies the physical location of the adapter corresponding to this network interface. Do not specify both location and interface_name.

  **Note:** Except for the multilink pseudo-device, use of the location is highly recommended. If the location is not specified and the user adds multiple adapters or adds an adapter at the
same time that the operating system is reinstalled, the adapter and network interface names might be reassigned by the operating system in unexpected ways.

**multiple_physloc**
This attribute can be used with etherchannel or VIPA stanzas to specify the physical adapters to associate with the interface.

**media_speed**
Specifies the media speed (optional if network_type is en or et).

**secondary_hostname**
Host name to save in the `/etc/hosts` file with the netaddr attribute. This host name will not be set using the `hostname` command or `uname -S` command.

### Secondary Adapter File Stanza Errors
A secondary adapter stanza causes an error under any of the following conditions:
- The host name that was used in the stanza header for the definition cannot be resolved.
- A required attribute is missing.
- An invalid value was specified for an attribute.
- An attribute mismatch occurs. For example, if the interface_type is not en or et, you cannot specify cable_type=bnc or media_speed=1000_Full_Duplex.
- The stanza contains both a location attribute and an interface_name attribute.
- Secondary adapter definitions occur multiple times for the same adapter location and the same host name.
- Secondary adapter definitions occur multiple times for the same interface_name and the same host name.

If a secondary adapter stanza is incorrect, the errors are reported, the stanza is ignored, and the following input is processed without regard to the incorrect stanza.

**Example Secondary Adapter File:** The following is an example of how a secondary adapter file can look:

```
# Set default values.

default:
    machine_type = secondary
    subnet_mask = 255.255.240.0
    network_type = en
    media_speed = 100_Full_Duplex

# Define the machine "lab1"

# Take all defaults and specify 2 additional attributes.
# Unlike the case of the client definitions that are input to the
# nimdef command, the secondary adapter definition includes at least
# one required field that cannot be defaulted.

lab1:
    netaddr = 9.53.153.233
    location = P2-I1/E1
```
# Change the default "media_speed" attribute.
default:
   media_speed = 100_Half_Duplex

# define the machine "test1"
# Take all defaults and include a comment.
test1:
   comments = "This machine is a test machine."

# define a machine with a VIPA interface that uses interfaces en2 and en3.
lab2:
   machine_type = secondary
   interface_type = vi
   interface_name = v10
   netaddr = 9.53.153.235
   subnet_mask = 255.255.255.0
   secondary_hostname = lab3
   interface_attributes = "interface_names=en2,en3"

# define a machine with an etherchannel adapter that uses the adapters at
# the following location codes P1-I4/E1 and P1/E1
lab4:
   machine_type = etherchannel
   interface_type = en
   interface_name = en2
   netaddr = 9.53.153.237
   subnet_mask = 255.255.255.0
   multiple_physloc = P1-I4/E1,P1/E1

# define a machine with an etherchannel adapter that uses the
# ent2 and ent3 adapters and uses mode 8023ad.
lab6:
   machine_type = etherchannel
   interface_type = en
   interface_name = en2
   netaddr = 9.53.153.239
   subnet_mask = 255.255.255.0
   adapter_attributes = "adapter_names=ent2,ent3 mode=8023ad"
Flags

-a Assigns the following attribute=value pairs:

client=nim_client_name
    Specifies the NIM client that will have a secondary adapter definition added or removed. This option allows you to define one secondary adapter for a client. To define multiple secondary adapters, use a stanza file.

info=AttributeList
    When previewing or defining a secondary adapter, the info attribute must be used when the client attribute is specified. AttributeList is a list of attributes separated by commas. The attributes must be specified in the following order:
    interface_type,
    location,
    interface_name,
    cable_type,
    media_speed,
    netaddr,
    subnet_mask,
    interface_attributes,
    secondary_hostname,
    machine_type,
    adapter_attributes,
    multiple_physloc.
    Use lowercase n/a to specify that a value will not be used.

-d Defines secondary adapters. A Client.adapter file is created in the adapter_def location for each valid secondary adapter definition. If the nimadapters command encounters existing secondary adapter definitions for a NIM client, the existing definitions are replaced.

-f SecondaryAdapterFileName Specifies the name of the secondary adapter file.

-p Displays a preview operation to identify any errors. This flag processes the secondary adapter file or info attribute but does not add adapter definitions to the NIM environment.

The preview shows the following:

- All complete and valid secondary adapter stanzas.
- All invalid secondary adapter stanzas and the reason for failure.
    Note: Specify the -p flag to verify that all stanzas are correct before using the secondary adapter file for configuring secondary adapters.

-r Removes the secondary adapter definitions of a specific client or all the clients listed in a secondary adapter stanza file. If the client attribute or secondary adapter stanza file are not specified, then all the secondary adapter definitions in the adapter_def resource will be removed.

Parameters

adapter_def This parameter is required to run the nimadapters command. Specifies the adapter_def NIM resource that is the directory containing secondary adapter definition files. An adapter_def resource must be defined using the nim -o define operation before the adapter_def can be used with the nimadapters command.

Exit Status

0 The command completed successfully.

>0 An error occurred.

Security

Only the root user can run this command.
Examples

1. To add the NIM secondary adapters described in the secondary adapters definition file
   secondary_adapters.defs to the my_adapter_def resource, type:
   nimadapters -d -f secondary_adapters.defs my_adapter_def

2. To preview the client definition file secondary_adapters.defs, type:
   nimadapters -p -f secondary_adapters.defs my_adapter_def

3. To define a NIM secondary adapter for a client called pilsner, type:
   nimadapters -d \
   -a info="en,P2-I1/E1,n/a,bnc,1000_Full_Duplex,9.53.153.233,255.255.254.0,n/a,n/a,n/a,n/a,n/a,n/a" \
   -a client=pilsner my_adapter_def

4. To remove the NIM secondary adapter definitions for a client called pilsner from the my_adapter_def
   resource, type:
   nimadapters -r -a client=pilsner my_adapter_def

5. To remove the NIM secondary adapter definitions for clients defined in the file
   secondary_adapters.defs, type:
   nimadapters -r -f secondary_adapters.defs my_adapter_def

6. To remove all the NIM secondary adapter definitions from the my_adapter_def resource, type:
   nimadapters -r my_adapter_def

Files

/usr/sbin/nimadapters Contains the nimadapters command.

Related Information


Configuring the NIM Master and Creating Basic Installation Resources in Installation and migration

nimadm Command

Purpose

The nimadm command (Network Install Manager Alternate Disk Migration) is a utility that allows the system administrator to do the following:

- Create a copy of rootvg to a free disk (or disks) and simultaneously migrate it to a new version or release level of AIX.
- Using a copy of rootvg, create a new nim mksysb resource that has been migrated to a new version or release level of AIX.
- Using a nim mksysb resource, create a new nim mksysb resource that has been migrated to a new version or release level of AIX.
- Using a nim mksysb resource, restore to a free disk (or disks) and simultaneously migrate to a new version or release level of AIX.

nimadm uses NIM resources to perform these functions.

Syntax

Perform Alternate Disk Migration:

Cleanup Alternate Disk Migration on client:


Wake-up Volume Group:


Put-to-sleep Volume Group:


Synchronize Alternate Disk Migration Software:


mksysb to Client Migration:


mksysb to mksysb Migration:


Client to mksysb Migration:


Description

nimadm (Network Install Manager Alternate Disk Migration) is a utility that allows the system administrator to create a copy of rootvg to a free disk (or disks) and simultaneously migrate it to a new version or release level of AIX. nimadm uses NIM resources to perform this function.

There are several advantages to using nimadm over a conventional migration:

1. Reduced downtime. The migration is performed while the system is up and functioning normally. There is no requirement to boot from install media, and the majority of processing occurs on the NIM master.

2. nimadm facilitates quick recovery in the event of migration failure. Since nimadm uses alt_disk_install to create a copy of rootvg, all changes are performed to the copy (altinst_rootvg). In the event of serious migration installation failure, the failed migration is cleaned up and there is no need for the administrator to take further action. In the event of a problem with the new (migrated) level of AIX, the system can be quickly returned to the pre-migration operating system by booting from the original disk.
3. **nimadm** allows a high degree of flexibility and customization in the migration process. This is done with the use of optional NIM customization resources: image_data, bosinst_data, exclude_files, pre-migration script, installp_bundle, and post-migration script.

Please note that this document will only address subjects pertaining to **nimadm**. For complete coverage of *alt_disk_install*, NIM, migration, and other related install issues please refer to the latest editions of the following publications:

- "Network Installation Management Guide and Reference"
- "AIX Installation Guide"
- "Migration Redbook"

**nimadm Local Disk Caching**

Local disk caching allows the NIM master to avoid having to NFS write to the client, which can be useful if the **nimadm** operation is not performing well due to an NFS write bottle neck. If this function is invoked with the `-j VGname` flag, **nimadm** will create file systems on the specified volume group (on the NIM master) and will use streams to cache all of the data from the client to these file systems.

The advantages/disadvantages to this function are as follows:

**Advantages:**
1. Improved performance for nimadm operations that are on relatively slow networks.
2. Improved performance for nimadm operations that are bottle necked in NFS writes (NFS writes are very expensive).
3. Decreased CPU usage on the client.
4. Client file systems are not exported.

**Disadvantages:**
1. Cache file systems take up space on the nim master (you must have enough space to host the client's `rootvg` file systems + migration space for each client)
2. Increased CPU usage on the master.
3. Increased I/O on the master (for optimal performance use a volume group (disk) that does not contain the NIM resource being used in the operation).

How to execute disk caching:

1. Make sure you are at the latest level of `bos.alt_disk_install.rte` on the NIM master.
2. Add the `-j VGName` flag to any **nimadm** operations. For example:
   ```
   nimadm -j rootvg ...
   
   or
   
   nimadm -j cachevg
   ```

   You can exclude specific file systems (which will not be involved in the migration) from being cached over the network (they will still be copied locally to `altinst_rootvg` on the client). To specify a list of file systems to be excluded from network caching, you will need to create a file in the location of the SPOT resource that will be used for the migration. To get the exact location of the SPOT path, enter:
   ```
   # lsnim -a location SpotName
   ```

   The file should be named in the following format:
   ```
   Nim_Client.nimadm_cache.excl
   ```

   **Note:** This file will only apply to the nim client specified in *Nim_Client*. The full path should be:
   ```
   Spot_Location/Nim_Client.nimadm_cache.excl
   ```
For example: /nim_resources/520spot/usr/myclient.nimadm_cache.excl.

To exclude a file system from caching, enter one file system (to be excluded) per line in this file. There are two important things you should keep in mind:

1. Do not exclude any file systems that will be involved in the migration process. In other words, these file systems contain software files that will be migrated. This can lead to unpredictable results.
2. You should not (cannot) exclude the following AIX file systems: /, /usr, /var, /opt, /home, and /tmp.

With disk caching, nimadm changes the following four phases (all other phases remain the same):

**Phase 2:** The NIM master creates local cache file system in specified target volume group (on the NIM master).

**Phase 3:** The NIM master populates the cache file systems with the client’s data.

**Phase 9:** The NIM master writes all migrated data to the client’s alternate rootvg.

**Phase 10:** The NIM master cleans up and removes the local cache file systems.

**nimadm Requirements**

The nimadm requirements are:

1. Configured NIM master running AIX 5.1 or higher with AIX recommended maintenance level 5100-03 or higher.
2. The NIM master must have the same level of bos.alt_disk_install.rte installed in its rootvg and the SPOT which will be used to perform the migration. (Note: it is not necessary to install the alt_disk_install utilities on the client).
3. The selected lpp_source NIM resource, and selected SPOT NIM resource must match the AIX level to which you are migrating.
4. The NIM master should be at the same or higher AIX level then the level being migrated to.
5. The client (the system to be migrated) must be at AIX 4.3.3 or higher.
6. The client must have a disk (or disks) large enough to clone the rootvg and an additional 500 Megs (approximately) of free space for the migration. The total amount of required space will depend on original system configuration and nimadm customization.
7. The target client must be a registered with the master as a standalone NIM client (see the niminit command for more information). The nim master must be able to execute remote commands on the client using the rshd protocol.
8. The nim master must be able to execute remote commands on the client using the rshd protocol.
9. The NIM master and client must both have a minimum of 128 megabytes of RAM.
10. A reliable network, which can facilitate large amounts of NFS traffic, must exist between the NIM master and the client. The NIM master and client must be able to perform NFS mounts and read/write operations.
11. The client’s hardware and software should support the AIX level that is being migrated to and meet all other conventional migration requirements.

**Note:** If you cannot meet requirements 1-10, you will need to perform a conventional migration. If you cannot meet requirement 11, then migration is not possible.

**Attention:** Before performing a nimadm migration you will be required to agree to all software license agreements for software to be installed. You can do this by specifying the -Y flag as an argument to the nimadm command or setting the ADM_ACCEPT_LICENSES environment variable to “yes”.

**nimadm Limitations**

The following limitations apply to nimadm:

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1. If the client’s rootvg has TCB turned on, you will need to either disable it (permanently) or perform a conventional migration. (This limitation exists because TCB needs to access file metadata which is not visible over NFS).

2. All NIM resources used by nimadm must be local to the NIM master.

3. Although there is almost no interference with the client’s active rootvg during the migration, the client may experience minor performance decrease due to increased disk input/output, biod activity, and some CPU usage associated with alt_disk_install cloning.

4. NFS tuning may be required to optimize nimadm performance.

**NIM resources used by nimadm:**

**SPOT resource (-s flag)**

The NIM spot resource is required for all nimadm operations (migration, cleanup, wake-up, sleep). All nimadm and alt_disk_install utilities that will be used by the client are installed in this resource. It is not necessary to install nimadm software on the client. The NIM cust operation should be used to install the following file sets into the spot:

- Required: bos.alt_disk_install.rte (must match the NIM master’s level).
- Optional message catalog: bos.msg.$LANG.alt_disk_install.rte

**lpp_source resource (-l flag)**

This NIM resource is the source of install images that will be used to migrate the system. It is required for nimadm migration operations. The lpp_source must contain all system images for the level being migrated to (check the lpp_source images attribute in lsnim -l lpp_source output). It should also contain any optional installp images that need to be migrated.

**pre-migration**

This script resource that is run on the NIM master, but in the environment of the client’s alt_inst file system that is mounted on the master (this is done by using the chroot command). This script is run before the migration begins.

**post-migration**

This script resource is similar to the pre-migration script, but it is executed after the migration is complete.

**image_data**

Specifies an image_data resource that is passed to alt_disk_install (as arguments to the -i flag). NIM will allocate and mount this resource on the client before calling alt_disk_install.

**exclude_files**

Specifies an exclude_files resource that is passed to alt_disk_install (as an argument to the -e flag). NIM will allocate and mount this resource on the client before calling alt_disk_install.

**installp_bundle**

This NIM resource specifies any additional software that nimadm will install after completing the migration.

**bosinst_data**

This NIM resource specifies various install settings that may be used by nimadm.

**The nimadm Migration Process**

nimadm performs migration in 12 phases. Each phase can be executed individually using the -P flag. The user should have a good understanding of the nimadm process before performing a migration in phases. The nimadm phases are as follows:

1. The master issues an The alt_disk_install command to the client which makes a copy of the rootvg to the target disks (coincidentally this is Phase 1 of the alt_disk_install process). In this phase altinst_rootvg (alternate rootvg) is created. If a target mksysb has been specified, the mksysb is used to create a rootvg using local disk caching on the NIM master.
2. The master runs remote client commands to export all of the /alt_inst file systems to the master. The file systems are exported as read/write with root access to the master. If a target mksysb has been specified, the cache file systems are created based on the image data from the mksysb.

3. The master NFS mounts the file systems exported in Phase 2. If a target mksysb has been specified, the mksysb archive is restored in the cache file systems that were created in phase 2.

4. If a pre-migration script resource has been specified, it is executed at this time.

5. System configuration files are saved. Initial migration space is calculated and appropriate file system expansions are made. "bos" is restored and the device database is merged (similar to a conventional migration). All of the migration merge methods are executed and some miscellaneous processing takes place.

6. All system file sets are migrated using installp. Any required RPM images are also installed during this phase.

7. If a post-migration script resource has been specified, it is executed at this time.

8. bosboot is executed to create a client boot image, which is written out to the client's boot logical volume (hd5).

9. All mounts made on the master in phase 3 are removed.

10. All client exports created in phase 2 are removed.

11. alt_disk_install is called again (phase 3 of alt_disk_install) to make final adjustments and put altinst_rootvg to sleep. The bootlist is set to the target disk (unless the -B flag is used). If an output mksysb has been specified, the cache is archived into a mksysb file and made into a NIM mksysb resource.

12. Cleanup is executed to end the migration. The client is rebooted, if the -r flag is specified.

Note: nimadm supports migrating several clients simultaneous.

nimadm Cleanup Operation
This operation, indicated with the "-C" flag, is designed to clean up after a failed migration that for some reason did not perform a cleanup it self. It can also be used to clear a previous migration in order to perform a new migration.

nimadm Wake-up and Sleep
After a migration completes, nimadm can be used to "wake-up" the migrated altinst_rootvg or the original rootvg (if booted from the migrated disk). The nimadm wake-up (-W flag) performs an alt_disk_install wakeup, NFS exports the /alt_inst file systems, and mounts them on the NIM master. The nimadm sleep function (-S flag) reverses the wake-up by unmounting the NIM master mounts, unexporting the /alt_inst file systems, and executing the alt_disk_install sleep function on the client.

Flags

- `a PreMigrationScript` Specifies the pre-migration NIM script resource.
- `b installp_bundle` Specifies the installp_bundle NIM resource.
- `B` Specifies not running bootlist after nimadm migration. If set, then -r flag cannot be used.
- `c TargetDisks` Specifies the NIM defined client which will be the target of this nimadm operation. This flag is required for all nimadm operations.
- `C` Performs nimadm cleanup.
- `d TargetDisks` Specifies the client target disk which will be used to create altinst_rootvg (the volume group that will be migrated).
- `D` Sets nimadm into debug mode. This function should only be used to debug nimadm related problems and is not set by default.
- `e exclude_files` Specifies the exclude_files NIM resource. This resource is used by the alt_disk_install command during Phase 1.
- `E` Enters the nimadm debugger if a serious migration error occurs.
-F Forces a client to unlock. Normally, nimadm locks a client to perform various operations. While the client is locked, other nimadm or NIM operations cannot be performed. This flag should ONLY be used in the unusual condition that a client is incorrectly locked (this can happen if for some reason nimadm could not call cleanup after a failure).

-i image_data Specifies the image_data NIM resource. This resource is used by the alt_disk_install command during Phase 1 and 11.

-j VName Creates file systems on the specified volume group (on the NIM master) and will use streams to cache all of the data from the client to these file systems.

-l lpp_source Specifies the lpp_source NIM resource to be used for this nimadm operation. This flag is required for migration operations.

-M Verifies that the levels of the alt_disk_install software (bos.alt_disk_install) on the NIM master , SPOT, lpp_source, and optional device are synchronized (match). If there is no match, nimadm installs the highest level found in the lpp_source or optional device.

-m NFSMountOptions Specifies arguments which will be passed to the mount command that mounts client resources on the master. This flag can be used to tune nimadm related NFS performance.

-N NIMmksysb Specifies the unique new nim mksysb resource to create. If the -N flag is specified, the -O flag must be specified.

-o bosinst_data Specifies bosinst_data NIM resource.

-O mksysbfile Specifies the file pathname for the migrated mksysb. If the -O flag is specified, the -j flag and either the -c or -T flag must be specified.

-P Phase The phase to execute during this invocation of nimadm. If there is more than one phase, the phases should be separated by spaces or commas. Valid phases are 1 through 12.

-r Specifies that the client should reboot after nimadm migration is complete.

-s SPOT Specifies the SPOT NIM resource to be used for this nimadm operation. This flag is required for all nimadm operations.

-S Performs the nimadm "sleep" function. This function should be executed to end a nimadm "wake-up".

-T NIMmksysb Specifies an existing nim mksysb resource to migrate. If the -T flag is specified, the -j flag and either the -O or -c flag must be specified.

-V Turns on verbose output.

-W Performs the nimadm "wake-up" function.

-Y Agrees to required software license agreements for software to be installed.

-z PostMigrationScript Specifies the post-migration NIM script resource.

Exit Status
0 All nimadm related operations completed successfully.
>0 An error occurred.

Security
Only the root user can execute nimadm.

Examples
1. To execute nimadm migration to target NIM client aix1, using NIM SPOT resource spot1, NIM lpp_source resource lpp1, and target disks hdisk1 & hdisk2. Note that the -Y flag agrees to all required software license agreements for software to be installed, enter the following:
   nimadm -c aix1 -s spot1 -l lpp1 -d "hdisk1 hdisk2" -Y

2. To execute the same operation as in the example above to hdisk2, and also run pre-migration script nimscrip1 and post-migration script nimscrip2, enter the following:
   nimadm -c aix1 -s spot1 -a nimscrip1 -z nimscrip2 -l lpp1 -d hdisk1 -Y
3. To execute `nimadm` cleanup on client aix1, using NIM SPOT resource spot1, enter the following:
   `nimadm -C -c aix1 -s spot1`

4. To create a migrated new mksysb resource of a client with the filename nim1, type the following:
   `nimadm -c aix1 -s spot1 -l lpp1 -O /export/mksysb/mksysb1 -j vg00 -Y -N nim1`

5. To create a new migrated mksysb resource with the filename nim3 from an existing NIM mksysb resource, type the following:
   `nimadm -s spot1 -l lpp1 -j vg00 -Y -T nim2 -N nim3`

6. To migrate an existing NIM resource and put it on a client, type the following:
   `nimadm -c aix1 -s spot1 -l lpp1 -d hdisk1 -j vg00 -T nim2 -Y`

   **Note:** No changes are made to the nim2 NIM mksysb resource.

**Files**

`/usr/sbin/nimadm` Contains the `nimadm` command.

**Related Information**

The `lslpp` command, the `nim` command, the `lsnim` command, the `alt_disk_install` command, the `installp` command, the `chroot` command.

---

**nimclient Command**

**Purpose**

Allows Network Installation Management (NIM) operations to be performed from a NIM client.

**Syntax**

**To Enable or Disable the NIM Master’s Push Permissions**

`nimclient { -p } | { -P }`

**To Enable or Disable Cryptographic Authentication for NIM Master Push Operations**

`nimclient { -c } | { -C }`

**To List Information about the NIM Environment**

`nimclient [ LsnimParameters ]`

**To Set the Date and Time to That of the NIM Master**

`nimclient -d`

**To Perform a NIM Operation**

`nimclient -o Operation [ -a Attribute=Value ] ...`

**Description**

The `nimclient` command is used by workstations that are NIM clients to pull NIM resources. This command can enable or disable the NIM master server’s ability to initiate workstation installation and customization for the workstation. The `nimclient` command can be used to generate a list of available NIM resources or display the NIM resources that have already been allocated to the client. A limited set of NIM operations can also be performed by the `nimclient` command using the `-o` flag.
Flags

-a Attribute=Value
Passes information to NIM operations.

From the master
Use the \texttt{lsnim -q Operation -t Type} command to get a list of valid attributes for a specific operation.

From the client
Use the \texttt{nimclient -l -q Operation -t Type} command to get a list of valid attributes for a specific operation.

-c
Enables SSL authentication during NIM master push operations.
Note: OpenSSL certificates must be configured on the NIM master using the \texttt{nimconfig -c} command. The SSL certificate is copied from the NIM master when \texttt{nimclient -c} is executed.

-C
Disables SSL authentication and uses standard nimsh security during NIM master push operations.

-d
Sets the client's date and time to that of the master.

-I Lsnim parameters
Executes the \texttt{lsnim} command on the master using the \texttt{lsnim} parameters that you specify. All the parameters which you use with this option must adhere to the syntax rules of the \texttt{lsnim} command. Note that some \texttt{lsnim} syntax requires the use of a NIM object name. To find out what the NIM name is for your machine, look in the \texttt{/etc/niminfo} file.

-o Operation
Performs the specified operation. The possible operations are:

\begin{itemize}
  \item allocate
    Allocates a resource for use.
  \item bos_inst
    Performs a BOS installation.
  \item change
    Changes an object's attributes.
  \item check
    Checks the status of a NIM object.
  \item cust
    Performs software customization.
  \item deallocate
    Deallocates a resource.
  \item diag
    Enables a machine to boot a diagnostic image.
  \item maint_boot
    Enables a machine to boot in maintenance mode.
  \item reset
    Resets an object's NIM state.
  \item showres
    Displays the contents of a NIM resource.
\end{itemize}

-p
Enables the NIM master to push commands.

-P
Removes the NIM master's permissions to push commands.

Note: The master can override this restriction by using the \texttt{-F} flag.

Security
Access Control: You must have root authority to run the \texttt{nimclient} command.

Examples
1. To list all the NIM resources which are available to this machine when its NIM name is \texttt{pluto}, enter:
   \texttt{nimclient -l -L pluto}
2. To list all the Shared Product Object Trees (SPOTs) which are available to this machine when its NIM name is pluto, enter:
   nimclient -l -L -t spot pluto

3. To list the operations which may be initiated from this machine, enter:
   nimclient -l -p -s pull_ops

4. To prevent the NIM master from running commands locally on the client, enter:
   nimclient -P

5. To allocate a spot resource named myspot, an lpp_source resource named images, and an installp bundle file name dept_bundle, enter:
   nimclient -o allocate -a spot=myspot -a lpp_source=images \
   -a installp_bundle=dept_bundle

6. To perform a base system installation after the required resources have been allocated, enter:
   nimclient -o bos_inst

7. From a standalone client, to allocate an lpp_source and install a software product such that the image for the installable option, adt, is contained in the lpp_source, images, enter:
   nimclient -o allocate -a lpp_source=images

   Then enter:
   nimclient -o cust -a filesets="adt"

8. From a standalone client, to allocate an lpp_source and install a software product such that the image for the installable option, adt, is contained in the lpp_source, images, and the name of the installable option is contained in the installp_bundle, bundle3, enter:
   nimclient -o allocate -a lpp_source=images \
   -a installp_bundle=bundle3

   Then enter:
   nimclient -o cust

9. To install all fileset updates associated with APAR IX12345, residing in the lpp_source updt_images, enter:
   nimclient -o allocate -a lpp_source=updt_images
   nimclient -o cust -a filesets=IX12345

10. To update all installed software on the client with the latest updates from the updt_images lpp_source, enter:
    nimclient -o allocate -a lpp_source=updt_images
    nimclient -o cust -a filesets=update_all

11. To enable the system to boot in maintenance mode using a SPOT resource named spot1, enter:
    nimclient -o maint_boot -a spot=spot1

    This sets up the maintenance boot operation, but you must initiate the network boot locally.

12. To show the contents of the config script script1, enter:
    nimclient -o showres -a resource=script1

13. To show the contents of the bosinst.data resource bosinst_data1, enter:
    nimclient -o showres -a resource=bosinst_data1

14. To list all the filesets in the lpp_source lpp_source1 relative to what is currently installed on the machine machine1, from the NIM client machine machine1, enter:
    nimclient -o showres -a resource=lpp_source1

    The reference attribute is automatically supplied by the nimclient command.

15. To list user instructions for the bos.INed and x1C.rte filesets on the lpp_source lpp_source1, enter:
    nimclient -o showres -a filesets="bos.INed x1C.rte" \
    -a resource=lpp_source1 -a installp_flags="qi"

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16. To list all problems fixed by software on the lpp_source lpp_source1, use:
   
   nimclient -o showres -a instfix_flags="T" -a resource=lpp_source

17. To install the filessets listed in the NIM installp_bundle client_bundle using the lpp_source
    client_images, while automatically allocating these resources during the installation operation, enter:
    
   nimclient -o cust -a installp_bundle=client_bundle \
   -a lpp_source=client_images

18. To perform a base system installation while automatically allocating all applicable resources from the
    NIM resource group named client_grp, enter:
    
   nimclient -o bos_inst -a group=client_grp

19. To perform a base system installation while automatically allocating all applicable resources from the
    NIM group defined as the default resource group on the master, enter:
    
   nimclient -o bos_inst

20. To copy an SSL certificate and enable SSL authentication, type:
    
   nimclient -c

   **Note:** OpenSSL must be installed on the NIM client prior to using this command option.

---

**Files**

/etc/niminfo

Contains variables used by NIM.

---

**Related Information**

The `lsnim` command, `nim` command, `nimconfig` command, `niminit` command.

The `.info` file.

---

**nimconfig Command**

**Purpose**

Initializes the Network Installation Management (NIM) master package.

**Syntax**

To Initialize the NIM master package

nimconfig -a pif_name=PiF -a netname=ObjectName [-a master_port=PortNumber] [ -a platform=Value ] [-a registration_port=PortNumber] [-a ring_speed=Speed | -a cable_type=CableType ]

To Configure SSL for the NIM Environment

nimconfig [-c]

To Rebuild the `/etc/niminfo` file:

nimconfig [-r]

**Description**

The `nimconfig` command initializes the NIM master package. You must initialize the package before any
other NIM commands can be used. When you use the `-a` flag to supply the proper attributes, the
nimconfig command initializes the NIM environment by performing the following tasks:

- Defines a network object specified by the `ObjectName` parameter to represent the network to which the
  NIM master’s primary interface, specified by the `Pif` parameter, is connected.
- Completes the definition of the NIM master by connecting it to the newly defined network object.
• Defines a resource object to represent the network boot resource, which is managed automatically by NIM.
• Defines a resource object to represent the customization scripts that NIM automatically builds to perform customization.
• Starts the NIM communications daemon, nimesis.

Flags

-a Assigns the following attribute=value pairs:

  pif_name=Name
  Designates the primary network interface for the NIM master. This value must be a logical interface name (such as tr0 or en0) in the available state.

  master_port=PortNumber
  Specifies the port number of the nimesis daemon used for NIM client communication.

  platform=Value
  Specifies the platform. The supported platforms are:
  rs6K   Micro Channel-based, uniprocessor models for AIX 5.1 and earlier
  rs6ksmp Micro Channeled-based, symmetric multiprocessor models for AIX 5.1 and earlier
  rspc   PowerPC PCI bus-based, uniprocessor models for AIX 5.1 and earlier
  rspcsmp PowerPC PCI bus-based, symmetric multiprocessor models for AIX 5.1 and earlier

  netname=ObjectName
  Specifies the name you want the nimconfig command to use when creating the network object to represent the network to which the master’s primary interface connects.

  ring_speed=Speed
  Speed in Mbps. When the pif_name refers to a token ring network, this value must be given. Acceptable values are:
  4
  16

  cable_type=CableType
  Specifies the ethernet cable type. When the pif_name refers to an ethernet network, this value must be given. Acceptable values are:
  bnc
  dix
  N/A

  registration_port=PortNumber
  Specifies the port number used for NIM client registration.
  Note: If you do not specify port numbers on the command line, the port numbers in the /etc/services file for NIM are used. If the /etc/services file does not contain entries for the NIM ports nim and nimreg, the default values of 1058 for master_port and 1059 for registration_port are used.

-c When OpenSSL is installed on the NIM master, this option creates SSL keys and certificates for use during NIM client communication. The SSL certificates are later copied to NIM clients using the nimclient -c command.

-r Rebuilds the /etc/niminfo file on the master using the information already exists in the NIM database. Note that if the bos.sysmgt.nim.master package has not been configured on this machine, this option will fail. This option is provided in case the /etc/niminfo file is accidentally removed by a user.
Security
Access Control: You must have root authority to run the nimconfig command.

Examples
1. To initialize the NIM environment using token ring and the default NIM ports for network communications, type:
   \texttt{nimconfig -a pif\_name=tr0 -a netname=net1 -a ring\_speed=16}
2. To initialize the NIM environment using ethernet and the default NIM ports, type:
   \texttt{nimconfig -a pif\_name=en0 -a master\_port=1058 -a netname=net2 -a cable\_type=bnc}
3. To rebuild the /etc/niminfo file on the NIM master when that machine has already been correctly configured as a master, type:
   \texttt{nimconfig -r}
4. To initialize the NIM master using an ATM network interface, type:
   \texttt{nimconfig -a pif\_name=at0 -a master\_port=1058 -a netname=ATMnet}
   \textbf{Note:} Because an interface to an ATM network does not currently support booting over the network, this operation will define a generic network object corresponding to the master's subnet.
5. To initialize the NIM environment using TCP/IP port 1060 for NIM client communications and TCP/IP port 1061 for NIM client registration, type:
   \texttt{nimconfig -a pif\_name=tr0 -a netname=net2 -a master\_port=1060 -a registration\_port=1061 -a ring\_speed=16}
6. To create SSL keys and certificates for NIM communication, type:
   \texttt{nimconfig -c}
   \textbf{Note:} OpenSSL must be installed on the NIM master prior to using this command option.

Files
/etc/niminfo Contains variables used by NIM.

Related Information
The \texttt{lsnim} command, \texttt{nim} command, \texttt{nimclient} command, \texttt{niminit} command.
The \texttt{.info} file.

\underline{nimdef Command}

\textbf{Purpose}
Defines Network Installation Management (NIM) clients from a stanza file.

\textbf{Syntax}
\texttt{nimdef [ -p | -d | -c ] -f Name}

\textbf{Description}
The \texttt{nimdef} command parses a definition stanza file to build the commands required to add NIM client definitions to the NIM environment.
The **nimdef** command can also create NIM networks and NIM machine groups automatically in the NIM environment to support the new client definitions.

**Note:** Before using the **nimdef** command, you must configure the NIM master. (See Basic NIM operations and configuration in *Installation and migration* for more information.)

### Client Definition File Rules

The format of the client definition file must comply with the following rules:

- After the stanza header, follow attribute lines of the form `Attribute = Value`.
- If you define an attribute value multiple times within the same stanza, only the last definition is used unless the attribute is **machine_group**. If you specify multiple **machine_group** attributes, all are applied to the machine definition.
- If you use an invalid attribute keyword, then that attribute definition is ignored.
- Each line of the file can have only one header or attribute definition.
- Only one stanza may exist in a definition file for each machine hostname.
- If the stanza header entry is the keyword **default**, this specifies to use it for the purpose of defining default values.
- You can specify a default value for any machine attribute except the machine hostname. If you do not specify an attribute for a machine but define a default value, then the default value is used.
- You can specify and change default values at any location in the definition file. After a default value is set, it applies to all definitions following it.
- To turn off a default value for all following machine definitions, set the attribute value to **nothing** in a default stanza.
- To turn off a default value for a single machine definition, set the attribute value to **nothing** in the machine stanza.
- You can include comments in a client definition file. Comments begin with the pound (`#`) character.
- When parsing the definition file for header/attribute keywords and values, tab characters and spaces are ignored.

### Client Definition File Keywords

The client definition file uses the following keywords to specify machine attributes:

#### Required Attributes

- **cable_type**: Specifies the cable type of the machine. Required if **network_type** is **ent**.
- **gateway**: Specifies the hostname or IP address of the default gateway used by the machine. If the machine does not use a gateway, then specify the value 0 (zero) for this attribute.
- **machine_type**: Specifies the type of the machine: **standalone**, **diskless**, or **dataless**.
- **network_type**: Specifies the type of the machine's network adapter: **ent** or **tok**.
- **ring_speed**: Specifies the ring speed of the machine. Required if **network_type** is **tok**.
- **subnet_mask**: Specifies the subnet mask used by the machine.

#### Optional Attributes

- **nim_name**: Specifies the NIM name to use for a machine. Use this attribute if something other than the hostname is used for the NIM name. By default, the NIM name given to a machine is the hostname of the machine with any domain information stripped off. If you use non-unique hostnames in different domains, a conflict occurs because the same NIM name is used for both machines. In such an environment, define this attribute for the affected machine definitions.
- **platform**: Specifies the machine hardware platform. If you do not specify this attribute, default is **rs6k** through AIX 5.1 only.
### Client Definition File Stanza Errors

A definition stanza is incorrect under any of the following conditions:

- The hostname used in the stanza header for the definition is unresolvable.
- A required attribute is missing.
- You specify an invalid value for an attribute.
- An attribute mismatch occurs. For example, you can not specify `network_type=tok` and `cable_type=bnc` in the same stanza.
- A group-type mismatch occurs. For example, you can not specify a group for a machine if the group includes standalone machines and you specify `machine_type=diskless`.
- Machine definitions occur multiple times for the same hostname.
- A machine definition occurs for a machine that is already defined in the NIM environment.
- The `primary_interface` value in a machine definition does not match the hostname of any defined machine or stanza definition.
- The `primary_interface` value in a machine definition matches the hostname of another machine definition, but that definition is incorrect.

### Sample Client Definition File

These default values are for AIX 5.1 and earlier.

```bash
# Set default values.
default:
    machine_type = standalone
    subnet_mask = 255.255.240.0
    gateway = gateway1
    network_type = tok
    ring_speed = 16
    platform = rs6k
    machine_group = all_machines

# Define the machine "lab1"
# Take all defaults.
lab1:

# Define the machine "lab2"
# Take all defaults and specify 2 additional attributes.
# The machine "lab2" uses IPL ROM emulation, and will be added to
# the machine groups "all_machines" and "lab_machines".
lab2:
    ipl_rom_emulation = /dev/fd0
    machine_group = lab_machines
```
# Define the machine "lab3"
# Take all defaults, but do not add the machine to the default
# group.
lab3:
    machine_group =

# Define the machine "lab4"
# Take all defaults, but do not add "lab4" to the default group
# "all_machines".
# Instead add it to the groups "lab_machines" and "new_machines".
lab4:
    machine_group =
        machine_group = lab_machines
        machine_group = new_machines

# Change the default "platform" attribute.
default:
    platform = rspc

# define the machine "test1"
# Take all defaults and include a comment.
test1:
    comments = "This machine is a test machine."

## Flags

- **-c** Generates commands from a client definition file. This flag processes the definition file and generates the commands to add the definitions. The commands are not invoked but displayed as a KSH script that you can redirect to a file and invoke at a later time.

- **-d** Defines machines from a client definition file. This flag processes the definition file and invokes the commands to add the definitions to the NIM environment.

- **-f Name** Specifies the name of the client definition file.

- **-p** Displays a preview of the client definition file. This flag processes the definition file but does not add machines to the NIM environment. Displays the following:

  All complete and valid NIM definition stanzas.

  All additional interfaces that will be defined for machines.

  All invalid definitions stanzas and the reason for failure.

  All new machine groups and the members to add.

  All existing machine groups and the members to add.

  All network definitions to add to the NIM environment.

  The commands to invoke to add each new machine.

  The commands to invoke to add each additional machine interface.

  The commands to invoke to create new machine groups and add their members.

  The commands to invoke to add new members to existing machine groups.

  **Note:** We recommend that you specify the **-p** flag on a client definition file to verify that all stanzas are correct before using it for adding machines.

## Exit Status

This command returns the following exit values:

- **0** Successful completion.
Security
Access Control: You must have root authority to run this command.

Auditing Events: N/A

Examples
1. To preview the client definition file client.defs, enter:
   nimdef -p -f client.defs
2. To add the NIM clients described in the client definition file client.defs, enter:
   nimdef -d -f client.defs
3. To create a ksh script called client.add to add the NIM clients described in the client definition file
   client.defs, enter:
   nimdef -c -f client.defs > client.add

Files
/usr/sbin/nimdef Contains the nimdef daemon/command.

Related Information
The lsnim command, nim command, nimclient command, nimconfig command.

niminit Command

Purpose
Configures the Network Installation Management (NIM) client package.

Syntax

To Configure the NIM Client Package
niminit [-a name=Name -a pif_name=Pif -a [master=Hostname] [ -a master_port=PortNumber ] [ -a registration_port=PortNumber ] [ -a cable_type=Type ] [ -a ring_speed=Speed ] [ -a [plrom_emu=Device] ] [ -a platform=PlatformType ] [ -a netboot_kernel=NetbootKernelType ] [ -a adpt_add=AdapterAddress ] [ -a is_alternate=yes | no ] [ -a connect=value ]

To Rebuild the /etc/niminfo File
niminit [-a name=Name -a master=Hostname -a master_port=PortNumber]

Description
The niminit command configures the NIM client package. This must be done before the nimclient command can be used. When the required attributes are supplied to the niminit command, a new machine object will be created to represent the machine where the niminit command is being executed. When the niminit command completes successfully, the machine will be able to participate in the NIM environment.

After the NIM client package has been successfully configured, the niminit command can be run again to rebuild the /etc/niminfo on the client. The /etc/niminfo file is used by the nimclient command and must be rebuilt if it is accidentally removed by a user.
This command configures an alternate_master when the is_alternate attribute is set to yes. The bos.sysmg.t.nim.master fileset must be installed prior to configuring an alternate_master. Once the configuration of an alternate_master is successful, the master that it registered with will be able to run alternate_master operations on this machine.

Flags

*a* Specifies up to five different attributes for the niminit command. All of the following attribute=value pairs are preceded by the -a flag:

- **name=Name** Specifies the name that NIM will use to identify the workstation. This value is required.

- **pif_name=Pif** Defines the name of the network interface for all NIM communications. This value is required.

- **master=Hostname** Specifies the hostname of the NIM master. The client must have the ability to resolve this hostname to an Internet Protocol (IP) address. This value is required.

- **master_port=PortNumber** Specifies the port number of the nimesis daemon used for NIM communications.

- **cable_type=CableType** Specifies the ethernet cable type. When the pif_name refers to an ethernet network, this value must be given. Acceptable values are: bnc, dix, and N/A.

- **ring_speed=Speed** Speed in Mbps. When the pif_name refers to a token ring network, this value must be given. Acceptable values are: 4 and 16.

- **iplrom_emu=Device** Specifies a device that contains a ROM emulation image. This image is required for models that do not have internal support for booting via network interface.

- **platform=PlatformType** Specifies the platform that corresponds to the client’s machine type. If this attribute is not specified, the default, rs6k, will be used. The supported platforms are:

  - **rs6k** Micro Channel-based, uniprocessor models for AIX 5.1 and earlier
  - **rs6ksmp** Micro Channel-based, symmetric multiprocessor models for AIX 5.1 and earlier
  - **rspc** PowerPC PCI bus-based, uniprocessor machines for AIX 5.1 and earlier
  - **rspcsmp** PowerPC PCI bus-based, symmetric multiprocessor machines for AIX 5.1 and earlier

- **adpt_add=AdapterAddress** Specifies the hardware address that corresponds to the network adapter.

- **registration_port=PortNumber** Specifies the port number used for NIM client registration.

Notes:

1. If you do not specify port numbers on the command line, the port numbers in the /etc/services file for NIM is used. If the /etc/services file does not contain entries for the NIM ports nim and nimreg, the default values of 1058 for master_port and 1059 for registration_port are used.

2. The values used for master_port and registration_port should match the values used by the NIM master. To display the values used by the NIM master, run the command lsnim -l master on the NIM master.
**netboot_kernel=**

Specifies the type of kernel to use when booting the client over the network. The `netboot_kernel` values are:

- **up**  
  Kernel for uniprocessor machines

- **mp**  
  Kernel for multiprocessor machines

The default is **up**.

**is_alternate=[yesno]**

Set this to yes if this machine is to be configured as an alternate_master.

**connect= value**

Specifies the communicating service used by the NIM client for remote execution of NIM commands. Value options are `shell` (for rsh) and `nimsh`. The default setting is `connect=shell`. This attribute is optional.

### Security

Access Control: You must have root authority to run the niminit command.

### Examples

1. To configure the NIM client package on a machine that has a BOOTP-enabled IPL ROM such that it will be known as `scuba` in the NIM environment, using `en0` as its primary interface and an ethernet cable type of `bnc`, and specifying that it communicates with the NIM master using the master’s hostname of `manta` and the default NIM ports located in `/etc/services` for network install communications, type:

   ```
   niminit -a name=scuba -a pif_name=en0 -a cable_type=bnc \
   -a master=manta
   ```

2. To rebuild the `/etc/niminfo` file when it has accidentally been removed by a user, using a hostname of `superman` for the master’s hostname and a port number of 1058, type:

   ```
   niminit -a name=robin -a master=superman -a master_port=1058
   ```

3. To configure the NIM client package for AIX 5.1 and earlier on a machine that is a PowerPC PCI bus-based, uniprocessor system that has a BOOTP-enabled IPL ROM such that it will be known as `starfish` in the NIM environment, using `en0` as its primary interface and an Ethernet cable type of `dix`, and specifying that it communicates with the NIM master using the master’s host name of `whale` and a port number of 1058, type:

   ```
   niminit -a name=starfish -a pif_name=en0 -a cable_type=dix \
   -a master=whale -a master_port=1058 -a platform=rspc
   ```

4. To configure the NIM client, on a machine to be known as `bluefish` in the NIM environment, using `at0` as its primary interface and specifying that it communicates with the NIM master using the master’s host name `redfish` and a port number of 1058, type:

   ```
   niminit -a name=bluefish -a pif_name=at0 -a master=redfish \
   -a master_port=1058
   ```

   **Note:** Because an interface to an ATM network does not currently support booting over the network, this operation will define a machine object on the NIM master if a Generic network object corresponding to the client’s subnet is already defined.

5. To configure the NIM client for AIX 5.1 and earlier on a machine that is a PowerPC PCI bus-based, symmetric multiprocessor system that has a BOOTP-enabled IPL ROM such that it will be known as `jellyfish` in the NIM environment, using `en0` as its primary interface and an Ethernet cable type of `dix`, and specifying that it communicates with the NIM master using the master’s host name `whale` and a port number of 1058, type:

   ```
   niminit -a name=jellyfish -a pif_name=en0 -a cable_type=dix \
   -a master=whale -a master_port=1058 -a platform=rspcsmp
   ```

6. To configure the NIM client package on a machine that will use an IPL ROM emulation in device `/dev/fd0`, such that it will be known as `octopus` in the NIM environment and uses `tr0` as its primary
interface and a ring speed of 16, and communicates with the NIM master using the master’s hostname of dolphin and a port number of 1700 for client communications and 1701 for client registration, type:

```
niminit -a iprom_emu=/dev/fd0 -a name=octopus -a pif_name=tr0 -a ring_speed=16 -a master=dolphin -a master_port=1700 -a registration_port=1701
```

7. To configure this machine as an alternate_master with the NIM master dolphin and communicate over interface en0, type:

```
niminit -a is_alternate=yes -a name=octopus -a pif_name=en0 -a cable_type=bnc -a master=dolphin
```

**Files**

`/etc/niminfo` Contains variables used by NIM.

**Related Information**

The `lsnim`, `nim`, `nimclient`, `nimconfig` command.

The `.info` file.

**niminv Command**

**Purpose**

Allows system administrators to gather, conglomerate, compare, and download fixes based on installation inventory of NIM objects.

**Syntax**

To get installation inventory:

```
niminv -o invget [-a targets=object1,object2,... [-a location=path] [-a colonsep=yes/no ]
```

To conglomerate installation inventory:

```
niminv -o invcon [-a targets=object1,object2,... [-a base=highest|lowest] [-a location=path] [-a colonsep=yes/no ]
```

To compare installation inventory:

```
niminv -o invcmp [-a targets=object1,object2,... [-a base=object|any] [-a location=path]
```

To get fixes based on conglomerate inventory:

```
niminv -o fixget [-a targets=object1,object2,... [-a download=yes/no] [-a lp_source=object] [-a location=path] [-a newlppname=name]
```

**Description**

The `niminv` command (Network Install Manager Inventory) allows system administrators to accomplish the following tasks:

- Gather installation inventory of several NIM objects.
- Conglomerate installation inventory of several NIM objects.
- Compare installation inventory of several NIM objects.
- Download fixes based on the installation inventory of several NIM objects.
The `niminv` command can use any NIM object that contains installation information. Examples of such objects include standalone client objects, SPOT objects, `lpp_source` objects and `mksysb` objects.

Using the `niminv` command has the following advantages:
- Hardware installation inventory is gathered alongside the software installation inventory.
- Data files are saved with a naming convention that is easily recognizable.
- All NIM objects that have installation inventory can be used.
- The command provides a holistic view of all managed NIM objects.

The information displayed by `niminv` can be limited by any of the following factors:
- Only software installation inventory is provided for objects that do not actually have physical devices (such as SPOT objects, `lpp_source` objects, and `mksysb` objects).
- Software and hardware installation inventory on client objects are limited to what commands on the remote system can provide.
- The recognition of fixes to download is based on the fix backend server. For more details, see [Using the Software Service Management menu (including SUMA)](#).

### Flags

- `-a attribute=value` Specifies the attribute and value. The supported attributes and values are based on the operation.
- `-o operation` Specifies the operation. The following operations are currently supported:
  - `fixget` Gathers the latest fixes based on the installation inventory. This operation supports the following attributes:
    - `targets` (required) A comma-separated list of NIM objects to base the gathering of fixes.
    - `lpp_source` (optional) The NIM `lpp_source` object to use as a filter for downloading fixes. If the location and `newlppname` attributes are not used, this `lpp_source` object will also be where any fixes are downloaded to.
    - `location` (optional) A directory to store the fixes. Use this attribute only if the fixes should not be downloaded to the object supplied to the `lpp_source` attribute. This attribute can only be used with the `newlppname` attribute.
    - `newlppname` (optional) The NIM object name of the `lpp_source` to create at location. This attribute can only be used with the `location` attribute. The value supplied must be distinct and currently unused in the NIM environment.
    - `download` (optional) Instructs the command whether or not to download the fixes. If no `lpp_source` or `location` field is specified and the value of this attribute is `yes`, fixes will be downloaded to the default location through the `suma` command.

Note: The `suma` command will increase the file system space according to the `MaxFSSize` field in the `suma` configuration.
invcmp

Compares installation inventory. This operation supports the following attributes:

targets (required) A comma-separated list of NIM objects to compare installation inventory.

base (required) The NIM object to use as the comparison base, or the keyword any. If the NIM object is supplied, the installation inventory in the object is the sole determinate of the data displayed, and only inventory in the base object is compared against inventory in the target objects. The keyword any forces the command to use any installation inventory of the targets.

location (optional) A directory to store the data files. If this option is used, each inventory is saved with the format conglomerate base_object.target_object_list.timestamp, where base_object is the NIM name of the base object used for comparison (or the keyword any), target_object_list is a colon-separated and sorted list of the NIM name of the objects, and timestamp is the time the command was run. If the directory does not exist, it will be created. The default is to display the data to the screen.
invcon Conglomerates installation inventory. This operation supports the following attributes:

_targets_ (required) A comma-separated list of NIM objects to conglomerate installation inventory.
_base_ (optional) Specifies whether the conglomerate inventory is based on the highest or lowest software levels.
_location_ (optional) A directory to store the data files. If this option is used, each inventory is saved with the format _base_.target_object_list.timestamp, where _base_ indicates whether the conglomerate is based on the highest or lowest levels, _target_object_list_ is a colon-separated and sorted list of the NIM name of the objects, and _timestamp_ is the time that the command was run (year month day hour minute second). If the directory does not exist, it will be created. The default is to display the data to the screen.

Colonsep (optional) Instructs the command whether or not to produce colon-separated output. The default is no.

invget Gathers installation inventory. This operation supports the following attributes:

_targets_ (required) A comma-separated list of NIM objects to gather installation inventory.
_location_ (optional) A directory to store the data files. If this option is used, each inventory is saved with the format conglomerate.target_object_name.timestamp, where _target_object_name_ is the NIM name of the object, and _timestamp_ is the time that the command was run (year month day hour minute second). If the directory does not exist, it will be created. The default is to display the data to the screen.

Colonsep (optional) Instructs the command whether or not to produce colon-separated output. The default is no.

Exit Status

0 The command completed successfully.
>0 An error occurred.

Examples

1. To gather installation inventory of a two clients and save the output to /tmp/inventory, enter:

   niminv -o invget -a targets=client1,client2 -a location=/tmp/inventory

   Output similar to the following is displayed:
   Installation Inventory for client1 saved to
   /tmp/inventory/inventory.client1.060406140453.
   Installation Inventory for client2 saved to
   /tmp/inventory/inventory.client2.060406140453.

   The information in the files is similar to the output of lslpp -L
2. To conglomerate installation inventory of two clients and save the output to `/tmp/inventory`, enter:

```
niminv -o invcon -a targets=client1,client2 -a location=/tmp/inventory
```

Output similar to the following is displayed:
```
Installation Inventory for client1 saved to
/tmp/inventory/conglomerate.client1:client2.060406140500.
```

The information in the files is similar to the output of `lslpp -L`.

3. To compare installation inventory of a `mksysb`, SPOT, and `ipp_source` to what's currently installed on the master, and save the output to `/tmp/inventory`, enter:

```
niminv -o invcon -a targets=mksysb1,spot1,lpp_source1 -a base=master -a \
location=/tmp/inventory
```

Output similar to the following is displayed:
```
Installation Inventory for client1 saved to
/tmp/inventory/comparison.master.mksysb1:spot1:lpp_source1.060406140610.
```

The information in the file is listed in column format. The comparison only includes installation inventory on the master.

4. To do the same comparison as in the preceding example but also include software on any of the objects, enter:

```
niminv -o invcon -a targets=mksysb1,spot1,lpp_source1,master -a base=any -a \
location=/tmp/inventory
```

Output similar to the following is displayed:
```
Installation Inventory for client1 saved to
/tmp/inventory/comparison.any.mksysb1:spot1:lpp_source1.060406140733.
```

The information in the file is listed in column format. The comparison includes any installation inventory in any of the target objects.

5. To see the fixes that can be downloaded based on the lowest installations in a `mksysb`, SPOT and `ipp_source`, enter:

```
niminv -o fixget -a targets=mksysb1,spot1,lpp_source1
```

Output similar to the following is displayed:
```
****************************************
Performing preview download.
****************************************
Download SUCCEEDED: /usr/sys/inst.images/installp/ppc/Java14.debug.1.4.1.0.bff
Download SUCCEEDED: /usr/sys/inst.images/installp/ppc/Java14.debug.1.4.1.7.bff
Download SUCCEEDED: /usr/sys/inst.images/installp/ppc/devices.pci.00100100.com.5.2.0.50.bff
Download SUCCEEDED: /usr/sys/inst.images/installp/ppc/devices.pci.00100300.diag.5.2.0.75.bff
Download SUCCEEDED: /usr/sys/inst.images/installp/ppc/devices.pci.00100f00.rte.5.2.0.85.bff
Download SUCCEEDED: /usr/sys/inst.images/installp/ppc/devices.pci.13100560.rte.5.2.0.85.bff

Summary:
6 downloaded
0 failed
0 skipped
```

6. To download the latest fixes based on the lowest installations in a `mksysb`, SPOT and `ipp_source`, enter:

```
niminv -o fixget -a targets=mksysb1,spot1,lpp_source1 -a download=yes
```

Output similar to the following is displayed:
```
Extending the /usr filesystem by 30 blocks.
File System size changed to 8126464
```
Download SUCCEEDED: /usr/sys/inst.images/installp/ppc/Java14.debug.1.4.1.0.bff
Download SUCCEEDED: /usr/sys/inst.images/installp/ppc/Java14.debug.1.4.1.7.bff
Download SUCCEEDED: /usr/sys/inst.images/installp/ppc/devices.pci.00100100.com.5.2.0.50.bff
Download SUCCEEDED: /usr/sys/inst.images/installp/ppc/devices.pci.00100300.diag.5.2.0.75.bff
Download SUCCEEDED: /usr/sys/inst.images/installp/ppc/devices.pci.00100f00.rte.5.2.0.85.bff
Download SUCCEEDED: /usr/sys/inst.images/installp/ppc/devices.pci.13100560.rte.5.2.0.85.bff

Summary:
6 downloaded
0 failed
0 skipped

Note: Any installations already contained in the default download path (as specified by the `suma` command) will not be downloaded again. The default download path in this example was `/usr/sys/inst.images`. Refer to the `suma` command for specifics on where the default download path will be.

7. To download the latest fixes based on the lowest installations in a `mksysb`, `SPOT` and `lpp_source` to an existing `lpp_source`, enter:

   `niminv -o fixget -a targets=mksysb1,spot1,lpp_source1 -a download=yes -a lpp_source=lpp_source2`

Output similar to the following is displayed:

   Download SUCCEEDED: /nim/lpps/lpp_source2/installp/ppc/Java14.debug.1.4.1.0.bff
   Download SUCCEEDED: /nim/lpps/lpp_source2/installp/ppc/Java14.debug.1.4.1.7.bff

   Summary:
   2 downloaded
   0 failed
   0 skipped

Note: Any installations already contained in `lpp_source2` will not be downloaded again. In this example, the `filessets` device already existed in the `lpp_source2`.

8. To download the latest fixes based on the lowest installations in a `mksysb`, `SPOT` and `lpp_source` to a new `lpp_source` while filtering filesets in an existing `lpp_source`, enter:

   `niminv -o fixget -a targets=mksysb1,spot1,lpp_source1 -a download=yes -a location=/nim/lpps/newlpp1 -a newlppname=newlpp1`

Output similar to the following is displayed:

   Download SUCCEEDED: /nim/lpps/newlpp1/installp/ppc/Java14.debug.1.4.1.0.bff
   Download SUCCEEDED: /nim/lpps/newlpp1/installp/ppc/Java14.debug.1.4.1.7.bff

   Summary:
   2 downloaded
   0 failed
   0 skipped

Note: Any installations already contained in `lpp_source2` will not be downloaded again. In this example, the `filessets` device already existed in the `lpp_source2`.

9. To download the latest fixes based on the lowest installations in a `mksysb`, `SPOT` and `lpp_source` to a new `lpp_source`, enter:

   `niminv -o fixget -a targets=mksysb1,spot1,lpp_source1 -a download=yes -a location=/nim/lpps/newlpp2 -a newlppname=newlpp2`

Output similar to the following is displayed:

   Download SUCCEEDED: /nim/lpps/newlpp2/installp/ppc/Java14.debug.1.4.1.0.bff
   Download SUCCEEDED: /nim/lpps/newlpp2/installp/ppc/Java14.debug.1.4.1.7.bff
   Download SUCCEEDED: /nim/lpps/newlpp2/installp/ppc/devices.pci.00100300.diag.5.2.0.75.bff
   Download SUCCEEDED: /nim/lpps/newlpp2/installp/ppc/devices.pci.00100f00.rte.5.2.0.85.bff
   Download SUCCEEDED: /nim/lpps/newlpp2/installp/ppc/devices.pci.13100560.rte.5.2.0.85.bff
Summary:
6 downloaded
0 failed
0 skipped

Location
/usr/sbin/niminv

Related Information
The **installp Command**, **lslpp Command**, **lscode Command**, **lscfg Command**, **nim Command** on page 79, **suma Command**.

---

**nimol_backup Command**

**Purpose**
Creates NIMOL install resources from an AIX client.

**Syntax**
nimol_backup [-c client_hostname] [ -t directory] [ -m remote_access_method] [-L label] [-D]

**Description**
The `nimol_backup` command creates NIMOL install resources from a configured NIMOL client using the specified remote access method, which is `/usr/bin/rsh` by default, to call the nimol_mk_resources method on the client. When configuring a NIMOL server using the `nimol_config` command, the user can set the default remote access method to something other than `/usr/bin/rsh`, such as `/usr/bin/ssh`. A machine is considered a NIMOL client when it has been installed using the `nimol_install` command without the `-n` flag.

The command creates the target directory and label on the NIMOL server. The directory is then exported. The default label is `default`. For example, if the command is passed `-t /export/aix -L aix530`, then the command creates the `/export/aix/aix530` directory on the NIMOL server.

The command then uses the remote access method to run the `nimol_mk_resources` command. The `nimol_mk_resources` command creates the necessary install resources in the target directory.

**Flags**
- `-c client_hostname`
  Specifies the NIMOL client hostname on which to execute the `geninstall` command.
- `-D`
  Runs the command in debug mode.
- `-L label`
  Specifies the label or name to create for the created resources.
- `-m remote_access_method`
  Specifies the remote access method to use to run the `geninstall` command. The default `/usr/bin/rsh`. Another option is `/usr/bin/ssh`.
- `-t directory`
  Specifies the target directory where the AIX install resources will be created from the NIMOL client. The default directory is `/export/aix`.

**Exit Status**
0 The command completed successfully.
> 0 Error returned.
Security

To run the `nimol_backup` command on a NIMOL client, the client must provide remote access permissions to the NIMOL server. Using `/usr/bin/ssh` is a more secure remote access method than `/usr/bin/rsh`.

Examples

1. To create install resources from client `myclient` in the `/export/aix` directory and named 530, type:
   
   ```
   nimol_backup -c myclient -L 530 -t /export/aix
   ```

2. To execute `nimol_mk_resources` using ssh, type:

   ```
   nimol_backup -c myclient -m ssh
   ```

Location

`/usr/sbin/nimol_backup`

Files

`/etc/nimol.conf`  Stores configuration information for the command.

Related Information

The "nimol_config Command," "nimol_install Command" on page 140, "nimol_lslpp Command" on page 143, "nimol_update Command" on page 144.

`nimol_config` Command

Purpose

Configures a Linux® server to network install a machine with AIX by configuring services and copying install resources.

Syntax

```bash
```  

Description

The `nimol_config` command configures a Linux server to network install a machine with AIX. The command performs the following configuration.

1. First, the command obtains the hostname and IP address of the Linux server. If no hostname is specified with the `-s` flag, the command uses the hostname of the local machine and the IP address associated with the hostname. If a hostname and IP address are specified, then the pair is added to the `/etc/hosts` file, if it does not already exist.

2. The command then starts the portmap service and nfs server.

3. The command stores the remote access method in the `/etc/nimol.conf` file if specified with the `-m` flag. The default remote access command is `/usr/bin/rsh`, which is used to communicate with NIMOL clients that have been installed without specifying the `-n` flag to the `nimol_install` command.

4. Next, tftpboot is configured. The `/tftpboot` directory is created if it does not exist and the `/etc/xinetd.d/tftp` file is created if it does not exist. Then the command sets disable equal to no in the `/etc/xinetd.d/tftp` file and restarts xinetd so that the tftp server can handle incoming requests.

5. The `nimol_config` command also sets up syslog to accept incoming messages from other machines. Clients pass back status while installing to the syslog server. The `/etc/sysconfig/syslog` file is modified to include the `-r` flag in the SYSLOGD_OPTIONS or SYSLOGD_PARAMS variable. Then the
command searches /etc/syslog.conf for the first available local log and sets it to write messages to /var/log/nimol.log. Clients write status to this log file, which can be monitored during a client installation. After the changes are made to the syslog configuration files, the service is restarted.

6. Next, the command sets up the DHCP server to receive bootp requests from AIX clients. The subnet of the NIMOL server is determined and added to the dhcpd.conf file. The options allow bootp, not authoritative, and ddns-update-style none are added if they do not already exist. Existing settings for these options will be overwritten.

7. Once the services have been configured, the nimol_config command attempts to copy AIX install resources locally, if the -C flag was not passed to the command. The command copies resources from the source directory specified with the -d flag (/mnt/cdrom by default) to the target directory (/export/aix by default). A directory is created (name that matches the LABEL name specified with the -L flag ‘default’ by default). The command looks in the source directory for the following resources:
   • a SPOT (Source Product Object Tree) directory named /SPOT and a SPOT directory named ispot.tar.Z
   • an lpp_source directory named /lpp_source
   • a mksysb named mksysb or mksysb.bff
   • a boot image named booti.chrp.mp.ent
   • a bosinst.data file named bosinst.data
   • an image.data file named image.data
   • a customization script named cust.script
   • a resolv.conf file named resolv.conf
   A SPOT, boot image, and either mksysb or lpp_source are required.

8. The target directory is then globally exported unless the -e flag is specified.

9. If a target directory and label are specified that contain resources, then these resources will be used and no resources will be copied. For example, if the command is passed -t /export/aix -L aix530 and the directory /export/aix/aix530 contains resource, then the command will not attempt to copy resources from the source directory.

10. After the NIMOL server has been configured, the nimol_config command will not attempt to reconfigure services on the NIMOL server when defining new resource labels.

11. The command also lists defined resource labels with the -l flag.

12. Resource labels can be removed by specifying the -r flag with a resource label. The command unexports the directory, if exported, and deletes the directory of the resource label.

13. When the -U flag is passed, the command attempts to undo any configuration that it has done, such as unconfiguring services.

Flags

- **-C** Specifies that the server should only configure services without copying install resources.
- **-d directory** Specifies the source directory that contains the AIX install resources. The default directory is /mnt/cdrom.
- **-D** Runs the command in debug mode.
- **-e** Instructs the command not to globally export the directory of newly created resource label.
- **-l** Lists the defined resource labels available to install a client.
- **-L label** Specifies the label or name to create for the copied resources.
- **-m method** Specifies the remote access method to use when running commands on clients that have been installed without specifying the -n flag to the nimol_install command.
- **-r** Instructs the command to remove the specified resource label.
- **-s hostname** The hostname to use for the NIMOL server. The default is to determine the hostname by running the hostname command.
Instructs the command to not configure the syslog service. No status will be logged when clients are installing.

\textbf{-t directory}\hspace{1em}Specifies the target directory where the AIX install resources will be copied from the source directory. The default directory is \texttt{/export/aix}.

\textbf{-U}\hspace{1em}Instructs the command to unconfigure the NIMOL server. The command will attempt to undo any configuration that it performed.

\section*{Exit Status}

\begin{itemize}
  \item \texttt{0}\hspace{1em}The command completed successfully.
  \item \texttt{> 0}\hspace{1em}Error returned.
\end{itemize}

\section*{Security}

Configuring the syslog service to accept messages from remote clients can be a security issue. Configure your firewall to only accept syslog messages from known clients.

\section*{Examples}

1. To configure the NIMOL server without copying resources, type:
   \begin{verbatim}
   nimol_config -C
   \end{verbatim}

2. To configure the NIMOL server, copy resources from \texttt{/mnt/aix} to \texttt{/export/aix}, and label the resource aix530, type:
   \begin{verbatim}
   nimol_config -d /mnt/aix -t /export/aix -L aix530
   \end{verbatim}

3. To configure the NIMOL server and copy resources without configuring syslog and without globally exporting the resource label directory, type:
   \begin{verbatim}
   nimol_config -S -e
   \end{verbatim}

4. To list defined resource labels, type:
   \begin{verbatim}
   nimol_config -l
   \end{verbatim}

5. To remove the aix530 resource label, type:
   \begin{verbatim}
   nimol_config -L aix530 -r
   \end{verbatim}

\section*{Location}

\texttt{/usr/sbin/nimol_config}

\section*{Files}

\texttt{/etc/nimol.conf}\hspace{1em}Stores configuration information for the command.

\section*{Related Information}

“nimol_install Command,” “nimol_lslpp Command” on page 143, “nimol_update Command” on page 144.

\section*{nimol_install Command}

\textbf{Purpose}

Sets up a configured NIMOL server to install AIX to a specific client machine.

\textbf{Syntax}

\begin{verbatim}
nimol_install [-c client_hostname [\texttt{-g gateway} \texttt{-m mac_address} \texttt{-p ip_address} \texttt{-s subnet_mask} \texttt{-L label} \texttt{-n} \texttt{-r} \texttt{-D}]
\end{verbatim}

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The **nimol_install** command sets up a configured NIMOL server to network install a machine with AIX. The command performs the following configuration.

1. The command determines the IP address of the client hostname if the client IP address isn’t specified. If the client hostname isn’t resolvable and a client IP address is specified, then the pair will be added to the `/etc/hosts` file if it does not exist.

2. The client is added to the `/etc/nimol.conf` file.

3. The directory of the resource label is exported to the client if it is not already globally exported.

4. A stanza for the client is added to the `/etc/dhcpd.conf` file. The client’s subnet will also be added to the `/etc/dhcpd.conf` file if it does not exist. If the client or its subnet already exist in the `/etc/dhcpd.conf` file, an error is displayed.

5. A symbolic link to the boot image is created in the `/tftpboot` directory for the client.

6. A static `arp` entry is added if the client is on the same subnet as the NIMOL server.

7. The command will turn off the firewall rules to a client that is installing if the `iptables` command exists by running:
   
   ```
   iptables -I INPUT 1 -s client_hostname -j ACCEPT
   
   This allows the various services used by NIMOL to succeed. When a client is removed, the `nimol_install` command will run the following command to delete the rule: `iptables -D INPUT -s client_hostname`.
   
8. The command ensures that the required resources exist in the resource label’s directory.

9. A nim_script is created in the scripts subdirectory of the resource label’s directory if a `resolv.conf` or customization script was specified or if the client will remain a client of the NIMOL server after the installation. The `nimol_install` command will look for a general customization script in the resource label’s directory named `cust.script` or a specific customization script for the client named `client_name.script`.

10. An information file is created in the `/tftpboot` directory that will be used during the installation of the operating system.

11. If the `-l` flag is specified, the command will list clients set up for an installation. A client will be removed if the `-r` flag is specified with a client name.

12. Once the client has been set up to install, the client must be told to perform a network install. If the client has AIX installed and is running, then use the `bootlist` command. For example, if the NIMOL server is 192.168.1.20 and the AIX client is 192.168.1.30, then to boot off `ent0` run:

   ```
   bootlist -m normal -ent0 bserver=192.168.1.20 \ 
   gateway=0.0.0.0 client=192.168.1.30
   
   then reboot by running:
   ```
   
   ```
   shutdown -Fr
   ```

13. If the client is not running, then boot into the SMS menus and specify the network boot parameters and the network boot device. If the client is on the same subnet as the NIMOL server, then the client will be able to do a broadcast `bootp` install. A broadcast `bootp` does not require the IP parameters to be set; the `bserver`, `gateway` and `client` would be `0.0.0.0` on a broadcast bootp install.

### Flags

- `-c client_hostname`
  
  Specifies the client hostname that will be set up for an install or will be removed.

- `-D`
  
  Runs the command in debug mode.

- `-g gateway`
  
  Specifies the gateway that will be configured after the client has installed AIX. This is required when installing a client.

- `-l`
  
  Lists the clients set up to install.

- `-L label`
  
  Specifies the label or name of resources with which to install the client. The default is `default`.
-m mac_address  Specifies the MAC address of the network interface the client will install over. This is required when installing a client. The MAC address must contain colons (for example 00:60:08:3F:E8:DF).

-n  Specifies not to configure the machine to remain a client of the NIMOL server after the installation has completed. If this option is specified, the client will not have its network configured after the installation.

-p ip_address  Specifies the IP address of the client. Use this flag if the client’s hostname is not resolvable.

-r  Removes the client. The client will not be able to install AIX until it is reconfigured. This flag requires a client hostname.

-s subnet_mask  Specifies the subnet mask of the client interface. This flag is required when installing a client.

Exit Status

0  The command completed successfully.
> 0  Error returned.

Security

If the machine remains a client of the NIMOL server (the -n flag is not specified), then it will give the NIMOL server /usr/bin/rsh permissions so it can run commands on the client.

Examples

1. To setup client myclient to install the aix530 resource label with gateway 192.168.1.1, MAC address 00:60:08:3F:E8:DF, and subnet mask 255.255.255.0, type:
   
   nimol_install -c myclient -g 192.168.1.1 \ 
   -m 00:60:08:3F:E8:DF -s 255.255.255.0 -L aix530

2. To setup client myclient and not have it remain a client to the NIMOL server after the installation, type:

   nimol_install -n -c myclient -g 192.168.1.1 \ 
   -m 00:60:08:3F:E8:DF -s 255.255.255.0 -L aix530

3. To list the clients configured to be installed, type:

   nimol_install -l

4. To remove client myclient, type:

   nimol_config -c myclient -r

Location

/usr/sbin/nimol_install

Files

/etc/nimol.conf  Stores configuration information for the command.

Related Information

The "nimol_config Command" on page 138, "nimol_lslpp Command" on page 143, "nimol_update Command" on page 144.
nimol_lslpp Command

**Purpose**

Runs the lslpp command on a NIMOL client.

**Syntax**

```
imol_lslpp [options] [flags]
```

**Description**

The `nimol_lslpp` command executes the `lslpp` command on a configured NIMOL client using the specified remote access method, which is `/usr/bin/rsh` by default. When configuring a NIMOL server using the `nimol_config` command, the user can set the default remote access method to something other than `/usr/bin/rsh`, such as `/usr/bin/ssh`. A machine is considered a NIMOL client when it has been installed using the `nimol_install` command without the `-n` flag.

The command runs the `lslpp` command with `-Lc` as the default flags. The `lslpp` command flags can be specified with the `-f` flag.

**Flags**

- `-c client_hostname` Specifies the NIMOL client hostname on which to execute the `lslpp` command.
- `-D` Runs the command in debug mode.
- `-f lslpp_flags` Specifies the `lslpp` command flags to pass to the `lslpp` command.
- `-m remote_access_method` Specifies the remote access method to use to run the `lslpp` command. The default is `/usr/bin/rsh`. Another option is `/usr/bin/ssh`.

**Exit Status**

- `0` The command completed successfully.
- `> 0` Error returned.

**Security**

To run the `nimol_lslpp` command on a NIMOL client, the client must provide remote access permissions to the NIMOL server. Using `/usr/bin/ssh` is a more secure remote access method than `/usr/bin/rsh`.

**Examples**

1. To run the `lslpp` command on client `myclient`, with the default flags `-Lc`, type:
   ```
nimol_lslpp -c myclient
   ```
2. To run the `lslpp` command on client `myclient`, with the flags `-i bos.rte`, type:
   ```
nimol_lslpp -c myclient -f "-i bos.rte"
   ```
3. To run the `lslpp` command on client `myclient`, using `ssh` as the remote access method, type:
   ```
nimol_lslpp -c myclient -m ssh
   ```

**Location**

`/usr/sbin/nimol_lslpp`

**Files**

`/etc/nimol.conf` Stores configuration information for the command.
**Related Information**

The "nimol_config Command" on page 138, "nimol_install Command" on page 140, "nimol_update Command.

---

**nimol_update Command**

**Purpose**

Runs geninstall on a NIMOL client to perform software maintenance.

**Syntax**

```bash
nimol_update [c client_hostname [-L label] [d geninstall_flags] [-m remote_access_method] [-p package_list] [-D]
```

**Description**

The `nimol_update` command executes the `geninstall` command on a configured NIMOL client using the specified remote access method, which is `/usr/bin/rsh` by default. When configuring a NIMOL server using the `nimol_config` command, the user can set the default remote access method to something other than `/usr/bin/rsh`, such as `/usr/bin/ssh`. A machine is considered a NIMOL client when it has been installed using the `nimol_install` command without the `-n` flag.

The command runs the `geninstall` command with `-acgX` as the default flags. Use the `-f` flag to specify `geninstall` command flags. The software packages to pass the `geninstall` command are specified with the `-p` flag.

When installing filesets using the `nimol_update` command, you must specify a resource label that has an `lpp_source`. Run `nimol_config -l -L label` to determine if a resource label contains an `lpp_source`. The command will export the resource label directory if it is not already globally exported. The client will mount the directory and use it as the source directory during an installation.

**Flags**

- `-c client_hostname` Specifies the NIMOL client hostname on which to execute the `geninstall` command.
- `-D` Runs the command in debug mode.
- `-f geninstall_flags` Specifies the flags to pass to the `geninstall` command. The default flags are `-acgX`.
- `-L label` Specifies the name of the resource label that will be used as the source for install images.
- `-m remote_access_method` Specifies the remote access method to use to run the `geninstall` command. The default is `/usr/bin/rsh`. Another option is `/usr/bin/ssh`.
- `-p package_list` Specifies the name of software packages to pass to the `geninstall` command. The default is all.

**Exit Status**

- `0` The command completed successfully.
- `> 0` Error returned.

**Security**

To run the `nimol_update` command on a NIMOL client, the client must provide remote access permissions to the NIMOL server. Using `/usr/bin/ssh` is a more secure remote access method than `/usr/bin/rsh`.

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Examples
1. To install all packages in resource label 530 to client myclient, type:
   ```
   nimol_update -c myclient -L 530
   ```
2. To apply an update for bos.games on client myclient, type:
   ```
   nimol_update -c myclient -L 530 -f "-a" -p "bos.games"
   ```
3. To remove bos.games from client myclient, type:
   ```
   nimol_update -c myclient -f "-u" -p "bos.games"
   ```
4. To execute the `geninstall` command using ssh, type:
   ```
   nimol_update -c myclient -L 530 -m ssh
   ```

Location
/usr/sbin/nimol_update

Files
/etc/nimol.conf Stores configuration information for the command.

Related Information
The "nimol_config Command" on page 138, "nimol_install Command" on page 140, "nimol_lslpp Command" on page 143.

nimquery Command

Purpose
Query a machine for NIM define information. Creates client objects in the NIM environment.

Syntax
```
nimquery [a] host=hostname
   [-a name=client_obj]
   [-d] [-p] [-q] [-v]
```

Description
The `nimquery` command queries a machine for system information. The information is used for defining a new client object in the NIM environment. System information is provided from machines using the NIM Service Handler (nimsh).

Flags
- `-a` Assigns the following attribute=value pairs:
- `-d` Defines a new client object (requires the name attribute).
- `-p` Enables nice print format.
- `-q` Shows attribute list for `nimquery` command.
- `-v` Enables verbose debug output during command execution.

Parameters
- `host=hostname` Specifies the hostname of the system to query. This attribute is required.
- `name=client_obj` Specifies the name to assign the client object when creating a new definition in the NIM database.
Exit Status

0    Returns zero upon success.

Security
You must have root authority to run the nimquery command.

Examples
1. To query machine buckey for system information, type:
   
nimquery -a host=buckey
2. To query machine buckey for system information and output detailed information, type:
   
nimquery -a host=buckey -p
3. To define machine buckey.austin.ibm.com using name client6 as the NIM object name, type:
   
nimquery -a name=client6 -a host=buckey -d

Files

/usr/sbin/nimquery  Location of the nimquery command.

Related Information
The nim command, nimconfig command, nimdef command.

nis_cachemgr Daemon

Purpose
Starts the NIS+ cache manager daemon.

Syntax

nis_cachemgr [-i] [-n] [-v]

Description

The nis_cachemgr daemon maintains a cache of the NIS+ directory objects. The cache contains location information necessary to contact the NIS+ servers that serve the various directories in the name space. This includes transport addresses, information needed to authenticate the server, and a time to live field which gives a hint on how long the directory object can be cached. The cache helps to improve the performance of the clients that are traversing the NIS+ name space. The nis_cachemgr daemon should be running on all the machines that are using NIS+. It is required for the nis_cachemgr daemon to be running for NIS+ requests to be serviced.

The cache maintained by this daemon is shared by all the processes that access NIS+ on that machine. The cache is maintained in a file that is memory mapped by all the processes. On start up, the nis_cachemgr daemon initializes the cache from the cold start file and preserves unexpired entries that already exist in the cache file. Thus, the cache survives machine reboots.

The nis_cachemgr daemon is normally started from a system startup script. The nis_cachemgr daemon makes NIS+ requests under the NIS+ principal name of the host on which it runs. Before running the nis_cachemgr daemon, security credentials for the host should be added to the cred.org_dir table in the
host's domain using the `nisaddcred` command. Credentials of type DES are needed if the NIS+ service is operating at security level 2 (see the `rpc.nisd` command). Additionally, `keylogin -r` needs to be done on the machine.

**Attention:** If the host principal does not have the proper security credentials in the cred.org_dir table for its domain, then running this daemon without the `-n` insecure mode flag may significantly degrade the performance of processes issuing NIS+ requests.

**Flags**

- `-i` Forces the `nis_cachemgr` daemon to ignore the previous cache file and reinitialize the cache from just the cold start file. By default, the cache manager initializes itself from both the cold start file and the old cache file, thereby maintaining the entries in the cache across machine reboots.

- `-n` Runs the `nis_cachemgr` daemon in an insecure mode. By default, before adding a directory object to the shared cache on the request of another process on the machine, it checks the encrypted signature on the request to make sure that the directory object is a valid one and is sent by an authorized server. In this mode, the `nis_cachemgr` daemon adds the directory object to the shared cache without making this check.

- `-v` Sets verbose mode. In this mode, the `nis_cachemgr` daemon logs not only errors and warnings but also additional status messages. The additional messages are logged using `syslog` with a priority of LOG_INFO.

**Diagnostics**

The `nis_cachemgr` daemon logs error messages and warnings using `syslog`. Error messages are logged to the DAEMON facility with a priority of LOG_ERR and warning messages with a priority of LOG_WARNING. Additional status messages can be obtained using the `-v` flag.

**Files**

- `/var/nis/NIS_SHARED_DIRCACHE` Contains the shared cache file
- `/var/nis/NIS_COLD_START` Contains the coldstart file
- `/etc/init.d/rpc` Contains initialization scripts for NIS+

**Related Information**

The `keylogin` command, `nisaddcred` command, `nisinit` command, `nisshowcache` command.

The `rpc.nisd` daemon.

**nisaddcred Command**

**Purpose**

Creates NIS+ credential information.

**Syntax**

`nisaddcred [ principal ] [ nis_principal ] [ login_password ] auth_type [ domain_name ]`

`nisaddcred -r [ nis_principal ] [ domain_name ]`

**Description**

The `nisaddcred` command is used to create security credentials for NIS+ principals. NIS+ credentials serve two purposes. The first is to provide authentication information to various services; the second is to map the authentication service name into a NIS+ principal name.
When the `nisaddcred` command is run, these credentials get created and stored in a table named `cred.org_dir` in the default NIS+ domain. If `domain_name` is specified, the entries are stored in the `cred.org_dir` of the specified domain. The specified domain must either be the one to which you belong or one in which you are authenticated and authorized to create credentials; that is, a subdomain. Credentials of normal users must be stored in the same domain as their passwords.

It is simpler to add credentials using the `nisclient` command because it obtains the required information itself. The `nispopulate` command is used for bulk updates and can also be used to add credentials for entries in the hosts and the passwd NIS+ tables.

NIS+ principal names are used in specifying clients that have access rights to NIS+ objects. Various other services can also implement access control based on these principal names.

The `cred.org_dir` table is organized as follows:

<table>
<thead>
<tr>
<th>cname</th>
<th>auth_type</th>
<th>auth_name</th>
<th>public_data</th>
<th>private_data</th>
</tr>
</thead>
<tbody>
<tr>
<td>user1.foo.com.</td>
<td>LOCAL</td>
<td>2990</td>
<td>10,102,44</td>
<td></td>
</tr>
<tr>
<td>user1.foo.com.</td>
<td>DES</td>
<td><a href="mailto:unix.2990@foo.com">unix.2990@foo.com</a></td>
<td>098...819</td>
<td>3b8...ab2</td>
</tr>
</tbody>
</table>

The `cname` column contains a canonical representation of the NIS+ principal name. By convention, this name is the login name of a user or the host name of a machine followed by a dot (\'.\') followed by the fully qualified home domain of that principal. For users, the home domain is defined to be the domain where their DES credentials are kept. For hosts, their home domain is defined to be the domain name returned by the `domainname` command executed on that host.

There are two types of `auth_type` entries in the `cred.org_dir` table. Those with authentication type LOCAL and those with authentication type DES. `auth_type`, specified on the command line in upper or lower case, should be either local or des.

Entries of type LOCAL are used by the NIS+ service to determine the correspondence between fully qualified NIS+ principal names and users identified by UIDs in the domain containing the `cred.org_dir` table. This correspondence is required when associating requests made using the AUTH_SYS RPC authentication flavor to a NIS+ principal name. It is also required for mapping a UID in one domain to its fully qualified NIS+ principal name whose home domain may be elsewhere. The principal’s credentials for any authentication flavor may then be sought for within the `cred.org_dir` table in the principal’s home domain (extracted from the principal name). The same NIS+ principal may have LOCAL credential entries in more than one domain. Only users, and not machines, have LOCAL credentials. In their home domain, users of NIS+ should have both types of credentials.

The `auth_name` associated with the LOCAL type entry is a UID that is valid for the principal in the domain containing the `cred.org_dir` table. This may differ from that in the principal’s home domain. The public information stored in `public_data` for this type contains a list of GIDs for groups in which the user is a member. The GIDs also apply to the domain in which the table resides. There is no private data associated with this type. Neither a UID nor a principal name should appear more than once among the LOCAL entries in any one `cred.org_dir` table.

The DES `auth_type` is used for Secure RPC authentication.

The authentication name associated with the DES `auth_type` is a Secure RPC netname. A Secure RPC netname has the form `unix.id@domain.com`, where `domain` must be the same as the domain of the principal. For principals that are users, the id must be the UID of the principal in the principal’s home domain. For principals that are hosts, the id is the host’s name. In Secure RPC, processes running under effective UID 0 (root) are identified with the host principal. Unlike LOCAL, there cannot be more than one DES credential entry for one NIS+ principal in the NIS+ namespace.
The public information in an entry of authentication type DES is the public key for the principal. The private information in this entry is the private key of the principal encrypted by the principal’s network password.

User clients of NIS+ should have credentials of both types in their home domain. In addition, a principal must have a LOCAL entry in the cred.org_dir table of each domain from which the principal wishes to make authenticated requests. A client of NIS+ that makes a request from a domain in which it does not have a LOCAL entry is unable to acquire DES credentials. A NIS+ service running at security level 2 or higher considers such users unauthenticated and assign them the name `nobody` for determining access rights.

This command can only be run by those NIS+ principals who are authorized to add or delete the entries in the cred table.

If credentials are being added for the caller itself, `nisaddcred` automatically performs a keylogin for the caller.

You can list the cred entries for a particular principal with `nismatch`.

**Flags**

- `-l login_password`
  Use the `login_password` specified as the password to encrypt the secret key for the credential entry. This overrides the prompting for a password from the shell. This flag is intended for administration scripts only. Prompting guarantees not only that no one can see your password on the command line using the `ps` command, but it also checks to make sure you have not made any mistakes.

  **Note:** `login_password` does not have to be the user’s password; but, if it is, it simplifies logging in.

- `-p principal`
  Specifies the name of the principal as defined by the naming rules for that specific mechanism. For example, LOCAL credential names are supplied with this flag by including a string specifying a UID. For DES credentials, the name should be a Secure RPC netname of the form `unix.id@domain.com`, as described earlier. If the `-p` flag is not specified, the `auth_name` field is constructed from the effective UID of the current process and the name of the local domain.

- `-P nis_principal`
  Use the NIS+ principal name `nis_principal`. This flag should be used when creating LOCAL or DES credentials for users whose home domain is different than the local machine’s default domain. Whenever the `-P` flag is not specified, `nisaddcred` constructs a principal name for the entry as follows. When it is not creating an entry of type LOCAL, `nisaddcred` calls `nis_local_principal`, which looks for an existing LOCAL entry for the effective UID of the current process in the cred.org_dir table and uses the associated principal name for the new entry. When creating an entry of authentication type LOCAL, `nisaddcred` constructs a default NIS+ principal name by taking the login name of the effective UID for its own process and appending to it a dot (‘.’) followed by the local machine’s default domain. If the caller is a superuser, the machine name is used instead of the login name.

- `-r [ nis_principal ]`
  Remove all credentials associated with the principal `nis_principal` from the cred.org_dir table. This flag can be used when removing a client or user from the system. If `nis_principal` is not specified, the default is to remove credentials for the current user. If `domain_name` is not specified, the operation is executed in the default NIS+ domain.
Exit Status
This command returns the following exit values:

0  Success
1  Failure

Examples
1. To add the LOCAL and DES credentials for some user, user1, with a UID of 2990, who is an NIS+ user principal in the some.domain.com. NIS+ domain, enter:
   nisaddcred -p 2990 -P user1.some.domain.com local
   
   Credentials are always added in the cred.org_dir table in the domain where nisaddcred is run, unless domain_name is specified as the last parameter on the command line. If credentials are being added from the domain server for its clients, then domain_name should be specified. The caller should have adequate permissions to create entries in the cred.org_dir table.

2. To add a DES credential for the same user, the system administrator can enter:
   nisaddcred -p unix.2990@some.domain.com -P user1.some.domain.com.des
   
   DES credentials can be added only after the LOCAL credentials have been added. The secure RPC netname does not end with a dot (') while the NIS+ principal name (specified with the -P flag) does. This command should be executed from a machine in the same domain as is the user.

3. To add a machine's DES credentials in the same domain, enter:
   nisaddcred -p unix.foo@some.domain.com -P foo.some.domain.com.des
   
   No LOCAL credentials are needed in this case.

4. To add a NIS+ workstation's principal DES credential, enter:
   nisaddcred -p unix.host1@sub.some.domain.com -P newhost.sub.some.domain.com.des sub.some.domain.com
   
   This format is particularly useful if you are running this command from a server that is in a higher domain than sub.some.domain.com. Without the last option for domain name, nisaddcred would fail because it would attempt to use the default domain of some.domain.com.

5. To add DES credentials without being prompted for the root login password, enter:
   nisaddcred -p unix.2990@some.domain.com -P user1.some.domain.com.des -l login_password

Related Commands
The chkey command, domainname command, keylogin command, niscat command, nischmod command, nisclient command, nismatch command, nispopulate command, ps command.

nisaddent Command

Purpose
Creates NIS+ tables from corresponding /etc files or NIS maps.

Syntax
Description

The `nisaddent` command creates entries in NIS+ tables from their corresponding `/etc` files and NIS maps. This operation is customized for each of the standard tables that are used in the administration of systems. The `type` argument specifies the type of the data being processed. Legal values for this type are one of `aliases`, `bootparams`, `ethers`, `group`, `hosts`, `netid`, `netmasks`, `networks`, `passwd`, `protocols`, `publickey`, `rpc`, `services`, `shadow`, or `timezone` for the standard tables or `key-value` for a generic two-column (key, value) table. For a site specific table, which is not of `key-value` type, you can use `nirstbladm` to administer it.

The NIS+ tables should have already been created by `nirstbladm`, `nissetup`, or `nisserver`.

It is easier to use `nispopulate` instead of `nisaddent` to populate the system tables.

By default, `nisaddent` reads from the standard input and adds this data to the NIS+ table associated with the `type` specified on the command line. An alternate NIS+ table may be specified with the `-t` flag. For type `key-value`, a table specification is required.

Note: The `data` type can be different than the table name (`-t`). For example, the automounter tables have `key-value` as the table type.

Although, there is a `shadow` data type, there is no corresponding `shadow` table. Both the shadow and the passwd data is stored in the `passwd` table itself.

Files may be processed using the `-f` flag, and NIS version 2 (YP) maps may be processed using the `-y` flag. The `-m` flag is not available when reading data from standard input.

When a `ypdomain` is specified, the `nisaddent` command takes its input from the `dbm` files for the appropriate NIS map (`mail.aliases`, `bootparams`, `ethers.byaddr`, `group.byname`, `hosts.byaddr`, `netid.byname`, `netmasks.byaddr`, `networks.byname`, `passwd.byname`, `protocols.byname`, `publickey.byname`, `rpc.bynumber`, `services.byname`, or `timezone.byname`). An alternate NIS map may be specified with the `-Y` flag. For type `key-value`, a map specification is required. The map must be in the `/var/yp/ypdomain` directory on the local machine.

Note: `ypdomain` is case sensitive. The `ypxfr` command can be used to get the NIS maps.

If a `nisdomain` is specified, `nisaddent` operates on the NIS+ table in that NIS+ domain, otherwise the default domain is used.

In terms of performance, loading up the tables is fastest when done through the `dbm` files (`y`).

Flags

- `-a` Adds the file or map to the NIS+ table without deleting any existing entries. This flag is the default. This mode only propagates additions and modifications, not deletions.

- `-A` Specifies that the data within the table and all of the data in tables in the initial table’s concatenation path be returned.

- `-d` Dumps the NIS+ table to the standard output in the appropriate format for the given `type`. For tables of type `key-value`, use `niscat` instead. To dump the credential table, dump the `publickey` and the `netid` types.
-D defaults

Specifies a different set of defaults to be used during this operation. The defaults string is a series of tokens separated by colons. These tokens represent the default values to be used for the generic object properties. All of the legal tokens are described below:

- **ttl=time**
  Sets the default time to live for objects that are created by this command. The value `time` is specified in the format as defined by the `nischttl` command. The default is 12 hours.

- **owner=ownername**
  Specifies that the NIS+ principal `ownername` should own the created object. The default for this value is the principal who is executing the command.

- **group=groupname**
  Specifies that the group `groupname` should be the group owner for the object that is created. The default is `NULL`.

- **access=rights**
  Specifies the set of access rights that are to be granted for the given object. The value `rights` is specified in the format as defined by the `nischmod` command. The default is `—rmcd—r—-`.

- **f file**
  Specifies that `file` should be used as the source of input (instead of the standard input).

- **m**
  Merges the file or map with the NIS+ table. This is the most efficient way to bring a NIS+ table up to date with a file or NIS map when there are only a small number of changes. This flag adds entries that are not already in the database, modifies entries that already exist (if changed), and deletes any entries that are not in the source. Use the `-m` flag whenever the database is large and replicated and the map being loaded differs only in a few entries. This flag reduces the number of update messages that have to be sent to the replicas. Also see the `-r` flag.

- **M**
  Specifies that lookups should be sent to the master server. This guarantees that the most up-to-date information is seen at the possible expense that the master server may be busy or that it may be made busy by this operation.

- **p**
  Processes the password field when loading password information from a file. By default, the password field is ignored because it is usually not valid (the actual password appears in a shadow file).

- **P**
  Specifies that lookups should follow the concatenation path of a table if the initial search is unsuccessful.

- **q**
  Dumps tables in "quick" mode. The default method for dumping tables processes each entry individually. For some tables (for example, hosts), multiple entries must be combined into a single line, so extra requests to the server must be made. In "quick" mode, all of the entries for a table are retrieved in one call to the server, so the table can be dumped more quickly. However, for large tables, there is a chance that the process will run out of virtual memory and the table will not be dumped.

- **r**
  Replaces the file or map in the existing NIS+ table by first deleting any existing entries and then add the entries from the source (`/etc` files or NIS+ maps). This flag has the same effect as the `-m` flag. The use of this flag is strongly discouraged due to its adverse impact on performance, unless there are a large number of changes.

- **t table**
  Specifies that `table` should be the NIS+ table for this operation. This should be a relative name as compared to your default domain or the `domainname` if it has been specified.

- **v**
  Sets verbose mode.

- **y ypdomain**
  Uses the `dbm` files for the appropriate NIS map, from the NIS domain `ypdomain`, as the source of input. The files are expected to be on the local machine in the `/var/yp/ypdomain` directory. If the machine is not an NIS server, use the `ypxfr` command to get a copy of the `dbm` files for the appropriate map.
-Y map  Use the dbm files for map as the source of input.

Environment

NIS_DEFAULTS  This variable contains a default string that overrides the NIS+ standard defaults. If the -D flag is used, those values will then override both the NIS_DEFAULTS variable and the standard defaults. To avoid security accidents, the access rights in the NIS_DEFAULTS variable are ignored for the passwd table but access rights specified with the -D flag are used.

NIS_PATH  If this variable is set and neither the nisdomain nor the table are fully qualified, each directory specified in NIS_PATH will be searched until the table is found (see the nisdefaults command).

Exit Status

This command returns the following exit values:

<table>
<thead>
<tr>
<th>Exit Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Success</td>
</tr>
<tr>
<td>1</td>
<td>Failure caused by an error other than parsing</td>
</tr>
<tr>
<td>2</td>
<td>A parsing error occurred on an entry. A parsing error does not cause termination; the invalid entries are simply skipped.</td>
</tr>
</tbody>
</table>

Examples

1. To add the contents of /etc/passwd to the passwd.org_dir table, enter:
   ```
cat /etc/passwd | nisaddent passwd
   ```
2. To add the shadow information, enter:
   ```
cat /etc/shadow | nisaddent shadow
   ```
   The table type is shadow, not passwd, even though the actual information is stored in the passwd table.
3. To replace the hosts.org_dir table with the contents of /etc/hosts (in verbose mode), enter:
   ```
nisaddent -rv -f /etc/hosts hosts
   ```
4. To merge the passwd map from yypdomain with the passwd.org_dir.nisdomain table (in verbose mode), enter:
   ```
nisaddent -mv -y myypdomain passwd nisdomain
   ```
   This example assumes that the /var/yp/myypdomain directory contains the yppasswd map.
5. To merge the auto.master map from myypdomain with the auto_master.org_dir table, enter:
   ```
nisaddent -m -y myypdomain -Y auto.master -t auto_master.org_dir key-value
   ```
6. To dump the hosts.org_dir table, enter:
   ```
nisaddent -d hosts
   ```

Related Information

The niscat command, nischmod command, nisdefaults command, nispopulate command, nisserver command, nissetup command, nistbladm command, passwd command, ypxfr command.
niscat Command

Purpose
Displays the contents of an NIS+ table.

Syntax

Description
In the first syntax, the niscat command displays the contents of the NIS+ tables named by tablename. In
the second syntax, it displays the internal representation of the NIS+ objects named by name.

Flags
-A Displays the data within the table and all of the data in tables in the initial table's concatenation path.
-h Displays the header line prior to displaying the table. The header consists of the # character followed
by the name of each column. The column names are separated by the table separator character.
-L Follows links. When this flag is specified if tablename or name names a LINK type object, the link is
followed and the object or table named by the link is displayed.
-M Specifies that the request should be sent to the master server of the named data. This guarantees
that the most up-to-date information is seen at the possible expense of increasing the load on the
master server and increasing the possibility of the NIS+ server being unavailable or busy for updates.
-o Displays the internal representation of the named NIS+ objects. If name is an indexed name, then
each of the matching entry objects is displayed. This flag is used to display access rights and other
attributes of individual columns.
-P Follows concatenation path. This flag specifies that the request should follow the concatenation path
of a table if the initial search is unsuccessful. This flag is only useful when using an indexed name for
name and the -o flag.
-v Displays binary data directly. This flag displays columns containing binary data on the standard
output. Without this flag, binary data is displayed as the string *BINARY*.

Environment
NIS_PATH If this variable is set and the NIS+ name is not fully qualified, each directory specified will be
searched until the object is found (see the nisdefaults command).

Exit Status
This command returns the following exit values:
0 Success
1 Failure

Examples
1. To display the contents of the host's table, type:
   niscat -h hosts.org_dir
   #: name addr comment
   client1 client1 129.144.201.100 Joe Smith
   crunchy crunchy 129.144.201.44 Jane Smith
   crunchy softy 129.144.201.44
The string *NP* is returned in those fields where the user has insufficient access rights.

2. To display the passwd.org_dir on the standard output, type:
   niscat passwd.org_dir

3. To display the contents of table frodo and the contents of all tables in its concatenation path, type:
   niscat -A frodo

4. To display the entries in the table groups.org_dir as NIS+ objects, type:
   niscat -o '[[ ]groups.org_dir'
   The brackets are protected from the shell by single quotation marks.

5. To display the table object of the passwd.org_dir table, type:
   niscat -o passwd.org_dir
   The previous example displays the passwd table object and not the passwd table. The table object includes information such as the number of columns, column type, searchable or not searchable separator, access rights, and other defaults.

6. To display the directory object for org_dir, which includes information such as the access rights and replica information, type:
   niscat -o org_dir

Related Information
The nistbladm command, nisdefaults command, nismatch command.

nischgrp Command

Purpose
Changes the group owner of a NIS+ object.

Syntax
nischgrp [-A] [-f] [-L] [-P] group name

Description
The nischgrp command changes the group owner of the NIS+ objects or entries specified by name to the specified NIS+ group. Entries are specified using indexed names. If group is not a fully qualified NIS+ group name, it is resolved using the directory search path. For additional information, see the nisdefaults command.

The only restriction on changing an object’s group owner is that you must have modify permissions for the object.

This command will fail if the master NIS+ server is not running.

The NIS+ server will check the validity of the group name prior to effecting the modification.

Flags
-A  Modifies all entries in all tables in the concatenation path that match the search criterion specified in name. This flag implies the -P flag.
-f  Forces the operation and fails silently if it does not succeed.
-L  Follows links and changes the group owner of the linked object or entries rather than the group owner of the link itself.
-P  Follows the concatenation path within a named table. This flag is valid when either name is an indexed name or the L flag is also specified and the named object is a link pointing to entries.
Environment

**NIS_PATH**
If this variable is set and the NIS+ name is not fully qualified, each directory specified will be searched until the object is found (see the `nisdefaults` command).

Exit Status
This command returns the following exit values:

- **0** Success
- **1** Failure

Examples
1. To change the group owner of an object to a group in a different domain, enter:
   ```bash
   nischgrp newgroup.remote.domain.object
   ```
2. To change the group owner of an object to a group in the local domain, enter:
   ```bash
   nischgrp my-buds object
   ```
3. To change the group owner for a password entry, enter:
   ```bash
   nischgrp admins '[uid=99],pwd.org_dir'
   ```
   `admins` is a NIS+ group in the same domain.
4. To change the group owner of the object or entries pointed to by a link, enter:
   ```bash
   nischgrp -L my-buds linkname
   ```
5. To change the group owner of all entries in the **hobbies** table, enter:
   ```bash
   nischgrp my-buds '{[],hobbies}'
   ```

Related Information
The `nischmod` command, `nischown` command, `nisdefaults` command, `nisgrpadm` command.

**nischmod Command**

**Purpose**
Changes the access rights on a NIS+ object.

**Syntax**
```bash
nischmod [-A] [-F] [-L] [-P] mode name...
```

**Description**
The `nischmod` command changes the access rights (mode) of the NIS+ objects or entries specified by `name` to `mode`. Entries are specified using indexed names. Only principals with modify access to an object may change its mode.

`mode` has the following form:

```bash
rights [,rights]...
```

`rights` has the form:
[who] op permission [op permission]...

who is a combination of:

- n: Nobody's permissions
- o: Owner's permissions
- g: Group's permissions
- w: World's permissions
- a: All, or owg

If who is omitted, the default is a.

op is one of:

- +: Grants the permission
- -: Revokes the permission
- =: Sets the permissions explicitly

permission is any combination of:

- r: Read
- m: Modify
- c: Create
- d: Destroy

Flags

- -A: Modifies all entries in all tables in the concatenation path that match the search criteria specified in name. This flag implies the -P flag.
- -f: Forces the operation and fails silently if it does not succeed.
- -L: Follows links and changes the permission of the linked object or entries rather than the permission of the link itself.
- -P: Follows the concatenation path within a named table. This flag is only applicable when either name is an indexed name or the -L flag is also specified and the named object is a link pointing to an entry.

Environment

NIS_PATH

If this variable is set and the NIS+ name is not fully qualified, each directory specified will be searched until the object is found (see the nisdefaults command).

Exit Status

This command returns the following exit values:

- 0: Success
- 1: Failure

Examples

1. To give everyone read access to an object. (that is, access for owner, group, and all), enter:

   nischmod a+r object
2. To deny create and modify privileges to group and unauthenticated clients (nobody), enter:
   nischmod gn-cm object

3. To set a complex set of permissions for an object, enter:
   nischmod o=rmcd,g=rm,w=rc,n=r object

4. To set the permissions of an entry in the password table so that the group owner can modify them, enter:
   nischmod g+m 'uid=55',passwd.org_dir'

5. To change the permissions of a linked object, enter:
   nischmod -L w+mr linkname

Related Information
The chmod command, nischgrp command, nischown command, nisdefaults command.

nischown Command

Purpose
Changes the owner of one or more NIS+ objects or entries.

Syntax
nischown [-A] [-f] [-L] [P] owner name...

Description
The nischown command changes the owner of the NIS+ objects or entries specified by name to owner. Entries are specified using indexed names. If owner is not a fully qualified NIS+ principal name (see the nisaddcred command), the default domain (see the nisdefaults command) will be appended to it.

The only restriction on changing an object's owner is that you must have modify permissions for the object.

Note: If you are the current owner of an object and you change ownership, you may not be able to regain ownership unless you have modify access to the new object.

The command fails if the master NIS+ server is not running.

The NIS+ server will check the validity of the name before making the modification.

Flags

-A  Modifies all entries in all tables in the concatenation path that match the search criteria specified in name. It implies the P flag.

-f  Forces the operation and fails silently if it does not succeed.

-L  Follows links and changes the owner of the linked object or entries rather than the owner of the link itself.

-P  Follows the concatenation path within a named table. This flag is only meaningful when either name is an indexed name or the L flag is also specified and the named object is a link pointing to entries.
Environment

**NIS_PATH**

If this variable is set and the NIS+ name is not fully qualified, each directory specified will be searched until the object is found (see the `nisdefaults` command).

Exit Status

This command returns the following exit values:

<table>
<thead>
<tr>
<th>Exit Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Success</td>
</tr>
<tr>
<td>1</td>
<td>Failure</td>
</tr>
</tbody>
</table>

Examples

1. To change the owner of an object to a principal in a different domain, enter:
   ```bash
   nischown bob.remote.domain.
   object
   ```
2. To change the owner of an object to a principal in the local domain, enter:
   ```bash
   nischown skippy
   ```
3. To change the owner of an entry in the passwd table, enter:
   ```bash
   nischown bob.remote.domain. '[uid=99],passwd.org_dir'
   ```
4. To change the object or entries pointed to by a link, enter:
   ```bash
   nischown -L skippy linkname
   ```

Related Information

The `nisaddcred` command, `nischgrp` command, `nischttl` command, `nischmod` command, `nisdefaults` command.

**nischttrl Command**

Purpose

The `nischttrl` command changes the *time-to-live* value of objects or entries in the namespace.

Syntax

To Change the Time-to-Live Value of Objects

```bash
nischttrl [-A] [-L] [-P] [time-to-live] [object-name]
```

To Change the Time-to-Live Value of Entries

```bash
nischttrl [ time-to-live ] [ column=value,... ] [ table-name ] [-A] [-L] [-P]
```

*Note:* Where time-to-live is expressed as:

- **Number of seconds.** A number with no letter is interpreted as a number of seconds. Thus, `1234` for TTL would be interpreted as 1234 seconds. A number followed by the letter `s` is also interpreted as a number of seconds. Thus, `987s` for TTL would be interpreted as 987 seconds. When seconds are specified in combination with days, hours, or minutes, you must use the letter `s` to identify the seconds value.

- **Number of minutes.** A number followed by the letter `m` is interpreted as a number of minutes. Thus, `90m` for TTL would be interpreted as 90 minutes.

- **Number of hours.** A number followed by the letter `h` is interpreted as a number of hours. Thus, `9h` for TTL would be interpreted as 9 hours.
• **Number of days.** A number followed by the letter `d` is interpreted as a number of days. Thus, `7d` for TTL would be interpreted as 7 days.

**Note:** These values may be used in combination. For example, a TTL value of `4d3h2m1s` would specify a time to live of four days, three hours, two minutes, and one second.

**Description**

This *time-to-live* value is used by the cache manager to determine when to expire a cache entry. You can specify the *time-to-live* in total number of seconds or in a combination of days, hours, minutes, and seconds. The *time-to-live* values you assign objects or entries should depend on the stability of the object. If an object is prone to frequent change, give it a low *time-to-live* value. If it is steady, give it a high one. A high *time-to-live* is a week; a low one is less than a minute. Password entries should have *time-to-live* values of about 12 hours to accommodate one password change per day. Entries in tables that don’t change much, such as those in the RPC table, can have values of several weeks.

**Notes**

1. To change the *time-to-live* of an object, you must have modify rights to that object. To change the *time-to-live* of a table entry, you must have modify rights to the table, entry, or columns you wish to modify.

2. To display the current *time-to-live* value of an object or table entry, use the `nisdefaults -t` command, described in [Administering NIS+ Access Rights](#).

**Flags**

- `-A` Apply the change to all the entries that match the column=value specifications that you supply.
- `-L` Follow links and apply the change to the linked object or entry rather than the link itself.
- `-P` Follow the path until there is one entry that satisfies the condition.

**Examples**

**Changing the Time-to-Live of an Object**

1. To change the *time-to-live* of an object, type the `nischttl` command with the *time-to-live* value and the object-name. You can add the `-L` command to extend the change to linked objects.

   ```
   nischttl -L time-to-live object-name
   ```

2. You can specify the *time-to-live* in seconds by typing the number of seconds. Or, you can specify a combination of days, hours, minutes, and seconds by using the suffixes `s`, `m`, `h`, and `d` to indicate the number of seconds, minutes, days, and hours. For example:

   ```
   TTL of 86400 seconds  
   client% nischttl 86400 sales.wiz.com. 
   ```

   ```
   TTL of 24 hours  
   client% nischttl 24h sales.wiz.com. 
   ```

   ```
   TTL of 2 days, 1 hour, 1 minute, and 1 second  
   client% nischttl 2d1h1m1s sales.wiz.com. 
   ```

3. The first two commands change the *time-to-live* of the sales.wiz.com. directory to 86,400 seconds, or 24 hours. The third command changes the *time-to-live* of all the entries in a hosts table to 2 days, 1 hour, 1 minute, and 1 second.

**Changing the Time-to-Live of a Table Entry**

1. To change the *time-to-live* of entries, use the indexed entry format. You can use any of the options, `-A`, `-L`, or `-P`.

   ```
   nischttl [-ALP] time-to-live [column=value,...], 
   table-name
   ```

2. These examples are similar to those above, but they change the value of table entries instead of objects:
client% nischt1 86400 '([uid=99],passwd.org_dir.wiz.com.)
client% nischt1 24h '([uid=99],passwd.org_dir.wiz.com.)
client% nischt1 2d1h1m1s '([name=fred],hosts.org_dir.wiz.com')

Note C shell users should use quotes to prevent the shell from interpreting the square bracket (]) as a metacharacter.

Related Information
The defaults command.

nisclient Command

Purpose
Initializes NIS+ credentials for NIS+ principals.

Syntax
Add DES Credentials for NIS+ Principals

nisclient -c [ -x ] [ -v ] [ -l network_password ] [ -d NIS+_domain ] client_name...

Initialize a NIS+ Client Machine

nisclient -i [ -x ] [ -v ] -h NIS+_server_host [ -a NIS+_server_addr ] [ -d NIS+_domain ] [ S 0 | 2 ]

Initialize a NIS+ User

nisclient -u [ -x ] [ -v ]

Restore Network Service Environment

nisclient -r [ -x ]

Description
The nisclient command can be used to:
• Create NIS+ credentials for hosts and users
• Initialize NIS+ hosts and users
• Restore the network service environment

NIS+ credentials are used to provide authentication information of NIS+ clients to NIS+ service.

Use the first syntax ( -c ) to create individual NIS+ credentials for hosts or users. You must be logged in as a NIS+ principal in the domain for which you are creating the new credentials. You must also have write permission to the local credential table. The client_name argument accepts any valid host or user name in the NIS+ domain (for example, the client_name must exist in the hosts or passwd table). The nisclient command verifies each client_name against both the host and passwd tables, then adds the proper NIS+ credentials for hosts or users.

Note: If you are creating NIS+ credentials outside your local domain, the host or user must exist in the host or passwd tables in both the local and remote domains.

By default, nisclient will not overwrite existing entries in the credential table for the hosts and users specified. To overwrite, use the -o flag. After the credentials have been created, nisclient will print the command that must be executed on the client machine to initialize the host or the user. The -c flag
requires a network password for the client which is used to encrypt the secret key for the client. You can either specify it on the command line with the \texttt{-l} flag or the script will prompt you for it. You can change this network password later with either the \texttt{nispasswd} or \texttt{chkey} command.

The \texttt{-c} flag is not intended to be used to create NIS+ credentials for all users and hosts that are defined in the \texttt{passwd} and \texttt{hosts} tables. To define credentials for all users and hosts, use the \texttt{nispopulate} command.

Use the second syntax (\texttt{-i}) to initialize a NIS+ client machine. The \texttt{-i} flag can be used to convert machines to use NIS+ or to change the machine’s domainname. You must be logged in as superuser on the machine that is to become a NIS+ client. Your administrator must have already created the NIS+ credential for this host by using the \texttt{nisclient -c} or \texttt{nispopulate -c} command. You will need the network password your administrator created. The \texttt{nisclient} command will prompt you for the network password to decrypt your secret key and then for this machine’s root login password to generate a new set of secret/public keys. If the NIS+ credential was created by your administrator using \texttt{nisclient -c}, then you can simply use the initialization command that was printed by the \texttt{nisclient} script to initialize this host instead of typing it manually.

To initialize an unauthenticated NIS+ client machine, use the \texttt{-i} flag with \texttt{-S 0}. With these flags, the \texttt{nisclient -i} flag will not ask for any passwords.

During the client initialization process, files that are being modified are backed up as \texttt{files.no_nisplus}. The files that are usually modified during a client initialization are: \texttt{/etc/defaultdomain}, \texttt{/etc/nsswitch.conf}, \texttt{/etc/inet/hosts}, and, if it exists, \texttt{/var/nis/NIS_COLD_START}.

\textbf{Note:} A file will not be saved if a backup file already exists.

The \texttt{-i} flag does not set up a NIS+ client to resolve hostnames using DNS. Refer to the DNS documentation for information on setting up DNS. (See information on the \texttt{resolv.conf} file format.

It is not necessary to initialize either NIS+ root master servers or machines that were installed as NIS+ clients.

Use the third syntax (\texttt{-u}) to initialize a NIS+ user. You must be logged in as the user on a NIS+ client machine in the domain where your NIS+ credentials have been created. Your administrator should have already created the NIS+ credential for your username using the \texttt{nisclient} or \texttt{nispopulate} command. You will need the network password your administrator used to create the NIS+ credential for your username. The \texttt{nisclient} command will prompt you for this network password to decrypt your secret key and then for your login password to generate a new set of secret/public keys.

Use the fourth syntax (\texttt{-r}) to restore the network service environment to whatever you were using before \texttt{nisclient} was executed. You must be logged in as superuser on the machine that is to be restored. The restore will only work if the machine was initialized with \texttt{nisclient -i} because it uses the backup files created by the \texttt{-i} flag.

Reboot the machine after initializing a machine or restoring the network service.

\section*{Flags}

\begin{itemize}
\item \texttt{-a NIS+_server_addr} Specifies the IP address for the NIS+ server. This flag is used only with the \texttt{-i} flag.
\item \texttt{-c} Adds DES credentials for NIS+ principals.
\item \texttt{-d NIS+_domain} Specifies the NIS+ domain where the credential should be created when used in conjunction with the \texttt{-c} flag. It specifies the name for the new NIS+ domain when used in conjunction with \texttt{-d}. The default is your current domainname.
\item \texttt{-h NIS+_server_host} Specifies the NIS+ server’s hostname. This flag is used only with the \texttt{-i} flag.
\end{itemize}
-i Initializes a NIS+ client machine.

-\textit{network\_password} Specifies the network password for the clients. This flag is used only with the \textit{-c} flag. If this flag is not specified, the script will prompt you for the network password.

-o Overwrite existing credential entries. The default is not to overwrite. This is used only with the \textit{-c} flag.

-r Restores the network service environment.

-\textit{S} 0 | 2 Specifies the authentication level for the NIS+ client. Level 0 is for unauthenticated clients and level 2 is for authenticated (DES) clients. The default is to set up with level 2 authentication. This is used only with the \textit{-i} flag. The \texttt{nisclient} command always uses level 2 authentication (DES) for both \textit{-c} and \textit{-u} flags. There is no need to run \texttt{nisclient} with \textit{-u} and \textit{-c} for level 0 authentication.

-u Initializes a NIS+ user.

-v Runs the script in verbose mode.

-x Turns the echo mode on. The script just prints the commands that it would have executed. Note that the commands are not actually executed. The default is off.

Examples
1. To add the DES credential for host \textit{dilbert} and user \textit{fred} in the local domain, enter:
\begin{verbatim}
nisclient -c dilbert fred
\end{verbatim}

2. To add the DES credential for host \textit{dilbert} and user \textit{fred} in domain \texttt{xyz.ibm.com}, enter:
\begin{verbatim}
nisclient -c -d xyz.ibm.com. dilbert fred
\end{verbatim}

3. To initialize host \textit{dilbert} as a NIS+ client in domain \texttt{xyz.ibm.com} where \texttt{nisplus\_server} is a server for the domain \texttt{xyz.ibm.com}, enter:
\begin{verbatim}
nisclient -i -h nisplus\_server -d xyz.ibm.com.
\end{verbatim}

The script will prompt you for the IP address of \texttt{nisplus\_server} if the server is not found in the \texttt{/etc/hosts} file. The \texttt{-d} flag is needed only if your current domain name is different from the new domain name.

4. To initialize host \textit{dilbert} as an unauthenticated NIS+ client in domain \texttt{xyz.ibm.com} where \texttt{nisplus\_server} is a server for the domain \texttt{xyz.ibm.com}, enter:
\begin{verbatim}
nisclient -i -S 0 -h nisplus\_server -d xyz.ibm.com. -a 129.140.44.1
\end{verbatim}

5. To initialize user \textit{fred} as a NIS+ principal, log in as user \textit{fred} on a NIS+ client machine by entering:
\begin{verbatim}
nisclient -u
\end{verbatim}

Files
\begin{itemize}
  \item \texttt{/var/nis/NIS\_COLD\_START} This file contains a list of servers, their transport addresses, and their Secure RPC public keys that serve the machines default domain.
  \item \texttt{/etc/defaultdomain} The system default domainname
  \item \texttt{/etc/nsswitch.conf} Configuration file for the name-service switch
  \item \texttt{/etc/inet/hosts} Local host name database
\end{itemize}

Related Information
The \texttt{chkey} command, \texttt{keylogin} command, \texttt{keyserv} command, \texttt{nisaddcred} command, \texttt{nisinit} command, \texttt{nispopulate} command.

\texttt{resolv.conf} file format.
nisdefaults Command

Purpose
Displays the seven default values currently active in the namespace.

Syntax
nisdefaults \[ -d domain \] \[ -g group \] \[ -h host \] \[ -p principal \] \[ -a access_rights \] \[ -s search_path \] \[ -t time_to_live \] \[ -a all(terse) \] \[ -v verbose \]

Description
The nisdefaults command displays the seven default values currently active in the namespace. To display NIS+ defaults the default values are either:

- Preset values supplied by the NIS+ software
- The defaults specified in the NIS_DEFAULTS environment variable (if you have NIS_DEFAULTS values set)

Any object that you create on this machine will automatically acquire these default values unless you override them with the -D flag of the command you are using to create the object.

Setting Default Security Values
This section describes how to perform tasks related to the nisdefaults command, the NIS_DEFAULTS environment variable, and the -D flag. The NIS_DEFAULTS environment variable specifies the following default values:

- Owner
- Group
- Access rights
- Time-to-live

The values that you set in the NIS_DEFAULTS environment variable are the default values applied to all NIS+ objects that you create using that shell (unless overridden by using the -D flag with the command that creates the object).

You can specify the default values (owner, group, access rights, and time-to-live) specified with the NIS_DEFAULTS environment variable. After you set the value of NIS_DEFAULTS, every object you create from that shell will acquire those defaults, unless you override them by using the -D flag when you invoke a command.

Displaying the Value of NIS_DEFAULTS
You can check the setting of an environment variable by using the echo command, as shown in the following example:

client% echo $NIS_DEFAULTS
owner=butler:group=gamblers:access=o+rmcd

You can also display a general list of the NIS+ defaults active in the namespace by using the nisdefaults command.

Changing Defaults
You can change the default access rights, owner, and group, by changing the value of the NIS_DEFAULTS environment variable. Use the environment command that is appropriate for your shell (setenv for csh or NIS_DEFAULTS=, export for sh and ksh) with the following arguments:

- access=right, where right are the access rights using the formats described in Specifying Access Rights in Commands
• owner=name, where name is the user name of the owner.
• group=group, where group is the name of the default group.

You can combine two or more arguments into one line separated by colons:
owner=principal-name:group=group-name

Changing Defaults—Examples

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>This command grants owner read access as the default access right.</td>
<td>client% setenv NIS_DEFAULTS access=o+r</td>
</tr>
<tr>
<td>This command sets the default owner to be the user abe whose home domain is Wiz.com.</td>
<td>client% setenv NIS_DEFAULTS owner=abe.wiz.com.</td>
</tr>
<tr>
<td>This command combines the first two examples on one code line.</td>
<td>client% setenv NIS_DEFAULTS access=o+r:owner=abe.wiz.com.</td>
</tr>
</tbody>
</table>

All objects and entries created from the shell in which you changed the defaults will have the new values you specified. You cannot specify default settings for a table column or entry; the columns and entries simply inherit the defaults of the table.

Resetting the Value of NIS_DEFAULTS
You can reset the NIS_DEFAULTS variable to its original values, by typing the name of the variable without arguments, using the format appropriate to your shell:

For C shell:
client# unsetenv NIS_DEFAULTS

For Bourne or Korn shell:
client$ NIS_DEFAULTS=; export NIS_DEFAULTS

Flags

- **-d domain** Displays the home domain of the workstation from which the command was entered. Displays the value of /etc/defaultdomain environment variable.
- **-g group** Displays the group that would be assigned to the next object created from this shell. Displays the value of NIS_GROUP environment variable.
- **-h host** Displays the workstation’s host name. Displays the value of uname -n environment variable.
- **-p principal** Displays the fully qualified user name or host name of the NIS+ principal who entered the nisdefaults command. Displays the value of gethostname() environment variable.
- **-r access_rights** Displays the access rights that will be assigned to the next object or entry created from this shell. Format: ——rmcdr——r——. Displays the value of NIS_DEFAULTS environment variable.
- **-s search_path** Displays the syntax of the search path, which indicate the domains that NIS+ will search through when looking for information. Displays the value of the NIS_PATH environment variable if it is set. Displays the value of NIS_PATH environment variable.
- **-t time_to_live** Displays the time-to-live that will be assigned to the next object created from this shell. The default is 12 hours. Displays the value of the NIS_DEFAULTS environment variable.
- **-a all (terse)** Displays all seven defaults in terse format. Displays the value of the environment variable.
- **-v verbose** Display specified values in verbose mode. Displays the value of the environment variable.

Note: You can use these options to display all default values or any subset of them.

Examples

1. To display all values in verbose format, type the nisdefaults command without arguments.
master% nisdefaults
Principal Name : topadmin.wiz.com.
Domain Name : Wiz.com.
Host Name : rootmaster.wiz.com.
Group Name : salesboss
Access Rights : ----rmcdr---r---
Time to live : 12:00:00:00:00

2. To display all values in terse format, add the -a option.
3. To display a subset of the values, use the appropriate options. The values are displayed in terse mode.
   For example, to display the rights and search path defaults in terse mode, type:
   rootmaster% nisdefaults -rs
   ----rmcdr---r---
   Wiz.com.
4. To display a subset of the values in verbose mode, add the -v flag.

niserror Command

Purpose
Displays NIS+ error messages.

Syntax
niserror error-num

Description
The niserror command prints the NIS+ error associated with status value error-num on the standard output. It is used by shell scripts to translate NIS+ error numbers that are returned into text messages.

Examples
To print the error associated with the error number 20, enter:
niserror 20
Not Found, no such name

nissgrep Command

Purpose
Utility for searching NIS+ tables.

Syntax

Description
The nissgrep command can be used to search NIS+ tables. The command nissgrep differs from the nismatch command in its ability to accept regular expressions keypat for the search criteria rather than simple text matches.

Because nissgrep uses a callback function, it is not constrained to searching only those columns that are specifically made searchable at the time of table creation. This makes it more flexible, but slower, than nismatch.

In nismatch, the server does the searching; whereas in nissgrep, the server returns all the readable entries and then the client does the pattern-matching.
In both commands, the parameter `tablename` is the NIS+ name of the table to be searched. If only one key or key pattern is specified without the column name, then it is applied searching the first column. Specific named columns can be searched by using the `colname=key` syntax. When multiple columns are searched, only entries that match in all columns are returned. This is the equivalent of a logical join operation.

`nismatch` accepts an additional form of search criteria, `indexedname`, which is a NIS+ indexed name of the form:

```
colname=value, ..., tablename
```

**Flags**

- **-A**
  All data. Return the data within the table and all of the data in tables in the initial table's concatenation path.

- **-c**
  Print only a count of the number of entries that matched the search criteria.

- **-h**
  Display a header line before the matching entries that contains the names of the table's columns.

- **-M**
  Master server only. Send the lookup to the master server of the named data. This guarantees that the most up to date information is seen at the possible expense that the master server may be busy.

- **-o**
  Display the internal representation of the matching NIS+ object(s).

- **-P**
  Follow concatenation path. Specify that the lookup should follow the concatenation path of a table if the initial search is unsuccessful.

- **-s sep**
  This option specifies the character to use to separate the table columns. If no character is specified, the default separator for the table is used.

- **-v**
  Verbose. Do not suppress the output of binary data when displaying matching entries. Without this option binary data is displayed as the string `BINARY`.

**Return Values**

- **0** Successfully matches some entries.
- **1** Successfully searches the table and no matches are found.
- **2** An error condition occurs. An error message is also printed.

**Examples**

This example searches a table named `passwd` in the `org_dir` subdirectory of the `zotz.com` domain. It returns the entry that has the username of `skippy`. In this example, all the work is done on the server.

```
example% nismatch name=skippy passwd.org_dir.zotz.com.
```

This example is similar to the one above except that it uses `nisgrep` to find all users in the table named `passwd` that are using either `ksh` or `csh`.

```
example% nisgrep 'shell=[ck]sh' passwd.org_dir.zotz.com.
```

**NIS_PATH** If this variable is set, and the NIS+ table name is not fully qualified, each directory specified will be searched until the table is found (see `nisdefaults`).

**Related Information**

The `niscat` command, `nisdefaults` command, `nisls` command, and `nistbladm` command.

**nisgrpadm Command**

**Purpose**

Creates, deletes, and performs miscellaneous administration operations on NIS+ groups.

**Note:** To use `nisgrpadm`, you must have access rights appropriate for the operation.
Syntax

To Create or Delete a Group or to List the Members
nisgrpadm [-c group_name.domain_name ] [ [-d ] [ -l group_name ] ]

To Add or Remove Members or Determine if They Belong to the Group
nisgrpadm [ [ -a ] [ -r ] [ -t ] group_name ]

Note: A member can be any combination of the six membership types.

Description
The nisgrpadm command has two main forms, one for working with groups and one for working with group members.

All operations except create (-c) accept a partially qualified group-names. However, even for the -c flag, nisgrpadm will not accept the use of groups_dir in the group-name argument.

Flags
To Create or Delete a Group or to List the Members
- c group_name.domain_name Creates an NIS+ group. You must have create rights to the groups_dir directory of the group's domain.
- d group_name Deletes an NIS+ group. You must have destroy rights to the groups_dir directory in the group's domain.
- l group_name Lists the members of an NIS+ group. You must have read rights to the group object.

To Add or Remove Members or Determine if They Belong to the Group
- a group_name Adds members to an NIS+ group. You must have modify rights to the group object.
- r group_name Removes members from an NIS+ group. You must have modify rights to the group object.
- t group_name Find out whether an NIS+ principal is a member of a particular NIS+ group. You must have read access to the group object.

Related Information
The nisdefaults command.

nisinit Command

Purpose
Initializes a workstation to be a NIS+ client.

Syntax

To Initialize a Client
nisinit [ [ -c ] [ -k key_domain ] ] [ [ -C coldstart ] [ -H host ] [ -B ] ]

To Initialize a Root Master Server
nisinit [-r]

To Initialize a Parent Server
[ -p Y D N parent_domain_host... ]
Description
The `nisinit` command initializes a workstation to be an NIS+ client. As with the `rpc.nisd` command, you don't need any access rights to use the `nisinit` command, but you should be aware of its prerequisites and related tasks.

Flags

- **-c** Initializes the machine to be a NIS+ client. There are three initialization options available: initialize by `coldstart`, initialize by `hostname`, and initialize by broadcast. The most secure mechanism is to initialize from a trusted `coldstart` file. The second option is to initialize using a `hostname` that you specify as a trusted host. The third method is to initialize by broadcast and it is the least secure method.

  - **-C coldstart** Causes the file `coldstart` to be used as a prototype coldstart file when initializing a NIS+ client. This `coldstart` file can be copied from a machine that is already a client of the NIS+ namespace. For maximum security, an administrator can encrypt and encode (with `uuencode(1C)`) the `coldstart` file and mail it to an administrator bringing up a new machine. The new administrator would then decode (with `uudecode`), decrypt, and then use this file with the `nisinit` command to initialize the machine as an NIS+ client. If the `coldstart` file is from another client in the same domain, the `nisinit` command may be safely skipped and the file copied into the `/var/nis` directory as `/var/nis/NIS_COLD_START`.

  - **-H hostname** Specifies that the host `hostname` should be contacted as a trusted NIS+ server. The `nisinit` command will iterate over each transport in the NETPATH environment variable and attempt to contact `rpcbind` on that machine. This hostname must be reachable from the client without the name service running. For IP networks this means that there must be an entry in `/etc/hosts` for this host when `nisinit` is invoked.

  - **-B** Specifies that the `nisinit` command should use an IP broadcast to locate a NIS+ server on the local subnet. Any machine that is running the NIS+ service may answer. No guarantees are made that the server that answers is a server of the organization’s namespace. If this flag is used, it is advisable to check with your system administrator that the server and domain served are valid. The binding information can be written to the standard output using the `nisshowcache` command.

Note: `nisinit -c` will just enable navigation of the NIS+ namespace from this client. To make NIS+ your name service, modify the file `/etc/nsswitch.conf` to reflect that.

  - **-k key_domain** Specifies that the domain where root’s credentials are stored. If it is not specified, then the system default domain is assumed. This domain name is used to create the `/var/nis/NIS_COLD_START` file.

  - **-p Y|D|N parent_domain host...** Initialize on a root server a `/var/nis/data/parent.object` to make this domain a part of the namespace above it. Only root servers can have parent objects. A parent objects describes the namespace above the NIS+ root. If this is an isolated domain, this flag should not be used. The argument to this flag tells the command what type of name server is serving the domain above the NIS+ domain. When clients attempt to resolve a name that is outside of the NIS+ namespace, this object is returned with the error `NIS_FOREIGNNS` indicating that a namespace boundary has been reached. It is up to the client to continue the name resolution process.

The parameter "parent_domain" is the name of the parent domain in a syntax that is native to that type of domain. The list of host names that follow the domain parameter are the names of hosts that serve the parent domain. It there is more than one server for a parent domain, the first host specified should be the master server for that domain.
Y Specifies that the parent directory is a NIS version 2 domain.

D Specifies that the parent directory is a DNS domain.

N parent_domain_host...

Specifies that the parent directory is another NIS+ domain. This flag is useful for connecting a pre-existing NIS+ subtree into the global namespace.

-r Initializes the machine to be a NIS+ root server. This flag creates the file /var/nis/data/root.object and initializes it to contain information about this machine. It uses the sysinfo(2) system call to retrieve the name of the default domain.

Examples

1. To initialize a client, use:
   ```
nisinit -c -B
nisinit -c -H hostname
nisinit -c -C filename
   ```

2. To initialize a root master server, use:
   ```
nisinit -r
   ```

3. You can initialize a client in three different ways:
   - By host name
   - By broadcast
   - By cold-start file

   **Note:** Each way has different prerequisites and associated tasks. For instance, before you can initialize a client by host name, the client’s /etc/hosts file must list the host name you will use and nsswitch.conf file must have files as the first choice on the hosts line. Complete instructions for each method, including prerequisites and associated tasks, are provided in Initializing an NIS+ Client. Following is a summary of the steps that use the nisinit command.

4. To initialize a client by host name, use the -c and -H options, and include the name of the server from which the client will obtain its cold-start file:
   ```
nisinit -c -H hostname
   ```

5. To initialize a client by cold-start file, use the -c and -C options, and provide the name of the cold-start file:
   ```
nisinit -c -C filename
   ```

6. To initialize a client by broadcast, use the -c and -B options:
   ```
nisinit -c -B
   ```

7. To initialize the root master server, use the nisinit -r command:
   ```
nisinit -r
   ```

Files

- `/var/nis/NIS_COLD_START` This file contains a list of servers, their transport addresses, and their Secure RPC public keys that serve the machine’s default domain.

- `/var/nis/data/root.object` This file describes the root object of the NIS+ namespace. It is standard XDR-encoded NIS+ directory object that can be modified by authorized clients using the nis_modify() interface.

- `/var/nis/data/parent.object` This file describes the namespace that is logically above the NIS+ namespace. The most common type of parent object is a DNS object. This object contains contact information for a server of that domain.

- `/etc/hosts` Internet host table.
Related Information

The `nisclient` command, and `nisshowcache` command.

nisIn Command

Purpose

Creates symbolic links between NIS+ objects and table entries.

Syntax

```bash
```

Description

The `nisln` command links objects to objects, or links objects to table entries. All NIS+ administration commands accept the `-L` flag, which directs them to follow links between NIS+ objects.

To create a link to another object or entry, you must have modify rights to the source object; that is, the one that will point to the other object or entry.

**Notes:**

1. A link cannot be created if it originates with a table entry.
2. Never link a cred table. Each `org_dir` directory should have its own cred table. Do not use a link to some other `org_dir` cred table.

Flags

- `-L` Follows link. If the `source` is itself a link, the new link will not be linked to it, but to that link’s original source.
- `-D` Specifies a different set of defaults for the linked object. Defaults are described in [Specifying Nondefault Security Values at Creation Time](#).

Example

To create a link between objects, specify both object names: first the `source`, and then the `target`. To create links between objects and entries use indexed names.

```bash
nisln source-object target-object
nisln [column=value,...], tablename target-object
```

nislog Command

Purpose

The `nislog` command displays the contents of the transaction log.

Syntax

```bash
nislog [-h num | -t num] [-v] [directory]...
```
Description

The **nislog** command displays the contents of the transaction log.

Each transaction consists of two parts: the particulars of the transaction and a copy of an object definition.

Here is an example that shows the transaction log entry that was made when the **wiz.com** directory was first created. XID refers to the transaction ID.

```
rootmaster# /usr/sbin/nislog -h 1
NIS Log printing facility.
NIS Log dump:
   Log state : STABLE
   Number of updates : 48
   Current XID : 39
   Size of log in bytes : 18432
***UPDATES***#00000
   XID : 1
Entry type : ADD Name
Principal : rootmaster.wiz.com.
Object name : org_dir.wiz.com.
.................Object......................
Object Name : org_dir
Owner : rootmaster.wiz.com.
Access Rights : r---rmcdr---r---
Time to Live : 24:0:0
Object Type : DIRECTORY
Name : `org_dir.wiz.com.'
Type: NIS
.................Object......................
```

Flags

- `-h num` Display transactions starting with the head (beginning) of the log. If the number is omitted, the display begins with the first transaction. If the number 0 is entered, only the log header is displayed.
- `-t num` Display transactions starting backward from the end (tail) of the log. If the number is omitted, the display begins with the last transaction. If the number 0 is entered, only the log header is displayed.
- `-v` Verbose mode

nisls Command

Purpose

Lists the contents of an NIS+ directory.

Syntax

```
nisls [ -d ] [ -g ] [ -l ] [ -L ] [ -m ] [ -M ] [ -R ] [ Directory... ]
```
Description

The `nisls` command writes to standard output the contents of each directory specified in the parameter that is an NIS+ directory. If `Directory` specifies any other NIS+ object that is not a directory, `nisls` simply echoes the object's name. If no directory is given as a parameter, the first directory in the search path, the default, is listed (see `nisdefaults`).

Flags

- `-d` Treats an NIS+ directory like other NIS+ objects instead of listing its contents.
- `-g` Displays group owner instead of owner when using the `-l` flag to list in long format.
- `-i` Lists in long format. The `-i` flag displays additional information about the `Directory` such as its type, creation time, owner, and permission rights.
- `-L` Indicates that links are to be followed. If `Directory` actually points to a link, it is followed to a link object.
- `-m` Displays modification time instead of creation time when using the `-l` flag to list contents in long format.
- `-M` Specifies that the master server of the named directory returns the standard output of the `nisls` command. Using the `-M` flag guarantees that the most current information is listed.
- `-R` Lists directories recursively. The `-R` flag displays the contents of each subdirectory contained in the directory specified in `Directory`.

Environment

`NIS_PATH` Searches each directory specified until the object is found if the NIS+ directory name is not fully qualified (see `nisdefaults`).

Exit Status

0 Successful completion.
1 An error occurred.

Examples

1. To list in short format the contents of `org.com`, including its subdirectories, enter:
   ```
   nisls -R org.com.
   ```

2. To display detailed information about `rootmaster.org.com`, including when it was last modified, enter:
   ```
   nisls -lm rootmaster.org.com.
   ```

Related Information

The `nisdefaults` command, `nisgrpadm` command, `nismatch` command, and `nistbladm` command.

nismatch Command

Purpose

Utility for searching NIS+ tables.

Syntax

```
```

DESCRIPTION

The command `nismatch` differs from the `nismatch` command in its ability to accept regular expressions for the search criteria rather than simple text matches.
Because **nisgrep** uses a callback function, it is not constrained to searching only those columns that are specifically made searchable at the time of table creation. This makes it more flexible, but slower, than **nismatch**.

In **nismatch**, the server does the searching; whereas in **nisgrep**, the server returns all the readable entries and then the client does the pattern-matching.

In both commands, the parameter **tablename** is the NIS+ name of the table to be searched. If only one key or key pattern is specified without the column name, then it is applied searching the first column.

Specific named columns can be searched by using the syntax.

When multiple columns are searched, only entries that match in all columns are returned. This is the equivalent of a logical join operation. **nismatch** accepts an additional form of search criteria, which is a NIS+ indexed name of the form:

### Flags

- **-A** Return the data within the table and all of the data in tables in the initial table’s concatenation path.
- **-c** Print only a count of the number of entries that matched the search criteria.
- **-h** Display a header line before the matching entries that contains the names of the table’s columns.
- **-M** Master server only. Send the lookup to the master server of the named data. This guarantees that the most up to date information is seen at the possible expense that the master server may be busy.
- **-o** Display the internal representation of the matching NIS+ object(s).
- **-P** Follow concatenation path. Specify that the lookup should follow the concatenation path of a table if the initial search is unsuccessful.
- **-v** Do not suppress the output of binary data when displaying matching entries. Without this option binary data is displayed as the string "*s-1BINARY*s0*".
  1. **0** - Successfully matches some entries.
  2. **1** - Successfully searches the table and no matches are found.
  3. **2** - An error condition occurs. An error message is also printed.

### Examples

1. This example searches a table named **passwd** in the **org_dir** subdirectory of the **zotz.com.domain**. It returns the entry that has the username of skippy.

   In this example, all the work is done on the server.

   ```
   nismatch\ name=skippy\ passwd.org_dir.zotz.com.
   ```

2. This example is similar to the one above except that it uses **nisgrep** to find all users in the table named **passwd** that are using either ksh (1) or csh (1).

   ```
   nisgrep\ 'shell=[ck]sh'\ passwd.org_dir.zotz.com.
   ```

3. NIS_PATH - If this variable is set, and the NIS+ table name is not fully qualified, each directory specified will be searched until the table is found (see **nisdefaults**, **niscat**, **nisls**, and **nistbladm**).

### Related Information

The **nisgrep**, **nisdefaults**, **niscat**, **nisls**, and **nistbladm** command.

### nismkdir Command

**Purpose**

Creates non-root NIS+ directories.
Syntax
nismkdir [-D Defaults] [-m MasterHost | -s ReplicaHost] DirName

Description
The nismkdir command creates subdirectories within an existing domain. It can also create replicated directories. Without any flags, the nismkdir command creates a subdirectory with the same master server and replica servers as its parent directory’s. In addition, the nismkdir command can add a replica to an already existing directory.

A host that serves an NIS+ directory must be an NIS+ client in a directory above the one being served. The only exception is a root NIS+ server that acts as both client and server to the same NIS+ directory.

If the host’s default domain is not the domain where the nismkdir command is executed, then the host name specified in the parameter with the -s or -m flags must be fully qualified.

Note: You should use the nisserver command to create an NIS+ domain that consists of the named directory with the org_dir and group_dir.

Flags
-m MasterHost
If the directory named by the DirName parameter does not yet exist, then the -m flag creates the new directory with MasterHost as its master server. If the directory named by DirName does exist, then the host named by the MasterHost parameter becomes its master server.

Note: To create a directory you must have create rights to the parent directory on that domain master server.

-s ReplicaHost
Adds a nonroot NIS+ directory and its master server to an existing system. Also, the -s flag can assign a new replica server to an existing directory. If DirName already exists, then the nismkdir command does not recreate it. Instead, it only assigns the new replica server to that existing directory.

After invoking the -s flag, you must run the nisping command from the master server on the directory that was added or assigned the replica server. You should include a nisping command for each directory in its master server’s cron file so that it is pinged at least once every 24 hours before being updated.

Notes:
1. You cannot assign a server to support its parent domain, unless it belongs to the root domain.
2. Always run the nismkdir command on the master server. Never run nismkdir on the replica server. Running nismkdir on the replica server causes communication problems between the master and the replica.
-D Defaults

Specifies a different set of defaults for the new directory. The defaults string is a series of tokens each separated by a colon. These tokens represent the default values to be used for the generic object properties:

\texttt{ttl=Time}

Sets the default time-to-live for objects created by the \texttt{nismkdir} command. The value \texttt{Time} is specified in the format defined by the \texttt{nischttl} command. The default value is 12h (12 hours).

\texttt{owner=Ownername}

Specifies that the NIS+ principal \texttt{Ownername} should own the created object. The default for this value is the principal who is executing the command.

\texttt{group=Groupname}

Specifies that the group \texttt{Groupname} should be the group owner for the object created. The default value is NULL.

\texttt{access=Rights}

Specifies the set of access rights to be granted for the created object. The value \texttt{Rights} must be given in the format defined by the \texttt{nischmod} command. The default value is ——rmcdr—-.

Environments

\textbf{NIS_DEFAULTS}

Contains a defaults string that overrides the NIS+ standard defaults. If the -D flag is invoked then those values override both the NIS_DEFAULTS variable and the standard defaults.

\textbf{NIS_PATH}

If the NIS+ directory name is not fully qualified, searches all directories specified until the directory is found (see \texttt{nisdefaults}).

Exit Status

This command returns the following the exit values:

0  Successful completion.
1  An error occurred.

Examples

1. To create the new directory \texttt{bar} under the \texttt{abc.com}. domain that shares the same master and replicas as the \texttt{abc.com}. directory, enter:
   \begin{verbatim}
nismkdir def.abc.com.
   \end{verbatim}

2. To create the new directory \texttt{def.abc.com.} that is not replicated under the \texttt{abc.com}. domain, enter:
   \begin{verbatim}
nismkdir \-m myhost.abc.com\-m def.abc.com.
   \end{verbatim}

3. To add a replica server of the \texttt{def.abc.com.} directory, enter:
   \begin{verbatim}
nismkdir \-s replica.abc.com\-s def.abc.com.
   \end{verbatim}

Files

Related Information

The \texttt{nischmod} command, \texttt{nisdefaults} command, \texttt{nisls} command, \texttt{nismkdir} command, and \texttt{nisserver} command.
nismkuser Command

Purpose
Creates a new NIS+ user account.

Syntax
nismkuser [ Attribute=Value ... ] Name

Description
The nismkuser command creates a NIS+ user entry in the NIS+ domain. The Name parameter must be a unique 8-byte or less string. You cannot use the ALL or default keywords in the user name. By default, the nismkuser command creates a standard user account. To create an administrative user account, specify the -a flag.

Note: You cannot use the nismkuser command to add users to an NIS+ groups. Use the nisgrpadm command to perform this function.

The nismkuser command will allow the input of the NIS+ user password at the time of user creation. If no password is given at user creation time, the NIS+ user’s LOCAL and DES cred is created with the password nisplus. Later, passwords may be set or reset with the passwd command. New accounts are not disabled and are active after the nismkuser command completes.

Notes:
1. Although this command allows the user to set the “home” directory for the NIS+ user, no actual physical directory is created if the directory does not already exist.
2. You need to have a group in group.org_dir with the gid that matches the new users gid first before you can add a user. The default gid for nismkuser is 1.

You can use the Web-based System Manager Users application or the System Management Interface Tool (SMIT) to run this command (under the NIS+ administration area).

Restrictions on Creating User Names
To prevent login inconsistencies, you should avoid composing user names entirely of uppercase alphabetic characters. While the nismkuser command supports multi-byte user names, it is recommended that you restrict user names to characters with the POSIX portable filename character set.

To ensure that your user database remains uncorrupted, you must be careful when naming users. User names must not begin with a - (dash), + (plus sign), @ (at sign), or ~ (tilde). You cannot use the keywords ALL or default in a user name. Additionally, do not use any of the following characters within a user-name string:

. Dot
: Colon
" Double quote
# Pound sign
, Comma
= Equal sign
\ Back slash
/ Slash
? Question mark
` Single quote
` Back quote
Attention: You will not be allowed to create a NIS+ user with the identical name of a pre-existing NIS+ client or server name.

Finally, the Name parameter cannot contain any space, tab, or new-line characters.

### Parameters

- **Attribute=Value** Initializes a user attribute. Refer to the `chuser` command for the valid attributes and values.
- **Name** Specifies a unique 8-byte or less string.

### Valid Parameters

`nismkuser` will allow an administrator to enter the same attributes and parameters as you would with the `mkuser` command. However, only the following parameters will be used by the `nismkuser` command (the others will be ignored and not considered an error):

- `id`, `pgrp`, `gecos`, `shell`, `home`, `minage`, `maxage`, `maxexpired`, `password`, `pwdwarntime`.

### Security

**Access Control:** This command should grant execute (x) access only to the root user and members of the security group. This command should be installed as a program in the trusted computing base (TCB). The command should be owned by the root user with the `setuid` (SUID) bit set.

**Auditing Events:**

<table>
<thead>
<tr>
<th>Event</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>USER_Create</td>
<td>user</td>
</tr>
</tbody>
</table>

### Examples

1. To create the `davis` user account with the default values in the `/usr/lib/security/nismkuser.default` file, enter:

   ```
   nismkuser davis
   ```

2. To create the `davis` user account and set the `su` attribute to a value of `false`, enter:

   ```
   nismkuser su=false davis
   ```

### Files

- `/usr/bin/nismkuser` Contains the `nismkuser` command.

### Related Information

The `chfn` command, `chgroup` command, `chgrpmem` command, `chsh` command, `chuser` command, `lsgrp` command, `lsuser` command, `mkgroup` command, `passwd` command, `pwdadm` command, `rmgroup` command, `rmuser` command, `setgroups` command, `setsenv` command.

For more information about the identification and authentication of users, discretionary access control, the trusted computing base, and auditing, refer to [Securing the network](#) in the *Security*.

For more information about administrative roles, refer to [Users, roles, and passwords](#) in the *Security*.

For information on installing the Web-based System Manager, see [Chapter 2: Installation and System Requirements](#) in *AIX 5L Version 5.3 Web-based System Manager Administration Guide*. 
nisping Command

Purpose
Pings replica servers, telling them to ask the master server for updates immediately. When a replica responds, nisping updates the replica's entry in the root master server's niscachemgr cache file, /var/nis/NIS_SHARED_DIRCACHE.

Note: The replicas normally wait a couple of minutes before executing this request.

Syntax

To Display the Time of the Last Update
nisping [-u domain ]

To Ping Replicas
nisping [-H hostname ] [domain]

To Checkpoint a Directory
nisping [-C hostname ] [domain ]

Description
Before pinging, the command checks the time of the last update received by each replica. If it is the same as the last update sent by the master, it does not ping the replica.

The nisping command can also checkpoint a directory. This consists of telling each server in the directory, including the master, to update its information on disk from the domain's transaction log.

Flags

-U domain Display the time of the last update; no servers are sent a ping.

-H hostname Only the host hostname is sent the ping, checked for an update time, or checkpointed.

-C hostname Send a request to checkpoint rather than a ping to each server. The servers schedule to commit all the transactions to stable storage.

Examples

Displaying the Time of the Last Update
Use the -u flag. It displays the update times for the master and replicas of the local domain, unless you specify a different domain name. It does not perform a ping.
/usr/lib/nis/nisping -u [domain]

Here is an example:
rootmaster# /usr/lib/nis/nisping -u org_dir
Last updates for directory wiz.com:
Master server is rootmaster.wiz.com.
Last update occurred at Wed Nov 25 10:53:37 1992
Replica server is rootreplica1.wiz.com.
Last update seen was Wed Nov 25 10:53:37 1992

Pinging Replicas
You can ping all the replicas in a domain, or one in particular. To ping all the replicas, use the command without options:
/usr/lib/nis/nisping
To ping all the replicas in a domain other than the local domain, append a domain name:

```
/usr/lib/nis/nisping domainname
```

Here is an example that pings all the replicas of the local domain, wiz.com.:

```
rrootmaster# /usr/lib/nis/nisping org_dir
Ping replicas serving directory wiz.com.:
Master server is rootmaster.wiz.com.
  Last update occurred at Wed Nov 25 10:53:37 1992
Replica server is rootreplica1.wiz.com.
  Last update seen was Wed Nov 18 11:24:32 1992
    Pinging ... rootreplica1.wiz.com.
```

Since the update times were different, it proceeds with the ping. If the times had been identical, it would not have sent a ping.

You can also ping all the tables in all the directories on a single specified host. To ping all the tables in all the directories of a particular host, use the -a flag:

```
/usr/lib/nis/nisping -a hostname
```

**Checkpointing a Directory**

To checkpoint a directory, use the -C flag:

```
/usr/lib/nis/nisping -C directory-name
```

All the servers that support a domain, including the master, transfer their information from their .log files to disk. This erases the log files and frees disk space. While a server is checkpointing, it will still answer requests for service, but it will be unavailable for updates.

Here is an example of nisping output:

```
rrootmaster# /usr/lib/nis/nisping -C
Checkpointing replicas serving directory wiz.com.:
Master server is rootmaster.wiz.com.
  Last update occurred at Wed May 25 10:53:37 1995
Master server is rootmaster.wiz.com.
  checkpoint has been scheduled with rootmaster.wiz.com.
Replica server is rootreplica1.wiz.com.
  Last update seen was Wed May 25 10:53:37 1995
Replica server is rootreplica1.wiz.com.
  checkpoint has been scheduled with rootmaster.wiz.com.
```

**nispopulate Command**

**Purpose**
Populates the NIS+ tables in a NIS+ domain.

**Syntax**

```
nispopulate [Y] [x] [f] [n] [u] [v] [S] [0 | 2] [d] network_password [e] NIS+_domain [h] NIS_server_host [a] NIS_server_addr [y] NIS_domain [table] ...
nispopulate [F] [x] [f] [d] [v] [S] [0 | 2] [d] NIS+_domain [e] network_password [e] NIS_domain [directory_path] [table] ...
nispopulate [C] [x] [f] [v] [d] NIS+_domain [e] network_password [e] hosts | passwd]
```
Description

The `nispopulate` command can be used to populate NIS+ tables in a specified domain from their corresponding files or NIS maps. The `nispopulate` command assumes that the tables have been created either through the `nisserver` command or the `nissetup` command.

The `table` argument accepts standard names and non-standard `key-value` type tables. See `nisaddent` for more information on `key-value` type tables. If the `table` argument is not specified, `nispopulate` will automatically populate each of the standard tables. These standard (default) tables are: `auto_master`, `auto_home`, `ethers`, `group`, `hosts`, `networks`, `passwd`, `protocols`, `services`, `rpc`, `netmasks`, `bootparams`, `netgroup`, `aliases`, and `shadow`.

Note: The `shadow` table is only used when populating from files. The non-standard tables that `nispopulate` accepts are those of `key-value` type. These tables must first be created manually with the `nistbladm` command.

Use the first syntax (`-Y`) to populate NIS+ tables from NIS maps. The `nispopulate` command uses the `ypxfr` command to transfer the NIS maps from the NIS servers to the `/var/yp/NIS_domain` directory on the local machine. Then, it uses these files as the input source.

Note: `NIS_domain` is case sensitive. Make sure there is enough disk space for that directory.

Use the second syntax (`-F`) to populate NIS+ tables from local files. The `nispopulate` command will use those files that match the table name as input sources in the current working directory or in the specified directory.

When populating the `hosts` and `passwd` tables, the `nispopulate` command will automatically create the NIS+ credentials for all users and hosts that are defined in the `hosts` and `passwd` tables, respectively. A network password is required to create these credentials. This network password is used to encrypt the secret key for the new users and hosts. This password can be specified using the `-l` flag or it will use the default password, `nisplus`. This `nispopulate` will not overwrite any existing credential entries in the credential table. Use `nisclient` to overwrite the entries in the credential table. It creates both LOCAL and DES credentials for users and only DES credentials for hosts. To disable automatic credential creation, specify the `-S 0` flag.

The third syntax (`-C`) is used to populate NIS+ credential table with level 2 authentication (DES) from the passwd and hosts tables of the specified domain. The valid `table` arguments for this operation are `passwd` and `hosts`. If this argument is not specified, then it will use both `passwd` and `hosts` as the input source.

If `nispopulate` was earlier used with the `-S 0` flag, then no credentials were added for the hosts or the users. If later the site decides to add credentials for all users and hosts, then this `-C` flag can be used to add credentials.

The `nispopulate` command normally creates temporary files in the directory `/tmp`. You may specify another directory by setting the environment variable `TMPDIR` to your chosen directory. If `TMPDIR` is not a valid directory, then `nispopulate` will use `/tmp`.

Flags

- `-a NIS_server_addr` Specifies the IP address for the NIS server. This flag is only used with the `-Y` flag.
- `-C` Populates the NIS+ credential table from passwd and hosts tables using DES authentication (security level 2). Specifies the NIS+ domain. The default is the local domain.
- `-d NIS+_domain` Populates NIS+ tables from files.
-f  Forces the script to populate the NIS+ tables without prompting for confirmation.

-h NIS_server_host  Specifies the NIS server hostname from where the NIS maps are copied from. This is only used with the -Y flag. This host must already exist in either the NIS+ hosts table or /etc/hosts file. If the hostname is not defined, the script will prompt you for its IP address, or you can use the -a flag to specify the address manually.

-l network_passwd  Specifies the network password for populating the NIS+ credential table. This is only used when you are populating the hosts and passwd tables. The default password is nisplus.

-n  Does not overwrite local NIS maps in /var/yp/NISdomain directory if they already exist. The default is to overwrite the existing NIS maps in the local /var/yp/NISdomain directory. This is only used with the -Y flag.

-p directory_path  Specifies the directory where the files are stored. This is only used with the -F flag. The default is the current working directory.

-S 0 | 2  Specifies the authentication level for the NIS+ clients. Level 0 is for unauthenticated clients, and no credentials will be created for users and hosts in the specified domain. Level 2 is for authenticated (DES) clients, and DES credentials will be created for users and hosts in the specified domain. The default is to set up with level 2 authentication (DES). There is no need to run the nispopulate command with the -C flag for level 0 authentication.

-u  Updates the NIS+ tables (that is, adds, deletes, modifies) from either files or NIS maps. This flag should be used to bring an NIS+ table up to date when there are only a small number of changes. The default is to add to the NIS+ tables without deleting any existing entries. Also, see the -m flag for updating NIS+ tables from existing maps in the /var/yp directory.

-v  Runs the script in verbose mode.

-x  Turns the "echo" mode on. The script just prints the commands that it would have executed. The commands are not actually executed. The default is off.

-Y  Populates the NIS+ tables from NIS maps.

-y NIS_domain  Specifies the NIS domain to copy the NIS maps from. This is only used with the -Y flag. The default domainname is the same as the local domainname.

Examples
1. To populate all the NIS+ standard tables in the domain xyz.ibm.com. from NIS maps of the yp.ibm.com domain as input source where host yp_host is a YP server of yp.ibm.com, enter:

2. To update all of the NIS+ standard tables from the same NIS domain and hosts shown above, enter:

3. To populate the hosts table in domain xyz.ibm.com. from the hosts file in the /var/nis/files directory and using somepasswd as the network password for key encryption, enter:
   /usr/lib/nis/nispopulate -F -p /var/nis/files -l somepasswd hosts

4. To populate the passwd table in domain xyz.ibm.com. from the passwd file in the /var/nis/files directory without automatically creating the NIS+ credentials, enter:
   /usr/lib/nis/nispopulate -F -p /var/nis/files -d xys.ibm.com. -S 0 passwd

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5. To populate the credential table in domain \texttt{xyz.ibm.com} for all users defined in the passwd table, enter:

\texttt{/usr/lib/nis/nispopulate -C -d xyz.ibm.com. passwd}

6. To create and populate a non-standard key-value type NIS+ table, \texttt{private}, from the file \texttt{/var/nis/files/private}: (\texttt{nispopulate} assumes that the \texttt{private.org_dir} key-value type table has already been created), enter:

\begin{verbatim}
/usr/bin/nistbladm -D access=og=rmcd,nw=r \n-c private key=S,nogw= value*,nogw= private.org.dir
/usr/lib/nis/nispopulate -F -p /var/nis/files private
\end{verbatim}

\section*{Files}

\begin{tabular}{ll}
\texttt{/etc/hosts} & Local host name database \\
\texttt{/var/yp} & NIS (YP) domain directory \\
\texttt{/var/nis} & NIS+ domain directory \\
\end{tabular}

\section*{Related Information}
The \texttt{nistbladm} command, \texttt{nisaddcred} command, \texttt{nisaddent} command, \texttt{nisclient} command, \texttt{nisserver} command, \texttt{nissetup} command, \texttt{rpc.nisd} command, \texttt{ypxfr} command.

\section*{nisrm Command}

\section*{Purpose}
Removes NIS+ objects from the namespace.

\section*{Syntax}
\texttt{nisrm [ [ ] ] [ ] Obj_name...}

\section*{Description}
The \texttt{nisrm} command removes NIS+ objects from the NIS+ namespace. The \texttt{nisrm} command fails if the NIS+ master server is not running.

\begin{itemize}
\item \texttt{-i} Sets the \texttt{nisrm} command in interactive mode. With the \texttt{-i} flag the \texttt{nisrm} command asks for confirmation before removing the specified object. If the object’s name is not fully qualified then the \texttt{-i} flag is forced, preventing the unintended removal of another object.
\item \texttt{-f} Sets the \texttt{nisrm} command in force mode. If \texttt{nisrm} fails because you do not have the necessary permissions, \texttt{nischmod} is invoked and the removal is attempted again. If \texttt{nisrm} fails, it does not return an error message.
\end{itemize}

\section*{Examples}
1. To remove the objects \texttt{xyz}, \texttt{abc}, and \texttt{def} from the namespace, enter:

\texttt{nisrm xyz abc def}

\section*{Environment}

\textbf{NIS\_PATH} \quad With this variable set, if the NIS+ object name is not fully qualified, \texttt{nisrm} searches each directory indicated until the object is found.
Exit Status

0  Successful completion.
1  An error occurred.

Related Information

The `nischmod` command, `nisdefaults` command, `nisrmdir` command, `nistbladm` command, and the `rm` command.

nisdirm Command

Purpose

Removes NIS+ objects from the namespace.

Syntax

```
nisdirm [-i][ -f][ -s Hostname ] Dimame
```

Description

The `nisdirm` command removes existing NIS+ directories and subdirectories. The `nisdirm` command can also remove replicas from serving a directory.

The `nisdirm` command modifies the object that describes the directory (indicated in the parameter `Dimame`), then notifies each replica to remove it. If this notification fails, then the directory object is returned to its original state unless the `-f` flag is used.

`nisdirm` fails if the NIS+ master server is not running.

- Set the `nisdirm` command in interactive mode. With the `-i` flag, the `nisrm` command asks for confirmation before removing the specified object. If the directory’s name in `Dimame` is not fully qualified, then the `-i` flag is forced, preventing the unintended removal of another directory.

- Set the `nisrm` command in force mode. The `-f` flag forces `nisdirm` to succeed even though the command might not be able to contact the affected replica servers. Use this flag when you know that a replica is down and cannot respond to the removal notification. When the replica is finally rebooted, it reads the updated directory object, notes that it is no longer a replica for `Dimame`, and therefore, stops responding to lookups for that directory.

  **Note:** You can clean up the files that held the removed directory by manually removing the appropriate files in the `/var/nis` directory.

- `-s Hostname` Specifies that the server `Hostname` should be removed as a replica for the directory `Dimame`. If the `-s` flag is not used, then all replicas and the master server for `Dimame` are removed and the directory removed from the namespace.

Examples

1. To remove the directory `xyz` under the `abc.com` domain, enter:

   ```
nisdirm xyz.abc.com.
   ```

2. To remove a replica serving the directory `xyz.abc.com`, enter:

   ```
nisdirm -s replica.abc.com xzy.abc.com.
   ```

3. To force the removal of the directory `xyz.abc.com` from the namespace, enter:

   ```
nisdirm -f xyz.abc.com.
   ```
Environment

**NIS_PATH**  With this variable set, if the NIS+ directory name is not fully qualified, *nisrmuser* searches each directory indicated until the directory is found.

Exit Status

<table>
<thead>
<tr>
<th>Exit Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful completion.</td>
</tr>
<tr>
<td>1</td>
<td>An error occurred.</td>
</tr>
</tbody>
</table>

Related Information

The [nisdefaults](#) command and the [nisrmdir](#) command.

**nisrmuser Command**

**Purpose**
Removes a NIS+ user account.

**Syntax**

```bash
nismuser Name
```

**Description**

The *nisrmuser* command removes the NIS+ user account identified by the *Name* parameter. This command removes a user’s attributes without removing the user’s home directory and files. The user name must already exist as a string of 8 bytes or less.

Only the root user can remove administrative users. Administrative users are those users with `admin=true` set in the `/etc/security/user` file.

You can use the Web-based System Manager Users application or System Management Interface Tool (SMIT) to execute this command within the NIS+ administration section.

**Security**

Access Control: This command should grant execute (x) access only to the root user and members of the security group. This command should be installed as a program in the trusted computing base (TCB). The command should be owned by the root user with the `setuid` (SUID) bit set.

Auditing Events: ;

<table>
<thead>
<tr>
<th>Event</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>USER_Remove</td>
<td>user</td>
</tr>
</tbody>
</table>

**Examples**

1. To remove the user *davis* account and its attributes from the local system, enter:

   ```bash
   nismuser davis
   ```

**Files**

```
/usr/sbin/nismuser
```
Contains the *nismuser* command.
Related Information
The `chfn` command, `chgrpmem` command, `chsh` command, `chgroup` command, `chuser` command, `lsgrp` command, `lsuser` command, `mkgroup` command, `mkuser` command, `passwd` command, `pwdadm` command, `rmgrp` command, `setgroups` command, `setsenv` command.

For more information about the identification and authentication of users, discretionary access control, the trusted computing base, and auditing, refer to Security in the Securing the network.

For more information about administrative roles, refer to Users, roles, and passwords in the Security.

For information on installing the Web-based System Manager, see Chapter 2: Installation and System Requirements in AIX 5L Version 5.3 Web-based System Manager Administration Guide.

nissserver Command

Purpose
Sets up NIS+ servers.

Syntax

To set up a root master server
`/usr/lib/nis/nissserver -r [ -d Domain ] [ -f ] [ -g GroupName ] [ -l Password ] [ -v ] [ -x ] [ -Y ]`

To set up a non-root master server
`/usr/lib/nis/nissserver -M -d Domain [ -f ] [ -g GroupName ] [ -h HostName ] [ -v ] [ -x ] [ -Y ]`

To set up a replica server
`/usr/lib/nis/nissserver -R [ -d Domain ] [ -f ] [ -h HostName ] [ -v ] [ -x ] [ -Y ]`

Description
The nissserver command is a shell script used to set up root master, non-root master, and replica NIS+ servers with level 2 security (DES).

When setting up a new domain, this script creates the NIS+ directories (including groups.dir and org.dir) and system table objects for the domain specified in Domain. However, nissserver does not populate tables with data. Use nispopulate to populate tables.

The -r flag is used to set up a root master server. In order to use this flag, you must be a superuser on the server where nisserver is executing. The -M flag is used to set up a non-root master server for the specified domain. To use this flag you must be an NIS+ principal on an NIS+ machine and have write permission to the parent directory of Domain. The new non-root master server must already be an NIS+ client (see the nisclient command) with the rpc.nisd daemon running. The -R flag is used to set up a replica server for both root and non-root domains. You must be an NIS+ principal on an NIS+ server and have write permission to the parent directory of the domain being replicated.

Flags

- `-d Domain` Specifies the NIS+ domain. The default is your local domain.
- `-f` Forces the NIS+ server setup without prompting for confirmation.
- `-g GroupName` Specifies the NIS+ group for the new domain. The -g flag is invalid with the -R flag. The default group is admin.
-h HostName  Specifies the host name for the NIS+ server. The server must be a valid host in the local domain. Use a fully qualified host name to specify a host outside of your local domain. The -h flag is only valid for setting up non-root master or replica servers. The default for the master server is to use the same list of servers as the parent domain's. The default for the replica server is to use the local host name.

-li Password  Specifies the network password for creating the credentials for the root master server. The -l flag is only valid with the -r flag. If you do not supply this flag, the nisserver script prompts you for the login password.

-M  Sets up the specified host as the master server. The rpc.nisd daemon must be running on that host before you execute the nisserver command with the -M flag.

-R  Sets up the specified host as the replica server. The rpc.nisd daemon must be running on that host before you execute the nisserver command with the -M flag.

-r  Sets up the server as the root master server.

-v  Runs the script in verbose mode.

-x  Turns the echo mode on.

-Y  Sets up an NIS+ server with NIS-compatibility mode. The default is no NIS-compatibility mode.

Examples

1. To set up a root master server for the domain abc.com., enter:
/usr/lib/nis/nisserver -r -d abc.com.

2. To set up a replica server for the domain abc.com. on the host abcreplica, enter:
/usr/lib/nis/nisserver -R -d abc.com.

3. To set up a non-root master server for the domain abc.xyz.com. on the host defhost with the NIS+ group name as admin-mgr.abc.xyz.com. enter:

4. To set up a non-root replica server for the domain abc.xyz.com. on defhost, enter:
/usr/lib/nis/nisserver -R -d abc.xyz.com. -h defhost

Note: In each of the last three examples, the host must be an NIS+ client with the rpc.nisd daemon running before executing the command string.

Related Information

The nisaddcred command, the nisclient command, the nisgrpadm command, the nisinit command, the nismkdir command, the nispopulate command, the nissetup command, and the rpc.nisd daemon.

nissetup Command

Purpose

Initializes an NIS+ domain.

Syntax

/usr/lib/nis/nissetup [ -Y ] NIS+Domain

Description

The nissetup command initializes a domain to serve clients and to store system administration information. nissetup is a shell script that establishes an NIS+ domain to service clients needing to store system administration information in the domain NIS+Domain. That domain should already exist before executing nissetup (see nismkdir and nisinit for more information on how to create a domain).
An NIS+ domain consists of an NIS+ directory and its subdirectories, org_dir and groups_dir. The org_dir subdirectory stores system administration information and groups_dir stores information for group access control.

nissetup creates the subdirectories org_dir and groups_dir in NIS+Domain. Both org_dir and groups_dir are replicated on the parent domain’s server. After the subdirectories are created, nissetup creates the default tables that NIS+ serves:

- auto_master
- auto_home
- bootparams
- cred
- ethers
- group
- hosts
- mail_aliases
- netmasks
- networks
- passwd
- protocols
- rpc
- services and
- timezone

The nissetup script uses the nistbladm command to create those tables. You can easily customize the script to add site-specific tables to be created at setup time.

**Note:** Although nissetup creates the default tables, it does not initialize them with data. Use the nisaddent command to accomplish this.

Normally, the nissetup command is executed only once per domain.

**Flags**

- Y Specifies that the domain is served as both an NIS+ and an NIS domain. The -Y flag makes all the system tables readable for unauthenticated clients; consequently, the domain is less secure.

**Related Information**
The nisaddent command, the nisinit command, the nismkdir command, and the nistbladm command.

---

### nisshowcache Command

**Purpose**

Prints out the contents of the shared cache file.

**Syntax**

```
/usr/lib/nis/nisshowcache [ -v ]
```
Description
The **nisshowcache** command prints out the contents of the per-server NIS+ directory cache shared by all processes accessing NIS+ on the server. By default, **nisshowcache** only prints out the directory names in the cache along with the cache header. The shared cache is maintained by the **nis_cachemgr** command.

Flags

- **-v** Sets the **nisshowcache** command in verbose mode. With the **-v** flag, **nisshowcache** prints out the contents of each directory object, including information on the server name and its universa addresses.

Files

/var/nis/NIS_SHARED_DIRCACHE contains the **nisshowcache** command.

Related Information
The **nis_cachemgr** command and the **syslogd** daemon.

---

### nisstat Command

**Purpose**
Reports NIS+ server statistics.

**Syntax**

```
/usr/lib/nis/nisstat [ -H HostName ] [ DirName ]
```

**Description**

The **nisstat** command queries an NIS+ server for statistics about its operations. These statistics vary from release to release and between implementations. Not all statistics are available from all servers. If you request a statistic from a server that does not support it, **nisstat** simply returns **unknown statistic**.

By default, statistics are retrieved from the server(s) of the NIS+ directory for the default domain. If a directory is specified in **DirName**, then that directory’s server is queried.

To retrieve a specific statistic, use one of these keywords:

- **root server** Reports whether or not the server is a root server.
- **NIS compat mode** Reports whether or not the server is running in NIS compat mode.
- **DNS forwarding in NIS mode** Reports whether or not the server in NIS compat mode will forward host-lookup calls to DNS.
- **security level** Reports the security level of the default server or the server specified in **HostName**.
- **serves directories** Lists the directories served by the default server or the server specified in **HostName**.
Operations

Returns results in the format

\[ OP=opname;C=\text{calls};E=\text{errors};T=\text{micros} \]

- **opname**: States the RPC procedure or operation.
- **calls**: States the number of calls to the RPC procedure made since the server began running.
- **errors**: States the number of errors that occurred while a call was being processed.
- **micros**: States the average amount of time (in microseconds) to complete the most recent 16 calls.

Directory Cache

Reports the number of calls to the internal directory object cache, the number of hits on that cache, the number of misses, and the hit rate percentage.

Group Cache

Reports the number of calls to the internal NIS+ group object cache, the number of hits on that cache, the number of misses, and the hit rate percentage.

Static Storage

Reports the number of bytes the server allocated for its static storage buffers.

Dynamic Storage

Reports the amount of heap the server process is currently using.

Uptime

Reports the amount of time the service has been running.

Flags

-H **HostName**

Indicates that only the server specified in **HostName** is queried by the **nisstat** command. By default, all servers for the directory are queried. If **HostName** does not serve the directory, no statistics are returned.

Environment

**NIS_PATH**

If the NIS+: name is not fully qualified, searches each NIS+ directory specified until the directory is found.

Related Information

The **nisdefaults** command.

**nistbladm Command**

Purpose

Administers NIS+ tables.

Syntax

To add or overwrite table entries

```
nistbladm -a | -A [ -D Defaults ] { Col_name=Value... Tbl_name }```

```
nistbladm -a | -A [ -D Defaults ] { Entry_Name }```

Note: **Entry_Name** has the syntax [column=value],table.

To create an NIS+ table

```
nistbladm -c [ -D Defaults ] [ -p Path ] [ -s Sep ] Type Col_name=[ S][ I][ C][ B][ X] [ Access ]... Tbl_name```

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Note: The flags after Col_name must be comma separated.

Example:
nistbladm -c hobby_tbl name=S,a+r,0+m hobby=S,a+r hobbies.abc.com.

To delete an entire NIS+ table
nistbladm -d Tbl_name

To edit table entries
nistbladm -m | E Col_name=Value... Entry_name

To remove table entries
nistbladm -r | R { [ Col_name=Value... ] Tbl_name }

To update a table’s attributes
nistbladm -u [ -p Path ] [ -s Sep ] [ -t Type ] [ Col_name=Access... ] Tbl_name

Description
The nistbladm command is used to administer NIS+ tables. It performs five primary operations: creating tables, deleting tables, adding table entries, modifying table entries, and removing table entries.

Though NIS+ does not restrict the size of tables or entries, the size of data affects the performance and the disk space requirements of the NIS+ server. NIS+ is not designed to store huge amounts of data, such as files. Instead, store pointers to files located on other servers. NIS+ can support up to 10,000 objects totaling 10M bytes. If the you need more storage space, create the domain hierarchy, or use the data stored in the tables as pointers to the actual data, instead of storing the actual data in NIS+.

To create a table, its directory must already exist and you must have create rights to that directory. You must specify a table name, table type, and a list of column definitions. Type is a string that acts as a standard by which NIS+ verifies that entries are of the correct type.

To delete a table, you must have destroy rights to the directory where it is stored. To modify entries, whether adding, changing, or deleting, you must have modify rights to the tables or individual entries.

Flags
-a
 Adds a new entry to an NIS+ table. Create the entry’s contents by supplying Col_name=Value pairs on the command line.

Notes:
1. You must specify a value for each column when adding an entry to an NIS+ table.
2. When entering the value string, enclose terminal characters in single quotation marks (‘) or double quotation marks (“). Those characters are the equals sign (=), comma (,), left bracket ([), right bracket (]), and space ( ). They are sparsed by NIS+ within an indexed name.

With the -a flag, the nistbladm command reports an error if you attempt to add an entry that would overwrite a pre-existing value in the desired column. The nistbladm command does not automatically overwrite pre-existing entry values. (See the -A flag for information about overwriting entries.)

-A
 Forces the nistbladm command to overwrite a pre-existing entry value. Even if Col_name already contains a value, nistbladm overwrites the old value with the new value. Unlike with the -a flag, the nistbladm command does not return an error.
-c Tbl_name  Creates a new NIS+ table named in the parameter Tbl_name. When creating a table, you must specify a table type, entry type, and a list of column definitions. The syntax for column definitions is Col_name=[ Flags ] [ Access ]. The parameter Flags can have these possible values:

  S  Specifies that searches can be performed on the column’s values.
  I  Specifies that searches ignore the case of column values. This flag is only valid in combination with the S flag.
  C  Encrypts the column’s values.
  B  Sets the column’s values as binary data. If the B flag is not set, column values are null-terminated ASCII strings. This flag is only valid in combination with the S flag.
  X  Sets the column’s values as XDR-encoded data. The X flag is only valid in combination with the B flag.

The newly created table must contain at least one column in number and at least one searchable column; in other words, if Tbl_name only has only one column, that column must be searchable.

-d Tbl_name  Deletes the entire table indicated in the parameter Tbl_name. The table must be empty before you delete it. (Use the -R flag to delete a table’s contents.)

-D  Specifies a set of defaults to be used when new objects are created. The defaults string is a series of tokens separated by colons. These tokens represent the default values to be used for the generic object properties.

ttl=Time  Sets the default time-to-live for objects created by the nistbladm command. The value Time must be given in the format defined by the nischttl command. The default value is 12 hours.

owner=Ownername  Specifies that the NIS+ principal Ownername should own the created object. The default value is the same as the principal who executes the nistbladm command to create the object.

group=Groupname  Specifies that the group Groupname should be the group owner for the object created. The default value is NULL.

access=Rights  Specifies the set of access rights to be granted for the given object. The value Rights must be given in the format defined by the nischmod command. The default value is ——r—c—d—r—-

-e Entry_name  Edits the entry specified by Entry_name. Entry_name must uniquely identify only one single entry. While editing the value of Entry_name, you can also change that entry’s indexed name.

  Note: If the entry’s new indexed name (resulting from the edit) matches that of another’s entry, the nistbladm command fails and returns an error message.

-E Entry_name  Edits the entry specified by Entry_name. Entry_name must uniquely identify only one single entry.

  Note: If the new indexed name matches that of another entry, then the -E flag automatically overwrites that existing entry with the entry just edited. So, in effect, two entries are being replaced by one.

-m  Same functionality as -E.

-r  Removes an entry from a table. Either identify the entry by its indexed name in Entry_value, or by a series of Col_name=Value pairs on the command line. With the -r flag, the nistbladm command fails when the indexed name or the column=value pairs match more than one entry.

-R  Removes multiple entries from a table. The -R flag forces the nistbladm command to remove all entries that match the criterion for removal. If that criterion is null—if you do not specify column=value pairs or an indexed name—then all entries from the table are removed.
-u  Updates attributes of a table. This allows the concatenation path, separation character, column access rights, and table type string of a table to be changed. Neither the number of columns nor the number of searchable columns can be changed with this flag.

-p Path  Specifies the table's search path when creating or modifying a table. When you invoke the nis_list function, you can specify the flag FOLLOW_PATH to tell the client library to continue searching tables in Path if the search criteria does not yield any entries. The path consists of an ordered list of table names separated by colons. The names in the path must be fully qualified.

-s Sep  Specifies the table's separator character when creating or modifying a table. The separator character is used by the niscat command when writing tables to standard output. The purpose of the separator character is to separate column data when the table is in ASCII form. The default value is a <space>.

t Type  Specifies the table's Type string when modifying a table.

Exit Status

0  Successful completion.
1  An error occurred.

Environment Variables

NIS_DEFAULTS  Contains a defaults string that overrides the NIS+ standard defaults. However, if you specify different values with the -D flag, then those values overrides both the NIS_DEFAULTS variable and the standard defaults.

NIS_PATH  If Tbl_name is not fully qualified, then setting this variable instructs nistbladm to search each directory specified until the table is found.

Examples

1. To create a table named hobbies in the directory abc.com. of the type hobby_tbl with two searchable columns name and hobby, type:

   nistbladm -c hobby_tbl name=S,a+r,o+m hobby=S,a+r hobbies.abc.com.

   The column name has read access for all (owner, group, and world) and modify access for only the owner. The column hobby has read access for all but cannot be modified by anyone.

   If access rights are not specified, then the table access rights would be either the standard defaults or those specified by the NIS_DEFAULTS variable.

2. Too add entries to the hobbies table, type:

   nistbladm -a name=bob hobby=skiing hobbies.abc.com.
   nistbladm -a name=sue hobby=skiing hobbies.abc.com.
   nistbladm -a name=ted hobby=swimming hobbies.abc.com.

3. To add the concatenation path, type:

   nistbladm -u -p hobbies.xyz.com.:hobbies.def.com. hobbies

4. To delete skiing-enthusiasts from the table, type:

   nistbladm -R hobby=skiing hobbies.abc.com.

   Note: Using the -r flag in this example would fail because two entries contain the value skiing.

5. To create a table with a column that is named with no flags set, type:

   nistbladm -c notes_tbl name=S,a+r,o+m note=notes.abc.com.
This command string creates the table notes.abc.com of the type notes_tbl with the two columns, name and note. The note column is not searchable.

Related Information
The niscat command, the nischmod command, the nischnown command, the nisdefaults command, the nismatch command, and the nissetup command.

nistest Command

Purpose
Returns the state of the NIS+ namespace using a conditional expression.

Syntax

\[
\text{nistest} \ [\text{[-A]} \ [\text{[-L]} \ [\text{[-M]} \ [\text{[-P]} \ [\text{[-a]} \ [\text{[-t]} \ ] \ ] \ ] \ ] \ ] \ ] \ [\text{Object}]
\]

\[
\text{nistest} \ [\text{[-A]} \ [\text{[-L]} \ [\text{[-M]} \ [\text{[-P]} \ [\text{[-a]} \ [\text{Rights} \ ] \ ] \ ] \ ] \ ] \ ] \ [\text{IndexedName}]
\]

Description
The nistest command provides a way for shell scripts and other programs to test for the existence, type, and access rights of objects and entries. Entries are named using indexed names (see the nismatch command.)

Flags

- \textbf{-A} Specifies that all of the data within the table and all of the data in tables in the initial table’s concatenation path be returned. This flag is only valid when using indexed names or following links.

- \textbf{-L} Follow links. If the object named by Object or the tablename component of IndexedName names a LINK type object, the link is followed when this switch is present.

- \textbf{-M} Specifies that the lookup should only be sent to the master server of the named data. This guarantees that the most up to date information is seen at the possible expense that the master server may be busy.

- \textbf{-P} Specifies that the lookup should follow the concatenation path of a table if the initial search is unsuccessful. This flag is only valid when using indexed names or following links.

- \textbf{-a Rights} Verifies that the current process has the desired or required access rights on the named object or entries. The access rights are specified in the same way as the nischmod command.

- \textbf{-t Type} Tests the type of Object. The value of type can be one of the following:

\begin{itemize}
  \item \textbf{G} Return true if the object is a group object.
  \item \textbf{D} Return true if the object is a directory object.
  \item \textbf{T} Return true if the object is a table object.
  \item \textbf{L} Return true if the object is a link object.
  \item \textbf{P} Return true if the object is a private object.
\end{itemize}

RETURN VALUES

\begin{itemize}
  \item \textbf{0} Success.
  \item \textbf{1} Failure due to object not present, not of specified type and/or no such access.
  \item \textbf{2} Failure due to illegal usage.
\end{itemize}
Examples

1. When testing for access rights, **nistest** returns success (0) if the specified rights are granted to the current user. Thus testing for access rights

   ```bash
   nistest \-a \w=mr skippy.domain
   ```

   Tests that all authenticated NIS+ clients have read and modify access to the object named `skippy.domain`.

2. Testing for access on a particular entry in a table can be accomplished using the indexed name syntax. The following example tests to see if an entry in the password table can be modified.

   ```bash
   nistest \-a o=m \'[uid=99],passwd.org_dir\'
   ```

Environment

**NIS\_PATH**

If this variable is set, and the NIS+ name is not fully qualified, each directory specified will be searched until the object is found (see **nisdefaults**).

Related Information

The **nischmod** command and **nisdefaults** command.

**nistoldif Command**

**Purpose**

Exports user, group, name resolution, and rpc data to rfc 2307-compliant form.

**Syntax**

```bash
nistoldif -d Suffix [ -a BindDN -h Host -p Password -n Port ] [ -d Directory ] [ -y domain ] [ -S Schema ] [ -k KeyPath -w SSLPassword ] [ -s Maps ] [ -m ldap_mapname ]
```

**Description**

The **nistoldif** command converts the data from passwd, group, hosts, services, protocols, rpc, networks, netgroup, and automount into forms compliant with rfc2307. It will first attempt to read data from NIS, and if it cannot find a NIS map it will fall back to the flat files.

If the server information (the `-a`, `-h`, and `-p` flags) is given on the command line, data will be written directly to the server. If any data conflicts with an entry already on the server, either because the entry already exists, or because the uid or gid already exists, a warning will be printed. If the server information is not given, the data will be written to stdout in LDIF. In either case, **nistoldif** does not add an entry for the suffix itself; if that entry does not exist, attempts to add data to the server will fail. This entry will be added during server setup, usually by the **mksecldap** command.

Translation is not exact. Because of the limitations of the rfc2307 definitions, some attributes are defined in a case-insensitive way; for example, TCP, Tcp, and tcp are all the same protocol name to the LDAP server. Uids and gids greater than 2^31-1 will be translated to their negative twos complement equivalent for storage.

The **nistoldif** command reads the `/etc/security/ldap/sectoldif.cfg` file to determine what to name the sub-trees that the passwd, group, hosts, services, protocols, rpc, networks and netgroup data will be exported to. The names specified in the file will be used to create sub-trees under the base DN specified with the `-d` flag. For more information, see the `/etc/security/ldap/sectoldif.cfg` file documentation.
## Flags

- **-a** Specifies the administrative bind DN used to connect to the LDAP server. If this flag is used, -h and -p must also be used, and data will be written directly to the LDAP server.
- **-d** Specifies the suffix that the data should be added under.
- **-f** Specifies the directory to look for flat files in, or the name of the automount map file. If this flag is not used, `nistoldif` will look for files in `/etc`. This flag is required for automount maps.
- **-h** Specifies the host name which is running the LDAP server. If this flag is used, -a and -p must also be used, and data will be written directly to the LDAP server. This flag will be ignored for automount data.
- **-k** Specifies the SSL key path. If this flag is used, -w must also be used.
- **-m** Specifies the automount map on the LDAP server.
- **-n** Specifies the port to connect to the LDAP server on. If this flag is used, -a, -h and -p must also be used; if it is not used, the default LDAP port is used.
- **-p** Specifies the password used to connect to the LDAP server. If this flag is used, -a and -h must also be used, and data will be written directly to the LDAP server.
- **-s** Specifies a set of maps to be written to the server. This flag should be followed by a list of letters representing the maps that should be migrated. If this flag is not used, all maps will be migrated. The letters are: a for automount, e for netgroup, g for group, h for hosts, n for networks, p for protocols, r for rpc, s for services, and u for passwd.
- **-S** Specifies the LDAP schema to use for users and groups. This can be either RFC2307 or RFC2307AIX; RFC2307AIX gives extended AIX schema support. If this flag is not used, RFC2307 is the default.
- **-w** Specifies the SSL password. If this flag is used, -k must also be used.
- **-y** Specifies the NIS domain to read maps from. If this flag is not used, the default domain will be used.

## Exit Status

This command returns the following exit values:

- **0** No errors occurred. Note that failure to find a map is not considered an error.
- **>0** An error occurred.

## Security

Access Control: Only the root user can run this command.

## Examples

1. To export the NIS maps from the domain `austin.ibm.com` (falling back to the flat files in `/tmp/etc`) to LDIF under the suffix `cn=aixdata`, type:

   ```bash
   nistoldif -d cn=aixdata -y austin.ibm.com -f /tmp/etc > ldif.out
   ```

2. To export the hosts and services maps from the default domain (falling back to the flat files in `/etc`) to the LDAP server `ldap.austin.ibm.com`, with administrator bind `DNcn=root` and password `secret` under the suffix `cn=aixdata`, type:

   ```bash
   nistoldif -d cn=aixdata -h ldap.austin.ibm.com -a cn=root -p secret -s hs
   ```

3. To convert the `/etc/auto_master` automount map file into LDIF, type:

   ```bash
   nistoldif -s a -f /etc/auto_master > ldif.out
   ```

4. In order to remove automount data, the LDIF file must be created manually. For example, suppose the user `user1` was erroneously added to the `auto_home` automount map in the `dc=austin,dc=ibm,dc=com` suffix, and needs to be deleted. Create the following LDIF:

   ```bash
   # cat /tmp/del_user1.ldif
dn: automountKey=user1,automountMapName=auto_home,dc=austin,dc=ibm,dc=com
   changetype: delete
   ```

   Then run the following command:
ldapmodify -f /tmp/del_user1.ldif

5. In order to edit automount data, the LDIF file must be created manually. For example, suppose the user user2 was given the wrong mount point in the auto_home automount map in the dc=austin,dc=ibm,dc=com suffix, and needs to be changed to the correct location of /home/user2. Create the following LDIF:

```bash
# cat /tmp/ch_user2.ldif
dn: automountKey=user2,automountMapName=auto_home,dc=austin,dc=ibm,dc=com
changetype: modify
replace: automountInformation
automountInformation: /home/user2
```

The run the following command:

```
ldapmodify -f /tmp/ch_user2.ldif
```

**Files**

/usr/sbin/nistoldif Contains the nistoldif command.

**Related Information**

The mksecldap command.

The /etc/security/ldap/sectoldif.cfg file.

---

**nisupdkeys Command**

**Purpose**
Updates the public keys in NIS directory objects.

**Syntax**

```
/usr/lib/nis/nisupdkeys [ -a ] [ -C ] [ -H Hostname ] [ -s ] [ Dirname ]
```

**Description**

The nisupdkeys command updates the public keys in an NIS+ directory object. When the public key for an NIS+ server is changed, the new key must be propagated to all directory objects that reference that server. nisupdkeys reads a directory object and attempts to copy the public key for each server of that directory. The key is then placed in the directory object and then the object is modified to reflect the new key.

If Dirname exists, then its directory object is updated. If not, then the directory object for the default domain is updated. nisupdkeys -s obtains a list of all the directories served by Hostname and updates those directory objects, assuming that the caller has the necessary permission rights. That list of directories can also be obtained by the nisstat command.

Before you run nisupdkeys, make sure you have propagated the new address/public key to all replica servers.
Flags

-a Updates the universal addresses of the NIS+ servers in the directory object. The -a flag only works for the TCP/IP family of transports. You should use this flag when the IP address of the server is changed. The new address is resolved using `gethostname` on that server. In order for this resolution to work, the `/etc/nsswitch.conf` file must point to the correct source of the server's entry.

-C Clears the public key. Communication with a server that has no public key does not require the use of a secure remote procedure call.

-H Hostname Updates the keys of the server named Hostname for the current domain directory object. If the host name is not fully qualified, then `nisupdkeys` assumes the server is in the default domain. If Hostname does not serve the directory, then nothing happens.

-s Updates all the NIS+ directory objects served by the server Hostname, assuming that you have the necessary permission rights. If you do not have permission to update the directory objects, those updates fail and you will be notified. If the `rpc.nisd` on Hostname can't return the list of servers it serves, `nisupdkeys` returns an error message. Then you must invoke the `nisupdkeys` multiple times, once per NIS+ directory the `rpc.nisd` serves.

Dirname Updates the keys of the directory object for the directory Dirname.

Examples

1. To update the keys for servers of the abc.def. domain, enter:
   `nisupdkeys abc.def`.

2. To update the keys for host xyzserver that serves the abc.def. domain, enter:
   `nisupdkeys -H xyzserver abc.def`.

3. To clear the keys for host xyzserver in the abc.def. domain, enter:
   `nisupdkeys -CH xyzserver abc.def`.

4. To update the keys in all directory objects served by xyzserver, enter:
   `nisupdkeys -sH xyzserver`.

Security

Access Control: To use the `nisupdkeys` command, you must have modify rights to the NIS+ directory object.

Files

`/usr/lib/nis` Directory where the `nisupdkeys` command resides.

Related Information

The `chkey` command, the `nisaddcred` command, and the `niscat` command.

The `gethostbyname` subroutine.

nl Command

Purpose

Numbers lines in a file.

Syntax

```
 nl [-b Type] [-H Type] [-I Number] [-d Delimiter] [-i Number] [-n Format] [-v Number] [-w Number] [-p] [-s Separator] [ File ]
```
Description

The **nl** command reads the *File* parameter (standard input by default), numbers the lines in the input, and writes the numbered lines to standard output. In the output, the **nl** command numbers the lines on the left according to the flags you specify on the command line.

The input text must be written in logical pages. Each logical page has a header, a body, and a footer section (you can have empty sections). Unless you use the **-P** flag, the **nl** command resets the line numbers at the start of each logical page. You can set line-numbering flags independently for the header, body, and footer sections (for example, the header and footer lines can be numbered while the text lines are not).

Signal the start of logical-page sections with lines in the file that contain only the following delimiter characters:

<table>
<thead>
<tr>
<th>Line Contents</th>
<th>Start Of</th>
</tr>
</thead>
</table>
| \\
| Header       |
| \:           | Body       |
| \             | Footer     |

You can name only one file on the command line. You can list the flags and the file name in any order.

Flags

All the parameters are set by default. Use the following flags to change these default settings. Except for the **-s** flag, enter a **-n** flag without a variable to see its default value.

- **-b Type**
  Chooses which body section lines to number. Recognized values for the *Type* variable are:
  - *a* Numbers all lines
  - *t* Does not number lines that are blank or lines that contain any non-graphic character such as a tab within them. (default)
  - *n* Does not number any lines
  - *p* Pattern
    Numbers only those lines specified by the *Pattern* variable.

- **-d Delimiter**
  Uses the two characters specified by the *Delimiter* variable as the delimiters for the start of a logical page section. The default characters are \: (backslash, colon). You may specify two ASCII characters, two 1-byte extended characters, or one extended character. If you enter only one 1-byte character after the **-d** flag, the second character remains the default (a colon). If you want to use a backslash as a delimiter, enter two backslashes (\). More specifically, the **-d** flag does not accept the following characters: the backslash (\), linefeed (\n), backspace (\b), horizontal tab (\t), vertical tab (\v), form feed (\f), carriage return (\r), null (\0), or escape sequences (\xxyy, where xxyy is a two-digit hexadecimal number).

- **-f Type**
  Chooses which logical-page footer lines to number. The possible values for the *Type* variable are the same as the **-b** flag. The default value of the *Type* variable is *n* (no lines numbered).

- **-h Type**
  Chooses which logical-page header lines to number. The possible values for the *Type* variable are the same as the **-b** flag. The default value of the *Type* variables *n* (no lines numbered).

- **-i Number**
  Increments logical-page line numbers by the number specified in the *Number* variable. The default value of the *Number* variable is 1. The range of the *Number* variable is from 1 to 250.

- **-l Number**
  (Lowercase L) Uses the value specified in the *Number* parameter as the number of blank lines to count as one. For example, -13 numbers every third blank line in a series. The default value of the *Number* variable is 1. This flag works when the **-ha**, **-ba**, or **-fa** option is set. The range of the *Number* variable is from 1 to 250.

- **-n Format**
  Uses the value of the *Format* variable as the line numbering format. Recognized formats are:
  - *ln* Left-justified, leading zeros suppressed
  - *rn* Right-justified, leading zeros suppressed (default)
  - *rz* Right-justified, leading zeros kept

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-p
Does not restart numbering at logical page delimiters.

-s Separator
Separates the text from its line number with the character specified in the Separator variable. The default value of the Separator variable is a tab character.

-v Number
Sets the initial logical-page line number to the value specified by the Number variable. The default value of the Number variable is 1. The range of the Number variable is from 0 to 32767.

-w Number
Uses the value specified by the Number variable as the number of characters in the line number. The default value of the Number variable is 6. The range of the Number variable is from 1 to 20.

Exit Status
This command returns the following exit values:

0 Successful completion.
>0 An error occurred.

Examples
1. To number only the non-blank lines, enter:
   nl chap1
   
   This displays a numbered listing of chap1, numbering only the non-blank lines in the body sections. If chap1 contains no \:\:\+:, or \ delimiters, then the entire file is considered the body.

2. To number all lines:
   nl -ba chap1
   
   This numbers all the lines in the body sections, including blank lines. This form of the nl command is adequate for most uses.

3. To specify a different line number format, enter:
   nl -i10 -nrz -s:: -v10 -w4 chap1
   
   This numbers the lines of chap1 starting with ten (-v10) and counting by tens (-i10). It displays four digits for each number (-w4), including leading zeros (-nrz). The line numbers are separated from the text by two colons (-s : :).
   
   For example, if chap1 contains the text:
   
   A not-so-important
   note to remember:
   You can't kill time
   without injuring eternity.
   
   then the numbered listing is:
   0010::A not-so-important
   0020::note to remember
   0030::You can't kill time
   0040::without injuring eternity.

   Note that the blank line was not numbered. To do this, use the -ba flag as shown in example 2.

Files
/usr/bin/nl Contains the nl command.
Related Information

Files and Input and output redirection in Operating system and device management.

The pr command.

nlssrc Command

Purpose
Gets the status of a subsystem or a group of subsystems in canonical form.

Syntax
nlssrc [-h host] -a

nlssrc [-h host] -g group_name

nlssrc [-h host] [-l] [-c] -s subsystem_name

nlssrc [-h host] [-l] [-c] -p subsystem_pid

The syntax for the first two usages of nlssrc will generate the exact same output as lssrc. The syntax for the last two usages will generate the output in the canonical form as lssrc.

Description
Use the nlssrc command to get the status of a subsystem or a group of subsystems in canonical form. Use the nlssrc -c command to get language-independent output for supported subsystems from the lssrc command. The status is displayed in English regardless of the installed language locale. If the -c flag is not present, the nlssrc command will invoke the lssrc command that uses the daemon's locale.

Flags

-a Lists the current status of all defined subsystems.

-c Requests the canonical lssrc output of the supported subsystems.

-g group_name Specifies a group of subsystems to get status for. The command is unsuccessful if the group_name parameter is not contained in the subsystem object class.

-h host Specifies the foreign host on which this status action is requested. The local user must be running as root. The remote system must be configured to accept remote System Resource Controller (SRC) requests. That is, the srcmstr daemon (see /etc/inittab) must be started with the -r flag and the /etc/hosts.equiv file or the .rhosts file must be configured to allow remote requests.

-l Requests that a subsystem send its current status in long form. Long status requires that a status request be sent to the subsystem; it is the responsibility of the subsystem to return the status.

-p subsystem_pid Specifies a particular instance of the subsystem_pid parameter to get status for, or a particular instance of the subsystem to which the status subserver request is to be taken.

-s subsystem_name Specifies a subsystem to get status for. The subsystem_name parameter can be the actual subsystem name or the synonym name for the subsystem. The command is unsuccessful if the subsystem_name parameter is not contained in the subsystem object class.
Security
You do not need root authority to run this command.

Exit Status
0 Command has run successfully.
1 Command was not successful.

Restrictions
This command applies to the cthags and cthats subsystems only.

Standard Output
When the -h flag is specified, this command's usage statement is written to standard output.

Standard Error
Error messages are written to standard error (and to the ctsnap.host_name.nnnnnnnn.log file).

Examples
1. To get nlssrc output in English from a subsystem called cctsubsys, enter:
   nlssrc -c -ls cctsubsys
2. The following example shows the same information in different formats:
   nlssrc -ls cctsubsys (locale-dependent)
   Subsystem  Group  PID  Status
   cctsubsys  cctsubsys  6334  active
   2 locally-connected clients. Their PIDs:
   15614  23248
   HA Subsystem domain information:
   Domain established by node 5
   Number of groups known locally: 1
   Group Name  providers  providers/subscribers
   ha_filesys  7          1          0
   nlssrc -ls cctsubsys -c (canonical form)
   Number of local clients: 2
   PIDs: 15614 23248
   HA Subsystem domain information:
   Domain established by node 5.
   Number of known local groups: 1
   Group Name: ha_filesys
   Providers: 7
   Local Providers: 1
   Local Subscribers: 0

Location
/usr/sbin/rsct/bin/nlssrc Contains the nlssrc command

Files
/tmp/ctsupt Location of the default directory that contains the output files.
/tmp/ctsupt/ctsnap.host_name.nnnnnnnn.log Location of the log file of the command execution, where nnnnnnnn is a timestamp and host_name is the name of the host on which the command is running.
Related Information
Commands: lssrc(1)

nm Command

Purpose
Displays information about symbols in object files, executable files, and object-file libraries.

Syntax

Description
The nm command displays information about symbols in the specified File, which can be an object file, an executable file, or an object-file library. If the file contains no symbol information, the nm command reports the fact, but does not interpret it as an error condition. The nm command reports numerical values in decimal notation by default.

The nm command writes the following symbol information to standard output:

• Library or Object Name
  The nm command reports either the library or the object name associated with the file only if you specify the -A option.

• Symbol Name

• Symbol Type
  The nm command represents the file’s symbol type with one of the following characters (with weak symbols represented by the same characters as global symbols):

  A Global absolute symbol.
  a Local absolute symbol.
  B Global bss symbol.
  b Local bss symbol.
  D Global data symbol.
  d Local data symbol.
  f Source file name symbol.
  L Global thread-local symbol (TLS).
  I Static thread-local symbol (TLS).
  T Global text symbol.
  t Local text symbol.
  U Undefined symbol.

• Value

• Size
  The nm command reports the size associated with the symbol, if applicable.
Flags

-A Displays either the full path name or library name of an object on each line.

-B Displays output in the Berkeley Software Distribution (BSD) format:

value type name

-C Suppresses the demangling of C++ names. The default is to demangle all C++ symbol names.

Note: Symbols from C++ object files have their names demangled before they are used.

-d Displays a symbol’s value and size as a decimal. This is the default.

-e Displays only static and external (global) symbols.

-f Displays full output, including redundant .text, .data, and .bss symbols, which are normally suppressed.

-g Displays only external (global) symbols.

-h Suppresses the display of output header data.

-l Distinguishes between WEAK and GLOBAL symbols by appending a * to the key letter for WEAK symbols. If used with the -P option, the symbol type for weak symbols is represented as follows:

V Weak Data Symbol
W Weak Text Symbol
w Weak Undefined Symbol
Z Weak bss Symbol

-o Displays a symbol’s value and size as an octal rather than a decimal number.

-P Displays information in a standard portable output format:

library/object name name type value size

This format displays numerical values in hexadecimal notation, unless you specify a different format with the -t, -d, or -o flags.

The -P flag displays the library/object name field only if you specify the -A flag. Also, the -P flag displays the size field only for symbols for which size is applicable.

-p Does not sort. The output is printed in symbol-table order.

-r Sorts in reverse order.

-T Truncates every name that would otherwise overflow its column, making the last character displayed in the name an asterisk. By default, nm displays the entire name of the symbols listed, and a name that is longer than the width of the column set aside for it causes every column after the name to be misaligned.

-t Format Displays numerical values in the specified format, where the Format parameter is one of the following notations:

d Decimal notation. This is the default format for the nm command.

-o Octal notation.

-x Hexadecimal notation.

-u Displays only undefined symbols.

-v Sorts output by value instead of alphabetically.

-x Displays a symbol’s value and size as a hexadecimal rather than a decimal number.

-X mode Specifies the type of object file nm should examine. The mode must be one of the following:

32 Processes only 32-bit object files
64 Processes only 64-bit object files
32_64 Processes both 32-bit and 64-bit object files

The default is to process 32-bit object files (ignore 64-bit objects). The mode can also be set with the OBJECT_MODE environment variable. For example, OBJECT_MODE=64 causes nm to process any 64-bit objects and ignore 32-bit objects. The -X flag overrides the OBJECT_MODE variable.
Note: The nm command supports the — (double hyphen) flag. This flag distinguishes a File operand if the file name can be misinterpreted as an option. For example, to specify a file name that begins with a hyphen, use the — flag.

Exit Status
This command returns the following exit values:

0    Successful completion.
>0   An error occurred.

Examples
1. To list the static and external symbols of the object file a.out, enter:
   
   ```
   nm -e a.out
   ```

2. To display symbol sizes and values as hexadecimal and sort the symbols by value, enter:
   
   ```
   nm -xv a.out
   ```

3. To display symbol of all 64-bit objects in libc.a, ignoring all 32-bit objects:
   
   ```
   nm -X64 /usr/lib/libc.a
   ```

Files

/usr/ccs/bin/nm    Contains the nm command.

Related Information
The ar command, as command, ld command, size command, strip command.

The a.out file, ar file.

Commands in Operating system and device management.

no Command

Purpose
Manages network tuning parameters.

Syntax

```bash
no [-p | -r] { -o Tunable=[NewValue] }
no [-p | -r] { -d Tunable }
no [-p | -r] { -D }
no [-p | -r] { -a }
no -h [ Tunable ]
no -L [ Tunable ]
no -x [ Tunable ]
```

Note: Multiple flags -o, -d, -x, and -L are allowed.
Use the `no` command to configure network tuning parameters. The `no` command sets or displays current or next boot values for network tuning parameters. This command can also make permanent changes or defer changes until the next reboot. Whether the command sets or displays a parameter is determined by the accompanying flag. The `-o` flag performs both actions. It can either display the value of a parameter or set a new value for a parameter. When the `no` command is used to modify a network option it logs a message to the syslog using the LOG_KERN facility. For a more information on how the network parameters interact with each other, refer to the Networks and communication management.

Understanding the Effect of Changing Tunable Parameters

Be careful when you use this command. If used incorrectly, the `no` command can cause your system to become inoperable.

Before modifying any tunable parameter, you should first carefully read about all its characteristics in the Tunable Parameters section below, and follow any Refer To pointer, in order to fully understand its purpose. For more information about tunable parameters, see “Network Tunable Parameters” on page 208 and “Streams Tunable Parameters” on page 245 below.

You must then make sure that the Diagnosis and Tuning sections for this parameter truly apply to your situation and that changing the value of this parameter could help improve the performance of your system.

If the Diagnosis and Tuning sections both contain only “N/A”, you should probably never change this parameter unless specifically directed by AIX development.

Flags

- **-a**
  Displays current, reboot (when used in conjunction with `-r`) or permanent (when used in conjunction with `-p`) value for all tunable parameters, one per line in pairs Tunable = Value. For the permanent options, a value only displays for a parameter if its reboot and current values are equal. Otherwise NONE displays as the value.

- **-d Tunable**
  Resets Tunable its to default value. If Tunable needs to be changed (that is it is currently not set to its default value) and it is of type Bosboot or Reboot, or if it is of type Incremental and has been changed from its default value, and `-r` is not used in combination, it is not changed but a warning displays instead.

- **-D**
  Resets all tunables to their default value. If a tunable needing to be changed are of type Bosboot or Reboot, or if they are of type Incremental and have been changed from their default value, and neither `-p` nor `-r` are used in combination, they will not be changed but a warning displayed instead.

- **-h [Tunable]**
  Displays help about Tunable parameter if one is specified. Otherwise, displays the `no` command usage statement.

- **-L [Tunable]**
  Lists the characteristics of one or all Tunables, one per line, using the following format:

  ```
  NAME
  DEPENDENCIES
  CUR  DEF  BOOT  MIN  MAX  UNIT  TYPE
  --------------------------------------------------------------------------------
  General Network Parameters
  sockthresh 85 85 85 0 100 %_of_thewall D
  fasttimo 200 200 200 50 200 millisecond D
  inet_stack_size 16 16 16 1 kbyte R
  --------------------------------------------------------------------------------
  ...
  ```

  where:
  - CUR = current value
  - DEF = default value
  - BOOT = reboot value
  - MIN = minimal value
  - MAX = maximum value
  - UNIT = tunable unit of measure
  - TYPE = parameter type: D (for Dynamic), S (for Static), R (for Reboot), B (for Bosboot), M (for Mount), I (for Incremental), C (for Connect), and d (for Deprecated)
  - DEPENDENCIES = list of dependent tunable parameters, one per line
-o Tunable [=NewValue] Displays the value or sets the Tunable to NewValue. If a tunable needs to be changed (the specified value is different than current value), and is of type Bosboot or Reboot, or it is of type Incremental and its current value is bigger than the specified value, and -r is not used in combination, it will not be changed but a warning displays instead.

When -r is used in combination without a new value, the nextboot value for Tunable is displayed. When -p is used in combination without a new value, a value displays only if the current and next boot values for tunable are the same Otherwise NONE displays as the value.

-p Makes changes apply to both current and reboot values when used in combination with -o, -d or -D, that is turns on updating of the /etc/tunables/nextboot file in addition to the updating of the current value. These combinations cannot be used on Reboot and Bosboot type parameters because their current value can't be changed.

When used with -a or -o without specifying a new value, values displays only if the current and next boot values for a parameter are the same. Otherwise NONE displays as the value.

-r Makes changes apply to reboot values when used in combination with -o, -d or -D , that is is turns on the updating of the /etc/tunables/nextboot file. If any parameter of type Bosboot is changed, the user is prompted to run bosboot. When used with -a or -o without specifying a new value, next boot values for tunables display instead of the current values.

-x [Tunable] Lists characteristics of one or all tunables, one per line, using the following (spreadsheet) format:

tunable, current, default, reboot, min, max, unit, type, {dtunable}

where:
current = current value
default = default value
reboot = reboot value
min = minimal value
max = maximum value
unit = tunable unit of measure
type = parameter type: D (for Dynamic), S (for Static), R (for Reboot), B (for Bosboot), M (for Mount), I (for Incremental), C (for Connect), and d (for Deprecated)
dtunable = space separated list of dependent tunable parameters

Any change (with -o, -d, or -D) to a parameter of type Mount results in a message sdisplaying to warn the user that the change is only effective for future mountings.

Any change (with -o, -d or -D flags) to a parameter of type Connect will result in inetd being restarted, and a message displaying to warn the user that the change is only effective for future socket connections.

Any attempt to change (with -o, -d, or -D without -r) a parameter of type Bosboot or Reboot without -r, results in an error message.

Any attempt to change (with -o, -d, or -D but without -r) the current value of a parameter of type Incremental with a new value smaller than the current value, results in an error message.

Tunable Parameters Type
All the tunable parameters manipulated by the tuning commands (no, nfso, vmo, ioo, schedo, and raso) have been classified into these categories:

Dynamic If the parameter can be changed at any time
Static If the parameter can never be changed
Reboot If the parameter can only be changed during reboot
Bosboot If the parameter can only be changed by running bosboot and rebooting the machine
Mount If changes to the parameter are only effective for future file systems or directory mounts
Incremental If the parameter can only be incremented, except at boot time
Connect If changes to the parameter are only effective for future socket connections
Depreciated If changing this parameter is no longer supported by the current release of AIX.

For parameters of type Bosboot, whenever a change is performed, the tuning commands automatically prompt the user to ask if they want to execute the bosboot command. For parameters of type Connect, the tuning commands automatically restart the inetd daemon if pre520tune is disabled.

Note that the current set of parameters managed by the no command only includes Reboot, Static, Dynamic, Incremental, and Connect types.

Compatibility Mode
When running in pre 5.2 compatibility mode (controlled by the pre520tune attribute of sys0, see AIX 5.2 compatibility mode), reboot values for parameters, except those of type Bosboot, are not really meaningful because in this mode they are not applied at boot time.

In pre 5.2 compatibility mode, setting reboot values to tuning parameters continues to be achieved by imbedding calls to tuning commands in scripts called during the boot sequence. Parameters of type Reboot can therefore be set without the -r flag, so that existing scripts continue to work.

This mode is automatically turned ON when a machine is MIGRATED to AIX 5L Version 5.2. For complete installations, it is turned OFF and the reboot values for parameters are set by applying the content of the /etc/tunables/nextboot file during the reboot sequence. Only in that mode are the -r and -p flags fully functional. See Kernel Tuning in the AIX 5L Version 5.3 Performance Tools Guide and Reference for details.

Network Tunable Parameters

arpqsize

Purpose:
Specifies the maximum number of packets to queue while waiting for ARP responses.

Values:
Default: 12
Range: 1 to MAXSHORT
Type: Dynamic

Diagnosis:
N/A

Tuning This parameter is supported by Ethernet, 802.3, Token-Ring and FDDI interfaces. This parameter applies to AIX 4.1.5, AIX 4.2.1 and later

Refer To:
ARP cache tuning
arpt_killc

**Purpose:**
Specifies the time in minutes before a complete ARP entry will be deleted.

**Values:**
- Default: 20
- Range: 0 to 255
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning:** To reduce ARP activity in a stable network, you can increase **arpt_killc**.

**Refer To:**
- ARP cache tuning

arptab_bsiz

**Purpose:**
Specifies Address Resolution Protocol (ARP) table bucket size.

**Values:**
- Default: 7
- Range: 1 to MAXSHORT
- Type: Reboot

**Diagnosis:**
**netstat -p arp** will show the number of ARP packets sent and the number of ARP entries purged from the ARP table. If large number of entries are being purged, the ARP table size should be increased. Use **arp -a** to show the ARP table hashing distribution.

**Tuning**
N/A

**Refer To:**
- ARP cache tuning

arptab_nb

**Purpose:**
Specifies the number of ARP table buckets.

**Values:**
- Default: 149
- Range: 1 to MAXSHORT
- Type: Reboot

**Diagnosis:**
**netstat -p arp** will show the number of ARP packets sent and the number of ARP entries purged from the ARP table. If large number of entries are being purged, the ARP table size should be increased. Use **arp -a** to show the ARP table hashing distribution.

**Tuning**
Increase this value for systems that have a large number of clients or servers. The default provides for 149 x 7 = 1043 ARP entries, but assumes an even hash distribution.

**Refer To:**
- ARP cache tuning
bcastping

Purpose:
Allows response to ICMP echo packets to the broadcast address.

Values:
Default: 0 (off)
Range: 0 or 1
Type: Dynamic

Diagnosis:
N/A

Tuning
The default is to not respond to echo packets to a broadcast address. This prevents "broadcast storms" on the network that can result when multiple machines respond to a broadcast address.

clean_partial_conns

Purpose:
Specifies whether or not SYN (synchronizes the sequence number) attacks are being avoided.

Values:
Default: 0 (off)
Range: 0 or 1
Type: Dynamic

Diagnosis:
N/A

Tuning
This option should be turned on for servers that need to protect against network attacks. If on, randomly removes partial connections to make room for new non-attack connections.

delayack

Purpose:
Delays acknowledgements (ACK) for certain TCP packets and attempts to piggyback them with the next packet sent instead.

Values:
Default: 0
Range: 0 to 3
Type: Dynamic

Diagnosis:
N/A

Tuning
This action will only be performed for connections whose destination port is specified in the list of the delayackports parameter. This can be used to increase performance when communicating with an HTTP server by reducing the total number of packets sent. The parameter can have one of four values:

0 No delays; normal operation
1 Delay the ACK for the server’s SYN (Synchronizes the sequence numbers)
2 Delay the ACK for the server’s FIN (Sender has reached the end of its byte stream)
3 Delay both the ACKs for the SYN and FIN.
delayackports

Purpose:
Specifies the list of destination ports for which the operation defined by the delayack port option will be performed.

Values:
Default: {}
Range: List of port numbers (maximum 10)
Type: Dynamic

Diagnosis:
N/A

Tuning
The parameter takes a list of up to ten ports, separated by commas and enclosed in curly braces. For example:
no -o delayackports={80,30080}

To clear the list, set the option to {}.

dgd_packets_lost

Purpose:
Specifies how many consecutive packets must be lost before Dead Gateway Detection decides that a gateway is down.

Values:
Default: 3
Range: 1 to MAXSHORT
Type: Dynamic

Diagnosis:
N/A

Tuning
N/A

dgd_ping_time

Purpose:
Specifies how many seconds should pass between pings of a gateway by Active Dead Gateway Detection.

Values:
Default: 5
Range: 1 to MAXINT
Type: Dynamic

Diagnosis:
N/A

Tuning
N/A

dgd_retry_time

Purpose:
Specifies how many minutes a route's cost should remain raised when it has been raised by Passive Dead Gateway Detection. After this many minutes pass, the route's cost is restored to its user-configured value.

Values:
Default: 5
Range: 1 to MAXSHORT
Type: Dynamic

Diagnosis:
N/A

Tuning
N/A
directed_broadcast

**Purpose:**
Specifies whether to allow a directed broadcast to a gateway.

**Values:**
Default: 0 (off)
Range: 0 or 1
Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
The value of 1 allows packets to be directed to a gateway to be broadcast on a network on the other side of the gateway.

extendednetstats

**Purpose:**
Enables more extensive statistics for network memory services.

**Values:**
Default: 0 (off)
Range: 0 or 1
Type: Reboot

**Diagnosis:**
N/A

**Tuning**
The default for this parameter is 0, for off, because these extra statistics cause a reduction in system performance on SMP systems.

fasttimo

**Purpose:**
Allows you to set the millisecond delay for the TCP fast timeout timer. This timeout controls how often the system scans the TCP control blocks to send delayed acknowledgments.

**Values:**
Default: 200
Range: 50 to 200 milliseconds
Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
Reducing this timer value may improve performance with some non-IBM systems. However, this may also result in slightly increased system utilization.

icmp6_errmsg_rate

**Purpose:**
Specifies the upper limit for the number of ICMP v6 error messages that can be sent per second. This prevents excessive bandwidth being used by ICMP v6 error messages.

**Values:**
Default: 10 msg/sec
Range: 1 to 255
Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
N/A
icmpaddressmask

Purpose:
Specifies whether the system responds to an ICMP address mask request.

Values:
Default: 0 (off)
Range: 0 or 1
Type: Dynamic

Diagnosis:
N/A

Tuning
If the default value 0 is set, the network silently ignores any ICMP address mask request that it receives.

ie5_old_multicast_mapping

Purpose:
Specifies IP multicasts on Token-Ring should be mapped to the broadcast address rather than a functional address when value 1 is used.

Values:
Default: 0 (off)
Range: 0 or 1
Type: Dynamic

Diagnosis:
N/A

Tuning
N/A

ifsize

Purpose:
Specifies the maximum number of network interface structures per interface of a single type (e.g. Ethernet). This limit does not apply to ethernet interface structures for which the infrastructure expands dynamically to handle any number of ethernet interface structures.

Values:
Default: 256
Range: 8 to 1024
Type: Reboot

Diagnosis:
N/A

Tuning
The ifsize needs to be large on machines that support hotplug adapters and on DLPAR configurations because adapters can be added on the fly and the static interface tables must be large enough to accept the worst case number of adapters that may be added for this system or partition. If the system detects at boot time that more adapters of a type are present that would be allowed by the current value of ifsize, it will automatically increase the value to support the number of adapters present.

Refer To:
N/A
inet_stack_size

Purpose:
Specifies size of inet interrupt stack table in kilobytes.

Values:
Default: 16
Range: 1 to MAXSHORT
Type: Reboot

Diagnosis:
N/A

Tuning
This is needed if you were running with unoptimized debug kernel or the
netinet kernel extension. This is different from the pin more stack code
(which is not configurable) because this is on interrupt. This parameter
only needs to be changed if there is a system panic due to interrupt stack
overflow.

ip_nfrag

Purpose:
Specifies whether or not IP fragmentation attacks are avoided.

Values:
Default: 200
Range: 1 to MAXSHORT
Type: Dynamic

Diagnosis:
N/A

Tuning:
Specifies the maximum number of fragments of an IP packet that can be
kept in the IP reassembly queue at a time. The default value of 200 keeps
up to 200 fragments of an IP packet in the IP reassembly queue.

ipforwarding

Purpose:
Specifies whether the kernel should forward packets.

Values:
Default: 0 (off)
Range: 0 or 1
Type: Dynamic

Diagnosis:
N/A

Tuning
Set this parameter to 1, if the system is acting as an IP router.

Refer To:
traceroute command

ipfragttl

Purpose:
Specifies the time to live for IP fragments in half-seconds.

Values:
Default: 60
Range: 60 to 255
Type: Dynamic

Diagnosis:
Fragments dropped after timeout (netstat -p ip).

Tuning
If value of IP: fragments dropped after timeout is nonzero, increasing
ipfragttl may reduce retransmissions.
ipignoreredirects

Purpose:
Specifies whether to process redirects that are received.

Values:
Default: 0 (does redirects)
Range: 0 or 1 (1 ignores redirects)
Type: Dynamic

Diagnosis:
N/A

Tuning
This option only applies to AIX 4.2.1 or later.

ipqmaxlen

Purpose:
Specifies the number of received packets that can be queued on the IP protocol input queue.

Values:
Default: 100
Range: 100 to MAXINT
Type: Reboot

Diagnosis:
Examine `ipintrq` overflows (`netstat -s`) or use crash to access IP input queue overflow counter.

Tuning
Increase size if system is using a lot of loopback sessions. Most operating system network drivers call IP directly and do not use the IP queue. On these devices increasing ipqmaxlen has no effect.

Refer To:
N/A

ipsendredirects

Purpose:
Specifies whether the kernel should send redirect signals.

Values:
Default: 1 (send redirects)
Range: 0 (do not send redirects) or 1
Type: Dynamic

Diagnosis:
N/A

Tuning
This is a configuration decision with performance consequences.

ipsrcreuteforward

Purpose:
Specifies whether the system forwards source-routed packets.

Values:
Default: 1 (on)
Range: 0 or 1
Type: Dynamic

Diagnosis:
N/A

Tuning
The default value of 1 allows the forwarding of source-routed packets. A value of 0 causes all source-routed packets that are not at their destinations to be discarded. This parameter only applies to AIX 4.2.1 or later.
ipsrcrecv

Purpose:
Specifies whether the system accepts source-routed packets.

Values:
Default: 0 (off)
Range: 0 or 1
Type: Dynamic

Diagnosis:
N/A

Tuning
The default value of 0 causes all source-routed packets destined for this system to be discarded. A value of 1 allows source-routed packets to be received. This parameter only applies to AIX 4.2.1 or later.

ipsrcroutesend

Purpose:
Specifies whether applications can send source-routed packets.

Values:
Default: 1 (on)
Range: 0 or 1
Type: Dynamic

Diagnosis:
N/A

Tuning
The default value of 1 allows source-routed packets to be sent. A value of 0 causes setsockopt() to return an error if an application attempts to set the source routing option, and removes any source routing options from outgoing packets. This parameter only applies to AIX 4.2.1 or later.

ip6_defttl

Purpose:
Specifies the default hop count that is used for Internet Protocol Version 6 (IPv6) packets if no other hop count is specified.

Values:
Default: 64
Range: 1 to 255
Type: Dynamic

Diagnosis:
N/A

Tuning
N/A

ip6_prune

Purpose:
Specifies how often to check the IPv6 routing table for expired routes in seconds.

Values:
Default: 1
Range: 1 to MAXINT
Type: Dynamic

Diagnosis:
N/A

Tuning
N/A
ip6forwarding

**Purpose:**
Specifies whether the kernel should forward IPv6 packets.

**Values:**
- Default: 0 (off)
- Range: 0 or 1
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
The default value of 0 prevents forwarding of IPv6 packets when they are not for the local systems. A value of 1 enables forwarding.

ip6srcrouteforward

**Purpose:**
Specifies whether the system forwards source-routed IPv6 packets.

**Values:**
- Default: 1 (on)
- Range: 0 or 1
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
The default value of 1 allows the forwarding of source-routed packets. A value of 0 causes all source-routed packets that are not at their destinations to be discarded.

llsleep_timeout

**Purpose:**
Specifies timeout value in seconds for link local timeouts (used when multi_homed=1)

**Values:**
- Default: 3
- Range: 1 to MAXINT
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
N/A

lo_perf

**Purpose:**
Improves performance over loopback by creating multiple handler structures for offlevel interrupt processing.

**Note:** This parameter is not available in AIX 5.3 or later.

**Values:**
- Default: 1 (on)
- Range: 0 or 1
- Type: Reboot

**Diagnosis:**
N/A

**Tuning**
This option creates an array of off-level handlers along with an array of ipintrqs, which holds packets based on a hash function applied to them. A value of 0 causes loopback processing routines to use one off-level interrupt handler along with one ipintrq. This option only applies to AIX 5.2 or later.
main_if6

**Purpose:**
Specifies the interface to use for link local addresses. This is only used by `autoconf6` to set up initial routes.

**Values:**
- Default: 0
- Range: 0 or 1
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
N/A

main_site6

**Purpose:**
Specifies the interface to use for site local address routing. This is only used if `multi_homed` is set to 3

**Values:**
- Default: 0
- Range: 0 or 1
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
N/A

maxnip6q

**Purpose:**
Specifies the maximum number of IPv6 packet-reassembly queues.

**Values:**
- Default: 20
- Range: 1 to MAXSHORT
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
N/A

maxttl

**Purpose:**
Specifies the time to live for Routing Information Protocol (RIP) packets in seconds.

**Values:**
- Default: 255
- Range: 1 to 255
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
N/A
mpr_policy

Purpose:
Specifies the global routing policy used in conjunction with Multipath Routing. Available routing policies are:

- Weighted Round-Robin (1) - Based on user-configured weights assigned to the multiple routes (through the route command) round-robin is applied. If no weights are configured then it behaves identical to plain round-robin.
- Random (2) - Chooses a route at random.
- Weighted Random (3) - Chooses a route based on user-configured weights and a randomization routine. The policy adds up the weights of all the routes and pick a random number between 0 and total weight. Each of the individual weights are removed from the total weight, until this number is zero. This picks a route in the range of the total number of routes available.
- Lowest Utilization (4) - Chooses a route with the minimum number of current connections going through it.
- Hash-based (5) - Hash-based algorithm chooses a route by hashing based on the destination IP address.

Values:
Default: 1
Range: 1 to 5
Type: Dynamic

Diagnosis: N/A
Tuning N/A

multi_homed

Purpose:
Specifies the level of multi-homed IPv6 host support.

Values:
Default: 1
Range: 0 to 3
Type: Dynamic

Diagnosis: N/A
Tuning: This will only be performed for connections whose destination port is specified in the list of the delayackports parameter. This can be used to increase performance when communicating with an HTTP server. The parameter can have one of four values:

0 - Indicates the original functionality in AIX 4.3.
1 - Indicates that link local addresses will be resolved by querying each interface for the link local address.
2 - Indicates that link local addresses will only be examined for the interface defined by main_if6.
3 - Indicates that link local addresses will only be examined for the interface defined by main_if6, and site local addresses will only be routed for the main_site6 interface.
nbc_limit

**Purpose:**
Specifies the total maximum amount of memory that can be used for the Network Buffer Cache (NBC) in Kbytes.

**Values:**
- Default: derived from **thewall**
- Range: 0 to MAXINT
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
When the cache grows to this limit, the least-used caches are flushed out of cache to make room for the new ones. This parameter only applies to AIX 4.3.2 or later. NBC is only used by the `send_file()` API and some Web servers that use the get engine in the kernel.

nbc_max_cache

**Purpose:**
Specifies the maximum size of the cache object allowed in the Network Buffer Cache (NBC) in bytes.

**Values:**
- Default: 131072 (128K) if **nbc_limit** is not zero, otherwise 0
- Range: 1 to MAXINT
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
Data object bigger than this size is not be put in the NBC. This parameter only applies to AIX 4.3.2 or later. NBC is only used by the `send_file()` API and some Web servers that use the get engine in the kernel.

nbc_min_cache

**Purpose:**
Specifies the minimum size of the cache object allowed in the Network Buffer Cache (NBC) in bytes.

**Values:**
- Default: 1 byte if **nbc_limit** is not zero, otherwise 0
- Range: 1 to 131072 (128K)
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
Data object smaller than this size is not be put in the NBC. This parameter only applies to Version 4.3.2 or later. NBC is only used by the `send_file()` API and some Web servers that use the get engine in the kernel.
**Purpose:**
Specifies the size of the hash table (number of slots) used for hashing cache objects in the Network Buffer Cache. This hash table size applies to only opened file entries, that is, entries that cache files from the filesystem. Since this attribute resizes the hash table size and affects the hashing of all existing entries, it can only be modified when the Network Buffer Cache is empty. If the Network Buffer Cache is not empty, this option will return an error.

**Values:**
- Default: 12841
- Range: 1 to MAXINT
- Type: Dynamic

**Tuning:**
Hash table sizes are generally chosen to be prime as this results in a more even distribution of hash table entries.

**Purpose:**
Specifies the maximum number of private segments that can be created for the Network Buffer Cache (NBC).

**Values:**
- Default: 0
- Range: 0 to MAXINT
- Type: Dynamic

**Tuning:**
When this option is set to a nonzero value, data objects with size between the size specified in *nbc_max_cache* and the segment size (256 MB) will be cached in a private segment. Data objects bigger than the segment size will not be cached at all. When this many private segments exist in NBC, cache data in private segments may be flushed for new cache data so the number of private segments will not exceed the limit. When this option is set to 0, all cache in private segments will be flushed.

**Purpose:**
Specifies the maximum total cached data size (KB) allowed in private segments in the Network Buffer Cache (NBC).

**Values:**
- Default: 1/2 of RAM on the running system
- Range: 0 to MAXINT
- Type: Dynamic

**Tuning:**
Because data cached in private segments will be pinned by the Network Buffer Cache, this option provides a control on the amount of pinned memory used for Network Buffer Cache in addition to the network buffers in global segments. When this limit is met, cache data in private segments may be flushed for new cache data so the total pinned memory size will not exceed the limit. When this option is set to 0, all cache in private segments will be flushed.
ndd_event_name

Purpose:
Specifies the list of interface name for ns_alloc and ns_free event to be captured. This is a debug option (not normally enabled) that tunes device driver tracing.

Values:
Default: {all}
Range: string of 127 char maximum representing a list of interface name (up to 16). The string must begin with a { and terminate with a }. The list separator character is : (colon).
Type: Dynamic

Diagnosis:
N/A

Tuning
If the string is different than {all}, only ns_alloc events concerning those names will be captured.

ndd_event_tracing

Purpose:
Specifies the size of the ns_alloc and ns_free trace buffers. This is a debug option (not normally enabled) that tunes device driver tracing.

Values:
Default: 0
Range: 0 to MAXINT
Type: Dynamic

Diagnosis:
N/A

Tuning
If the value of this variable is non-zero, all ns_alloc and ns_free events will be traced in a kernel buffer. Enable this parameter only when investigating ndd reference problems, because performance is affected negatively when turned on. The default value is zero (tracing off). Values of ndd_event_tracing larger than 1024 will allocate as many items in the kernel buffer for tracing.

ndp_mmaxtries

Purpose:
Specifies the maximum number of Multicast NDP packets to send.

Values:
Default: 3
Range: 0 to MAXINT
Type: Dynamic

Diagnosis:
N/A

Tuning
N/A

ndp_umaxtries

Purpose:
Specifies the maximum number of Unicast NDP packets to send.

Values:
Default: 3
Range: 0 to MAXINT
Type: Dynamic

Diagnosis:
N/A

Tuning
N/A
**ndpqsize**

**Purpose:**
Specifies the number of packets to hold waiting on completion of a Neighbor Discovery Protocol (NDP) entry (used by MTU Path Discovery).

**Values:**
- Default: 50
- Range: 1 to MAXSHORT
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
N/A

**ndpt_down**

**Purpose:**
Specifies the time, in half-seconds, to hold down a Neighbor Discovery Protocol (NDP) entry. This network option is obsolete in AIX 5.2 and later versions.

**Values:**
- Default: 3 (1.5 seconds)
- Range: 1 to MAXINT
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
N/A

**ndpt_keep**

**Purpose:**
Specifies the time, in half seconds, to keep a Neighbor Discovery Protocol (NDP) entry.

**Values:**
- Default: 120 (60 seconds)
- Range: 1 to MAXINT
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
N/A

**ndpt_probe**

**Purpose:**
Specifies the time, in half-seconds, to delay before sending the first Neighbor Discovery Protocol (NDP) probe.

**Values:**
- Default: 5 (2.5 seconds)
- Range: 1 to MAXINT
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
N/A
ndpt_reachable

**Purpose:**
Specifies the time, in half-seconds, to test if a Neighbor Discovery Protocol (NDP) entry is still valid.

**Values:**
- Default: 30 (15 seconds)
- Range: 1 to MAXINT
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
N/A

ndpt_retrans

**Purpose:**
Specifies the time, in half-seconds, to wait before retransmitting a Neighbor Discovery Protocol (NDP) request.

**Values:**
- Default: 1 (half a second)
- Range: 1 to MAXINT
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
N/A

net_buf_size

**Purpose:**
Specifies a list of buffer sizes for net_malloc/free event to be captured. This is a debug option (not normally enabled) that controls which size buffers are traced by the `net_malloc_policy` option.

**Values:**
- Default: 0
- Range: String of 127 character maximum representing a list (up to 16) of size. The string must begin with a `{` and terminate with a `}`. The list separator character is `:` (colon).
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
If the string is different than `{all}`, only `net_malloc` event of those sizes will be captured.

net_buf_type

**Purpose:**
Specifies the buffer type for net_malloc/free event to be captured. This is a debug option (not normally enabled) that controls which buffer types are traced by the `net_malloc_policy` option.

**Values:**
- Default: `{all}
- Range: String of 127 character maximum representing a list of type. The string must begin with a `{` and terminate with a `}`. The list separator character is `:` (colon).
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
If the string is different than `{all}`, only `net_malloc` events of that type will be captured.
net_malloc_police

Purpose:
Specifies the size of the net_malloc and net_free trace buffers.

Attention: This is a system debug option and should be used only when instructed to by IBM service and support. Setting this option to any non-zero value will impact system performance.

Values:
- Default: 0
- Range: 0 to MAXINT
- Type: Dynamic

nonlocsrcroute

Purpose:
Tells the Internet Protocol that strictly source-routed packets may be addressed to hosts outside the local network.

Values:
- Default: 0
- Range: 0 or 1
- Type: Dynamic

passive_dgd

Purpose:
Specifies whether Passive Dead Gateway Detection is enabled. A value of 0 turns it off, and a value of 1 enables it for all gateways in use.

Values:
- Default: 0
- Range: 0 or 1
- Type: Dynamic

Diagnosis: N/A
Tuning N/A
**pmtu_default_age**

**Purpose:**
Specifies the default amount of time (in minutes) before the path MTU value for UDP paths is checked for a lower value.

**Values:**
- Default: 10
- Range: 0 to MAXSHORT
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning:**
A value of zero allows no aging. The default value is 10 minutes. The `pmtu_default_age` value can be overridden by UDP applications. `pmtu_default_age` is a runtime attribute. On AIX 5.3, this option is unused as UDP applications will have to set the `IP_DONTFRAG` socket option to detect decreases in the Path MTU.

**pmtu_expire**

**Purpose:**
Specifies the default amount of time (in minutes) before which the unused path MTU entries are deleted.

**Values:**
- Default: 10
- Range: 0 to MAXSHORT
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning:**
A value of 0 means the PMTU entries do not expire. The default value is 10 minutes. This attribute only applies to AIX 5.3 or later. `pmtu_expire` is a runtime attribute.

**pmtu_rediscover_interval**

**Purpose:**
Specifies the default amount of time (in minutes) before the path MTU value for UDP and TCP paths are checked for a higher value.

**Values:**
- Default: 30
- Range: 0 to MAXSHORT
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning:**
A value of 0 allows no path MTU rediscovery. The default value is 30 minutes.
rfc1122addrchk

Purpose:
Performs address validation as specified by RFC1122 (Requirements for Internet Hosts-Communication Layers).

Values:
Default: 0 (off)
Range: 0 or 1
Type: Dynamic

Diagnosis:
N/A

Tuning
The default value of 0 does not perform address validation. A value of 1 performs address validation.

rfc1323

Purpose:
Enables window scaling and timestamps as specified by RFC 1323 (TCP Extensions for High Performance). Window scaling allows the TCP window sizes (tcp_recvspace and tcp_sendspace) to be larger than 64KB (65536) and is typically used for large MTU networks.

Values:
Default: 0 (off)
Range: 0 or 1
Type: Connect

Diagnosis:
N/A

Tuning
The default value of 0 disables the RFC enhancements on a systemwide scale. A value of 1 specifies that all TCP connections will attempt to negotiate the RFC enhancements. The SOCKETS application can override the default behavior on individual TCP connections, using the setsockopt subroutine. Make changes before attempting to set tcp_sendspace and tcp_recvspace to more than 64 KB.

Refer to:
TCP workload tuning

rfc2414

Purpose:
Enables the increasing of TCP's initial window as described in RFC 2414. When it is on, the initial window will depend on the setting of the tunable tcp_init_window.

Values:
Default: 1 (on)
Range: 0 or 1 (on)
Type: Connect

Diagnosis:
N/A

Tuning
N/A
route_expire

**Purpose:**
Specifies whether unused routes created by cloning, or created and modified by redirects expire.

**Values:**
- Default: 1 (on)
- Range: 0 or 1
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
A value of 1 allows route expiration, which is the default. Negative values are not allowed for this option.

routeresvalidate

**Purpose:**
Specifies that each connection's cached route should be revalidated each time a new route is added to the routing table. This will ensure that applications that keep the same connection open for long periods of time (for example, NFS) use the correct route after routing-table changes occur.

**Values:**
- Default: 0 (off)
- Range: 0 or 1
- Type: Dynamic

**Diagnosis:**
If there is communication loss between HACMP™ nodes or between NFS client and server, routes may have been changed but the values in the cache are being used.

**Tuning**
The default value of 0 does not revalidate the cached routes. Turning on this option may cause some performance degradation. Value should be set to 1 for HACMP.

rto_high

**Purpose:**
Specifies the TCP Retransmit Time Out high value used in calculating factors and the maximum retransmits allowable used in TCP data segment retransmits. \texttt{rto\_high} is the high factor. Its value should be an even number. If \texttt{rto\_high} is set to an odd number, its value will default to 64. Default value 64. \texttt{rto\_high} is a loadtime attribute.

**Values:**
- Default: 64
- Range: 2 to MAXINT
- Type: Reboot

**Diagnosis:**
N/A

**Tuning**
The \texttt{rto\_high} parameter is the high factor.
rto_length

**Purpose:**
Specifies the TCP Retransmit timeout length value used in calculating factors and the maximum retransmittals allowable used in TCP data segment retransmittals.

**Values:**
- Default: 13
- Range: 1 to 64
- Type: Reboot

**Diagnosis:**
N/A

**Tuning**
The `rto_length` parameter is the total number of time segments.

---

rto_limit

**Purpose:**
Specifies the TCP Retransmit timeout limit value used in calculating factors and the maximum retransmittals allowable used in TCP data segment retransmittals.

**Values:**
- Default: 7
- Range: 1 to 64
- Type: Reboot

**Diagnosis:**
N/A

**Tuning**
The `rto_limit` parameter is the number of time segments from `rto_low` to `rto_high`.

---

rto_low

**Purpose:**
Specifies the TCP Retransmit Time Out low value used in calculating factors and the maximum retransmits allowable used in TCP data segment retransmits. `rto_low` is the low factor. Its value should be 1 or an even number. If `rto_low` is set to an odd number, its value will default to 1. The default value 1. `rto_low` is a loadtime attribute.

**Values:**
- Default: 1
- Range: 1 to 64
- Type: Reboot

**Diagnosis:**
N/A

**Tuning**
The `rto_low` parameter is the low factor.
sack (AIX 4.3.3 and later)

**Purpose:**
Specifies if Selective Acknowledgment is on.

**Values:**
- Default: 0 (off)
- Range: 0 or 1
- Type: Connect

**Diagnosis:**
N/A

**Tuning**
Normal TCP has to retransmit all packets after a dropped packet. With large window sizes, this can result in lost performance if many packets are dropped. Selective Ack enables code to selectively retransmit the lost packet(s). If there are a lot of retransmits of fragments and the receive buffer sizes are large, then it might be beneficial to turn this parameter on. This is a TCP negotiated option, so it must be supported on both endpoints before it will be used.

sb_max

**Purpose:**
Specifies the maximum buffer size allowed for a TCP and UDP socket. Limits `setsockopt`, `udp_sendspace`, `udp_recvspace`, `tcp_sendspace`, and `tcp_recvspace`.

**Values:**
- Default: 1048576 bytes
- Range: 1 to MAXINT
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
Increase size, preferably to multiple of 4096. Should be approximately two to four times the largest socket buffer limit.

Refer to:
TCP streaming workload tuning

send_file_duration

**Purpose:**
Specifies the cache validation duration for all the file objects that the `send_file` system call accessed in the Network Buffer Cache (in seconds).

**Values:**
- Default: 300 (5 minutes)
- Range: 0 to MAXINT
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
A value of 0 means that the cache will be validated for every access. This parameter only applies to AIX 4.3.2 or later.
site6_index

Purpose:
Specifies the maximum interface number for site local routing.

Values:
Default: 0
Range: 0 to MAXSHORT
Type: Dynamic

Diagnosis:
N/A

Tuning
N/A

sockthresh

Purpose:
Specifies the maximum amount of network memory that can be allocated for sockets. Used to prevent new sockets or TCP connections from exhausting all MBUF memory and reserve the remaining memory for the existing sockets or TCP connections.

Values:
Default: 85 percent
Range: 0 to 100
Type: Dynamic

Diagnosis:
N/A

Tuning
When the total amount of memory allocated by the net_malloc subroutine reaches this threshold, the socket and socketpair system calls fail with an error of ENOBUFS. Incoming connection requests are silently discarded. Existing sockets can continue to use additional memory. The sockthresh parameter represents a percentage of the thewall parameter, with possible values of 1 to 100 and a default of 85.

Refer to:
Tuning mbuf pool performance

sodebug

Purpose:
Specifies whether the newly created sockets will have SO_DEBUG flag on.

Values:
Default: 0 (no)
Range: 0 or 1 (yes)
Type: Connect

Diagnosis:
N/A

Tuning
N/A
sodebug_env

**Purpose:**
Specifies whether the SODEBUG process environment variable is checked for the newly created sockets.

**Values:**
- Default: 0 (no)
- Range: 0 or 1 (yes)
- Type: Connect

**Diagnosis:**
N/A

**Tuning:**
N/A

---

somaxconn

**Purpose:**
Specifies the maximum listen backlog.

**Values:**
- Default: 1024 connections
- Range: 0 to MAXSHORT
- Type: Connect

**Diagnosis:**
N/A

**Tuning:**
Increase this parameter on busy Web servers to handle peak connection rates.

---

subnetsarelocal

**Purpose:**
Specifies whether all subnets that match the subnet mask are to be considered local for purposes of establishing, for example, the TCP maximum segment size.

**Values:**
- Default: 1 (yes)
- Range: 0 or 1
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
This parameter is used by the `in_localaddress` subroutine. The default value of 1 specifies that addresses that match the local network mask are local. If the value is 0, only addresses matching the local subnetwork are local. This is a configuration decision with performance consequences. If the subnets do not all have the same MTU, fragmentation at bridges may degrade performance. If the subnets do have the same MTU, and `subnetsarelocal` is 0, TCP sessions may use an unnecessarily small MSS.

**Refer to:**
- [TCP Maximum Segment Size tuning](#)
**tcp_bad_port_limit**

**Purpose:**
Specifies the number of TCP packets to a port with no socket that can be received in a 500 millisecond period before TCP stops sending resets in response to such packets. When it is set as its default value 0, resets will always be sent when TCP packets are received for a bad port number.

**Values:**
- Default: 0
- Range: 0 to MAXINT
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning:**
N/A

**tcp_ecn**

**Purpose:**
Enables TCP level support for Explicit Congestion Notification as described in RFC 2481. Default is off (0). Turning it on (1) will make all connections negotiate ECN capability with the peer. For this feature to work you need support from the peer TCP and also IP level ECN support from the routers in the path.

**Values:**
- Default: 0 (off)
- Range: 0 or 1 (on)
- Type: Connect

**Diagnosis:**
N/A

**Tuning:**
N/A

**tcp_ephemeral_high**

**Purpose:**
Specifies the largest port number to allocate for TCP ephemeral ports.

**Values:**
- Default: 65535
- Range: 32769 to 65535
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning:**
The number of ephemeral sockets is determined by `tcp_ephemeral_high` minus `tcp_ephemeral_low`. For maximum number of ephemeral sockets, set `tcp_ephemeral_high` to 65535 and `tcp_ephemeral_low` to 1024.

**tcp_ephemeral_low**

**Purpose:**
Specifies the smallest port number to allocate for TCP ephemeral ports.

**Values:**
- Default: 32768
- Range: 1024 to 65534
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning:**
The number of ephemeral sockets is determined by `tcp_ephemeral_high` minus `tcp_ephemeral_low`. For maximum number of ephemeral sockets, set `tcp_ephemeral_high` to 65535 and `tcp_ephemeral_low` to 1024.
tcp_finwait2

**Purpose:** Specifies the length of time to wait in the FIN_WAIT2 state before closing the connection, measured in half seconds.

**Values:**
- Default: 1200 half-seconds (600 seconds or 10 minutes)
- Range: 0 to USHORTEX
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning:**
N/A

tcp_icmpsecure

**Purpose:** Specifies whether or not ICMP (Internet Control Message Protocol) attacks on TCP are avoided.

**Values:**
- Default: 0 (off)
- Range: 0 or 1
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning:**
This option should be turned on to protect TCP connections against ICMP attacks. The ICMP attacks may be of the form of ICMP source quench attacks and PMTUD (Path MTU Discovery) attacks. If this network option is turned on, the system does not react to ICMP source quench messages. This will protect against ICMP source quench attacks. Also, if this network option is enabled, the payload of the ICMP message is tested to determine if the sequence number of the TCP header portion of the payload is within the range of acceptable sequence numbers. This will mitigate PMTUD attacks to a large extent.

tcp_init_window

**Purpose:** This value is used only when rfc2414 is turned on (ignored otherwise). If rfc2414 is on and this value is zero, then the initial window computation is done according to rfc2414. If this value is non-zero, the initial (congestion) window is initialized a number of maximum sized segments equal to tcp_init_window.

**Values:**
- Default: 0
- Range: 0 to MAXSHORT
- Type: Connect

**Diagnosis:**
N/A

**Tuning** Changing tcp_init_window allows you to tune the “TCP slow start” to control the number of TCP segments (packets) outstanding before an ACK is received. For example, setting this value to 6 would allow 6 packets to be sent initially, instead of the normal 2 or 3 packets, thus speeding up the initial packet rate.
**tcp_inpcb_hashtab**

**Purpose:** Specifies the size of the **inpcb** hash table for TCP connections. This table holds the inpcs required for connection management and is implemented as a table of hash chains. A large table means that the linked hash chains will be small and lower the traversal time on average, but the memory footprint will be larger.

**Values:**
- Default: 24999
- Range: 1 to 999999
- Type: Reboot

**Diagnosis:** N/A

**Tuning:** This option impacts performance and should be used with extreme caution. Please consult a performance analyst in case the value needs to be changed. The execution environment could have an influence on the value. It is strongly encouraged to maintain the system-defined defaults, because they tend to execute optimally in most environments.

**tcp_keepcnt**

**Purpose:** Represents the number of keepalive probes that could be sent before terminating the connection.

**Values:**
- Default: 8
- Range: 0 to MAXINT
- Type: Dynamic

**Diagnosis:** N/A

**Tuning**

**tcp_keepidle**

**Purpose:** Specifies the length of time to keep an idle TCP connection active, measured in half-seconds.

**Values:**
- Default: 14400 (2 hours)
- Range: 1 to MAXINT
- Type: Connect

**Diagnosis:** N/A

**Tuning** This is a configuration decision with minimal performance consequences. No change is recommended.

**tcp_keepinit**

**Purpose:** Sets the initial timeout value for a TCP connection in half-seconds.

**Values:**
- Default: 150 (75 seconds)
- Range: 1 to MAXINT
- Type: Dynamic

**Diagnosis:** N/A

**Tuning** N/A
tcp_keepintvl

**Purpose:**
Specifies the interval, measured in half-seconds, between packets sent to validate the TCP connection.

**Values:**
- Default: 150 (75 seconds)
- Range: 1 to MAXSHORT
- Type: Connect

**Diagnosis:**
N/A

**Tuning**
This is a configuration decision with minimal performance consequences. No change is recommended. If the interval were shortened significantly, processing and bandwidth costs might become significant.

tcp_limited_transmit

**Purpose:**
Enables the feature that enhances TCP’s loss recovery as described in the RFC 3042.

**Values:**
- Default: 1 (on)
- Range: 0 or 1
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
N/A

tcp_low_rto

**Purpose:**
Specifies the RTO (in milliseconds) for all TCP connections that begin to experience packet drops.

**Values:**
- Default: 3 (seconds)
- Range: 0-3000 (milliseconds)
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
The value set should be equal to or a multiple of 10 times the `timer_wheel_tick` value. The current value must be a non-zero value before setting the `tcp_low_rto` option.

tcp_maxburst

**Purpose:**
Specifies the number of back-to-back packets that TCP can send before pausing to allow those packets to be forwarded to their destination. This can be useful if routers are unable to handle large bursts of TCP packets and are dropping some of them. A value of 0 means no limitation for back-to-back packets before pausing.

**Values:**
- Default: 0
- Range: 0 to MAXSHORT
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
N/A
tcp_mssdflt

Purpose:
Default maximum segment size used in communicating with remote networks.

Values:
Default: 1460 bytes
Range: 1 to 1460
Type: Connect

Diagnosis:
N/A

Tuning
For AIX 4.2.1 or later, tcp_mssdflt is only used if path MTU discovery is not enabled or path MTU discovery fails to discover a path MTU. Limiting data to (MTU - 40) bytes ensures that, where possible, only full packets will be sent.

Refer to:
TCP Maximum Segment Size tuning

tcp_nagle_limit

Purpose:
This is the Nagle Algorithm threshold in bytes which can be used to disable Nagle.

Values:
Default: 65535 - maximum size of IP packet
Range: 0 to 65535
Type: Dynamic

Diagnosis:
N/A

Tuning
The default (65535 - the maximum size of IP packet) is Nagle turned on. To disable Nagle, set this value to 0 or 1. TCP disables Nagle for data segments larger than or equal to this threshold value.

tcp_ndebug

Purpose:
Specifies the number of tcp_debug structures.

Values:
Default: 100
Range: 0 to MAXSHORT
Type: Dynamic

Diagnosis:
N/A

Tuning
N/A
tcp_newreno

**Purpose:** Enables the modification to TCP’s Fast Recovery algorithm as described in RFC 2582. This fixes the limitation of TCP’s Fast Retransmit algorithm to recover fast from dropped packets when multiple packets in a window are dropped. sack also achieves the same thing but sack needs support from both ends of the TCP connection; the NewReno modification is only on the sender side.

**Values:**
- Default: 1 (on)
- Range: 0 or 1
- Type: Dynamic

**Diagnosis:**
- N/A

**Tuning**
- N/A

---

tcp_nodelayack

**Purpose:** Turning this parameter on causes TCP to send immediate acknowledgement (Ack) packets to the sender. When tcp_nodelayack is off, TCP delays sending Ack packets by up to 200ms. This allows the Ack to be piggy-backed onto a response and minimizes system overhead.

**Values:**
- Default: 0 (off)
- Range: 0 or 1
- Type: Dynamic

**Diagnosis:**
- N/A

**Tuning**
- This option can be used to overcome bugs in other implementations of the TCP nagle algorithm. Setting this option to 1 will cause slightly more system overhead, but can result in much higher performance for network transfers if the sender is waiting on the receiver’s acknowledgment.

---

tcp_pmtu_discover

**Purpose:** Enables or disables path MTU discovery for TCP applications.

**Values:**
- Default: 1 (0 before AIX 4.3.3)
- Range: 0 or 1
- Type: Dynamic

**Diagnosis:**
- N/A

**Tuning**
- A value of 0 disables path MTU discovery for TCP applications, while a value of 1 enables it. This parameter only applies to AIX 4.2.1 or later.

**Refer to:**
- TCP Maximum Segment Size tuning
tcp_recvspace

Purpose:
Specifies the system default socket buffer size for receiving data. This affects the window size used by TCP.

Values:
Default: 16384 bytes
Range: 4096 to 1048576
Type: Connect

Diagnosis:
N/A

Tuning
Setting the socket buffer size to 16 KB (16,384) improves performance over standard Ethernet and Token-Ring networks. Lower bandwidth networks, such as Serial Line Internet Protocol (SLIP), or higher bandwidth networks, such as Serial Optical Link, should have different optimum buffer sizes. The optimum buffer size is the product of the media bandwidth and the average round-trip time of a packet.

For high speed networks, like gigabit Ethernet or ATM 622, a value of 65536 should be used for the minimum size for best performance.

The tcp_recvspace parameter must specify a socket buffer size less than or equal to the setting of the sb_max parameter. The ISNO options for each interface will also override this global setting. For values larger than 65536, you must enable rfc1323 (rfc1323=1) to enable TCP window scaling.

Refer to:
TCP workload tuning

tcp_sendspace

Purpose:
Specifies the system default socket buffer size for sending data.

Values:
Default: 16384 bytes
Range: 4096 to 1048576
Type: Connect

Diagnosis:
N/A

Tuning
This affects the window used by TCP. Setting the socket buffer size to 16 KB (16,384) improves performance over standard Ethernet and Token-Ring networks.

Lower bandwidth networks, such as Serial Line Internet Protocol (SLIP), or higher bandwidth networks, such as Serial Optical Link, should have different optimum buffer sizes. The optimum buffer size is the product of the media bandwidth and the average round-trip time of a packet:

optimum_window=bandwidth * average_round_trip_time

For high speed networks, like gigabit Ethernet or ATM 622, a value of 65536 should be used for the minimum size for best performance.

The tcp_sendspace parameter must specify a socket buffer size less than or equal to the setting of the sb_max parameter. The ISNO options for each interface will also override this global setting. For values larger than 65536, you must enable rfc1323 (rfc1323=1) to enable TCP window scaling.

Refer to:
TCP workload tuning
**tcp_tcpsecure**

**Purpose:**
Specifies whether or not connection reset attacks and data corruption attacks on TCP are avoided.

**Values:**
- Default: 0 (off)
- Range: 0 to 7
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning:**
This option is used to protect TCP connections from one or more of the following three vulnerabilities. The first vulnerability involves the sending of a fake SYN to an established connection to abort the connection. A tcp_tcpsecure value of 1 provides protection from this vulnerability. The second vulnerability involves the sending of a fake RST to an established connection to abort the connection. A tcp_tcpsecure value of 2 provides protection from this vulnerability. The third vulnerability involves injecting fake data in an established TCP connection. A tcp_tcpsecure value of 4 provides protection from this vulnerability. Values for tcp_tcpsecure can range from a minimum of 0 (this is the default value and provides no protection from these vulnerabilities) to a maximum value of 7. Values of 3, 5, 6, or 7 will protect the connection from combinations of these three vulnerabilities.

**tcp_timewait**

**Purpose:**
The tcp_timewait option is used to configure how long connections are kept in the timewait state in 15-second intervals.

**Values:**
- Default: 1
- Range: 1 to 5
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
Increasing this value will degrade performance of Web servers or applications that open and close a lot of TCP connections.

**tcp_ttl**

**Purpose:**
Specifies the time to live for TCP packets.

**Values:**
- Default: 60 ticks (100 ticks per minute)
- Range: 1 to 255
- Type: Connect

**Diagnosis:**
netstat -s

**Tuning**
If the system is experiencing TCP timeouts, increasing tcp_ttl may reduce retransmissions.
tcprexmtthresh

**Purpose:**
Specifies the number of consecutive duplicate acknowledgement that will cause TCP to go to fast retransmit phase.

**Values:**
- Default: 3
- Range: 1 to MAXSHORT
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning:**
Increase this parameter if TCP performance is low due to an increased number of duplicate acknowledgements but the network is not congested. Be aware that setting a high value for this option can cause TCP to time out and retransmit.

thewall

**Purpose:**
Specifies the maximum amount of memory, in kilobytes, that is allocated to the memory pool.

**Values:**
- Default: AIX 5.1 and later:
  - 1/2 of RAM or 64 GB (whichever is smaller) for 64-bit kernel
  - 1/2 of RAM or 1 GB (whichever is smaller) for 32-bit kernel
- Range: N/A
- Type: Static

**Diagnosis:**
N/A

**Tuning:**
Not settable from AIX 5.1 and later.

**Refer to:**
[Network performance analysis](#)

**timer_wheel_tick**

**Purpose:**
Specifies the slot interval of the timer wheel in ticks, where a tick equals 10 ms. If this option is modified, reboot the system for the changed value to take effect.

**Values:**
- Default: 0
- Range: 0-100
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
The value specified must be multiplied by 10 ms to get the actual slot interval.
udp_bad_port_limit

**Purpose:**
Specifies the number of UDP packets to a port with no socket that can be received in a 500 millisecond period before UDP stops sending ICMP errors in response to such packets. If set to 0, ICMP errors will always be sent when UDP packets are received for a bad port number. If greater than 0, it specifies the number of packets to be received before UDP stops sending ICMP errors.

**Values:**
- Default: 0
- Range: 0 to MAXINT
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
N/A

udp_ephemeral_high

**Purpose:**
Specifies the largest port number to allocate for UDP ephemeral ports.

**Values:**
- Default: 65535
- Range: 32769 to 65535
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
N/A

udp_ephemeral_low

**Purpose:**
Specifies the smallest port number to allocate for UDP ephemeral ports.

**Values:**
- Default: 32768
- Range: 1 to 65534
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning**
N/A
udp_inpcb_hashtab_siz

**Purpose:** Specifies the size of the `inpcb` hash table for UDP connections. This table holds the `inpcbs` required for connection management and is implemented as a table of hash chains. A large table means that the linked hash chains will be small and lower the traversal time on average, but the memory footprint will be larger.

**Values:**
- Default: 24999
- Range: 1 to 83000
- Type: Reboot

**Diagnosis:** N/A

**Tuning:** This option impacts performance and should be used with extreme caution. Please consult a performance analyst in case the value needs to be changed. The execution environment could have an influence on the value. It is strongly encouraged to maintain the system-defined defaults because they tend to execute optimally in most environments.

udp_pmtu_discover

**Purpose:** Enables or disables path MTU discovery for UDP applications.

**Values:**
- Default: 1 (0 before AIX 4.3.3)
- Range: 0 or 1
- Type: Dynamic

**Diagnosis:** N/A

**Tuning** UDP applications must be specifically written to use path MTU discovery. A value of 0 disables the feature, while a value of 1 enables it. The default value is 0. This parameter only applies to AIX 4.2.1 or later.

udp_recvspace

**Purpose:** Specifies the system default socket-buffer size for receiving UDP data.

**Values:**
- Default: 42080 bytes
- Range: 4096 to 1048576
- Type: Connect

**Diagnosis:** Nonzero $n$ in `netstat -s` report of udp: $n$ socket buffer overflows

**Tuning** The `udp_recvspace` parameter must specify a socket buffer size less than or equal to the setting of the `sb_max` parameter. Increase size, preferably to multiple of 4096.

**Refer to:** UDP tuning
**udp_sendspace**  
**Purpose:** Specifies the system default socket-buffer size for sending UDP data.  
**Values:**  
- Default: 9216 bytes  
- Range: 4096 to 1048576  
- Type: Connect  
**Diagnosis:** N/A  
**Tuning** The `udp_sendspace` parameter must specify a socket buffer size less than or equal to the setting of the `sb_max` parameter. Increase size, preferably to multiple of 4096.  
**Refer to:** UDP tuning

**udp_ttl**  
**Purpose:** Specifies the time to live for UDP packets.  
**Values:**  
- Default: 30 second  
- Range: 1 to 255  
- Type: Connect  
**Diagnosis:** N/A  
**Tuning** N/A

**udpcksum**  
**Purpose:** Allows UDP checksum to be turned on/off.  
**Values:**  
- Default: 1  
- Range: 0 or 1  
- Type: Dynamic  
**Diagnosis:** N/A  
**Tuning** A value of 0 turns it off; while a value of 1 turns it on.

**use_isno**  
**Purpose:** Allows per interface tuning options.  
**Values:**  
- Default: 1 (on)  
- Range: 0 or 1  
- Type: Dynamic  
**Diagnosis:** N/A  
**Tuning** A value of 1 means it is on, 0 is off. If the TCP tunable parameters per interface (tunable through SMIT or the chdev command) have been set, they will override the TCP global values if `use_isno` is set to 1. Application can still override all of these with the `setsockopt` subroutine.  
**Refer to:** Interface-Specific Network Options (ISNO)
use_sndbufpool

**Purpose:** Enables caching of mbuf clusters to improve performance. If this value is disabled, then to allocate a mbuf cluster, AIX has to allocate a cluster buffer and also an mbuf buffer to point to it, thus requiring two buffer allocation operations. Likewise, to free the cluster, two buffer free operations are required. With this option enabled, AIX will maintain a cache of clusters for each cluster size that is being used. This improves performance by reducing overhead to allocate and free mbuf clusters.

**Values:**
- Default: 1 (on)
- Range: 0 or 1
- Type: Reboot

**Diagnosis:** N/A

**Tuning** The default value of 1 enables this option on a system-wide scale. The mbuf cluster cache can be displayed using the `netstat -M` command.

**Refer to:** [Tuning mbuf pool performance](#)

---

**Streams Tunable Parameters**

**lowlthresh**

**Purpose:** Specifies the maximum number of bytes that can be allocated using the `allocb` call for the BPRI_LO priority.

**Values:**
- Default: 90 (percent of thewall)
- Range: 0 to 100
- Type: Dynamic

**Diagnosis:** N/A

**Tuning** When the total amount of memory allocated by the `net_malloc` call reaches this threshold, then the `allocb` request for the BPRI_LO priority returns 0. The `lowlthresh` parameter represents a percentage of the `thewall` parameter, and you can set its value from 0 to 100.

---

**medthresh**

**Purpose:** Specifies the maximum number of bytes that can be allocated using the `allocb()` call for the BPRI_MED priority.

**Values:**
- Default: 95 (percent of thewall)
- Range: 0 to 100
- Type: Dynamic

**Diagnosis:** N/A

**Tuning** When the total amount of memory allocated by the `net_malloc` call reaches this threshold, then the `allocb` request for the BPRI_MED priority returns 0. The `medthresh` parameter represents a percentage of the `thewall` parameter, and you can set its value from 0 to 100.
nstrpush

Purpose:
Specifies the maximum number (should be at least 8) of modules that you can push onto a single stream.

Values:
- Default: 8
- Range: 8 to MAXSHORT
- Type: Reboot

Diagnosis:
N/A

Tuning
N/A

psebufcalls

Purpose:
Specifies the maximum number of bufcalls to allocate by streams.

Values:
- Default: 20
- Range: 20 to MAXINT
- Type: Incremental

Diagnosis:
N/A

Tuning
The stream subsystem allocates certain number of bufcall structures at initialization. When the allocb call fails, the user can register their requests for the bufcall call. You cannot lower this value until the system reboots, at which time it returns to its default value.

psecache

Purpose:
Controls the number of stream buffers.

Values:
- Default: 1
- Range: 0 or 1
- Type: Dynamic

Diagnosis:
N/A

Tuning
N/A

pseintrstack

Purpose:
Specifies the maximum size of the interrupt stack allowed by streams while running in the offlevel.

Values:
- Default: 0x6000 (decimal 24576)
- Range: 12288 to MAXINT
- Type: Reboot

Diagnosis:
N/A

Tuning
When a process running other than INTBASE level enters into a stream, it occasionally encounters a stack overflow problem because the interrupt stack size is too small. Setting this parameter correctly reduces the chances of stack overflow problems.
psetimers

Purpose:
Specifies the maximum number of timers to allocate by streams.

Values:
Default: 20
Range: 20 to MAXINT
Type: Incremental

Diagnosis:
N/A

Tuning
The stream subsystem allocates a certain number of timer structures at initialization, so that the streams driver or module can register their timeout calls. You cannot lower this value until the system reboots, at which time it returns to its default value.

strctlisz

Purpose:
Specifies the maximum number of bytes of information that a single system call can pass to a stream to place into the control part of a message (in an M_PROTO or M_PCPROTO block).

Values:
Default: 1024
Range: 1 to MAXSHORT
Type: Dynamic

Diagnosis:
N/A

Tuning
A putmsg call with a control part exceeding this size will fail with ERANGE.

strmsgsz

Purpose:
Specifies the maximum number of bytes of information that a single system call can pass to a stream to place into the data part of a message (in M_DATA blocks).

Values:
Default: 0
Range: 1 to MAXSHORT
Type: Dynamic

Diagnosis:
N/A

Tuning
Any write call exceeding this size is broken into multiple messages. A putmsg call with a data part exceeding this size will fail with ERANGE.
strthresh

Purpose:
Specifies the maximum number of bytes that streams are normally allowed to allocate, expressed as a percentage of the wall.

Values:
- Default: 85% of the wall
- Range: 0 to 100
- Type: Dynamic

Diagnosis:
N/A

Tuning
When the threshold is exceeded, it does not allow users without the appropriate privilege to open streams, push modules, or write to streams devices, and returns ENOSR. The threshold applies only to output side and does not affect data coming into the system (for example, the console continues to work correctly). A value of zero means that there is no threshold. The strthresh parameter represents a percentage of the thewall parameter, and you can set its value from 0 to 100. The thewall parameter indicates the maximum number of bytes that can be allocated by streams and sockets using the net malloc call.

Refer to:
Tuning mbuf pool performance

strturncnt

Purpose:
Specifies the maximum number of requests handled by the current running thread for Module- or Elsewhere-level streams synchronization.

Values:
- Default: 15
- Range: 1 to MAXINT
- Type: Dynamic

Diagnosis:
N/A

Tuning
With Module-level synchronization, only one thread can run in the module at any time, and all other threads which try to acquire the same module will enqueue their requests and exit. After the current running thread completes its work, it dequeues all the previously enqueued requests one by one and invokes them. If there is a large number of requests enqueued in the list, then the current running thread has to serve everyone and will always be busy serving others and starves itself. To avoid this situation the current running thread serves only the strturncnt number of threads, following that, a separate kernel thread wakes up and invokes all the pending requests.

Examples

1. To display the maximum size of the mbuf pool, type:
   ```bash
   no -o thewall
   ```

2. To reset the time to live for UDP packets its default size, type:
   ```bash
   no -d udp_ttl
   ```

3. To change the default socket buffer sizes on your system, type:
   ```bash
   no -r -o tcp_sendspace=32768
   no -r -o udp_recvspace=32768
   ```
4. To use a machine as an internet work router over TCP/IP networks, type:
   ```
   no -o ipforwarding=1
   ```

5. To list the current and reboot value, range, unit, type and dependencies of all tunables parameters managed by the `no` command, type:
   ```
   no -L
   ```

6. To display help information on `udp_ephemeral_high`, type:
   ```
   no -h udp_ephemeral_high
   ```

7. To permanently turn off `ip6srcrouteforward`, type:
   ```
   no -p -o ip6srcrouteforward=0
   ```

8. To list the reboot values for all Network tuning parameters, type:
   ```
   no -r
   ```

9. To list (spreadsheet format) the current and reboot value, range, unit, type and dependencies of all tunables parameters managed by the `no` command, type:
   ```
   no -x
   ```

10. To log all allocations and frees of type `mbuf` or socket that are size 256 or 4096, type:
    ```
    no -o net_buf_type={mbuf:socket} -o net_buf_size={256:4096} -o net_malloc_police=1
    ```

11. To log all allocations and frees of type `mbuf`, type:
    ```
    no -o net_buf_type={mbuf} -o net_buf_size={all} -o net_malloc_police=1
    ```

12. To log all `ns_allocs` and `ns_frees` for `en0` or `en3` using a 2000 events buffer size, type:
    ```
    no -o ndd_event_name={en0:en3} -o ndd_event_tracing=2000
    ```

13. To log all `ns_allocs` and `ns_frees` for all `en` adapters using a 2000 events buffer size, type:
    ```
    no -o ndd_event_name={en} -o ndd_event_tracing=2000
    ```

14. To log all `ns_allocs` and `ns_frees` for all adapters, type:
    ```
    no -o ndd_event_name={all} -o ndd_event_tracing=1
    ```

**Related Information**

The `ifconfig` command, the `inetd` command, the `vmo` command, the `ioo` command, the `raso` command, the `schedo` command, the `tunsave` command, the `tunchange` command, the `tunrestore` command, the `tuncheck` command, the `tundefault` command.

The `setsockopt` subroutine.

**Communications and networks**

- TCP/IP addressing
- TCP/IP protocols
- TCP/IP routing
- Internet Protocol
- Transmission Control Protocol
- Internet Application-Level Protocols
- User Datagram Protocol

**Network performance**

- Path MTU discovery

**Kernel Tuning** in *AIX 5L Version 5.3 Performance Tools Guide and Reference.*

**AIX 5.2 compatibility mode**

---

**nohup Command**

**Purpose**

Runs a command without hangups.
Syntax

nohup \{ [-p] pid | Command [ Arg ... ] [ & ] \}

Description

The `nohup` command runs the command specified by the `Command` parameter and any related `Arg` parameters, ignoring all hangup (SIGHUP) signals or modifies the process specified with `-p` option to ignore all hangup (SIGHUP) signals.

The `nohup` command can also be used to run programs in the background after logging off. To run a `nohup` command in the background, add an `&` (ampersand) to the end of the command.

**Note:** `-p pid` and `Command` can not be specified together.
When `-p pid` is used, the output of the specified process will not be re-directed to `nohup.out`.

Flags

- `-p pid`  
  `pid` is the process-id of a running process. The `nohup` command modifies the specified process, to ignore all hangup (SIGHUP) signals.

Exit Status

This command returns the following exit values:

<table>
<thead>
<tr>
<th>Exit Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>126</td>
<td>The command specified by the <code>Command</code> parameter was found but could not be invoked.</td>
</tr>
<tr>
<td>127</td>
<td>An error occurred in the <code>nohup</code> command or the command specified by the <code>Command</code> parameter could not be found.</td>
</tr>
</tbody>
</table>

Otherwise, the exit status of the `nohup` command is that of the command specified by the `Command` parameter.

Examples

1. To run a command in the background after you log off, enter:

   ```
   $ nohup find / -print &
   ```

   After you enter this command, the following is displayed:

   ```
   670
   $ Sending output to nohup.out
   ```

   The process ID number changes to that of the background process started by `&` (ampersand). The message `Sending output to nohup.out` informs you that the output from the `find / -print` command is in the `nohup.out` file. You can log off after you see these messages, even if the `find` command is still running.

2. To run a command in the background and redirect the standard output to a different file, enter:

   ```
   $ nohup find / -print >filenames &
   ```

   This example runs the `find / -print` command and stores its output in a file named `filenames`. Now only the process ID and prompt are displayed:

   ```
   677
   $
Wait before logging off because the `nohup` command takes a moment to start the command specified by the `Command` parameter. If you log off too quickly, the command specified by the `Command` parameter may not run at all. Once the command specified by the `Command` parameter starts, logging off does not affect it.

3. To run more than one command, use a shell procedure. For example, if you write the shell procedure:

   ```bash
   neqn math1 | nroff > fmath1
   ```

   and name it the `nnfmath1` file, you can run the `nohup` command for all of the commands in the `nnfmath1` file with the command:

   ```bash
   nohup sh nnfmath1
   ```

4. If you assign execute permission to the `nnfmath1` file, you get the same results by issuing the command:

   ```bash
   nohup nnfmath1
   ```

5. To run the `nnfmath1` file in the background, enter:

   ```bash
   nohup nnfmath1 &
   ```

6. To run the `nnfmath1` file in the Korn shell, enter:

   ```bash
   nohup ksh nnfmath1
   ```

7. To make a running process ignore all hangup signals, enter:

   ```bash
   nohup -p 161792
   ```

**Related Information**

The `csh` command, `nice` command, `sh` command.

The `signal` subroutine.

---

**enotifyevent Command, notifyevent Command**

**Purpose**

Mails event information generated by the event response resource manager (ERRM) to a specified user ID.

**Syntax**

```bash
enotifyevent [-h] [user-ID]
```

```bash
notifyevent [-h] [user-ID]
```

**Description**

The `enotifyevent` script always return messages in English. The language in which the messages of the `notifyevent` script are returned depend on the locale settings.

These scripts capture event information that is posted by the event response resource manager (ERRM) in environment variables that are generated by the ERM when an event occurs. These scripts can be used as actions that are run by an event response resource. They can also be used as templates to create other user-defined actions.

Event information is returned about the ERM environment variables, and also includes the following:
Local Time
Time when the event or rearm event is observed. The actual environment variable supplied by ERRM is ERRM_TIME. This value is localized and converted to readable form before being displayed.

These scripts use the mail command to send event information to the specified user ID. When a user ID is specified, it is assumed to be valid, and it is used without verifying it. If a user ID is not specified, the user who is running the command is used as the default.

user-ID is the optional ID of the user to whom the event information will be mailed. If user-ID is not specified, the user who is running the command is used as the default.

Flags
-h Writes the script's usage statement to standard output.

Parameters
log_file
Specifies the name of the file where event information is logged. An absolute path for the log_file parameter should be specified.

The log_file is treated as a circular log and has a fixed size of 64KB. When log_file is full, new entries are written over the oldest existing entries.

If log_file already exists, event information is appended to it. If log_file does not exist, it is created so that event information can be written to it.

Exit Status
0 Command has run successfully.

Restrictions
1. These scripts must be run on the node where the ERRM is running.
2. The mail command is used to read the file.

Standard Output
When the -h flag is specified, the script's usage statement is written to standard output.

Examples
1. Specify user1 in Web-based System Manager to send mail to a user. The event response resource manager then runs the following command:
/usr/sbin/rsct/bin/notifyevent user1
2. You can use the mail command to read the contents of the event information. The following example shows how a warning event for the /var file system (a file system resource) is formatted and logged:

========================================================================
Event reported at Sun Mar 26 16:38:03 2002
Condition Name: /var space used
Severity: Warning
Event Type: Event
Expression: PercentTotUsed>90
Resource Name: /var
Resource Class Name: IBM.FileSystem
Data Type: CT_UINT32
Data Value: 91

Commands Reference, Volume 4
nrglbd Daemon

Purpose
Manages the global location broker database.

Syntax
nrglbd 

Description
The glbd daemon manages the global location broker (GLB) database. The GLB database, part of the Network Computing System (NCS), helps clients to locate servers on a network or internet. The GLB database stores the locations (that is, the network addresses and port numbers) of servers on which processes are running. The glbd daemon maintains this database and provides access to it.

There are two versions of the GLB daemon, glbd and nrglbd. You should run only one nrglbd on a network or internet, and you should not run a nrglbd and a glbd on the same network or internet.

The nrglbd daemon is typically started in the background; it can be started in one of two ways:
• By a person with root user authority entering on the command line:
  /etc/ncs/nrglbd &
• Through the System Resource Controller (SRC), by entering on the command line:
  startsrc -s nrglbd

TCP/IP must be configured and running on your system before starting the nrglbd daemon. The llbd daemon must also be started and running before you start the nrglbd daemon.

Flags
-version Displays the version of NCS that this nrglbd belongs to, but does not start the daemon.

Files
/etc/rc.ncs Contains commands to start the NCS daemons.

Related Information
The lb_admin command.
The llbd daemon.

The Location Broker in AIX 5L Version 5.3 Communications Programming Concepts.
nroff Command

Purpose
Formats text for printing on typewriter-like devices and line printers.

Syntax
nroff { -e | -h | -i | -q | -z | -o List | -n Number | -s Number | -r ANumber | -u Number | -T Name | -man | -me | -mm | -mptx | -ms } [ File ... ]

Description
The nroff command reads one or more files for printing on typewriter-like devices and line printers. If no file is specified or the - (minus sign) flag is specified as the last parameter, standard input is read by default. The File variable specifies files to be printed on a typewriter-like device by the nroff command. The default is standard input.

The col command may be required to postprocess nroff command output in certain cases.

Flags
- Produces equally spaced words in adjusted lines, using the full resolution of a particular terminal.
- Uses output tabs during horizontal spacing to speed output and reduce the output character count. Tab settings are assumed to be every eight nominal character widths.
- Reads standard input after reading all specified files.
- Selects the man macro processing package.
- Selects the me macro processing package.
- Selects the mm macro processing package.
- Selects the mptx macro processing package.
- Selects the ms macro processing package.
- Assigns the specified number to the first printed page.
- Prints only those pages specified by the List variable, which consists of a comma-separated list of page numbers and ranges, as follows:
  - A range of Start-Stop means print pages Start through Stop. For example, 9-15 prints pages 9 through 15.
  - An initial -Stop means print from the beginning to page Stop.
  - A final Start- means print from page Start to the end.
  - A combination of page numbers and ranges prints the specified pages. For example, -3, 6-8,10,12- prints the beginning through page 3, pages 6 through 8, page 10, and page 12 to the end.

  Note: When the -o List flag is used in a pipeline (as with one or more of the eqn or tbl commands) you may receive a broken pipe message if the last page in the document is not specified in the List parameter. This broken pipe message is not an indication of any problem and can be ignored.
- Calls the simultaneous input/output mode of the rd request.
- Sets register A to the specified number. The value specified by the A variable must have a one-character ASCII name.
-s Number

Stops every specified number of pages (the default is 1). The nroff command halts every specified number of pages to allow paper loading or changing, then resumes upon receipt of a linefeed or new-line character. This flag does not work in pipelines (for example, with the mm command). When the nroff command halts between pages, an ASCII BEL character is sent to the workstation.

-T Name

Prepares the output for the specified printing device. Typewriter-like devices and line printers use the following Name variables for international extended character sets, as well as English-language character sets, digits, and symbols:

hplj Hewlett-Packard LaserJet II and other models in the same series of printers.

ibm3812 3812 Pageprinter II.

ibm3816 3816 Pageprinter.

ibm4019 4019 LaserPrinter.

Note: The 4019 and the HP Laser Jet II printer both have nonprintable areas at the top and bottom of a page. If a file is targeted for these printers, be sure to define top and bottom margins (for example, by formatting with the -mm flag) so that all output can be positioned within the printable page.

37 Teletype Model 37 terminal (default) for terminal viewing only. This device does not support extended characters that are inputted by the \[N] form. Inputting Extended Single-Byte Characters provides more information.

lp Generic name for printers that can underline and tab. All text sent to the lp value using reverse linefeeds (for example, text that includes tables) must be processed with the col command. This device does not support extended characters that are inputted by the \[N] form. Inputting Extended Single-Byte Characters provides more information.

ppds Generic name for printers that support the personal printer data streams such as the Quietwriter® III, Quickwriter, and Proprinters.

ibm5575 5575 Kanji Printer.

ibm5577 5577 Kanji Printer.

Note: For completeness of the text formatting system, the following devices are shipped as is from the AT&T Distribution center. No support is provided for these tables.
-T Name (Continued)

2631  Hewlett-Packard 2631 printer in regular mode.

2631-c  Hewlett-Packard 2631 printer in compressed mode.

2631-e  Hewlett-Packard 2631 printer in expanded mode.

300  DASI-300 printer.

300-12  DASI-300 terminal set to 12 characters per inch.

382  DTC-382.

4000a  Trendata 4000a terminal (4000A).

450  DASI-450 (Diablo Hyterm) printer.

450-12  DASI-450 terminal set to 12 characters per inch.

832  Anderson Jacobson 832 terminal.

8510  C.ITOH printer.

tn300  GE Terminet 300 terminal.

X  Printers equipped with a TX print train.

300s  DASI-300s printer (300S).

300s-12  DASI-300s printer set to 12 characters per inch (300S-12).

-u Number  Sets the bold factor (number of character overstrokes) for the third font position (bold) to the specified number, or to 0 if the Number variable is missing.

-z  Prints only messages generated by .tm (workstation message) requests.

Note: See the article Macro Packages for Formatting Tools in the troff command for more information on the macros.

-  Forces input to be read from standard input.

Files

/usr/share/lib/tmac/tmac.*  Contains pointers to standard macro files.
/usr/share/lib/macros/*  Contains standard macro files.
/usr/share/lib/nterm/*  Contains the terminal driving tables for the nroff command.
/usr/share/lib/pub/terminals  Contains a list of supported terminals.

Related Information

The col command, mm command, neqn command, tbl command, troff command.

The nroff and troff Input file format.

The article nroff and troff Requests for the nroff and troff Commands in the troff command.

nslookup Command

Purpose
Queries Internet domain name servers.

Syntax
nslookup [ -Option ... ] [ Host ] [ -NameServer ]
Description

The nslookup command queries Internet domain name servers in two modes. Interactive mode allows you to query name servers for information about various hosts and domains, or to print a list of the hosts in a domain. In noninteractive mode, the names and requested information are printed for a specified host or domain.

The nslookup command enters interactive mode when no arguments are given, or when the first argument is a - (minus sign) and the second argument is the host name or Internet address of a name server. When no arguments are given, the command queries the default name server. The - (minus sign) invokes an optional subcommand (-Option... variable). With the exception of the set command, these subcommands are specified on the command line and must precede the nslookup command arguments. The set subcommand options can alternatively be specified in the .nslookuprc file in the user’s home directory.

The nslookup command executes in noninteractive mode when the first argument is the name or Internet address of the host being searched for. In this case, the host name or Internet address of the name server is optional.

The noninteractive command looks up information for the specified Host using the default name server or the name server specified by the NameServer parameter. If the Host parameter specifies an Internet address and the query type is A or PTR, the name of the host is returned. If the Host parameter specifies a name and the name does not have a trailing period, the default domain name is appended to the name. To look up a host not in the current domain, append a single period to the name.

Note: If they are specified in the .nslookuprc file of the user’s home directory, the set subcommand’s domain, srchlist, defname, and search options can affect the behavior of the noninteractive command.

Subcommands

The following commands can be interrupted at any time by entering a Ctrl-C key sequence. To exit, enter a Ctrl-D key sequence or type exit. To treat a built-in command as a host name, precede it with an escape character, which is a \. Unrecognized commands are interpreted as host names.

The following subcommands are recognized by the nslookup command:

- **finger [Name] [> FileName]**
  Connects with the finger daemon server on the current host. The current host is defined when a previous lookup for a host was successful and returned address information, such as that returned with the set querytype=A command. The Name parameter, which specifies a user name, is optional. The > and >> characters can be used to redirect output to a new or existing file.

- **finger [Name] [>> FileName]**
  Connects with the finger daemon server on the current host. The current host is defined when a previous lookup for a host was successful and returned address information, such as that returned with the set querytype=A command. The Name parameter, which specifies a user name, is optional. The > and >> characters can be used to redirect output to a new or existing file.

- **server Domain**
  Changes the default server to the value specified by the Domain parameter. The server subcommand uses the initial server to look up information about the domain. The server subcommand uses the current default server. If an authoritative answer cannot be found, the names of any additional servers that might have the answer are returned.

- **Iserver Domain**
  Changes the default server to the server for the root of the domain name space. Currently, the host ns.nic.ddn.mil is used. The name of the root server can be changed with the set root subcommand. (The root subcommand is synonymous with the Iserver ns.nic.ddn.mil subcommand.)
ls [Option] Domain [> FileName] Lists the information available for the Domain specified, optionally creating or appending the output to the file specified by the FileName parameter. The default output contains host names and their Internet addresses. Possible values for the Option parameter are:

- **-t QueryType**
  Lists all records of the specified type. The default record type is A. Valid types are:
  - **A** Host's Internet address
  - **CNAME** Canonical name for an alias
  - **HINFO** Host CPU and operating system type
  - **KEY** Security Key Record
  - **MINfo** Mailbox or mail list information
  - **MX** Mail exchanger
  - **NS** Nameserver for the named zone
  - **PTR** Host name if the query is an Internet address; otherwise, the pointer to other information
  - **SIG** Signature Record
  - **SOA** Domain's "start-of-authority" information
  - **TXT** Text information
  - **UIINFO** User information
  - **WKS** Supported well-known services

- **-a** Lists aliases of hosts in the domain (synonymous with the -t CNAME option).
- **-d** Lists all records for the domain (synonymous with the -t ANY option).
- **-h** Lists CPU and operating system information for the domain (synonymous with the -t HINFO option).
- **-s** Lists well-known services of hosts in the domain (synonymous with the -t WKS option).

**Note:** When output is redirected to a file, hash marks are printed for every 50 records received from the server.

view FileName Sorts the output of previous ls commands and lists them using the more command.

help ? Prints a brief summary of commands.

exit Exits the program.
**set Keyword=Value**

Changes state information that affects lookups. This subcommand can be specified on the command line or optionally included in the .nslookuprc file in the user's home directory. Valid keywords are:

**all**
Prints the current values of the frequently used options to set. Information about the current default server and host is also printed.

**class=**Value
Changes the query class to one of the following. The class specifies the protocol group of the information. The default is IN.

- **IN** Internet class
- **CHAOS** Chaos class
- **HESIOD** MIT Althena Hesiod class
- **ANY** Wildcard (any of the above)

**[no]debug**
Turns debugging mode on. The default is **nodebug** (off).

**[no]d2**
Turns comprehensive debugging on. The default is **nod2** (off).

**domain=**Name
Changes the default domain name to the name specified by the **Name** parameter. The default domain name is appended to a lookup request, depending on the state of the **defname** and **search** options. The domain search list contains the parents of the default domain if the search list has at least two components in its name. For example, if the default domain is **CC.Berkeley.EDU**, the search list is **CC.Berkeley.EDU** and **Berkeley.EDU**. Use the **set srchlist** command to specify a different list. Use the **set all** command to display the list of names. The default values are specified in the system’s **hostname**, **/etc/resolv.conf**, or **LOCALDOMAIN** file.

**srchlst=**Name1/Name2...
Changes the default domain name to the name specified by the **Name1** parameter, and changes the domain search list to the names specified by the **Name1**, **Name2**, ... parameters. A maximum of six names separated by slashes can be specified. Use the **set all** command to display the list of names. The default values are specified in the system’s **hostname**, **/etc/resolv.conf**, or **LOCALDOMAIN** file.

Note: This command overrides the default domain name and search list of the **set domain** command option.

**[no]defname**
Appends the default domain name to a single component lookup request (one that does not include a period). The default is **defname** (append).

**[no]search**
Appends the domain names in the domain search list to the request until an answer is received, if the lookup request contains a period other than a trailing period. The default is **search**.

**port=**Value
Changes the default TCP/UDP nameserver port to the number specified by the **Value** parameter. The default value is 53.

**querytype=**Value
type=\textit{Value} \quad \text{Changes the information query to one of the following values. The default is A.}

A \quad \text{Host’s Internet address}

ANY \quad \text{Any of the options available.}

CNAME \quad \text{Canonical name for an alias}

HINFO \quad \text{Host CPU and operating system type}

KEY \quad \text{Security Key Record}

MININFO \quad \text{Mailbox or mail list information}

MX \quad \text{Mail exchanger}

NS \quad \text{Name server for the named zone}

PTR \quad \text{Host name if the query is an Internet address; otherwise, the pointer to other information}

SIG \quad \text{Signature Record}

SOA \quad \text{Domain’s “start-of-authority” information}

TXT \quad \text{Text information}

UINFO \quad \text{User information}

WKS \quad \text{Supported well-known services}

\textbf{[no]recurse} \quad \text{Tells the name server to query other servers if it does not have information. The default is recurse.}

\textbf{retry=\textit{Number}} \quad \text{Sets the number of times a request is retried to the value specified by the \textit{Number} parameter. When a reply to a request is not received within the time frame specified by the \textit{set timeout} command, the timeout period is doubled and the request resent. This subcommand controls the number of times a request is sent before timing out. The default value is 4.}

\textbf{root=\textit{Host}} \quad \text{Changes the name of the root server to the name specified by the \textit{Host} parameter. The default is ns.nic.ddn.mil.}

\textbf{timeout=\textit{Number}} \quad \text{Changes the initial time-out interval for waiting for a reply to the number of seconds specified by the \textit{Number} parameter. The default value is 5 seconds.}

\textbf{[no]vc} \quad \text{Uses a virtual circuit when sending requests to the server. The default is novc (no virtual circuit).}

\textbf{[no]ignoretc} \quad \text{Ignores packet truncation errors. The default is noignoretc (do not ignore).}

\section*{Examples}

1. To change the default query type to host information (HINFO) and the initial time-out to 10 seconds, enter:
   \texttt{nslookup -query=hinfo -timeout=10}

2. To set the domain and the search list to three names, lcs.MIT.EDU, ai.MIT.EDU, and MIT.EDU, enter:
   \texttt{nslookup -set srchlist=lcs.MIT.EDU/ai.MIT.EDU/MIT.EDU}
This command overrides the default domain name and search list of the set domain command. Use the set all command to display the list.

3. To determine whether a name specifies a host, domain, or other entity, enter:
   nslookup -querytype=ANY austin.ibm.com

   The nslookup command returns all available information about the name austin.ibm.com, including Statement of Authority (SOA), name server, mail exchanger, and host Internet address information, as follows:
   Server: benames.austin.ibm.com
   Address: 9.3.199.2
   austin.ibm.com origin = ausname1.austin.ibm.com
   mail addr = brian.chriss.austin.ibm.com
   serial=1993081210,refresh=3600,retry=300,expire=604800, min=86400
   austin.ibm.com nameserver = ausname1.austin.ibm.com
   austin.ibm.com nameserver = bb3names.austin.ibm.com
   austin.ibm.com nameserver = benames.austin.ibm.com
   austin.ibm.com nameserver = b45names.austin.ibm.com
   austin.ibm.com nameserver = bbcnames.austin.ibm.com
   austin.ibm.com nameserver = netmail.austin.ibm.com
   austin.ibm.com preference = 10, mail exchanger = netmail.austin.ibm.com
   austin.ibm.com inet address = 129.35.208.98
   ausname1.austin.ibm.com inet address = 129.35.17.2
   bb3names.austin.ibm.com inet address = 129.35.208.99
   benames.austin.ibm.com inet address = 9.3.199.2
   b45names.austin.ibm.com inet address = 129.35.49.2
   bbcnames.austin.ibm.com inet address = 129.35.17.68
   netmail.austin.ibm.com inet address = 129.35.208.98

4. To perform a noninteractive query on host opus, enter:
   nslookup opus

   The nslookup command responds similarly to the [host] command. The command returns the domain name and Internet address of host opus, as follows:
   Name: opus.austin.ibm.com
   Address: 129.35.129.223

   If host opus had been a name server (a host running the named daemon with an empty /etc/resolv.conf file), the following information would have been displayed:
   Server: loopback
   Address: 0.0.0.0

Exit Status

When a lookup request is not successful, the nslookup command returns one of the following error messages:

- **Timed Out**: Indicates the server did not respond to the request after the specified number of retries.
- **No Response from Server**: Indicates that a name server is not running on the server machine.
- **No Records**: Indicates the server does not have the resource records of the specified query type for the host, although the host name is valid.
- **Non-Existent Domain**: Indicates the host or domain name does not exist.
- **Connection Refused**: Indicates the connection to the name or finger server could not be made at the time of the inquiry. This error is typically associated with ls and finger requests.
- **Network Is Unreachable**: Indicates the connection to the name or finger server could not be made at the time of the inquiry. This error is typically associated with ls and finger requests.
Server Failure Indicates the name server encountered an internal inconsistency and could not return a valid answer.
Refused Indicates the name server refused to service the request.
Format Error Indicates the name server refused the request packet because it was not in the proper format.

Files

/usr/bin/nslookup Contains the nslookup command.
/etc/resolv.conf Contains the initial domain name and nameserver addresses.
$HOME/.nslookuprc Contains the user’s initial options.
HOSTALIASES Contains the host aliases.
LOCALDOMAIN Contains the override default domain.

Related Information

namerslv command, traceroute command.
named daemon.
res_query subroutine, res_search subroutine.
resolv.conf file format for TCP/IP.
TCP/IP name resolution in Networks and communication management.

nsupdate Command

Purpose
Updates a DNS server.

Syntax
Refer to the syntax for the nsupdate4, nsupdate8, or nsupdate9 command.

Description
AIX supports three versions of BIND: 4, 8, and 9. By default, named links to named8, nsupdate to nsupdate4, named-xfer to named-xfer4. To use a different version of nsupdate, you must relink the symbolic links accordingly for the nsupdate command.

For example, to use nsupdate9, type:

ln -fs /usr/sbin/nsupdate9 /usr/sbin/nsupdate

nsupdate4 can be used with named8, but nsupdate9 must be used with named9 because the security process is different.

Files

/usr/sbin/named Contains a symbolic link to the version of named being used on the system.
/usr/sbin/nsupdate Contains a symbolic link to the version of nsupdate being used on the system.
nsupdate4 Command

Purpose
Updates a DNS server.

Syntax
nsupdate4 [-a] [-g] [-i] [-q] [-v] [-?] [-k KeyFile] [-h HostName] [-d DomainName] [-p PrimaryName] [-r IPAddress] [-s "CommandString"]

Description
The nsupdate4 command updates the DNS server. The nsupdate4 command runs in either interactive mode or command mode. If a command string is provided, the nsupdate4 command runs the command string and then exits. The return code is dependent upon the successfullness of the command string.

The valid internal commands for the command string or interactive modes are:

- **r**  Reset update packets. This must be first.
- **d**  Delete a record. Following this command are questions for a record type and the value to delete.
- **a**  Add a record. Following this command are questions for a record type and the value to add.
- **n**  Add a record only if it doesn’t exist yet. Following this command are questions for a record type and the value to add.
- **e**  Add a record only if it already exists. Following this command are questions for a record type and the value to add.
- **t**  Sets the default time to live value for the updated records.
- **s**  Signs the update. Depending on if the -a or -g flags were specified, a key will be generated and the update will be signed.
- **x**  Transmits the update packet to the server specified by the -p flag.
- **v**  Turns on or off verbose mode.
- **i**  Returns the information passed in by the parameters.
- **p**  Prints the update packet in record format.

Related Information
The nsupdate4 command, nsupdate8 command, nsupdate9 command.

The named daemon.

The bootp configuration file, DHCP Client configuration file, DHCP Server configuration file.

Name server resolution and Planning for DOMIAN name resolution in Networks and communication management.

TCP/IP address and parameter assignment - Dynamic Host Configuration Protocol (DHCP) in Networks and communication management.

TCP/IP name resolution and TCP/IP daemons in Networks and communication management.
q Exits the command

The -g flag allows you to generate a set of keys to distribute to clients for use in secure mode. This flag takes the hostname and the primaryname and generates a public and a private key. For secure mode zone operation, the public is entered into the DNS server’s database for the data to secure and the private key is placed on the client so that it can update that information at a later time.

The -a flag allows you to enter administrative mode. The zone may be secured by a zone key. This key gives the user full access to the zone. The -a flag tries to use the zone key for update signatures instead of the individual records key.

**Flags**

- **-a** Administrative mode. Attempts to use zone key instead of individual records key.
- **-d DomainName** Specifies the name of the domain to apply the update to. This is used with all records except PTR records.
- **-g** Generation mode. Used to generate a key pair for a primary name and a hostname.
- **-h HostName** Specifies the name of the record to update. This is used with all records except PTR records.
- **-i** Ignores errors and runs all the commands in the string.
- **-k KeyFile** Specifies the name of the default keyfile. This is the file for keys.
- **-p PrimaryName** Specifies the name or IP address of a DNS server. The primary DNS server is preferred.
- **-q** Turns off output.
- **-r IPAddress** Specifies the IP Address of the record to update. This is used only with PTR records.
- **-s “CommandString”** A set of internal commands separated by spaces or colons.
- **-v** Turns on verbose output.
- **-?** Command line options list

**Exit Status**

This command returns the following exit values:

<table>
<thead>
<tr>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful completion.</td>
</tr>
<tr>
<td>&gt;0</td>
<td>An error occurred.</td>
</tr>
</tbody>
</table>

**Security**

Access Control: Any User

**Example**

To initialize a packet, delete all A records for the specified hostname, add an A record for the hostname to 9.3.145.2 association, signed and valid for 300 seconds with a default KEY pad of 3110400, transmit the packet, and quit: (where ";" is pressing the enter key)

```
r;d;a;*;a;9.3.145.2;s;300;3110400;x;q
```

If any one of the items had failed, a message would be printed. In command line mode, an error would cause the program to exit and return 1.

**Files**

`/usr/sbin/nsupdate4` Contains the `nsupdate4` command.
nsupdate8 Command

Purpose
Generates a DNS update packet readable by a BIND 8 nameserver.

Syntax
nsupdate8 [-v] [-d] [Filename]

Description
The nsupdate8 command can read from a file specified on the command line, from stdin for pipes or redirected input from a file, or interactively from a tty. All three methods use the same format specified below. The input defines a DNS update packet that can be used to update a ZONE. There are two sections to an update, a prerequisite section and an update section. The DNS name server verifies that all the prerequisites are true before processing the update section.

Flags
-\d
Causes nsupdate8 to generate additional debug information about its actions.
-\v
Tells nsupdate8 to use a virtual circuit (TCP connection), instead of the usual UDP connection.

The input format is defined as a set of update packets. Each packet is a set of strings terminated with a newline. The last string in the input stream may end with an EOF. If the stream is to contain multiple update packets, each packet must be separated from the next packet by a blank line (single newline character). The semi-colon is used a comment character. Anything after it is ignored and thrown out of the update packet.

The input format for nsupdate8 is a follows:
section opcode name [ttl] [class] [type] [data]

This is the general form. Each value of section and opcode modify what is required for later arguments.

section
Defines the section of the update this record is for. Values are:
prereq Indicates the record is for the prerequisites section.
update Indicates the record is for the update section.
**opcode**

Defines the operation to do with this record.

**Values are:**

**Prerequisite operations:**

**nxdomain**

Indicates that the name should be checked for non-existance. The ttl must be a non-zero value to indicate for how long it shouldn't exist. An optional class can be specified to restrict the search to only that class. The type of T_ANY is used as a wildcard to match any record type.

**nydomain**

Indicates that the name should be checked for existance. The ttl must be a non-zero value to indicate for how long the name should continue to exist. An optional class is allowed to restrict the search to only that class. The record type is T_NONE. This forces the check to make sure the name exists.

**nxrrset**

Indicates that the record of a specific type doesn't exist for the name. An optional class and ttl are allowed to restrict the search. A type is mandatory.

**nyrrset**

Indicates that the record of a specific type must exist for the name. The ttl and class are optional to restrict the search. The type and data are mandatory. Data may be a wild card. If the data is not a wildcard, it must match the format for the type specified.

**Values are:**

**Update operations:**

**add**

Indicates that the record should be added to the zone. The type and data are mandatory. Wildcards are not allowed as data. The ttl is mandatory and must be non-zero. The class is optional.

**delete**

Indicates that the record should be deleted from the zone. The type and data are optional. A wildcard is allowed for data. Data defaults to the NULL string and type defaults to T_ANY. Ttl and class are optional. If ttl is specified, it is reset to 0.

**name**

The name of the DNS entry that one is testing or modifying.

**[ttl]**

Optional time-to-live for the record being added. In some forms, this is not optional.

**[class]**

Class of the record to be added to the zone. Values are IN, HESIOD, and CHAOS. The default for all messages is IN.

**[type]**

The type of the record to be added to or checked against the zone. Values are A, NS, CNAME, SOA, MB, MR, NULL, WKS, PTR, HINFO, MINFO, MX, TXT, RP, AFSDB, X25, ISDN, RT, NSAP, NSAP_PTR, PX, and LOC. NOTE: The CNAME type may only be added with TSIG and TKEY records which are not currently supported in BIND 8.

**[data]**

The data to be added or checked against the zone. The data should be valid for the specified type and in the DOMAIN data file format of a DNS server zone file. For prerequisite checking, an asterisk (*) is used to match any value. This can also be used to delete all records of a particular type.

Here are the specific format cases:

- `prerreq nxdomain <name> <ttl != 0> [class]`
- `prerreq nydomain <name ttl != 0> [class]`
- `prerreq nxrrset <name> [ttl] [class] <type>`
- `prerreq nyrrset <name> [ttl] [class] <type> <data>`
- `update delete <name> [ttl] [class] [type] [data]`
- `update add <name> <ttl != 0> [class] [type] <data>`

**Diagnostics**

Messages indicating the different actions done and/or problems encountered by the program.

**Related Information**

The `nsupdate` command, `named` command.
nsupdate9 Command

Purpose
Dynamic DNS update utility.

Syntax
nsupdate9 [-d] [-y keyname:secret | -k keyfile] [-v] [filename]

Description
The nsupdate9 command is used to submit Dynamic DNS Update requests as defined in RFC2136 to a name server. This allows resource records to be added or removed from a zone without manually editing the zone file. A single update request can contain requests to add or remove more than one resource record.

Zones that are under dynamic control via nsupdate9 or a DHCP server should not be edited by hand. Manual edits could conflict with dynamic updates and cause data to be lost.

The resource records that are dynamically added or removed with nsupdate9 have to be in the same zone. Requests are sent to the zone’s master server. This is identified by the MNAME field of the zone’s SOA record.

The -d option makes nsupdate9 operate in debug mode. This provides tracing information about the update requests that are made and the replies received from the name server.

Transaction signatures can be used to authenticate the Dynamic DNS updates. These use the TSIG resource record type described in RFC2845. The signatures rely on a shared secret that should only be known to nsupdate9 and the name server. Currently, the only supported encryption algorithm for TSIG is HMAC-MD5, which is defined in RFC 2104. Once other algorithms are defined for TSIG, applications will need to ensure they use the appropriate algorithm as well as the key when authenticating each other. For instance suitable key and server statements would be added to /etc/named.conf so that the name server can associate the appropriate secret key and algorithm with the IP address of the client application that will be using TSIG authentication. nsupdate9 does not read /etc/named.conf.

nsupdate9 uses the -y or -k option to provide the shared secret needed to generate a TSIG record for authenticating Dynamic DNS update requests. These options are mutually exclusive. With the -k option, nsupdate9 reads the shared secret from the file keyfile, whose name is of the form K{name}+157+(random).private. For historical reasons, the file K{name}+157+(random).key must also be present. When the -y option is used, a signature is generated from keyname:secret. keyname is the name of the key, and secret is the base64 encoded shared secret. Use of the -y option is discouraged because the shared secret is supplied as a command line argument in clear text. This may be visible in the output from ps(1) or in a history file maintained by the user’s shell.

By default nsupdate9 uses UDP to send update requests to the name server. The -v option makes nsupdate9 use a TCP connection. This may be preferable when a batch of update requests is made.
**Flags**

- **-d** Makes `nsupdate9` operate in debug mode.
- **-y keyname:secret** Generates a signature from keyname:secret
- **-k keyfile** Reads the shared secret from the file keyfile.
- **-v** Makes `nsupdate9` use a TCP connection.

**Parameters**

`filename` File to be updated.

**Input Format**

`nsupdate9` reads input from the file `filename` or standard input. Each command is supplied on exactly one line of input. Some commands are for administrative purposes. The others are either update instructions or prerequisite checks on the contents of the zone. These checks set conditions that some name or set of resource records (RRset) either exists or is absent from the zone. These conditions must be met if the entire update request is to succeed. Updates will be rejected if the tests for the prerequisite conditions fail.

Every update request consists of zero or more prerequisites and zero or more updates. This allows a suitably authenticated update request to proceed if some specified resource records are present or missing from the zone. A blank input line (or the send command) causes the accumulated commands to be sent as one Dynamic DNS update request to the name server.

The command formats and their meaning are as follows:

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>server [servername] [port]</td>
<td>Sends all dynamic update requests to the name server servername. When no server statement is provided, <code>nsupdate9</code> will send updates to the master server of the correct zone. The MNAME field of that zone's SOA record will identify the master server for that zone. port is the port number on servername where the dynamic update requests get sent. If no port number is specified, the default DNS port number of 53 is used.</td>
</tr>
<tr>
<td>local [address] [port]</td>
<td>Sends all dynamic update requests using the local address. When no local statement is provided, <code>nsupdate9</code> will send updates using an address and port chosen by the system. port can additionally be used to make requests come from a specific port. If no port number is specified, the system will assign one.</td>
</tr>
<tr>
<td>zone [zonename]</td>
<td>Specifies that all updates are to be made to the zone zonename. If no zone statement is provided, <code>nsupdate9</code> will attempt determine the correct zone to update based on the rest of the input.</td>
</tr>
<tr>
<td>key [name] [secret]</td>
<td>Specifies that all updates are to be TSIG signed using the keyname keysecret pair. The key command overrides any key specified on the command line via -y or -k.</td>
</tr>
<tr>
<td>prereq nxdomain [domain-name]</td>
<td>Requires that no resource record of any type exists with name domain-name.</td>
</tr>
<tr>
<td>prereq yxdomain [domain-name]</td>
<td>Requires that domain-name exists (has as at least one resource record, of any type).</td>
</tr>
<tr>
<td>prereq nxrset [domain-name] [class] [type]</td>
<td>Requires that no resource record exists of the specified type, class and domain-name. If class is omitted, IN (internet) is assumed.</td>
</tr>
<tr>
<td>prereq yxrset [domain-name] [class] [type]</td>
<td>This requires that a resource record of the specified type, class and domain-name must exist. If class is omitted, IN (internet) is assumed.</td>
</tr>
</tbody>
</table>
The data from each set of prerequisites of this form sharing a common type, class, and domain-name are combined to form a set of RRs. This set of RRs must exactly match the set of RRs existing in the zone at the given type, class, and domain-name. The data are written in the standard text representation of the resource record’s RDATA.

Deletes any resource records named domain-name. If type and data is provided, only matching resource records will be removed. The internet class is assumed if class is not supplied. The ttl is ignored, and is only allowed for compatibility.

Adds a new resource record with the specified ttl, class and data.

Displays the current message, containing all of the prerequisites and updates specified since the last send.

Sends the current message. This is equivalent to entering a blank line.

Lines beginning with a semicolon are comments and are ignored.

Examples

The examples below show how nsupdate9 could be used to insert and delete resource records from the example.com zone. Notice that the input in each example contains a trailing blank line so that a group of commands are sent as one dynamic update request to the master name server for example.com.

```
# nsupdate9
> update delete oldhost.example.com A
> update add newhost.example.com 86400 A 172.16.1.1
>
```

Any A records for oldhost.example.com are deleted. and an A record for newhost.example.com it IP address 172.16.1.1 is added. The newly-added record has a 1 day TTL (86400 seconds)

```
# nsupdate9
> prereq nxdomain nickname.example.com
> update add nickname.example.com CNAME somehost.example.com
>
```

The prerequisite condition gets the name server to check that there are no resource records of any type for nickname.example.com. If there are, the update request fails. If this name does not exist, a CNAME for it is added. This ensures that when the CNAME is added, it cannot conflict with the long-standing rule in RFC1034 that a name must not exist as any other record type if it exists as a CNAME. (The rule has been updated for DNSSEC in RFC2535 to allow CNAMEs to have SIG, KEY and NXT records.)

Files

/etc/resolv.conf Used to identify default name server
K{name}.+157.+{random}.key Base-64 encoding of HMAC-MD5 key created by dnssec-keygen(8).
K{name}.+157.+{random}.private Base-64 encoding of HMAC-MD5 key created by dnssec-keygen(8).

Related Information


The named9 daemon and dnssec-keygen command.
ntpdate Command

Purpose
Sets the date and time using the Network Time Protocol (NTP). This command only applies to AIX 4.2 or later.

Syntax
```
ntpdate [-b] [-c] [-d] [-s] [-u] [-a Keyid] [ -e AuthenticationDelay ] [ -k KeyFile ] [ -o Version ] [ -p Samples ] [ -t TimeOut ] Server ...
```

Description
The ntpdate command sets the local date and time by polling the NTP servers specified to determine the correct time. It obtains a number of samples from each server specified and applies the standard NTP clock filter and selection algorithms to select the best of the samples.

The ntpdate command makes time adjustments in one of the following ways:
- If it determines that the clock is off by more than 0.5 seconds, it steps the clock’s time by calling the `settimeofday` subroutine. This is the preferred method at boot time.
- If it determines that the clock is off by less than 0.5 seconds, it slews the clock’s time by calling the `adjtime` subroutine with the offset. This method tends to keep a badly drifting clock more accurate, though at some expense to stability. When running the ntpdate command on a regular basis from the `cron` command instead of running a daemon, doing so once every hour or two results in precise enough timekeeping to avoid stepping the clock.

Notes:
1. The ntpdate command’s reliability and precision improves dramatically with a greater number of servers. Although you can use a single server, you obtain better performance by providing at least three or four servers.
2. If an NTP server daemon like the `xntpd` daemon is running on the same host, the ntpdate command will decline to set the date.
3. You must have root authority on the local host to run this command.

Flags
- `a Keyid` Authenticate all packets using `Keyid`.
- `b` Step the clock’s time by calling the `settimeofday` subroutine.
- `c` Slew the clock’s time by calling the `adjtime` subroutine.
- `d` Specifies debug mode. Determines what results the ntpdate command produces without actually doing them. The results appear on the screen. This flag uses unprivileged ports.
- `e AuthenticationDelay` Specifies the amount of time in seconds to delay the authentication processing.
- `k KeyFile` Specifies a different name for the file containing the keys when not using the default `/etc/ntp.keys` file. See ... for the description of the `KeyFile`.
- `o Version` Specifies the NTP version implementation to use when polling its outgoing packets. The values for `Version` can be 1, 2 or 3. The default is 3.
- `p Samples` Specifies the number of samples to acquire from each server. The values for `Samples` can be between 1 and 8 inclusive. The default is 4.
- `s` Specifies the use of the syslog facility to log actions instead of using standard output. Useful when running the ntpdate command with the `cron` command.
- `t TimeOut` Specifies the amount of time to wait for a response. The value given for `TimeOut` is rounded to a multiple of 0.2 seconds. The default is 1 second.
Specifies the use of an unprivileged port to send the packets from. Useful when you are behind a firewall that blocks incoming traffic to privileged ports, and you want to synchronize with hosts beyond the firewall. A firewall is a system or machine that controls the access from outside networks to a private network.

Parameters

Server ... Specifies the servers to poll.

Exit Status

This command returns the following exit values:

0 Successful completion.
>0 An error occurred.

Security

Access Control: You must have root authority to run this command.

Auditing Events: N/A

Examples

To set the local date and time by polling the NTP servers at address 9.3.149.107, enter:
/usr/sbin/ntpdate 9.3.149.107

Output similar to the following appears:
28 Feb 12:09:13 ntpdate [18450]: step time server 9.3.149.107
offset 38.417792 sec

Files

/usr/sbin/ntpdate Contains the ntpdate command.
/etc/ntp.keys Contains the default key file.

Related Information

Commands: ntpq ntptrace xntpd
Daemons: xntpd

ntpq Command

Purpose

Starts the standard Network Time Protocol (NTP) query program. This command only applies to AIX 4.2 or later.

Syntax

ntpq [-i] [-n] [-p] [-c SubCommand] [Host ...]
Description
The **ntpq** command queries the NTP servers running on the hosts specified which implement the recommended NTP mode 6 control message format about current state and can request changes in that state. It runs either in interactive mode or by using command-line arguments. You can make requests to read and write arbitrary variables, and raw and formatted output options are available. The **ntpq** command can also obtain and print a list of peers in a common format by sending multiple queries to the server.

If you enter the **ntpq** command with one or more flags, the NTP servers running on each of the hosts specified (or defaults to local host) receive each request. If you do not enter any flags, the **ntpq** command tries to read commands from standard input and run them on the NTP server running on the first host specified or on the local host by default. It prompts for subcommands if standard input is the terminal.

The **ntpq** command uses NTP mode 6 packets to communicate with the NTP server and can query any compatible server on the network which permits it.

The **ntpq** command makes one attempt to retransmit requests, and will time-out requests if the remote host does not respond within a suitable time.

Specifying a flag other than `-i` or `-n` sends the queries to the specified hosts immediately. Otherwise, the **ntpq** command attempts to read interactive format subcommands from standard input.

Flags
- **-c SubCommand** Specifies an interactive format command. This flag adds *SubCommand* to the list of commands to run on the specified hosts. You can enter multiple `-c` flags.
- **-i** Specifies interactive mode. Standard output displays prompts and standard input reads commands.
- **-n** Displays all host addresses in dotted decimal format (x.x.x.x) rather than the canonical host names.
- **-p** Displays a list of the peers known to the server and a summary of their state. Same as using the `peers` subcommand.

Parameters

Host ...

Specifies the hosts.

Exit Status
This command returns the following exit values:

- **0** Successful completion.
- **>0** An error occurred.

Security
Access Control: You must be part of the system group to run this command.

Auditing Events: N/A

Examples
1. To start the Network Time Protocol query program in interactive mode, type:
   ```bash
tenpq -i
   ```
2. To add a time interval of 1000 milliseconds to timestamps, type:
ntpq -c "delay 1000"

### ntpq Internal Subcommands

The following subcommands can only be used while running the ntpq query program.

#### Interactive Format Subcommands

Interactive format subcommands consist of a keyword followed by zero to four arguments. You only need to type enough characters of the full keyword to uniquely identify the subcommand. The output of a subcommand goes to standard output, but you can redirect the output of individual subcommands to a file by appending a > (greater than sign), followed by a file name, to the command line.

Some interactive format subcommands run entirely within the ntpq query program and do not result in sending NTP mode 6 requests to a server.

The data carried by NTP mode 6 messages consists of a list of items of the form:

```
Variable=Value
```

where Value is ignored, and can be omitted, in requests to the server to read variables. The ntpq query program maintains an internal list where data to be included in control messages can be assembled and sent using the readlist and writelist control message subcommands.

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>? [ SubCommand ]</td>
<td>Displays command usage information. When used without SubCommand, displays a list of all the ntpq command keywords. When used with SubCommand, displays function and usage information about the subcommand.</td>
</tr>
<tr>
<td>addvars Variable [ =Value ] [ ... ]</td>
<td>Specifies the variables and their optional values to be added to the internal data list. If adding more than one variable, the list must be separated by commas and not contain spaces.</td>
</tr>
<tr>
<td>authenticate yes</td>
<td>yes</td>
</tr>
<tr>
<td>clearvars</td>
<td>Removes all variables from the internal data list.</td>
</tr>
<tr>
<td>cooked</td>
<td>Displays all results received from the remote server reformatted. A trailing ? (question mark) marks variables that do not have decodeable values.</td>
</tr>
<tr>
<td>debug more</td>
<td>less</td>
</tr>
<tr>
<td>delay MilliSeconds</td>
<td>Specifies the time interval to add to timestamps included in requests which require authentication. This subcommand enables unreliable server reconfiguration over long delay network paths or between machines whose clocks are unsynchronized. If you enter this subcommand without an argument, it prints the current setting for this subcommand.</td>
</tr>
<tr>
<td>host HostName</td>
<td>Specifies the host to send queries to. HostName may be either a host name or a numeric address. If you enter this subcommand without an argument, it prints the current setting for this subcommand.</td>
</tr>
<tr>
<td>hostnames yes</td>
<td>no</td>
</tr>
<tr>
<td>keyid Number</td>
<td>Specifies the server key number to use to authenticate configuration requests. If you enter this subcommand without an argument, it prints the current setting for this subcommand.</td>
</tr>
<tr>
<td>ntpversion 1</td>
<td>2</td>
</tr>
<tr>
<td>passwd</td>
<td>Prompts you to type in the NTP server authentication password to use to authenticate configuration requests.</td>
</tr>
<tr>
<td>quit</td>
<td>Exits the ntpq query program.</td>
</tr>
</tbody>
</table>
raw Displays all results received from the remote server without formatting. Only transforms non-ascii characters into printable form.

rmvars Variable [ =Value ] [ ... ] Specifies the variables and their optional values to be removed from the internal data list. If removing more than one variable, the list must be separated by commas and not contain spaces.

timeout MilliSeconds Specifies the time-out period for responses to server queries. The default is 5000 milliseconds. If you enter this subcommand without an argument, it prints the current setting for this subcommand.

Note: Because ntpq query program retries each query once after a time-out, the total waiting time for a time-out is twice the time-out value set.

Control Message Subcommands
Each peer known to an NTP server has a 16-bit integer association identifier assigned to it. NTP control messages which carry peer variables must identify the peer that the values correspond to by including its association ID. An association ID of 0 is special and indicates the variables are system variables whose names are drawn from a separate name space.

The ntpq control message subcommands result in one or more NTP mode 6 messages sent to the server, and outputs the data returned in some format. Most subcommands currently implemented send a single message and expect a single response. The current exceptions are the peers subcommand, which sends a preprogrammed series of messages to obtain the data it needs, and the mreadlist and mreadvar subcommands, which iterate over a range of associations.

associations Obtains and prints a list of association identifiers and peer statuses for in-spec peers of the server being queried. The list is printed in the following columns:

- First column contains the index numbering the associations from 1 for internal use.
- Second column contains the actual association identifier returned by the server.
- Third column contains the status word for the peer.
- Remaining columns contain data decoded from the status word.

Note: The data returned by the associations subcommand is cached internally in the ntpq query program. When dealing with servers that use difficult association identifiers, use the index as an argument, in the form &index, as an alternative to the association identifier.

clockvar [ AssocID ] [ Variable [ =Value ], ... ] Displays a list of the server’s clock variables. Servers which have a radio clock or other external synchronization respond positively to this. To request the system clock variables, leave AssocID blank or type 0. If the server treats clocks as pseudo-peers and can possibly have more than one clock connected at once, referencing the appropriate peer association ID shows the variables of a particular clock. Omitting the variable list causes the server to return a default variable display.

lassociations Displays a list of association identifiers and peer statuses for all associations for which the server is maintaining state. This subcommand differs from the associations subcommand only for servers which retain state for out-of-spec client associations.

lpassociations Displays data for all associations, including out-of-spec client associations, from the internally cached list of associations.

lpeers Displays a summary of all associations the server maintains state for. Similar to the peers subcommand. This may produce a longer list of peers from out-of-spec client servers.

mreadvar AssocID AssocID [ Variable [ =Value ], ... ] Displays the values of the specified peer variables for each server in the range of given nonzero association IDs. The association list cached by the most recent associations command determines the range.

or

mrv AssocID AssocID [ Variable [ =Value ], ... ]
mreadlist AssocID AssocID or
mrl AssocID AssocID
opeers
passociations
peers
pstatus AssocID
readlist [AssocID] or
rl [AssocID]

Displays the values of the specified peer variables in the internal variable list for each server in the range of given nonzero association IDs. The association list cached by the most recent associations command determines the range.

An old form of the peers subcommand. Replaces the reference ID with the local interface address.

Displays association data concerning in-spec peers from the internally cached list of associations. This subcommand works like the associations subcommand except that it displays the internally stored data rather than making a new query.

Displays a list of in-spec peers of the server and a summary of each peer's state. Summary information includes the following:

- Address of the remote peer
- Reference ID (0.0.0.0 for an unknown reference ID)
- Stratum of the remote peer (a stratum of 16 indicates the remote peer is unsynchronized)
- Type of peer (local, unicast, multicast, or broadcast)
- Time the last packet was received, the polling interval (seconds)
- Polling interval (seconds)
- Reachability register (octal)
- Current estimated delay, offset and dispersion of the peer (seconds)

The character in the left margin indicates the fate of this peer in the clock selection process:

- **space** Discarded due to high stratum and/or failed sanity checks.
- **x** Designated falseticker by the intersection algorithm.
- **.** Culled from the end of the candidate list.
- **-** Discarded by the clustering algorithm.
- **+** Included in the final selection set.
- **#** Selected for synchronization but distance exceeds maximum.
- ***** Selected for synchronization.
- **o** Selected for synchronization, pps signal in use.

The contents of the host field may be a host name, an IP address, a reference clock implementation name with its parameter or REFCLK (ImplementationNumber, Parameter). Only IP addresses display when using hostnames no.

Note:

The peers subcommand depends on the ability to parse the values in the responses it gets. It may fail to work from time to time with servers that poorly control the data formats.

The peers subcommand is non-atomic and may occasionally result in spurious error messages about invalid associations occurring and terminating the command.

Displays the names and values of the peer variables of the server with the given association by sending a read status request. The output displays the header preceding the variables, both in hexadecimal and in English.

Displays the values of the peer variables in the internal variable list of the server with the given association. To request the system variables, leave AssocID blank or type 0. If the internal variable list is empty, the server returns a default variable display.
readvar [ AssocID ] [ Variable [ =Value ], ... ] or rv [ AssocID ] [ Variable [ =Value ], ... ]

Displays the values of the specified peer variables of the server with the given association by sending a read variables request. To request the system variables, leave AssocID blank or type 0. Omitting the variable list causes the server to return a default variable display.

writevar [ AssocID ] [ Variable [ =Value ], ... ]

Writes the values of the specified peer variables to the server with the given association by sending a write variables request.

writelists [ AssocID ]

Writes the values of the peer variables in the internal variable list of the server with the given association.

Files

/usr/sbin/ntpq

Contains the ntpq command.

Related Information

Commands: ntpdate, ntptrace, xntpd

Daemons: xntpd

.ntptrace Command

Purpose

Traces a chain of Network Time Protocol (NTP) hosts back to their master time source.

Syntax

ntptrace [ -d ] [ -n ] [ -v ] [ -r Retries ] [ -t TimeOut ] [ Server ]

Description

The ntptrace command determines where a given NTP server gets its time, and follows the chain of NTP servers back to their master time source. For example, stratum 0 server.

Flags

-d

Turns on debugging output.

-n

Outputs host IP addresses instead of host names.

-r Retries

Specifies the number of retransmission attempts for each host. The default is 5.

-t TimeOut

Specifies the retransmission timeout in seconds. The default is 2 seconds.

-v

Specifies verbose mode.

Parameters

Server

Specifies the server. The default is the local host.

Exit Status

This command returns the following exit values:

0 Successful completion.

>0 An error occurred.
Security
Access Control: You must be part of the system group to run this command.

Auditing Events: N/A

Examples
To trace where the local host NTP server gets its time from, enter:
ntptrace

Output similar to the following appears:
localhost: stratum 4, offset 0.0019529, synch distance 0.144135
server2.bozo.com: stratum 2, offset 0.0124263, synch distance 0.115784
usndh.edu: stratum 1, offset 0.0019298, synch distance 0.011993, refid 'WWVB'

On each line, the fields are:
1. the host's stratum,
2. the time offset between that host and the local host, as measured by the ntptrace command, (this is why it is not always zero for localhost).
3. the host's synchronization distance, which is a measure of the quality of the clock's time, and
4. the reference clock ID This only applies to stratum-1 servers.

All times are given in seconds.

Files
/usr/sbin/ntptrace       Contains the ntptrace command.

Related Information
Commands: ntpq, ntpdate, xntpdc

Daemons: xntpd

ntsc Command

Purpose
Enables or disables NTSC (National Television Standards Committee) video output of the G10 Graphics with Motion Video Adapter.

Syntax
ntsc [ -v ] [ on | off ]

Description
The ntsc command enables or disables the NTSC video output of the G10 Graphics with Motion Video Adapter. When the NTSC video output is enabled, the same image displayed on LCD and/or CRT is displayed on NTSC video output. While video capture or playback application is running, the ntsc command can not enable NTSC video output. If on or off parameter is not specified, the ntsc command usage is displayed.
Flags

-\(v\) Displays the result of the action taken.

Parameters

on Enables NTSC video output, if a video capture or playback application is not running.
off Disables NTSC video output.

Security
Access Control: Any User
Auditing Events: N/A

Examples

1. To enable NTSC video output, enter:
   \(\text{ntsc on}\)
2. To disable NTSC video output with result message, enter:
   \(\text{ntsc -v off}\)

Something similar to the following displays:
\(\text{ntsc off succeeded}\)

Files

/\(\text{usr/bin/ntsc}\) Contains the ntsc command.

nulladm Command

Purpose
 Creates active accounting data files.

Syntax

/\(\text{usr/sbin/acct/nulladm}\) [ File ... ]

Description
The nulladm command creates the file specified by the File parameter, gives read (r) and write (w) permission to the file owner, and group and read (r) permission to other users, and ensures that the file owner and group are adm. Various accounting shell procedures call the nulladm command. A user with administrative authority can use this command to set up the active data files, such as the /\(\text{var/adm/wtmp}\) file.

Note: You should not share accounting files among nodes in a distributed environment. Each node should have its own copy of the various accounting files.

Security
Access Control: This command should grant execute (x) access only to members of the adm group.
Files

/usr/sbin/acct
Contains the accounting commands.
/var/adm/acct/sum
Contains accounting data files.

Related Information
The `acctmerge` command, `prdaily` command.

System accounting in *Operating system and device management.*
Setting up an accounting subsystem in *Operating system and device management.*
Monitoring and tuning commands and subroutines in *Performance management.*

number Command

Purpose
Displays the written form of a number.

Syntax
number

Description
The `number` command translates the numerical representation of an entered number to the written form. The largest number it can translate accurately contains 66 digits. For example:

```
12345678
```
```
twelve million.
```
```
three hundred forty five thousand.
```
```
six hundred seventy eight.
```

In the above example, you entered 12345678 and the computer translated it to twelve million three hundred forty five thousand six hundred seventy eight.

The `number` command does not prompt you for a number. Once started, it simply waits for input. To exit the program, press the Interrupt (Ctrl-C) or End Of File (Ctrl-D) key sequence.

Files

/usr/games
Contains the system games.

Related Information
The `arithmetic` command, `back` command, `bj` command, `craps` command, `fish` command, `fortune` command, `hangman` command, `moo` command, `quiz` command, `ttt` command, `turnoff` command, `turnon` command.

od Command

Purpose
Displays files in a specified format.
Syntax

To Display Files Using a Type-String to Format the Output
```
od [-v] [A AddressBase] [N Count] [j] Skip] [[ TypeString ... [ File ... ]
```

To Display Files Using Flags to Format the Output
```
od [ -a | -b | c | C | d | -D | e | f | F | h | -H | j | -t | -N | -j | Skip] [ -v] [ -s] ... ] [ File ... ]
```

Description

The `od` command displays the file specified by the `File` parameter in the format specified. If the `File` parameter is not given, the `od` command reads standard input. Multiple types can be specified by using multiple `-bcDdFfOsstvXxOptions`.

In the first syntax format, the output format is specified by the `-t` flag. If no format type is specified, `-t o2` is the default.

In the second syntax format, the output format is specified by a combination of flags. The `Offset` parameter specifies the point in the file where the file output begins. By default, the `Offset` parameter is interpreted as octal bytes. If the . (dot) suffix is appended, the parameter is interpreted as a decimal; if the parameter begins with a leading `x` or `0x`, it is treated as a hexadecimal. If the `b` suffix is added to the parameter, it is interpreted in blocks of 512 bytes; if the `B` suffix is added to the parameter, it is interpreted in blocks of 1024 bytes.

The `Label` parameter is interpreted as a pseudo-address for the first byte displayed. If used, it is given in ( ) (parentheses) following the `Offset` parameter. The suffixes have the same meanings as for the `Offset` parameter.

When the `od` command reads standard input, the `Offset` parameter and the `Label` parameter must be preceded by a + (plus sign).

The setting of environment variables such as `LANG` and `LC_ALL` affects the operation of the `od` command. See "Understanding Locale Environment Variables" in Operating system and device management for more information.

Flags

The flags for the first format are:

- `-A AddressBase` Specifies the input offset base. The `AddressBase` variable is one of the following characters:
  - `d` Offset base is written in decimal.
  - `o` Offset base is written in octal.
  - `x` Offset base is written in hexadecimal.
  - `n` Offset base is not displayed.

Unless `-A n` is specified, the output line will be preceded by the input offset, cumulative across input files, of the next byte to be written. In addition, the offset of the byte following the last byte written will be displayed after all the input data has been processed. Without the `-A address_base` option and the [offset_string] operand, the input offset base is displayed in octal.
-j Skip

Jumps over the number of bytes given by the Skip variable before beginning to display output. If more than one file is specified, the od command jumps over the designated number of bytes of the concatenated input files before displaying output. If the combined input is not at least the length of the skip bytes, the od command will write a diagnostic message to standard error and exit non-zero status.

By default, the value of the Skip variable is interpreted as a decimal number. With a leading 0x or 0X, the offset is interpreted as a hexadecimal number; otherwise, with a leading 0, the offset shall be interpreted as an octal number. If the characters b, k, or m are appended to the number contained by the Skip variable, the offset is equal to the value, in bytes, of the Skip variable multiplied by 512, 1024, or 1024*1024, respectively.

-N Count

Formats no more than the number of input bytes specified by the Count variable. By default, the value of the Count variable is interpreted as a decimal number. With a leading 0x or 0X, it is treated as a hexadecimal number. If it begins with a 0, it is treated as an octal number. The base of the address displayed is not implied by the base of the Count option-argument.

-t TypeString

Specifies the output type. The TypeString variable is a string specifying the types to be used when writing out data. Multiple types can be concatenated within the same TypeString variable, and the -t flag can be specified more than once. Output lines are written for each type specified, in the order in which the type specification characters are given. The TypeString variable can consist of the following characters:

a Displays bytes as named characters. Bytes with the least seven bits in the range of 0 through 01777 are written using the corresponding names for those characters.

c Displays bytes as characters. The number of bytes transformed by the c type string is determined by the LC_CTYPE local category. Printable multibyte characters are written in the area corresponding to the first byte of the character; the two character sequence ** is written in the area corresponding to each remaining byte in the character, as an indication that the character is continued. The following nongraphic characters are used as C-language escape sequences:

\ Backslash
\a Alert
\b Backspace
\f Form-feed
\n New-line character
\0 Null
\r Carriage return
\t Tab
\v Vertical tab

d Displays bytes as signed decimals. By default, the od command transforms the corresponding number of bytes in the C-language type int. The d type string can be followed by an unsigned decimal integer that specifies the number of bytes to be transformed by each instance of the output type.

An optional C, I, L, or S character can be appended to the d option, indicating that the conversion should be applied to an item of type char, int, long, or short, respectively.

f Displays bytes as floating points. By default, the od command transforms the corresponding number of bytes in the C-language type double. The f type string can be followed by an unsigned decimal integer that specifies the number of bytes to be transformed by each instance of the output type.

An optional F, D, or L character can be appended to the f option, indicating that the conversion should be applied to an item of type float, double, or long double, respectively.
o  Displays bytes as octals. By default, the od command transforms the corresponding number of bytes in the C-language type int. The o type string can be followed by an unsigned decimal integer that specifies the number of bytes to be transformed by each instance of the output type.

An optional C, I, L, or S character can be appended to the o option, indicating that the conversion should be applied to an item of type char, int, long, or short, respectively.

u  Display bytes as unsigned decimal. By default, the od command transforms the corresponding number of bytes in the C-language type int. The u type string can be followed by an unsigned decimal integer that specifies the number of bytes to be transformed by each instance of the output type.

An optional C, I, L, or S character can be appended to the u option, indicating that the conversion should be applied to an item of type char, int, long, or short, respectively.

x  Display bytes as hexadecimal. By default, the od command transforms the corresponding number of bytes in the C-language type int. The x type string can be followed by an unsigned decimal integer that specifies the number of bytes to be transformed by each instance of the output type.

An optional C, I, L, or S character can be appended to the x option, indicating that the conversion should be applied to an item of type char, int, long, or short, respectively.

The flags for the second format are:

-a  Displays bytes as characters and displays them with their ASCII names. If the -p flag is also given, bytes with even parity are underlined. The -P flag causes bytes with odd parity to be underlined. Otherwise, parity is ignored.

-b  Displays bytes as octal values.

-c  Displays bytes as ASCII characters. The following nongraphic characters appear as C-language escape sequences:

\ Backslash
\a Alert
\b Backspace
\f Form-feed
\n New-line character
\0 Null
\r Carriage return
\t Tab
\v Vertical tab

Others appear as three-digit octal numbers.

-C  Displays extended characters as standard printable ASCII characters (using the appropriate character escape string) and displays multibyte characters in hexadecimal form.

-d  Displays 16-bit words as unsigned decimal values.

-D  Displays long words as unsigned decimal values.

-e  Displays long words as double-precision, floating point. (same as the -F flag)

-f  Displays long words as floating points.

-F  Displays long words as double-precision, floating point. (same as the -e flag)

-h  Displays 16-bit words as unsigned hexadecimal.

-H  Displays long words as unsigned hexadecimal values.

-i  Displays 16-bit words as signed decimal.

-I  (Uppercase i) Displays long words as signed decimal values.

-l  (Lowercase l) Displays long words as signed decimal values.

-L  Displays long words as signed decimal values.
Note: The flags -I (uppercase i), -l (lowercase L), and -L are identical.

-0 Displays 16-bit words as unsigned octal.
-0 Displays long words as unsigned octal values.
-p Indicates even parity on -a conversion.
-P Indicates odd parity on -a conversion.
-s Displays 16-bit words as signed decimal values.
-S[N] Searches for strings of characters ending with a null byte. The N variable specifies the minimum length string to be recognized. If the N variable is omitted, the minimum length defaults to 3 characters.

The -v flag is the same for both formats:

-v Writes all input data. By default, output lines that are identical to the immediately preceding output lines are not printed, but are replaced with a line containing only an * (asterisk). When the -v flag is specified, all the lines are printed.

-w [N] Specifies the number of input bytes to be interpreted and displayed on each output line. If the -w flag is not specified, 16 bytes are read for each display line. If the -w flag is specified without the N variable, 32 bytes are read for each display line. The maximum input value is 4096 bytes. Input values greater than 4096 bytes will be reassigned the maximum value.

-x Displays 16-bit words as hexadecimal values.
-X Displays long words as unsigned hexadecimal values. (same as the -H flag)

Exit Status
This command returns the following exit values:

0 All input files were processed successfully.
>0 An error occurred.

Examples
1. To display a file in octal, a page at a time, enter:
   od a.out | pg
   This command displays the a.out file in octal format and pipes the output through the pg command.
2. To translate a file into several formats at once, enter:
   od -t cx a.out > a.xcd
   This command writes the contents of the a.out file, in hexadecimal format (x) and character format (c), into the a.xcd file.
3. To start displaying a file in the middle (using the first syntax format), enter:
   od -t acx -j 100 a.out
   This command displays the a.out file in named character (a), character (c), and hexadecimal (x) formats, starting from the 100th byte.
4. To start in the middle of a file (using the second syntax format), enter:
   od -bcx a.out +100.
   This displays the a.out file in octal-byte (b), character (-c), and hexadecimal (x) formats, starting from the 100th byte. The . (period) after the offset makes it a decimal number. Without the period, the output would start from the 64th (100 octal) byte.
Files

/usr/bin/od Contains the od command.

Related Information

The dbx command, pg command.


odmadd Command

Purpose

Adds objects to created object classes.

Syntax

odmadd [ InputFile ... ]

Description

The odmadd command takes as input one or more InputFile files and adds objects to object classes with data found in the stanza files. Each InputFile file is an ASCII file containing the data that describes the objects to be added to object classes. If no file is specified, input is taken from stdin (standard input).

The classes to be added to are specified in the ASCII input file. The file is in the following general format:

class1name:
  descriptor1name = descriptor1value
  descriptor2name = descriptor2value
  descriptor3name = descriptor3value

class2name:
  descriptor4name = descriptor4value

.
.
.

The input file can contain the \ (backslash), which is handled as it is in C language. String and method values in the input file must be enclosed in " " (double-quotation marks). A descriptor value can span more than one line.

Examples

An ASCII input file used by the odmadd command looks like the following:

Fictional_Characters:
  Story_Star = "Cinderella"
  Birthday = "Once upon a time"
  Age = 19
  Friends_of = Cinderella
  Enemies_of = "Cinderella"

Friend_Table:
  Friend_of = "Cinderella"
  Friend = "Fairy godmother"

Friend_Table:
  Friend_of = "Cinderella"
  Friend = "Mice"
Enemy Table:
Enemy_of = "Cinderella"
Enemy = "Wicked sisters"

Enemy Table:
Enemy_of = "Cinderella"
Enemy = "Mean stepmother"

If the preceding file is named NewObjects, the following command adds the objects to existing object classes:

```
odmadd NewObjects
```

See “ODM Example Code and Output” in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs for another example of an ASCII file that can be input with the `odmadd` command.

**Related Information**

- Object Data Manager (ODM) Overview for Programmers in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.
- The `odm_add_obj` subroutine.
- List of ODM Commands and Subroutines in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.
- Understanding ODM Object Classes and Objects in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.
- How to Create an Object Class in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.
- How to Add Objects to an Object Class in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.
- How to Store Object Classes and Objects in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.

### odmchange Command

**Purpose**
Changes the contents of a selected object in the specified object class.

**Syntax**
```
odmchange [-o ObjectClass] [-q Criteria] [ inputFile]
```

**Description**
The `odmchange` command, given the object class to modify, the search criteria, and the new object (only for attributes that need to change), modifies all objects that satisfy the search criteria. The `inputFile` file has the same format as the `inputFile` file (the ASCII input file) for the `odmadd` command.

**Flags**
- `-o ObjectClass` Specifies the object class to modify.
-q Criteria Specifies the criteria used to select objects from the object class. For information on qualifying criteria, see “Understanding ODM Object Searches” in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs. If no criteria are specified (no -q flag), all object entries in the object class are changed.

Related Information

Object Data Manager (ODM) Overview for Programmers in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.

Object Data Manager (ODM) Overview for Programmers in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.

The odmadd command.

The odm_change_obj subroutine.

Understanding ODM Descriptors in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.

List of ODM Commands and Subroutines in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.

ODM Example Code and Output in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.

odmcreate Command

Purpose

Produces the .c (source) and .h (include) files necessary for ODM application development and creates empty object classes.

Syntax

odmcreate [ -p ] [ -c | -h ] ClassDescriptionFile

Description

The odmcreate command is the ODM class compiler. The command takes as input an ASCII file that describes the objects a user wishes to use in a specific application. The odmcreate command can create empty object classes as part of its execution.

The output of the odmcreate command is a .h file (an include file) that contains the C language definitions for the object classes defined in the ASCII ClassDescriptionFile file. The resulting include file is used by the application for accessing objects stored in ODM. The odmcreate command also produces a .c file that must be compiled and bound in with the application. The .c file contains structures and definitions that are used internally by ODM at run time.

The ClassDescriptionFile parameter specifies an ASCII file that contains descriptions of one or more object classes. The general syntax for the ClassDescriptionFile parameter is as follows:

```
file : classes
classes : class | classes class
class : head body tail
head : struct ClassName {
```
The default suffix for a ClassDescriptionFile file is .cre. If no suffix is specified on the odmcreate command, then a .cre suffix is appended. The file can have C language comments if run with the -p flag, and can include #define and #include lines that can be preprocessed if the -p flag is used to run the C language preprocessor on the file.

Note: ODM data bases are 32-bit data bases. The long type, when used in the class description file is a 32-bit data item. The long64 or int64 type, when used in the class description file is a 64-bit data item. The generated files will function the same for both 32- and 64-bit applications.

Flags

-c  Creates empty object classes only; does not generate the C language .h and .c files.
-h  Generates the .c and .h files only; does not create empty classes.
-p  Runs the C language preprocessor on the ClassDescriptionFile file.

Example

Assuming that a ClassDescriptionFile file named FileName.cre exists, the following command creates object classes:

odmcreate FileName.cre

Below is the FileName.cre source file and the resulting .h file:

/* This is an example odmcreate input file */
/* FileName.cre */

class Class2 {
    char keys[32];
    method card;
    long cash;
};
class TstObj {
    long a;
    char b[80];
    link Class2 Class2 card Class2Ln;
};

/* End of FileName.cre */

/* This is the generated header file FileName.h */
#include <odmi.h>
struct Class2 {
    long _id;    /* unique object id within object class */
    long _reserved; /* reserved field */
    long _scratch;    /* extra field for application use */
    char keys[32];
    char card[256];  /* method */
    long cash;
};
#define Class2_Descs 3
extern struct Class2_CLASS[];
#define get_Class2_list (a,b,c,d,e) (struct Class2 *) odm_get_list (a,b,c,d,e)

struct TstObj {
    long _id;    /* unique object id within object class */
    long _reserved; /* reserved field */
    long _scratch;    /* extra field for application use */
    long a;
    char b[80];
    struct Class2 *Class2Ln;  /* link */
    struct objlistinfo *Class2Ln_info; /* link */
    char Class2Ln_Lvalue[256];  /* link */
};
#define TstObj_Descs 3
extern struct Class TstObj_CLASS[];
#define get_TstObj_list (a,b,c,d,e) (struct TstObj *) odm_get_list (a,b,c,d,e)

/* End of generated header file FileName.h */

See “ODM Example Code and Output” in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs for another example of a ClassDescriptionFile parameter and the resulting .h file.

Related Information

Object Data Manager (ODM) Overview in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.

The odm_create_class subroutine.

List of ODM Commands and Subroutines in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.

Understanding ODM Object Classes and Objects in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.

Understanding ODM Descriptors in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.

How to Create an Object Class in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.

How to Add Objects to an Object Class in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.

How to Store Object Classes and Objects in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.
odmdelete Command

Purpose
Deletes selected objects from a specified object class.

Syntax
odmdelete [-o ObjectClass [ -q Criteria ]]

Description
The odmdelete command, given the object class to delete from and the search criteria, deletes all objects that meet those criteria.

Flags
- o ObjectClass
  Specifies the object class to delete from.
- q Criteria
  Specifies the criteria used to select objects from the object class. For information on qualifying criteria, see "Understanding ODM Object Searches" in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs. If no criteria are specified (no -q flag), then all objects are deleted.

Related Information
Object Data Manager (ODM) Overview for Programmers in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.

odmdrop Command

Purpose
Removes an object class.

Syntax
odmdrop [-o ClassName]

Description
The odmdrop command removes an entire object class and all of its objects. No checking is done to see if other object classes are linked to this one.

Flags
- o ClassName
  Specifies the object class to remove.
Example
Assuming that an object class named MyObjectClass exists, the following command removes the object class:

```bash
odmdrop -o MyObjectClass
```

Related Information
- [Object Data Manager (ODM) Overview for Programmers](#) in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.

The `odm_rm_class` subroutine.

- [Understanding ODM Object Classes and Objects](#) in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.

- [List of ODM Commands and Subroutines](#) in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.

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### odmget Command

**Purpose**
Retrieves objects from the specified object classes into an **odmadd** input file.

**Syntax**

```bash
odmget [ -q Criteria ] ObjectClass ...
```

**Description**
The **odmget** command takes as input a search criteria and a list of object classes, retrieves the selected objects from the specified object classes, and writes an ASCII **odmadd** input file to standard output.

**Flags**

- `-q Criteria` Specifies the search criteria used to select objects from the object class or classes. For information on search criteria, see [Understanding ODM Object Searches](#) in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs. If no criteria are specified (no `-q` flag), all objects in the object class or classes are retrieved.

**Example**
The following **odmget** command retrieves objects from an existing object class called Supporting_Cast_Ratings that has an Others descriptor equal to the string 'Fairy Godmother':

```bash
odmget -q "Others='Fairy Godmother'" Supporting_Cast_Ratings
```

See the **odmadd** command or ["ODM Example Code and Output"](#) in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs for an example of an ASCII **odmadd** input file.

**Related Information**
The **odmadd** command.
odmshow Command

Purpose
Displays an object class definition on the screen.

Syntax
odmshow ObjectClass

Description
The odmshow command takes as input an object class name (ObjectClass) and displays the class description on the screen. The class description is in the format taken as input to the odmcreate command.

Example
Assuming that an object class named MyObjectClass exists, the following command displays the description of MyObjectClass on the screen:

odmshow MyObjectClass

Also, see the odmcreate command or "ODM Example Code and Output" in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs for an example of the output listing.

Related Information
Object Data Manager (ODM) Overview for Programmers in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.

The odmcreate command.

Understanding ODM Object Classes and Objects in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.

ODM Example Code and Output in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.

List of ODM Commands and Subroutines in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.
on Command

Purpose
Executes commands on remote systems.

Syntax
/usr/bin/on [ -d ] [ -i ] [ -n ] Host Command [ Argument ... ]

Description
The on command executes commands on other systems in an environment that is similar to the one running the program. The on command passes the local environment variables to the remote machine, thus preserving the current working directory. When using the on command, both users must have the same user identification. Relative path names work only if they are within the current file system. Absolute path names can cause problems since commands are issued at one machine and executed on another.

The standard input is connected to the standard input of the remote command. The standard output and standard error from the remote command are sent to the corresponding files for the on command. The root user cannot execute the on command.

Attention: When the working directory is remotely mounted over the Network File System (NFS), the Ctrl-Z key sequence causes the window to hang.

Flags
- -d Specifies debug mode. Displays status messages as work progresses.
- -i Specifies interactive mode. Uses remote echoing and special character processing. This option is needed for programs that expect to be talking to a terminal. All terminal modes and window size changes are increased.
- -n Specifies no input. This option causes the remote program to get an end-of-file (EOF) message when it reads from standard input. This flag is necessary when running commands in the background with job control.

Example
To execute the ls -al command on another machine and display the in-progress status messages on your terminal, enter:

don -d zorro ls -al

In this example, the on command executes the ls command on a workstation named zorro.

Files
/etc/exports
Lists the directories that the server can export.

/etc/inetd.conf
Defines how the inetd daemon handles Internet service requests.

Related Information
The rexd daemon.

Network File System (NFS) Overview for System Management in Networks and communication management.
List of NFS commands in Networks and communication management.

OS_install Command

Purpose
Performs network install operations on OS_install objects.

Syntax
Traditional usage:

\texttt{OS\_install \{ -o \textit{Operation} \} \{-a \textit{attr}=\textit{value}... \} \{ObjectName\}}

For system plan installations (System Plan mode):

\texttt{OS\_install \{-i \textit{sysplan} \{-x \textit{sysplan.xml} \} \{-d\}}

For listing OS_install objects (List mode):

\texttt{OS\_install \{-l \{-v\} \{-t \textit{object\_type} | \textit{object\_name}\} \}}

Description
The \texttt{OS\_install} command performs a network install operation on an OS_install object. The type of operation is dependent on the type of object specified by the \textit{ObjectName} parameter. The object pointed to by the \textit{ObjectName} parameter can be one of three types: client, OS_Resource, or ControlHost. Command operations involve the creation and management of OS_install objects in order to network install an operation system onto a client machine.

\texttt{OS\_install} can also be run in System Plan mode by passing the -i \textit{sysplan} flag instead of specifying an operation. This provides the ability to combine multiple OS_install operations into a single XML document.

The List mode of OS_install is used to list the current configuration of objects in the OS_install environment.

Flags

\texttt{-a \textit{attr}=\textit{value}}

Assigns the specified value to the specified attribute.

\texttt{-d}

Destroys all OS_install objects created during System Plan mode after all operations have been completed.

\texttt{-i \textit{sysplan}}

Specifies System Plan mode.

\texttt{-l}

Lists all OS_install objects in the environment by default.

\texttt{-o \textit{Operation}}

Specifies an operation to perform on an OS_install object.

\texttt{-t \textit{object\_type} | \textit{object\_name}}

Narrows the list returned by the -l flag to only objects of type \textit{object\_type} or to the single OS_install object specified by \textit{object\_name}.

\texttt{-v}

Displays the list returned by the -l flag.

\texttt{-x \textit{sysplan.xml}}

Specifies the XML file that contains the system plan.
## Operations

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<tr>
<td>Operation</td>
<td>Description</td>
<td>Required Attributes</td>
<td>Optional Attributes</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>netboot</td>
<td>Instructs the hardware control host of the client object to initiate a network boot.</td>
<td>None.</td>
<td>None.</td>
</tr>
<tr>
<td>monitor_installation</td>
<td>Monitors the installation status of the client object.</td>
<td>None.</td>
<td>None.</td>
</tr>
<tr>
<td>deallocate</td>
<td>Deallocates the OS_Resource that was allocated to the client object by an allocate operation.</td>
<td>None.</td>
<td>None.</td>
</tr>
<tr>
<td>remove</td>
<td>Removes the object from the OS_install environment.</td>
<td>None.</td>
<td>None.</td>
</tr>
</tbody>
</table>

**Exit Status**

0  The command completed successfully.

>0  An error occurred.

**Examples**

1. To define a client object, enter a command similar to the following:
   ```
   OS_install -o define_client -a ip_addr=128.0.64.117 -a mac_addr=ab:cc:de:10:23:45 -a \
   gateway=128.0.64.1 -a subnet_mask=255.255.255.0 -a ctrl_host=myhmc -a lpar=AIX1 -a \
   profile=AIX1 -a managed_system=myMngSys myclient01
   ```
   The preceding client object is a logical partition in a managed system.

2. To define an OS_Resource object, enter a command similar to the following:
   ```
   OS_install -o define_resource -a location=/images/AIX/53ML3 -a type=AIX -a version=53ML3 my53resource
   ```

3. To allocate the OS_Resource object defined in the preceding example to a client object, enter a command similar to the following:
   ```
   OS_install -o allocate -a os_resource=my53resource myclient01
   ```

4. To deallocate the my53resource client object that was allocated in the preceding example, enter:
   ```
   OS_install -o deallocate myclient01
   ```

5. To define a ControlHost object to be specified for the ctrl_host attribute, enter a command similar to the following:
   ```
   OS_install -o define_ctrl_host -a type=hmc -a hostname=hmc_hostname -a communication_method=ssh myhmc
   ```
   Although the preceding example shares the same name of the ctrl_host attribute in the first example, the define_client operation allows an undefined ControlHost object to be specified for the ctrl_host attribute. In that case, the ControlHost object must be defined before calling the netboot operation for the client. To define the ControlHost object, enter:
   ```
   OS_install -o netboot myclient01
   ```

6. To view a myclient01 installation, enter:
   ```
   OS_install -o monitor_installation myclient01
   ```

7. To remove the definition of the my53resource object, enter:
   ```
   OS_install -o remove my53resource
   ```

8. To remove the definition of the myclient01 object, enter:
   ```
   OS_install -o remove myclient01
   ```
If an OS_Resource object is specified, the remove operation also removes any OS images that exist in the file system directory specified by the object's location attribute.

**Location**
/usr/sbin/OS_install

**Files**
/var/osinstall Directory containing configuration files for the OS_install environment.

**Related Information**
[Installing with Network Installation Management](index.html) in *Installation and migration*.

---

### oslevel Command

**Purpose**
Reports the latest installed maintenance and technology level of the system.

**Syntax**
```
oslevel [-l Level | -g | -q | -r | -s | -f]
oslevel [-l Level | -g | -q | -r | -s | -f]
```

**Description**
The oslevel command reports the maintenance and technology levels of the operating system using a subset of all filesets installed on your system. These filesets include the Base Operating System (BOS), base devices, base printers, and X11 2d.

The oslevel command also prints information about maintenance and technology levels, including which filesets are not at a specified maintenance and technology level.

**Flags**
- `-l Level` Lists file sets at maintenance and technology levels earlier than the maintenance and technology level specified by the Level parameter.
- `-f` Forces the oslevel command to rebuild the cache for this operation.
- `-g` Lists file sets at maintenance and technology levels later than the current maintenance and technology level.
- `-q` Lists names of known maintenance and technology levels that can be specified using the `-l` flag.
- `-r` Applies all flags to the recommended maintenance and technology levels.
- `-s` Applies all flags to Service Packs.

If no flags are specified, the base system software is entirely at or above the maintenance and technology levels that are listed in the output of the oslevel command.

**Examples**
1. To determine the maintenance and technology level of the system, type:
   ```
oslevel
   ```
2. To determine the file sets that are below maintenance level 4.1.2.0, type:
   ```
oslevel -l 4.1.2.0
   ```
3. To determine the file sets at levels later than the current maintenance and technology level, type:
4. To determine the highest recommended maintenance and technology level reached for the current version of AIX on the system, type:

    oslevel -g

5. To list all known recommended maintenance and technology levels on the system, type:

    oslevel -r

6. To list which software is below the recommended maintenance and technology level, AIX 5L Version 5.3 with the 5300-03 Recommended Maintenance package, type:

    oslevel -r -l 5300-03

7. To list the known Service Packs on a system, type:

    oslevel -q -s

The output will be similar to the following:

    Known Service Packs
    -------------------
    5300-04-01
    5300-04-00

Files

    /usr/bin/oslevel

    Contains the oslevel command.

Related Information

The lspp command.

ospf_monitor Command

Purpose

Monitors the OSPF gateways.

Syntax

ospf_monitor mon_db_file

Description

The ospf_monitor command is used to query OSPF routers. The ospf_monitor command operates in interactive mode. It allows the user to query the various OSPF routers to provide detailed information on I/O statistics, error logs, link-state data bases, AS external data bases, the OSPF routing table, configured OSPF interfaces, and OSPF neighbors.

Specify the complete pathname of a database composed of records configuring destinations for ospf_monitor remote commands with mon_db_file. Each destination record is a single-line entry which lists the destination IP address, the destination hostname, and an OSPF authentication key (if authentication is activated by the destination). Since authentication keys may be present in the destination records, it is recommended that general access to this database be restricted.

Refer to RFC-1583 (OSPF Specification, version 2) for details about OSPF database and packet formats.

Commands

Upon entering interactive mode, ospf_monitor presents the `[ # ] dest command params >' prompt, at which you can enter any of ospf_monitor's interactive commands. Interactive commands can be interrupted at any time with a keyboard interrupt.
Note: The command line length must be less than 200 characters.

Local Commands

?          Displays all local commands and their functions.
?R         Displays all remote commands and their functions.
d          Displays all configured destinations. This command displays dest_index, the IP address, and the hostname of all potential ospf_monitor command destinations configured in mon_db_file.
h          Displays the command history buffer showing the last 30 interactive commands.
x          Exits the ospf_monitor program.
@ remote_command       Sends remote_command to the same (previous) destination.
@dest_index remote_command       Sends remote_command to configured destination dest_index.
F filename           Sends all ospf_monitor output to filename.
S          Sends all ospf_monitor output to stdout.

Remote Commands

a area_id type ls_id adv_rtr        Displays link state advertisement. Area_id is the OSPF area for which the query is directed. adv_rtr is the router-id of the router which originated this link state advertisement. Type specifies the type of advertisement to request and should be specified as follows:

1 Request the router links advertisements. They describe the collected states of the router’s interfaces. For this type of request, the ls_id field should be set to the originating router’s Router ID.

2 Request the network links advertisements. They describe the set of routers attached to the network. For this type of request, the ls_id field should be set to the IP interface address of the network’s Designated Router.

3 Request the summary link advertisements describing routes to networks. They describe inter-area routes, and enable the condensing of routing information at area borders. For this type of request, the ls_id field should be set to the destination network’s IP address.

4 Request the summary link advertisements describing routes to AS boundary routers. They describe inter-area routes, and enable the condensing of routing information at area borders. For this type of request, the ls_id field should be set to the Router ID of the described AS boundary router.

5 Request the AS external link advertisements. They describe routes to destinations external to the Autonomous System. For this type of request, the ls_id field should be set to the destination network’s IP address.

c          Displays cumulative log. This log includes input/output statistics for monitor request, hello, data base description, link-state request, link-state update, and link-state ack packets. Area statistics are provided which describe the total number of routing neighbors and number of active OSPF interfaces. Routing table statistics are summarized and reported as the number of intra-area routes, inter-area routes, and AS external data base entries.

e          Displays cumulative errors. This log reports the various error conditions which can occur between OSPF routing neighbors and shows the number of occurrences for each.

h          Displays the next hop list. This is a list of valid next hops mostly derived from the SPF calculation.
I [ retrans ]
Displays the link-state database (except for ASE’s). This table describes the routers and networks making up the AS. If retrans is non-zero, the retransmit list of neighbors held by this lsdb structure will be printed.

A [ retrans ]
Displays the AS external data base entries. This table reports the advertising router, forwarding address, age, length, sequence number, type, and metric for each AS external route. If retrans is non-zero, the retransmit list of neighbors held by this lsdb structure will be printed.

o [ which ]
Displays the OSPF routing table. This table reports the AS border routes, area border routes, summary AS border routes, networks, summary networks and AS external networks currently managed via OSPF. If which is omitted, all of the above will be listed. If specified, the value of which (between 1 and 63) specifies that only certain tables should be displayed. The appropriate value is determined by adding up the values for the desired tables from the following list:

1 Routes to AS border routers in this area.
2 Routes to area border routers for this area.
4 Summary routes to AS border routers in other areas.
8 Routes to networks in this area.
16 Summary routes to networks in other areas.
32 AS routes to non-OSP networks.

I Displays all interfaces. This report shows all interfaces configured for OSPF. Information reported includes the area, interface IP address, interface type, interface state, cost, priority, and the IP address of the DR and BDR for the network.

N Displays all OSPF routing neighbors. Information reported includes the area, local interface address, router ID, neighbor IP address, state, and mode.

V Displays Gated version information.

Related Information
The [gated] Daemon.

pac Command

Purpose
Prepares printer/plotter accounting records.

Syntax
/usr/sbin/pac [ -c ] [ -m ] [ -P Price ] [ -P Printer ] [ -q File ] [ -r ] [ -s ] [ Name ... ]

Description
The pac command prepares printer/plotter accounting records for each user of the selected printer or for the users specified by the Name parameter. For printer choices, see the -P flag.

The unit of measure is the number of pages, with the exception of raster devices, for which feet of paper is measured. Output is expressed both as the number of units used and the charge in dollars. For information on the charge (price) per unit, see the -p flag.

The accounting file specified in the /etc/qconfig file and the file created to contain the summary information must grant read and write permissions to the root user or printq group. The pac command generates the summary file name by appending _sum to the path name specified by the acctfile = clause in the /etc/qconfig file. For example, if the qconfig file reads:

acctfile = /var/adm/1p0acct

Alphabetical Listing of Commands 299
The `pac` command expects the summary file to be named `/var/adm/1p0acct_sum`.

**Flags**

- `-c` Sorts the output by price instead of alphabetically by user.
- `-m` Groups all the printing charges for a user, regardless of the host machine.
- `-p Price` Specifies the price, in dollars, charged per unit of output. By default, the system charges $0.02 per unit.
- `-P Printer` Specifies the printer for which accounting records are prepared. By default, the system selects the printer named by the `PRINTER` environment variable or the default value `lp0`.

   **Note:** When the `LPDEST` environment variable is set, it takes precedence over the `PRINTER` environment variable, which has an identical function. Any destination options issued from the command line override both the `LPDEST` and `PRINTER` environment variables.

- `-q File` Specifies the queue configuration file. The default value is the `/etc/qconfig` file.
- `-r` Reverses the sorting order, so that records are sorted alphabetically from z to a, or in descending order by price.
- `-s` Summarizes the accounting information in a summary file. This flag is needed for busy systems.

**Examples**

1. To produce printer/plotter accounting information for all users of the `lp0` printer, enter:
   
   ```
   /usr/sbin/pac
   ```
   
   The command displays the number of printed pages and the charge, sorted by user. This example assumes that there is no `PRINTER` environment variable.

2. To collect printer/plotter accounting records in a summary file, enter:
   
   ```
   /usr/sbin/pac -s
   ```

3. To produce printer/plotter accounting information for `smith`, `jones`, and `greene` from the `lp12` printer, enter:
   
   ```
   /usr/sbin/pac -Plp12 smith jones greene
   ```

   **Note:** Do not place a space between a flag and its variable; for example, the `-p Price`, `-P Printer`, and `-q File`

**Files**

- `/usr/sbin/pac` Contains the `pac` command.
- `/etc/qconfig` Specifies the path to the file.

**Related Information**

- The `acctcms` command, `acctcon` command, `acctcon1` or `acctcon2` command, `acctmerg` command, `acctprc1`, `acctprc2`, or `accton` command, `runacct` command.

**Setting up an accounting subsystem** in *Operating system and device management.*

**System accounting** in *Operating system and device management.*
pack Command

Purpose
Compresses files.

Syntax
pack [ ] [ ] File ...

Description
The pack command stores the file specified by the File parameter in a compressed form. The input file is replaced by a packed file with the same name and the suffix .z appended. The packed file maintains the same access modes, access and modification dates, and owner as the original file. The input file name can contain no more than 253 bytes to allow space for the added .z suffix. If the pack command is successful, the original file is removed. Packed files can be restored to their original form using the unpack or pcat commands.

If the pack command cannot create a smaller file, it stops processing and reports that it is unable to save space. (A failure to save space generally happens with small files or files with uniform character distribution.) The amount of space saved depends on the size of the input file and the character frequency distribution. Because a decoding tree forms the first part of each .z file, you do not save space with files smaller than three blocks. Typically, text files are reduced 25 to 40 percent.

Note: The pack command’s algorithm uses Huffman encoding to compress files. This algorithm has fundamental limitations. Consequently, the pack command can only consistently compress files under 8MB. To consistently compress files larger than 8MB, use the compress command.

The exit value of the pack command is the number of files that it could not pack. The pack command does not pack under any of the following conditions:
- The file is already packed.
- The input file name has more than 253 bytes.
- The file has links.
- The file is a directory.
- The file cannot be opened.
- No storage blocks are saved by packing.
- A file called File.z already exists.
- The .z file cannot be created.
- An I/O error occurred during processing.

Flags
- -f Forces packing of the file specified by the File parameter. This is useful for packing an entire directory, even if some of the files will not benefit.

Parameters
- File Specifies the file to be packed.
- - Displays statistics about the file specified by the File parameter. The statistics are calculated from a Huffman minimum redundancy code tree built on a byte-by-byte basis. Additional occurrences of the - (minus sign) parameter on the command line toggles this function for the next specified file. See example 2.
Exit Status

This command returns the following exit values:

- **0** Specifies that the file was successfully packed.
- **>0** Specifies that an error occurred.

Examples

1. To compress the files named `chap1` and `chap2` and display the revised file names, enter:
   ```
   pack chap1 chap2
   ```
   The compressed versions are renamed `chap1.z` and `chap2.z`. The **pack** command displays the percent decrease in size for each file compressed.

2. To display statistics about the amount of compression done, enter:
   ```
   pack -chap1 -chap2
   ```
   This compresses the files named `chap1` and `chap2` and displays statistics about the file named `chap1`, but not about the file named `chap2`. The first `-` (minus sign) parameter turns on the statistic display, and the second `-` parameter turns it off.

Files

`/usr/bin/pack` Contains the **pack** command.

Related Information

The **cat** command, **pcat** command, **unpack** command.

Files in *Operating system and device management*.

Input and output redirection in *Operating system and device management*.

---

**packf Command**

**Purpose**

Compresses the contents of a folder into a file.

**Syntax**

```
packf [ RFolder ] [ Messages ] [ -file File ]
```

**Description**

The **packf** command compresses the messages in a folder into a specified file. By default, the **packf** command compresses messages from the current folder and places them in the **msgbox** file. If the file does not exist, the system prompts you for permission to create it. Each message in the file is separated with four Ctrl-A characters and a new-line character.

**Note:** You can use the **inc** command to unpack compressed messages.
Flags

-file File  Specifies the file in which to put compressed messages. The default is the ./msgbox file. If the file exists, the packf command appends the messages to the end of the file. Otherwise, the system prompts you for permission to create the file.
+Folder  Identifies the folder containing the messages you want to pack.
-help  Lists the command syntax, available switches (toggles), and version information.

Note: For Message Handler (MH), the name of this flag must be fully spelled out.

Messages  Specifies what messages to pack. The Messages parameter can specify several messages, a range of messages, or a single message. If several messages are specified, the first message packed becomes the current message. Use the following references to specify messages:

Number  Number of the message. When specifying several messages, separate each number with a comma. When specifying a range, separate the first and last numbers in the range with a hyphen.

Sequence  A group of messages specified by the user. Recognized values include:

-all  All the messages in the folder. This is the default.
-cur or . (period)  Current message.
-first  First message in a folder.
-last  Last message in a folder.
-next  Message immediately after the current message.
-prev  Message immediately before the current message.

Profile Entries
The following entries are entered in the $UserMhDirectory/.mh_profile file:

Current-Folder:  Sets your default current folder.
Msg-Protect:  Sets the protection level for your new message files.
Path:  Specifies the user's MH directory.

Examples
1. To pack all the messages in the current folder and place the resulting text in the schedule file, enter:

   packf -file schedule

   The system responds with a message similar to the following:
   Create file "/home/mary/schedule"?
   Enter y to create the file.

2. To pack the range of messages from 3 to 7 from the test folder into an existing msgbox file, enter:

   packf +test 3-7

   The system responds with the shell prompt when the command is complete.

3. To pack the current, first, and last message in the inbox folder into an existing msgbox file, enter:

   packf cur first last
Files

$HOME/.mh_profile
Specifies the MH user profile.

/usr/bin/packf
Contains the packf command.

Related Information

The `inc` command.

The `.mh_alias` file format, `.mh_profile` file format.

Mail applications in Networks and communication management.

pagdel Command

Purpose

Removes any existing PAG association within the current process’ credentials.

Syntax

```
paginit [-R module_name] [ username ]
```

Description

The pagdel command will remove the PAG identifier from the current process’ credentials structure. If the `-R` option is omitted, the registry attribute will be used as the `module_name`.

Flags

\[-R\] \textit{module\_name}\]

Specifies a load module found in `/usr/lib/security/modules.cfg`. The load module will be asked to delete any PAG currently associated with the process.

Security

Access Control: This command should grant execute (x) access only to the root user and members of the security group. This command should be installed as a program in the trusted computing base (TCB). The command should be owned by the root user with the setuid (SUID) bit set.

Auditing

\texttt{USER\_PagDelete}

Example

To remove the PKI authentication certificate associated with the current process, type:

```
pagdel -R FPKI
```

Related Information

The \texttt{paginit} and \texttt{paglist} commands.

pagesize Command

Purpose

Displays the system page size.
Syntax
pagesize [ -a ] [ -f ]

Description
The `pagesize` command prints the size, in bytes, of a page of memory, as returned by the `getpagesize` subroutine. Provided for system compatibility, this command is useful when constructing portable shell scripts.

If the `-a` flag is specified, the `pagesize` command prints all of the page size values (in bytes) supported on the system.

Flags
- `-a` Prints all of the page size values (in bytes) supported on the system.
- `-f` Prints the formatted page sizes with an alphabetical suffix rather than the page size in bytes (for example, 4K)

Example
1. To obtain the size system page, enter:
   ```
   pagesize
   ```
   The system returns the number of bytes, such as 4096.
2. To print the formatted page size, enter:
   ```
   pagesize -f
   ```
   The system returns the formatted page size (for example, 4K).
3. To print all of the supported page size with an alphabetical suffix, enter:
   ```
   pagesize -af
   ```
   The system returns all of the supported page sizes. For example:
   
   4K
   64K
   16M

Files
/usr/bin/pagesize Contains the `pagesize` command.

Related Information
The `getpagesize` subroutine.

paginit Command

Purpose
Authenticate a user and create a PAG association.

Syntax
```
paginit [ -R module_name ] [ username ]
```
Description

The `paginit` command authenticates `username` (by default, the user issuing the command) and creates an association between the `username` and a kernel token called a Process Authentication Group entry (PAG). A new login shell is spawned by this command.

If the `-R` flag is not given, `paglist` queries the user’s registry attribute and use that value for `module_name`.

To associate the `username` with an alternate Identification and Authentication (I&A) mechanism, the `-R` flag can be used to specify the I&A load module used to create the user. Load modules are defined in the `/usr/lib/security/methods.cfg` file.

Flags

- `-R module_name` Specifies the loadable I&A module used to authenticate the user.

Parameters

- `username` Specifies the user. This parameter defaults to the user issuing the command. Only the `root` user may override the default.

Security

Access Control: This command should be executable by all. It should be owned by `root` and should be `setuid`.

Auditing

USER_Paginit

Example

`paginit -R FPKI`

The user is authenticated using the registry FPKI, which is defined in the `/usr/lib/security/methods.cfg` file. A PAG is associated with the current process credentials.

Related Information

The `pagdel` and `paglist` commands.

paglist Command

Purpose

Lists authentication information associated with the current process.

Syntax

`paglist [ -R module_name ]`

Description

The `paglist` command queries the current process’ credentials to display its authentication certificate.

If the `-R` option is not given, `paglist` will query the user’s registry attribute and use that value for `module_name`.

306 Commands Reference, Volume 4
Flags

-\texttt{R module\_name}  
  Specifies that the load module \textit{module\_name} is to list its authentication certificate associated with the current process.

Security

Access Control: This command runs with the ID of the invoking user, without any elevated privileges. It should be owned by \texttt{root}, but executable by all.

Example

\texttt{paglist -R FPKI}

This example will list the PAG associated with the current process within the FPKI registry.

Related Information

The \texttt{pagdel} and \texttt{paginit} commands.

\textbf{panel20 Command}

\textbf{Purpose}

Diagnoses activity between an HIA and the 5080 Control Unit.

\textbf{Syntax}

\texttt{panel20 [ HIA0 | HIA1 | HIA2 ]}

\textbf{Description}

Use the \texttt{panel20} command as a diagnostic tool to determine whether the Host Interface Adapter (HIA) is correctly installed and communicating with the 5088 Graphics Channel Control Unit (GCCU).

The \texttt{panel20} command displays a diagnostic screen with the following columns: Device Name, Channel Address, Link Address, Link Status, Poll Counter, SNRM Counter.

If the HIA is correctly installed and the host operating system is correctly configured to support 3270 devices on the 5088, the entries in the Set Normal Response Mode (SNRM Counter) column will be increasing. If the entries in SNRM Counter are not increasing, refer to problem determination procedures for the HIA and verify that the host operating system is correctly configured.

\textbf{Examples}

To start the \texttt{panel20} command, enter:

\texttt{panel20}

By default, the \texttt{panel20} command will monitor HIA0. To monitor HIA1 or HIA2, enter:

\texttt{panel20 HIA1}

\textbf{OR}

\texttt{panel20 HIA2}
passwd Command

Purpose
Changes a user’s password.

Syntax
passwd [ -R load_module ] [ -f | -s ] [ User ]

Description
The passwd command sets and changes passwords for users. Use this command to change your own password or another user’s password. You can also use the passwd command to change the full name (gecos) associated with your login name and the shell you use as an interface to the operating system.

Depending on how the user is defined, the user’s password can exist locally or remotely. Local passwords exist in the /etc/security/passwd database. Remote passwords are stored in the database provided by the remote domain.

To change your own password, enter the passwd command. The passwd command prompts the nonroot user for the old password (if one exists) and then prompts for the new password twice. (The password is never displayed on the screen.) If the two entries of the new password do not match, the passwd command prompts for the new password again.

Note: The passwd command uses only the first eight characters of your password for local and NIS passwords. Only 7-bit characters are supported in passwords. For this reason, National Language Support (NLS) code points are not allowed in passwords.

To change another user’s password, enter the passwd command and the user’s login name (the User parameter). Only the root user or a member of the security group is permitted to change the password for another user. The passwd command prompts you for the old password of the user as well as the new password. For local passwords, the passwd command does not prompt the root user for either the old user password or the root password. For remote passwords, by default the root user will be prompted to input the old password so the remote domain can make the decision to use the password or ignore it. To change this behavior, see the rootrequiresopw option in the /usr/lib/security/methods.cfg file. The passwd command does not enforce any password restrictions upon the root user.

The /etc/passwd file records your full name and the path name of the shell that you use. To change your recorded name, enter the passwd -f command. To change your login shell, enter the passwd -s command.

Construct locally-defined passwords according to the password restrictions in the /etc/security/user configuration file. This file contains the following restrictions:

- minalpha: Specifies the minimum number of alphabetic characters.
- minother: Specifies the minimum number of other characters.
- minlen: Specifies the minimum number of characters.
  Note: This value is determined by either the minalpha value plus the minother value or the minlen value, whichever is greater.
- mindiff: Specifies the minimum number of characters in the new password that are not in the old password.
  Note: This restriction does not consider position. If the new password is abcd and the old password is edcb, the number of different characters is 1.
- maxrepeats: Specifies the maximum number of times a single character can be used in a password.
- minage: Specifies the minimum age at which a password can be changed. Passwords must be kept for a minimum period. This value is measured in weeks.
maxage

Specifies the maximum age of a password. A password must be changed after a specified amount of time measured in weeks.

maxexpired

Specifies the maximum number of weeks beyond the maxage value that a password can be changed by the user.

histexpire

Specifies the number of weeks that a user cannot reuse a password.

histsize

Specifies the number of previous passwords that the user cannot reuse.

dictionlist

Specifies the list of dictionary files checked when a password is changed.

pwdchecks

Specifies the list of external password restriction methods invoked when a password is changed.

If the root user adds the NOCHECK attribute to your flags entry in the /etc/security/passwd file, your password does not need to meet these restrictions. Also, the root user can assign new passwords to other users without following the password restrictions.

If the root user adds the ADMIN attribute to your flags entry or if the password field in the /etc/passwd file contains an * (asterisk), only the root user can change your password. The root user also has the exclusive privilege of changing your password if the password field in /etc/passwd contains an ! (exclamation point) and the password field in the /etc/security/passwd file contains an * (asterisk).

If the root user changes your password, the ADMCHG attribute is automatically added to your flags entry in the /etc/security/passwd file. In this case, you must change the password the next time you log in.

If the user’s registry value in the /etc/security/user file is either DCE or NIS, the password change can only occur in the specified database.

Flags

- Changes the user information accessed by the finger command. You can use this flag to provide your full name in the /etc/passwd file.
- Changes the login shell.
- Specifies the loadable I&A module used to change a user’s password.

Security

The passwd command is a PAM-enabled application with a service name of passwd. System-wide configuration to use PAM for authentication is set by modifying the value of the auth_type attribute, in the u$w stanza of /etc/security/login.cfg, to PAM_AUTH as the root user.

The authentication mechanisms used when PAM is enabled depend on the configuration for the passwd service in /etc/pam.conf. The passwd command requires /etc/pam.conf entries for the password module type. Listed below is a recommended configuration in /etc/pam.conf for the passwd service:

```
# AIX passwd configuration
#

passwd password required /usr/lib/security/pam_aix
```

Examples

1. To change your password, type:

```
passwd
```

The passwd command prompts you for your old password, if it exists and you are not the root user. After you enter the old password, the command prompts you twice for the new password.

2. To change your full name in the /etc/passwd file, type:
passwd  -f

The `passwd` command displays the name stored for your user ID. For example, for login name `sam`, the `passwd` command could display this message:

```
sam's current gecos:  
"Sam Smith"
Change (yes) or (no)? 
```

If you type a `Y` for yes, the `passwd` command prompts you for the new name. The `passwd` command records the name you enter in the `/etc/passwd` file.

3. To use a different shell the next time you log in, type:

```
passwd  -s
```

The `passwd` command lists the path names of the available shells and the shell you are currently using. The command also displays a prompt:

```
Change (yes) or (no)? 
```

If you type a `Y` for yes, the `passwd` command prompts you for the shell to use. The next time you log in, the system provides the shell that you specify here.

### Files

- `/usr/bin/passwd` Contains the `passwd` command.
- `/etc/passwd` Contains user IDs, user names, home directories, login shell, and finger information.
- `/etc/security/passwd` Contains encrypted passwords and security information.

### Related Information

The `chfn` command, `chsh` command, `login` command, `pwdadm` command, `pwdck` command.

The `getpass` subroutine, `newpass` subroutine.

[Securing the network](index.html) in [Security](index.html).

[Trusted Computing Base](index.html) in [Security](index.html).

[Shells](index.html) in [Operating system and device management](index.html) to learn more about the available shells.

---

### paste Command

**Purpose**

Joins the lines of different files.

**Syntax**

```
paste [ -s ] [ -d List ] File1 ... 
```

**Description**

The `paste` command reads input from the files specified on the command line. The command reads from standard input if a `-` (minus sign) appears as a file name. The command concatenates the corresponding lines of the given input files and writes the resulting lines to standard output.
By default, the **paste** command treats each file as a column and joins them horizontally with a tab character (parallel merging). You can think of the **paste** command as the counterpart of the **cat** command (which concatenates files vertically, that is, one file after another).

With the `-s` flag, the **paste** command combines subsequent lines of the same input file (serial merging). These lines are joined with the tab character by default.

**Notes:**
1. The **paste** command supports up to 32767 input files (the **OPEN_MAX** constant).
2. The action of the **pr** `-t -m` command is similar to that of the **paste** command, but creates extra spaces, tabs, and lines for a nice page layout.
3. Input files should be text files, but may contain an unlimited number of line lengths.

**Flags**

- **-d List**  Changes the delimiter that separates corresponding lines in the output with one or more characters specified in the **List** parameter (the default is a tab). If more than one character is in the **List** parameter, then they are repeated in order until the end of the output. In parallel merging, the lines from the last file always end with a new-line character instead of one from the **List** parameter.

  The following special characters can also be used in the **List** parameter:

  - `\n` New-line character
  - `\t` Tab
  - `\` Backslash
  - `\0` Empty string (not a null character)
  - `c` An extended character

  You must put quotation marks around characters that have special meaning to the shell.

- **-s**  Merges subsequent lines from the first file horizontally. With this flag, the **paste** command works through one entire file before starting on the next. When it finishes merging the lines in one file, it forces a new line and then merges the lines in the next input file, continuing in the same way through the remaining input files, one at a time. A tab separates the lines unless you use the **-d** flag. Regardless of the **List** parameter, the last character of the file is forced to be a new-line character.

**Exit Status**

This command returns the following exit values:

- **0**  Successful completion.
- **>0**  An error occurred.

**Examples**

1. To paste several columns of data together, enter:

```bash
paste names places dates > npd
```

This creates a file named **npd** that contains the data from the **names** file in one column, the **places** file in another, and the **dates** file in a third. If the **names**, **places**, and **dates** file look like:

<table>
<thead>
<tr>
<th>names</th>
<th>places</th>
<th>dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>rachel</td>
<td>New York</td>
<td>February 5</td>
</tr>
<tr>
<td>jerry</td>
<td>Austin</td>
<td>March 13</td>
</tr>
<tr>
<td>mark</td>
<td>Chicago</td>
<td>June 21</td>
</tr>
<tr>
<td>marsha</td>
<td>Boca Raton</td>
<td>July 16</td>
</tr>
<tr>
<td>scott</td>
<td>Seattle</td>
<td>November 4</td>
</tr>
</tbody>
</table>

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then the npd file contains:

<table>
<thead>
<tr>
<th>name</th>
<th>place</th>
<th>date</th>
</tr>
</thead>
<tbody>
<tr>
<td>rachel</td>
<td>New York</td>
<td>February 5</td>
</tr>
<tr>
<td>jerry</td>
<td>Austin</td>
<td>March 13</td>
</tr>
<tr>
<td>mark</td>
<td>Chicago</td>
<td>June 21</td>
</tr>
<tr>
<td>marsha</td>
<td>Boca Raton</td>
<td>July 16</td>
</tr>
<tr>
<td>scott</td>
<td>Seattle</td>
<td>November 4</td>
</tr>
</tbody>
</table>

A tab character separates the name, place, and date on each line. These columns do not always line up because the tab stops are set at every eighth column.

2. To separate the columns with a character other than a tab, enter:

```
paste -d'!@' names places dates > npd
```

This alternates ! and @ as the column separators. If the names, places, and dates files are the same as in example 1, then the npd file contains:

```
rachel!New York@February 5
jerry!Austin@March 13
mark!Chicago@June 21
marsha!Boca Raton@July 16
scott!Seattle@November 4
```

3. To display the standard input in multiple columns, enter:

```
ls | paste - - - -
```

This lists the current directory in four columns. Each - (minus) tells the paste command to create a column containing data read from the standard input. The first line is put in the first column, the second line in the second column, and so on.

This is equivalent to:

```
ls | paste -d"\t\t\t\n" -s -
```

This example fills the columns across the page with subsequent lines from the standard input. The -d"\t\t\t\n" defines the character to insert after each column: a tab character (\t) after the first three columns, and a new-line character (\n) after the fourth. Without the -d flag, the paste -s - command would display all of the input as one line with a tab character between each column.

Files

`/usr/bin/paste` Contains the paste command.

Related Information

The `cat` command, `cut` command, `grep` command, `pr` command.


[Files](Operating system and device management).

[Input and output redirection](Operating system and device management).

patch Command

Purpose

Applies changes to files.
Syntax

```
patch [ -b [ -B Prefix ] ] [ -f ] [ -j ] [ -N ] [ -R ] [ -s ] [ -v ] [ -c | -e | -n ] [ -d Directory ] [ -D Define ] [ -F Number ] [ -i PatchFile ] [ -o OutFile ] [ -p Number ] [ -r RejectFile ] [ -x Number ] [ File ]
```

Description

The `patch` command reads a source file’s instructions on how to change a file, then applies the changes. The source file contains difference listings (or `diff` listings) produced by the `diff` command. The `diff` listings are the result of comparing two files and building instructions about how to reconcile the differences. By default, the `patch` command uses the source file read from standard input, but this can be overridden using the `-i` flag and the `PatchFile` variable.

Diff listings come in three formats: normal, context, or in the style of the ed editor. The `patch` command determines the `diff` listing format, unless overruled by the `-c`, `-e`, or `-n` flags.

By default, the patched version of a file replaces the original version. When the `-b` flag is specified, the original of each patched file is saved in a file of the same name with the suffix `.orig` appended to it. You may also specify where you want the output to go with the `-o` flag.

The `-p` flag makes it possible to customize a patch file to local user directory structures without manually editing the patch file. This is done by specifying how many components to remove from the full path name. For example, if the patch file contained the path name `/curds/whey/src/blurfl/blurfl.c`, then:

- `-p 0` causes the entire path name to be used.
- `-p 1` removes the leading slash, leaving `curds/whey/src/blurfl/blurfl.c`.
- `-p 4` removes leading slashes and the first three directories, leaving `blurfl/blurfl.c`.

Not specifying the `-p` flag causes the `patch` command to use the base name. In the above example, that would be `blurfl.c`.

Patch File Format

The patch file must contain one or more lines of header information followed by one or more patches. Each patch must contain one or more lines of file name identification in the format produced by the `diff -c` command, and one or more sets of `diff` command output, customarily called hunks.

The `patch` command skips any leading text in a patch file, applies the actual `diff` listing, and skips any trailing text. Thus, you could use as a patch file an article or message that includes a `diff` listing, and the `patch` command would still work. In such a case, if the entire `diff` listing is indented by a consistent amount, the `patch` command will also adjust for that spacing.

To change a line range within the original file, each hunk within a patch must be a separate `diff` listing. The line numbers for successive hunks within a patch must occur in ascending order.

File Name Determination

If no `File` parameter is specified, the `patch` command performs the following steps to obtain the name of the file to edit:

1. In the header of a context `diff` listing, the file name is determined from lines beginning with *** (three asterisks) or —-  (three dashes). A line beginning with *** indicates the name of the file from which the patches were taken, while a line beginning with —-  indicates the name of the file to which the patches should be applied. The shortest name of an existing file is selected.
2. If there is an Index: line in the leading text, the `patch` command tries to use the file name from that line.
3. A context `diff` header takes precedence over an Index: line.
4. If no file name can be determined from the leading text, the `patch` command prompts you for the name of the file to patch.

5. If the original file cannot be found, but a suitable SCCS or RCS file is available, the `patch` command attempts to get or check out the file.

6. If the leading text contains a `Prereq:` line, the `patch` command takes the first word from the prerequisites line (normally a version number) and checks the input file to see if that word can be found. If not, the `patch` command prompts you for confirmation before proceeding.

**Patch Application**

If the patch file contains more than one patch, the `patch` command tries to apply each diff listing as if it came from a separate patch file. In this case, the name of the file to patch is determined for each diff listing, and the header text before each diff listing is examined for information such as file name and revision level.

If you specify the `-c`, `-e`, or `-n` flag, the `patch` command interprets information within each hunk as a context difference, an ed editor difference, or a normal difference, respectively. Otherwise, the `patch` command determines the type of difference based on the format of the information within the hunk.

The `patch` command searches for the place to apply each hunk by taking the first line number of the hunk and adding or subtracting any line offset caused by applying the previous hunk. If an exact match is not possible at this line location, the `patch` command scans both forward and backward for a set of lines matching the hunk's content exactly.

If no such place is found, and if the `patch` command is applying a context diff listing, the `patch` command can search for a less exact match. A *fuzz factor* specifies how many lines can be inexactly matched. If the fuzz factor is set to 1 or more, the `patch` command performs a second scan, this time ignoring the first and last line of context. If no match results, and the maximum fuzz factor is set to 2 or more, the `patch` command performs a third scan, this time ignoring the first two lines and the last two lines of the context. (The default maximum fuzz factor is 2.) If no match is found, the `patch` command places the hunk in a reject file. The reject file is created with the same name as the output file and the suffix `.rej`. This naming convention can be overridden by using the `-r` flag.

The rejected hunk is written in context diff listing form, regardless of the format of the patch file. If the input was a normal or ed editor style difference, the reject file may contain differences with zero lines of context format. The line numbers on the hunks in the reject file may be different from the line numbers in the patch file. This is because the reject file line numbers reflect the approximate locations for the failed hunks in the new file rather than the old one.

As each hunk is completed, the `patch` command tells you whether the hunk succeeded or failed. You are also informed of the new line number assumed for each hunk. If this is different from the line number specified in the diff listing, you are notified of the offset. The `patch` command also tells you if a fuzz factor was used to make the match.

**Note:** A single large offset may be an indication that a hunk was installed in the wrong place. Use of a fuzz factor may also indicate bad placement.

**Preparing Patches for Other Users**

Programmers preparing patches that will be shipped to other users should consider the following additional guidelines:

- If you try to apply the same patch twice, the `patch` command assumes the second application should be a reverse patch and prompts you for confirmation of this reversal. Therefore, avoid sending out reversed patches, since this makes users wonder whether they already applied the patch.

- It is recommended that you keep a `patchlevel.h` file that is updated with the latest patch level. The patch level can then be used as the first diff listing in the patch file you send out. If your patch includes a `Prereq:` line, users cannot apply patches out of order without receiving a warning.
• Make sure you specify the file names correctly, either in a context diff listing header or with an Index: line. If you are patching something in a subdirectory, be sure to tell the patch user to specify a -p flag as needed.

• You can create a file by sending out a diff listing that compares a null file to the file you want to create. However, this only works if the file you want to create does not already exist in the target directory.

• While you may be able to put many diff listings into one file, it is advisable to group related patches into separate files.

• The patch command cannot tell if the line numbers are incorrect in an ed script, and can only detect bad line numbers in a normal diff listing when it finds a change or a delete command. A context diff listing using a fuzz factor of 3 may have the same line-number problem. Until a suitable interactive interface is added, use a context diff listing in such cases to check the changes for accuracy. Compilation without errors usually means that the patch worked, but it is not an infallible indicator.

• The results of the patch command are guaranteed only when the patch is applied to exactly the same version of the file from which the patch was generated.

• If the code has been duplicated, for example:

```c
#ifdef
... NEWCODE
#else
... OLD CODE
#endif
```

the patch command is incapable of patching both versions. If the patch command succeeds, it may have patched the wrong version and return a successful exit status.

### Flags

- **-b**
  Saves a copy of each modified file before the differences are applied. The copied original is filed with the same name and the suffix .orig. If a file by that name already exists, it is overwritten. If multiple patches are applied to the same file, only one copy is made of the original file at the time of the first patch. If the -o OutFile flag is also specified, the .orig file is not created. But if the specified out file already exists, OutFile.orig is created.

- **-B Prefix**
  Specifies a prefix to the backup file name. This flag only works in conjunction with the -b flag.

- **-c**
  Interprets the patch file as a context diff listing (the output of the diff -c or diff -C command). This flag cannot be used with the -e or -n flag.

- **-d Directory**
  Changes the current directory to the specified directory before processing.

- **-D Define**
  Marks changes with the following C preprocessor construct:

  ```c
  #ifdef Define
  ...
  (NEWCODE)
  #else
  ...
  (OLDCODE)
  #endif /* Define */
  ```

  The Define variable is used as the differentiating symbol. This flag only works when the normal or context form of diff listing is used as a patch file.

- **-e**
  Interprets the patch file as an ed editor script. This flag cannot be used with the -c or -n flag.

- **-f**
  Suppresses queries to the user. To suppress commentary, use the -s flag.

- **-F Number**
  Sets the maximum fuzz factor. This flag applies to context diff listings only and causes the patch command to ignore the specified number of lines when determining where to install a hunk. If the -F flag is not specified, the default fuzz factor is 2. The factor may not be set to more than the number of lines of content in the context diff listing (ordinarily 3).

  **Note:** A larger fuzz factor increases the odds of a faulty patch.

- **-i PatchFile**
  Reads the patch information from the specified file, rather than from standard input.

- **-l**
  (lowercase L) Causes any sequence of blank characters in the diff listing script to match any sequence of blank characters in the input file. Other characters are matched exactly.
-n Interprets the script as a normal diff listing. This flag cannot be used with the -c or -e flag.
-N Ignores patches where the differences have already been applied to the file. By default, already-applied patches are rejected.
-o OutFile Copies the files to be patched, applies the changes, then writes the modified version to the specified output file. Multiple patches for a single file are applied to the intermediate versions of the file created by any previous patches. Therefore, multiple patches result in multiple, concatenated versions of the output file.
-p Number Sets the path name strip count, which controls how path names found in the patch file are treated. This flag is useful if you keep your files in a directory different from the specified path. The strip count specifies how many slashes are stripped from the front of the path name. Any intervening directory names are also stripped. For example, assume a patch file specified /u/leon/src/blurf1/blurf1.c:
  • -p 0 leaves the entire path name unmodified.
  • -p 1 removes the leading slash, leaving u/leon/src/blurf1/blurf1.c.
  • -p 4 removes four slashes and three directories, leaving blurf1/blurf1.c.

If the -p flag is not specified, only the base name (the final path name component) is used. This flag works only when the File parameter is not specified.
-r RejectFile Overrides the default reject file name. The default reject file name is formed by appending the suffix .rej to the original file name.
-R Reverses the sense of the patch script. For example, if the diff listing was created from new version to old version, using the -R flag causes the patch command to reverse each portion of the script before applying it. Rejected differences are saved in swapped format. The -R flag cannot be used with ed scripts, because there is too little information to reconstruct the reverse operation. If the -R flag is not specified, the patch command attempts to apply each portion in its reversed sense as well as in its normal sense, until a portion of the patch file is successfully applied. If the attempt is successful, the user is prompted to determine if the -R flag should be set.

  Note: This method cannot detect a reversed patch if used with a normal diff listing where the first command is an append (that is, would have been a delete). Appends always succeed because a null context matches anywhere. Fortunately, most patches add or change lines rather than delete lines. Therefore most reversed normal diff listings begin with a delete, causing a failure and triggering heuristics.
-s Patches silently unless an error occurs.
-v Prints the revision header and patch level. If the -v flag is used with other flags, the other flags are ignored.
-x Number Sets internal debugging flags. This flag is only for patch command developers.

Exit Status
The following exit values are returned:

0 Successful completion.
1 An error occurred.

Examples
1. To apply diff listings in the difflisting file to the prog.c file, enter:
   patch -i difflisting prog.c
2. To save the original version of the prog.c file, enter:
   patch -b -i difflisting prog.c

   This applies changes to prog.c and saves the original contents of prog.c in the file prog.c.orig.
3. To patch the prog.c file without altering the original version, enter:
   patch -i difflisting -o prog.new prog.c
This uses prog.c as a source file, but the changed version is written to a file named prog.new.

Files

/usr/bin/patch Contains the patch command.

Related Information

The diff command, ed command.

pathchk Command

Purpose

Checks path names.

Syntax

pathchk [ -p ] PathName ...

Description

The pathchk command checks that one or more path names are valid and portable. By default, the pathchk command checks each component of each path name specified by the path name parameter based on the underlying file system. An error message is sent for each path name that meets the following criteria:

- The byte length of the full path name is longer than allowed by the system.
- The byte length of a component is longer than allowed by the system.
- Search permission is not allowed for a component.
- A character in any component is not valid in its containing directory.

It is not considered an error if one or more components of a path name do not exist, as long as a file matching the path name specified by the PathName parameter could be created that does not violate any of the above criteria.

More extensive portability checks are performed when the -p flag is specified.

Flags

- The byte length of the full path name is longer than allowed by POSIX standards.
- The byte length of a component is longer than allowed by POSIX standards.
- A character in any component is not in the portable file-name character set.

Exit Status

This command returns the following exit values:

0 All PathName operands passed all of the checks.
>0 An error occurred.
Examples
1. To check the validity and portability of the /home/bob/work/tempfiles path name on your system, enter:
   ```
   pathchk /home/bob/work/tempfiles
   ```
2. To check the validity and portability of the /home/bob/temp path name for POSIX standards, enter:
   ```
   pathchk -p /home/bob/temp
   ```

Files
`/usr/bin/pathchk` Contains the `pathchk` command.

Related Information
The `mhpath` command.
The `File systems` in *Operating system and device management*.

pax Command

Purpose
Extracts, writes, and lists members of archive files; copies files and directory hierarchies.

Syntax

To List Member Files of Archived Files
```
```

To Extract Archive Files Using the `-r` Flag
```
```

To Write Archive Files Using the `-w` Flag
```
```

To Copy Files Using the `-r` and `-w` Flags
```
```

Description
The `pax` command extracts and writes member files of archive files; writes lists of the member files of archives; and copies directory hierarchies. The `-r` and `-w` flags specify the type of archive operation.

Note: `pax` actively sparses files that are being restored. If a file has block aligned and sized areas that are NULL populated, `pax` does not cause physical space for those filesystem blocks to be allocated. The size in bytes of the file remains the same, but the actual space taken within the filesystem is only for the non-NULL areas.

Listing Member Files of Archived Files (List Mode)
When neither the `-r` nor the `-w` flags are specified, the `pax` command lists all the member files of the archive file read from standard input. If the `Pattern` parameter is specified, only the member files with pathnames that match the specified patterns are written to standard output. If a named file is a directory,
the file hierarchy contained in the directory is also written. When neither the -r or -w flags are specified, the -c, -d, -f, -n, -s, and -v flags, and the Pattern parameter may be specified.

**Extracting Archive Files Using the -r Flag (Read Mode)**
When the -r flag is specified, but the -w flag is not, the pax command extracts all the member files of the archive files read from standard input. If the Pattern parameter is specified, only the member files with pathnames that match the specified patterns are written to standard output. If a named file is a directory, the file hierarchy contained in the directory is also extracted. The -r flag can be specified with the -c, -d, -f, -l, -k, -n, -s, -u, and -v flags, and with the Pattern parameter.

The access and modification times of the extracted files are the same as when they were archived, unless they are affected by the user's default file creation mode (umask). The S_ISUID and S_ISGID bits of the extracted files are cleared.

If intermediate directories are necessary to extract an archive member, the pax command creates the directories with access permissions set as the bitwise inclusive OR of the values of the S_IRWXU, S_IRWXG, and S_IRWXO masks.

If the selected archive format supports the specification of linked files, it is an error if these files cannot be linked when the archive is extracted.

**Writing Archive Files Using the -w Flag (Write Mode)**
When the -w flag is specified and the -r flag is not, the pax command writes the contents of the files specified by the File parameter to standard output in an archive format. If no File parameter is specified, a list of files to copy, one per line, is read from the standard input. When the File parameter specifies a directory, all of the files contained in the directory are written. The -w flag can be specified with the -a, -b, -d, -f, -i, -o, -s, -t, -u, -v, -x, and -X flags and with File parameters.

When specifying pathnames that are greater than 100 characters for the United States Tape Archiver (USTAR) format, remember that the pathname is composed of a prefix buffer, a / (slash), and a name buffer. The prefix buffer can be a maximum of 155 characters and the name buffer can hold a maximum of 100 characters. If the pathname cannot be split into these two parts by a slash, it cannot be archived. This limitation is due to the structure of tar archive headers, and must be maintained for compliance with standards and backwards compatibility.

**Copying Files Using the -r and -w Flags (Copy Mode)**
When both the -r and -w flags are specified, the pax command copies the files specified by the File parameters to the destination directory specified by the Directory parameter. If no files are specified, a list of files to copy, one per line, is read from the standard input. If a specified file is a directory, the file hierarchy contained in the directory is also copied. The -r and -w flags can be specified with the -d, -i, -k, -l, -o, -p, -s, -t, -u, -v, and -X flags and with File parameters. The Directory parameter must be specified.

Copied files are the same as if they were written to an archive file and subsequently extracted, except that there may be hard links between the original and the copied files.

**Modifying the Archive Algorithm Using the -o Flag**
Use the -o flag to modify the archive algorithm according to keyword-value pairs. The keyword-value pairs must adhere to a correct archive format. A list of valid keywords and their behavior is given in the subsequent description of the -o flag.

**Further Notes**
In read or copy modes, if intermediate directories are necessary to extract an archive member, pax performs actions equivalent to the mkdir() subroutine with the intermediate directory used as the path argument and the value S_IRWXU as the mode argument.
If any specified pattern or file operands are not matched by at least one file or archive member, **pax** writes a diagnostic message to standard error for each one that did not match and exits with an error status.

In traversing directories, **pax** will detect infinite loops; i.e., entering a previously visited directory that is an ancestor of the last file visited. Upon detection of an infinite loop, **pax** writes a diagnostic message to standard error and terminates.

When **pax** is in read mode or list mode, using the **-x pax** archive format, and a file name, link name, owner name, or any other field in an extended header record cannot be translated from the **pax** UTF8 codeset format to the current codeset and locale, **pax** writes a diagnostic message to standard error, processes the file as described for the **-o invalid** option, and then processes the next file in the archive.

For AIX 5.3, the **pax** command will ignore extended attributes by default. The **-U** option informs **pax** to archive or restore extended attributes, which includes ACLs. The **-pe** option will preserve ACLs. When the **-pe** option is specified if pax fails to preserve the ACLs a diagnostic message shall be written to standard error, but the extracted file will not be deleted. A non-zero exit code will be returned. A new record type is required for extended attribute entries in **pax** archive files.

**Variables**

<table>
<thead>
<tr>
<th>Directory</th>
<th>Specifies the path of a destination directory when copying files.</th>
</tr>
</thead>
<tbody>
<tr>
<td>File</td>
<td>Specifies the path of a file to be copied or archived. If no file matches the <strong>File</strong> parameter, the <strong>pax</strong> command detects the error, exits, and writes a diagnostic message.</td>
</tr>
<tr>
<td>Pattern</td>
<td>Specifies a pattern that matches one or more paths of archive members. A / (backslash) character is not recognized in the <strong>Pattern</strong> parameter and it prevents the subsequent character from having any special meaning. If no <strong>Pattern</strong> parameter is specified, all members are selected in the archive.</td>
</tr>
</tbody>
</table>

If a **Pattern** parameter is specified, but no archive members are found that match the pattern specified, the **pax** command detects the error, exits, and writes a diagnostic message.

**Flags**

- **-a**

  Appends files to the end of an archive.

  **Note:** Streaming tape devices do not allow append.
**-b Blocking**

Specifies the block size for output. The *Blocking* parameter specifies a positive decimal integer value that specifies the number of bytes per block. Application conforming to POSIX2 should not specify a blocksize value greater than 32256. Devices and archive formats may impose restrictions on blocking. Blocking is automatically determined on input. Default blocking when creating archives depends on the archive format. (See the -x flag definition.)

The value of the *Blocking* parameter may be one of the following:

- **Integer b**
  - Specifies that the block size, in bytes, be the value of the positive decimal integer specified by the *Integer* parameter multiplied by 512.

- **Integer k**
  - Specifies that the block size, in bytes, be the value of the positive decimal integer specified by the *Integer* parameter multiplied by 1024.

- **Integer m**
  - Specifies that the block size, in bytes, be the value of the positive decimal integer specified by the *Integer* parameter multiplied by 1024 x 1024.

- **Integer+Integer**
  - Specifies that the block size, in bytes, be the sum of the positive decimal integers specified by the *Integer* parameters.

- **-c**
  - Matches all file or archive members except those specified by the *Pattern* parameter.

- **-d**
  - Causes directories being copied, archived, or extracted, to match only the directory itself and not the contents of the directory.

- **-E**
  - Avoids truncation of the long user and group names during addition of files to new/existing archive.

- **-f Archive**
  - Specifies the path of an archive file to be used instead of standard input (when the -w flag is not specified) or standard output (when the -w flag is specified but the -r flag is not). When specified with the -a flag option, any files written to the archive are appended to the end of the archive.

- **-H**
  - If a symbolic link referencing a directory is specified on the command line, *pax* archives the file hierarchy rooted in the directory referenced in the link, using the name of the link as the name of the file hierarchy. By default, *pax* archives the symbolic link itself.

- **-i**
  - Renames files or archives interactively. For each archive member that matches the *Pattern* parameter or file that matches a *File* parameter, a prompt is written to the display device that contains the name of a file or archive member. A line is then read from the display device. If this line is empty, the file or archive member is skipped. If this line consists of a single period, the file or archive member is processed with no modification to its name. Otherwise, its name is replaced with the contents of the line.

- **-k**
  - Prevents the *pax* command from writing over existing files.

- **-l**
  - Links files when copying files. Hard links are established between the source and destination file hierarchies whenever possible.

- **-L**
  - If a symbolic link referencing a directory is specified on the command line or encountered during the traversal of a file hierarchy, *pax* archives the file hierarchy rooted in the directory referenced in the link, using the name of the link as the name of the file hierarchy. By default, *pax* archives the symbolic link itself.

- **-n**
  - Selects the first archive member that matches each *Pattern* parameter. No more than one archive member is matched for each pattern.
-o Options

Modifies the archiving algorithm according to the keyword-value pairs specified in the Options parameter. The keyword-value pairs must be in the following format:

```plaintext
keyword=value,keyword=value,...
```

Some keywords apply only to certain file formats, as indicated with each description. Use of keywords that are inapplicable to the file format being processed will be ignored by pax.

Keywords can be preceded with white space. The value field consists of zero or more characters; within value, any literal comma must be preceded with a backslash (\). A comma as the final character, or a comma followed solely by white space as the final character, in Options will be ignored. Multiple -o options can be specified. If keywords given to these multiple -o options conflict, the keywords and values appearing later in command-line sequences take precedence; earlier values are ignored.

The following keyword-value pairs are supported for the indicated file formats:

**datastream=pathname, datastr_size=size** (Applicable to all file formats.)

The datastream keyword indicates the incoming archive file is not in a file format; instead, it is a data stream from the standard input device. Consequently, the data should be archived as a regular file in a format recognized by the -x flag. The file name of the data stream should be specified in the pathname parameter and should include the identification of the person who invoked the command, the group identification, and the umask for the file mode.

**Note:** The datastream keyword does not have a default variable size. You must specify one.

The datastr_size keyword denotes the size of the data stream input in bytes using decimal digits. If the pax command reaches the end of file (EOF) character before it reads the size parameter, it pads the archive file with null values. The null values make the archive file the same size as specified by the size parameter. If the data in the archive file exceeds the size specified, the pax command truncates the archive file to the size specified by the size parameter. The pax command also stops taking input and closes the archive file.

**Note:** You can specify multiple instances of keyword pairs. If you assign different values to the same keyword, the pax command uses the last value assigned to the keyword to execute the -o flag.

**delete=pattern** (Applicable only to the -x pax format.)

When used in write or copy mode, pax omits any keywords matching pattern from the extended header records that it produces. When used in read or list mode, pax ignores any keywords matching pattern in the extended header records. In all cases, matching is done using standard shell pattern-matching notation. For example, -o delete=security.* suppresses security-related information.
**exthdr.name**=**string** (Applicable only to the -x pax format.)

This keyword allows user control over the name written into the ustar header blocks for the extended header records. The name is the contents of **string** after the following character substitutions have been made:

**string includes:**

<table>
<thead>
<tr>
<th>Replaced by:</th>
<th>Replaced by:</th>
</tr>
</thead>
<tbody>
<tr>
<td>%d</td>
<td>The directory name of the file, equivalent to the result of the dirname utility on the translated pathname</td>
</tr>
<tr>
<td>%f</td>
<td>The filename of the file, equivalent to the result of the basename utility on the translated pathname</td>
</tr>
<tr>
<td>%%</td>
<td>A %% character</td>
</tr>
</tbody>
</table>

Any other % characters in **string** produce undefined results. If this keyword-value pair is not specified in the -o Options list, the default value of the name is:

%d/PaxHeaders/%f

**globexthdr.name**=**string** (Applicable only to the -x pax format.)

When used in write or copy mode with the appropriate options, pax creates global extended header records with ustar header blocks that will be treated as regular files by previous versions of pax. This keyword allows user control over the name that is written into the ustar header blocks for global extended header records. The name is the contents of **string** after the following character substitutions have been made:

**string includes:**

<table>
<thead>
<tr>
<th>Replaced by:</th>
<th>Replaced by:</th>
</tr>
</thead>
<tbody>
<tr>
<td>%n</td>
<td>An integer that represents the sequence number of the global extended header record in the archive starting at 1</td>
</tr>
<tr>
<td>%%</td>
<td>A % character</td>
</tr>
</tbody>
</table>

Any other % characters in **string** produce undefined results. If this keyword-value pair is not specified in the -o Options list, the default value of the name is:

$TMPDIR/GlobalHead.%%n

where **$TMPDIR** is either the value of the TMPDIR environment variable or /tmp if TMPDIR is unset.

**invalid=action** (Applicable only to the -x pax format.)

This keyword allows user control over the action pax takes upon encountering values in an extended header record that:

- in read or copy mode, are invalid in the destination hierarchy, or
- in list mode, cannot be written in the codeset and current locale.
-o Options (Continued)

pax recognizes these invalid values:

- In read or copy mode, a filename or link name that contains character encodings invalid in the destination hierarchy. (For example, the name may contain embedded NULLs.)
- In read or copy mode, a filename or link name that is longer than the maximum allowed in the destination hierarchy (for either a pathname component or the entire pathname).
- In list mode, any character string value (filename, link name, user name, etc.) that cannot be written in the codeset and current locale.

These mutually exclusive values of the action argument are supported:

- **bypass**
  In read or copy mode, pax bypasses the file, causing no change to the destination hierarchy. In list mode, pax writes all requested valid values for the file, but its method for writing invalid values is unspecified.

- **rename**
  In read or copy mode, pax acts as if the -i flag is in effect for each file with invalid filename or link name values, allowing the user to provide a replacement name interactively. In list mode, pax behaves identically to the bypass action.

- **UTF8**
  When used in read, copy, or list mode and a filename, link name, owner name, or any other field in an extended header record cannot be translated from the pax UTF8 codeset format to the current codeset and locale, pax uses the actual UTF8 encoding for the name.

- **write**
  In read or copy mode, pax writes the file, translating or truncating the name, regardless of whether this may overwrite an existing file with a valid name. In list mode, pax behaves identically to the bypass action.

If no -o invalid=action is specified, pax acts as if the bypass action is specified. Any overwriting of existing files that may be allowed by the -o invalid=actions is subject to permission (-p) and modification time (-u) restrictions, and is suppressed if the -k flag is also specified.

**linkdata** (Applicable only to the -x pax format.)

In write mode, pax writes the contents of a file to the archive, even when that file is merely a hard link to a file whose contents have already been written to the archive.

- -o Options (Continued)

**listopt=format** (Applicable to all file formats.)

This keyword specifies the output format of the table of contents produced when the -v option is specified in list mode. To avoid ambiguity, this keyword-value pair should be used as the only or final keyword-value pair following the -o flag; all characters in the remainder of the option-argument are considered part of the format string. If multiple -o listopt=format options are specified, the format strings are considered to be a single, concatenated string, evaluated in command-line order. Please refer to the [List-Mode Format Specifications](#) section for more information.

**times** (Applicable only to the -x pax format.)

When used in write or copy mode, pax includes atime, ctime, and mtime extended header records for each file.

**Extended header keywords**

(Applicable only to the -x pax format.)
If the -x pax format is specified, any of the keywords and values defined in the list below can be used as parameters to the -o flag, in either of two modes:

```
keyword=value
```

When used in write or copy mode, these keyword-value pairs are written into the global extended header records of the new archive. When used in read or list mode, these keyword-value pairs act as if they were present in the global extended header records of the archive being read. In both cases, the given value is applied to all files that do not have a value assigned in their individual extended header records for the specified keyword.

```
keyword=value
```

When used in write or copy mode, these keyword-value pairs are written into the extended header records of each file in the new archive. When used in read or list mode, these keyword-value pairs act as if they were present in the extended header records of each file in the archive being read. In both cases, the given value overrides any value for the specified keyword found in global or file-specific extended header records.

### atime

The file access time for the following file(s), equivalent to the value of the st_atime member of the stat structure for a file.

### charset

The name of the character set used to encode the data in the following file(s). The entries in this table are defined to refer to known standards:

<table>
<thead>
<tr>
<th>value</th>
<th>Formal Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;ISO-IR 646 1990&quot;</td>
<td>ISO/IEC 646 IRV</td>
</tr>
<tr>
<td>&quot;ISO-IR 8859 1 1987&quot;</td>
<td>ISO 8859-1</td>
</tr>
<tr>
<td>&quot;ISO-IR 8859 2 1987&quot;</td>
<td>ISO 8859-2</td>
</tr>
<tr>
<td>&quot;ISO-IR 10646 1993&quot;</td>
<td>ISO/IEC 10646</td>
</tr>
<tr>
<td>&quot;ISO-IR 10646 1993 UTF8&quot;</td>
<td>ISO/IEC 10646, UTF8 encoding</td>
</tr>
<tr>
<td>&quot;BINARY&quot;</td>
<td>None</td>
</tr>
</tbody>
</table>

The encoding is included in an extended header for information only; when pax is used as described, it does not translate the file data into any other encoding. The BINARY entry indicates binary data that is not encoded.

### comment

A series of characters used as a comment. All characters in the value field are ignored by pax.

### ctime

The file creation time for the following file(s), equivalent to the value of the st_ctime member of the stat structure for a file.

### gid

The group ID of the group that owns the file, expressed as a decimal number using digits from ISO/IEC 646. This record overrides the gid field in the following header block(s). When used in write or copy mode, pax includes a gid extended header record for each file whose group ID is greater than 99,999,999.
gname

The group of the following file(s), formatted as a group name in the group database. This record overrides the gid and gname fields in the following header blocks, and any gid extended header record. When used in read, copy, or list mode, pax translates the name from the UTF8 encoding in the header record to the character set appropriate for the group database on the receiving system. If any of the UTF8 characters cannot be translated, and if the -o invalid=UTF8 option is not specified, the results are undefined. When used in write or copy mode, pax includes a gname extended header record for each file whose group name cannot be represented entirely with the letters and digits of the portable character set.

linkpath

The pathname of a link being created to another file, of any type, previously archived. This record overrides the linkname field in the following ustar header block(s).

The following ustar header block determines the type of link created, whether hard or symbolic. In the latter case, the linkpath value is the contents of the symbolic link. pax translates the name of the link (contents of the symbolic link) from the UTF8 encoding to the character set appropriate for the local file system.

When used in write or copy mode, pax includes a linkpath extended header record for each link whose pathname cannot be represented entirely with the members of the portable character set other than NULL.

mtime

The file modification time of the following file(s), equivalent to the value of the st_mtime member of the stat structure for a file. This record overrides the mtime field in the following header block(s). The modification time is restored if the process has the appropriate privilege to do so.

path

The pathname of the following file(s). This record overrides the name and prefix fields in the following header block(s). pax translates the pathname of the file from the UTF8 encoding to the character set appropriate for the local file system. When used in write or copy mode, pax includes a path extended header record for each file whose pathname cannot be represented entirely with the members of the portable character set other than NULL.

realtime.any

The keywords prefixed by realtime are reserved for future POSIX realtime standardization. pax recognizes but silently ignores them.

security.any

The keywords prefixed by security are reserved for future POSIX security standardization. pax recognizes but silently ignores them.

size

The size of the file in octets, expressed as a decimal number using digits from ISO/IEC 646. This record overrides the size field in the following header block(s). When used in write or copy mode, pax includes a size of extended header record for each file with a size value greater than 999,999,999,999.
The user ID of the user that owns the file, expressed as a decimal number using digits from ISO/IEC 646. This record overrides the `uid` field in the following header block(s). When used in write or copy mode, `pax` includes a uid extended header record for each file whose owner ID is greater than 99,999,999.

**uname**

The owner of the following file(s), formatted as a user name in the user database. This record overrides the `uid` and `uname` fields in the following header block(s), and any `uid` extended header record. When used in read, copy, or list mode, `pax` translates the name from the UTF8 encoding in the header record to the character set appropriate for the user database on the receiving system. If any of the UTF8 characters cannot be translated, and if the `-o invalid=UTF8` option is not specified, the results are undefined. When used in write or copy mode, `pax` includes a uname extended header record for each file whose user name cannot be represented entirely with the letters and digits of the portable character set.

If the `value` field is zero length, it deletes any header block field, previously entered extended header value, or global extended header value of the same name.

If a keyword in an extended header record (or in a `-o` option-argument) overrides or deletes a corresponding field in the `ustar` header block, `pax` ignores the contents of that header block field.

**Extended header keyword precedence**

(Applicable only to the `-x pax` format.)

This section describes the precedence in which the various header records and fields and command-line options are selected to apply to a file in the archive. When `pax` is used in read or list modes, it determines a file attribute in this sequence:

1. If `-o delete=keyword-prefix` is used, the affected attribute is determined from step (7) if applicable, or ignored otherwise.
2. If `-o keyword=:` is used, the affected attribute is ignored.
3. If `-o keyword=value` is used, the affected attribute is assigned the value.
4. If value exists in a file-specific extended header record, the affected attribute is assigned the value. When extended header records conflict, the last one given in the header takes precedence.
5. If `-o keyword=value` is used, the affected attribute is assigned the value.
6. If a value exists in a global extended header record, the affected attribute is assigned the value. When global extended header records conflict, the last one given in the global header takes precedence.
7. Otherwise, the attribute is determined from the `ustar` header block.
-p String

Specifies one or more file characteristics to be retained or discarded on extraction. The String parameter consists of the characters a, e, m, o, and p. Multiple characteristics can be concatenated within the same string and multiple -p flags can be specified. The specifications have the following meanings:

a  Does not retain file-access times.

e  Retains the user ID, group ID, file mode, access time, modification time, and ACLs.

m  Does not retain file-modification times.

o  Retains the user ID and the group ID.

p  Retains the file modes.

If neither the -e nor the -o flag is specified, or the user ID and group ID are not preserved for any reason, the pax command does not set the S_ISUID and S_ISGID bits of the file mode. If the retention of any of these items fails, the pax command writes a diagnostic message to standard error. Failure to retain any of the items affects the exit status, but does not cause the extracted file to be deleted. If specification flags are duplicated or conflict with each other, the last flag specified takes precedence. For example, if -p e me is specified, file-modification times are retained.

-r

Reads an archive file from the standard input.

-s ReplacementString

Modifies file- or archive-member names specified by the Pattern or File parameters according to the substitution expression ReplacementString, using the syntax of the ed command. The substitution expression has the following format:

-s /old/new[gp]

where (as in the ed command), old is a basic regular expression and new can contain an & (ampersand), \n (n is a digit) back references, or subexpression matching. The old string can also contain new-line characters.

Any non-null character can be used as a delimiter (the / (backslash) is the delimiter in the example). Multiple -s flag expressions can be specified; the expressions are applied in the order specified, terminating with the first successful substitution. The optional trailing g character performs as in the ed command. The optional trailing p character causes successful substitutions to be written to standard error. File or archive-member names that substitute to the empty string are ignored when reading and writing archives.

-t

Causes the access times of input files to be the same as they were before being read by the pax command.

-U

Performs archival and extraction of ACL and Extended Attributes. Attributes include Access control list (ACL) also. If the ACL type is not supported on the Target filesystem then it is converted to the ACL type supported by the Target filesystem. If the EA is not supported on the filesystem then it is not copied. When listing members of the archive this option will list the names of any named extended attributes and the type of any ACLs associated with each file that are part of the archive image.
-u Ignores files that are older than a preexisting file or archive member with the same name.

- v When extracting files, an archive member with the same name as a file in the file system is extracted if the archive member is newer than the file.

- v When writing files to an archive file, an archive member with the same name as a file in the file system is superseded if the file is newer than the archive member. If the -a flag is specified this is accomplished by appending to the archive. Otherwise it is unspecified if this is accomplished by actual replacement in the archive or by appending to the archive.

- v When copying files to a destination directory, the file in the destination hierarchy is replaced by the file in the source hierarchy or by a link to the file in the source hierarchy if the file in the source hierarchy is newer.

- v Writes information about the process. If neither the -r or -w flags are specified, the -v flag produces a verbose table of contents; otherwise, archive member pathnames are written to standard error.

- w Writes files to the standard output in the specified archive format.

- x Format Specifies the output archive format. The pax command recognizes the following formats:

  - pax The default interchange format. The default blocking value for this format for character-special archive files is 10240. Blocking values from 512 to 32256 in increments of 512 are supported.
  - cpio Extended cpio interchange format. The default blocking value for this format for character-special archive files is 5120. Blocking values from 512 to 32256 in increments of 512 are supported.
  - ustar Extended tar interchange format. The default blocking value for this format for character-special archive files is 10240. Blocking values from 512 to 32256 in increments of 512 are supported.

Any attempt to append to an archive file in a format different from the existing archive format causes the pax command to exit immediately with a nonzero exit status.

In copy mode, if no -x format is specified, pax behaves as if -x pax were specified.

- X When traversing the file hierarchy specified by a pathname, the pax command does not descend into directories that have a different device ID.

Flag Interaction and Processing Order
The flags that operate on the names of files or archive members (-c, -i, -n, -s, -u, and -v) interact as follows:

- When extracting files, archive members are selected according to the user-specified pattern parameters as modified by the -c, -n, and -u flags. Then, any -s, and -i flags modify, in that order, the names of the selected files. The -v flag writes the names resulting from these modifications.

- When writing files to an archive file, or when copying files, the files are selected according to the user-specified pathnames as modified by the -n (this option is not valid for Copy Mode) and -u flags. Then, any -s, and -i flags modify, in that order, the names resulting from these modifications. The -v flag writes the names resulting from the modification.

- If both the -u and -n flags are specified, the pax command does not consider a file selected unless it is newer than the file to which it is compared.

List Mode Format Specifications
In list mode with the -o listopt= format option, the format argument is applied for each selected file. pax appends a newline character to the listopt output for each selected file. The format argument is used as the format string described in printf(), with the following exceptions:
1. The sequence *keyword* can occur before a format conversion specifier. The conversion argument is defined by the value of *keyword*. The following keywords are supported:
   - Any of the field name entries for *ustar* and *cpio* header blocks.
   - Any keyword defined for the extended header or provided as an extension within the extended header.

   For example, the sequence \%(charset)s is the string value of the name of the character set in the extended header.

   The result of the keyword conversion argument is the value from the applicable header field or extended header, without any trailing NULLs.

   All keyword-values used as conversion arguments are translated from the UTF8 encoding to the character set appropriate for the local file system, user database, etc., as applicable.

2. An additional conversion character, **T**, specifies time formats. The **T** conversion character can be preceded by the sequence *keyword=subformat*, where *subformat* is a date format allowed by the *date* command. The default keyword is **mtime** and the default subformat is: %b %e %H:%M %Y.

3. An additional conversion character, **M**, specifies the file mode string as displayed by the *ls -l* command. If *keyword* is omitted, the **mode** keyword is used. For example, %1M writes the single character corresponding to the *entry type* field of the *ls -l* command.

4. An additional conversion character, **D**, specifies the device for block or special files, if applicable. If not applicable and *keyword* is specified, then this conversion is equivalent to %**keyword**. If not applicable and *keyword* is omitted, this conversion is equivalent to <space>.

5. An additional conversion character, **F**, specifies a pathname. The **F** conversion character can be preceded by a sequence of comma-separated keywords:

   
   *keyword,keyword*

   The values for all the non-null keywords are concatenated together, each separated by a /. The default is *path* if the keyword path is defined; otherwise, the default is *prefix,name*.

6. An additional conversion character, **L**, specifies a symbolic link expansion. If the current file is a symbolic link, then %**L** expands to:

   "%s -> %s", value_of_keyword, contents_of_link

   Otherwise, the %**L** conversion character is equivalent to %F.

**Exit Status**

This command returns the following exit values:

0    Successful completion.

>0   An error occurred.

**Examples**

1. To copy the olddir directory hierarchy to newdir, enter:

   ```
   mkdir newdir
   pax -rw olddir newdir
   ```

2. To copy the contents of the current directory to the tape drive, enter:

   ```
   pax -wf /dev/rmt0
   ```

3. To archive the file xxx as XXX and display the successful substitution, enter:

   ```
   pax -wvf/dev/rfd0 -s /xxx/XXX/p xxx
   ```

   OR

   ```
   pax -wvf/dev/rfd0 -s/x/X/gp xxx
   ```

4. To read a file from a standard input and dump it to a datastream file with a specified size, enter:
dd if=/dev/hd6 bs=36b count=480 | pax -wf /dev/rfd0 -o
datastream=_filename_,datastr_size=_size_

5. To list the files in an archive **pax.ar** in a specified format, enter:
   pax -v -o listopt="start %F end" -f pax.ar

6. To create an archive **pax.ar** in **pax** format, enter:
   pax -wf pax.ar -x pax file

7. To extract a file from an archive **pax.ar** in **pax** format with a new path, enter:
   pax -rxf pax.ar -x pax -o path=newfilename

8. To copy the contents of a symbolic link from source to destination, enter:
   pax -rwl srclink destdir

9. To extract files from the archive with group name as **bin**, enter:
   pax -rvf pax.ar -x pax -o gname=bin

10. To ignore the path name from the archive in **pax** format during extraction, enter:
    pax -rxf pax.ar -o delete=path

11. To avoid the truncation of long user and group names while creating the archive, enter:
    pax -wEf file.pax file

12. To copy the **olddir** directory hierarchy to **newdir** with ACL and EA associated with the files, enter:
    mkdir newdir
    pax -rUw olddir newdir

**Files**

/usr/bin/pax Contains the **pax** command.

**Related Information**

The **ed** command, **cpio** command, **tar** command, and **rmt** command.

The **Files** in *Operating system and device management*.

**pcat Command**

**Purpose**

Unpacks files and writes them to standard output.

**Syntax**

pcat **File** ...

**Description**

The **pcat** command reads the files designated by the **File** parameter, unpacks them, and writes them to standard output. Whether or not the specified file ends in the **.z** characters, the **pcat** command assumes that the file is packed andunpacks it.

The exit value of the **pcat** command is the number of files it was unable to unpack. A file cannot be unpacked if any of the following occurs:

- The file name (exclusive of **.z**) has more than 253 bytes.
- The file cannot be opened.
- The file is not a packed file.
Exit Status
This command returns the following exit values:

0 Successful completion.
>0 An error occurred.

Examples
1. To display compressed files, enter:
   pcat chap1.z chap2 | pg

   This command sequence displays the compressed files chap1.z and chap2.z on the screen in
   expanded form, a page at a time ( | pg ). Note that the pcat command accepts files with and without
   the .z characters.
2. To use a compressed file without expanding the copy stored on disk, enter:
   pcat chap1.z | grep 'Greece'

   This command sequence prevents the pcat command from displaying the contents of chap1.z in its
   expanded form and pipes it to the grep command.

File
/usr/bin/pcat Contains the pcat command.

Related Information
The cat command, grep command, pack command, unpack command.

Files and Input and output redirection in Operating system and device management.

pdelay Command

Purpose
Enables or reports the availability of delayed login ports.

Syntax
pdelay [-a] [ Device ]

Description
The pdelay command enables delayed ports. Delayed ports are enabled like shared ports, except that the
login herald is not displayed until you type one or more characters (usually carriage returns). If a port is
directly connected to a remote system or connected to an intelligent modem, it is enabled as a delayed
port to prevent the getty command from talking to a getty on the remote side or to the modem on a local
connection. This action conserves system resources and is equivalent to pdelay enabled=delay. If you do
not specify a Device parameter, the pdelay command reports the names of the currently enabled ports.

Use the Device parameter to specify the ports to be enabled. Permitted values include:
• Full device name, such as the /dev/tty1 device
• Simple device name, such as the tty1 device
• A number (for example, 1 to indicate the /dev/tty1 device)
**Note:** You must have root user authority to run this command.

**Flags**

- `-a` Enables all ports as delayed.

**Example**

To display the names of the delayed ports that are currently enabled, enter:

```
pdelay
```

**Files**

- `/etc/locks` Contains lock files for the `pshare` and `pdelay` commands.
- `/usr/sbin/pdelay` Contains the `pdelay` command.

**Related Information**

The `getty` command, `init` command, `pdisable` command, `penable` command, `phold` command, `pshare` command, `pstart` command.

---

**pdisable Command**

**Purpose**

Disables login ports.

**Syntax**

```
pdisable [-a] [ Device ]
```

**Description**

The `pdisable` command disables a specific port, even if a user is logged in at that port. The system disables a port by updating an entry in the `/etc/inittab` file and then sending a signal to the `init` process. When the `init` process receives the signal and reads the updated status entry, it takes the appropriate action.

Use the `Device` parameter to specify the ports to be disabled. Permitted values include:

- A full device name, such as the `/dev/tty1` device
- A simple device name, such as the `tty1` device
- A number (for example, 1 to indicate the `/dev/tty1` device).

If you do not specify a `Device` parameter, the `pdisable` command reports the names of currently disabled ports in its set.

**Note:** You must have root user authority to run this command.

**Flag**

- `-a` Disables all ports that are currently enabled.
Examples
1. To display the names of all ports currently disabled, enter:
   
   `pdisable`

2. To disable all ports that are enabled, even if users are logged in, enter:
   
   `pdisable -a`

3. To disable the workstation attached to the `/dev/tty8` port, enter:
   
   `pdisable tty8`

Files

`/etc/locks`  
Contains lock files for the `pshare` and `delay` commands.

`/usr/sbin/pdisable`  
Contains the `pdisable` command.

Related Information

The `init`, `pdelay`, `penable`, `phold`, `pshare`, and `pstart` command.

The `inittab` file.

penable Command

Purpose

Enables or reports the availability of login ports.

Syntax

`penable [-a] [ Device ]`

Description

The `penable` command enables normal ports. Normal ports are asynchronous and only allow users to log in. No outgoing use of the port is allowed while it is enabled. The system enables a port by updating an entry in the `/etc/inittab` file and then sending a signal to the `init` process. After receiving the signal and reading the updated status entry, the process takes the appropriate action.

Use the `Device` parameter to specify the ports to be enabled. Permitted values include:

- Full device name, such as the `/dev/tty1` device
- Simple device name, such as the `tty1` device
- A number (for example, 1 to indicate the `/dev/tty1` device).

If you do not specify a `Device` parameter, the `penable` command reports the names of the currently enabled normal ports.

**Note:** You must have root user authority to run this command.

Flags

`-a` Enables all normal ports.
Example
To enable all normal ports listed in the /etc/inittab file, enter:
penable -a

Files
/etc/locks
Contains lock files for the pshare and pdelay commands.

/usr/sbin/penable
Contains the penable command.

Related Information
The init command, pdelay command, pdisable command, phold command, pshare command, pstart command.

The inittab file.

perfwb Command

Purpose
Starts the Performance Workbench to monitor system activity

Syntax
perfwb

Note: The DISPLAY environment variable must be set.

Description
The perfwb command is used to start the Performance Workbench. It is a graphical interface to monitor the system activity and processes.

A panel shows the partition configuration and the CPU and memory consumptions.

Another panel lists the top processes that can be sorted on the different provided metrics. A filtering device is also provided to restrict the list to particular processes.

Exit Status
0 The command completed successfully.
>0 An error occurred.

Location
/usr/bin/perfwb

Files
/usr/bin/perfwb Contains the perfwb command.
$HOME/workspace Contains the perfwb working directory that contains preferences.

Related Information
The [ps Command] on page 469, topas command.
## pg Command

### Purpose
Formats files to the display.

### Syntax
```
pg [- Number] [ -c ] [ -e ] [ -f ] [ -n ] [ -p String ] [ -r ] [ -s ] [+LineNumber ] [ /Pattern ] [ File ... ]
```

### Description
The `pg` command reads a file name from the `File` parameter and writes the file to standard output one screen at a time. If you specify a - (dash) as the `File` parameter, or run the `pg` command without options, the `pg` command reads standard input. Each screen is followed by a prompt. If you press the Enter key, another page is displayed. Subcommands used with the `pg` command let you review or search in the file.

To determine workstation attributes, the `pg` command scans the file for the workstation type specified by the `TERM` environment variable. The default type is `dumb`.

When the `pg` command pauses and issues a prompt, you can issue a subcommand. Some of these subcommands change the display to a particular place in the file, some search for specific patterns in the text, and others change the environment in which the `pg` command works.

### Changing Location Within the File
The following subcommands display a selected place in the file:

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>Page</code></td>
<td>Displays the page specified by the <code>Page</code> parameter.</td>
</tr>
<tr>
<td><code>+Number</code></td>
<td>Displays the page obtained by adding the <code>Number</code> value to the current page.</td>
</tr>
<tr>
<td><code>-Number</code></td>
<td>Displays the page as specified by the <code>Number</code> value before the current page.</td>
</tr>
<tr>
<td><code>-l</code> (Lowercase L)</td>
<td>Scrolls the display one line forward.</td>
</tr>
<tr>
<td><code>+Number</code></td>
<td>Scrolls the display forward for the specified number of lines.</td>
</tr>
<tr>
<td><code>-Number</code></td>
<td>Scrolls the display backward for the specified number of lines.</td>
</tr>
<tr>
<td><code>d</code></td>
<td>Scrolls half a screen forward. Pressing the Ctrl-D key sequence functions the same as the <code>d</code> subcommand.</td>
</tr>
<tr>
<td><code>-d</code></td>
<td>Scrolls half a screen backward. Pressing the -Ctrl-D key sequence functions the same as the <code>-d</code> subcommand.</td>
</tr>
<tr>
<td><code>Ctrl-L</code></td>
<td>Displays the current page again. A single . (dot) functions the same as the <code>Ctrl-L</code> key sequence subcommand.</td>
</tr>
<tr>
<td><code>$</code></td>
<td>Displays the last page in the file. Do not use this when the input is from a pipeline.</td>
</tr>
</tbody>
</table>

### Searching for Text Patterns
The following subcommands search for text patterns in the text. (You can also use the patterns described in the `ed` command.) They must always end with a new-line character, even if the `-n` flag is used.

In an expression such as `[k..a-z]k.`, the minus implies a range, as in a through z, according to the current collating sequence. A collating sequence defines equivalence classes for use in character ranges.

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>[Number]/Pattern/</code></td>
<td>Searches for the occurrence of the <code>Pattern</code> value as specified by the <code>Number</code> variable. The search begins immediately after the current page and continues to the end of the current file, without wraparound. The default for the <code>Number</code> variable is 1.</td>
</tr>
<tr>
<td><code>Number?Pattern?</code></td>
<td></td>
</tr>
<tr>
<td><code>Number^Pattern^</code></td>
<td></td>
</tr>
</tbody>
</table>
Searches backward for the occurrence of the Pattern value as specified by the Number variable. The searching begins immediately before the current page and continues to the beginning of the current file, without wraparound. The default for the Number variable is 1. The ^ notation is useful for Adds 100 terminals which will not properly handle the ? notation.

After searching, the pg command displays the line with the matching pattern at the top of the screen. You can change the position of the display by adding the m or b suffix to the search command. The m suffix displays the line with the matching pattern in the middle of the screen for all succeeding subcommands. The b suffix displays the line with the matching pattern at the bottom of the screen for all succeeding subcommands. The t suffix displays the line with the matching pattern at the top of the screen again.

Changing the pg Environment
You can change the pg command environment with the following subcommands:

- Numbern Begins examining the next file in the command line, as specified by the Number variable. The default for the Number variable is first.
- Numberp Begins examining the previous file on the command line, as specified by the Number variable. The default for the Number variable is first.
- Numberw Displays another window of text. If the Number variable is specified, sets the window size to the number of lines it specifies. This subcommand is the same as the [Number]z subcommand.
- Numberz Displays another window of text. If the Number variable is specified, sets the window size to the number of lines it specifies. This subcommand is the same as the [Number]w subcommand.

- s File Saves the input in the specified file. Only the current file being examined is saved. This command must always end with a new-line character, even if you specify the -n flag.
- h Displays an abbreviated summary of available subcommands.
- q or Q Quits the pg command.
- !Command Sends the specified command to the shell named in the SHELL environment variable. If this is not available, the default shell is used. This command must always end with a new-line character, even if the -n flag is used.

Attention:
1. Some output is lost when you press the QUIT WITH DUMP (Ctrl-\) or INTERRUPT (Ctrl-C) key sequence because any characters waiting in the output queue are purged when the QUIT signal is received.
2. If workstation tabs are not set every eight positions, unpredictable results can occur.

At any time output is being sent to the workstation, you can press the QUIT WITH DUMP or INTERRUPT key sequence. This causes the pg command to stop sending output and displays the prompt. Then you can enter one of the preceding subcommands at the command prompt.

If standard output is not a workstation, the pg command acts like the cat command, except that a header is displayed before each file.

While waiting for workstation input, the pg command stops running when you press the INTERRUPT key sequence. Between prompts these signals interrupt the current task and place you in the prompt mode.

Flags

- -c Moves the cursor to the home position and clears the screen before each page. This flag is ignored if the clear_screen field is not defined for your workstation type in the terminfo file.
- -e Does not pause at the end of each file.
- -f Does not split lines. Normally, the pg command splits lines longer than the screen width.
- -n Stops processing when a pg command letter is entered. Normally, commands must end with a new-line character.
-p String Uses the specified string as the prompt. If the String contains a %d value, that value is replaced by the current page number in the prompt. The default prompt is : (colon). If the specified string contains spaces, you must enclose the string in quotation marks.

-r Prevents shell escape when the "!" subcommand is used.

-s Highlights all messages and prompts.

+LineNumber Starts at the specified line number.

-Number Specifies the number of lines in the window. On workstations that contain 24 lines, the default is 23.

+Pattern Starts at the first line that contains the specified pattern.

Exit Status
This command returns the following exit values:

0 Successful completion.
>0 An error occurred.

Example
To look at the contents of a file one page at a time, enter:
pg filename

Files
/usr/bin/pg Contains the pg command.
/usr/share/lib/terminfo/* Contains the terminfo file that defines terminal types.
/tmp/pg* Contains the temporary file created when using pg command.

Related Information
The cat command, ed command, grep command.

File and directory access modes in the Operating system and device management.
Input and output redirection and Shells in the Operating system and device management.
Files in the Operating system and device management.

phold Command

Purpose
Disables or reports the availability of login ports on hold.

Syntax
phold [a] [ Device ]

Description
The phold command disables a set of login ports. The phold command allows logged-in users to continue, but does not allow any more users to log in. A user cannot log in on a disabled port. The system disables a port by updating an entry in the /etc/inittab file and then sending a signal to the init process. When the init process receives the signal and reads the updated status entry, it takes the appropriate action.
Use the *Device* parameter to specify the ports to be disabled. Permitted values include:

- A full device name, such as the `/dev/tty1` device
- A simple device name, such as the `tty1` device
- A number (e.g., 1 to indicate the `/dev/tty1` device)

If you do not specify a *Device* parameter, the `phold` command reports the names of currently disabled ports in its set.

*Note:* You must have root user authority to run this command.

**Flags**

- `-a` Holds all ports that are currently enabled.

**Example**

To list the ports that are currently on hold, enter:

```
phold
```

**Files**

- `/etc/locks` Contains lock files for the `pshare` and `pdelay` commands.
- `/etc/phold` Contains the `phold` command.

**Related Information**

The `init` command, `pdelay` command, `pdisable` command, `penable` command, `pshare` command, and `pstart` command.

The `inittab` file.

---

**pic Command**

**Purpose**

Preprocesses `troff` command input for the purpose of drawing pictures.

**Syntax**

```
pic [ -T Name ] [ [-] File ... ]
```

**Description**

The `pic` command is a `troff` command preprocessor for drawing simple figures on a typesetter. The basic objects are a box, circle, ellipse, line, spline, arrow, arc, and the text specified by the `Text` variable. The top-level object is the picture.

*File* Specifies the output from a `troff` command that is processed by the `pic` command to draw pictures.

**Pictures**

The top-level object in the `pic` command is the picture.

*.PS OptionalWidth OptionalHeight*

*ElementList*
If the .PF macro is used instead of the .PE macro, the position after printing is restored to what it was upon entry.

OptionalWidth
Specifies the width of the picture (in inches), if present, regardless of any dimensions used internally. The maximum value is 8.5.

OptionalHeight
Specifies a height value, in inches, different from the default, which is scaled to the same proportion. The maximum value is 14.

ElementList
Represents the following list of elements:

Shape AttributeList
  For Statement
  Placename: Element
    If Statement
  Placename: Position
    Copy Statement
  Variable = Expression
    Print Statement
  Direction
    Plot Statement
  { List of Elements }
    sh X Commandline X
  [ List of Elements ]
    troff-command

Variable names begin with a lowercase letter, followed by zero or more letters or numbers. Place names begin with an uppercase letter, followed by zero or more letters or numbers. Place and variable names retain their values from one picture to the next.

Elements in a list must be separated by new-line characters or ; (semicolon); a long element can be continued by ending the line with a \ (backslash). Comments are introduced by a # character and ended by a new-line character.

Primitives
The primitive objects are as follows:

  box
  circle
  ellipse
  arc
  line
  arrow
  spline
  move

Text-List
The arrow object is the same as the line object with the -> attribute.

Attributes
An AttributeList element is a sequence of zero or more attributes; each attribute consists of a keyword, perhaps followed by a value.
<table>
<thead>
<tr>
<th>Attribute</th>
<th>Attribute</th>
</tr>
</thead>
<tbody>
<tr>
<td>h(eigh)t</td>
<td>wid(th) Expression</td>
</tr>
<tr>
<td>rad(ius)</td>
<td>diam(eter) Expression</td>
</tr>
<tr>
<td>up OptionalExpression</td>
<td>down OptionalExpression</td>
</tr>
<tr>
<td>right OptionalExpression</td>
<td>left OptionalExpression</td>
</tr>
<tr>
<td>from Position</td>
<td>to Position</td>
</tr>
<tr>
<td>at Position</td>
<td>with Corner</td>
</tr>
<tr>
<td>by Expression, Expression</td>
<td>then</td>
</tr>
<tr>
<td>dotted OptionalExpression</td>
<td>dashed OptionalExpression</td>
</tr>
<tr>
<td>chop OptionalExpression</td>
<td>-&gt; &lt;-&gt;</td>
</tr>
<tr>
<td>invis</td>
<td>same</td>
</tr>
<tr>
<td>Text-list</td>
<td></td>
</tr>
</tbody>
</table>

Missing attributes and values are filled in from defaults. Not all attributes make sense for all primitives; irrelevant ones are not processed. The following are the currently meaningful attributes:

<table>
<thead>
<tr>
<th>Primitives</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>box</td>
<td>h(eigh)t, wid(th), at, same, dotted, dashed, invis, Text</td>
</tr>
<tr>
<td>circle, ellipse</td>
<td>rad(ius), diam(eter), h(eigh)t, wid(th), at, same, invis, Text</td>
</tr>
<tr>
<td>arc</td>
<td>up, down, left, right, h(eigh)t, wid(th), from, to, at, rad(ius), invis, ccw, cw, &lt;-&gt;, -&gt;, &lt;-&gt;, Text</td>
</tr>
<tr>
<td>line, arrow</td>
<td>up, down, left, right, h(eigh)t, wid(th), from, to, by, then, at, same, dotted, dashed, invis, &lt;-&gt;, -&gt;, &lt;-&gt;, Text</td>
</tr>
<tr>
<td>spline</td>
<td>up, down, left, right, h(eigh)t, wid(th), from, to, by, then, at, same, invis, &lt;-&gt;, -&gt;, &lt;-&gt;, Text</td>
</tr>
<tr>
<td>move</td>
<td>up, down, left, right, to, by, same, Text</td>
</tr>
<tr>
<td>Text-list</td>
<td>at, Text-item</td>
</tr>
</tbody>
</table>

The **at** attribute implies placing the geometrical center at the specified place. For lines, splines, and arcs, the **h(eigh)t** and **wid(th)** attributes refer to arrowhead size.

The **Text-item** variable is usually an attribute of some primitive; by default, it is placed at the geometrical center of the object. Stand-alone text is also permitted. A **Text-list** primitive is a list of text items; a text item is a quoted string optionally followed by a positioning request, as follows:

"..."

"..." center

"..." ljust

"..." rjust

"..." above

"..." below

If there are multiple text items for some primitives, they are centered vertically except as qualified. Positioning requests apply to each item independently.
Text items can contain \texttt{troff} commands that control, for example, size and font changes and local motions. Make sure these commands are balanced so that the entering state is restored before exiting.

**Positions/Places**

A position is ultimately an $X,Y$ coordinate pair, but it can also be specified in the following ways:

- \texttt{Place}
  \begin{verbatim}
  ( Position )
  \end{verbatim}
- \texttt{Expression, Expression}
  \begin{verbatim}
  (Position ) [\pm (Expression, Expression)]
  \end{verbatim}
- \texttt{Expression} \begin{verbatim}
  ( Position ) [\pm Expression, Expression]
  \end{verbatim}
- \texttt{Place1, Place2}
- \texttt{(Place1.X, Place2.Y)}
- \texttt{Expression < Position, Position >}
- \texttt{Expression \textbf{of the way} between Position and Position}
- \texttt{Placename [Corner]}
- \texttt{Corner Placename}
- \texttt{Here}
- \texttt{Corner of Nth Shape}
- \texttt{Nth shape [Corner]}

**Note:** A \texttt{Corner} variable designates one of the eight compass points or the center, beginning, or end of a primitive, as follows:

\begin{verbatim}
  .n .e .w .s .ne .se .nw .sw
  .t .b .r .l
  c .start .end
\end{verbatim}

Each object in a picture has an ordinal number; \texttt{Nth} refers to this, as follows:

- \texttt{Nth}
- \texttt{Nth last}

The \texttt{pic} command is flexible enough to accept names like \textit{1th} and \textit{3th}. Usage like \textit{1st} and \textit{3st} are accepted as well.

**Variables**

The built-in variables and their default values are as follows:

- \texttt{boxwid} 0.75
- \texttt{boxht} 0.5
- \texttt{circlerad} 0.25
- \texttt{arcrad} 0.25
- \texttt{ellipsetwid} 0.75
- \texttt{ellipsetht} 0.5
- \texttt{linewid} 0.5
- \texttt{lineht} 0.5
These default values can be changed at any time, and the new values remain in force from picture to picture until changed again.

The `textht` and `textwid` variables can be set to any value to control positioning. The width and height of the generated picture can be set independently from the `.PS` macro line. Variables changed within the `[ (left bracket) delimiter and the ] (right bracket) delimiter revert to their previous value upon exit from the block. Dimensions are divided by `scale` during output.

**Note:** The `pic` command has an eight inch by eight inch limitation on picture sizes generated and sent to the `troff` command, even when the `.ps (size) line specifies a size greater than eight inches.

**Expressions**
The following `pic` command expressions are evaluated in floating point. All numbers representing dimensions are taken to be in inches.

```
Expression + Expression
Expression - Expression
Expression * Expression
Expression / Expression
Expression % Expression (modulus)
- Expression
( Expression )
variable
number
Place .x
Place .y
Place .ht
Place .wid
Place .rad
```

```
sin(Expression) cos(Expression) atan2(Expression, Expression) log(Expression) sqrt(Expression)
int(Expression) max(Expression, Expression) min(Expression,Expression) rand(Expression)
```
Logical Operators
The `pic` command provides the following operators for logical evaluation:

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>!</td>
<td>Not</td>
</tr>
<tr>
<td>&gt;</td>
<td>Greater than</td>
</tr>
<tr>
<td>&lt;</td>
<td>Less than</td>
</tr>
<tr>
<td>&gt;=</td>
<td>Greater than or equal to</td>
</tr>
<tr>
<td>&lt;=</td>
<td>Less than or equal to</td>
</tr>
<tr>
<td>&amp;&amp;</td>
<td>And</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>==</td>
<td>Equal to</td>
</tr>
<tr>
<td>!=</td>
<td>Not equal to</td>
</tr>
</tbody>
</table>

Definitions
The following `define` statement is not part of the grammar:

```
define Name X Replacement text X
```

Occurrences of values such as `$1` and `$2` in the `Replacement text` variable are replaced by the corresponding options if the `Name` variable is called, as follows:

```
Name(Option1, Option2, ...)
```

Non-existent options are replaced by null strings. The `Replacement text` variable can contain newline characters.

**copy and copy thru Statements**
The `copy` statement includes data from a file or values that immediately follow, such as:

```
copy File
```
```
copy thru Macro
```
```
copy File thru Macro
```
```
copy File thru Macro until String
```

The `Macro` parameter value can be either the name of a defined macro or the body of a macro enclosed in some character not part of the body. If no file name is given, the `copy` statement copies the input until the next `.PE` macro line.

**for Loops and if Statements**
The `for` and `if` statements provide for loops and decision-making, as follows:

```
Variable=Expression to Expression by Expression do X anything X
```
```
if Expression then X anything X else X anything X
```

The `by` and `else` clauses are optional. The `Expression` variable in an `if` statement can use the usual relational operators or the `String1 == (or !=) String2` string tests.

**Miscellaneous Information**
The `sh` command runs a command line, as follows:

```
sh X Commandline X
```

It is possible to plot the value of an expression, as follows:

```
plot Expression OptionalFormat Attributes
```

The `Expression` variable value is evaluated and converted to a string (using the format specification, if provided).
The state of fill or no-fill mode is preserved with respect to pictures.

Input numbers can be expressed in \texttt{E} (exponential) notation.

**Flags**

\texttt{-T Name} Prepares the output for the specified printing device. Possible values for \textit{Name} are:

- \texttt{ibm3812} 3812 Pageprinter.
- \texttt{ibm3816} 3816 Pageprinter.
- \texttt{hplj} Hewlett-Packard LaserJet II.
- \texttt{ibm5587G} 5587-G01 Kanji Printer multi-byte language support.
- \texttt{psc} PostScript printer.
- \texttt{X100} AIXwindows display.
- \texttt{X100K} AIXwindows display for multi-byte character support.

The default is \texttt{ibm3816}.

\textbf{Note:} It is possible to set the \texttt{TYPESETTER} environment variable to one of the preceding values instead of using the \texttt{-T Name} flag of the \texttt{troff} command.

\texttt{-} Reverts to standard input.

**Related Information**

The \texttt{grap} command, \texttt{sh} command, \texttt{troff} command.

The \texttt{.PE} macro, \texttt{.PF} macro, \texttt{.PS} macro, \texttt{me} macro package.

---

**pick Command**

**Purpose**

Selects messages by content and creates and modifies sequences.

**Syntax**

\begin{verbatim}
pick [ [+Folder ] [ Messages ] [ -datefield Field ] [ -not ] [ -brace ] [ -after Date ] [ -before Date ] [ -cc "Pattern" ] [ -date "Pattern" ] [ -from "Pattern" ] [ -search "Pattern" ] [ -to "Pattern" ] [ -Component ] [ -brace ] [ -and ] [ -or ] [ -sequence Name [ -zero | -nozero ] [ -public | -nopublic ] [ -list | -nolist ] ]
\end{verbatim}

**Description**

The \texttt{pick} command selects messages containing particular character patterns or particular dates. You can use the \texttt{-and}, \texttt{-or}, \texttt{-not}, \texttt{-brace}, and \texttt{-brace} flags to construct compound conditions for selecting messages.
Flags

- **after Date**
  Selects messages with dates later than that specified by the Date variable. Use the following specifications for the Date variable:

<table>
<thead>
<tr>
<th>Date</th>
<th>Date</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>yesterday</td>
<td>today</td>
<td>tomorrow</td>
</tr>
<tr>
<td>sunday</td>
<td>monday</td>
<td>tuesday</td>
</tr>
<tr>
<td>wednesday</td>
<td>thursday</td>
<td>friday</td>
</tr>
<tr>
<td>saturday</td>
<td>-Days</td>
<td>SystemDate</td>
</tr>
</tbody>
</table>

  The pick command treats the days of the week as days in the past. For example, Monday means last Monday, not today or next Monday. You can use the -Days argument to specify a number of days in the past. For example, -31 means 31 days ago. For the SystemDate argument, you can specify any valid format defined for your system.

- **and**
  Forms a logical AND operation between two message-selecting flags; for example, pick -after Sunday -and -from mark. The -and flag has precedence over the -or flag, but the -not flag has precedence over the -and flag. Use the -lbrace and -rbrace flags to override this precedence.

- **before Date**
  Selects messages with dates earlier than the specified date. See the -after flag on how to specify Date.

- **cc "Pattern"**
  Selects messages that contain the character string specified by the "Pattern" variable in the cc: field.

- **date "Pattern"**
  Selects messages that contain the character string specified by the "Pattern" variable in the Date: field.

- **datefield Field**
  Specifies which dated field is parsed when the -after and -before flags are given. By default, the pick command uses the Date: field.

- **+Folder**
  Identifies the folder that contains the messages you wish to pick. By default, the system uses the current folder.

- **from "Pattern"**
  Selects messages that contain the character string specified by the "Pattern" variable in the From: field.

- **help**
  Lists the command syntax, available switches (toggles), and version information.

  Note: For MH, the name of this flag must be fully spelled out.

- **lbrace**
  Groups -and, -or, and -not operations. Operations between the -lbrace and -rbrace flags are evaluated as one operation. You can nest the -lbrace and -rbrace flags.

- **list**
  Sends a list of selected message numbers to standard output. This allows you to use the pick command to generate message numbers to use as input for other commands. For example, to scan all messages in the current folder that were sent after Tuesday, you would enter the following:

  `scan 'pick -after tuesday -list'`

  If you do not specify a sequence, the -list flag is the default.
Messages
Specifies the messages to search. You can specify several messages, a range of messages, or a single message. Use the following to specify messages:

Number
Number of the message.

Sequence
A group of messages specified by the user. Recognized values include:

all
All of the messages in the folder. This is the default.

cur or . (period)
Current message.

first
First message in a folder.

last
Last message in a folder.

new
New message that is created.

next
Message following the current message.

prev
Message preceding the current message.

-nolist
Prevents the pick command from generating a list of the selected message numbers. If a sequence is specified, the -nolist flag is the default.

-nopublic
Restricts a sequence to your usage. The -nopublic flag does not restrict the messages in a sequence, only the sequence itself. This option is the default if the folder is write-protected from other users.

-not
Forms a logical NOT operation on a message-selecting flag; for example, pick -not -from george. This construction evaluates all messages not chosen by the message-selecting flag. The -not flag has precedence over the -and flag, and the -and flag has precedence over the -or flag. Use the -lbrace and -rbrace flags to override this precedence.

-nozero
Appends the selected messages to the specified sequence.

-or
Forms a logical OR operation on two message-selecting flags; for example, pick -from amy -or -from mark. The -not flag has precedence over the -and flag, and the -and flag has precedence over the -or flag. Use the -lbrace and -rbrace flags to override this precedence.

-public
Allows other users access to a sequence. The -public flag does not make protected messages available, only the sequence itself. This option is the default if the folder is not write-protected from other users.

-rbrace
Groups -and, -or, and -not operations. Operations between the -lbrace and -rbrace flags are evaluated as one operation. You can nest the -lbrace and -rbrace flags.

-search "Pattern"
Selects messages that contain the character string specified by the "Pattern" variable anywhere in the message.

-sequence Name
Stores the messages selected by the pick command in the sequence specified by the Name variable.

to "Pattern"
Selects messages that contain the character string specified by the "Pattern" variable in the To: field.

-zero
Clears the specified sequence before placing the selected messages into the sequence. This flag is the default.

—Component "Pattern"
Selects messages that contain the character string specified by the "Pattern" variable in the heading field specified by the Component variable; for example, pick -reply-to amy.
Profile Entries
The following profile entries are part of the UserMHDirectory/.mh_profile file:

Current-Folder: Sets the default current folder.
Path: Specifies the user's MH directory.

Examples
1. To get a list of message numbers in the current folder that are from user jones, enter:
   
   pick -from jones
   
   The system responds with a message similar to the following:
   
   12
   15
   19

2. To see a list of message numbers in the schedule folder received within the last 30 days, enter:
   
   pick schedule -after -30
   
   The system responds with a message similar to the following:
   
   5
   8
   21
   30

Files
$HOME/.mh_profile Contains the user's MH profile.
/usr/bin/pick Contains the pick command.

Related Information
The mark command.
The .mh_alias file format, .mh_profile file format.
Mail applications in Networks and communication management.

ping Command

Purpose
Sends an echo request to a network host.

Syntax


Description
The /usr/sbin/ping command sends an Internet Control Message Protocol (ICMP) ECHO_REQUEST to obtain an ICMP ECHO_RESPONSE from a host or gateway. The ping command is useful for:

• Determining the status of the network and various foreign hosts.
• Tracking and isolating hardware and software problems.
• Testing, measuring, and managing networks.

If the host is operational and on the network, it responds to the echo. Each echo request contains an Internet Protocol (IP) and ICMP header, followed by a timeval structure, and enough bytes to fill out the packet. The default is to continuously send echo requests until an Interrupt is received (Ctrl-C).

The ping command sends one datagram per second and prints one line of output for every response received. The ping command calculates round-trip times and packet loss statistics, and displays a brief summary on completion. The ping command completes when the program times out or on receipt of a SIGINT signal. The Host parameter is either a valid host name or Internet address.

By default, the ping command will continue to send echo requests to the display until an Interrupt is received (Ctrl-C). The Interrupt key can be changed by using the stty command.

Because of the load that continuous echo requests can place on the system, repeated requests should be used primarily for problem isolation.

Flags

**-c Count**
Specifies the number of echo requests, as indicated by the Count variable, to be sent (and received).

**-w timeout**
This option works only with the -c option. It causes ping to wait for a maximum of 'timeout' seconds for a reply (after sending the last packet).

**-d**
Starts socket-level debugging.

**-D**
This option causes a hex dump to standard output of ICMP ECHO_REPLY packets.

**-f**
Specifies flood-ping option. The -f flag "floods" or outputs packets as fast as they come back or one hundred times per second, whichever is more. For every ECHO_REQUEST sent, a . (period) is printed, while for every ECHO_REPLY received, a backspace is printed. This provides a rapid display of how many packets are being dropped. Only the root user may use this option.

**Note:** This can be very hard on a network and should be used with caution. Flood pinging is only permitted by the root user. The -f flag is incompatible with the -i Wait flag.

**-I a.b.c.d**
Specifies that the interface specified by a.b.c.d is to be used for outgoing IPv4 multicasts. The -I flag is an uppercase i.

**-o interface**
Specifies that interface is to be used for outgoing IPv6 multicasts. The interface is specified in the form 'en0', 'tr0' etc.

**-i Wait**
Waits the number of seconds specified by the Wait variable between the sending of each packet. The default is to wait for one second between each packet. This option is incompatible with the -f flag.

**-L**
Disables local loopback for multicast pings.

**-l Preload**
Sends the number of packets specified by the Preload variable as fast as possible before falling into normal mode of behavior (one per second). The -l flag is a lowercase l.

**-n**
Specifies numeric output only. No attempt is made to look up symbolic names for host addresses.

**-p Pattern**
Specifies up to 16 'pad' bytes to fill out the packet you send. This is useful for diagnosing data-dependent problems in a network. For example, -p ff fills the packet with all 1's.

**-q**
Specifies quiet output. Nothing is displayed except the summary lines at startup time and when finished.

**-r**
Bypasses the routing tables and sends directly to a host on an attached network. If the Host is not on a directly connected network, the ping command generates an error message. This option can be used to ping a local host through an interface that no longer has a route through it.
-R  Specifies record route option. The -R flag includes the RECORD_ROUTE option in the ECHO_REQUEST packet and displays the route buffer on returned packets.

**Note:** The IP header is only large enough for nine such routes. Also, many hosts and gateways ignore this option.

-a  **addr_family**  Maps the destination address of the ICMP packets to IPv6 format if addr_family is equal to "inet6".

-s  **PacketSize**  Specifies the number of data bytes to be sent. The default is 56, which translates into 64 ICMP data bytes when combined with the 8 bytes of ICMP header data.

-S  **hostname/IP addr**  Uses the IP address as the source address in outgoing ping packets. On hosts with more than one IP address, the -S flag can be used to force the source address to be something other than the IP address of the interface on which the packet is sent. If the IP address is not one of the machine's interface addresses, an error is returned and nothing is sent.

-T  **ttl**  Specifies that the time-to-live for a multicast packet is **ttl** seconds.

-v  Requests verbose output, which lists ICMP packets that are received in addition to echo responses.

### Parameters

**PacketSize**  Specifies the number of data bytes to be sent. The default is 56, which translates into 64 ICMP data bytes when combined with the 8 bytes of ICMP header data. This parameter is included for compatibility with previous versions of the **ping** command.

**Count**  Specifies the number of echo requests to be sent (and received). This parameter is included for compatibility with previous versions of the **ping** command.

### Examples

1. To check the network connection to host canopus and specify the number of echo requests to send, enter:

   ```
   ping -c 5 canopus
   OR
   ping canopus 56 5
   ```

   Information similar to the following is displayed:

   ```
   PING canopus.austin.century.com: (128.116.1.5): 56 data bytes
   64 bytes from 128.116.1.5: icmp_seq=0 ttl=255 time=2 ms
   64 bytes from 128.116.1.5: icmp_seq=1 ttl=255 time=2 ms
   64 bytes from 128.116.1.5: icmp_seq=2 ttl=255 time=3 ms
   64 bytes from 128.116.1.5: icmp_seq=3 ttl=255 time=2 ms
   64 bytes from 128.116.1.5: icmp_seq=4 ttl=255 time=2 ms
   ----canopus.austin.century.com PING Statistics-----
   5 packets transmitted, 5 packets received, 0% packet loss
   round-trip min/avg/max = 2/2/3 ms
   ```

2. To get information about host lear and start socket-level debugging, enter:

   ```
   ping -d lear
   ```

   Information similar to the following is displayed:

   ```
   PING lear.austin.century.com: (128.114.4.18) 56 data bytes
   64 bytes from 128.114.4.18: icmp_seq=0 ttl=255 time=6 ms
   64 bytes from 128.114.4.18: icmp_seq=1 ttl=255 time=17 ms
   64 bytes from 128.114.4.18: icmp_seq=2 ttl=255 time=6 ms
   64 bytes from 128.114.4.18: icmp_seq=3 ttl=255 time=6 ms
   ```
To obtain information about host opus and specify the number of data bytes to be sent, enter:

```
ping -s 2000 opus
```

**Note:** The output is repeated until an Interrupt (Ctrl-C) is received.

4. To invoke the flood-ping option to host stlopnor, enter:

```
ping -f stlopnor
```

**Note:** The flood-ping output continues until an Interrupt (Ctrl-C) is received.

5. To specify an interval of five seconds between packets sent to host opus, enter:

```
ping -i5 opus
```

**Note:** The output is repeated until an Interrupt (Ctrl-C) is received.

6. To send the number of packets specified by the `Preload` variable as fast as possible before falling into normal mode of behavior to host opus, enter:
**ping** -l 10 opus

Information similar to the following is displayed:

```
PING opus.austin.century.com: (129.35.34.234): 56 data bytes
64 bytes from 129.35.34.234: icmp_seq=0 ttl=255 time=9 ms
64 bytes from 129.35.34.234: icmp_seq=1 ttl=255 time=11 ms
64 bytes from 129.35.34.234: icmp_seq=2 ttl=255 time=16 ms
64 bytes from 129.35.34.234: icmp_seq=3 ttl=255 time=22 ms
64 bytes from 129.35.34.234: icmp_seq=4 ttl=255 time=26 ms
64 bytes from 129.35.34.234: icmp_seq=5 ttl=255 time=27 ms
64 bytes from 129.35.34.234: icmp_seq=6 ttl=255 time=30 ms
64 bytes from 129.35.34.234: icmp_seq=7 ttl=255 time=31 ms
64 bytes from 129.35.34.234: icmp_seq=8 ttl=255 time=33 ms
64 bytes from 129.35.34.234: icmp_seq=9 ttl=255 time=35 ms
64 bytes from 129.35.34.234: icmp_seq=10 ttl=255 time=36 ms
64 bytes from 129.35.34.234: icmp_seq=11 ttl=255 time=6 ms
64 bytes from 129.35.34.234: icmp_seq=12 ttl=255 time=6 ms
64 bytes from 129.35.34.234: icmp_seq=13 ttl=255 time=6 ms
64 bytes from 129.35.34.234: icmp_seq=14 ttl=255 time=7 ms
64 bytes from 129.35.34.234: icmp_seq=15 ttl=255 time=6 ms
^C
---opus.austin.century.com PING Statistics---
16 packets transmitted, 16 packets received, 0% packet loss
round-trip min/avg/max = 6/19/36 ms
```

**Note:** The output is repeated until an Interrupt (Ctrl-C) is received.

7. To diagnose data-dependent problems in a network, enter:

```
ping -p ff opus
```

This command sends packets with a pad-pattern of all 1's to host opus. Information similar to the following is displayed:

```
PATTERN: 0xff
PING opus.austin.century.com: (129.35.34.234): 56 data bytes
64 bytes from 129.35.34.234: icmp_seq=0 ttl=255 time=5 ms
64 bytes from 129.35.34.234: icmp_seq=1 ttl=255 time=5 ms
64 bytes from 129.35.34.234: icmp_seq=2 ttl=255 time=5 ms
64 bytes from 129.35.34.234: icmp_seq=3 ttl=255 time=5 ms
64 bytes from 129.35.34.234: icmp_seq=4 ttl=255 time=5 ms
^C
---opus.austin.century.com PING Statistics---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 5/5/6 ms
```

**Note:** The output is repeated until an Interrupt (Ctrl-C) is received.

8. To specify quiet output, enter:

```
ping -q bach
```

Only summary information similar to the following is displayed:

```
PING bach.austin.century.com: (129.35.34.234): 56 data bytes
^C
---bach.austin.century.com PING Statistics---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 5/5/8 ms
```

**Note:** Although not displayed, the output of packets continues until an Interrupt (Ctrl-C) is received.
Related Information
The `ifconfig` command, `netstat` command.

Communications and networks in *Networks and communication management.*

pioattred Command

Purpose
Provides a way to format and edit attributes in a virtual printer.

Syntax
```
pioattred [-q PrintQueueName] [-d QueueDeviceName] [-o Action] [-a Attribute]
```

Description
The `pioattred` command provides a way to format virtual printer attributes and to edit the attributes. Specifically, attributes in the printer definition file can be formatted and/or edited according to the action specified with the `-o` flag. Formatted attributes are written to standard output `stdout`. Attributes are edited with the editor specified in the `VISUAL` environment variable. The virtual printer definition file is assumed to be in the `/var/spool/lpd/pio/@local/custom/*` directory.

Flags
- `-a Attribute` Specifies the name of the attribute in the virtual printer definition file to format or edit. This flag may be specified many times.
- `-d QueueDeviceName` Specifies the `QueueDeviceName` spooler of the virtual printer definition to format or edit.
- `-o Action` Specifies the action that the `pioattred` command should take on the virtual printer definition. If this flag is omitted, the `pioattred` command assumes a value of 0 (zero).
  
  0 Format the attributes specified. The result goes to `stdout`.
  1 Format and edit the attribute(s) specified; use the editor specified in the `VISUAL` environment variable. If no editor is specified in the `VISUAL` environment variable, use the vi editor. If an error is made in editing the attributes, save the erroneous attributes in a temporary file, and return a return code indicating an error.

  The following values are used in the event that an error return code was returned after editing the attributes.
  
  2 Edit the attributes again. The virtual printer definition will be the state it was left in when the error occurred.
  3 Ignore the error and save the edited attributes in the virtual printer definition.
  4 Clean up and leave things in the state they were before the `pioattred` command was started.
- `-q PrintQueueName` Specifies the `PrintQueueName` spooler of the virtual printer definition to format or edit.

Examples
1. To format the `ci` and `sh` attributes in the queue: quedev virtual printer definition, enter:
   
   `pioattred -q queue -d quedev -o 0 -a ci -a sh`
2. To format all attributes in the queue: quedev virtual printer definition, enter:
   pioattred -q queue -d quedev -o 0

   OR
   pioattred -q queue -d quedev

3. To edit the st attribute in the queue: quedev virtual printer definition, enter:
   pioattred -q queue -d quedev -o 1 -a st

Files

/usr/sbin/pioattred Contains the pioattred command.

Related Information

The lsvirprt command.

Virtual printer definitions and attributes in the Printers and printing.

piobe Command

Purpose
Print job manager for the printer backend.

Syntax
/usr/lpd/piobe [ -a PreviewLevel ] [ -A DiagnosticLevel ] [ -d InputDataStream ] [ -f FilterName ] [ FormatterFlags ] [ File ... ]

Description
The piobe command is a spooler backend program called by the qdaemon program to process a print job. The piobe command serves as the print job manager.

Based on the argument of the -d flag (or its default value in the database), which specifies the data stream type of the print files, the piobe command retrieves a pipeline from the database and passes it to a shell. The pipeline contains a string of filters to convert the print files as necessary and send them to a printer. If requested, the piobe command also retrieves and runs pipelines from the database to generate header and trailer pages.

The FormatterFlags argument (flags other than the flags listed in this article) is assumed to be referenced by the filter commands in the pipelines. If a flag is specified but not referenced by the pipelines, an error message is issued and the print job ended.

Note: The piobe command should not be typed directly on the command line. This command is invoked by the qdaemon process and is dependent on the various services provided by the qdaemon process.
Flags

-a PreviewOption

Provides a way to preview parameter values that would be used for a print job without actually printing any files. Values that can be specified for the PreviewOption variable are:

0   Specifies normal print processing
1   Returns a list of flag values and the pipeline of filters that would be used to convert the input data type to the data type expected by the printer, but does not actually invoke the pipeline of filters or send the file to the printer.

The list of flag values returned are the default command line flag values from the configuration database. These values are overridden by any flag arguments specified on the command line. Please note that:

- Only flags that are valid for the InputDataType variable specified (or defaulted) for the -d flag are shown.
- Flag values related only to the spooling of your print job, instead of the actual printing, are not shown. The default values for the spooling flags are included with the descriptions of the flags for the qprt command.
- The flag values may not have been checked to verify that they are valid.

The pipeline of filters shows the filter commands (and the flag values passed to the filter commands) that would process the data from your print file before it is sent to the printer. You can review the description for each of the filter commands to determine the type of filtering that would be performed.

-A Value

Specifies the level of diagnostic output. Diagnostic output is useful for diagnosing errors encountered by a pipeline of filters that is processing a print file, a header page, or a trailer page. Diagnostic output is mailed to the user who submitted the print job. The Value variable can be one of the following:

0   Discards any standard error output that is produced by the header, trailer, or print file pipelines.
1   If any standard error output is produced, returns the standard error output and the pipeline that produced it and ends the print job.
2   Returns the flag values, standard error output (if any), and completes pipelines, regardless of whether an error is detected. If an error is detected, the print job is ended.
3   Similar to a value of 2, except that the file is not printed.

A value of 1 is recommended. A value of 0 is used if a filter in a pipeline produces output to standard error, even if no error is encountered, such as for status information. A value of 2 or 3 is used for diagnosing a problem even if the problem does not cause any output to standard error.
-d InputDataType

Specifies the type of data that is in the file to be printed. This flag is a one-character identifier. Based on the data type for the print file and the data type expected by the printer, the print files are passed through filters (if necessary) before being sent to the printer. Examples of data type identifiers are:

- a IBM® extended ASCII
- p Pass-through (sent to the printer unmodified)
- s PostScript
- c PCL
- d Diablo 630
- k Kanji.

If the printer you select does not support the InputDataType variable and filters are not available to convert the data type of your print file to a data type supported by the printer, the print job will be ended with an error message.

-f FilterType

 Specifies a type of filter through which your print file is passed before being sent to the printer. This flag is a one-character identifier. The identifiers are similar to the filter flags available with the lpr command. The available filter identifier is p which invokes the pr filter.

Files

/var/spool/lpd/pio/@local/ddi/* Contains the digested database files.

Related Information

The lpr command, pr command, qdaemon command, qprt command.

The qconfig file.

Printer backend programming in the Printers and printing.

Backend and qdaemon interaction in the Printers and printing.

Backend routines in libqb in the Printers and printing.


Configuring a printer without adding a queue in the Printers and printing.

Adding a printer using the printer colon file in the Printers and printing.

pioburst Command

Purpose

Generates burst pages (header and trailer pages) for printer output.

Syntax

/usr/lpd/pio/etc/pioburst [ -H HostName ] TextFile
Description

The `pioburst` command retrieves prototype text for a burst page from the file specified by the `TextFile` variable, fills in the variable fields identified by `%` escape sequences in the prototype text, and writes the constructed text to standard output. It is invoked as a filter in a pipeline by the print job manager, the `piobe` command.

The `%` escape sequences, which are replaced by corresponding values, are:

- `%A` Specifies the formatting flag values.
- `%D` Specifies the user to whom the print output is to be delivered.
- `%H` Specifies the name of the host machine printing the job.
- `%P` Specifies the time the print job was printed.
- `%Q` Specifies the time the print job was queued.
- `%S` Specifies the user who submitted the print job.
- `%T` Specifies the title of the print job.
- `%%` Specifies the % (percent sign).

Labels (20 characters long) for each of the variable fields can be specified by using the same escape sequence as for the variable field, except using lowercase letters. For example, to generate a label for the variable field specifying the print job was queued (%Q), use `%q`. The `%e` variable represents the label `END OF OUTPUT FOR:`.

The `pioburst` command requires the following environment variables to be initialized:

- `PIOTITLE` Title of the print job (for %T)
- `PIOQDATE` Time the print job was queued (for %Q)
- `PIOFROM` User who submitted the print job (for %S)
- `PIOTO` User to whom the print output is to be delivered (for %D)
- `PIOFLAGS` Flag values (for %A).

Flags

- `-H HostName` Specifies that the host name designated by the `HostName` variable override the default host name (the name of the host machine printing the job).

Example

To generate a header page and send it to standard output, enter:

```
pioburst /usr/lpd/pio/burst/H.ascii
```

Files

`/usr/lpd/pio/etc/pioburst` Contains the `pioburst` command.

Related Information

The `digest` command, `piobe` command, `pioldigest` command, `pioformat` command, `piofquote` command, `pioout` command, `piopredef` command.

The `Printing administration` in the Printers and printing.

`Printer colon file conventions` in the Printers and printing.
piocnvt Command

Purpose
Expands or contracts a predefined printer definition or a virtual printer definition.

Syntax
piocnvt [ -s State ] [ -i SourceFile [ -o TargetFile ] ]

Description
The piocnvt command takes either a predefined printer definition or a virtual printer definition and expands or contracts the file. An expanded printer definition file contains all the attributes associated with that printer definition. A contracted printer definition contains only the printer specific attributes for that printer definition.

Printer definition files are arranged in a hierarchical parent-child relationship. For example the predefined printer definition 4201-3.asc has the parent master. An expanded printer definition for 4201-3.asc would contain all the attributes from 4201-3.asc as well as those from master. A contracted printer definition for 4201-3.asc would contain only the attributes not found in master. The piocnvt command simply provides a way to move back and forth between the expanded and contracted states of a printer definition file.

Flags

- **-i SourceFile** Specifies the complete path and name of the input file.
- **-o TargetFile** Specifies the complete path and name of the output file. If the -o flag is omitted, the SourceFile will be used for output.
- **-s State** Specifies whether the state of the TargetFile parameter should be expanded or contracted. If the -s flag is omitted, the piocnvt command attempts to determine the state by examining the zD attribute in the SourceFile. If a determination cannot be made the TargetFile parameter will be left in an expanded state.
  
  + Indicates that the state of the TargetFile parameter should be expanded.
  
  ! Indicates that the state of the TargetFile parameter should be contracted.

Examples

1. To expand the virtual printer definition lp0:lp0 into the file new:lp0; enter:
   
piocnvt -s+ -i lp0:lp0 -o new:lp0

2. To contract the virtual printer definition lp0:lp0 in place; enter:
   
piocnvt -s! -i lp0:lp0

Files

/usr/sbin/piocnvt Contains the piocnvt command.
Related Information
The `chvirprt` command, `lsvirprt` command, `mkvirprt` command.

Printing administration in the Printers and printing.

Print spooler in the Printers and printing.

Printer-specific information in the Printers and printing.

Installing support for additional printers in the Printers and printing.

Virtual printer definitions and attributes in the Printers and printing.

piodigest Command

Purpose
Digests attribute values for a virtual printer definition into a memory image and stores the memory image in a file.

Syntax
`/usr/lpd/pio/etc/piodigest` [-s DataStreamType] [-n DeviceName] [-p DirectoryPath] [-q PrintQueueName] [-t PrinterType] [-d QueueDeviceName] { ColonFileName | - }

Description
The `piodigest` command retrieves virtual printer attribute values from a colon file, builds a memory image of the attribute values and their lookup tables, and writes the constructed memory image to a file. The memory image in the file is then available for access by a print formatter and by the `piobe` command (the print job manager). The command also creates Object Data Manager (ODM) stanzas for the specified queue and queue devices. The ODM stanzas are used in System Management Interface Tool (SMIT) dialogs. If an attribute called `zV` is specified and the attribute contains a value of `+`, the `piodigest` command performs syntax, reference, and limits validation on all attributes specified in the colon file.

The `piodigest` command should be invoked whenever a customized version of a virtual printer definition is initially generated or is later modified. Each invocation of the `piodigest` command digests the attribute values for one virtual printer definition.

The `ColonFileName` parameter is the name of the input file in colon format. A colon file contains the attribute values for one virtual printer. A value of `-` (dash) for the `ColonFileName` parameter indicates that the colon file should be read from standard input.

The name of the output file that is generated will be of the form:
`PrinterType.DataStreamType.DeviceName.PrintQueueName:QueueDeviceName`

Flags
- `d QueueDeviceName` Specifies the name of the virtual printer (queue device).
  If this flag is not specified, the virtual printer name specified by the `mv` attribute from the input colon file is assumed.
- `n DeviceName` Specifies the name of the printer device, such as `lp0` for line printer 0, or `lp1` for line printer 1.
  If this flag is not specified, the device name specified by the `mn` attribute from the input colon file is assumed.
Specifies the path name of the directory where the output file is to be generated. If this flag is not specified, the /var/spool/lpd/pio/@local/ddi directory is assumed.

Specifies the name of the print queue to which the virtual printer is assigned. If this flag is not specified, the print queue name specified by the mq attribute from the input colon file is assumed.

Specifies the printer data stream type. Example data stream types are asc (IBM extended ASCII), ps (PostScript), pcl (HP PCL), and 630 (Diablo 630). If this flag is not specified, the data stream type specified by the md attribute from the input colon file is assumed.

Specifies the printer type. Examples are 4201-3 and t12115. If this flag is not specified, the printer type specified by the mt attribute from the input colon file is assumed.

Example
To generate a digested virtual printer definition, enter:
piodigest -d mypro -n lp0 -q proq -s asc -t 4201-3

The attribute values for the virtual printer assigned to the mypro queue device on the proq print queue are digested and stored in the file named 4201-3.asc.lp0.proq:mypro in the /var/spool/lpd/pio/@local/ddi directory.

Files
/var/spool/lpd/pio/@local/ddi/* Contains the digested, virtual printer definitions.
/usr/lpd/pio/etc/piodigest Contains the piodigest command.

Related Information
The mkvirprt command, piobe command, pioburst command, pioformat command, pioquote command, pioout command, piopredef command.

The Printing administration and Virtual printer definitions and attributes, Printer code page translation tables, Printer colon file conventions, Printer colon file escape sequences, Printer backend programming, Backend and qdaemon interaction, Backend routines in llibq in Printers and printing.

piodmogr Command
Purpose
Compacts the Object Data Manager (ODM) database in the /var/spool/lpd/pio/@local/smit directory.

Syntax
piodmogr { -c | -h }

Description
The piodmogr command extracts existing printer definitions from the ODM database in the /var/spool/lpd/pio/@local/smit directory, recreates the ODM database, compacts the database, and reloads the compacted database.
The -c and -h flags are mutually exclusive. The -h flag only compacts the database when the host name has been changed. The -c flag always compacts the database.

**Note:** Root user authority is needed to run this command.

**Flags**

- **-c** Extracts existing printer definitions from the ODM database, recreates the database, compacts the information, and replaces the database.
- **-h** Performs exactly like the -c flag, but the -h flag compacts the information only if the host name has been changed. If the host name has been changed, the -h flag extracts the new name and updates the host name information in the database. If the host name has not been changed, the -h flag does not compact the information. This flag is an optional compactor rather than an automatic compactor as with the -c flag.

**Examples**

1. To compact and update the ODM printer definition database, enter:
   ```
   piodmgr -c
   ```
2. To perform compaction of the information depending on whether the host name has been changed or not, enter:
   ```
   piodmgr -h
   ```

**Files**

- **/usr/lib/lpd/pio/etc/piodmgr** Contains the `piodmgr` command.
- **/var/spool/lpd/pio/@local/smit/*** Contains predefined printer definitions used by the command.

**Related Information**

The `piobe` command.

Printing administration, Print spooler, and Printer backend programming in the Printers and printing.

Object Data Manager (ODM) Overview for Programmers in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.

---

**piofontin Command**

**Purpose**

Copies fonts from a multilingual font diskette.

**Syntax**

```
piofontin [PrinterType] [-c Codepage [-d Device]]
```

**Description**

The `piofontin` command copies font files from a multilingual font diskette to a directory one level beneath the `/usr/lib/lpd/pio/fonts` label. The directory to which the font files are copied has the name specified by the `PrinterType` parameter. The font files are named according to the naming convention for files. Names are of the form:

```
codepage.typeface.pitch*10.quality
```

Only the root user can use the `piofontin` command.
Flags

- `c Codepage` Specifies the code page for the fonts. For Greek fonts the value is 851, and for Turkish fonts the value is 853.

- `d Device` Specifies the diskette-drive device name. This defaults to the `-d/dev/fd0` label, the standard 3.5-inch diskette drive.

- `t PrinterType` Specifies the type of printer for the fonts. Supported printer types are 4201-3, 4202-3, 4207-2, 4208-2, 2380, 2381, 2390, and 2391.

Example

To read a diskette containing 4201-3 fonts in code page 851 from diskette drive `/dev/fd1`; enter:

```
piofontin 4201-3 851 /dev/fd1
```

The font files are copied to the `/usr/lib/lpd/pio/fonts/4201-3` directory.

File

`/usr/sbin/piofontin` Contains the `piofontin` command.

Related Information

Printing administration, Printer-specific information, Installing support for additional printers, Virtual printer definitions and attributes, Printer code page translation tables in the Printers and printing.

pioformat Command

Purpose

Drives a printer formatter.

Syntax

```
/usr/lpd/pio/etc/pioformat [ @DataBaseFile [ [ -! FormatterName ] [ [ -# +# ] PassThroughOption ] ]]
```

Description

The `pioformat` command initiates the printer formatter driver. The formatter driver establishes access to the database values, loads and links a printer formatter, and then drives the formatter by calling its setup function, initialize function, lineout function, passthru function, and restore function as appropriate. The formatter driver also provides the `piogetvals` subroutine, `piogetopt` subroutine, `piocmdout` subroutine, `piogetstr` subroutine, `piomsgout` subroutine, and `pioexit` subroutine used by the formatter.

The flags listed below are processed by the formatter driver and are not passed on to the formatter. However, all flags NOT listed below are assumed to be formatting flags and are passed on to the formatter.
Flags

-@ DatabaseFile  Specifies either of the following:
  - The full path name of the (digested) database file to be accessed
  - The print queue and queue device names, separated by a colon

If the argument string begins with a / (slash) character, it is assumed to be a full path name.

The combination of the queue name and the queue device name results in a unique string that is a part of the database file name and is used to search for the database file name in the /var/spool/lpd/pio/@local/ddi directory. This short form alternative is provided as a convenience when the formatter driver and formatter are run as standalone devices, instead of by the spooler.

-! FormatterName  Specifies the full path name of the formatter to be loaded, linked, and driven.

If the -! flag is not specified, the default formatter name defined by the mf attribute name in the database is used. A default formatter name is provided as a convenience when the formatter driver and formatter are run as standalone devices, instead of by the spooler.

-# + PassThroughOption  Specifies that the print file should be passed through unmodified. If the -# + flag is not specified, the print file will be formatted.

The parameter that is passed to the formatter's setup routine contains a value of 1 instead of 0, indicating that the file should be passed through instead of being formatted.

Examples

1. To format the myfile file according to the database file (virtual printer description) for the queue device named std associated with the print queue named pro, overriding the page width to 132 characters, and using the pioformat command and a formatter as a standalone filter, enter:

   ```
   cat myfile | pioformat -@ pro:std -w 132 > /dev/lp0
   ```

2. To use the pioformat command and a formatter in a pipeline running under the spooler, enter:

   ```
   %Ide/pioformat -@ %Idd/%Imm -! %Idf/piof420x %Fbb %Fee ...
   ```

   For this example, assume that:
   - The printer is a 4207 Model 2 Proprinter.
   - The print queue name is pro.
   - There is only one queue device (virtual printer) defined for the print queue and its name is std and its output data stream type is asc (extended ASCII).
   - The printer device name is /dev/lp0.
   - The print job submitter specified the flag and argument -i 5.

   Before the print job manager (the piobe command) passes the pipeline to a shell to format the file, it resolves the pipeline's embedded references to attribute values. Based on the assumptions listed above for this example, the attribute references would be resolved as:

   ```
   %Ide -> /usr/lpd/pio/etc
   Directory where the pioformat command resides
   
   %Idd -> /var/spool/lpd/pio/@local/ddi
   Directory for database files
   
   %Imm -> 4207-2.asc.lp0.pro:std
   ```
The resulting pipeline shown below would be passed to a shell to format the file (shown on multiple lines for readability):

```
/usr/lpd/pio/etc/pioformat  # initiate the formatter driver
-0/usr/lpd/pio/ddi/4207-2.asc.lp0.pro:std
               # (digested) database file
-!usr/lpd/pio/fmtrs/piof420x  # loadable formatter
-15  # formatting option
       # (indent 5 characters)
```

Files

- `/usr/lpd/pio/etc/pioformat`: Contains the formatter driver.
- `/usr/lpd/pio/fmtrs/*`: Contains the formatters.
- `/var/spool/lpd/pio/@local/ddi/*`: Contains the digested database files.

Related Information

- `piobe` command, `pioburst` command, `piodigest` command, `piofquote` command, `pioout` command, `piopredef` command.

- `piocmdout` subroutine, `piogetvals` subroutine, `piogetopt` subroutine, `piogerstr` subroutine, `piomsgout` subroutine, `pioexit` subroutine.

Printing administration in the *Printers and printing*.

Virtual printer definitions and attributes in the *Printers and printing*.


Printer code page translation tables in the *Printers and printing*.

Printer colon file conventions in the *Printers and printing*.

Printer colon file escape sequences in the *Printers and printing*.

Printer-specific information in the *Printers and printing*.

Installing support for additional printers in the *Printers and printing*.

Printer backend programming in the *Printers and printing*.

Adding a printer using the printer colon file in the *Printers and printing*.

piofquote Command

**Purpose**

Converts certain control characters destined for PostScript printers.

---

364 Commands Reference, Volume 4
Syntax
/usr/lpd/pio/etc/piofquote

Description
The piofquote command is a filter that converts certain control characters destined for PostScript printers that can emulate other printers. The command reads data from standard input, checks for control characters, and modifies them as needed. It then writes the data to standard output.

If a least 1 byte of data appears on standard input, the piofquote command writes a hex 04 control character to standard output before the first input data byte is written to standard output. The command also writes a hex 04 to standard output when end-of-file is recognized on standard input.

If a hex 01, 03, 04, 05, 11, 13, 14, or 1c control character is found in the input data read from standard input, the hex 40 bit in the control character is turned on and a hex 01 character is prefixed to the control character before it is written to standard output.

Files
standard input Input data stream to be processed.
standard output Output data stream containing converted control characters.

Related Information
The piobe command, pioburst command, piodigest command, pioformat command, piout command, piopredef command.

Printing administration in the Printers and printing.

piolsvp Command

Purpose
Lists virtual printers on a system.

Syntax
piolsvp \{ -q | -v | -Q | -p | -A \} [ -n AttachmentField ]
piolsvp -P Queue [- QueueDevice] [ -n AttachmentField ]
piolsvp -P Queue -d
piolsvp -N AttachmentType [ -n AttachmentField ]

Description
The piolsvp command lists the virtual printers and attachment types on the system. The piolsvp command displays either the queues or the queues plus the queue-device pairs for virtual printers.

The order of the list of queues and queue-device pairs is the same as the order used by the /etc/qconfig file.
Flags

- **A**
  Displays all attachment types and descriptions for the attachment types. The .attach and .config files in the /usr/lib/lpd/pio/etc directory define all attachment types.

- **d**
  Displays the queue devices associated with a given queue.

- **nAttachmentField**
  Specifies a field name for an attachment. The field name is typically a SMIT selector name. Possible values for the AttachmentField variable are:

  - submit_job
  - add_queue
  - add_printer
  - remove_queue
  - printer_conn
  - change_queue
  - change_filters

Examples

1. To display all the print queues on the system, enter:
   
   ```bash
   piolsvp -q
   ```

   The output of this command is:

<table>
<thead>
<tr>
<th>Queue</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>e4019a</td>
<td>4019 (IBM ASCII)</td>
</tr>
<tr>
<td>d3816</td>
<td>IBM 3816 Page Printer</td>
</tr>
<tr>
<td>ena_asc</td>
<td>4029 (IBM ASCII)</td>
</tr>
</tbody>
</table>
2. To display all the virtual printers in the system, enter:

\texttt{piolsvp -v}

The output of this command is:

<table>
<thead>
<tr>
<th>#QUEUE</th>
<th>DEVICE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>e4019a</td>
<td>e4019</td>
<td>4019 (IBM ASCII)</td>
</tr>
<tr>
<td>d3816</td>
<td>ena3816</td>
<td>IBM 3816 Page Printer</td>
</tr>
<tr>
<td>ena_asc</td>
<td>ena</td>
<td>4029 (IBM ASCII)</td>
</tr>
<tr>
<td>ena_gl</td>
<td>ena</td>
<td>4029 (Plotter Emulation)</td>
</tr>
<tr>
<td>ena_pcl</td>
<td>ena</td>
<td>4029 (HP LaserJet II Emulation)</td>
</tr>
<tr>
<td>ena_ps</td>
<td>ena</td>
<td>4029 (PostScript)</td>
</tr>
<tr>
<td>hplj2</td>
<td>lxx</td>
<td>Hewlett-Packard LaserJet II</td>
</tr>
<tr>
<td>tstx</td>
<td>lxx</td>
<td>4216-31 (Proprinter XL Emulation)</td>
</tr>
<tr>
<td>e4019ps</td>
<td>e4019</td>
<td>4019 (PostScript)</td>
</tr>
<tr>
<td>40191xxa</td>
<td>lxx</td>
<td>4029 (PostScript)</td>
</tr>
<tr>
<td>40191xxa:rkmlxx</td>
<td>4019</td>
<td>IBM ASCII</td>
</tr>
<tr>
<td>40191xxa:rkmlxxl</td>
<td>4019</td>
<td>IBM ASCII</td>
</tr>
</tbody>
</table>

3. To list all the queues on the system, enter:

\texttt{piolsvp -Q}

The output of this command is:

<table>
<thead>
<tr>
<th></th>
<th>DEVICE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>e4019</td>
<td>4019 (IBM ASCII)</td>
<td></td>
</tr>
<tr>
<td>d3816</td>
<td>IBM 3816 Page Printer</td>
<td></td>
</tr>
<tr>
<td>ena_asc</td>
<td>4029 (IBM ASCII)</td>
<td></td>
</tr>
<tr>
<td>ena_gl</td>
<td>4029 (Plotter Emulation)</td>
<td></td>
</tr>
<tr>
<td>ena_pcl</td>
<td>4029 (HP LaserJet II Emulation)</td>
<td></td>
</tr>
<tr>
<td>ena_ps</td>
<td>4019 (PostScript)</td>
<td></td>
</tr>
<tr>
<td>hplj2</td>
<td>Hewlett-Packard LaserJet II</td>
<td></td>
</tr>
<tr>
<td>tstx</td>
<td>4216-31 (Proprinter XL Emulation)</td>
<td></td>
</tr>
<tr>
<td>e4019ps</td>
<td>e4019</td>
<td>4019 (PostScript)</td>
</tr>
<tr>
<td>40191xxa</td>
<td>lxx</td>
<td>4029 (PostScript)</td>
</tr>
<tr>
<td>40191xxa</td>
<td>rkmlxx</td>
<td>4019 (IBM ASCII)</td>
</tr>
<tr>
<td>40191xxa</td>
<td>rkmlxxl</td>
<td>4019 (IBM ASCII)</td>
</tr>
</tbody>
</table>

4. To list all the attachment types that have a SMIT selector value specified for the add_queue SMIT selector, enter:

\texttt{piolsvp -A -n add_queue}

The output from this command is:

<table>
<thead>
<tr>
<th>#ATTACHMENT TYPE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>local</td>
<td>Local Attached</td>
</tr>
<tr>
<td>remote</td>
<td>Remote Attached</td>
</tr>
<tr>
<td>ascii</td>
<td>ASCII Terminal Attached</td>
</tr>
<tr>
<td>other</td>
<td>Generic Backend Attached</td>
</tr>
</tbody>
</table>

5. To list information for the 40191xxa queue, enter:

\texttt{piolsvp -P40191xxa -n add_queue}

The output from this command is:

<table>
<thead>
<tr>
<th>lxx</th>
<th>xsta</th>
<th>sm_xsta_addq_sel</th>
</tr>
</thead>
</table>

6. To list the SMIT selector value for the remote attachment, enter:

\texttt{piolsvp -Axst -n add_queue}
The output from this command is:

```
sm_xsta_addq_sel
```

### Files

- `/usr/lib/lpd/pio/etc/piolsvp` Contains the `piolsvp` command.
- `/etc/qconfig` Contains the configuration files.
- `/var/spool/lpd/pio/@local/custom/*` Contains the customized virtual printer attribute files.
- `/usr/lib/lpd/pio/etc/*.attach` Contains the attachment type files.

### Related Information

- The `piobe` command, `qprt` command.
- Printer attachment files in the *Printers and printing*.
- Printing administration in the *Printers and printing*.
- Print spooler in the *Printers and printing*.
- Printer backend programming in the *Printers and printing*.

### piomgpdev Command

#### Purpose

Manages printer pseudo-devices.

#### Syntax

```
piomgpdev [-p PseudoDevice] [-t AttachmentType] [ -A | -C | -R | -D ] [ -a Clause ... ]
```

#### Description

The `piomgpdev` command changes and removes pseudo-devices for printer attachments. The `piomgpdev` command stores information about the pseudo-devices in files in the `/var/spool/lpd/pio/@local/dev` directory. The file contains stanzas in the following form:

```
key_word = value
```

The information stored in these files pertains to connection characteristics for a given attachment and a printer.

#### Flags

- `-a Clause` Specifies a clause to be added or changed in the file for a pseudo-device. The clause is in the following form:

  ```
  key_word = value
  ```

  If the `-D` flag is specified, the clause can contain only the keyword.

- `-A` Adds a pseudo-device.
- `-C` Changes a pseudo-device.
- `-D` Displays information for a specified clause of a pseudo-device definition.
- `-p PseudoDevice` Specifies the name of a pseudo-device for a printer attachment.
- `-R` Removes a pseudo-device.
Files
/usr/lib/lpd/pio/etc/piomgpdev
/var/spool/lpd/pio/@local/dev/*

Contains the piomgpdev command.
Contains the printer pseudo-device files.

Related Information
The piobe command, qprt command.

Printing administration in the Printers and printing.
Print spooler in the Printers and printing.
Printer backend programming in the Printers and printing.

piomkapqd Command

Purpose
Builds a SMIT dialog to create print queues and printers.

Syntax

To Create a Print Queue for an Existing Printer
piomkapqd -A AttachmentType -p Printer -d DeviceName -h Header [-e]

To Create a Printer and a Print Queue
piomkapqd -A AttachmentType -p Printer -v Device -s Subclass -r Adapter -h Header [-e]

To Create a Printer Attached to a TTY or to Assign Printer Output to a File and Create a New Queue
piomkapqd -A AttachmentType -p Printer [-T TTYName | -f FileName] -h Header [-e]

To Use a User-Defined Attachment for a New Printer and Print Queue
piomkapqd -A AttachmentType -p Printer [-d DeviceName] -c CmdExec [-i DiscCmd] -o ObjectID -h Header [-e]

Description
The piomkapqd command creates a System Management Interface Tool (SMIT) dialog that allows the user to create new printers and print queues. The piomkapqd command also allows users to add their user-defined attachment types to a SMIT printer or queue definition dialog.

Flags

-A AttachmentType Specifies the type of attachment used to connect the printer to the data source. Common values for the AttachmentType variable are:

local Specifies a local attachment type.
ascii Specifies an ASCII attachment type.
file Specifies a file where the data is stored.

-c CmdExec Specifies the value for the cmd_to_execute SMIT command. This flag is used when creating a user-defined attachment dialog. If this flag is not included, the piomkpq command is used as the default.

-d DeviceName Specifies the name of the device, pseudo-device, or file where the output is directed, for example lp0 or tty1.
-e Specifies that an existing print queue is to be used for printer output. The -e prevents the piomkapqd command from creating a new queue.

-File Name Indicates the name of the file where output is stored.

-h Header Specifies the title or header of the SMIT dialog that is being created.

-i DiscCmd Specifies the value of the cmd_to_discover SMIT command. This flag is used when creating a user-defined attachment dialog. If this flag is not included, the piomkapqd command default value is used to create the dialog.

-o ObjectID Specifies the SMIT object whose ID matches the value of the ObjectID variable.

-p Printer Specifies the printer type as defined in the /usr/lib/lpd/pio/predef directory, for example ibm4019.

-r ParentAdapter Specifies the parent adapter for the printer.

-s Subclass Specifies the subclass type to which the printer belongs. The possible values for the Subclass variable are:
  - parallel
  - rs232
  - rs422

-T TTYName Specifies the name of the TTY attached to the new printer or queue.

-v Device Specifies the device type as defined in the ODM database. The -v flag retrieves printer definitions that are not stored in the /usr/lib/lpd/pio/predef directory.

Examples
1. To create a SMIT dialog that adds a print queue to an existing local printer, enter:
   piomkapqd -A local -p ibm4019 -d lp0 -h 'Add a New Queue'
2. To create a SMIT dialog that adds a new printer named lp2 and new print queue attached locally, enter:
   piomkapqd -A local -p ibm4019 -v ibm4019 -s rs232 -r sa0 -h 'Add New Printer'
3. To create a SMIT dialog that adds a printer attached to a TTY and create a new queue for the printer, enter:
   piomkapqd -A tty -p ibm4039 -T tty12 -h 'Add TTY Printer'
4. To create a SMIT dialog that directs output to a file name stuff and to create a new queue, enter:
   piomkapqd -A file -p ibm4039 -f stuff -h 'Add Output File' -e
5. To create a SMIT dialog that adds a user-defined printer attachment type and creates a new queue, enter:
   piomkapqd -A hpJetDirect -p hplj-4 [-d lp0] -c /usr/sbin/mkjetd -i /usr/bin/lsjd -o JetDirect -h 'Add New Attachment Type'

File
/usr/lib/lpd/pio/etc/piomkapqd Contains the piomkapqd command.

Related Information
The piobe command, piomkp command.

Printing administration Print spooler in the Printers and printing.

System management interface tool in the Operating system and device management.

Printer backend programming in the Printers and printing.
piomkpq Command

Purpose
Creates a print queue.

Syntax
To add a new printer
piomkpq -A AttachmentType -p PrinterType -Q QueueName -D DataStream -v DeviceType -s Subclass
                    -r ParentAdapter -w PortNumber
                    { interface | ptop | autoconfig | speed | parity | bpc | stops | xon | dtr | tbc=DescValue } ...

To create a new print queue
piomkpq -A AttachmentType -p PrinterType { -D DataStream | -q QueueName } -s Subclass
                    -r ParentAdapter -w PortNumber
                    { interface | ptop | autoconfig | speed | parity | bpc | stops | xon | dtr | tbc=DescValue } ...

To create print queues for an existing printer
piomkpq -A AttachmentType -p PrinterType -d DeviceName { -D DataStream | -q QueueName }

To add an existing printer to an existing print queue
piomkpq -A AttachmentType -p PrinterType -d DeviceName -D DataStream -q QueueName

Description
The piomkpq command creates print queues and printers. This command is used by SMIT dialogs created with the piomkapqd command. The piomkpq command performs the following functions:
• Creates printer devices with various attachment types.
• Creates print queues.
• Creates queue devices.
• Creates virtual printers.
• Creates pseudo-devices.

Flags
-a
  Specifies a device attribute. This takes the form Attribute=Value, for example: -a speed=9600. The valid attributes are:
  Interface
  ptop
  autoconfig
  speed
  parity
  bpc
  stops
  xon
  dtr
  tbc
-A AttachmentType Specifies the type of attachment used to connect the printer to the data source. Common values for the AttachmentType variable are:

<table>
<thead>
<tr>
<th>AttachmentType</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>local</td>
<td>Specifies a local attachment type.</td>
</tr>
<tr>
<td>ascii</td>
<td>Specifies an ASCII attachment type.</td>
</tr>
<tr>
<td>file</td>
<td>Specifies a file where the data is stored.</td>
</tr>
</tbody>
</table>

-d DeviceName Specifies the name of the device, pseudo-device, or file where the output is directed, for example lp0 or tty1.

-D DataStream Specifies the datastream of a print queue to be created or an existing print queue.

-p PrinterType Specifies the printer type as defined in the /usr/lib/lpd/pio/predef directory, for example ibm4019.

-q QueueName Specifies a new queue name. The -q and -Q flags are exclusive.

-Q QueueName Specifies an existing queue name. The -q and -Q flags are exclusive.

-s Subclass Specifies the subclass type to which the printer belongs. The possible values for the Subclass variable are:

- parallel
- rs232
- rs422

-r ParentAdapter Specifies the parent adapter for the printer.

-w PortNumber Specifies the port number for the printer attachment.

-v DeviceType Specifies the device type as defined in the ODM database.

Examples

1. To create a local print queue named castor of datastream ASCII for an existing IBM 4019 printer named lp0, enter:
   ```
   piomkpq -A local -p ibm4019 -d lp0 -D asc -q castor
   ```

2. To add an existing local printer to an existing local print queue called pyrite for the datastream PostScript, enter:
   ```
   piomkpq -A local -p ibm4019 -d lp0 -Q pyrite -D ps
   ```

3. To create local print queue called baker for a new printer, enter:
   ```
   piomkpq -A local -p ibm4019 -D asc -Q baker -s parallel -r ppa0
   ```

4. To create the clues file print queue, enter:
   ```
   piomkpq -A file -p ibm4019 -d clues -D asc -q baker
   ```

Files

- `/usr/lib/lpd/pio/etc/piomkpq` Contains the `piomkpq` command.
- `/usr/lib/lpd/pio/etc/piomgpdev` Creates a pseudo-device.
- `/usr/sbin/mkque` Creates a queue.
- `/usr/sbin/mkque` Creates a queue device.
- `/usr/sbin/mkvirprt` Creates a virtual printer.

Related Information

The `piobe` command, `piomkapqd` command.

**Printing administration** in Printers and printing

**Print spooler** in Printers and printing
piomsg Command

Purpose
Sends a printer backend message to the user.

Syntax
piomsg [ -u UserList ] [ -c MsgCatalog [ -s MsgSet ] -n MsgNumber ] [ -a MsgArg ] ...
[ MsgText ]

Description
The piomsg command either retrieves a printer backend message from a message catalog or sends
a specified message text to one or more users. The piomsg command runs when a print job is executed.
Typically, the piomsg command is used in printer colon files to send a message to the user submitting a
print job while the print job is processed by the piobe command.

When the -c, -s, or -n flags are specified, the piomsg command retrieves a message from a message
catalog. The command searches for the message in the directory specified in the NLSPATH environment
variable. If the NLSPATH environment variable does not contain a directory path, the piomsg command
searches the /usr/lib/lpd/pio/etc default directory. If no message is found in the /usr/lib/lpd/pio/etc
directory, the command supplies the text specified in the MessageText variable. When the -c, -s, or -n
flags are not specified, the piomsg command returns the value (if any) of the MessageText variable.

Each message is parsed for the %s or %n$s printf subroutine conversion specifications. The printf
conversion specifications are replaced with supplied message strings, if any, before the message is sent
to the user. The piomsg command processes escape sequences, such as, linefeed \n or horizontal tab \t,
that are embedded in the message.

Flags
-a MsgArg Specifies the message argument string. The value of the MsgArg variable is substituted into
the message, if it contains the %s or %n$s printf subroutine conversion specifications. The
-a flag can be specified up to 10 times to specify multiple arguments. If there are any errors
while parsing conversion specifications, the original message is sent.
-c MsgCatalog Specifies the message catalog that contains the message to be retrieved. The -c flag must
be specified with the -n flag.
-n MsgNumber Specifies the message number. The -n flag must be specified with the -c flag.
-s MsgSet Specifies an optional message set. The default value for the MsgSet variable is 1. The -s
flag must be specified with both the -c and -n flags.
-u UserList Specifies the list of users who receive the message. The names of users or nodes in the
UserList variable are separated by commas. To include a node name in the user list specify
the @ character followed by a node name or address. If the -u flag is omitted, the message
returns to the user who initiated the print job.

Examples
1. To retrieve message number 100 in message set number 1 from the piobe.cat message catalog and
send the message to user joe on the same node as the print server and tom on node foobar, enter:
   piomsg -u joe,tom@foobar -c piobe.cat -n 100
2. To send a message with a message argument string to the user who submitted the print job, enter:
   piomsg -a "/usr/bin/troff" "The specified filter %s is not found\n"
3. To retrieve message number 5 in set number2 from the xyz.cat, use a dummy message in the event of a failure, and send the message to the printer, enter:
   
   piomsg -cxyz.cat -s2 -n5 "xyz.cat is not installed."

   **Note:** When the piomsg command cannot retrieve messages from the catalog specified with the NLSPATH environment variable or the default directory, the supplied message text is sent to the users.

**File**

/usr/lib/lpd/pio/etc/piomsg

Contains the piomsg command.

**Related Information**

The **pioe** command.

The **printf** subroutine.

**Printing administration** in *Printers and printing*.

**Print spooler** in *Printers and printing*.

**Printer backend programming** in *Printers and printing*.

---

**pioout Command**

**Purpose**

Printer backend's device driver interface program.

**Syntax**

```
```

**Description**

The **pioout** command is at the end of pipelines invoked by the **pioe** command (the print job manager) to print a file or a burst page on a printer. It reads input data from standard input, the prefix file (if the `-P` flag is specified), and the suffix file (if the `-S` flag is specified), and then writes the data to the printer (or `OutFile`, if the `-O` flag is specified). Error conditions and situations where intervention is required (unless the `-I` flag is specified) are reported to the user who submitted the print job.

The values specified with the `-A` flag and the `-B` flag are used to periodically report to the **qdaemon** process the percentage of the print job that has completed. The `-C` flag and the `-D` flag specify the data string sent to the printer if the print job is canceled.

The `-O` flag is used to generate a header page and store it in a temporary file. The `-P` flag is then used to print the header page (that was saved in a temporary file) just prior to printing the print file.

The **pioout** command requires the following environment variables to be initialized:

- **PIOTITLE**  
  
  Title of the print job

- **PIODEVNAME**  
  
  Device name
<table>
<thead>
<tr>
<th>Flag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>-A</strong> BytesPrinted</td>
<td>Specifies the number of bytes already printed for the print job.</td>
</tr>
<tr>
<td><strong>-B</strong> TotalBytes</td>
<td>Specifies the total number of bytes to be printed for the print job.</td>
</tr>
<tr>
<td><strong>-C</strong> NumberCancelStrings</td>
<td>Specifies the number of times the string specified by the -D flag is to be sent to the printer when a print job is canceled. If this flag is not specified, the value is assumed to be 3168.</td>
</tr>
<tr>
<td><strong>-D</strong> CancelString</td>
<td>Specifies the string to be sent to the printer when a print job is canceled. If the -D flag is not specified, the string is assumed to consist of 1 null character.</td>
</tr>
<tr>
<td><strong>-E</strong> Mask</td>
<td>Specifies, as Mask, one or more device-driver error-flag names, separated by commas. If the mask is one returned by the ioctl subroutine with an LPQUERY command, the error condition indicated by the mask is ignored. Flag names can include LPST_ERROR, LPST_NOSLCT, and LPST_SOFT, and are defined in the /usr/include/sys/lpio.h file.</td>
</tr>
<tr>
<td><strong>-F</strong> FormFeed String</td>
<td>Specifies the string to be sent to the printer to cause a form feed. If the -F flag is not specified, the string is assumed to be \014.</td>
</tr>
<tr>
<td><strong>-I</strong> InterventionRequiredUser</td>
<td>Specifies the user to whom a message is to be sent when the printer requires intervention. If this flag is not specified, the message is sent to the user who submitted the print job.</td>
</tr>
<tr>
<td><strong>-K</strong> TextString</td>
<td>Specifies that messages sent by a PostScript printer will be discarded if they contain the specified text string. For example, if the TextString variable is warming up, messages that include the text warming up will be discarded.</td>
</tr>
<tr>
<td><strong>-L</strong> TextString</td>
<td>Specifies that if a message received from a PostScript printer includes the specified text string, the text following this text string in the message will be sent to the intervention-required user specified by the -I flag.</td>
</tr>
<tr>
<td><strong>-N</strong> NumberFormFeedStrings</td>
<td>Specifies the number of form-feed strings to be sent to the printer at the end of the input data stream. If this flag is not specified, the value is assumed to be zero. This flag is normally used only to align continuous forms after the printer has been idle, or to feed forms when the printer goes idle.</td>
</tr>
<tr>
<td><strong>-O</strong> OutFile</td>
<td>Specifies that the output is sent to the specified file instead of being sent to the printer.</td>
</tr>
<tr>
<td><strong>-P</strong> PrefixFile</td>
<td>Specifies the file sent to the printer before the first byte of the print file is sent. If the print job terminates before the first byte of the print file arrives, the prefix file is not sent.</td>
</tr>
<tr>
<td><strong>-R</strong> ParseRoutine</td>
<td>Specifies the full path name of a routine to parse data read from the printer. An example of a parse routine is contained in the /usr/include/piostruct.h file. If the -R flag is not specified, a default parse routine is used.</td>
</tr>
<tr>
<td><strong>-S</strong> SuffixFile</td>
<td>Specifies the file sent to the printer after the print file has been sent. If the print job terminates before the first byte of the print file arrives, the suffix file is not sent.</td>
</tr>
<tr>
<td><strong>-W</strong> +</td>
<td>Specifies that EOF (hex 04) must be received from the printer in order to exit.</td>
</tr>
</tbody>
</table>
piopredef Command

Purpose
Creates a predefined printer data-stream definition.

Syntax
piopredef [ -r ] [ -d QueueDeviceName -q PrintQueueName -s DataStreamType -t PrinterType ]

Description
The piopredef command creates a predefined printer data-stream definition from a virtual printer definition. It can be thought of as the inverse of the mkvirprt command. The mkvirprt command copies a predefined printer data stream definition to create a virtual printer definition, which can then be customized as desired. The piopredef command, however, copies a customized virtual printer definition to create a predefined printer data stream definition.

The piopredef command can be used to create a predefined printer definition for an unsupported printer that accepts a print data stream similar to that of a supported printer. For example, a virtual printer definition for a 4201-3 Proprinter III can be created with the mkvirprt command, displayed with the lsvirprt command, modified as necessary for the unsupported printer with the chvirprt command, and then specified with the piopredef command to create a predefined definition for the unsupported printer.

The new predefined printer definition can then be specified with a mkvirprt command to generate additional virtual printers for the unsupported printer type on the same computer, or transported to other computers and used there.

Flags

-d QueueDeviceName Specifies with the QueueDeviceName variable the spooler of the customized virtual printer definition to be used to create the predefined printer definition.

-q PrintQueueName Specifies with the PrintQueueName variable the spooler of the virtual printer definition to be used to create the predefined printer definition.
-r Specifies that if the -s flag and the -t flag specify a predefined printer definition that already exists, the existing one should be replaced.

-s DataStreamType Specifies with the DataStreamType variable the printer for the predefined printer definition to be created. Example data stream types are:

- asc IBM extended ASCII
- gl Hewlett-Packard GL
- pcl Hewlett-Packard PCL
- ps PostScript
- 630 Diablo 630
- 855 Texas Instruments 855.

-t PrinterType Specifies the printer type for the predefined printer definition to be created. Examples of existing printer types are: 4201-3, hplj-2, ti2115, and so on.

Note: If no flags are specified, the command syntax is displayed.

Example
To create a new predefined printer definition from an existing virtual printer definition for the virtual printer, enter:

piopredef -d mypro -q proq -s asc -t 9234-2

The attributes for the virtual printer assigned to the mypro queue device on the proq print queue are copied to create a new predefined printer definition for the 9234-2 printer (asc data stream).

Files

/etc/piopredef Contains the piopredef command.
/usr/lpd/pio/predef/* Predefined printer data stream attribute files. File names are in the format: PrinterType.DataStreamType.
/var/spool/lpd/pio/@local/custom/* Customized virtual printer attribute files. File names are in the format: PrintQueueName:QueueDeviceName.

Related Information

Printing administration | Printer-specific information | Virtual printer definitions and attributes | Printer backend programming | Adding a printer using the printer colon file | Printer code page translation tables in Printers and printing.


pkgadd Command

Purpose
Transfers a software package or set to the system.

Syntax

To Install a Software Package
pkgadd [-d Device] [-r Response] [-n] [-a Admin] [-P Path] [Pkginst1] [Pkginst2] [...]]
To Copy a Software Package to the Specified Spool Directory
pkgadd [-s] Spool [-d Device] [Pkginst1] [Pkginst2] [.

Description
pkgadd transfers the contents of a software package or set from the distribution medium or directory to install it onto the system. A package is a collection of related files and executables that can be independently installed. A set is made up of a special-purpose package, referred to as a Set Installation Package (SIP), and a collection of one or more packages that are members of the set. The SIP controls the installation of the set.

pkgadd checks that all packages listed on the command line are on the installation medium. If any of the packages listed does not exist, no changes are made to the system, that is, none of the listed packages are installed.

Note: Nonroot users must meet the following conditions to run the pkgadd command successfully:
1. Users must have write permission to the paths specified in the pkgmap file.
2. The current user:group must match the user:group specified in the pkgmap file.
3. Users must have write permissions on the /var/sadm/install and /var/sadm/pkg directories.

Used without the -d flag, pkgadd looks in the default spool directory for the package (/var/spool/pkg).
Used with the -s flag, it writes the package to a spool directory instead of installing it.

Error messages are always logged. In addition, when pkgadd terminates, it sends mail (by default, to "root") with all the error messages and a summary of which packages installed completely, partially, or not at all.

Flags
-d Device Installs or copies a package/set from Device. Device can be the full pathname to a directory, file or named pipe, or "-" which specifies packages in datastream format read from standard input. The default device is the installation spool directory (/var/spool/pkg).
-r Response Identifies a file or directory, Response, which contains the answers to questions posed by a "request script" during a previous pkgask session conducted in interactive mode [see the pkgask command]. When Pkginst is a package, Response can be a full pathname or a directory; when Pkginst is a SIP, Response must be a directory.
-n Specifies that installation runs in non-interactive mode. The default mode is interactive.
-a Admin Defines an installation administration file, Admin, to be used in place of the default administration file to specify whether installation checks (such as the check on the amount of space, the system state, and so on) are done. The token "none" overrides the use of any admin file, and thus forces interaction with the user. Unless a full pathname is given, pkgadd looks in the /var/sadm/install/admin directory for the file. By default, the file default in that directory is used. default specifies that no checking is done, except to see if there is enough room to install the package and if there are dependencies on other packages. The -a flag cannot be used if Pkginst is a SIP.
-P Path Specifies an alternative root directory path for installation. Files will be installed under this location.
**Pkginst**

Defines a short string used to designate an abbreviation for the package/set name. (The term "package instance" is used loosely: it refers to all instantiations of Pkginst.) See the pkginfo command and the pkginfo file format.

If Pkginst is a SIP, the SIP controls installation of the set by using request scripts and pre-install scripts. The SIP request script, not the package installation tools, is responsible for prompting the user for responses and taking the appropriate actions. If the request script fails, only the SIP is processed.

To indicate all instances of a package, specify 'Pkginst.*', enclosing the command line in single quotes, as shown, to prevent the shell from interpreting the "*" character. Use the token "all" to refer to all packages available on the source medium.

- **s Spool**

Reads the package into the directory Spool instead of installing it.

**Special Notes**

The -r flag can be used to indicate a directory name as well as a filename. The directory can contain numerous Response files, each sharing the name of the package with which it should be associated. This would be used, for example, when adding multiple interactive packages with one invocation of pkgadd. Each package that had a request script would need a Response file. If you create response files with the same name as the package (for example, Package1 and Package2) then, after the -r flag, name the directory in which these files reside.

The -n flag causes the installation to halt if any interaction is needed to complete it.

When invoked with no Pkginst specified on the command line, pkgadd only displays the names of sets if at least one SIP exists on the media. Because of this, you shouldn’t include packages on the same media if some are members of sets and some are not. If you do, the packages which are not members of sets can be installed only if their pkginst names are provided on the command line.

The pkgadd command checks to see if any of the files in Pkginst are already installed on the system and, if any are, saves this fact before continuing with installation. Later, pkgadd does not reinstall these files on the system. If one of the packages installation scripts removes such a file, the result is that the file will no longer be on the system when package installation completes.

The pkgadd command does not uncompress any files that were already compressed (that is, only those in ".Z" form) before being processed by pkgmk.

**Exit Status**

This command returns the following exit values:

0  Successful completion of script.
1  Fatal error. Installation process is terminated at this point.
2  Warning or possible error condition. Installation continues. A warning message is displayed at the time of completion.
3  Script was interrupted and possibly left unfinished. Installation terminates at this point.
4  Script was suspended (administration). Installation terminates at this point.
5  Script was suspended (interaction was required). Installation terminates at this point.
10  System should be rebooted when installation of all selected packages is completed. (This value should be added to one of the single-digit exit codes described above.)
20  The system should be rebooted immediately upon completing installation of the current package. (This value should be added to one of the single-digit exit codes described above.)
77  No package was selected for the set.
99  Internal error.
Files
/var/sadm/install/admin/default  default package administration file
/var/sadm/install/logs/pkginst.log  error message log
/var/spool/pkg  default spool directory

Related Information
The pkgask command, pkgchk command, pkginfo command, pkgmk command, pkgparam command, pkgrm command.

pkgask Command

Purpose
Stores answers to a request script.

Syntax
pkgask [-d Device] [r Response [Pkginst [Pkginst] [. .]]]

Description
pkgask enables an administrator to store answers to an interactive package (one with a request script) or a set of packages. A set is made up of a special-purpose package, referred to as a Set Installation Package (SIP), and a collection of one or more packages that are members of the set. The SIP controls the installation of the set.

Invoking pkgask generates a Response file that is then used as input at installation time. The use of this Response file prevents any interaction from occurring during installation since the file already contains all of the information the package needs.

When pkgask runs, it creates the response file as well as the following directories:

/ptfvars  Contains variables pertaining to the package.
/fileinfo  Contains checksum information about the package.
/oldfiles  Contains backups of previous versions of the package.

To install the package on another system non-interactively, you must copy all of these files and directories to the target system.

Note: If you overwrite any of these directories, for example, to install another package non-interactively, you will not be able to successfully remove the first package unless you restore the original directory contents first.

You can use the -r flag to indicate a directory name as well as a filename. The directory name is used to create numerous Response files, each sharing the name of the package with which it should be associated. This is useful, for example, when you add multiple interactive packages with one invocation of pkgadd. Each package needs a Response file. To create multiple response files with the same name as the package instance, name the directory in which the files should be created and supply multiple instance names with the pkgask command. When installing the packages, you can identify this directory to the pkgadd command.
Flags

-d Device
Runs the request script for a package on Device. Device can be the full pathname to a directory (such as /var/tmp), or "-" which specifies packages in datastream format read from standard input. The default device is the installation spool directory (/var/spool/pkg).

-r Response
Identifies a file or directory, Response, which should be created to contain the responses to interactions with the packages request script. The file, or directory of files, can later be used as input to the pkgadd command [see the pkgadd command]. When Pkginst is a package, Response can be a full pathname or a directory; when Pkginst is a SIP, Response must be a directory.

Pkginst
Defines a short string used to designate an abbreviated package/set name. (The term "package instance" is used loosely: it refers to all instantiations of Pkginst, even those that do not include instance identifiers.)

To create a package name abbreviation, assign it with the "PKG" parameter. For example, to assign the abbreviation "cmds" to the Advanced Commands package, enter PKG=cmds.

If Pkginst specifies a SIP, all request scripts for packages which are members of that set are run (if any) and the resulting response files are placed in the directory provided to the -r flag.

To indicate all instances of a package, specify 'Pkginst.*', enclosing the command line in single quotes, as shown, to prevent the shell from interpreting the "*" character. Use the token "all" to refer to all packages available on the source medium.

Note: When invoked with no Pkginst specified on the command line, pkgask only displays the names of sets if at least one SIP exists on the device. Thus, if you have packages which are not members of sets, they can be referenced only if their Pkginst names are provided on the command line.

Exit Status
This command returns the following exit values:

0   Successful completion of script.
1   Fatal error. Installation process is terminated at this point.
2   Warning or possible error condition. Installation continues. A warning message is displayed at the time of completion.
3   Script was interrupted and possibly left unfinished. Installation terminates at this point.
4   Script was suspended (administration). Installation terminates at this point.
5   Script was suspended (interaction was required). Installation terminates at this point.
10  System should be rebooted when installation of all selected packages is completed. (This value should be added to one of the single-digit exit codes described above.)
20  The system should be rebooted immediately upon completing installation of the current package. (This value should be added to one of the single-digit exit codes described above.)
77  No package was selected for the set.
99  Internal error.

Files
/var/spool/pkg                          default spool directory

Related Information
The pkgadd command, pkgchk command, pkginfo command, pkgm command, pkgparam command, pkgtrans command, pkgrm command.
pkgchk Command

Purpose
Checks the accuracy of an installation.

Syntax
To Check the Contents of Installed Objects
pkgchk [ -l [a-c-f-q-v] [ -n-x ] [ -P path ] [ -p Path1[ ,Path2 ... ] ] [ -i File ] [ -P Pkginst ... ]]

To Check the Contents of a Package Spooled on a Specified Device
pkgchk [ -d Device [ -l | -v ] [ -P Path1[ ,Path2 ... ] ] [ -i File ] [ -P Pkginst ... ]]

To Check the Contents of a Package Described in the Specified pkgmap
pkgchk [ -m Pkgmap [ -e Envfile ] [ -l | -a-c-f-q-v ] [ -n-x ] [ -i File ] [ -p Pkgmap-pattern ... ]]

Description
pkgchk checks the accuracy of installed files or, by use of the -l flag, displays information about package files. The command checks the integrity of directory structures and the files. Discrepancies are reported on stderr along with a detailed explanation of the problem.

The first synopsis defined above is used to list or check the contents and/or attributes of objects that are currently installed on the system. Package names can be listed on the command line, or by default the entire contents of a machine is checked. If packages are installed in an alternative root directory path using the pkgadd command with the -P option, contents and attributes can be checked or listed using the same alternative root directory path specified with the -P option.

The second synopsis is used to list or check the contents of a package which has been spooled on the specified device, but not installed. Note that attributes cannot be checked for spooled packages.

The third synopsis is used to list or check the contents and/or attributes of objects which are described in the indicated Pkgmap.

Flags
- l Lists information on the selected files that make up a package. It is not compatible with the a, c, f, g, and v flags.
- a Audits the file attributes only, does not check file contents. Default is to check both.
- c Audits the file contents only, does not check file attributes. Default is to check both.
- f Corrects file attributes if possible. If used with the -x flag, it removes hidden files. When pkgchk is invoked with this flag it creates directories, named pipes, links, and special devices if they do not already exist.
- q Enables quiet mode. Does not give messages about missing files.
- v Enables verbose mode. Files are listed as processed.
- n Ignores volatile or editable files. This should be used for most post-installation checking.
- x Searches exclusive directories only, looking for files that exist that are not in the installation software database or the indicated Pkgmap file. (An exclusive directory is a directory created by and for a package; it should contain only files delivered with a package. If any non-package files are found in an exclusive directory, pkgchk reports an error.) If -x is used with the -f flag, hidden files are removed; no other checking is done.

Note: To remove hidden files only, use the -f and -x flags together. To remove hidden files and check attributes and contents of files, use the -f, -x, -c, and -a flags together.

-p Only checks the accuracy of the pathname or pathnames listed. ‘pathname’ can be one or more pathnames separated by commas (or by white space, if the list is quoted).
-i  Reads a list of pathnames from File and compares this list against the installation software database or the indicated Pkgmap file. Pathnames that are not contained in "inputfile" are not checked.

-d  Specifies the device on which a spooled package resides. Device can be a directory pathname, or "-" which specifies packages in datastream format read from standard input.

-m  Requests that the package be checked against the pkgmap file Pkgmap.

-e  Requests that the pkginfo file named as Envfile be used to resolve parameters noted in the specified pkgmap file.

Pkginst  Defines a short string used to designate an abbreviation for the package name. (The term "package instance" is used loosely: it refers to all instantiations of Pkginst, even those that do not include instance identifiers.)

To indicate all instances of a package, specify 'Pkginst.*', enclosing the command line in single quotes, as shown, to prevent the shell from interpreting the "*" character. Use the token "all" to refer to all packages available on the source medium.

-P path  Requests that the package in the alternate root directory path be checked.

Exit Status
This command returns the following exit values:

0  Successful completion of script.
1  Fatal error. Installation process is terminated at this point.

Files
/usr/sbin/pkgchk  Contains the pkgchk command.

Related Information
The pkgadd command, pkgask command, pkginfo command, pkgmk command, pkgrm command, pkgtrans command.

The pkginfo file format, pkgmap file format.

pkginfo Command

Purpose
Displays software package and/or set information.

Syntax

To Display Information on Installed Packages

To Display Information on Packages Contained in the Specified Device

Description
pkginfo displays information about software packages or sets that are installed on the system (as requested in the first synopsis) or that reside on a directory (as requested in the second synopsis). A package is a collection of related files and executables that can be independently installed. A set is made
up of a special-purpose package, referred to as a Set Installation Package (SIP), and a collection of one or more packages that are members of the set. The SIP controls the installation of the set.

When run without flags, `pkginfo` displays one line of information about every installed package (whether installed completely or partially) whose category is not the value "set". The information displayed includes the primary category, package instance, and name of the package. For UNIX software packages produced before UNIX System V Release 4, `pkginfo` displays only the package name and abbreviation.

The `-p` and `-i` flags are meaningless if used in conjunction with the `-d` flag. The `-p` and `-i` flags are mutually exclusive. The `-x` and `-l` flags are mutually exclusive.

**Flags**

- `-q` Enables quite mode - no information is displayed. This flag overrides the `-x`, `-l`, `-p`, and `-i` flags. (Can be invoked by a program to query whether or not a package has been installed.)
- `-x` Extracts and displays the following information about the specified package: abbreviation, name, and, if available, architecture and version.
- `-l` Displays a "long format" report (that is, one that includes all available information) about the specified package(s).
- `-r` Lists the installation base for the specified package if the package is relocatable.
- `-p` Displays information only for partially installed packages.
- `-i` Displays information only for fully installed packages.
- `-a Arch` Specifies the architecture of the package as `Arch`.
- `-P Path` Displays information for packages installed in the alternative root directory path.
- `-v Version` Specifies the version of the package as `Version`. All compatible versions can be requested by preceding the version name with a tilde "~".
- `-c Category . . .` Displays information about packages that belong to category `Category`. (Categories are defined in the category field of the `pkginfo` file; see the `pkginfo` file format for details.) More than one category may be specified in a comma-separated list. A package is required to belong to only one category, even when multiple categories are specified. The package-to-category match is not case-sensitive.

If the category specified is "set", `pkginfo` displays information about Set Installation Packages (SIPs).

**Pkginst**

Defines a short string used to designate an abbreviation for the package/set name. (The term "package instance" is used loosely: it refers to all instantiations of `Pkginst`, even those that do not include instance identifiers.)

To indicate all instances of a package, specify "`Pkginst.*`", enclosing the command line in single quotes, as shown, to prevent the shell from interpreting the "*" character. Use the token "all" to refer to all packages available on the source medium.

If `Pkginst` is a SIP, information about the packages with which the SIP is associated is displayed.

- `-d Device` Displays information from packages/sets that reside on `Device`. `Device` can be the full pathname to a directory (such as `/var/tmp`), or "-" which specifies packages in datastream format read from standard input. The default device is the installation spool directory (`/var/spool/pkg`).

**Exit Status**

This command returns the following exit values:

- **0** Successful completion of script.
- **1** Fatal error. Installation process is terminated at this point.
Files
/var/spool/pkg
Default spool directory

Related Information
The pkgadd command, pkgask command, pkgchk command, pkgmk command, pkgrm command, pkgtrans command.
The pkginfo file format, setinfo file format.

pkgmk Command
Purpose
Produces an installable package.

Syntax

Description
pkgmk produces an installable package to be used as input to the pkgadd command. A package is a collection of related files and executables that can be independently installed. The package contents will be in directory structure format.

The pkgmk command uses the package prototype file as input and creates a pkgmap file. The contents for each entry in the prototype file is copied to the appropriate output location. Information concerning the contents (checksum, file size, modification date) is computed and stored in the pkgmap file, along with attribute information specified in the prototype file.

Flags
-a Arch
This flag overrides the architecture information provided in the pkginfo file with Arch.

-b BaseDir
Prepends the indicated BaseDir to locate relocatable objects on the source machine.

-c
Compresses non-information files. You must also specify the -r option when using -c. Entries in the Prototype file that reference relative paths above the RootPath specification will not be compressed. Any files that were already compressed (that is, only those in "Z" form) before being processed by pkgmk will not be uncompressed by the pkgadd command.

-d Directory
Creates the package in Directory. The directory named must already exist.

-f Prototype
Uses the file Prototype as input to the command. The default name for this file is either Prototype or prototype.

You can use pkgproto to create the Prototype file. In this case, you must manually add in the entries for any installation scripts and files you are using in the package. You only need entries for those files and scripts that you use. However, you must always add an entry for the pkginfo file for the package. See pkgproto for more information.
-l Limit

Specifies the maximum size in 512-byte blocks of the output device as Limit. By default, if the output file is a directory or a mountable device, pkgmk will employ the df command to dynamically calculate the amount of available space on the output device. Useful in conjunction with pkgtrans to create a package with datastream format.

-o

Overwrites the same instance. The package instance will be overwritten if it already exists.

-p PStamp

Overrides the production stamp definition in the pkginfo file with PStamp.

-r RootPath

Appends the source pathname in the Prototype file to the indicated RootPath to locate objects on the source machine.

-v Version

Overrides version information provided in the pkginfo file with Version.

Variable=Value

Places the indicated variable in the packaging environment.

PkgInst

A short string used to designate an abbreviation for the package name. pkgmk will automatically create a new instance if the version and/or architecture is different. A user should specify only a package abbreviation; a particular instance should not be specified unless the user is overwriting it.

Examples

1. If you want to create a package named mypkgA containing the lsps and lsuser commands, you must first create the contents of the package. For example:

   mkdir -p /home/myuser/example/pkgmk/sbin
   cp /usr/sbin/lsps /home/myuser/example/pkgmk/sbin
   cp /usr/sbin/lsuser /home/myuser/example/pkgmk/sbin

Then, create the pkginfo file. In this example the pkginfo file is /home/myuser/example/pkgmk/pkginfo, which contains the following:

   PKG="mypkgA"
   NAME="My Package A"
   ARCH="PPC"
   RELEASE="1.0"
   VERSION="2"
   CATEGORY="Application"
   PSTAMP="AIX 2001/02/05"

Then, create the Prototype file, /home/myuser/example/pkgmk/prototype file which contains the following:

   !search /home/myuser/example/pkgmk/sbin
   i pkginfo=/home/myuser/example/pkgmk/pkginfo
d example /example 1777 bin bin
d example /example/pkgmk 1777 bin bin
d example /example/pkgmk/sbin 1777 bin bin
f example /example/pkgmk/sbin/lsps 555 bin bin
f example /example/pkgmk/sbin/lsuser 555 bin bin

Then, create the package with the above Prototype and pkginfo files using the pkgmk command:

   pkgmk -d /tmp -f /home/myuser/example/pkgmk/prototype

This produces the following output:

   Building pkgmap from package prototype file
   ## Processing pkginfo file
     WARNING:parameter <CLASSES> set to "example"

386 Commands Reference, Volume 4
## Attempting to volumize 5 entries in pkgmap

Part 1 -- 218 blocks, 10 entries

/tmp/mypkgA/pkgmap
/tmp/mypkgA/pkginfo
/tmp/mypkgA/root/example/pkgmk/sbin/lsp
/tmp/mypkgA/root/example/pkgmk/sbin/lsuser

## Packaging complete

The newly created package named mypkgA now exists in /tmp/mypkgA.

### Exit Status

<table>
<thead>
<tr>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful completion of script.</td>
</tr>
<tr>
<td>1</td>
<td>Fatal error. Installation process is terminated at this point.</td>
</tr>
<tr>
<td>99</td>
<td>Internal error.</td>
</tr>
</tbody>
</table>

### Files

- `/usr/sbin/pkgmk` contains the `pkgmk` command.

### Related Information

The `installp` command, `pkgadd` command, `pkgask` command, `pkgchk` command, `pkginfo` command, `pkgparam` command, `pkgproto` command, `pkgrm` command, `pkgtrans` command, `tar` command.

The `pkginfo` file format.

For information about preparing applications to be installed using the `installp` command, refer to [Packaging Software for Installation](#) in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.

### pkgparam Command

#### Purpose
Displays package parameter values.

#### Syntax

**To Display the Value of a Parameter Contained in pkginfo**

```
```

**To Display the Value of a Parameter Contained in a Device**

```
pkgparam -d Device [-v] [Param ...]
```

**To Display the Value of a Parameter Contained in a File**

```
pkgparam -f File [-v] [Param ...]
```

#### Description

`pkgparam` displays the value associated with the parameter or parameters requested on the command line. The values are located in one of the following places: in the `pkginfo` file for `Pkginst`, on the `Device` named with the `d` flag, or on the specific file named with the `f` flag. When a `Device` is given, but a `Pkginst` is not (as shown in the second synopsis), parameter information for all packages residing on `Device` is shown.
If packages are installed in an alternative root directory path using the \texttt{pkgadd} command with the -P option, package parameters can be requested using the same alternative root directory path specified with the -P option.

One parameter value is shown per line. Only the value of a parameter is given unless the -v flag is used. With this flag, the output of the command is in this format:

\begin{verbatim}
Parameter1='Value1'
Parameter2='Value2'
Parameter3='Value3'
\end{verbatim}

If no parameters are specified on the command line, values for all parameters associated with the package are shown.

\textbf{Flags}

\begin{itemize}
  \item \texttt{-v} Specifies verbose mode. Displays name of parameter and its value.
  \item \texttt{-d Device} Specifies the \textit{Device} on which a \texttt{Pkginst} is stored. \textit{Device} can be the full pathname to a directory (such as \texttt{/var/tmp}), or "-" which specifies packages in datastream format read from standard input.
  \item \texttt{-f} Requests that the command read \textit{File} for parameter values. This file should be in the same format as a \texttt{pkginfo} file. As an example, such a file might be created during package development and used while testing software during this stage.
  \item \texttt{Pkginst} Defines a specific package for which parameter values should be displayed. The format \texttt{Pkginst.*} can be used to indicate all instances of a package. When using this format, enclose the command line in single quotes to prevent the shell from interpreting the "*" character.
  \item \texttt{Param} Defines a specific parameter whose value should be displayed.
  \item \texttt{-P path} Searches for the \texttt{pkginfo} file in the alternate root directory path.
\end{itemize}

\textbf{Exit Status}

If parameter information is not available for the indicated package, the command exits with a non-zero status.

\begin{center}
\begin{tabular}{ll}
0 & Successful completion of script. \\
1 & Fatal error. Installation process is terminated at this point.
\end{tabular}
\end{center}

\textbf{Files}

\begin{itemize}
  \item \texttt{/var/spool/pkg} default spool directory
  \item \texttt{/usr/sbin/pkgparam} Contains the \texttt{pkgparam} command.
\end{itemize}

\textbf{Related Information}

The \texttt{pkgtrans} command.

The \texttt{pkginfo} file format.

\textbf{pkgproto Command}

\textbf{Purpose}
Generates a prototype file.

\textbf{Syntax}
\texttt{pkgproto [\texttt{-i}] [\texttt{-c} \textit{Class}] \textit{Path1} [=\textit{Path2}] ...}
**Description**

The `pkgproto` commands scans the indicated paths and generates a prototype file that may be used as input to the `pkgmk` command. To do this, the standard output of this command must be redirected to a file. The file can then be used when invoking `pkgmk`.

If no *Paths* are specified on the command line, standard input is assumed to be a list of *Paths*. If the *Path* listed on the command line is a directory, the contents of the directory are searched. However, if input is read from stdin, a directory specified as a path is not searched.

The prototype file attributes *mac*, *fixed*, and *inherited*, cannot be determined by `pkgproto` and must be manually added to the file.

By default, `pkgproto` creates symbolic link entries for any symbolic link encountered (ftype=s). When you use the `-i` flag, `pkgproto` creates a file entry for symbolic links (ftype=f). The prototype file must be edited to assign file types such as v (volatile), e (editable), or x (exclusive directory). `pkgproto` detects linked files. If multiple files are linked together, the first path encountered is considered the source of the link.

The output from this command is sent to standard output. You must redirect standard output to a file if you wish to use the result as a prototype file when invoking `pkgmk`. Since `pkgmk` uses prototype as the default filename for the prototype file, we suggest you direct the output of `pkgproto` to the file name prototype.

You must add entries to the prototype file produced by this command for any installation scripts and files your package may need. At minimum, you will need an entry for the `pkginfo` file. You may also need entries for any of the following files you use in your package: `copyright`, `compver`, `depend`, `setinfo`, `space`, any installation or removal scripts you define for the package, and/or any classes you define.

**Notes:**

1. By default, `pkgproto` creates symbolic link entries for any symbolic link encountered (ftype=s). When you use the `-i` option, `pkgproto` creates a file entry for symbolic links (ftype=f). The prototype file must be edited to assign file types such as v (volatile), e (editable), or x (exclusive directory). `pkgproto` detects linked files. If multiple files are linked together, the first path encountered is considered the source of the link.

2. The output from this command is sent to standard output. You must redirect standard output to a file if you wish to use the result as a prototype file when invoking `pkgmk`. Since `pkgmk` uses prototype as the default filename for the prototype file, we suggest you direct the output of `pkgproto` to the file name prototype.

3. Note that you must add entries to the *prototype* file produced by this command for any installation scripts and files your package may need. At minimum, you will need an entry for the `pkginfo` file; see `pkginfo` for more information. You may also need entries for any of the following files you use in your package: `copyright`, `compver`, `depend`, `setinfo`, `space`, any installation or removal scripts you define for the package, and/or any classes you define, (e.g., postinstall).

**Flags**

- `-i` 
  Ignores symbolic links and records the paths as ftype=f (a file) versus ftype=s (symbolic link).

- `-c Class`  
  Maps the class of all paths to *Class*.

*Path1*  
Path of directory where objects are located.

*Path2*  
Path that should be substituted on output for *Path1*.

**Examples**

The following examples show uses of `pkgproto` and a partial listing of the output produced.
1. $ pkgproto /usr/bin=bin /usr/usr/bin=usrbin /etc=etc
   f none bin/sed=/bin/sed 0775 bin bin
   f none bin/sh=/bin/sh 0755 bin daemon
   f none bin/sort=/bin/sort 0755 bin bin
d none etc/master.d 0755 root daemon
   f none etc/master.d/kernel=/etc/master.d/kernel 0644 root daemon
   f none etc/rc=/etc/rc 0744 root daemon

2. $ find / -type d -print | pkgproto
   d none / 755 root root
d none /usr/bin 755 bin bin
d none /usr 755 root root
d none /usr/bin 775 bin bin
d none /etc 755 root root
d none /tmp 777 root root

3. Identical to the previous example, but with the output captured in a file for later processing with pkgmk. Entries added for the required pkginfo file, and, for instance, a postinstall script that might be executed after the files are copied into the correct locations.

   $ find / -type d -print | pkgproto >prototype
   $ (edit the file to add entries for pkginfo and postinstall)
   $ cat prototype
   i pkginfo
   i postinstall
d none / 755 root root
d none /usr/bin 755 bin bin
d none /usr 755 root root
d none /usr/bin 775 bin bin
d none /etc 755 root root
d none /tmp 777 root root

Return Codes

0 Successful completion of script.
1 Fatal error. Installation process is terminated at this point.

Files

/usr/sbin/pkgproto Contains the pkgproto command

Related Information

The pkgmk command, pkgparam command, pkgtrans command.

The pkginfo file

pkgrm Command

Purpose
Removes a package or set from the system.

Syntax

To Remove an Installed Software Package
pkgrm [ -n ] [ -a Admin ] [ -P Path ] [ Pkginst1[ Pkginst2 [ . . . ]] ]

To Remove a Software Package from a Spool Device
pkgrm -s Spool[ Pkginst ]
Description

`pkgrm` removes a previously installed or partially installed package/set from the system. A package is a collection of related files and executables that can be independently installed. A set is made up of a special-purpose package, referred to as a Set Installation Package (SIP), and a collection of one or more packages that are members of the set.

`pkgrm` checks that all packages listed on the command line are on the system. If any of the packages listed does not exist, no changes are made to the system, that is, none of the listed packages are removed.

A check is also made to determine if any other packages depend on the one being removed. The action taken if a dependency exists is defined in the `Admin` file (see the `-a` flag, below).

The default state for the command is interactive mode, meaning that prompt messages are given during processing to allow the administrator to confirm the actions being taken. Non-interactive mode can be requested with the `-n` flag.

The `-s` flag can be used to specify the directory from which spooled packages should be removed.

Flags

- `-n` Enables non-interactive mode. If there is a need for interaction, the command exits. Use of this flag requires that at least one package instance be named upon invocation of the command.
- `-a Admin` Defines an installation administration file, `Admin`, to be used in place of the default administration file. [For a description of the format of an `Admin` file, see the `admin` file format.] The token "none" overrides the use of any `Admin` file, and thus forces interaction with the user. Unless a full pathname is given, `pkgrm` looks in the `/var/sadm/install/admin` directory for the file. By default, the file `default` in that directory is used.
- `-P Path` Removes the specified packages from the alternative root directory path.
- `-s Spool Pkginst` Removes the specified package(s) from the directory `Spool`. Defines a short string used to designate an abbreviation for the package/set name. (The term "package instance" is used loosely: it refers to all instantiations of `Pkginst`, even those that do not include instance identifiers.)

If `Pkginst` specifies a SIP, all installed packages which are members of the set, and the SIP itself, are removed in reverse dependency order.

To indicate all instances of a package, specify `'Pkginst.*'`, enclosing the command line in single quotes, as shown, to prevent the shell from interpreting the "*" character. Use the token "all" to refer to all packages available on the source medium.

Exit Status

This command returns the following exit values:

<table>
<thead>
<tr>
<th>Exit Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful completion of script.</td>
</tr>
<tr>
<td>1</td>
<td>Fatal error. Installation process is terminated at this point.</td>
</tr>
<tr>
<td>99</td>
<td>Internal error.</td>
</tr>
</tbody>
</table>

Files

```
/usr/sbin/pkgrm
```

Contains the `pkgrm` command
Related Information
The `pkgadd` command, `pkgask` command, `pkgchk` command, `pkginfo` command, `pkgmk` command, `pkgparam` command, `pkgtrans` command.

The `pkginfo` file format, `pkgmap` file format.

pkgtrans Command

Purpose
Translates package format.

Syntax
```
pkgtrans [-i -o -n -s [-z Blocksize] Device1 Device2 [Pkginst1 [Pkginst2 [...]]]
```

Description
The `pkgtrans` command translates an installable package from one format to another. It translates the following:

- A file system format to a datastream
- A datastream to a file system format

You cannot run `pkgtrans` from `csh`.

Flags

- `-i`
  Copies the `pkginfo` and `Pkgmap` files. If the packages category is defined as “set” for Set Installation Packages (SIPs) (see `setinfo` file format), then that packages’ `setinfo` file is also copied.

- `-o`
  Overwrites the same instance on the destination device. The package instance is overwritten if it already exists.

- `-n`
  Creates a new instance of the package on the destination device. If the package instance already exists on the destination device, it is left unchanged and a new instance is created. The new instance has a sequence number attached to distinguish it from the existing instance. For example, assume the destination device already contained an instance of package `X`. If you use `pkgtrans` with the `-n` flag to write a new instance of package `X` to the device, the existing instance of package `X` remains on the destination device, and a new instance, called `X.2`, would be created on the device. If you executed `pkgtrans` again with the `-n` flag, a third instance, called `X.3`, would be created.

- `-s`
  Indicates that the package should be written to `Device2` as a datastream rather than as a file system. The default behavior is to write to `Device2` in the file system format.

- `-z Blocksize`
  Indicates the blocksize to be used when transferring to cartridge tape. Packages that have been written to tape using the `-z` flag and a value not equal to 512 are always read using a blocksize of 32768. Thus, the `-z` flag is not applicable when reading from cartridge tape.

`Device1`
Indicates the source device. Can be - (hyphen) which specifies packages in datastream format read from standard input. The package or packages on this device are translated and placed on `Device2`. If `Device1` is a regular file or directory, you must use the absolute pathname, rather than a relative pathname.

`Device2`
Indicates the destination device. Can be - (hyphen) which specifies packages written to standard output in datastream format. Translated packages are placed on this device. If `Device2` is a regular file or directory, you must specify it as an absolute pathname, rather than a relative pathname.
**Pkginst**

Specifies which package on *Device1* should be translated. The token "all" may be used to indicate all packages. *Pkginst.* can be used to indicate all instances of a package. If no packages are defined, a prompt shows all packages on the device and asks which to translate. If a set is being transferred to datastream format, the *Pkginst* arguments should begin with the SIP and be followed by the packages listed in the SIP's *setinfo* file, in the order in which they appear in that file.

**Note:** By default, *pkgtrans* does not transfer any instance of a package if any instance of that package already exists on the destination device. Use of the `-n` flag creates a new instance if an instance of this package already exists. Use of the `-o` flag overwrites the same instance if it already exists. Neither of these flags are useful if the destination device is a datastream, because the entire datastream is overwritten anyway.

**Exit Status**

This command returns the following exit values:

0   Successful completion of script.
1   Fatal error. Installation process is terminated at this point.

**Files**

`/usr/sbin/pkgtrans` Contains the *pkgtrans* command.

**Examples**

1. To translate all packages located on drive *Device* and place the translations in `/tmp`, type:
   
   `pkgtrans Device /tmp all`

2. To translate "pkg1" and "pkg2" in tmp and place them on *Device* in a datastream format, type:
   
   `pkgtrans -s /tmp Device pkg1 pkg2`

**Related Information**

The *pkgadd*, *pkgask*, *pkginfo*, *pkgmk*, *pkgparam*, and *pkgrm* commands.

The *pkginfo* File Format.

---

**platform_dump Command**

**Purpose**

Perform platform (Hardware & Firmware) dump related actions.

**Syntax**


**Description**

The *platform_dump* command was introduced in AIX to support hardware and firmware problem determination for POWER5 platforms. You can use this command to help the operating system save firmware-related and hardware-related dumps. This command is supported only on partitions which have service authority enabled and is normally run by operating system functions such as base installation and dumpcheck. Platform dumps contain:
The hardware state
- The hypervisor state
- The FSP (Flexible Service Processor) state information

The disk space for platform dump files is reserved using the `platform_dump` command. A dedicated logical volume, `/dev/fwdump`, is created in the rootvg volume group and mounted on the `/var/adm/ras/platform` directory. The `fwdump_dev` device and `fwdump_dir` mount point are both saved in ODM in the SWservAt object class. During installation, AIX utilizes the `platform_dump` command to reserve the necessary disk space. The disk space is reserved only if the partition is designated to be a service partition. The maximum possible size for the platform dumps is indicated to AIX so that enough space can be allocated beforehand for the platform dumps. Note that this size can change dynamically. The operating system detects this and informs you about the extra requirements and automatically expands the logical volume if possible.

**Note:** If you assign service partition authority to an AIX partition after the partition was installed, run the `platform_dump -f <fstype>` command to create the `/dev/fwdump` rootvg logical volume. The `fstype` argument can have the `jfs2` or `jfs` value.

The `-L` flag is provided to record command output to the error log.

### Flags

- `-c` Performs a check on the estimated platform dump size (as indicated by the firmware) and the disk space allocated for the platform dumps. It will report the following: If estimated size is less than or equal to allocated space, will return 0. If estimated size is greater than allocated space, will return 1.
- `-d` Deletes the file system space reserved for platform dumps and free up the same for other uses. Any existing dump files on the reserved disk space will be lost.
- `-e` Provides an estimate of disk space required to save the platform dumps when they occur. This option will interact with the firmware to provide this estimate. It is expected that, based on this space information, the user will have enough disk space allocated for platform dumps to be saved. The value output will be the required size in bytes.
- `-f fstype` Reserves enough disk space on the system for platforming dumps. The `-f` option will create a file system (if one does not exist) exclusively for platform dumps. If a file system already exists and the size is not enough, the file system size will be increased. The `fstype` must be a valid file system type. If the file system already exists, any may be specified.
- `-F flag` Enables or disables platform dumps. If flag is 0, platform dumps are disabled, if 1, platform dumps are enabled.
- `-I` Lists the current configuration of platform dump.
- `-L` Tells `platform_dump` to log its output as well as displaying it. This does not apply to the size output by the `-e` option.
- `-q` Checks whether the platform supports platform dumps or not. Will return 0 if platform dump is supported.
- `-s seq_no` Saves the platform dump from the firmware as identified in the dump notification event. `seq_no` indicates the sequence number of the dump notification event as stored in the AIX error log file. This sequence number will be used by this command to parse the detailed data area and obtain dump tag and dump type information needed to obtain the dump data from firmware.
- `-S` Saves the scan dumps on systems which support scan data. When this option is specified, the command will check for the existence of a scan dump, and if so will read and save the `scandump` data from firmware using the existing scan dump interface.

### Exit Status

- **0** On successful completion.
- **1** Returned if `-c` was specified, and there is insufficient space to save platform dumps.
255 Returned if platform dumps are not supported on the system.
3 Returned if platform dumps has been disabled.
2 Returned in an error is encountered.

Security
The platform_dump may only be executed by the root user.

Example
1. To get an estimate of the platform dumps size, type the following:
   `platform_dump -e`
   This will report the estimated platform dump size in bytes.

Related Information
The `dumpcheck` command.

plotgbe Command

Purpose
Plots HP-GL files to a plotter device.

Syntax
```
/usr/lpd/plotgbe [-fr=X] [-noin] File
```

Description
The `plotgbe` command is a backend program which plots HP-GL files to a plotter device. The plotter device must be attached to a 5085/5086 workstation via the 5080 Attachment Adapter. To use the `plotgbe` command, you must define a print queue for the `plotgbe` backend program. See "How to Add Plotter Support with 5080" to learn how to use SMIT commands to add a plotter queue which specifies the `plotgbe` backend.

The `plotgbe` command is called by the `qdaemon` process. It should not be entered on the command line. Any options needed for a specific print request to a plotter should be passed to the `plotgbe` command with the command used to request a print job. In the case of the `enq` command, use the `-o` flag to pass options to the `plotgbe` backend for processing.

The `plotgbe` backend command also generates the appropriate HP-GL commands for plotter initialization and plot scaling. This data is sent to the plotter before the user-specified HP-GL file is sent. Thus, any scaling or initialization commands included in the HP-GL file override those generated by the `plotgbe` backend command.

**Note:** The user must have read access to the file sent to the `plotgbe` command with the print request command.

Flags

`-fr=X` Provides for plotting multi-frame drawings. This option causes X number of frames to be plotted, where X is a number in the range 1 through 9. For example, plotting a 20' drawing on E-size role media may require 5 frames. Thus, the option `fr=5` would be passed to the `plotgbe` backend.
-noin Allows plotter front panel settings to remain in effect for the current plot without being reset to default values. Normally, the P1 and P2 positions which define the plot page on the plotter are set by the plotgbe command to their default location. Use the -noin no-initialization option to override the default locations.

Examples
1. To send the file longaxis.gl to the plt plotter queue and specify to the backend that the file requires five frames to print, enter:
   ```
enq -Pplt -o -fr=5 longaxis.gl
   ```
2. To send the file plotdata.gl to the plt plotter queue, specifying that the plot page positions are not to be reset to default for this file, enter:
   ```
enq -Pplt -o -noin plotdata.gl
   ```
3. To send the file twoplot.gl to the plt plotter queue, specifying no plot page initialization and that the plotter print the drawing in two frames, enter:
   ```
enq -Pplt -o -noin -o fr=2 twoplot.gl
   ```

Files
/usr/lpd/plotgbe Contains the plotgbe command.

Related Information
The [enq](#) command, [plotbe](#) command, [qdaemon](#) command.

[Printing administration](#) in Printers and printing.

[Adding Plotter Support with 5080](#) in Printers and printing.

---

plotbe Command

**Purpose**
Plots HP-GL files to a plotter device.

**Syntax**
```
/usr/lpd/plotbe [-fr=X] [-noin] File
```

**Description**
The plotbe command is a backend program which plots HP-GL files to a plotter attached to a serial port defined as a TTY device. To use the plotbe command, you must define a TTY device for the serial port and define a print queue for the plotbe backend program.

When configuring the TTY serial port, set the baud-rate, parity, and stop bits to the appropriate settings for your plotter. You must also set XON/XOFF to FALSE for your TTY port.

The plotbe command is called by the qdaemon process. It should not be entered on the command line. Any options needed for a specific print request to a plotter should be passed to the plotbe command with the command used to request a print job (usually the enq command). With the enq command, use the -o flag to pass options to the plotbe backend for processing.

The plotbe backend command supports the following plotters: 7731, 7372, 7374, 7375-1, 7375-2, 6180, 6182, 6184, 6186-1, and 6186-2.
The **plotlbe** command supports ENQ/ACK handshaking. Refer to your plotter programming manual for more information on handshaking.

The **plotlbe** backend command also generates the appropriate HP-GL commands for plotter initialization and plot scaling. This data is sent to the plotter before the user-specified HP-GL file is sent. Thus, any scaling or initialization commands included in the HP-GL file override those generated by the **plotlbe** backend command.

**Note:** The user must have read access to the file sent to the **plotlbe** command with the print request command.

**Flags**

- **-fr=X** Provides for plotting multi-frame drawings. This option causes **X** number of frames to be plotted, where **X** is a number in the range 1 through 9. For example, plotting a 20' drawing on E-size roll media may require 5 frames. Thus, the option **-fr=5** would be passed to the **plotlbe** backend.

- **-noin** Allows plotter front panel settings to remain in effect for the current plot without being reset to default values. Normally, the P1 and P2 positions which define the plot page on the plotter are set by the **plotlbe** command to their default locations. Use the **-noin** no-initialization option to override the default locations.

**Examples**

1. To send the file **longaxis.gl** to the **plt** plotter queue and specify to the backend that the file requires five frames to plot, enter:
   
enq -Pplt -o -fr=5 longaxis.gl

2. To send the file **plotdata.gl** to the **plt** plotter queue, specifying that the plot page positions are not to be reset to default for this file, enter:
   
enq -Pplt -o -noin plotdata.gl

3. To send the file **twoplot.gl** to the **plt** plotter queue, specifying no plot page initialization and that the plotter print the drawing in two frames, enter:
   
enq -Pplt -o -noin -o fr=2 twoplot.gl

**Files**

**/usr/lpd/plotlbe** Contains the **plotlbe** command.

**Related Information**

The **enq** command, **plotlbe** command.

[Printing administration](#) in *Printers and printing*.

**pmcycles Command**

**Purpose**

Measures processor clock speed.

**Syntax**

```
pmcycles [d] [m]
```
**Description**

The `pmcycles` command uses the Performance Monitor cycle counter and the processor real-time clock to measure the actual processor clock speed in MHz. Optionally, it also displays the decrementer speed in MHz and nanoseconds per tick. The decrementer is a binary counter which generates a clock interrupt each time the clock goes to zero. The tick is the value of a decrement. On some machines, time is decremented in nanoseconds, so each tick is equal to one nanosecond. On other machines, the value of the decrement depends on the machine.

This command is only supported on processors supported by `bos.pmapi`.

**Flags**

- `-d` Displays the decrementer in MHz and nanoseconds per tick.
- `-m` Displays the speed of each of the processors.

**Examples**

1. To display the processor speed, type:

   ```
   pmcycles
   ```

   Output similar to the following appears:
   
   This machine runs at 133 MHz

2. To display each processor speed, type:

   ```
   pmcycles -m
   ```

   Output similar to the following appears:
   
   Cpu 0 runs at 200 MHz
   CPU 1 runs at 200 MHz

**Related Information**

`pm_cycles` subroutine.

`pmlist` command

**Purpose**

Lists information about supported processors.

**Syntax**

```
(pmlist [ -h ]
)
```

```
(pmlist [ -o t l c ] [ -l ]
```

```
(pmlist [ -o t l c ] [ ProcessorType ] [ -s ] [ -d ] [ -f Filter ] [ -e ShortName ] [ -c Counter[,Event ] ] [ -g Group ] [ -s Set ] [ -d DerivedMetricsID ]
```

**Description**

The `pmlist` command performs the following functions:

- List the supported processors.
- List the information summary for a specified processor.
- List the event table for a specified processor.
- List any existing event groups for a specified processor.
• List any existing event sets for a specified processor.
• List the event set and formula for a specified derived metric.

**Flags**

- `-c -l` Lists all events for all counters.
- `-c Counter` Lists all events for the specified `Counter`.
- `-c Counter,Event` Lists the specified `Event` for the specified `Counter`.
- `-d` Displays event detailed description.
- `-D -l` Displays all the derived metrics supported.
- `-D DerivedMetricID` Displays the specified `DerivedMetricID`.
- `-e ShortEvent` Lists the description of the specified `ShortName` for all Counters.
- `-f v,u,c` Specifies the event filter as a comma-separated list of filters. The valid filters are: `v` (verified), `u` (unverified), and `c` (caveat). These filters represent the testing status of an event. The default filter is `v,u,c`.
- `-g -l` Lists all event groups.
- `-g Group` Lists the specified event `Group`.
- `-h` Displays help information for the `pmlist` command.
- `-l` Lists all supported processor types.
- `-o t,c` Specifies the output format for the `pmlist` command. The valid output formats are specified as one of: `t` (text format) and `c` (CSV format). The default output format is text.
- `-p ProcessorType` Specifies the processor type.
- `-s` Displays the processor information summary.
- `-S -l` Displays all the event sets supported.
- `-S Set` Displays the specified event `Set`.

**Examples**

1. To display the list of all supported processors, type:
   ```
   pmlist -l
   ```
2. To display a summary information for the current processor, type:
   ```
   pmlist -s
   ```
3. To display a summary information for the current processor in CSV format, type:
   ```
   pmlist -s -o c
   ```
4. To display group number 62 for the current processor (if the current processor supports event groups), type:
   ```
   pmlist -g 62
   ```
5. To display detailed information for event 3 of counter 1 of POWER4™ processor, type:
   ```
   pmlist -p POWER4 -c 1,3 -d
   ```
6. To display set number 2 for the current processor (if the current processor supports event sets), type:
   ```
   pmlist -S 2
   ```

**Related Information**

`pm_initialize` Subroutine.

**pmtu Command**

**Purpose**

Displays and deletes Path MTU discovery related information.
Syntax

```
pmtu [-inet6] display/[delete [-dst destination] [-gw gateway]]
```

Description

The `pmtu` command is provided to manage the Path MTU information. The command can be used to display the Path MTU table. By default the Ipv4 pmtu entries are displayed. Ipv6 pmtu entries can be displayed using the `-inet6` flag. This command also enables a root user to delete a pmtu entry with the `pmtu delete` command. The delete can be based on destination, gateway, or both.

A pmtu entry gets added into the PMTU table when a route add occurs with an MTU value.

A network option, `pmtu_expire`, is provided to expire unused pmtu entries. The default value of `pmtu_expire` is 10 minutes.

Flags

- `-dst` Specifies the destination of the pmtu entry to be deleted.
- `-gw` Specifies the gateway of the pmtu entry to be deleted.
- `-inet6` Specifies to display or delete Ipv6 pmtu entry.

Exit Status

0 The command completed successfully.
1 An error occurred.

Examples

1. To display Ipv4 pmtu entries, type:
   ```
pmtu display
   ```
   The output will look similar to the following:
   ```
dst gw If pmtu refcnt redisc_t exp
---------------------------------------------------------------------------
192.168.5.5 192.168.10.33 en2 1500 1 0 0
```
   The reference count signifies the number of current TCP and UDP applications using this pmtu entry.
   The `redisc_t` entry signifies the amount of time that has elapsed since the last Path MTU discovery attempt. The PMTU is rediscovered after every `pmtu_rediscover_interval` minutes. Its default value is 30 minutes and can be changed using the `no` command.
   The PMTU entry expiry is controlled by the network option `pmtu_expire`. Its default value is 10 minutes. This value can be changed using the `no` command. A value of 0 does not expire any entries. The `exp` entry signifies the expiry time. PMTU entries having more than zero `refcnt` have `exp` of 0. When the `refcnt` becomes zero, the `exp` time increases every minute and the entry gets deleted when the `exp` variable becomes equal to `pmtu_expire`.

2. To delete an entry based on destination, type:
   ```
pmtu delete -dst 192.168.5.5
   ```

3. To display Ipv6, type:
   ```
pmtu -inet6 display
   ```
   Output will look similar to the following:
Location
/usr/sbin/pmtu

Files
/usr/sbin/pmtu Contains the pmtu command.

Related Information
The "no Command" on page 205, "route Command" on page 734.

pop3d Daemon

Purpose
Starts the Post Office Protocol Version 3 (POP3) server process.

Syntax
pop3d [-c]

Description
The pop3d command is a POP3 server. It supports the POP3 remote mail access protocol. Also, it accepts commands on its standard input and responds on its standard output. You normally invoke the pop3d command with the inetd daemon with those descriptors attached to a remote client connection.

The pop3d command works with the existing mail infrastructure consisting of sendmail and bellmail.

Flags
- c Suppresses the reverse host name lookup.

Parameters
None

Exit Status
All error and status information is written to a logfile if syslogd is configured for logging.

Security
The pop3d daemon is a PAM-enabled application with a service name of imap. System-wide configuration to use PAM for authentication is set by modifying the value of the auth_type attribute, in the usw stanza of /etc/security/login.cfg, to PAM_AUTH as the root user.
The authentication mechanisms used when PAM is enabled depend on the configuration for the imap service in /etc/pam.conf. The pop3d daemon requires /etc/pam.conf entries for the auth and session module types. Listed below is a recommended configuration in /etc/pam.conf for the imap service:

```
# AIX imap configuration
imap auth required /usr/lib/security/pam_aix
imap session required /usr/lib/security/pam_aix
```

**Note:** Because the pop3d daemon uses the imap library for authentication, the imap service is used for both the imapd and pop3d daemons.

**Files**

- `/usr/sbin/pop3d` Contains the pop3d command.
- `/etc/services` Specifies the file with port assignments for required services. The following entry must be in this file:
  ```
  pop3 110/tcp postoffice3 # Post Office Protocol Ver. 3
  ```

**Related Information**

**Daemons:** imapd

---

### pop3ds Daemon

**Purpose**

Starts the Post Office Protocol Version 3 (POP3) server process over TLS/SSL.

**Syntax**

```
pop3ds [-c]
```

**Description**

The pop3ds command is a POP3 server. It supports the POP3 remote mail access protocol. Also, it accepts commands on its standard input and responds on its standard output. You normally invoke the pop3d3 command with the inetd daemon with those descriptors attached to a remote client connection.

The pop3ds command works with the existing mail infrastructure consisting of sendmail and bellmail.

**Flags**

- `-c` Suppresses the reverse host name lookup.

**Parameters**

None

**Exit Status**

All error and status information is written to a logfile if syslogd is configured for logging.
Security

The **pop3ds** daemon is a PAM-enabled application with a service name of **imap**. System-wide configuration to use PAM for authentication is set by modifying the value of the **auth_type** attribute, in the **usw** stanza of **/etc/security/login.cfg**, to PAM_AUTH as the root user.

The authentication mechanisms used when PAM is enabled depend on the configuration for the **imap** service in **/etc/pam.conf**. The **pop3ds** daemon requires **/etc/pam.conf** entries for the **auth** and **session** module types. Listed below is a recommended configuration in **/etc/pam.conf** for the **imap** service:

```bash
# AIX imap configuration
#
imap auth      required    /usr/lib/security/pam_aix
imap session   required    /usr/lib/security/pam_aix
```

**Note:** Because the **pop3ds** daemon uses the **imap** library for authentication, the **imap** service is used for both the **imapds** and **pop3ds** daemons.

Files

**/usr/sbin/pop3ds**

Contains the **pop3ds** command.

**/etc/services**

Specifies the file with port assignments for required services. The following entry must be in this file:

```bash
pop3s 995/tcp # pop3 protocol over TLS/SSL
```

Related Information

**Daemons:** **imapds**

portmap Daemon

**Purpose**

Converts RPC program numbers into Internet port numbers.

**Syntax**

**/usr/sbin/portmap**

**Description**

The **portmap** daemon converts RPC program numbers into Internet port numbers.

When an RPC server starts up, it registers with the **portmap** daemon. The server tells the daemon which port number it is listening to and which RPC program numbers it serves. Thus, the **portmap** daemon knows the location of every registered port on the host and which programs are available on each of these ports.

A client consults the **portmap** daemon only once for each program the client tries to call. The **portmap** daemon tells the client which port to send the call to. The client stores this information for future reference.

Since standard RPC servers are normally started by the **inetd** daemon, the **portmap** daemon must be started before the **inetd** daemon is invoked.

**Note:** If the **portmap** daemon is stopped or comes to an abnormal end, all RPC servers on the host must be restarted.
Flags
None

Examples
1. To start the portmap daemon, enter the following command:
   startsrc -s portmap
2. To stop the portmap daemon enter the following command:
   stopsrc -s portmap

Files

- **inetd.conf**
  Starts RPC daemons and other TCP/IP daemons.
- **/etc/rpc**
  Contains a list of server names and their corresponding rpc program numbers and aliases.

Related Information
The [rpcinfo](#) command.
The [inetd](#) daemon.


System Resource Controller in *Operating system and device management*.
TCP/IP protocols in *Networks and communication management*.
NFS commands in *Networks and communication management*.

---

### portmir Command

**Purpose**
Allows one TTY stream (monitor) to attach to another TTY stream (target) and monitor the user session that is taking place on that stream.

**Syntax**
```
portmir [-d mir_modem] [-t target [-m monitor]] [-t target [-m monitor]] | (-o | -c monitor | -q)
```

**Description**
The portmir command allows one TTY stream (monitor) to attach to another TTY stream (target) and monitor the user session that is taking place on that stream. This is accomplished by pushing a special "mirror" module into both the target and monitor TTY streams.

Both the target and monitor TTYs receive a printed message on their respective displays when a monitoring session begins. The monitoring session can be terminated from either the target TTY, monitor TTY, or a third TTY not involved in the monitoring session. When the monitor is used in a non-service mode, both streams must be in the open state (that is, either a getty or active session must be taking place on each TTY) in order for the command to work. This is necessary to allow the pushing of the "mirror" streams module. The portmir command is supported for use with TTY devices only (PTS, TTY, LFT).
The terminal type, as defined in the TERM environment variable, must be the same for both the monitor and target TTY. The value of this environment variable must correspond to a valid entry in the terminfo database. An example terminal type would be ibm3151 or vt100. The LFT is similar to the vt100. Terminal emulators such as aixterm are usually similar in function to vt100.

Although the console can be used as either the target TTY or the monitor TTY, using the console as the monitor TTY is not recommended. However, if the console is used as the monitor TTY, note that the console is first automatically redirected to the target TTY for the duration of the monitoring session. When the monitoring session is terminated, the console is redirected back to the device specified in the CuAt ODM database attribute syscons. If the console had been previously redirected, the redirection is not preserved.

Async devices that provide offloading of character processing may have problems if they are mirroring devices that rely on the line discipline (ldterm) to provide this function. An example of this would be the 128-port async adapter. Use the chdev command to disable the fastcook attribute if a port of a dissimilar adapter is monitored. Run the command as follows:

```
chdev -l tty1 -a fastcook -disable
```

You can use the Devices application in Web-based System Manager (wsm) to change device characteristics.

**Flags**

- **-c monitor**
  Configures port for service boot by creating CuAt ODM database attribute portmir_monitor, which contains the device parameter as the value field. This device is used later as the default monitoring device when the portmir command is invoked in service mode (-s flag).

  Mirroring must be configured by the system administrator to execute at service boot time using the -c option. The target defaults to the device defined in the portmir_monitor attribute.

- **-d mir_modem**
  Sets monitoring port for dial-in purposes. Only the root user can issue the command with this flag. Ensure that /usr/share/mir_modem is linked to the correct modem setup file. /usr/share/mir_modem contains example files; you may need to create your own, depending on your type of modem.

- **-m monitor**
  Specifies monitoring device. If neither the -m option nor the -s option are specified, then the monitoring device defaults to the port on which the portmir command was run.

- **-o**
  Turns off monitoring and terminates the command.

- **-q**
  Queries the value set with the -c option.

- **-t target**
  Specifies target device to be monitored.

**Security**

Only a single mirror session may be running at any one time.

To mirror a port in the nonservice mode, place a list of users who may monitor them in a .mir file in your home directory (not required for the root user). When the mirror daemon begins running, the daemon checks to see who is on that port. It then checks to see if the user of the monitoring port is authorized to monitor that port. The mirrord command also validates the monitoring port’s user.

The .mir file must have the format of a single user ID per line.

**Attention:** Running the su command to change to root user during a mirror session gives root authority to both users.
Examples

1. After user1 has placed user2's login ID into /u/user2/.mir file, to mirror user1 on target tty1 from user2 on monitor tty2, enter:
   ```
   portmir -t tty1 -m tty2
   ```
2. To mirror target tty1 to user on monitor tty2 who is dialing in, enter:
   ```
   portmir -t tty1 -m tty2 -d mir_modem
   ```
3. To set up mirroring for service boot, specifying the monitoring device during the service boot, enter:
   ```
   portmir -c tty
   ```
4. To disable mirroring during the service boot, enter:
   ```
   portmir -c off
   ```
5. To query the service boot mirroring device, enter:
   ```
   portmir -q
   ```

Files

- /usr/share/modems/mir_modem: Modem configuration file examples for setting up dial-in.
- /usr/sbin/portmir: Contains the command file.

Related Information

The `chdev` command.

For information on installing the Web-based System Manager, see Chapter 2: Installation and System Requirements in AIX 5L Version 5.3 Web-based System Manager Administration Guide.

post Command

Purpose
Routes a message.

Syntax

```
```

Description

The `post` command routes messages to the correct destinations. The `post` command cannot be started by the user. The `post` command can be called only by other programs.

The `post` command searches a message for all components that specify a recipient's address and parses each address to check for the proper format. The `post` command then puts addresses into the standard format and calls the `sendmail` command. The `post` command also performs header operations, such as appending the `Date:` and `From:` components and processing the `Bcc:` component. The `post` command uses the `File` parameter to specify the name of the file to be posted.

**Note:** The `post` command may report errors when parsing complex addresses (for example, @A:harold@B.UUCP). If you use complex addresses, use the `spost` command instead of the `post` command.
Flags

-alias File  Searches the specified mail alias file for addresses. This flag may be repeated to specify multiple mail alias files. The post command automatically searches the /etc/mh/MailAliases file.

-filter File  Uses the header components in the specified file to copy messages sent to Bcc: recipients.

-format  Puts all recipient addresses into a standard format for the delivery transport system. This flag is the default.

-help  Lists the command syntax, available switches (toggles), and version information.

  Note: For Message Handler (MH), the name of this flag must be fully spelled out.

-msgid  Adds a message-identification component (such as Message-ID:) to the message.

-nofilter  Strips the Bcc: header from the message for the To: and cc: recipients. Sends the message with minimal headers to the Bcc: recipients. This flag is the default.

-noformat  Does not alter the format of the recipient addresses.

-nomsgid  Does not add a message-identification component to the message. This flag is the default.

-noverbose  Does not display information during the delivery of the message to the sendmail command. This flag is the default.

-nowatch  Does not display information during delivery by the sendmail command. This flag is the default.

-verbose  Displays information during the delivery of the message to the sendmail command. This information allows you to monitor the steps involved.

-watch  Displays information during the delivery of the message by the sendmail command. This information allows you to monitor the steps involved.

-width Number  Sets the width of components that contain addresses. The default is 72 columns.

Files

/etc/mh/MailAliases  Contains the default mail aliases.
/etc/mh/mtstailor  Contains MH command definitions.

Related Information

The ali command, conflict command, mhmail command, send command, sendmail command, spost command, whom command.

The .mh_alias File Format.

Mail applications in Networks and communication management.

pppattachd Daemon

Purpose

Attaches an asynchronous device stream to the PPP (Point to Point Protocol) subsystem. Can be invoked as a daemon or a normal process.

Syntax

To Use a Specific tty Port as a Connection (Runs as a Daemon):

pppattachd /dev/ttyPortNumber { client | server | demand } { ip | ipv6 | ip ipv6 } { multilink } { connect "ConnectorProgram" } { inactive Seconds } { authenticate pap | chap } { peer pap | chap } { user Name } { remote HostName } { nodaemon }
To Use Standard In and Standard Out as the tty Device (Runs as a Process):

```
pppattachd { client | server | demand } { [ip | ipv6 | ip ipv6] [multilink] [inactive Seconds] [authenticate pap | chap] [peer pap | chap] [user Name] [remote HostName] [nodaemon]
```

**Description**

The `pppattachd` daemon provides the mechanism to bind an asynchronous stream to the PPP subsystem. When placing an out going connection on a specific tty port, `pppattachd` becomes a daemon. When using stdin (standard in) and stdout (standard out) as the tty device for PPP communications `pppattachd` does not become a daemon. (It would be executed from the `$HOME/.profile` upon login on a tty device.)

You can activate PAP or CHAP authentication with the `authenticate` and `peer` options. Use the `smit` command to create entries in either the `/etc/ppp/pap-secrets` or `/etc/ppp/chap-secrets` file. The `pppattachd` daemon uses the passwords in these files to authenticate the connection. It searches only the `/etc/ppp/pap-secrets` file for PAP authentication and the `/etc/ppp/chap-secrets` file for CHAP authentication.

The multilink option is to used to identify the PPP link as having several attachments between the two PPP peers. PPP packets are fragmented at one peer, sent over the multiple attachments, and then reconnected on the remote peer that must also support multilink. The maximum receive reconstruction unit (MMRU) and endpoint descriptor are set through SMIT on the PPP Link Configuration menu. MRRU is the maximum data size before fragmentation. The endpoint discriminator uniquely identifies the local system.

Errors and messages are logged using the `syslog` facility.

**Options**

- `authenticate pap | chap
  client | server | demand`
  - Defines the current system as the authenticator of either PAP or CHAP.
  - Defines the type of subsystem connection to be bound to on the system running the daemon.

- `ip | ipv6 | ip ipv6
  connect “ConnectorProgram”`
  - Specifies protocol types.
  - Specifies the program to use to place an outgoing connection. The tty device opened is passed as stdin and stdout to the program. The `/usr/sbin/pppdial` command is a connector program that can be used.

- `inactive Seconds`
  - Specifies the number (unsigned integer) of seconds to wait for inactivity on the link before terminating the connection. The default value is 0 (no timeout).

- `multilink`
  - Identifies the PPP link as having a group of attachments connecting to two PPP peers.

- `nodaemon`
  - Specifies to the attachment process that it is not to become a daemon. You must use this option for attachment processes that are invoked with demand connections.

- `peer pap | chap
  remote HostName`
  - Defines the current system as the peer of either PAP or CHAP.
  - Defines the remote host name to be used for PAP authentication. An entry for `UserName RemoteHostName Password` must exist in `/etc/ppp/pap-secrets` file for a successful connection. This option only has meaning for PAP authentication on both the authenticator and peer.

- `user Name`
  - Defines the user entry to use for PAP authentication. An entry for `UserName RemoteHostName Password` must exist in `/etc/ppp/pap-secrets` file for a successful connection. This option only has meaning for PAP authentication on the peer.

**Exit Status**

This command returns the following exit values:

- 0  Successful completion.
Security
Access Control: Any User
Auditing Events: N/A

Examples
1. You want System A to act as a client to server System B. From System A enter:
   
   /usr/sbin/pppattachd /dev/tty0 client ip connect "sysbconnector"

   where sysbconnector is the connector program.

   On System B, the user that logged in would have invoked from $HOME/.profile:
   
   exec /usr/sbin/pppattachd server ip 2>/dev/null

2. You want server System B to contact client System A. From System B enter:

   /usr/sbin/pppattachd /dev/tty0 server ipv6 connect "sysaconnector"

   where sysaconnector is the connector program.

   On System A, the user that logged in would have invoked from $HOME/.profile:
   
   exec /usr/sbin/pppattachd client ipv6 2>/dev/null

3. You want System A to act as a client to server System B using PAP authentication. System B acts as
   the authenticator and System A is the peer to be authenticated. From System A enter:
   
   /usr/sbin/pppattachd /dev/tty0 client ip ipv6 peer pap user username \
   connect "sysbconnector"

   where sysbconnector is the connector program.

   On System A, the /etc/ppp/pap-secrets file contains: username * ppppassword.
   On System B, the user that logged in would have invoked from $HOME/.profile:
   
   exec /usr/sbin/pppattachd server ip ipv6 authenticate pap 2>/dev/null

   On System B, the /etc/ppp/pap-secrets file contains: username * ppppassword.

Files

/usr/sbin/pppattachd  
/ etc/ppp/attXXX.pid

Contains the pppattachd daemon.

/ etc/ppp/attXXX.pid

Contains the process id. XXX is the pid, the content of the file is the network layer ID to which the attachment was bound. The user must belong to uucp group for the pid file to be created.

Related Information

The pppcontrold daemon, pppdial command.

The syslog subroutine.

The profile file format.

Asynchronous Point-to-Point Protocol subsystem in Networks and communication management.
pppcontrold Daemon

Purpose
Controls startup and management of the PPP (Point to Point Protocol) subsystem.

Syntax
To Start and Stop by Using the System Resource Controller:
startsrc -s pppcontrold
stopsrc -s pppcontrold

Description
The `pppcontrold` daemon reads in the `/etc/ppp/lcp_config` and `/etc/ppp/if_conf` files to install and configure the PPP subsystem. SMIT should be used to generate both `/etc/ppp/lcp_config` and `/etc/ppp/if_conf`. To modify these files the user must have root authority or be a member of the uucp group. The configuration files are read at initialization where the appropriate streams modules are configured and loaded, and the tcpip network interface layers are installed into the system. After configuring the subsystem, the `pppcontrold` daemon monitors the streams associated with the IP and IPv6 interfaces to perform operations such as setting IP addresses, and the flags of the IP and IPv6 interface. The `pppcontrold` daemon terminates upon receipt of SIGTERM or when the `stopsrc` command is invoked. The preferred method of starting and stopping the `pppcontrold` daemon is with SRC (System Resource Controller). You must have root authority to run the src commands.

Errors and messages are logged using the `syslog` facility.

The `pppcontrold` daemon creates the `/etc/ppp/pppcontrold.pid` file, which contains a single line with the command process ID used to terminate the `pppcontrold` daemon.

Flags
None

/etc/ppp/lcp_config File
This file provides the configuration information required for the subsystem. These values are used to ensure proper allocation of storage at the time the subsystem is configured. It is important to configure just what is needed since these values define storage that is allocated within the kernel. Blank lines and lines beginning with a # (pound sign) are ignored in the configuration file. Do not use blank lines or lines beginning with # (pound sign) within the interface definition. Only use these lines between interface definitions.

Required Keywords

- **server_name name**
  Name of this system. This name should be unique to the system. Ensure that the first 20 bytes of the name are unique.

- **lcp_server #**
  Number of server connections. Represents the number of server connections that the subsystem will allow. Storage for all specified connections is allocated at the time the subsystem is configured. The minimum value is 0 and the maximum value is gated by the amount of memory in the system.

- **lcp_demand #**
  Specify the maximum number of demand links that you want the PPP LCP multiplexor to support. Set this value to the number of demand interfaces that you expect to configure. The default value is 0.

- **lcp_client #**
  Number of client connections. The minimum value is 0 and the maximum value is gated by the amount of memory in the system. Client connections are IP and IPv6 interfaces configured without addresses.
Required Keywords

num_if #
Number of IP and IPv6 interfaces to configure. Must be less than or equal to lcp_server + lcp_client.

num_if6 #
Maximum number of TCP/IPv6 interfaces to allow. The value is a decimal number. This number, along with "max ip interfaces" and "max ip & ipv6 interfaces", cannot be greater than total maximum number of server, client and demand links (max server links + max client links + max demand links = max ip interfaces + max ipv6 interfaces + max ip & ipv6 interfaces). When a machine is used solely as a client connecting up to one server, this field would be set to 1. On a server, this field would be set to the maximum number of IPv6 clients that can simultaneously connect to the server. In this case, make sure that you have enough IPv6 interfaces defined.

num_if_and_if6 #
Maximum number of TCP/IP and IPv6 interfaces to allow. The value is a decimal number. This number along with "max ip interfaces" and "max ipv6 interfaces" cannot be greater than total maximum number of server, client and demand links (max server links + max client links + max demand links = max ip interfaces + max ipv6 interfaces + max ip & ipv6 interfaces). When a machine is used solely as a client connecting up to one server, this field would be set to 1. On a server, this field would be set to the maximum number of IP and IPv6 clients that can simultaneously connect to the server. In this case, make sure that you have enough IP and IPv6 interfaces defined.

num_hdlc #
Maximum number of concurrent asynchronous PPP sessions (server, client and demand) that can be active. This field is a decimal number. The value can not be greater than the total maximum number of server, client and demand links ( [max server connections + max client connections + max demand connections] = max async hdlc attachments = [max ip interfaces + max ipv6 interfaces + max ip & ipv6 interfaces] ).

Optional Keywords

These keywords will override the global default LCP options.

 txacm 0xXXXXXXXX
Transmit Asynchronous Character Map.

-negacm
Do not negotiate async character mapping. Rejects the peers configuration information frames that contains this option.

-negmru
Do not negotiate MRU (Maximum Receive Unit). Rejects the peers configuration information frames that contains this option.

mru #
MRU desired. A default is 1500.

-negacf
Do not negotiate ACF (address control field) compression. ACF will not be compressed. Rejects the peers configuration information frames that contain this option.

-negprotocolcompress
Do not negotiate protocol compression. Normally, the PPP protocol field will be compressed by one byte for Network protocols. This disables negotiation of this option for both receiving and sending frames.

/etc/ppp/if_conf File
This file defines all the server TCP/IP interfaces. Blank lines and lines beginning with a # (pound sign) are ignored in the configuration file. Do not use blank lines or lines beginning with # (pound sign) within the interface definition. Only use these lines between interface definitions.

Keywords

interface
Indicates that a new interface definition is being started.

ip and ipv6
Specifies the protocol or protocols used for this interface and will coincide with the local_ip, local_ip6, remote_ip, and remote_ip6 keywords. These keywords can be used alone or in combination.
Keywords
server

Indicates that the interface is a server connection.

Requires the following keywords:

local_ip xxx.yyy.zzz.qqq
remote_ip xxx.yyy.zzz.qqq
local_ip6 ::XXXX:XXXX:XXXX:XXXX
remote_ip6 ::XXXX:XXXX:XXXX:XXXX

These addresses MUST be different on the pair basis, however the local IP and IPv6 address can be the same for all PPP interfaces. On a given server, the remote address must be unique. The "interface" "server" entry will contain only local_ip and remote_ip addresses if the smitty PPP IP Interfaces menu is used to configure the interface. remote_ip6 and local_ip6 will be seen in the entry if the smitty PPP IPv6 Interfaces menu is used. Finally, all four will be found if smitty PPP IP and IPv6 Interfaces is used.

client

This is an IPv6 option only. A client interface is required for all IPv6 connections. The address will be randomly generated based on the system model and ID. You can elect to zero out the address, (::0:0:0:0 or simply ::) and have the server assign an IPv6 address to the client. An example if_conf file entry follows:

interface
client
ipv6
local_ip6 ::0000:0000:0000:0000

interface
client
ip
ipv6
local_ip6 ::0007:0000:0000:4445

demand

There is a local_XXX and remote_XXX that are dependant on the protocol type (IP, IPv6 or both). A quoted command string is also required to establish connection with the authenticating host (server). An example if_conf file entry follows:

interface
demand
ipv6
local_ip6 ::0007:0000:0000:4444
remote_ip6 ::0009:0000:0000:5555
dcmd "exec /usr/sbin/pppattachd /dev/tty3 demand ipv6 >/dev/tty3 nodaemon"

interface
demand
ip
ipv6
local_ip 44,44,44,46
remote_ip 66,66,66,66
netmask 255,255,255,0
local_ip6 ::0007:0000:0000:4446
remote_ip6 ::0009:0000:0000:6666
dcmd "exec /usr/sbin/pppattachd /dev/tty4 demand ip ipv6 >/dev/tty4 nodaemon"

Optional Keywords

netmask xxx.xxx.xxx.xxx

Specifies a netmask for an IPv4 interface.
Exit Status
This command returns the following exit values:

0 Successful completion.
!0 An error occurred.

Security
Access Control: You must have root authority to run this command.

Examples
Example /etc/ppp/lcp_config File:

# Comment line
server_name pppclient
lcp_server 0
lcp_client 3
lcp_demand 2
num_if 1
num_if6 2
num_if_and_if6 2
num_hdlc 5

Example /etc/ppp/if_conf File:

# Sample ip server configuration information.
# Note that the complete stanza does not contain
# comments or blank lines
interface server
ip
local_ip 129.35.130.45
remote_ip 129.35.131.191
netmask 255.255.240.0

# Sample ipv6 server configuration information.
# Note that the complete stanza does not contain
# comments or blank lines
interface server
ipv6
local_ip6 ::0009:2313:4C00:3193
remote_ip6 ::0009:2313:4C00:3194

# However between stanzas one can have blank or
# comment lines.
interface server
ip
local_ip 129.35.130.45
remote_ip 129.35.131.196
netmask 255.255.240.0

interface server
ip
local_ip 129.35.130.45
remote_ip 129.35.131.197
netmask 255.255.240.0

interface server
ip
local_ip 129.35.130.45
remote_ip 129.35.131.201
netmask 255.255.240.0

interface
server
ip
local_ip 129.35.130.45
remote_ip 129.35.131.212
netmask 255.255.240.0

The above configuration files would result in a subsystem that installs the IP and IPv6 interfaces as follows:

pp0: flags=71<UP,POINTOPOINT,NOTRAILERS>
    inet 129.35.130.45 --> 129.35.131.191 netmask 0xfffff000
pp1: flags=31<UP,POINTOPOINT,NOTRAILERS>
    inet 129.35.130.45 --> 129.35.131.196 netmask 0xfffff000
pp2: flags=31<UP,POINTOPOINT,NOTRAILERS>
    inet 129.35.130.45 --> 129.35.131.197 netmask 0xfffff000
pp3: flags=31<UP,POINTOPOINT,NOTRAILERS>
    inet 129.35.130.45 --> 129.35.131.201 netmask 0xfffff000
pp4: flags=31<UP,POINTOPOINT,NOTRAILERS>
    inet 129.35.130.45 --> 129.35.131.212 netmask 0xfffff000
pp5: flags=30<POINTOPOINT,NOTRAILERS>
    inet netmask

Note: pp5 is the result of the lcp_client keyword in the /etc/ppp/lcp_config file (lcp_client 1). Both IP and IPv6 client interfaces will have no address associated with them until a connection is established with the server and the IPs are negotiated through IPCP/IPV6CP. The only exception is with demand client interfaces. These interfaces will specify their own address and demand it during negotiation. As such, they will have their IP and IPv6 address associated with their interface as soon as the PPP subsystem is started.

Files

/usr/sbin/pppcontrold Contains the pppcontrold daemon.
/etc/ppp/lcp_config Configures the subsystem (lcp_config should be generated by SMIT).
/etc/ppp/if.conf Configures the TCP/IP interfaces (if.conf should be generated by SMIT).
/etc/ppp/pppcontrold.pid Contains the pppcontrold process id.
/etc/ppp/ppp.conf Contains input to the strload command.

Related Information

The pppattachd daemon, pppdial command.
The startsrc command, stopsrc command.
The syslog subroutine.

Asynchronous Point-to-Point Protocol subsystem in Networks and communication management.

The System Resource Controller in Operating system and device management gives an explanation of subsystems, subservers, and the System Resource Controller.
pppdial Command

Purpose
Establish an asynchronous connection with a remote system for use by the PPP (Point to Point Protocol) subsystem.

Syntax
pppdial [ -t TimeOut ] [ -v ] [ -d VerboseFile ] [ ChatFile

Description
The pppdial command provides the capability to establish a connection with a remote system over an asynchronous device. It is used with the pppattachd daemon as the means for carrying out the dialog with modems and remote systems to the point where PPP frames should be sent. The pppdial command uses standard input (stdin) and standard output (stdout) as the devices over which the dialog occurs.

Errors and messages are logged using the syslog facility.

Flags
-\(d\) VerboseFile
Logs the chat activity to VerboseFile. If VerboseFile does not exist, the pppdial command creates it. If VerboseFile does exists, the pppdial command appends the output to the existing file.

-\(f\) ChatFile
Specifies the file which contains the dialog that is to occur over the tty device. The content of ChatFile conforms to the syntax of the Basic Networking Utility (BNU)/UNIX to UNIX Copy Program (UUCP).

-\(t\) TimeOut
Specifies the number of seconds to wait before timing out during the Expect phase of the chat activity.

-\(v\)
Logs the chat activity using the syslog facility.

Exit Status
This command returns the following exit values:

0 Successful completion.
!0 An error occurred.

Security
Access Control: Any User

Examples
To establish a connection with a remote system, enter on the command line in one line:
/usr/sbin/pppattachd client ip /dev/tty0 connect "/usr/sbin/pppdial -v -f /home/pppuser/dialer.file"

The ChatFile named /home/pppuser/dialer.file contains:

```
"atdt4311088
CONNECT
\d\n
login
pppuser
ssword
pppuserpwd
```
with the following meaning:

' ' Expect a null string
atdt4311088 Send the modem the dial command
4311088 is the phone number to dial
CONNECT Expect connect from the modem
\d\n Delay for 1 second then send a new line
ogin Expect the string ogin
pppuser Send the string pppuser
pppuser is the user id on the remote system
ssword Expect the string ssword
pppuserpwd Send the string pppuserpwd
pppuserpwd is the password of the user pppuser on the remote system

The remote system must have a user pppuser defined with a password pppuserpwd and a $HOME/.profile containing:
exec pppattachd server ip ipv6 2>/dev/null

This is a very simplistic example. The example requires that the PPP subsystem is running on both the client and server (or remote) system. The example requires that the client system have a modem defined on /dev/tty0. The ChatFile contains the number 4311088 to dial. The remote system must also have a user defined with a password and a .profile which starts a PPP attachment on the remote system. The device (/dev/tty0), phone number, user, user password and mechanism starting the PPP attachment are variable and should reflect the current values on the server system.

Files
/usr/sbin/pppdial Contains the pppdial command.

Related Information
The pppattachd daemon, pppcontrold daemon.
The syslog subroutine.

Asynchronous Point-to-Point Protocol subsystem in Networks and communication management.

pppstat Command

Purpose
Extracts and displays the RAS (Reliability, Availability, and Serviceability) information of the PPP (Point to Point Protocol) subsystem.

Syntax
pppstat

Description
The pppstat command provides the capability to monitor particular characteristics of active links. The following information is displayed for all active links:

LCP Multiplexing Layer
Local MRU Specifies the Maximum Receive Unit setting for this host. This is maximum length of a packet that the remote host can send to the local host.
Remote MRU | Specifies the Maximum Receive Unit setting for the remote host. This is the maximum length of a packet that we can send to the remote host.
---|---
Local To Peer ACCM | Specifies the ASYNC Character Map used in the transmission of packets to the remote host.
Peer To Local ACCM | Specifies the ASYNC Character Map used by the remote host in the transmission of packets to the local host.
Local To Remote Protocol Field Compression | Specifies whether Protocol Compression is used in the transmission of packets to the remote host.
Remote To Local Protocol Field Compression | Specifies whether Protocol Compression is used in the transmission of packets from the remote host to the local host.
Local To Remote Address/Control Field Compression | Specifies whether Address/Control field compression is being used in the transmission of packets to the remote host.
Remote To Local Address/Control Field Compression | Specifies whether Address/Control field compression is being used in the transmission of packets from the remote host to the local host.

**LCP Multiplexing Layer prior to PPP negotiating**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRU</td>
<td>Specifies the Maximum Receive Unit for receiving packets. This is the value that this host attempted to negotiate with the remote host.</td>
</tr>
<tr>
<td>Receive ACCM</td>
<td>Specifies the initial remote-to-local ASYNC Character Map that was used in the negotiation.</td>
</tr>
<tr>
<td>Transmit ACCM</td>
<td>Specifies the initial local-to-remote ASYNC Character Map that was used in the negotiation.</td>
</tr>
<tr>
<td>Magic Number</td>
<td>Specifies the magic number attempted in negotiation.</td>
</tr>
<tr>
<td>Frame Check Size</td>
<td>Specifies the length of the Frame Check Sequence that this host attempted to negotiate. This is fixed at 16 bits.</td>
</tr>
</tbody>
</table>

**HDLC Framing Layer**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bad Address Fields</td>
<td>Specifies the number of times a packet has been received with an incorrect address field.</td>
</tr>
<tr>
<td>Bad Controls Fields</td>
<td>Specifies the number of times a packet has been received with an incorrect control field.</td>
</tr>
<tr>
<td>Oversized Packets</td>
<td>Specifies the number of times a packet has been received that has a length that exceeds the Maximum Receive Unit length.</td>
</tr>
<tr>
<td>Bad Frame Check Sequence</td>
<td>Specifies the number of times a packet has been received with a bad Frame Check Sequence.</td>
</tr>
<tr>
<td>Incoming Good Octets</td>
<td>Specifies the number of octets received in valid packets.</td>
</tr>
<tr>
<td>Outgoing Good Octets</td>
<td>Specifies the number of octets sent successfully in packets.</td>
</tr>
<tr>
<td>Incoming Good Packets</td>
<td>Specifies the number of packets received successfully.</td>
</tr>
<tr>
<td>Outgoing Good Packets</td>
<td>Specifies the number of packets sent successfully.</td>
</tr>
</tbody>
</table>

The output is sent to **stdout**. Messages are sent to **stderr**.

**Exit Status**

This command returns the following exit values:

<table>
<thead>
<tr>
<th>Exit Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful completion.</td>
</tr>
<tr>
<td>&gt;0</td>
<td>An error occurred.</td>
</tr>
</tbody>
</table>
Security
Access Control: Any User
Auditing Events: N/A

Files
/usr/sbin/pppstat Contains the pppstat command.

Related Information
Commands: pppdial
Daemons: pppcontrold pppattachd
Files: profile
Subroutines: syslog

Asynchronous Point-to-Point Protocol subsystem in Networks and communication management.

pprof Command

Purpose
Reports CPU usage of all kernel threads over a period of time.

Syntax

pprof { [time | -l] pprof.flow | -i tracefile | -d } [ -T bytes ] [ -v ] [ -s ] [ -n ] [ -f ] [ -p ] [ -w ] [ -r PURR ]

Description
The pprof command reports on all kernel threads running within an interval using the trace utility. The raw process information is saved to pprof.flow, and five reports are generated. The pprof command can also take previously generated Pprof.flow to regenerate reports. If no flags are specified, all reports are generated.

Types of Reports

pprof.cpu
Lists all kernel level threads sorted by actual cpu time. Contains: Process Name, Process ID, Parent Process ID, Process State at Beginning and End, Thread ID, Parent Thread ID, Actual CPU Time, Start Time, Stop Time, Stop - Start

pprof.start

pprof.namecpu
Lists information about each type of kernel thread (all executable with the same name). Contains: Process Name, Number of Threads, CPU Time, % of Total CPU Time

pprof.famind
pprof.famcpu

Lists the information for all families (processes with a common ancestor). The Process Name and Process ID for the family is not necessarily the ancestor. Contains: Start Time, Process Name, Process ID, Number of Threads, Total CPU Time.

Flags

-\(d\)  
Waits for the user to execute trcon and trcstop from the command line.

-\(f\)  
Specifies to only generate the pprof.famcpu and pprof.famind reports.

-\(I\) pprof.flow  
Indicates to generate reports from a previously generated pprof.flow. Specifies to only generate the pprof.namecpu report.

-\(i\) tracefile  
Indicates to generate reports from a tracefile. The trace must contain the following hooks: 135,106,10C,134,139,465,467,00A

-\(n\)  
Specifies to only generate the pprof.namecpu report.

-\(p\)  
Specifies to only generate the pprof.cpu report.

-\(r\) PURR  
Uses PURR time instead of TimeBase in percent and CPU time calculation. Elapsed time calculations are unaffected.

-\(s\)  
Specifies to only generate the pprof.start report.

-\(T\)  
Sets the trace kernel buffer size in bytes. The default is 32000.

-\(v\)  
Sets verbose mode (print extra details).

-\(w\)  
Specifies to only generate pprof.flow.

time  
Specifies the number of seconds to trace the system.

Note: Review the /usr/lpp/perfagent/README.perfagent.tools file for the latest on changes to the performance analysis tools.

Related Information

The trace command, trcrpt command, filemon command.

The trcon subroutine, trcstop subroutine.

pr Command

Purpose

Writes a file to standard output.

Syntax

pr [ \(+\)Page ] [ \(-\)Column ] [ \(a\) ] [ \(-m\) ] [ \(-d\) ] [ \(-F\) ] [ \(-r\) ] [ \(-t\) ] [ \(-e\) Character ] [ \(-G\) ] [ \(-h\) Header ] [ \(-i\) Character ] [ \(-G\) ] [ \(-l\) Lines ] [ \(-n\) Character ] [ \(-W\) Width ] [ \(-o\) Offset ] [ \(-s\) Character ] [ \(-W\) Width ] [ \(-x\) Character ] [ \(-W\) Width ] [ \(-f\) ] [ \(-p\) ] [ File ... | - ]

Description

The pr command writes the specified file or files to standard output. If you specify the - (minus sign) parameter instead of the File parameter, or if you specify neither, the pr command reads standard input. A heading that contains the page number, date, time, and name of the file separates the output into pages.

Unless specified, columns are of equal width and separated by at least one space. Lines that are too long for the page width are cut off. If standard output is a workstation, the pr command does not display error messages until it has ended.
Flags

-Column
Sets the number of columns to the value specified by the Column variable. The default value is 1. This option should not be used with the -m flag. The -e and -i flags are assumed for multicolumn output. A text column should never exceed the length of the page (see the -l flag). When the -Column flag is used with the -t flag, use the minimum number of lines to write the output.

+Page
 Begins the display with the page number specified by the Page variable. The default value is 1.

-a
 Modifies the effect of the -Column flag so that multiple columns are filled horizontally, from left to right. For example, if there are two columns, the first input line goes in column 1, the second goes in column 2, the third becomes line 2 of column 1, and so forth. If the -a flag is not specified, columns are created vertically.

-d
 Produces double-spaced output.

-e[Character][Gap]
 Expands tabs to character positions as follows: Gap+1, 2*Gap+1, 3*Gap+1, and so on. The default value of Gap is 8. Tab characters in the input expand to the appropriate number of spaces in order to line up with the next tab setting. If you specify a value for the Character variable (any character other than a digit), that character becomes the input tab character. The default value of the Character variable is the ASCII TAB character.

-F
 Uses a form-feed character to advance to a new page. (Otherwise the pr command issues a sequence of line-feed characters.) Pauses before beginning the first page if the standard output is a workstation. This flag is equivalent to the -f flag.

-f
 Uses a form-feed character to advance to a new page. (Otherwise the pr command issues a sequence of line-feed characters.) Pauses before beginning the first page if the standard output is a workstation. This flag is equivalent to the -F flag.

-h Header
 Uses the specified header string as the page header. If the -h flag is not used, the page header defaults to the file name specified by the File parameter.

-i[Character][Gap]
 Replaces white space wherever possible by inserting tabs to character positions, as follows: Gap+1, 2*Gap+1, 3*Gap+1, and so forth. The default value of Gap is 8. If you specify a value for the Character variable (any character other than a digit), that character becomes the input tab character. The default value of the Character variable is the ASCII TAB character.

-l Lines
 Overrides the 66-line default and resets the page length to the number of lines specified by the Lines variable. If the Lines value is smaller than the sum of both the header and trailer depths (in lines), the header and trailer are suppressed (as if the -t flag were in effect).

-m
 Merges files. Standard output is formatted so the pr command writes one line from each file specified by the File parameter, side by side into text columns of equal fixed widths, based on the number of columns this position. This flag should not be used with the -Column flag.

-n[Character][Width]
 Provides line numbering based on the number of digits specified by the Width variable. The default is 5 digits. The line number occupies the first Width+1 column positions of each text column of default output, or of each line of output when the -m flag is set. If the Character variable is specified (any non-digit character), it is appended to the line number to separate it from what follows on the line. The default character separator is the tab character.

-o Offset
 Indents each line by the number of character positions specified by the Offset variable. The total number of character positions per line is the sum of the width and offset. The default Offset value is 0.

-p
 Pauses before beginning each page if the output is directed to a workstation. The pr command sounds the alarm at the workstation and waits for you to press the Enter key.

-r
 Does not display diagnostic messages if the system cannot open files.

-s[ Character ]
 Separates columns by the single character specified by the Character variable instead of by the appropriate number of spaces. The default value for the Character variable is an ASCII TAB character.
-t

Does not display the five-line identifying header and the five-line footer. Stops after the last line of each file without spacing to the end of the page.

-w Width

Sets the width of line to width column positions for multiple text-column output only. If the -w option is not specified and the -s option is not specified, the default width is 72. If the -w is not specified and the -s option is specified, the default width is 512. For single column output, input lines will not be truncated.

-x[ Character ][ Width ]

Provides the same line numbering functions as the -n flag.

Exit Status

This command returns the following exit values:

0 All files were successfully written.

>0 An error occurred.

Examples

1. To print a file with headings and page numbers on the printer, type:
   
   pr prog.c | qprt

   This adds page headings to the prog.c file and sends it to the qprt command. The heading consists of the date the file was last modified, the file name, and the page number.

2. To specify a title, type:
   
   pr -h "MAIN PROGRAM" prog.c | qprt

   This prints the prog.c file with the title Main Program in place of the file name. The modification date and page number are still printed.

3. To print a file in multiple columns, type:
   
   pr -3 word.lst | qprt

   This prints the word.lst file in three vertical columns.

4. To print several files side by side on the paper:
   
   pr -m -h "Members and Visitors" member.lst visitor.lst | qprt

   This prints the member.lst and visitor.lst files side by side with the title Members and Visitors.

5. To modify a file for later use, type:
   
   pr -t -e prog.c > prog.notab.c

   This replaces tab characters in the prog.c file with spaces and puts the result in prog.notab.c file. Tab positions are at every eighth column (that is 9, 17, 25, 33, . . .). The -e flag tells the pr command to replace the tab characters; the -t flag suppresses the page headings.

Files

/usr/bin/pr Contains the pr command.
/dev/tty* Suspends messages.

Related Information

The cat command, qprt command.

In Operating system and device management describes files, file types, and how to name files.
Input and output redirection in *Operating system and device management* describes how the operating system processes input and output.


Shells in *Operating system and device management* describes shells, the different types, and how they affect the way commands are interpreted.

File and directory access modes in *Operating system and device management* introduces file ownership and permissions to access files and directories.

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### prctmp Command

**Purpose**

Displays the session record files.

**Syntax**

```
/usr/sbin/acct/prctmp File...
```

**Description**

A user with administrative authority can enter the `prctmp` command to display the session record file created by the `acctcon1` command, normally the `/var/adm/acct/nite/ctmp` file. The session record file is converted into the connect-time total accounting record by the `acctcon2` command and then incorporated into the daily accounting report.

**Security**

Access Control: This command should grant execute (x) access only to members of the `adm` group.

**Example**

To display the session record file, enter:

```
prctmp /var/adm/acct/nite/ctmp
```

This command displays the session record file created by the `acctcon1` command.

**Files**

<table>
<thead>
<tr>
<th>File Path</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>/usr/sbin/acct</code></td>
<td>The path to the accounting commands.</td>
</tr>
<tr>
<td><code>/var/adm/acct/nite</code></td>
<td>Contains accounting data files.</td>
</tr>
</tbody>
</table>

**Related Information**

- [System accounting](#) in *Operating system and device management*.
- [Setting up an accounting subsystem](#) in *Operating system and device management*.

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### prdaily Command

**Purpose**

Creates an ASCII report of the previous day’s accounting data.
Syntax

/usr/sbin/acct/prdaily [ -X ] [ -l ] [ mmdd ] [ -c ]

Description

The prdaily command is called by the runacct command to format an ASCII report of the previous day’s accounting data. The report resides in the /var/adm/acct/sum/rprt/mmdd file, where mmdd specifies the month and day of the report.

Flags

- Reports exceptional resource usage by command. This flag may be used only on the current day’s accounting data.
- -l [mmdd] Reports exceptional usage by login ID for the specified date. Use the mmdd variable to specify a date other than the current day.
- -X Processes all available characters for each user name instead of truncating to the first 8 characters. This flag will also cause the prdaily command to use the /var/adm/acct/sumx directory instead of the /var/adm/acct/sum directory.

Security

Access Control: This command should grant execute (x) access only to members of the adm group.

Files

/usr/sbin/acct The path to the accounting commands.
/usr/sbin/acct/ptelus.awk Calculates the limits for exceptional usage by login ID. This is a shell procedure.
/usr/sbin/acct/ptecms.awk Calculates the limits of exceptional usage by command name. This is a shell procedure.
/var/adm/acct/sum Cumulative directory for daily accounting records.
/var/adm/acct/sumx Cumulative directory for daily accounting records when long user name processing is requested.

Related Information

The acctcms command, acctcom command, acctmerg command, runacct command.

For more information about the Accounting System, the preparation of daily and monthly reports, and the accounting files, see the System accounting in Operating system and device management.

Setting up an accounting subsystem in Operating system and device management explains the steps you must take to establish an accounting system.

preparevsd Command

Purpose

Makes a virtual shared disk available.

Syntax

preparevsd { -a | vsd_name... }
Description
The preparevsd command brings the specified virtual shared disks from the stopped state to the suspended state. The virtual shared disks are made available. Open and close requests are honored, while read and write requests are held until the virtual shared disks are brought to the active state. If they are in the suspended state, this command leaves them in the suspended state.

You can use the System Management Interface Tool (SMIT) to run this command. To use SMIT, enter:
```
smitty vsd_mgmt
```
and select the Prepare a Virtual Shared Disk option.

Under normal circumstances, you should not issue this command. The recoverable virtual shared disk subsystem uses this command to manage shared disks in a controlled manner. If you issue this command, the results may be unpredictable.

Flags
- `−a` Specifies that all the virtual shared disks in the stopped state are to be prepared.

Parameters
- `vsd_name` Specifies a virtual shared disk. If the virtual shared disk is not in the stopped state, you will get an error message.

Security
You must have root authority to run this command.

Restrictions
You must issue this command from a node that is online in the peer domain. To bring a peer domain online, use the startrpdomain command. To bring a particular node online in an existing peer domain, use the startrpnode command. For more information on creating and administering an RSCT peer domain, refer to RSCT Administration Guide.

Under normal circumstances, you should not issue this command. The recoverable virtual shared disk subsystem uses this command to manage shared disks in a controlled manner. If you issue this command, the results may be unpredictable.

Examples
To bring the virtual shared disk `vsd1vg1n1` from the stopped state to the suspended state, enter:
```
preparevsd vsd1vg1n1
```

Location
`/opt/rsct/vsd/bin/preparevsd`

Related Information
Commands: cfgvsd, lsvsd, resumevsd, startvsd, stopvsd, suspendvsd, ucfgvsd

preprpnode Command

Purpose
Prepares a node to be defined to a peer domain.
Syntax
preprpnode [-k] [-h] [-TV] node_name1 [node_name2 ...]
preprpnode -f | -F { file_name | "~" } [-k] [-h] [-TV]

Description
The preprpnode command prepares security on the node on which the command is run so it can be defined in a peer domain. It allows for peer domain operations to be performed on this node and must be run before the node can join a peer domain using the mkrpdomain or addrpnode command.

Before the mkrpdomain command is issued on a node, the preprpnode command must be run on each node to be defined to the new peer domain, using the name of the node that is to run the mkrpdomain command as the parameter. This gives the mkrpdomain node the necessary authority to create the peer domain configuration on each new node and set up additional security.

Before the addrpnode command is issued on a node, the preprpnode command must be run on each node that is to be added, using the names of all online nodes as the parameters. This gives the online nodes the authority to perform the necessary operations on the new node.

The preprpnode command performs the following:
1. Establishes trust with the node names specified on the command by adding their public keys to the trusted host list.
2. Modifies the resource monitoring and control (RMC) access control list (ACL) file to enable access to peer domain resources on this node from the other nodes in the peer domain. This allows peer domain operations to occur on the node. The RMC subsystem is refreshed so that these access changes will take effect.
3. RMC remote connections are enabled.

If the nodes that are to be defined to a peer domain are already in a management domain, you do not need to exchange public keys. You can use the -k flag to omit this step.

Flags
- f | - F { file_name | "~" }
   Reads a list of node names from file_name. Each line of the file is scanned for one node name. The pound sign (#) indicates that the remainder of the line (or the entire line if the # is in column 1) is a comment.
   Use - f "~" or - F "~" to specify STDIN as the input file.
-k Specifies that the command should not exchange public keys.
-h Writes the command's usage statement to standard output.
-T Writes the command's trace messages to standard error. For your software service organization's use only.
-V Writes the command's verbose messages to standard output.

Parameters
node_name1 [node_name2 ...]
Specifies the node (or nodes) from which peer domain commands can be accepted. Typically, this is the name of the node that will be running the mkrpdomain command when forming the peer domain. When adding to the peer domain, it is a list of the nodes that are currently online in the
peer domain. The node name is the IP address or the long or short version of the DNS host name. The node name must resolve to an IP address.

Security
The user of the `preprpnode` command needs write permission to the access control list (ACL) file. Permissions are specified in the ACL file. See the *RSCT: Administration Guide* for details on the ACL file and how to modify it.

Exit Status
0    The command ran successfully.
1    An error occurred with RMC.
2    An error occurred with a command-line interface script.
3    An incorrect flag was entered on the command line.
4    An incorrect parameter was entered on the command line.
5    An error occurred that was based on incorrect command-line input.

Environment Variables

**CT_CONTACT**
Determines the system where the session with the resource monitoring and control (RMC) daemon occurs. When CT_CONTACT is set to a host name or IP address, the command contacts the RMC daemon on the specified host. If CT_CONTACT is not set, the command contacts the RMC daemon on the local system where the command is being run. The target of the RMC daemon session and the management scope determine the resource classes or resources that are processed.

Restrictions
This command must run on a node that will be defined to the peer domain.

Implementation Specifics
This command is part of the Reliable Scalable Cluster Technology (RSCT) fileset for AIX.

Standard Input
When the `-f "-"` or `-F "-"` flag is specified, this command reads one or more node names from standard input.

Standard Output
When the `-h` flag is specified, this command’s usage statement is written to standard output. All verbose messages are written to standard output.

Standard Error
All trace messages are written to standard error.

Examples
1. Suppose `mkrpdomain` will be issued from `nodeA`. To prepare `nodeB`, `nodeC`, and `nodeD` to be defined to a new peer domain, `ApplDomain`, run this command on `nodeB`, on `nodeC`, and then on `nodeD`:
   
   `preprpnode nodeA`
2. Suppose nodeA and nodeB are online in ApplDomain. To prepare nodeC to be added to the existing domain, run this command on nodeC:
   preprpnode nodeA nodeB
   Alternatively, create a file called onlineNodes with these contents:
   nodeA
   nodeB

   Then, run this command on nodeC:
   preprpnode -f onlineNodes

Location

/usr/sbin/rsct/bin/preprpnode

Contains the preprpnode command

Files

The access control list (ACL) file — /var/ct/cfg/ctrmc.acls — is modified. If this file does not exist, it is created.

Related Information

Books: RSCT: Administration Guide, for information about peer domain operations

Commands: addrpnode, lsrpdomain, lsrpnode, mkrpdomain

Information Files: rmccli, for general information about RMC-related commands

Files: ctrmc.acls

prev Command

Purpose

Shows the previous message.

Syntax


Description

The prev command displays the previous message in a folder. The prev command is similar to the show command with the prev value specified.

The prev command passes any flags that it does not recognize to the showproc program.

Flags

+Folder
-header
-help
-noheader

Specifies the folder that contains the message you want to show.
Displays a one-line description of the message being shown. The description includes the folder name and the message number. This flag is the default.
Lists the command syntax, available switches (toggles), and version information.

Note: For Message Handler (MH), the name of this flag must be fully spelled out.
Prevents display of a one-line description of each message.
-noshowproc
-showproc CommandString

Uses the /usr/bin/cat command to list the previous command.

Uses the specified command string to perform the listing.

Profile Entries
The following entries are part of the UserMhDirectory/.mh_profile file:

Current-Folder: Sets the default current folder.
Path: Specifies the UserMhDirectory.
showproc: Specifies the program used to show messages.

Examples
1. To display the previous message in the current folder, enter:
   ```
   prev
   ```
   The system responds with a message similar to the following:
   ```
   (Message schedule: 10)
   ```
   The text of the message is also displayed. In this example, message 10 in the current folder schedule is the previous message.

2. To show the previous message in the meetings folder, enter:
   ```
   prev meetings
   ```
   The system responds with a message similar to the following:
   ```
   (Message inbox: 5)
   ```
   In this example, message 5 in the meetings folder is the previous message.

Files

$HOME/.mh_profile Contains the MH user profile.
/usr/bin/prev Contains the prev command.

Related Information
The next command, show command.

The .mh_alias file format, .mh_profile file format.

Mail applications in Networks and communication management.

printenv Command

Purpose
Displays the values of environment variables.

Syntax

printenv [ Name ]
Description
The `printenv` command displays the values of environment variables. If you specify the `Name` parameter, the system only prints the value associated with the `Name` parameter. If you do not specify the `Name` parameter, the `printenv` command displays the current environment, showing one `Name = Value` sequence per line.

If you specify a `Name` parameter that you have not defined in the environment, the `printenv` command returns an exit status of 1; otherwise it returns a status of 0 (zero).

Examples
1. To find the current setting of the `MAILMSG` environment variable, enter:
   ```bash
   printenv MAILMSG
   ```
2. The command returns the value of the `MAILMSG` environment variable. For example:
   ```bash
   YOU HAVE NEW MAIL
   ```

Related Information
The `env` command.
The `environment` file.

Profiles overview in *Operating system and device management*.
Shells in *Operating system and device management*.

printf Command

Purpose
Writes formatted output.

Syntax
`printf Format [ Argument ... ]`

Description
The `printf` command converts, formats, and writes its `Argument` parameters to standard output. The `Argument` parameters are formatted under control of the `Format` parameter. The formatted output line cannot exceed `LINE_MAX` bytes in length.

The following environment variables affect the execution of the `printf` command:

<table>
<thead>
<tr>
<th>Environment Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LANG</td>
<td>Determines the locale to use for the locale categories when both <code>LC_ALL</code> and the corresponding environment variable (beginning with <code>LC_</code>) do not specify a locale.</td>
</tr>
<tr>
<td>LC_ALL</td>
<td>Determines the locale to be used to override any values for locale categories specified by the setting of <code>LANG</code> or any other <code>LC_</code> environment variable.</td>
</tr>
<tr>
<td>LC_CTYPE</td>
<td>Determines the locale for the interpretation of sequences of bytes of text data as characters; for example, single versus multibyte characters in parameters.</td>
</tr>
<tr>
<td>LC_Messages</td>
<td>Determines the language in which messages should be written.</td>
</tr>
<tr>
<td>LC_NUMERIC</td>
<td>Determines the locale for numeric formatting. This environment variable affects the format of numbers written using the <code>e</code>, <code>E</code>, <code>f</code>, <code>g</code>, and <code>G</code> conversion characters.</td>
</tr>
</tbody>
</table>

The `Format` parameter is a character string that contains three types of objects:
- Plain characters copied to the output stream.
Conversion specifications, each of which cause 0 or more items to be retrieved from the value parameter list.

The following escape sequences. When copied to the output stream, these sequences cause their associated action to be displayed on devices capable of the action:

- Backslash
- Alert
- Backspace
- Form feed
- New line
- Carriage return
- Tab
- Vertical tab

\ddd Where ddd is a one-, two-, or three-digit octal number. These escape sequences are displayed as a byte with the numeric value specified by the octal number.

The Argument parameter is a list of one or more strings to be written to standard output under the control of the Format parameter.

The Format parameter is reused as often as necessary to satisfy the Argument parameters. Any extra c or s conversion specifications are evaluated as if a null string Argument were supplied; other extra conversion specifications are evaluated as if a 0 Argument were supplied. Where the Format parameter contains no conversion specifications and Argument parameters are present, the results are unspecified.

Each conversion specification in the Format parameter has the following syntax in this order:

1. A % (percent sign).
2. Zero or more options, which modify the meaning of the conversion specification. The option characters and their meanings are:
   - The result of the conversion is left-aligned within the field.
   - The result of a signed conversion always begins with a sign (+ or -).
   - blank If the first character of a signed conversion is not a sign, a blank is prefixed to the result. If both the blank and + option characters are displayed, then the blank option character is ignored.
   - # This option specifies that the value is to be converted to an alternate form. For c, d, i, o, u, x, and X conversions, the option has no effect. For i conversion, it increases the precision to force the first digit of the result to be a 0 (zero). For e and f conversions, a nonzero result has 0x, or 0X prefixed to it, respectively. For e, E, f, and g conversions, the result always contains a radix character, even if no digits follow the radix character. For g and G conversions, trailing zeros are not removed from the result as they usually are.
   - 0 For c, d, i, o, x, u, u, x, X, and G conversions, leading zeroes (following any indication of sign or base) are used to pad to the field width, no space padding is performed. If the 0 (zero) and the - (minus sign) options are displayed, the 0 (zero) option is ignored. For d, i, o, u, x, and X conversions, if a precision is specified, the 0 (zero) option is ignored.

Note: For other conversions, the behavior is undefined.

3. An optional decimal digit string that specifies the minimum field width. If the converted value has fewer characters than the field width, the field is padded on the left to the length specified by the field width. If the left-adjustment option is specified, the field is padded on the right. If the result of a conversion is wider than the field width, the field is expanded to contain the converted result. No truncation occurs. However, a small precision may cause truncation on the right.

4. An optional precision. The precision is a . (dot) followed by a decimal digit string. If no precision is given, it is treated as 0 (zero). The precision specifies:
   - The minimum number of digits to be displayed for the d, o, i, u, x, or X conversions.
   - The number of digits to be displayed after the radix character for the e and f conversions.
   - The maximum number of significant digits for the g conversion.
5. A character that indicates the type of conversion to be applied, such as:

- The maximum number of bytes to be printed from a string in the \texttt{s} conversion.

\%  
Perform a \% (percent sign) conversion.

\texttt{d}, \texttt{i}  
Accepts an integer value and converts it to signed decimal notation. The precision specifies the minimum number of digits to be displayed. If the value being converted can be represented in fewer digits, it is expanded with leading zeros. The default precision is 1. The result of converting a zero value with a precision of zero is a null string. Specifying a field width with a zero as a leading character causes the field width value to be padded with leading zeros.

\texttt{o}  
Accepts an integer value and converts it to signed octal notation. The precision specifies the minimum number of digits to be displayed. If the value being converted can be represented in fewer digits, it is expanded with leading zeros. The default precision is 1. The result of converting a zero value with a precision of zero is a null string. Specifying a field width with a zero as a leading character causes the field width value to be padded with leading zeros.

\texttt{u}  
Accepts an integer value and converts it to unsigned decimal notation. The precision specifies the minimum number of digits to be displayed. If the value being converted can be represented in fewer digits, it is expanded with leading zeros. The default precision is 1. The result of converting a zero value with a precision of zero is a null string. Specifying a field width with a zero as a leading character causes the field width value to be padded with leading zeros.

\texttt{x}, \texttt{X}  
Accepts an integer value and converts it to hexadecimal notation. The letters abedef are used for the \texttt{x} conversion and the letters ABCDEF are used for the \texttt{X} conversion. The precision specifies the minimum number of digits to be displayed. If the value being converted can be represented in fewer digits, it is expanded with leading zeros. The default precision is 1. The result of converting a zero value with a precision of zero is a null string. Specifying a field width with a zero as a leading character causes the field width value to be padded with leading zeros.

\texttt{f}  
Accepts a float or double value and converts it to decimal notation in the format \texttt{[-]\ ddd.ddd}. The number of digits after the radix character (shown here as the decimal point) is equal to the precision specification. The \texttt{LC_NUMERIC} locale category determines the radix character to use in this format. If no precision is specified, then six digits are output. If the precision is 0 (zero), then no radix character will be displayed.

\texttt{e}, \texttt{E}  
Accepts a float or double value and converts it to the exponential form \texttt{[-]\ dde(+-)ddd}. There is one digit before the radix character (shown here as the decimal point) and the number of digits after the radix character is equal to the precision specification. The \texttt{LC_NUMERIC} locale category determines the radix character to use in this format. If no precision is specified, then six digits are output. If the precision is 0 (zero), then no radix character will be displayed. The \texttt{E} conversion character produces a number with \texttt{E} instead of \texttt{e} before the exponent. The exponent always contains at least two digits. However, if the value to be printed requires an exponent greater than two digits, additional exponent digits are printed as necessary.

\texttt{g}, \texttt{G}  
Accepts a float or double value and converts it in the style of the \texttt{f} or \texttt{e} conversion characters (or \texttt{E} in the case of the \texttt{G} conversion), with the precision specifying the number of significant digits. Trailing zeros are removed from the result. A radix character is displayed only if it is followed by a digit. The style used depends on the value converted. Style \texttt{g} results only if the exponent resulting from the conversion is less than \texttt{-4}, or if it is greater than or equal to the precision.

\texttt{c}  
Accepts a value as a string and prints the first character in the string.

\texttt{s}  
Accepts a value as a string and prints characters from the string until the end of the string is encountered or the number of characters indicated by the precision is reached. If no precision is specified, all characters up to the first null character are printed.

\texttt{b}  
Accepts a value as a string, that may contain backslash-escape sequences. Bytes from the converted string are printed until the end of the string or number of bytes indicated by the precision specification is reached. If the precision is omitted, all bytes until the first null character are printed.

The following backslash-escape sequences are supported:

- The escape sequences previously listed above under the description of the \texttt{Format} parameter. These are converted to the individual characters they represented.

- The \texttt{\c} (backslash c) sequence, which is not displayed and causes the \texttt{printf} command to ignore any remaining characters in the string parameter containing it, any remaining string parameters, and any additional characters in the \texttt{Format} parameter.
Exit Status
This command returns the following exit values:

0 Successful completion.
>0 An error occurred.

Examples
1. Enter the following command:
   ```
   printf "%5d%4d\n" 1 21 321 4321 54321
   ```
   This produces the following output:
   
   |   |  
   |---|---|
   | 1 | 21 |
   | 321| 4321|
   | 54321| 0 |
   
   The *Format* parameter is used three times to print all of the given strings. The 0 (zero) is supplied by the *printf* command to satisfy the last %4d conversion specification.

2. Enter the following command:
   ```
   printf "%c %c\n" 78 79
   ```
   This produces the following output:
   
   |   |  
   |---|---|
   | 7 | 7 |

3. The following example demonstrates how the %$ format specifier can be used to print the date in an order different from the order of the arguments:
   ```
   printf ("%1$s,%3$d.%2$s,%4$s:%5$.2d", weekday, month, day, hour, min);
   Sunday, 3. July, 10:02
   (weekday, day, month, hour:min)
   ```

Files
`/usr/bin/printf` Contains the *printf* command.

Related Information
The `/usr/bin/echo` command.

The *printf* subroutine in *AIX 5L Version 5.3 Technical Reference: Base Operating System and Extensions*.

The *Input and Output Handling Programmer’s Overview* in *AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs* describes the files, commands, and subroutines used for low-level, stream, terminal, and asynchronous I/O interfaces.


**proccred Command**

**Purpose**
Prints the credentials (effective, real, saved user IDs and group IDs) of processes.

**Syntax**
```
proccred [ProcessID] ...
```
Description
The `/proc` filesystem provides a mechanism to control processes. It also gives access to information about the current state of processes and threads, but in binary form. The proctools commands provide ascii reports based on some of the available information.

Most of the commands take a list of process IDs or `/proc/ProcessID` strings as input. The shell expansion `/proc/*` can therefore be used to specify all processes in the system.

Each of the proctools commands gathers information from `/proc` for the specified processes and displays it to the user. The proctools commands like procrun and procstop start and stop a process using the `/proc` interface.

The information gathered by the commands from `/proc` is a snapshot of the current state of processes, and therefore can vary at any instant except for stopped processes.

The `proccred` command prints the credentials (effective, real, saved user IDs and group IDs) of processes.

Flags

```
ProcessID
```
Specifies the process id.

Examples

1. To display the credentials of process 5046, enter:
   
   ```
   proccred 5046
   ```

Files

```
/proc
```
Contains the `/proc` filesystem.

Related Information

The `procfiles`, `procflags`, `procldd`, `procmap`, `procrun`, `procsg`, `procstack`, `procstop`, `proctree`, `procwait` commands.

---

procfiles Command

Purpose
Reports information about all file descriptors opened by processes.

Syntax

```
procfiles \[ [-F] \[ -n ]\] \[ ProcessID \] ...
```

Description
The `/proc` filesystem provides a mechanism to control processes. It also gives access to information about the current state of processes and threads, but in binary form. The proctools commands provide ascii reports based on some of the available information.

Most of the commands take a list of process IDs or `/proc/ProcessID` strings as input. The shell expansion `/proc/*` can therefore be used to specify all processes in the system.
Each of the proctools commands gathers information from `/proc` for the specified processes and displays it to the user. The proctools commands like procrun and procstop start and stop a process using the `/proc` interface.

The information gathered by the commands from `/proc` is a snapshot of the current state of processes, and therefore can vary at any instant except for stopped processes.

The `procfiles` command reports information on all file descriptors opened by processes. With the `-n` option it also displays the names of the corresponding files.

**Flags**

- `-F` Forces procfiles to take control of the target process even if another process has control.
- `-n` Prints the names of the files referred to by file descriptors.
- `ProcessID` Specifies the process id.

**Examples**

1. To display status and control information on the file descriptors opened by process 11928, enter:
   ```
   procfiles 11928
   ```
   The output of this command might look like this:
   ```
   11928 : -sh
   Current rlimit: 2000 file descriptors
   0: S_IFCHR mode:0622 dev:10,4 ino:2584 uid:100 gid:100 rdev:28,1
      O_RDONLY
   1: S_IFCHR mode:0622 dev:10,4 ino:2584 uid:100 gid:100 rdev:28,1
      O_RDONLY
   2: S_IFCHR mode:0622 dev:10,4 ino:2584 uid:100 gid:100 rdev:28,1
      O_RDONLY
   63: S_IFREG mode:0600 dev:10,8 ino:311 uid:100 gid:100 rdev:40960,10317
      O_RDONLY size:2574
   ```

2. To display name, status and control information on the file descriptors opened by process 15502, enter:
   ```
   procfiles -n 15502
   ```
   The output of this command might look like this:
   ```
   15502 : /home/guest/test
   Current rlimit: 2000 file descriptors
   0: S_IFCHR mode:0622 dev:10,4 ino:2584 uid:100 gid:100 rdev:28,1
      O_RDONLY
   1: S_IFCHR mode:0622 dev:10,4 ino:2584 uid:100 gid:100 rdev:28,1
      O_RDONLY
   2: S_IFCHR mode:0622 dev:10,4 ino:2584 uid:100 gid:100 rdev:28,1
      O_RDONLY
   3: S_IFREG mode:0644 dev:10,7 ino:26 uid:100 gid:100 rdev:0,0
      O_RDONLY size:0 name:/tmp/foo
   ```

**Files**

- `/proc` Contains the `/proc` filesystem.
Related Information

The `proccred` command, `procflags` command, `procldd` command, `procmap` command, `procrun` command, `procsig` command, `procstack` command, `procstop` command, `proctree` command, `procwait` command.

`procflags` Command

**Purpose**

Prints the /proc tracing flags, the pending and held signals, and other /proc status information for each thread in the specified processes.

**Syntax**

`procflags [-r] [ProcessID]` ...

**Description**

The /proc filesystem provides a mechanism to control processes. It also gives access to information about the current state of processes and threads, but in binary form. The proctools commands provide ascii reports based on some of the available information.

Most of the commands take a list of process IDs or /proc/ProcessID strings as input. The shell expansion /proc/* can therefore be used to specify all processes in the system.

Each of the proctools commands gathers information from /proc for the specified processes and displays it to the user. The proctools commands like procrun and procstop start and stop a process using the /proc interface.

The information gathered by the commands from /proc is a snapshot of the current state of processes, and therefore can vary at any instant except for stopped processes.

The `procflags` command prints the /proc tracing flags, the pending and held signals, and other /proc status information for each thread in the specified processes. The machine register contents are printed when option `-r` is used and the process is stopped on an event of interest. The events of interest are PR_REQUESTED, PR_FAULTED, PR_SYSENTRY, and PR_SYSEXIT as defined in <sys/procfs.h>.

**Flags**

- `-r`  
  Displays the current machine registers state if a process is stopped in an event of interest.

- `ProcessID`  
  Specifies the process id.

**Examples**

1. To display the tracing flags of process 5046, enter:

   `procflags 5046`

   The output of this command might look like this:

   ```
   5046 : -sh
   data model = _ILP32  flags = PR_FORK
   /4289:  flags = PR_ASLLEEP | PR_NOREGS
   ```

2. To display the tracing flags and registers values of process 5040 which was stopped on an event of interest, enter:

   `procflags -r 5040`
The output of this command might look like this:

```
5040 : ls
data model = _ILP32 flags = PR_FORK
/6999: flags = PR_STOPPED | PR_ISTOP
why = PR_FAULTED  what = FLTBPT what = kfork
gpr  0 = 0x0  gpr1 = 0x2ff227b0  gpr2 = 0xf0083bec
gpr  3 = 0x2ff22cb3  gpr4 = 0x11  gpr5 = 0x65
gpr  6 = 0x50  gpr7 = 0x0  gpr8 = 0x41707a7c
gpr  9 = 0x4c4f47  gpr10 = 0x80000000  gpr11 = 0x34e0
gpr 12 = 0x0  gpr13 = 0xdeadbeef  gpr14 = 0x1
gpr15 = 0x2ff22c0c  gpr16 = 0x2ff22c14  gpr17 = 0x0
gpr18 = 0xdeadbeef  gpr19 = 0xdeadbeef  gpr20 = 0xdeadbeef
gpr21 = 0xdeadbeef  gpr22 = 0x10  gpr23 = 0xfd
gpr24 = 0x2f  gpr25 = 0x2ff227f0  gpr26 = 0x0
```

Files

/proc

Contains the /proc filesystem.

Related Information

The proccred command, procfiles command, procldd command, procmap command, procrun command, procsize command, proctest command, procstop command, proctree command, proctime command, procwait command.

procldd Command

Purpose

Lists the objects loaded by processes, including shared objects explicitly attached using dlopen().

Syntax

```
procldd [ -F ] [ ProcessID ] ...
```

Description

The /proc filesystem provides a mechanism to control processes. It also gives access to information about the current state of processes and threads, but in binary form. The proctools commands provide ascii reports based on some of the available information.

Most of the commands take a list of process IDs or /proc/ProcessID strings as input. The shell expansion /proc/* can therefore be used to specify all processes in the system.

Each of the proctools commands gathers information from /proc for the specified processes and displays it to the user. The proctools commands like procrun and procstop start and stop a process using the /proc interface.

The information gathered by the commands from /proc is a snapshot of the current state of processes, and therefore can vary at any instant except for stopped processes.

The procldd command lists the objects loaded by processes, including shared objects explicitly attached using dlopen(). All the information needed is gathered from the /proc/ProcessID/map files.
Flags

- **-F**

  Forces procldd to take control of the target process even if another process has control.

  Specifies the process id.

**Examples**

1. To display the list of objects loaded by process 12644, enter:

   ```
   procldd 12644
   ```

   The output of this command might look like this:

   ```
   12644 : -ksh
   ksh
   /usr/lib/libiconv.a[shr4.o]
   /usr/lib/libi18n.a[shr.o]
   /usr/lib/nls/loc/en_US
   /usr/lib/libcrypt.a[shr.o]
   /usr/lib/libc.a[shr.o]
   ```

**Files**

/proc

Contains the /proc filesystem.

Related Information

The `proccred` command, `procfiles` command, `procflags` command, `procmap` command, `procrun` command, `procsig` command, `procstack` command, `procstop` command, `proctree` command, `procwait` command, `procwdx` command.

**procmapper Command**

**Purpose**

Prints the address space map of processes.

**Syntax**

```
procmapper [ -F ] [ ProcessID ] ...
```

**Description**

The /proc filesystem provides a mechanism to control processes. It also gives access to information about the current state of processes and threads, but in binary form. The proctools commands provide ascii reports based on some of the available information.

Most of the commands take a list of process IDs or /proc/ProcessID strings as input. The shell expansion /proc/* can therefore be used to specify all processes in the system.

Each of the proctools commands gathers information from /proc for the specified processes and displays it to the user. The proctools commands like procrun and procstop start and stop a process using the /proc interface.

The information gathered by the commands from /proc is a snapshot of the current state of processes, and therefore can vary at any instant except for stopped processes.
The **procmap** command prints the address space map of processes. It displays the starting address and size of each of the mapped segments in the process. It gets all the information necessary from the `/proc/ProcessID/map` files.

### Flags

**-F**
- Forces procmap to take control of the target process even if another process has control.

**ProcessID**
- Specifies the process id.

### Examples

1. To display the address space of process 12644, enter:
   ```
   procmap 12644
   ```
   The output of this command might look like this:
   ```
   12644 : -ksh
   10000000  232K  read/exec  ksh
   200000f8  54K  read/write  ksh
   d008b100  80K  read/exec  /usr/lib/libiconv.a[shr4.0]
   f03e4c70  41K  read/write  /usr/lib/libiconv.a[shr4.o]
   d0080100  40K  read/exec  /usr/lib/libi18n.a[shr.o]
   f03f0b78  4K  read/write  /usr/lib/libi18n.a[shr.o]
   d007a000  11K  read/exec  /usr/lib/nls/loc/en_US
   d007d130  8K  read/write  /usr/lib/nls/loc/en_US
   d00790f8  2K  read/exec  /usr/lib/libcrypt.a[shr.o]
   f03e3508  0K  read/write  /usr/lib/libcrypt.a[shr.o]
   d02156c0  2282K  read/exec  /usr/lib/libc.a[shr.o]
   f03474e0  621K  read/write  /usr/lib/libc.a[shr.o]
   Total  3380K
   ```

### Files

**/proc**
- Contains the `/proc` filesystem.

### Related Information

The **proccred** command, **procfiles** command, **procflags** command, **procldd** command, **procrun** command, **procsig** command, **procstack** command, **procstop** command, **proctree** command, **procwait** command, **procwdx** command.

### procrun Command

#### Purpose

Starts a process that has stopped on the **PR_REQUESTED** event.

#### Syntax

```
procrun [ProcessID] ...
```

#### Description

The `/proc` filesystem provides a mechanism to control processes. It also gives access to information about the current state of processes and threads, but in binary form. The proctools commands provide ascii reports based on some of the available information.
Most of the commands take a list of process IDs or /proc/ProcessID strings as input. The shell expansion /proc/* can therefore be used to specify all processes in the system.

Each of the proctools commands gathers information from /proc for the specified processes and displays it to the user. The proctools commands like procrun and procstop start and stop a process using the /proc interface.

The information gathered by the commands from /proc is a snapshot of the current state of processes, and therefore can vary at any instant except for stopped processes.

The procrun command starts the process that has stopped on the PR_REQUESTED event.

Flags
ProcessID Specifies the process id.

Examples
1. To restart process 30192 which was stopped on the PR_REQUESTED event, enter:
   procrun 30192

Files
/proc Contains the /proc filesystem.

Related Information
The proccred command, procfiles command, procflags command, procidd command, procmmap
command, procsig command, procsstack command, procstop command, proctree command, procwait
command, procwdx command.

procsig Command

Purpose
Lists the signal actions defined by processes.

Syntax
procsig [ ProcessID ] ...

Description
The /proc filesystem provides a mechanism to control processes. It also gives access to information about the current state of processes and threads, but in binary form. The proctools commands provide ascii reports based on some of the available information.

Most of the commands take a list of process IDs or /proc/ProcessID strings as input. The shell expansion /proc/* can therefore be used to specify all processes in the system.

Each of the proctools commands gathers information from /proc for the specified processes and displays it to the user. The proctools commands like procrun and procstop start and stop a process using the /proc interface.

The information gathered by the commands from /proc is a snapshot of the current state of processes, and therefore can vary at any instant except for stopped processes.
The `procsig` command lists the signal actions defined by processes.

**Flags**

`ProcessID` Specifies the process id.

**Examples**

1. To list all the signal actions defined for process 11928, enter:

   ```
   procsig 11928
   ```

   The output of this command might look like this:

   ```
   HUP   caught
   INT   caught
   QUIT  caught
   ILL   caught
   TRAP  caught
   ABRT  caught
   EMT   caught
   FPE   caught
   KILL  default  RESTART
   BUS   caught
   SEGV  default
   SYS   caught
   PIPE  caught
   ALRM  caught
   TERM  ignored
   URG   default
   STOP  default
   TSTP  ignored
   CONT  default
   CHILD default
   TTIN  ignored
   TTOU  ignored
   IO    default
   XCPU  default
   XFSZ  ignored
   MSG   default
   WINCH default
   PWR   default
   USR1  caught
   USR2  caught
   PROF  default
   DANGER default
   VTALRM default
   MIGRATE default
   PRE   default
   VIRT  default
   MIGRATE default
   WAITING default
   CPUFAIL default
   KAP   default
   RETRACT default
   SOUND default
   SAK   default
   ```

**Files**

`/proc` Contains the `/proc` filesystem.
Related Information
The `proccred` command, `procfiles` command, `procflags` command, `procidd` command, `procmap` command, `procrun` command, `procstack` command, `procstop` command, `proctree` command, `procwait` command, `procwdx` command.

---

**procstack Command**

**Purpose**
Prints the hexadecimal addresses and symbolic names for all the threads in the process.

**Syntax**
`procstack [-F] [ProcessID] ...

**Description**
The `/proc` filesystem provides a mechanism to control processes. It also gives access to information about the current state of processes and threads, but in binary form. The proctools commands provide ascii reports based on some of the available information.

Most of the commands take a list of process IDs or `/proc/ProcessID` strings as input. The shell expansion `/proc/*` can therefore be used to specify all processes in the system.

Each of the proctools commands gathers information from `/proc` for the specified processes and displays it to the user. The proctools commands like procrun and procstop start and stop a process using the `/proc` interface.

The information gathered by the commands from `/proc` is a snapshot of the current state of processes, and therefore can vary at any instant except for stopped processes.

The `procstack` command prints the hexadecimal addresses and symbolic names for all the threads in the process.

**Flags**

- `-F` Forces proctool to take control of the target process even if another process has control.

- `ProcessID` Specifies the process id.

**Examples**
1. To display the current stack of process 11928, enter:
   ```
   procstack 11928
   ```
   The output of this command might look like this:
   ```
   11928 : -sh
   d01d15c4 waitpid (? , ? , ?) + e0
   10007a1c job_wait (?) + 144
   10020298 xec_switch (?, ?, ?, ?) + 9c0
   10021db4 sh_exec (?, ?, ?) + 304
   10001370 execfile () + 628
   10000300 main (?, ?) + alc
   10000100 __start () + 8c
   ```
2. To display the current stack of all the threads of the multi-threaded process 28243 for application `appl`, enter:
The output of this command would look like this:

```
28243 : appl
        tid# 54321
        d0059eb4 _p_nslee (?, ?) + 10
        d01f1fc8 nsleep (?, ?) + b4
        d026a6c0 sleep (?) + 34
        100003a8 main () + 98
        10000128 _start () + 8c
        d0059eb4 _p_nslee (?, ?) + 10
        d01f1fc8 nsleep (?, ?) + b4
        d026a6c0 sleep (?) + 34
        10000480 PrintHello (d) + 30
        d004b314 _pthread_body (?) + ec
        d0059eb4 _p_nslee (?, ?) + 10
        d01f1fc8 nsleep (?, ?) + b4
        d026a6c0 sleep (?) + 34
        10000480 PrintHello (c) + 30
        d004b314 _pthread_body (?) + ec
```

Files

/proc Contains the /proc filesystem.

Related Information

The `proccred` command, `procfiles` command, `procflags` command, `procldd` command, `procmap` command, `procrun` command, `procsig` command, `procstop` command, `proctree` command, `procwait` command.

procstop Command

Purpose

Stops processes on the PR_REQUESTED event.

Syntax

```
procstop [ProcessID] ...
```

Description

The /proc filesystem provides a mechanism to control processes. It also gives access to information about the current state of processes and threads, but in binary form. The proctools commands provide ascii reports based on some of the available information.

Most of the commands take a list of process IDs or /proc/ProcessID strings as input. The shell expansion /proc/* can therefore be used to specify all processes in the system.

Each of the proctools commands gathers information from /proc for the specified processes and displays it to the user. The proctools commands like procrun and procstop start and stop a process using the /proc interface.

The information gathered by the commands from /proc is a snapshot of the current state of processes, and therefore can vary at any instant except for stopped processes.
The `procstop` command stops processes on the `PR_REQUESTED` event.

**Flags**

`ProcessID` Specifies the process id.

**Examples**

1. To stop process 7500 on the `PR_REQUESTED` event, enter:

   `procstop 7500`

**Files**

/proc Contains the /proc filesystem.

**Related Information**

The `proccred` command, `procfiles` command, `procflags` command, `procidd` command, `procmmap` command, `procrun` command, `procsig` command, `procstack` command, `proctree` command, `procwait` command.

**proctree Command**

**Purpose**

Prints the process tree containing the specified process IDs or users.

**Syntax**

```
proctree [ -a ] [ \{ ProcessID | User \} ]
```

**Description**

The /proc filesystem provides a mechanism to control processes. It also gives access to information about the current state of processes and threads, but in binary form. The proctools commands provide ascii reports based on some of the available information.

Most of the commands take a list of process IDs or /proc/ProcessID strings as input. The shell expansion /proc/* can therefore be used to specify all processes in the system.

Each of the proctools commands gathers information from /proc for the specified processes and displays it to the user. The proctools commands like procrun and procstop start and stop a process using the /proc interface.

The information gathered by the commands from /proc is a snapshot of the current state of processes, and therefore can vary at any instant except for stopped processes.

The `proctree` command prints the process tree containing the specified process IDs or users. The child processes are indented from their respective parent processes. An argument of all digits is taken to be a process ID, otherwise it is assumed to be a user login name. The default action is to report on all processes, except children of process 0.
Flags

-a  Include children of process 0 in the display. The default is to exclude them.

ProcessID  Specifies the process id.

User  Specifies the User.

Examples

1. To display the ancestors and all the children of process 12312, enter:
   proctree 12312

   The output of this command might look like this:
   4954 /usr/sbin/srcmstr
   7224 /usr/sbin/inetd
   5958 telnetd -a
   13212 -sh
   14718 ./proctree 13212

2. To display the ancestors and children of process 12312, including children of process 0, enter:
   proctree -a 12312

   The output of this command might look like this:
   1 /etc/init
   4954 /usr/sbin/srcmstr
   7224 /usr/sbin/inetd
   5958 telnetd -a
   13212 -sh
   14724 ./proctree -a 13212

Files

/proc  Contains the /proc filesystem.

Related Information

The proccred command, procfiles command, procflags command, procldd command, procmap command, procrun command, proc sig command, procsig command, procstack command, procstop command, procwd command, procwait command.

procwait Command

Purpose

Waits for all of the specified processes to terminate.

Syntax

procwait [-v] [ProcessID] ...

Description

The /proc filesystem provides a mechanism to control processes. It also gives access to information about the current state of processes and threads, but in binary form. The proctools commands provide ascii reports based on some of the available information.

Most of the commands take a list of process IDs or /proc/ProcessID strings as input. The shell expansion /proc/* can therefore be used to specify all processes in the system.
Each of the proctools commands gathers information from /proc for the specified processes and displays it to the user. The proctools commands like procrun and procstop start and stop a process using the /proc interface.

The information gathered by the commands from /proc is a snapshot of the current state of processes, and therefore can vary at any instant except for stopped processes.

The procwait command waits for all of the specified processes to terminate.

**Flags**

- `-v` Specifies verbose output. Reports terminations to standard output.

  `ProcessID` Specifies the process id.

**Examples**

1. To wait for process 12942 to exit and display the status, enter:
   
   `procwait -v 12942`

   The output of this command might look like this:

   `12942 : terminated, exit status 0`

**Files**

/proc Contains the /proc filesystem.

**Related Information**

The proccred command, procfiles command, procflags command, procidd command, procmap command, procrun command, procsig command, procstack command, procstop command, proctree command, procwdx command.

---

**procwdx Command**

**Purpose**

Prints the current working directory of processes.

**Syntax**

`procwdx [-F] [ProcessID] ...`

**Description**

The /proc filesystem provides a mechanism to control processes. It also gives access to information about the current state of processes and threads, but in binary form. The proctools commands provide ascii reports based on some of the available information.

Most of the commands take a list of process IDs or /proc/ProcessID strings as input. The shell expansion /proc/* can therefore be used to specify all processes in the system.

Each of the proctools commands gathers information from /proc for the specified processes and displays it to the user. The proctools commands like procrun and procstop start and stop a process using the /proc interface.
The information gathered by the commands from /proc is a snapshot of the current state of processes, and therefore can vary at any instant except for stopped processes.

The procwdx command prints the current working directory of processes.

**Flags**

- **-F** Forces procfiles to take control of the target process even if another process has control.

**ProcessID**

Specifies the process id.

**Examples**

1. To display the current working directory of process 11928, enter:
   
   ```
   procwdx 11928
   ```

   The output of this command might look like this:

   ```
   11928: /home/guest
   ```

**Files**

/proc Contains the /proc filesystem.

**Related Information**

The proccred command, procfiles command, procflgs command, proclldd command, procmap command, procrun command, procsig command, procstack command, procstop command, proctree command, procwait command.

---

### prof Command

**Purpose**

Displays object file profile data.

**Syntax**

```bash
prof [ -i | -c | -a | -n ] [ -o | -x ] [ -g ] [ -z ] [ -h ] [ -s ] [ -S ] [ -v ] [ -L PathName ] [ Program ] [ -m MonitorData ... ]
```

**Description**

The prof command interprets profile data collected by the monitor subroutine for the object file Program (a.out by default). It reads the symbol table in the object file Program and correlates it with the profile file (mon.out by default). The prof command displays, for each external text symbol, the percentage of execution time spent between the address of that symbol and the address of the next, the number of times that function was called, and the average number of milliseconds per call.

**Note:** Symbols from C++ object files have their names demangled before they are used.

To tally the number of calls to a function, you must have compiled the file using the cc command with the -p flag. The -p flag causes the compiler to insert a call to the mcount subroutine into the object code generated for each recompiled function of your program. While the program runs, each time a parent calls a child function the child calls the mcount subroutine to increment a distinct counter for that parent-child pair. Programs not recompiled with the -p flag do not have the mcount subroutine inserted and therefore keep no record of which function called them.
The `-p` flag also arranges for the object file to include a special profiling startup function that calls the `monitor` subroutine when the program begins and ends. The call to the `monitor` subroutine when the program ends actually writes the `mon.out` file. Therefore, only programs that explicitly exit or return from the main program cause the `mon.out` file to be produced.

**Note:** To change the name of the generated output file, use the PROF environment variable and set it as follows:

```
PROF=filename:<filename>
```

For example, if you set `PROF=myprof`, then the generated file will be named as `myprof.out`.

The location and names of the objects loaded are stored in the `mon.out` file. If you do not select any flags, `prof` will use these names. You must specify a program or use the `-L` option to access other objects.

**Note:** Imported external routine calls, such as a call to a shared library routine, have an intermediate call to local `glink` code that sets up the call to the actual routine. If the timer clock goes off while running this code, time is charged to a routine called `routine.gl`, where `routine` is the routine being called. For example, if the timer goes off while in the `glink` code to call the `printf` subroutine, time is charged to the `printf.gl` routine.

### Flags

The mutually exclusive flags `a`, `c`, `n`, and `t` determine how the `prof` command sorts the output lines:

- `-a` Sorts by increasing symbol address.
- `-c` Sorts by decreasing number of calls.
- `-n` Sorts lexically by symbol name.
- `-t` Sorts by decreasing percentage of total time (default).

**Note:** The `prof` command can still run successfully if you use more than one of flags `a`, `c`, `n`, and `t` in the same command. The `prof` command accepts the first of these flags it encounters on the command line and ignores the others.

The mutually exclusive flags `o` and `x` specify how to display the address of each symbol monitored.

- `-o` Displays each address in octal, along with the symbol name.
- `-x` Displays each address in hexadecimal, along with the symbol name.

**Note:** The `prof` command can still run successfully if you use both the `-o` and `-x` flags in the same command. The `prof` command accepts the first of these two flags it encounters on the command line and ignores the other flag.

Use the following flags in any combination:

- `-g` Includes non-global symbols (static functions).
- `-h` Suppresses the heading normally displayed on the report. This is useful if the report is to be processed further.
- `-L PathName` Uses alternate path name for locating shared objects.
- `-m MonitorData` Takes profiling data from `MonitorData` instead of `mon.out`.
- `-s` Produces a summary file in `mon.sum`. This is useful when more than one profile file is specified.
- `-S` Displays a summary of monitoring parameters and statistics on standard error.
Suppresses all printing and sends a graphic version of the profile to standard output for display by the plot filters. When plotting, low and high numbers, by default 0 and 100, can be given to cause a selected percentage of the profile to be plotted with accordingly higher resolution.

Includes all symbols in the profile range, even if associated with 0 (zero) calls and 0 (zero) time.

**Examples**

1. To display, without a header, the amount of time spent at each symbol address, sorted by time, enter:
   ```
   prof -t -h
   ```
2. The following example obtains a local version of any shared libraries used to create the runfile file in the `/home/score/lib` directory. The data file used will be `runfile.mon` rather than `mon.out`.
   ```
   prof -x -L/home/score/lib runfile -m runfile.mon
   ```

**Files**

- `mon.out`: Default profile.
- `a.out`: Default object file.
- `mon.sum`: Summary profile.

**Related Information**

- The `cc` command, `nm` command, `gprof` command.
- The `exit` subroutine, `profil` subroutine, `monitor` subroutine.
- The `Commands` in *Operating system and device management*.
- The `Subroutines Overview` in *AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs*.

**proff Command**

**Purpose**

Formats text for printers with personal printer data streams.

**Syntax**

```bash
proff [ -L List ] [ -P Printer ] [ -t ] [ nroffFlags ] [ File ... ]
```

**Description**

The `proff` command formats text by using the `nroff` command on the specified files for printers that support ppds (personal printer data streams), such as the Quietwriter III printer, the Quickwriter printer, and the Proprinter printer.

If no file is specified, standard input is read. A parameter value of - (minus) specifies standard input.

**Parameters**

- `nroffFlags`: Specifies the `nroff` command flags used by the `proff` command to format the text file for a ppds-supported printer output.
- `File`: Specifies the text file that the `proff` command formats for printers that support ppds.
Flags

-List

Passes the specified list as flags for the qprt command.

To pass a single flag to the qprt command, use the -L flag followed immediately by the nroff command flag being passed. For example:

-\texttt{L-h}.

To pass multiple flags or a string to the lpr command, use the -L flag followed immediately by the flags or string enclosed by " " (double quotes):

\texttt{-L"-h -r -m"}.

\texttt{-P}

Sends output to a specified printer corresponding to an entry in the \texttt{/etc/qconfig} file. The default is taken from the PRINTER environment variable, if it exists; otherwise the system default queue name is used.

\texttt{-t}

Sends output to standard output.

\texttt{-}

Specifies that standard input is used as the source for the formatting process.

All other flags are passed to the nroff command.

Example

The following is a typical command sequence to process output for the IBM Proprinter printer:

\texttt{proff -t testfile}

Environment Variable

\texttt{PRINTER}

Specifies the desired printer queue.

Files

\texttt{/usr/share/lib/nterm/tab.ppds}

Contains driving tables for printers with personal printer data streams.

\texttt{/etc/qconfig}

Describes the queues and devices.

Related Information

The \texttt{col} command, \texttt{eqn} command, \texttt{lpr} command, \texttt{nroff} command, \texttt{qprt} command, \texttt{tbl} command.

projctl Command

Purpose

Supports project-based advanced accounting activities.

Syntax

\texttt{projctl add projname projnumber [comment] [ { -d projpath | -p [DN] } ]}

\texttt{projctl merge sourceprojpath [ -d targetprojfile ]}

\texttt{projctl rm projname [ { -d projpath | -p [DN] } ]}

\texttt{projctl chg projname [ -p pid [, pid] ] -f}

\texttt{projctl exec projname <cmd line> -f}
The various subcommands of `projctl` command perform project-based advanced accounting activities such as adding a new project, removing a new project, and loading a specific accounting policy. These various options of `projctl` command are as explained below.

**Flags**

- `-a`  Automatically loads the policies during system reboot.
-d Generally specifies the path from where the project definition file or the admin policy file should be referred. When used in the merge subcommand, it specifies the target project definition file where the merged project definitions are to be stored.

-f Overrides the policy rules when specified with chg and exec subcommands. Clears the project assigned to the processes when called with unldall subcommand. Force unload all the project definitions when called with unldprojs subcommand.

-g Specifies that the projects and policies are to be downloaded from the LDAP repository.

-n Sorts the list of project definitions based on the name.

-p When used in the chg subcommand, passes the list of process IDs that require a change in project assignment. When used in the add, rm, and chattr subcommands, specifies the LDAP DN where the project definition is to be updated. When used in the ld and unld subcommands, specifies that the projects and policies are to be uploaded to the LDAP repository. Its argument indicates the DN where the projects and policies are to be uploaded.

-r Reloads the policies.

-s Used in projct chattr agg subcommand to enable the project aggregation property.

-u Used in projct chattr agg subcommand to disable the project aggregation property.

### Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>admpath</td>
<td>Path from where to select the admin policy file.</td>
</tr>
<tr>
<td>appname</td>
<td>Absolute path of the application whose project assignment list is requested.</td>
</tr>
<tr>
<td>cmdline</td>
<td>Absolute path of the command to be executed through projct exec command.</td>
</tr>
<tr>
<td>comment</td>
<td>Project comments.</td>
</tr>
<tr>
<td>DN</td>
<td>Distinguished Name that indicates the absolute path to the project and policy objects on the LDAP server.</td>
</tr>
<tr>
<td>name</td>
<td>Name of the alternate admin policy definitions on the LDAP server.</td>
</tr>
<tr>
<td>pid</td>
<td>Process IDs.</td>
</tr>
<tr>
<td>projname</td>
<td>Name of the project.</td>
</tr>
<tr>
<td>projnumber</td>
<td>Numeric value for the project.</td>
</tr>
<tr>
<td>propath</td>
<td>Path from where to select the project definition file.</td>
</tr>
<tr>
<td>sourcepropath</td>
<td>Path from where the project definition file to be merged is to be picked up.</td>
</tr>
<tr>
<td>targetprofile</td>
<td>Target project definition file where the project definitions should be merged.</td>
</tr>
</tbody>
</table>

### Subcommands

#### add Subcommand

The add subcommand adds the definition of the project to the project definition file. If the –d flag is specified then the project definition is added into the project definition file, under the named path. The default is to add to the /etc/project/projdef system project definition file. The project definition file under any other path should be named as .projdef:. If the new project is to be added to the system project definition file and the projects are already loaded in kernel, then the specified new project will be added into kernel project registry. Otherwise, the entry will be made only in the file. The add subcommand takes the project name, project number, and an option argument for project comments as parameters. By default, the aggregation property of the project will be set to no for all the projects created using this command.

If -p is specified, the new project definition is added to default project DN or the specified DN on the LDAP server. If -p is not specified, .config will provide source information. Running the -p option requires root authority.

Each entry created by projct add in the Project Definition File has the following format:

ProjectName:ProjectNumber:AggregationStatus::Comment

Examples for Project Definitions that illustrate the file format are as follows:
chattr agg Subcommand
The chattr agg subcommand enables and disables aggregation property for the given project. If -s flag is used the aggregation is enabled. If -u flag is used aggregation is disabled. If -d flag is specified then the project definition is updated in the project definition file under the specified path. The default is to update the system project definition file (/etc/project/projdef). If the update is to the system project definition file and it is already loaded in kernel, then the specified new project is updated in kernel project registry as well. Otherwise, the changes will be made only to the project definition file.

If -p is specified, the project definition is modified on default project DN or the specified DN on the LDAP server. If -p is not specified, .config will provide source information. Executing the -p option requires root authority.

chg Subcommand
The chg subcommand enables the user to change the list of projects that the user is permitted to use for his processes. The intended project name is given as input to this subcommand. If the process IDs are provided as input, those processes will be classified under the specified project. If there are no process IDs provided as input, the project change will happen to the process which started the projctl command.

By default, the chg subcommand changes the project assignment within the scope of available rules. To override the rules and assign a project directly to a process, the -f force option must be specified.

chk Subcommand
The chk subcommands check the validity of various project policies. The subcommands validate the projects and policies so that they can be loaded safely into the kernel. There are several chk subcommands to support various project policies. The subcommands include:

chkadm Validates the admin policies. Each rule in the admin policy file usually has four attributes: user-id, group-id, application path name, and the project names. The chkadm subcommand checks whether these attributes are valid and reports any errors found in the policies. When the -d option is used, the chkadm subcommand uses the admin policy file from the specified path for checking the rules. It also uses the alias and the temporary project definition file (.projdef), if required. The projects used in the rule will be first searched in the system project definition file. If it is not found there, then the .projdef file under the specified path will be used.

chkall Performs all the above validation activities, that is, it validates projects, user, group and admin policies. When the -d option is used, the chkadm subroutine uses the admin, alias, and project definition files from the specified path to validate the admin policies.

chkgrp Validates the group policies. The validation involves checking whether the project list of the group contains valid projects.

chkprojs Validates the system project definition file. Project Definitions are validated for uniqueness, project name and number validity, and attributes validity. The project name should be a POSIX alphanumeric string and the project number should be within the numeric range 0x00000001 - 0x00ffffff. The project numbers can be either decimal or hexadecimal numbers. All hexadecimal numbers should be shown with a prefix of 0x. The aggregation property can be either y or n to indicate the status of aggregation. The chkprojs subcommand performs all these validity checks on the project definitions and reports any errors found with the project definitions.

chkusr Validates the user policies. The validation involves checking whether the project list of the user contains valid projects.

Note: If wildcard characters are used in the admin policy rules then chkadm and chkall subcommands expand the wildcard characters and validate the output obtained.
exec Subcommand
The exec subcommand allows a user to launch arbitrary commands with any of the project names from the list of projects on which the command can work. Similar to chg option, used to override the rules and use any project to run the command line, the -f force option should be used. To get the list of projects that the command can be assigned to, use the projctl qapp subcommand.

id Subcommand
The id subcommands are used to load and reload projects and policies. There are specific load commands to perform the load operation on a specific policy. These various subcommands are as follows:

id
Loads the policies, which should be loaded during the system startup. It refers the /etc/project/.config file to determine which policies to load. If the kernel is loaded already with any one policy or project definition, then this command simply returns.

ldadm
Loads the admin policies. Similar to ldusr and ldgrp subcommands, ldadm also checks and loads the projects first, if they are yet to be loaded. Then it loads the admin policy rules, after validating them. When the -d option is used, the admin policy file will be picked from the specified path. The alias and the temporary project definition file under the specified path will be used to check the existence of alias and project entries. After the policies are loaded, this subcommand also copies the admin policy file to /etc/project/.admin. Loading the admin policies related to LDAP is handled by the following -p and -g arguments:

projctl ldadm -g [name]
Specifies that an admin policy will be loaded into the kernel using the LDAP repository. If -g is not specified, the local admin policy (/etc/project/admin) will be downloaded into the kernel.

projctl ldadm -g [ [name]:]DN I name ] -d admpath
Specifies that an LDAP admin policy will be downloaded to a local file without downloading the policy into the kernel. The source admin policy is located at the specified DN or is found using the accounting DNs in the ldap.cfg. The -d parameter is used to specify where the policy files (projects, admin, and alias) are written. If the target location is below /etc/project/, the files are written according to the conventions used by the system. Files are written to:

• /etc/project/admin, /etc/project/alias, /etc/project/projdef
• /etc/project/idap/admin, /etc/project/idap/alias, /etc/project/idap/projdef
• /etc/project/projdef, /etc/project/alter/policyname/admin, .../alias
• /etc/project/idap/projdef, /etc/project/idap/alter/policyname/admin, .../alias

Otherwise, the three files are written to the specified directory. When an explicit DN is specified with the -g option, the projects are not downloaded because they could also be located on a different DN. In this case, the user has to download them separately.

projctl ldadm -p [ [name]:]DN I name ] -d admpath
Specifies that an admin policy located at the directory localpath will be uploaded to the LDAP server. This command also uploads projects that it finds in the localpath/projdef temporary project definition file.

When an explicit DN is specified with the -p option, only the admin policy is uploaded to the LDAP server because the projects could be located on a different DN. In this case, the user must explicitly upload the respective projdef file to the appropriate DN. The system does not know the identity of this DN.

The -d argument must be specified when the -g or -p arguments are used. The -r and -a arguments cannot be specified with the -p argument. If the -a argument is specified and the -g argument is not specified, the admin policies in the .config file are loaded. If the -r option is used, the .active file is used to determine the identity of the policies to load. The -r and -a options cannot be used together.

ldall
Downloads user, group, and admin policies into the kernel. Similar to the ldusr and ldgrp commands, this option attempts to download LDAP projects if an accounting DN has been specified for projects, because the User and Group Policies are not associated with Local or LDAP Users individually. This command attempts to download the default Admin policy using the configured admin DN in addition to downloading the Local Admin Policy.
ldgrp
Loads the group project policies. If they are not yet loaded, the ldgrp subcommand checks and loads the projects first. It then verifies the validity of the project list for all the groups and loads the rules.

ldprojs
Loads the project definitions from the system project definition /etc/project/projdef file. Before loading the projects, it checks the validity of the rules. If the rules are found to be valid, then it loads them.

projctl ldprojs -g
Specifies that the project definitions will be loaded into the kernel using the LDAP repository.

projctl ldprojs -p
Specifies that project definitions are to be uploaded to the LDAP server. If -g and the -p are not specified, the locally defined projects (/etc/project/projdef) are loaded into the kernel.

projctl ldprojs -g [DN] -d localpdfpath
Specifies that the project definition file from the LDAP repository will be downloaded to a local file without downloading the projects into the kernel. If the -d argument is not specified, the projects are downloaded to /etc/project/ldap/projdef and they are downloaded into the kernel. The -d argument directs you to create the file at the designated location, but not to download it into the kernel. In this case, the projdef file is created at the designated location rather than in the .projdef file. The source project definitions are located at the specified DN. Alternately, you can find them using the configured accounting DN in the ldap.cfg file.

projctl ldprojs -d localpdfpath
 Loads the local project definition file into the kernel.

projctl ldprojs -p [DN] -d localpdfpath
 Specifies that the project definitions located at the specified path will be uploaded to the LDAP server. The project definitions should be available in the projdef file at the specified directory. The -d argument must be specified when the -g or -p directs you to create the file at the designated location, but not to download it into the kernel. In this case, the projdef arguments are used. This way, the upload and download operations can be symmetric with respect to the specification of parameters. The -r and -a arguments cannot be specified with the -p argument. If the -a argument is specified and the -g argument is not specified, the project repositories in the .config file are loaded. If the -r option is used, the .active file is used to determine the project repositories to load. The -r and -a options cannot be used together.

ldusr
Loads the user project policies. If they are not yet loaded, the lduser subcommand checks and loads the projects first. It then verifies the validity of the project list for all the users and loads the rules.

Note:
- When -r option is used, all the above subcommands reload the respective policies. The ld -r subcommand queries the kernel to get the details of loaded policies and reloads them. The policy files to be reloaded will be referred from the /etc/project/.active file.
- When ldadm and ldall subcommands are issued with both the options -d and -r, -r will be ignored.
- All the ld subcommands update the /etc/project/.active file with the details of the policy that is loaded. When the -a option is passed, these subcommands also update the /etc/project/.config file in addition to updating the .active file. The /etc/project/.config file provides the details on the policies to be loaded automatically on system reboot.

merge Subcommand
The merge subcommand merges the projects defined in the project definition file under the specified path with the system project definition /etc/project/projdef file, by default. If a target project file name is passed using the -d option, the project definitions under the specified path are merged with the target project definition file. The merge operation will fail if there are conflicting entries between the target project definition file and the project definition file under the specified path. The merge command skips any duplicate entries to maintain unique entries in the target project definition file.
qapp Subcommand
The qapp subcommand displays the list of projects that an application can switch to in the current environment. It displays the list of all projects with which the specified application can be started.

qpolicy Subcommand
The qpolicy subcommand displays the currently loaded policies. This command queries the kernel to get the information about the types of loaded policies and displays them. If -g is specified, this command lists the policies from the LDAP default admin DN or from the specified DN.

qproj Subcommand
The qproj subcommand displays the details of the project name passed as its argument. If no argument is passed, then this subcommand lists all the project definitions in the system to which the calling process can be assigned. The display format will be the same as that of qprojs subcommand.

qprojs Subcommand
The qprojs subcommand displays the list of all the project definitions that is currently loaded in the kernel registry. The -n option provides the list sorted based on the project name. The display contains the project name, project number, and its aggregation status.

rm Subcommand
The rm subcommand removes the definition of locally defined projects from the project definition file. If the -d flag is specified, then the project definition is removed from the project definition file under the specified path. The default is to remove it from the system project definition file (/etc/project/projdef). If the update is to the system project definition file and it is already loaded in kernel, then the specified project is removed from kernel project registry. Otherwise, the entry will be removed only from the file.

If -p is specified, the source will be the LDAP from where the project definitions are to be removed. If an explicit DN is specified, the project definition will be removed from that specific DN. If no DN is passed, the default DN configured in the ldap.cfg file will be used. If the LDAP projects are currently loaded, the project definition is removed from the kernel project registry and the local LDAP project file also. Otherwise, only the LDAP repository is updated.

Note: The -p and -d options cannot be used together. If neither of these options are specified, the .config file will be used to provide the source information. This command requires root authority to execute.

unld Subcommand
The unld subcommands are used to unload project policies. Similar to the ld subcommands, the unld subcommands are used to unload specific policies. These various subcommands are as follows:

unldadm Unloads the admin policies.
unldall Unloads all the loaded policies.
unldgrp Unloads the group policies.
unldprojs Unloads only the project definitions.
unldusr Unloads the user policies.

Note:
- All these subcommands update the .active file after the respective policy is unloaded.
- When the -a option is used, the /etc/project/.config file is also updated with the unloaded status of the respective policy.
- The -g parameter specifies that the respective LDAP repository should be unloaded from the kernel. If -g is not specified, then the loaded repositories that are named in the .active file are unloaded.
- The -p option must be specified to remove the specified LDAP repository from the LDAP server.
• In the **unldadm** and **unsubcommand**, the *name* parameter indicates the admin policy name on the admin DN.

### Exit Status

<table>
<thead>
<tr>
<th>Exit Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>The command completed successfully.</td>
</tr>
<tr>
<td>&gt;0</td>
<td>An error occurred.</td>
</tr>
<tr>
<td>1</td>
<td>Default error return code for read, write, and malloc failures.</td>
</tr>
<tr>
<td>2</td>
<td>EINVAL and ENOENT</td>
</tr>
<tr>
<td>3</td>
<td>EPERM and EACCES</td>
</tr>
<tr>
<td>4</td>
<td>EEXIST</td>
</tr>
</tbody>
</table>

### Examples

1. To add a project *newproj* to the system project definition file, type:
   ```
   projctl add newproj 34 "Test Project"
   ```

2. To remove the project *test1* from the project definition file under the path /tmp/myproj, type:
   ```
   projctl rm test1 -d /tmp/myproj
   ```

3. To enable the aggregation status of the project *newproj*, type:
   ```
   projctl chattr agg newproj -s
   ```

4. To execute the *ps* command under the project *newproj*, overriding the existing rules, type:
   ```
   projctl exec newproj "/usr/bin/ps" -f
   ```

5. To retrieve the currently loaded policies, type:
   ```
   projctl qpolicy
   ```

   **Output:**
   
   Project definitions are loaded.
   Project definition file name: /etc/project/projdef
   User policies are loaded.

6. To load the admin policies from the path /tmp/myproj, type:
   ```
   projctl ldadm -d /tmp/myproj
   ```

7. To unload all the project policies now and during system reboot, type:
   ```
   projctl unldall -a
   ```

8. To add a new project to the LDAP repository on a different DN, where DN is ou=projects,ou=aacct,ou=cluster1,cn=aixdata, type:
   ```
   projctl add newproj 34 -p ou=projects,ou=aacct,ou=cluster1,cn=aixdata
   ```

9. To download the LDAP projects from the default DN to a local file under the `/etc/project/ldap` path, type:
   ```
   projctl ldprojs -g -d /etc/project/ldap
   ```

10. To load the LDAP admin policies stored under the label *newdef* in the default DN to the kernel, type:
    ```
    projctl ldadm -g newdef
    ```

### Location

/`usr/bin/projctl`

### Files

<table>
<thead>
<tr>
<th>File</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>/usr/bin/projctl</code></td>
<td>Contains the <strong>projctl</strong> command.</td>
</tr>
<tr>
<td><code>/etc/project/projdef</code></td>
<td>Contains the system project definition file.</td>
</tr>
<tr>
<td><code>/etc/project/ldap/projdef</code></td>
<td>Contains the default LDAP project definition file.</td>
</tr>
<tr>
<td><code>/etc/project/.active</code></td>
<td>Contains the status of currently loaded policies.</td>
</tr>
</tbody>
</table>
Related Information
The acctctl command, libaacct.a library routines.

AIX 5L Version 5.3 Understanding the accounting subsystem.

prompter Command

Purpose
Starts a prompting editor.

Syntax
prompter [ -erase Character ] [ -kill Character ] [ -prepend | -noprepend ] [ -rapid | -norapid ] File

Description
Part of the Message Handler (MH) package, the prompter command starts the prompting editor for message entry. The prompter command is not started by the user. The prompter command is called by other programs only.

The prompter command opens the file specified by the File parameter, scans it for empty components such as the To: component, and prompts you to fill in the blank fields. If you press the Enter key without filling in a required field, the prompter command deletes the component.

The prompter command accepts text for the body of the message after the first blank line or line of dashes in the file. If the body already contains text and the -noprepend flag is specified, the prompter command displays the text followed by the message:
--------Enter additional text

The prompter command appends any new text entered after the existing message. If you specify the -prepend flag, the prompter command displays the following message:
--------Enter initial text

Any new text precedes the body of the original message. When you press the Ctrl-D key sequence for End of File, the prompter command ends text entry and returns control to the calling program.

Flags

-erase Character
Sets the character to be used as the erase character. The value of the Character variable can be the octal representation of the character in the form \NNN where \NNN is a number or the character itself. For example, the character \e is \145 in octal representation.

-help
Lists the command syntax, available switches (toggles), and version information.

Note: For MH, the name of this flag must be fully spelled out.

-kill Character
Sets the character to be used as the kill, or stop, character. The value of the Character variable can be the octal representation of the character in the form \NNN where \NNN is a number or the character itself. For example, the character \e is \145 in octal representation.
-noprepend       Appends additional text after text already in the message body.
-norapid         Displays text already in the message body. This is the default.
-prepend         Appends additional text before text already in the message body. This is the default.
-rapid           Does not display text already in the message body.

Profile Entries

Msg-Protect:         Sets the protection level for your new message files.
prompter-next:       Specifies the editor used after exiting the prompter command.

Files

$HOME/.mh_profile    Contains the MH user profile.
/tmp/prompter*       Contains a temporary copy of a message.

Related Information

The comp command, dist command, forw command, repl command, whatnow command.
Mail applications in Networks and communication management.

proto Command

Purpose
Constructs a prototype file for a file system.

Syntax
proto Directory [ Prefix ]

Description
The proto command creates a prototype file for a file system or part of a file system. The mkfs command
uses the prototype file as input to construct a file system according to a predefined template. The
prototype file consists of a recursive directory listing of every file on the file system, with its owner, group,
and protection. It also contains the file from which the prototype file is to be initialized, formatted as
described in the mkfs command.

Specify the root directory from which the prototype file is made with the Directory parameter. The prototype
file includes the complete subtree below the Directory parameter, and is contained on the same file system
as the base directory specified by the Directory parameter.

The Prefix parameter is added to the names of all the initialization files, forcing the initialization files to be
taken from a place other than the prototype. Before the output from the proto command can be used with the
mkfs command, the mkfs command needs a startup program, a file system size, and an i-node list
size. Hard link information is not preserved with the proto command.

The collating sequence is determined by the LANG or LC_COLLATE environment variables.

Example
To make a prototype file for an existing file system /works, enter:
proto /works

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If the /works file system contains two directories called dir1 and dir2, and the dir1 directory contains the file1 file, then the proto command displays:

```bash
# Prototype file for /works
d--- 755 0 0
dir1 d--- 755 0 0
   file1 ---- 644 0 0 /works/dir1/file1
$
dir2 d--- 755 0 0
$
$
```

Files

/usr/sbin/proto Contains the proto command.

Related Information

The mkfs command, mkproto command.

The File systems in Operating system and device management explains file system types, management, structure, and maintenance.

The Files in Operating system and device management provides information on working with files.


proxymngr Command

Purpose
Proxy manager service.

Syntax
proxymngr [-config filename] [-timeout seconds] [-retries #] [-verbose]

Description
The proxymngr (proxy manager), is responsible for resolving requests from xfindproxy (and other similar clients), starting new proxies when appropriate, and keeping track of all of the available proxy services. The proxy manager strives to reuse existing proxies whenever possible.

There are two types of proxies that the proxy manager deals with, managed and unmanaged proxies.

A managed proxy is a proxy that is started on demand by the proxy manager.

An unmanaged proxy is started either at system boot time, or manually by a system administrator. The proxy manager is made aware of its existence, but no attempt is made by the proxy manager to start unmanaged proxies.
Flags

- **config**
  Overrides the default `proxymngr` config file. See below for more details about the `proxymngr` config file.

- **timeout**
  Sets the number of seconds between attempts made by the proxy manager to find an unmanaged proxy. The default is 10.

- **retries**
  Sets the maximum number of retries made by the proxy manager to find an unmanaged proxy. The default is 3.

- **verbose**
  Causes various debugging and tracing records to be displayed as requests are received and proxies are started.

Proxy Manager Config File

The proxy manager maintains a local configuration file describing the proxy services available. This configuration file is installed in `/usr/X11R6.3/lib/X11/proxymngr/pmconfig` during the installation of `proxymngr`. The location of the configuration file can be overwritten using the `-config` command line flag.

Aside from lines starting with an exclamation point for comments, each line of the configuration file describes either an unmanaged or managed proxy service.

For unmanaged proxies, the format is:

```
<service-name> unmanaged <proxy-address>
```

`service-name` is the name of the unmanaged proxy service, and must not contain any spaces, for example `XFWP`. `service-name` is case insensitive.

`proxy-address` is the network address of the unmanaged proxy. The format of the address is specific to the `service-name`. For example, for the `XFWP` service, the `proxy-address` might be `firewall.x.org:100`.

If there is more than one entry in the config file with the same unmanaged `service-name`, the proxy manager will try to use the proxies in the order presented in the config file.

For managed proxies, the format is:

```
<service-name> managed <command-to-start-proxy>
```

`service-name` is the name of the managed proxy service, and must not contain any spaces, for example `LBX`. `service-name` is case insensitive.

`command-to-start-proxy` is the command executed by the proxy manager to start a new instance of the proxy. If `command-to-start-proxy` contains spaces, the complete command should be surrounded by single quotes. If desired, `command-to-start-proxy` can be used to start a proxy on a remote machine. The specifics of the remote execution method used to do this is not specified here.

Example: sample configuration file

```
! proxy manager config file
!
! Each line has the format:
!   <serviceName> managed <startCommand>
! or
!   <serviceName> unmanaged <proxyAddress>
!
!bx managed /usr/X11R6.3/bin/lbxproxy
!
!substitute site-specific info
xfwp unmanaged firewall:4444
```
Proxy Manager Details
When the proxy manager gets a request from `xfindproxy` (or another similar client), its course of action will depend on the `service-name` in question.

For a managed proxy service, the proxy manager will find out if any of the already running proxies for this service can handle a new request. If not, the proxy manager will attempt to start up a new instance of the proxy (using the `command-to-start-proxy` found in the config file). If that fails, an error will be returned to the caller.

For an unmanaged proxy service, the proxy manager will look in the config file to find all unmanaged proxies for this service. If there is more than one entry in the config file with the same unmanaged `service-name`, the proxy manager will try to use the proxies in the order presented in the config file. If none of the unmanaged proxies can satisfy the request, the proxy manager will timeout for a configurable amount of time (specified by `-timeout` or default of 10) and reattempt to find an unmanaged proxy willing to satisfy the request. The number of retries can be specified by the `-retries` argument, or a default of 3 will be used. If the retries fail, the proxy manager has no choice but to return an error to the caller (since the proxy manager can not start unmanaged proxy services).

prs Command (SCCS)

Purpose
Displays a Source Code Control System (SCCS) file.

Syntax
prs [ [-a] ] [ [-d] String ] [ [-r] [ SID ] | [ -c Cutoff ] ] [ [-e] | [-l] ] File ...

Description
The `prs` command first reads the specified files and then writes to standard output a part or all of a Source Code Control System (SCCS) file. If you specify a directory for the `File` parameter, the `prs` command performs the requested actions on all SCCS files (those with the `s.` prefix). If you specify a `-` (minus) for the `File` parameter, the `prs` command reads standard input and interprets each line as the name of an SCCS file. The `prs` command continues to read input until it reaches an end-of-file character.

Data Keywords
Data keywords specify the parts of an SCCS file to be retrieved and written to standard output. All parts of an SCCS file have an associated data keyword. There is no limit to the number of times a data keyword can be in a specified file.

The information that the `prs` command displays consists of user-supplied text and appropriate values (extracted from the SCCS file) substituted for the recognized data keywords in the order they are displayed in the specified file. The format of a data keyword value is either simple, in which the keyword substitution is direct, or multiline, in which the substitution is followed by a carriage return. Text consists of any characters other than recognized data keywords. Specify a tab character with `\t` (backslash, letter t) and a carriage return or new-line character with `\n` (backslash, letter n). Remember to use the `\t` and `\n` with an extra `\` (backslash) to prevent the shell from interpreting the `\` and passing only the letter `t` or `n` to the `prs` command as text.

The following table lists the keywords associated with information in the delta table of the SCCS file. All the keywords have a simple format unless otherwise indicated.

**Delta Table Keywords**

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Data Represented</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>:R:</td>
<td>Release number</td>
<td>num</td>
</tr>
</tbody>
</table>
The following table lists the keywords associated with header flags in the SCCS file. All the keywords have a simple format unless otherwise indicated.

**Header Flag Keywords**

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Data Represented</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>:Y:</td>
<td>Module type</td>
<td>text</td>
</tr>
<tr>
<td>:MF:</td>
<td>MR validation flag set</td>
<td>yes or no</td>
</tr>
<tr>
<td>:MP:</td>
<td>MR validation program name</td>
<td>text</td>
</tr>
<tr>
<td>:KF:</td>
<td>Keyword/error warning flag set</td>
<td>yes or no</td>
</tr>
<tr>
<td>:BF:</td>
<td>Branch flag set</td>
<td>yes or no</td>
</tr>
</tbody>
</table>
**Header Flag Keywords**

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Data Represented</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>:J:</td>
<td>Joint edit flag set</td>
<td>yes or no</td>
</tr>
<tr>
<td>:Q:</td>
<td>User-defined keyword</td>
<td>text</td>
</tr>
<tr>
<td>:M:</td>
<td>Module name</td>
<td>text</td>
</tr>
<tr>
<td>:FB:</td>
<td>Floor boundary</td>
<td>:R:</td>
</tr>
<tr>
<td>:CB:</td>
<td>Ceiling boundary</td>
<td>:R:</td>
</tr>
<tr>
<td>:Ds:</td>
<td>Default SID</td>
<td>:I:</td>
</tr>
<tr>
<td>:ND:</td>
<td>Null Delta flag set</td>
<td>yes or no</td>
</tr>
<tr>
<td>:FL:</td>
<td>(multiline format)</td>
<td>Header flag list</td>
</tr>
</tbody>
</table>

The following table lists the keywords associated with other parts of the SCCS file. All the keywords have a simple format unless otherwise indicated.

**Other Keywords**

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Data Represented</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>:UN:</td>
<td>(multiline format) User names</td>
<td>text</td>
</tr>
<tr>
<td>:FD:</td>
<td>(multiline format) Descriptive text</td>
<td>text</td>
</tr>
<tr>
<td>:BD:</td>
<td>(multiline format) Body of text</td>
<td>text</td>
</tr>
<tr>
<td>:GB:</td>
<td>(multiline format) Text in a g-file</td>
<td>text</td>
</tr>
<tr>
<td>:W:</td>
<td>A what string</td>
<td>:Z::M: \	ab :I:</td>
</tr>
<tr>
<td>:A:</td>
<td>A what string</td>
<td>:Z::Y::M::I::Z::</td>
</tr>
<tr>
<td>:Z:</td>
<td>A what string delimiter</td>
<td>@(#)</td>
</tr>
<tr>
<td>:F:</td>
<td>SCCS file name</td>
<td>text</td>
</tr>
<tr>
<td>:PN:</td>
<td>SCCS file path name</td>
<td>text</td>
</tr>
</tbody>
</table>

**Flags**

Each flag or group of flags applies independently to each named file.

- `-a` Writes information for the specified deltas, whether or not they have been removed (see the `rmdel` command). If you do not specify the `-a` flag, the `prs` command supplies information only for the specified deltas that have not been removed.

- `-c Cutoff` Specifies a cutoff date and time for the `-e` and `-l` flags. Specify the `Cutoff` value in the following form:
  
  YY[MM[DD[HH[MM[SS]]]]]

  All omitted items default to their maximum values, so specifying `-c8402` is the same as specifying `-c840229235959`. You can separate the fields with any non-numeric character. For example, you can specify `-c84/2/20,9:22:25` or `-c"84/2/20 9:22:25"` or `-c"84/2/20 9:22:25"`. The `-c` flag cannot be specified with the `-r` flag.

- `-d String` Specifies the data items to be displayed. The string consists of optional text and SCCS file-data keywords. The string may include MBCS (multibyte character set) characters. If the string contains spaces, you must enclose the string in quotation marks.

- `-e` Requests information for all deltas created earlier than and including the delta specified by the `-r` flag.

- `-l` Requests information for all deltas created later than and including the delta specified by the `-r` flag.
-r [SID] Specifies the SCCS ID string (SID) of the delta for which the prs command will retrieve information. Do not enter a space between the -r flag and the optional SID parameter. If no SID is specified, the command retrieves the information for the SID of the highest numbered delta. The -r flag cannot be specified with the -c flag.

Exit Status
This command returns the following exit values:

0 Successful completion.
>0 An error occurred.

Examples
1. To display information on all deltas generated for SCCS file name s.test.c (including all deltas removed using the rmdel command), type:

   prs -a s.test.c

2. To display user login name, the number of lines inserted by delta, and the number of lines deleted by delta for SID 1.2 of s.test.c, type:

   prs -r1.2 -d"P:\n:Li:\n:Ld:" s.test.c

Files
/usr/bin/prs Contains the prs command.

Related Information
The admin command, delta command, get command, sccshelp command.

The sccsfile file format.

Source Code Control System (SCCS) Overview in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.

prtacct Command

Purpose
Formats and displays files in tacct format.

Syntax
/usr/sbin/acct/prtacct [X] [W] [F Fields] [V] File ["Heading"]

Description
The prtacct command formats and displays any total-accounting file; these files are in tacct format. You can enter this command to view any tacct file, such as the daily reports on connect time, process time, disk usage, and printer usage. To specify a title for the report with the Heading parameter, enclose the heading text in "" (quotation marks).

Flags
-1 Fields Selects fields to be displayed, using the field-selection mechanism of the acctmerg command.
-v Produces verbose output in which more precise notation is used for floating-point numbers.
Processes all available characters for each user name instead of truncating to the first 8 characters. This flag will also cause the `prtacct` command to expect to read in `tacctx` structures. It will then print out in the same column order, but it will allow long user names to misalign the columns. If the `-W` flag and the `-X` flag are used together, the `-X` will take precedence.

Processes all available characters for each user name instead of truncating to the first 8 characters. This flag will also cause the `prtacct` command to expect to read in `tacctx` structures and print out the user name in the last column. If the `-W` flag and the `-X` flag are used together, the `-X` will take precedence.

Security

Access Control: This command should grant execute (x) access only to members of the `adm` group.

Examples

To format and display selected records from the total accounting file for connect-time accounting, you first must create a file upon which to execute the `prtacct` command. In this example, you create the `tacct` file using the `acctcon1` and `acctcon2` commands. Enter:

tail /var/adm/wtmp > wtmp.sav
acctcon1 -t < wtmp.sav | sort +1n +2 | acctcon2 > tacct

If you created this file previously to process connect-time accounting data, you do not need to create it again.

The next step uses the `prtacct` command with the `-f` flag to display the fields of data in the total-accounting file that you want to see. The text for a heading can be included in quotation marks. To view the login name, prime connect-time, and nonprime connect-time records, and include the heading, Connect-time Accounting, enter:

`prtacct -f 2,11,12 tacct "Connect-time Accounting"`

You can also use this command to format and display other total-accounting files, such as the daily reports on process time, disk usage, and printer usage.

Files

```
/usr/sbin/acct  The path to the accounting commands.
/var/adm/pacct  Current file for process accounting.
/var/adm/pacct* Used if the pacct file gets too large.
```

Related Information

The `acctcon1` or `acctcon2` command, `acctdisk` or `acctdusg` command, `acctmerg` command, `acctprc1`, `acctprc2`, or `accton` command.

The `tacct` structure in the `acct` file format.

For more information about the Accounting System, the preparation of daily and monthly reports, and the accounting files, see the `System accounting` in *Operating system and device management*.

Setting up an accounting subsystem in *Operating system and device management* explains the steps you must take to establish an accounting system.
prtconf Command

Purpose
Displays system configuration information.

Syntax
prtconf [ -c ] [ -k ] [ -L ] [ -m ] [ -s ] [ -v ]

Description
If you run the prtconf command without any flags, it displays the system model, machine serial, processor type, number of processors, processor clock speed, cpu type, total memory size, network information, filesystem information, paging space information, and devices information.

Flags
- `-c` Displays cpu type, for example, 32-bit or 64-bit.
- `-k` Display the kernel in use, for example, 32-bit or 64-bit.
- `-L` Displays LPAR partition number and partition name if this is an LPAR partition, otherwise returns "-1 NULL".
- `-m` Displays system memory.
- `-s` Displays processor clock speed in MegaHertz.
- `-v` Displays the VPD found in the Customized VPD object class for devices.

Exit Status
0 The command completed successfully.
>0 An error occurred.

Examples
1. To display the system configuration information, enter:
   prtconf
   
   The system displays a message similar to the following:

   System Model: IBM,7025-F50
   Machine Serial Number: 1025778
   Processor Type: PowerPC_604
   Number Of Processors: 2
   Processor Clock Speed: 332 MHz
   CPU Type: 32-bit
   Kernel Type: 32-bit
   LPAR Info: -1 NULL
   Memory Size: 512 MB
   Good Memory Size: 512 MB
   Firmware Version: IBM,L02113
   Console Login: enable
   Auto Restart: false
   Full Core: false

   Network Information
   Host Name: vd01.austin.ibm.com
   IP Address: 9.3.207.112
   Sub Netmask: 255.255.255.128
   Gateway: 9.3.207.1
   Name Server: 9.3.199.2
Domain Name: austin.ibm.com

Paging Space Information

Total Paging Space: 512MB
Percent Used: 1%

Volume Groups Information

==============================================================================
<table>
<thead>
<tr>
<th>PV_NAME</th>
<th>PV STATE</th>
<th>TOTAL PPs</th>
<th>FREE PPs</th>
<th>FREE DISTRIBUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>hdisk0</td>
<td>active</td>
<td>537</td>
<td>394</td>
<td>107..43..29..107..108</td>
</tr>
</tbody>
</table>

==============================================================================

INSTALLED RESOURCE LIST

The following resources are installed on the machine.
+/- = Added or deleted from Resource List.
* = Diagnostic support not available.

Model Architecture: chrp
Model Implementation: Multi-Processor, PCI bus

+ sys0 00-00 System Object
+ sysplanar0 00-00 System Planar
+ mem0 00-00 Memory
etc.

2. To display the processor clock speed, enter:
   prtconf -s

   The system displays a message similar to the following:
   Processor Clock Speed: 332 MHz

3. To display the VPD for all physical devices in the Customized database, enter:
   prtconf -v

   The system displays a message similar to the following:
   INSTALLED RESOURCE LIST WITH VPD

   The following resources are installed on your machine.

   Model Architecture: chrp
   Model Implementation: Uni-Processor, PCI bus

   sys0       P1-C1     System Object
   sysplanar0 P1-C1     System Planar
   mem0       P1-C1     Memory
   L2cache0   P1-C1     L2 Cache
   proc0      P1-C1     Processor

   Device Specific.(YL).......P1-C1

   pci0       P1        PCI Bus

   Device Specific.(YL).......P1

   isa0       P1        ISA Bus

   Device Specific.(YL).......P1

   fda0       P1/D1     Standard I/O Diskette Adapter

   Device Specific.(YL).......P1/D1

   fd0        P1-D1     Diskette Drive
siokma0   P1/K1   Keyboard/Mouse Adapter  
Device Specific.(YL)........P1/K1

sioka0   P1-K1   Keyboard Adapter
kbd0     P1-K1-Lkbd PS/2 keyboard
sioma0   P1-O1   Mouse Adapter
mouse0   P1-O1-Lmouse3 button mouse
siota0   P1/Q1   Tablet Adapter  
Device Specific.(YL)........P1/Q1

pau0      P1/Q2   Ultimedia Integrated Audio  
Device Specific.(YL)........P1/Q2

ppa0      P1/R1   CHRP IEEE1284 (ECP) Parallel Port Adapter
Device Specific.(YL)........P1/R1

sa0       P1/S1   Standard I/O Serial Port  
Device Specific.(YL)........P1/S1

tty0      P1/S1-L0 Asynchronous Terminal
s1        P1/S2   Standard I/O Serial Port  
Device Specific.(YL)........P1/S2

ent0      P1/E1   IBM 10/100 Mbps Ethernet PCI Adapter (23100020)  
Network Address..............0004AC2A0419
Displayable Message...........PCI Ethernet Adapter (23100020)
Device Specific.(YL)........P1/E1

scsi0     P1/Z1   Wide/Fast-20 SCSI I/O Controller  
Device Specific.(YL)........P1/Z1

cd0       P1/Z1-A3 SCSI Multimedia CD-ROM Drive (650 MB)  
Manufacturer................IBM
Machine Type and Model......CD-ROM0203
ROS Level and ID............1_00
Device Specific.(Z0)........058002028F000018
Part Number.................97H7608
EC Level....................F15213
FRU Number..................97H7610

hdisk0    P1/Z1-A5 16 Bit SCSI Disk Drive (4500 MB)  
Manufacturer................IBM
Machine Type and Model......DDR5-3456W
FRU Number..................83H7105
ROS Level and ID............53393847
Serial Number..............RDHW5008
EC Level....................F21433
Part Number..................03L5256
Device Specific.(Z0)........000002029F00003A
Device Specific.(Z1)........00K0159S98G
Device Specific.(Z2)........0933
Device Specific.(Z3)........0299
Device Specific.(Z4)........0001
Device Specific.(Z5)........22
Device Specific.(Z6)........22

bl0       P1.1-I2/G1 GXT255P Graphics Adapter
GXT255P 2D Graphics Adapter:
EC Level....................E76756
FRU Number..................93H6267
Manufacture ID..............IBM053
Part Number..................93H6266
Serial Number..............88874164
Version.....................RS6K
Displayable Message........GXT255P
ROM Level.(alterable).......02
Product Specific.(DD).....00
Product Specific.(DG).....00
Device Specific.(YL).......P1.1-I2/G1

PCI1
Device Specific.(YL).......P1.1

4. To display the kernel type in use, type:
   `prtconf -k`

   The system displays information for the kernel type as follows:
   Kernel Type: 32-bit

5. To display memory, type:
   `prtconf -m`

   The system displays memory, as follows:
   Memory Size: 512 MB

Files

`/usr/sbin/prtconf` Contains the `prtconf` command.

Related Information
The `lsattr` command, `lsconn` command, `lsdev` command, `lsparent` command, `lscfg` command.

ps Command

Purpose
Shows current status of processes. This document describes the standard AIX ps command as well as the System V version of the ps command.

Syntax

X/Open Standards
Description
The *ps* command writes the current status of active processes and (if the *-m* flag is given) associated kernel threads to standard output. Note that while the *-m* flag displays threads associated with processes using extra lines, you must use the *-o* flag with the **THREAD** field specifier to display extra thread-related columns.

Without flags, the *ps* command displays information about the current workstation. The *-f, -o, l, -l, s, u,* and *v* flags only determine how much information is provided about a process; they do not determine which processes are listed. The *l, s, u,* and *v* flags are mutually exclusive.

With the *-o* flag, the *ps* command examines memory or the paging area and determines what the command name and parameters were when the process was created. If the *ps* command cannot find this information, the command name stored in the kernel is displayed in square brackets.

The **COLUMNS** environment variable overrides the system-selected, horizontal screen size.

The command-line flags that accept a list of parameters (the *-o, -G, -g, -p, -t, -U,* and *-u* flags) are limited to 128 items. For example, the *-u Ulist* flag can specify no more than 128 users.

Depending on the flags used with the *ps* command, column headings are displayed above the information displayed to standard output. The headings are defined in the following list (flags that cause these headings to be displayed are shown in parentheses):

<table>
<thead>
<tr>
<th>ADDR ( -l and <em>l</em> flags)</th>
<th>Contains the segment number of the process stack, if normal; if a kernel process, the address of the preprocess data area.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BND</strong> (-o <strong>THREAD</strong> flag)</td>
<td>The logical processor number of the processor to which the kernel thread is bound (if any). For a process, this field is shown if all its threads are bound to the same processor.</td>
</tr>
<tr>
<td><strong>C</strong> (-f, <em>l,</em> and <em>-l</em> flags)</td>
<td>CPU utilization of process or thread, incremented each time the system clock ticks and the process or thread is found to be running. The value is decayed by the scheduler by dividing it by 2 once per second. For the <strong>sched_other</strong> policy, CPU utilization is used in determining process scheduling priority. Large values indicate a CPU intensive process and result in lower process priority whereas small values indicate an I/O intensive process and result in a more favorable priority.</td>
</tr>
<tr>
<td><strong>CMD</strong> (-f, <em>l,</em> and <em>-l</em> flags)</td>
<td>Contains the command name. Under the <em>-f</em> flag, <em>ps</em> tries to determine the current command name and arguments both of which may be changed asynchronously by the process. These are then displayed. Failing this, the command name as it would appear without the option <em>-f,</em> is written in square brackets.</td>
</tr>
<tr>
<td><strong>COMMAND</strong></td>
<td>(s, u, and <em>v</em>) Contains the command name. The full command name and its parameters are displayed with the <em>-f</em> flag.</td>
</tr>
</tbody>
</table>

| **F Field Table** |
|-------------------|-----------------|------------------|
| **Flags** | **Hexadecimal Value** | **Definition** |
| **SLOAD** | 0x00000001 | Indicates that the process is operating in core memory. |
| **SNOSWAP** | 0x00000002 | Indicates that the process cannot be swapped out. |
| **STRC** | 0x00000008 | Indicates that the process is being traced. |
| **SWTED** | 0x00000010 | Indicates that the process stopped while being traced. |
| **SFWTED** | 0x00000020 | Indicates that the process stopped after a call to the **fork** subroutine, while being traced. |
### F Field Table

<table>
<thead>
<tr>
<th>Flags</th>
<th>Hexadecimal Value</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEWTED</td>
<td>0x00000040</td>
<td>Indicates that the process stopped after a call to the <strong>exec</strong> subroutine, while being traced.</td>
</tr>
<tr>
<td>SLWTED</td>
<td>0x00000080</td>
<td>Indicates that the process stopped after a call to the <strong>load</strong> or <strong>unload</strong> subroutine, while being traced.</td>
</tr>
<tr>
<td>SFIXPRI</td>
<td>0x00000100</td>
<td>Indicates that the process has a fixed priority, ignoring the <strong>pcpu</strong> field descriptor.</td>
</tr>
<tr>
<td>SKPROC</td>
<td>0x00000200</td>
<td>Indicates a Kernel process.</td>
</tr>
<tr>
<td>SOMASK</td>
<td>0x00000400</td>
<td>Indicates restoration of the old mask after a signal is received.</td>
</tr>
<tr>
<td>SWAKEONSIG</td>
<td>0x00000800</td>
<td>Indicates that the signal will abort the <strong>sleep</strong> subroutine. The contents must <em>not</em> be equal to those of the <strong>PCATCH</strong> flag. The contents of both <strong>PCATCH</strong> and <strong>SWAKEONSIG</strong> must be greater than those of <strong>PMASK</strong>.</td>
</tr>
<tr>
<td>SUSER</td>
<td>0x00001000</td>
<td>Indicates that the process is in user mode.</td>
</tr>
<tr>
<td>SLKDONE</td>
<td>0x00002000</td>
<td>Indicates that the process has done locks.</td>
</tr>
<tr>
<td>STRACING</td>
<td>0x00004000</td>
<td>Indicates that the process is a debugging process.</td>
</tr>
<tr>
<td>SMPTRACE</td>
<td>0x00008000</td>
<td>Indicates multi-process debugging.</td>
</tr>
<tr>
<td>SEEXIT</td>
<td>0x00010000</td>
<td>Indicates that the process is exiting.</td>
</tr>
<tr>
<td>SSEL</td>
<td>0x00020000</td>
<td>Indicates that the processor is selecting: wakeup/waiting danger.</td>
</tr>
<tr>
<td>SORPHANPGRP</td>
<td>0x00040000</td>
<td>Indicates an orphaned process group.</td>
</tr>
<tr>
<td>SNOCNTLPROC</td>
<td>0x00080000</td>
<td>Indicates that the session leader relinquished the controlling terminal.</td>
</tr>
<tr>
<td>SPPNOCLDSTOP</td>
<td>0x00100000</td>
<td>Indicates that the <strong>SIGLD</strong> signal is <em>not</em> sent to the parent process when a child stops.</td>
</tr>
<tr>
<td>SEXECED</td>
<td>0x00200000</td>
<td>Indicates that process has been run.</td>
</tr>
<tr>
<td>SJOBSESS</td>
<td>0x00400000</td>
<td>Indicates that job control was used in the current session.</td>
</tr>
<tr>
<td>SJBOFF</td>
<td>0x00800000</td>
<td>Indicates that the process is free from job control.</td>
</tr>
<tr>
<td>PSIGDELIVERY</td>
<td>0x01000000</td>
<td>Indicates that the process is used by the program-check handler.</td>
</tr>
<tr>
<td>SRMSHM</td>
<td>0x02000000</td>
<td>Indicates that the process removed shared memory during a call to the <strong>exit</strong> subroutine.</td>
</tr>
<tr>
<td>SslotFREE</td>
<td>0x04000000</td>
<td>Indicates that the process slot is free.</td>
</tr>
<tr>
<td>SNOMSG</td>
<td>0x08000000</td>
<td>Indicates that there are no more <strong>uprintf</strong> subroutine messages.</td>
</tr>
</tbody>
</table>

**DPGSZ**

(Z flag) The data page size of the process.

**F**  
(-l and I flags) Some of the more important F field flags (hexadecimal and additive) associated with processes and threads are shown in the following table:
### Field Table

<table>
<thead>
<tr>
<th>Flags</th>
<th>Hexadecimal Value</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLOAD</td>
<td>0x00000001</td>
<td>Indicates that the process is operating in core memory.</td>
</tr>
<tr>
<td>SNOSWAP</td>
<td>0x00000002</td>
<td>Indicates that the process cannot be swapped out.</td>
</tr>
<tr>
<td>STRC</td>
<td>0x00000008</td>
<td>Indicates that the process is being traced.</td>
</tr>
<tr>
<td>SKPROC</td>
<td>0x00000200</td>
<td>Indicates a kernel process.</td>
</tr>
<tr>
<td>SEXIT</td>
<td>0x00010000</td>
<td>Indicates that the process is exiting.</td>
</tr>
<tr>
<td>SLPDATA</td>
<td>0x00020000</td>
<td>Indicates that the process uses large pages.</td>
</tr>
<tr>
<td>SEXECED</td>
<td>0x00020000</td>
<td>Indicates that the process has been run.</td>
</tr>
<tr>
<td>SEXECING</td>
<td>0x01000000</td>
<td>Indicates that the process is execing (performing an exec).</td>
</tr>
<tr>
<td>SPSEARLYALLOC</td>
<td>0x04000000</td>
<td>Indicates that paging space for this process is allocated early.</td>
</tr>
<tr>
<td>TKTHREAD</td>
<td>0x00001000</td>
<td>Indicates that the thread is a kernel-only thread.</td>
</tr>
</tbody>
</table>

**Note:** You can see the definitions of all process and thread flags by consulting the `p_flags` and `t_flags` fields in the `/usr/include/sys/proc.h` and `/usr/include/sys/thread.h` files respectively.

- **LIM** (v flag) The soft limit on memory used, specified via a call to the `setrlimit` subroutine. If no limit has been specified, then shown as xx. If the limit is set to the system limit, (unlimited), a value of UNLIM is displayed.

- **NI** (-l and l flags) The nice value; used in calculating priority for the `sched` other policy.

- **PID** (all flags) The process ID of the process.

- **PGIN** (v flag) The number of disk I/Os resulting from references by the process to pages not loaded in core.

- **PPID** (-f, l, and -l flags) The process ID of the parent process.

- **PRI** (-l and l flags) The priority of the process or kernel thread; higher numbers mean lower priority.

- **PROJECT** (-P flag) Project name assigned to the process.

- **RSS** (v flag) The real-memory (resident set) size of the process (in 1KB units).

- **S** (-l and l flags) The state of the process or kernel thread:

  - **O** Nonexistent
  - **A** Active
  - **W** Swapped
  - **I** Idle (waiting for startup)
  - **Z** Canceled
  - **T** Stopped

  For kernel threads:

  - **O** Nonexistent
  - **R** Running
S  Sleeping
W  Swapped
Z  Canceled
T  Stopped

SC  (-o THREAD flag) The suspend count of the process or kernel thread. For a process, the suspend count is defined as the sum of the kernel threads suspend counts.

SCH  (-o THREAD flag) The scheduling policy for a kernel thread. The policies sched_other, sched_fifo, and sched_rr are respectively displayed using: 0, 1, 2.

SIZE  (v flag) The virtual size of the data section of the process (in 1KB units).

SPGSZ  (Z flag) The stack page size of the process.

SSIZ  (s flag) The size of the kernel stack. This value is always 0 (zero) for a multi-threaded process.

STAT  (s, u, and v flags) Contains the state of the process:
      0  Nonexistent
      A  Active
      I  Intermediate
      Z  Canceled
      T  Stopped
      K  Available kernel process

STIME  (-f and u flags) The starting time of the process. The LANG environment variables control the appearance of this field.

SUBPROJ  (-P flag) Subproject Identifier assigned to the process.

SZ  (-l and l flags) The size in 1KB units of the core image of the process.

THCNT  (-o thcount flag) The number of kernel threads owned by the process.

TID  (-o THREAD flag) The thread ID of the kernel thread.

TIME  (all flags) The total execution time for the process.

TPGSZ  (Z flag) The text page size of the process.

TRS  (v flag) The size of resident-set (real memory) of text.

TSIZ  (v flag) The size of text (shared-program) image.

TTY  (all flags) The controlling workstation for the process:
      -  The process is not associated with a workstation.
      ?  Unknown.
      Number  The TTY number. For example, the entry 2 indicates TTY2.
UID  (-f, -I, and I flags) The user ID of the process owner. The login name is printed under the -f flag.

USER (u flag) The login name of the process owner.

WCHAN  (-l flag) The event for which the process or kernel thread is waiting or sleeping. For a kernel thread, this field is blank if the kernel thread is running. For a process, the wait channel is defined as the wait channel of the sleeping kernel thread if only one kernel thread is sleeping; otherwise a star is displayed.

WCHAN  (l flag) The event on which process is waiting (an address in the system). A symbol is chosen that classifies the address, unless numerical output is requested.

%CPU  (u and v flags) The percentage of time the process has used the CPU since the process started. The value is computed by dividing the time the process uses the CPU by the elapsed time of the process. In a multi-processor environment, the value is further divided by the number of available CPUs because several threads in the same process can run on different CPUs at the same time. (Because the time base over which this data is computed varies, the sum of all %CPU fields can exceed 100%.)

%MEM  (u and v flags) The percentage of real memory used by this process. The %MEM value tends the exaggerate the cost of a process that is sharing program text with other processes. It does not account for times when multiple copies of a program are run and a copy of the program text is shared by all instances. The size of the text section is accounted for in every instance of the program. This means that if several copies of a program are run, the total %MEM value of all processes could exceed 100%.

A process that has exited and has a parent that has not yet waited for the process is marked <defunct>. A process that is blocked trying to exit is marked <exiting>. The ps command attempts to determine the file name and arguments given when the process was created by memory or by the swap area.

Notes:
1. The process can change while the ps command is running. Some data displayed for defunct processes is irrelevant.
2. The ps program examines memory to retrieve the file name and arguments used when the process was created. However, a process can destroy information, making this method of retrieving file name and arguments unreliable.

Flags
The following flags are preceded by a - (minus sign):

-A Writes to standard output information about all processes.
-a Writes to standard output information about all processes, except the session leaders and processes not associated with a terminal.
-c Clist Displays only information about processes assigned to the workload management classes listed in the Clist variable. The Clist variable is either a comma separated list of class names or a list of class names enclosed in double quotation marks (" "), which is separated from one another by a comma or by one or more spaces, or both.
-d Writes information to standard output about all processes, except the session leaders.
-e Writes information to standard output about all processes, except kernel processes.
-F Format Same as -o Format
-f Generates a full listing.
-G Glist  Writes information to standard output only about processes that are in the effective groups listed for the Glist variable. The Glist variable is either a comma-separated list of effective group identifiers or a list of effective group identifiers enclosed in double quotation marks (""") and separated from one another by a comma or by one or more spaces.

-g Glist  Writes information to standard output only about processes that are in the process groups listed for the Glist variable. The Glist variable is either a comma-separated list of process group identifiers or a list of process group identifiers enclosed in double quotation marks (""") and separated from one another by a comma or by one or more spaces.

-k  Lists kernel processes.

-I  Generates a long listing. See also the -l flag.

-L pidlist  Generates a list of descendants of each and every pid that has been passed to it in the pidlist variable. The pidlist variable is a list of comma-separated process IDs. The list of descendants from all of the given pid is printed in the order in which they appear in the process table.

-M  Lists all 64 bit processes.

-m  Lists kernel threads as well as processes. Output lines for processes are followed by an additional output line for each kernel thread. This flag does not display thread-specific fields (bnd, scount, sched, thcount, and tid), unless the appropriate -o Format flag is specified.

-N  Gathers no thread statistics. With this flag, ps reports those statistics that can be obtained by not traversing through the threads chain for the process.

-n NameList  Specifies an alternative system name-list file in place of the default. The operating system does not use the -n flag because information is supplied directly to the kernel.
Displays information in the format specified by the `Format` variable. Multiple field specifiers can be specified for the `Format` variable. The `Format` variable is either a comma-separated list of field specifiers or a list of field specifiers enclosed within a set of " " (double-quotiation marks) and separated from one another by a comma or by one or more spaces, or both.

Each field specifier has a default header. The default header can be overridden by appending an `=` (equal sign) followed by the user-defined text for the header. The fields are written in the order specified on the command line in column format. The field widths are specified by the system to be at least as wide as the default or user-defined header text. If the header text is null, (such as if `-o user=` is specified), the field width is at least as wide as the default header text. If all header fields are null, no header line is written.

The following field specifiers are recognized by the system:

- `args` Indicates the full command name being executed. All command-line arguments are included, though truncation may occur. The default header for this field is `COMMAND`.
- `bnd` Indicates to which (if any) processor a process or kernel thread is bound. The default header for this field is `BND`.
- `class` Indicates the workload management class assigned to the process or thread. The default header for this field is `CLASS`.
- `comm` Indicates the short name of the command being executed. Command-line arguments are not included. The default header for this field is `COMMAND`.
- `cpu` Determines process scheduling priority. CPU utilization of process or thread, incremented each time the system clock ticks and the process or thread is found to be running. The value is decayed by the scheduler by dividing it by 2 once per second. For the sched_other policy, Large values indicate a CPU intensive process and result in lower process priority whereas small values indicate an I/O intensive process and result in a more favorable priority.
- `dpgsz` Indicates the data page size of a process.
- `etime` Indicates the elapsed time since the process started. The elapsed time is displayed in the following format:

  \[ [[dd]-][hh]:mm:ss \]

  where `dd` specifies the number of days, `hh` specifies the number of hours, `mm` specifies the number of minutes, and `ss` specifies the number of seconds. The default header for this field is `ELAPSED`.
- `group` Indicates the effective group ID of the process. The textual group ID is displayed. If the textual group ID cannot be obtained, a decimal representation is used. The default header for this field is `GROUP`.
- `nice` Indicates the decimal value of the process nice value. The default header for this field is `NI`. 


pcpu Indicates the ratio of CPU time used to CPU time available, expressed as a percentage. The default header for this field is %CPU.

pgid Indicates the decimal value of the process group ID. The default header for this field is PGID.

pid Indicates the decimal value of the process ID. The default header for this field is PID.

ppid Indicates the decimal value of the parent process ID. The default header for this field is PPID.

rgroup Indicates the real group ID of the process. The textual group ID is displayed. If the textual group ID cannot be obtained, a decimal representation is used. The default header for this field is RGROUP.

ruser Indicates the real user ID of the process. The textual user ID is displayed. If the textual user ID cannot be obtained, a decimal representation is used. The default header for this field is RUSER.

scount Indicates the suspend count for a kernel thread. The default header for this field is SC.

sched Indicates the scheduling policy for a kernel thread. The default header for this field is SCH.

spgsz Indicates the stack page size of a process.

tag Indicates the Workload Manager application tag. The default header for this field is TAG. The tag is a character string up to 30 characters long and may be truncated when displayed by ps. For processes that do not set their tag, this field displays as a - (hyphen).

tcpu Total CPU time. Indicates the total accumulated CPU time for a single process. The default header for this field is TCPU.

tctime Total connect time. Indicates the total amount of time that a login session can be active. This is meaningful only in the case of session leader processes. The default header for this field is TCTIME.

tdiskio Total disk I/O. Indicates the total accumulated blocks of disk I/O for a single process. The default header for this field is TDISKIO.

tpgsz Indicates the text page size of a process.

vmsize Indicates the WLM virtual memory limits. When this is used, a new header, VMSIZ is displayed. VMSIZ displays the virtual memory used by the process. This value is displayed in 1 MB units.
-o Format (Continued)

**thcount**  
Indicates the number of kernel threads owned by the process. The default header for this field is **THCNT**.

**THREAD**  
Indicates the following fields:
- User name (the `uname` field)
- Process and parent process IDs for processes (the `pid` and `ppid` fields)
- Kernel thread ID for threads (the `tid` field)
- The state of the process or kernel thread (the `S` field)
- The CPU utilization of the process or kernel thread (the `C` field)
- The priority of the process or kernel thread (the `PRI` field)
- The suspend count of the process or kernel thread (the `scount` field)
- The wait channel of the process or kernel thread (the `WCHAN` field)
- The flags of the process or kernel thread (the `F` field)
- The controlling terminal of the process (the `tty` field)
- The CPU to which the process or kernel thread is bound (the `bnd` field)
- The command being executed by the process (the `comm` field).

Threads are not actually displayed with the `-o THREAD` flag, unless the `-m` flag is also specified.

**tid**  
Indicates the thread ID of a kernel thread. The default header for this field is **TID**.

**time**  
Indicates the cumulative CPU time since the process started. The time is displayed in the following format:

```
[ dd]hh:mm:ss
```

where `dd` specifies the number of days, `hh` specifies the number of hours, `mm` specifies the number of minutes, and `ss` specifies the number of seconds. The default header for this field is **TIME**.

**tty**  
Indicates the controlling terminal name of the process. The default header for this field is **TT**.

**user**  
Indicates the effective user ID of the process. The textual user ID is displayed. If the textual user ID cannot be obtained, a decimal representation is used. The default header for this field is **USER**.

**vsz**  
Indicates, as a decimal integer, the size in kilobytes of the process in virtual memory. The default header for this field is **VSZ**.
Otherwise, multiple fields in a specified format can be displayed by the `Format` variable, including field descriptors. If field descriptors are used in the `Format` variable, it must be enclosed in double quotation marks (" "). The following table shows how field descriptors correspond to field specifiers:

<table>
<thead>
<tr>
<th>Field Descriptors</th>
<th>Field Specifiers</th>
<th>Default Headers</th>
</tr>
</thead>
<tbody>
<tr>
<td>%a</td>
<td>args</td>
<td>COMMAND</td>
</tr>
<tr>
<td>%c</td>
<td>comm</td>
<td>COMMAND</td>
</tr>
<tr>
<td>%t</td>
<td>etime</td>
<td>ELAPSED</td>
</tr>
<tr>
<td>%D</td>
<td>dpgsz</td>
<td>DPGSZ</td>
</tr>
<tr>
<td>%G</td>
<td>group</td>
<td>GROUP</td>
</tr>
<tr>
<td>%n</td>
<td>nice</td>
<td>NI</td>
</tr>
<tr>
<td>%C</td>
<td>pcpu</td>
<td>%CPU</td>
</tr>
<tr>
<td>%r</td>
<td>pgid</td>
<td>PGID</td>
</tr>
<tr>
<td>%p</td>
<td>pid</td>
<td>PID</td>
</tr>
<tr>
<td>%P</td>
<td>ppid</td>
<td>PPID</td>
</tr>
<tr>
<td>%g</td>
<td>rgroup</td>
<td>RGROUP</td>
</tr>
<tr>
<td>%u</td>
<td>ruser</td>
<td>RUSER</td>
</tr>
<tr>
<td>%S</td>
<td>spgsz</td>
<td>SPGSZ</td>
</tr>
<tr>
<td>%x</td>
<td>time</td>
<td>TIME</td>
</tr>
<tr>
<td>%T</td>
<td>tpgsz</td>
<td>TPGSZ</td>
</tr>
<tr>
<td>%y</td>
<td>tty</td>
<td>TTY</td>
</tr>
<tr>
<td>%U</td>
<td>user</td>
<td>USER</td>
</tr>
<tr>
<td>%z</td>
<td>vsz</td>
<td>VSZ</td>
</tr>
</tbody>
</table>

Each field specifier has a default header. The default header can be overridden by appending an equal sign (=) followed by the user-defined text for the header. The fields are written in the order specified on the command line in column format. The field widths are specified by the system to be at least as wide as the default or user-defined header text. If the header text is null (for example, `-o user=` is specified), the field width is at least as wide as the default header text. If all header fields are null, no header line is written.
Following is the mapping between the default headers and various field specifiers. Every entry in the Default Header column can be overridden by appending an equal sign (=) to the corresponding entry in the Field specifier followed by the user-defined text for the header.

<table>
<thead>
<tr>
<th>Default Header</th>
<th>Field specifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARGS</td>
<td>&quot;args&quot;</td>
</tr>
<tr>
<td>COMM</td>
<td>&quot;comm&quot;</td>
</tr>
<tr>
<td>COMM</td>
<td>&quot;command&quot;</td>
</tr>
<tr>
<td>COMM</td>
<td>&quot;ucomm&quot;</td>
</tr>
<tr>
<td>F_ETIME</td>
<td>&quot;etime&quot;</td>
</tr>
<tr>
<td>GROUP</td>
<td>&quot;group&quot;</td>
</tr>
<tr>
<td>GROUP</td>
<td>&quot;gname&quot;</td>
</tr>
<tr>
<td>GID</td>
<td>&quot;gid&quot;</td>
</tr>
<tr>
<td>NICE</td>
<td>&quot;nice&quot;</td>
</tr>
<tr>
<td>PRI</td>
<td>&quot;pri&quot;</td>
</tr>
<tr>
<td>NICE</td>
<td>&quot;ni&quot;</td>
</tr>
<tr>
<td>PCPU</td>
<td>&quot;pcpu&quot;</td>
</tr>
<tr>
<td>PMEM</td>
<td>&quot;pmem&quot;</td>
</tr>
<tr>
<td>PGID</td>
<td>&quot;pgid&quot;</td>
</tr>
<tr>
<td>PID</td>
<td>&quot;pid&quot;</td>
</tr>
<tr>
<td>PPID</td>
<td>&quot;ppid&quot;</td>
</tr>
<tr>
<td>RGROUP</td>
<td>&quot;rgroup&quot;</td>
</tr>
<tr>
<td>RGROUP</td>
<td>&quot;rgname&quot;</td>
</tr>
<tr>
<td>RGRID</td>
<td>&quot;rgid&quot;</td>
</tr>
<tr>
<td>RUSER</td>
<td>&quot;ruser&quot;</td>
</tr>
<tr>
<td>RUSER</td>
<td>&quot;runame&quot;</td>
</tr>
<tr>
<td>RUID</td>
<td>&quot;ruid&quot;</td>
</tr>
<tr>
<td>TIME</td>
<td>&quot;time&quot;</td>
</tr>
<tr>
<td>TIME</td>
<td>&quot;cputime&quot;</td>
</tr>
<tr>
<td>TTY</td>
<td>&quot;tty&quot;</td>
</tr>
<tr>
<td>TTY</td>
<td>&quot;tt&quot;</td>
</tr>
<tr>
<td>TTY</td>
<td>&quot;tname&quot;</td>
</tr>
<tr>
<td>TTY</td>
<td>&quot;longtname&quot;</td>
</tr>
<tr>
<td>USER</td>
<td>&quot;user&quot;</td>
</tr>
<tr>
<td>USER</td>
<td>&quot;uname&quot;</td>
</tr>
<tr>
<td>UID</td>
<td>&quot;uid&quot;</td>
</tr>
<tr>
<td>LOGNAME</td>
<td>&quot;logname&quot;</td>
</tr>
<tr>
<td>STIME</td>
<td>&quot;start&quot;</td>
</tr>
<tr>
<td>VSZ</td>
<td>&quot;vsz&quot;</td>
</tr>
<tr>
<td>VSZ</td>
<td>&quot;vsize&quot;</td>
</tr>
<tr>
<td>RSS</td>
<td>&quot;rssize&quot;</td>
</tr>
<tr>
<td>FLAG</td>
<td>&quot;flag&quot;</td>
</tr>
<tr>
<td>STATUS</td>
<td>&quot;status&quot;</td>
</tr>
<tr>
<td>CP</td>
<td>&quot;cp&quot;</td>
</tr>
<tr>
<td>PAGEIN</td>
<td>&quot;pagein&quot;</td>
</tr>
<tr>
<td>WCHAN</td>
<td>&quot;wchan&quot;</td>
</tr>
<tr>
<td>NCHAN</td>
<td>&quot;nchan&quot;</td>
</tr>
<tr>
<td>ST</td>
<td>&quot;st&quot;</td>
</tr>
<tr>
<td>TID</td>
<td>&quot;tid&quot;</td>
</tr>
<tr>
<td>SCOUNT</td>
<td>&quot;scount&quot;</td>
</tr>
<tr>
<td>BIND</td>
<td>&quot;bnd&quot;</td>
</tr>
<tr>
<td>SCHEDE</td>
<td>&quot;sched&quot;</td>
</tr>
<tr>
<td>THCOUNT</td>
<td>&quot;thcount&quot;</td>
</tr>
<tr>
<td>TAG</td>
<td>&quot;tag&quot;</td>
</tr>
<tr>
<td>CLASS</td>
<td>&quot;class&quot;</td>
</tr>
<tr>
<td>TCPU</td>
<td>&quot;tcpu&quot;</td>
</tr>
<tr>
<td>TDISKIO</td>
<td>&quot;tdiskio&quot;</td>
</tr>
<tr>
<td>TCTIME</td>
<td>&quot;tctime&quot;</td>
</tr>
<tr>
<td>MACLAB</td>
<td>&quot;mac&quot;</td>
</tr>
</tbody>
</table>

Displays only information about processes with the process numbers specified for the _Plist_ variable. The _Plist_ variable is either a comma separated list of process ID numbers or a list of process ID numbers enclosed in double quotation marks (" ") and separated from one another by a comma or by one or more spaces, or both.
-P Displays the Project name, Project origin, and subproject identifier for the project. If the stick bit is set for the process, the project name will be preceded by an asterisk (*) character. The **Project origin** field designates the currently loaded project repository (LOCAL or LDAP).

-t Tlist Displays only information about processes associated with the workstations listed in the Tlist variable. The Tlist variable is either a comma separated list of workstation identifiers or a list of workstation identifiers enclosed in double quotation marks (" ") and separated from one another by a comma or by one or more spaces, or both.

-T pid Displays the process hierarchy rooted at a given pid in a tree format using ASCII art. This flag can be used in combination with the -f, -F, -o, and -l flags.

-U Ulist Displays only information about processes with the user ID numbers or login names specified for the Ulist variable. The Ulist variable is either a comma-separated list of user IDs or a list of user IDs enclosed in double quotation marks (" " ) and separated from one another by a comma and one or more spaces. In the listing, the ps command displays the numerical user ID unless the -f flag is used; then the command displays the login name. This flag is equivalent to the -u Ulist flag. See also the u flag.

-Ulist This flag is equivalent to the -U Ulist flag.

-X Prints all available characters of each user/group name instead of truncating to the first 8 characters.

-Z Displays the page size settings of processes.

-**DPGSZ** Indicates the data page size of a process.

-**SPGSZ** Indicates the stack page size of a process.

-**TPGSZ** Indicates the text page size of a process.

**Options**

The following options are not preceded by a - (minus sign):

- **a** Displays information about all processes with terminals (ordinarily only the user’s own processes are displayed).
- **c** Displays the command name, as stored internally in the system for purposes of accounting, rather than the command parameters, which are kept in the process address space.
- **e** Displays the environment as well as the parameters to the command, up to a limit of 80 characters.
- **ew** Wraps display from the e flag one extra line.
- **eww** Wraps display from the e flag as many times as necessary.
- **g** Displays all processes.
- **n** Displays numerical output. In a long listing, the **WCHAN** field is printed numerically rather than symbolically. In a user listing, the **USER** field is replaced by a **UID** field.
- **s** Displays the size (SSIZ) of the kernel stack of each process (for use by system maintainers) in the basic output format. This value is always 0 (zero) for a multi-threaded process.
- **t Tty** Displays processes whose controlling tty is the value of the Tty variable, which should be specified as printed by the ps command; that is, 0 for terminal /dev/tty0, 1 for /dev/pts/0, and pts/2 for /dev/pts/2.
- **u** Displays user-oriented output. This includes the **USER**, **PID**, **%CPU**, **%MEM**, **SZ**, **RSS**, **TTY**, **STAT**, **STIME**, **TIME**, and **COMMAND** fields.
- **w** Specifies a wide-column format for output (132 columns rather than 80). If repeated, (for example, wW), uses arbitrarily wide output. This information is used to decide how much of long commands to print.
- **x** Displays processes without a controlling terminal in addition to processes with a controlling terminal.
Exit Status

This command returns the following exit values:

0    Successful completion.
>0   An error occurred.

Examples

1. To display all processes, type:
   
   ps -e -f

   To display all processes with expanded user name, type:
   
   ps -X -e -f

2. To list processes owned by specific users, type:
   
   ps -f -l -u jim,jane,su

3. To list processes that are associated with the /dev/console and /dev/tty1 ttys, type:
   
   ps -t console,tty/1

4. To list processes not associated with a terminal, type:
   
   ps -t -

5. To display a specified format with field specifiers, type:
   
   ps -o ruser,pid,ppid=parent,args

   The output is:
   
   RUSER  PID  parent  COMMAND
   helene  34    12  ps -o ruser,pid,ppid=parent,args

6. To display a specified format with field descriptors, type:
   
   ps -o "%u %p %y : %a"

   The output is:

   < RUSER >  PID  TT :  COMMAND
   < helene >  34  pts/3 : ps -o %u %p %y : %a

7. To display information about processes and kernel threads controlled by the current terminal, type:
   
   ps -lm

   The output is similar to:

   F S UID  PID  PPID  C PRI  NI ADDR  SZ  WCHAN  TTY  TIME   CMD
   240003 A   26  8984  7190  1  60  20  2974  312  pts/1  0:00  -ksh
   400 S     -   -   -   -   1  60  -   -   -    -    -
   200005 A   26  9256  8984  15  67  20  18ed  164  pts/1  0:00  ps
   0 R      -   -  1567  -   -   -    -    -    -    -

8. To display information about all processes and kernel threads, type:
   
   ps -emo THREAD

   The output is similar to:

   USER  PID  PPID  TID  S  C PRI  SC  WCHAN  FLAG  TTY  BND  CMD
   jane  1716  19292  -A  10  60  1  *  260801 pts/7  -  biod
   -   -   -   4636  S  60  0  599e9d8  8400  -   -
   -   -  5537  R  10  60  1  5999e18  2420  -   3  -
   luke 19292 18524  -A  0  60  0  586ad84 200001 pts/7  -  -ksh
   -   -   -  7617  S  0  60  586ad84  400  -   -   -
   luke 25864 31168  -A  11  65  0  200001 pts/7  -
   -   -  8993  R  11  65  0    0    0    -

9. To list all the 64-bit processes, type:
10. To display the project assignment details for the processes, type:
   ```
   ps -M
   ```
11. To display the processes' page size settings, type:
   ```
   ps -Z
   ```

   The output is similar to:
   ```
   PID TTY TIME DPGSZ SPGSZ TPGSZ CMD
   41856 pts/15 0:00 4K 4K 4K ps
   84516 pts/15 0:00 4K 4K 4K ksh
   ```

**Files**

- `/usr/bin/ps` Contains the `ps` command.
- `/etc/passwd` Specifies user ID information.
- `/dev/pty*` Indicates workstation (PTY) names.
- `/dev/tty*` Indicates workstation (TTY) names.

**Related Information**

The `kill` command, `nice` command.

Using the `ps` command in *Performance management*.

**System V ps command**

**Syntax**

```
```

**Description**

The `ps` command prints information about active processes. Without flags, `ps` prints information about processes associated with the controlling terminal. The output contains the process ID, terminal identifier, cumulative execution time, and the command name. The information displayed with flags varies accordingly.

**Output**

Depending on the flags used with the `ps` command, column headings vary for the information displayed.

The headings are defined in the following list (flags that cause these headings to appear are shown in parentheses):

- **F (-l)** Flags (hexadecimal and additive) associated with the process, or the thread if the `-L` option is specified. Some of the more important F field flags (hexadecimal and additive) associated with processes and threads are shown below:

  **F Field Table**

<table>
<thead>
<tr>
<th>Flags</th>
<th>Hexadecimal Value</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLOAD</td>
<td>0x00000001</td>
<td>Indicates that the process is operating in core memory.</td>
</tr>
<tr>
<td>SNOSWAP</td>
<td>0x00000002</td>
<td>Indicates that the process cannot be swapped out.</td>
</tr>
<tr>
<td>STRC</td>
<td>0x00000008</td>
<td>Indicates that the process is being traced.</td>
</tr>
<tr>
<td>SKPROC</td>
<td>0x00000200</td>
<td>Indicates a Kernel process.</td>
</tr>
</tbody>
</table>
F Field Table

<table>
<thead>
<tr>
<th>Flags</th>
<th>Hexadecimal Value</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEXIT</td>
<td>0x00010000</td>
<td>Indicates that the process is exiting.</td>
</tr>
<tr>
<td>SEXECED</td>
<td>0x00200000</td>
<td>Indicates that process has been run.</td>
</tr>
<tr>
<td>SEXECING</td>
<td>0x01000000</td>
<td>Indicates that the process is execing (performing an exec).</td>
</tr>
<tr>
<td>TKTHREAD</td>
<td>0x00001000</td>
<td>Indicates that the thread is a kernel only thread.</td>
</tr>
</tbody>
</table>

**Note:** You can see the definitions of all process and thread flags by referring to the `p_flags` and `t_flags` fields in the `/usr/include/sys/proc.h` and `/usr/include/sys/thread.h` files respectively.

**S (-l)** The state of the process or kernel thread:

For processes:
- **O** Nonexistent
- **A** Active
- **W** Swapped
- **I** Idle
- **Z** Canceled
- **T** Stopped

For kernel threads:
- **O** Nonexistent
- **R** Running
- **S** Sleeping
- **W** Swapped
- **Z** Canceled
- **T** Stopped

**UID (-f, -l)**
- The user ID number of the process (the login name is printed under the -f option).

**PID (all)**
- The process ID of the process.

**PPID (-f, -l)**
- The process ID of the parent process.

**CLS (-c)**
- Scheduling class for the process. Printed only when the -c flag is used.

**NI (-l)**
- The nice value of the process used in calculating priority for the `sched_other` policy.

**PRI (-c, -l)**
- The priority of the process or kernel thread. Higher numbers mean lower priority.

**ADDR (-l)**
- Contains the segment number of the process stack, if normal; if a kernel process, the address of the preprocess data area.

**SZ (-l)**
- The size in pages of the core image of the process.
WCHAN(-l)
The event for which the process or kernel thread is waiting or sleeping. For a kernel thread, this field is blank if the kernel thread is running. For a process, the wait channel is defined as the wait channel of the sleeping kernel thread if only one kernel thread is sleeping; otherwise a star is displayed.

STIME (-f,-u)
The starting time of the process. The LANG environment variables control the appearance of this field.

TTY (all)
The controlling workstation for the process:
- The process is not associated with a workstation.
? Unknown

TIME (all)
The total execution time for the process.

LTIME (-L)
The execution time for an individual LWP.

CMD (all)
Contains the command name. The full command name and its parameters are displayed with the -f flag.

LWP (-L)
The tid of the kernel thread.

NLWP(-Lf)
The number of kernel threads in the process.

PSR (-P)
The logical processor number of the processor to which the kernel thread is bound (if any). For a process, this field is shown if all its threads are bound to the same processor.

RSS (-ly)
The real memory (resident set) size of the process in pages.

Format
The following list describes the field specifiers recognized by the system. These field specifiers can be used with the -o flag to specify the format for the output of the ps command.

The field specifiers recognized by the system are:

addr Indicates the segment number of the process stack, if normal; if a kernel process, the address of the preprocessor data area. The default header for this field is ADDR.

args Indicates the full command name being executed. All command line arguments are included, though truncation may occur. The default header for this field is COMMAND.

c CPU utilization of process or thread, incremented each time the system clock ticks and the process or thread is found to be running. The value is decayed by the scheduler by dividing it by 2 once per second. For the sched_other policy, CPU utilization is used in determining process scheduling priority. Large values indicate a CPU intensive process and result in lower process priority whereas small values indicate an I/O intensive process and result in a more favorable priority. The default header for this field is C.

class Indicates the scheduling policy for a kernel thread. The policies are sched_other, sched_fifo and sched_rr. The default header for this field is CLS.

comm Indicates the short name of the command being executed. Command line arguments are not included. The default header for this field is COMMAND.
etime  Indicates the elapsed time since the process started. The elapsed time is displayed in the format
[[ dd -] hh: ]mm :ss
where dd specifies the number of days, hh specifies the number of hours, mm specifies the
number of minutes, and ss specifies the number of seconds.

The default header for this field is **ELAPSED**.

f  Indicates flags (hexadecimal and additive) associated with the process. The default header for this
field is **COMMAND**.

fname Indicates the first 8 bytes of the base name of the process's executable file. The default header for
this field is **COMMAND**.

gid  Indicates the effective group ID number of the process as a decimal integer. The default header
for this field is **GID**.

group Indicates the effective group ID of the process. The textual group ID is displayed. If the textual
group ID cannot be obtained, a decimal representation is used. The default header for this field is
**GROUP**.

lwp  Indicates the thread ID of the kernel thread. The default header for this field is **TID**.

nice Indicates the decimal value of the process nice value. The default header for this field is **NI**.

nlwp Indicates the number of kernel threads owned by the process. The default header for this field is
**THCNT**.

pcpu Indicates the ratio of CPU time used to CPU time available, expressed as a percentage. The
default header for this field is **%CPU**.

pgid Indicates the decimal value of the process group ID. The default header for this field is **PGID**.

pid Indicates the decimal value of the process ID. The default header for this field is **PID**.

pmem Indicates the percentage of real memory used by this process. The default header for this field is
**%MEM**.

ppid Indicates the decimal value of the parent process ID. The default header for this field is **PPID**.

pri Indicates the priority of the process or kernel thread; higher numbers mean lower priority. The
default header for this field is **PRI**.

psr Indicates the logical processor number of the processor to which the kernel thread is bound (if
any). The default header for this field is **PSR**.

rgid Indicates the real group ID number of the process as a decimal integer. The default header for this
field is **RGID**.

rgroup Indicates the real group ID of the process. The textual group ID is displayed. If the textual group
ID cannot be obtained, a decimal representation is used. The default header for this field is
**RGROUP**.

rss  Indicates the real memory (resident set) size of the process (in 1 KB units). The default header for
this field is **RSS**.

ruid Indicates the real user ID number of the process as a decimal integer. The default header for this
field is **RUID**.

ruser Indicates the real user ID of the process. The textual user ID is displayed. If the textual user ID
cannot be obtained, a decimal representation is used. The default header for this field is **RUSER**.

s  Indicates the state of the process. The default header for this field is **S**.

sid Indicates the process ID of the session leader. The default header for this field is **SID**.
stime Indicates the starting time of the process. The LANG environment variables control the appearance of this field. The default header for this field is STIME.

time Indicates the cumulative CPU time since the process started. The time is displayed in the same format as in etime. The default header for this field is TIME.

tty Indicates the controlling terminal name of the process. The default header for this field is TT.

uid Indicates the effective user ID number of the process as a decimal integer. The default header for this field is UID.

user Indicates the effective user ID of the process. The textual user ID is displayed. If the textual user ID cannot be obtained, a decimal representation is used. The default header for this field is USER.

vsz Indicates, as a decimal integer, the size in kilobytes of the core image of the process. The default header for this field is VSZ.

wchan Indicates the event for which the process or kernel thread is waiting or sleeping. For a kernel thread, this field is blank if the kernel thread is running. For a process, the wait channel is defined as the wait channel of the sleeping kernel thread if only one kernel thread is sleeping; otherwise a star is displayed.

The default header for this field is WCHAN.

Flags
Some flags accept lists as arguments. Items in a list can be either separated by commas or else enclosed in double quotes and separated by commas or spaces. Values for proclist and pgrplist must be numeric.

-\(a\)  Writes to standard output information about all processes, except the session leaders and processes not associated with a terminal.
-\(A\)  Writes to standard output information about all processes.
-\(c\)  Prints information in a format that reflects scheduler properties. The -\(c\) flag affects the output of the -f and -l flags, as described below.
-\(d\)  Writes to standard output information about all processes, except the session leaders.
-\(e\)  Writes to standard output information about all processes, except kernel processes.
-\(f\)  Generates a full listing.
-\(g\) pgrplist  Writes to standard output information only about processes that are in the process groups specified by pgrplist. Values for pgrplist must be numeric.
-\(G\) grplist  Writes to standard output information only about processes that are in the process groups specified by grplist. The -\(G\) flag accepts group names.
-\(j\)  Displays session ID and process group ID.
-\(L\)  Generates a long listing.
-\(L\)  Prints status of active threads within a process.
-\(o\) format  Displays information in the format specified by format. Multiple field specifiers can be specified for the format variable. The field specifiers that can be used with the -\(o\) flag are described above in the Format section.
-\(p\) proclist  Displays information only about processes with the process numbers specified by proclist. Values for proclist must be numeric.
-\(P\)  Displays the logical processor number of the processor to which the primary kernel thread of the process is bound (if any).
-\(s\) sidlist  Displays all processes whose session leader’s IDs are specified by sidlist.
-\(t\) termlist  Displays information only about processes associated with the terminals specified by termlist.
-\(u\) uidlist  Displays information only about processes with the user ID numbers or login names specified by uidlist.
-\(U\) uidlist  Displays information only about processes with the user ID numbers or login names specified by uidlist.
-\(X\)  Prints all available characters of each user and group name instead of truncating to the first 8 characters.
-y  When combined with the -l option, changes the long listing so that it prints the "RSS" and "SZ" fields in kilobytes and does not print the "F" and "ADDR" fields.

**Exit Status**
This command returns the following exit values:

<table>
<thead>
<tr>
<th>Exit Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful completion.</td>
</tr>
<tr>
<td>&gt;0</td>
<td>An error occurred.</td>
</tr>
</tbody>
</table>

**Examples**

1. To display all processes, enter:
   ```
   ps -e -f
   ```
2. To list processes owned by the user 'guest', enter:
   ```
   ps -f -l -u guest
   ```
3. To list processes that are associated with the `/dev/pts/0` and `/dev/pts/1` terminals, enter:
   ```
   ps -t pts/0,pts/1
   ```
4. To list processes not associated with a terminal, enter:
   ```
   ps -t -
   ```
5. To display a specified format with field specifiers, enter:
   ```
   ps -o ruser,pid,ppid,args
   ```
6. To display information about all kernel threads in a process, enter:
   ```
   ps -L
   ```
7. To display session id and process group ids of all the processes, enter:
   ```
   ps -jA
   ```
8. To display the scheduling class and priority of processes, enter:
   ```
   ps -c -l
   ```
9. To display information about kernel threads and the number of kernel threads in a process, enter:
   ```
   ps -L -f
   ```
10. To display the processor to which the process or kernel thread is bound to, enter:
    ```
    ps -P
    ```
11. To print an ASCII art for a given process (inetd in the example below), enter:
    ```
    ps -T 14220
    ```

Output will look similar to the following:

```
PID  TTY  TIME  CMD
14220 - 0:00  inetd
16948 - 0:00  \--telnetd
32542 pts/4 0:00  \--ksh
26504 - 0:00  \--telnetd
41272 pts/5 0:00  \--ksh
26908 pts/5 0:00  \--vi
28602 - 0:00  \--telnetd
24830 pts/0 0:00  \--ksh
676416 pts/0 0:00  \--ksh
29984 - 0:00  \--telnetd
38546 pts/6 0:00  \--ksh
32126 - 0:00  \--telnetd
11162 pts/7 0:00  \--ksh
34466 - 0:00  \--rpc.ttdbserver
35750 - 0:00  \--telnetd
23612 pts/3 0:00  \--ksh
36294 - 0:00  \--telnetd
```
To print information about all processes rooted at a given pid, enter:
```
ps -fl 14220
```
Output will look similar to the following:

```
UID   PID   PPID  C   STIME   TTY   TIME   CMD
root  14220 8676  0   0:00   -   -   /usr/sbin/inetd
root  16948 14220  0   0:00   -   -   telnetd -a
root  23612 35750  0   Apr  10  pts/3  0:00   -ksh
root  24830 28602  1   18:30:56  pts/0  0:00   -ksh
root  28602 14220  0   18:30:55  -   -   telnetd -a
root  32542 16948  0   Apr  06  pts/4  0:00   -ksh
root  34466 14220  0   Apr  10  -   -   rpc.ttdbserver 100083 1
root  35750 14220  0   Apr  10  -   -   telnetd -a
root  40228 24830  8   18:36:01  pts/0  0:00   ps -fl 14220
```

To display all processes with expanded user name, type:
```
ps -X -e -f
```

### Files

- `/usr/sysv/bin/ps` Contains the System V R4 `ps` command.
- `/etc/passwd` Contains the user ID information.
- `/dev/pty*` Indicates workstation (PTY) names.
- `/dev/tty*` Indicates workstation (TTY) names.

### Related Information

The `kill` command, `nice` command.

### ps4014 Command

**Purpose**

Converts a Tektronix 4014 file to PostScript format.

**Syntax**

```
ps4014 [ [-m] | -C | -N | -R ] [ -s Width,Height ] [ -b Left,Bottom ] [ -s Width ] [ -o OutFile ]
```

**Description**

The `ps4014` command reads in a Tektronix 4014 format file and converts it to PostScript format for printing on a PostScript printer. If no file is specified, the standard input is used. The resulting PostScript file can be directed to standard output or to a named file.
Note: By default, the 4014 image is scaled to occupy nearly the entire page in a landscape orientation.

Flags

Note: The -m, -C, and -N flags specify values for 4014 hardware options that affect the interpretation of 4014 commands.

-C Causes a carriage return to move the pen position to the left margin but not down to the next line. By default, a carriage return command moves the pen down to the next line and over to the left margin.

-ILeft, Bottom Specifies the location on the printed page of the bottom left corner of the converted raster image. The values specified by the Left and Bottom parameters are the distances (in inches) from the bottom left corner of the printed page to the bottom left corner of the image.

-m Enables the "Margin 2" mode for the 4014.

-N Causes line feed to move the pen position down to the next line but not to the left margin. By default, a line feed command moves the pen down to the next line and over to the left margin.

-pOutFile Causes the PostScript file to be written to the file specified by the OutFile parameter rather than the standard output.

-R Rotates the image 90 degrees on the page for portrait orientation. The default is landscape orientation.

-sWidth, Height Specifies the size of the converted raster image on the printed page. The Width and Height parameters specify the dimensions (in inches) of the resulting image on the printed page.

-SWidth Allows you to scale the image without distorting its shape. The Width parameter specifies the width, in inches, of the resulting image on the printed page. The height of the image is computed to maintain the same ratio of height to width on the output image as on the input raster-format file.

International Character Support

See the NLSvec File for details related to character translation.

Environment Variable

PSLIBDIR Path name of a directory to use instead of the /usr/lib/ps for ps4014 prologue.

Files

/usr/lib/ps/ps4014.pro Contains the default prologue file.

Related Information

NLSvec file.

ps630 Command

Purpose

Converts Diablo 630 print files to PostScript format.

Syntax

ps630 [ [-Bodyfont ] [-File ] [-sPitch ] [-BBoldfont ] [ File ... ]

490 Commands Reference, Volume 4
Description

The ps630 command converts Diablo 630 format print files to PostScript format for printing on a PostScript printer. If no File variable is specified, the ps630 command reads from standard input. By default, the PostScript file is sent to the standard output.

The ps630 command can convert nroff files generated with the -Txerox flag. Typewheel emulation information can be specified as options. Font specifications (for bold and regular) are PostScript font names (such as Times-Roman, Times-Bold, Courier-Bold, Courier-BoldOblique). You can select 10, 12, or 15 characters per inch.

Some applications produce bold type by double-striking a character. This type of bolding is not translated into PostScript format. Only the bold effect produced by issuing the proper Diablo command sequence (Esc-O) results in bold characters.

The output of the ps630 command cannot be page-reversed. Times-Roman and Helvetica are narrow fonts that may look squeezed if no adjustment to the page width is made by the application.

The following Diablo 630 commands are not supported:

- Print suppression
- HY-Plot
- Extended character set
- Downloading print wheel information or program mode
- Page lengths other than 11 inches
- Paper feeder control
- Hammer energy control
- Remote diagnostic
- Backward printing control.

Note: The Diablo 630 command for reverse printing is supported.

Flags

- **-f**Bodyfont Sets the font to be used for normal printing. The default is Courier.
- **-p**File Causes the PostScript file to be written to the file specified by the File parameter rather than to the standard output.
- **-s**Pitch Selects type size for printing (both the regular and bold fonts are scaled to this size). Pitch is in characters per inch and must be one of 10, 12, or 15. The default is 12.
- **-F**Boldfont Sets the font to be used for bold type. The default is Courier-Bold.

International Character Support

See the [NLSvec File](#) for details related to character translation.

Environment Variable

**PSLIBDIR** Path name of a directory to use instead of the /usr/lib/ps directory for the ps630 prologue.

Files

/usr/lib/ps Contains PostScript fonts.
Related Information

The \texttt{enscript} command, \texttt{nroff} command.

The \texttt{NLSvec} file.

\section*{psc or psdit Command}

\subsection*{Purpose}

Converts \texttt{troff} intermediate format to PostScript format.

\subsection*{Syntax}

\begin{verbatim}
\{ psc \mid psdit \} [ \[-f1 \text{CodeSet:Font} \] [ \[-F \text{FontDirectory} \] [ \[-M \text{MediaName} \] [ \[-p \text{Prologue} \] [ \[-o \text{List \ File} \]
\end{verbatim}

\subsection*{Description}

The \texttt{psc} and \texttt{psdit} commands translate a file created by device-independent \texttt{troff} to PostScript format for printing with a PostScript printer. If no file is specified, the standard input is used. The PostScript file is sent to the standard output.

\textbf{Note:} The input for the \texttt{psc} and \texttt{psdit} commands should be prepared with the corresponding -Tpsc option, such as the \texttt{troff} or \texttt{pic} command.

The \texttt{psc} and \texttt{psdit} commands can handle extended characters created by modifying the printer code field in the font file (/usr/lib/font/devpsc/R). The modified field contains a string surrounded by double quotation marks. The string contains a \texttt{\textbackslash b} (backslash b) followed by a sequence of characters from the standard font that is composed into a new character by overstriking.

The \texttt{psc} and \texttt{psdit} commands allow users to cause the \texttt{troff} command to include arbitrary PostScript code in the generated PostScript file. The \texttt{psc} and \texttt{psdit} commands recognize the undefined \texttt{% (percent)} command in the \texttt{troff} intermediate file format to signal the start of raw PostScript code to be placed as is in the output file. Everything between (but not including) the \texttt{% (percent sign) and a line containing a . (period) will be placed in the generated PostScript output.

This PostScript output is not insulated from the \texttt{troff} command coordinate system or the state of the generated PostScript output. However, two functions are defined in the prologue so that users can insulate themselves if so desired. The \texttt{PB} (picture begin) function performs a PostScript save operation, translates the PostScript coordinate system to \texttt{troff}'s idea of the current position on the page, and changes the scale and orientation of the coordinate system axes to the standard PostScript 72 units per inch. The \texttt{PE} (picture end) macro ends this protected environment.

Several methods can be used to incorporate such included PostScript code into the \texttt{troff} intermediate file. For example, the .sy, \!, and .cf subcommands of the \texttt{troff} command use the following example to include the PostScript language description of a completely separate, printable document. In this example, the \texttt{showpage} operator is redefined to include mypic.ps as an illustration:

\begin{verbatim}
standard troff input
\&
\f1
\!\!\!\!PB
\!\!\!\!showpage{}def
\f1
.sy cat mypic.ps
\!\!PE
\!.
more standard troff input
\end{verbatim}
Information containing various media sizes for the **psdit** command and the **enscript** command are contained in the file `/usr/lib/ps/MediaSizes`.

The information required for each entry in the **MediaSizes** file can be obtained from the **PostScript Printer Description**, or **PPD**, file that matches the PostScript printer used with TranScript. The **PPD** files are available from Adobe Systems Incorporated. The measurements extracted from the **PPD** files are in points. A printer’s point is 1/72 of an inch.

Any line in the **MediaSizes** file beginning with an ASCII * (asterisk) is ignored when matching media size names provided on the command line to the **enscript** command and the **psdit** command.

Each entry in the **MediaSizes** file contains either eight or nine fields. The first eight fields are required for all entries. The ninth field is optional. Fields are separated by white space. The fields for each entry are as follows:

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EntryName</strong></td>
<td>Character string to match against a media name provided with the <strong>-M</strong> option with the <strong>enscript</strong> command or the <strong>psdit</strong> command.</td>
</tr>
<tr>
<td><strong>MediaWidth</strong></td>
<td>Media width in points.</td>
</tr>
<tr>
<td><strong>MediaDepth</strong></td>
<td>Media depth in points.</td>
</tr>
<tr>
<td><strong>ImageableLLX</strong></td>
<td>Imageable lower left-hand corner x coordinate in points.</td>
</tr>
<tr>
<td><strong>ImageableLLY</strong></td>
<td>Imageable lower left-hand corner y coordinate in points.</td>
</tr>
<tr>
<td><strong>ImageableURX</strong></td>
<td>Imageable upper right-hand corner x coordinate in points.</td>
</tr>
<tr>
<td><strong>ImageableURY</strong></td>
<td>Imageable upper right-hand corner y coordinate in points.</td>
</tr>
<tr>
<td><strong>PageRegionName</strong></td>
<td>PostScript sequence for the particular printer to identify the size of the imageable area.</td>
</tr>
<tr>
<td><strong>PaperTrayName</strong></td>
<td>PostScript sequence for the particular printer to select a particular paper/media tray. This field is optional.</td>
</tr>
</tbody>
</table>

**Note:** The sequence can be multiple PostScript operators or words for both the **PageRegionName** field and the **PaperTrayName** field. To specify such a sequence, use the ASCII " (double quotation mark character) to delimit the entire sequence.

The following are examples of field entries in the **MediaSizes** file:

<table>
<thead>
<tr>
<th>Name</th>
<th>Entries</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Letter</strong></td>
<td>Width 612</td>
</tr>
<tr>
<td></td>
<td>Depth 792</td>
</tr>
<tr>
<td></td>
<td>llx 18</td>
</tr>
<tr>
<td></td>
<td>lly 17</td>
</tr>
<tr>
<td></td>
<td>urx 597</td>
</tr>
<tr>
<td></td>
<td>ury 776</td>
</tr>
<tr>
<td><strong>Page-Region-Name</strong></td>
<td>Letter</td>
</tr>
<tr>
<td><strong>Page-Tray-Name</strong></td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>Entries</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Legal</td>
<td></td>
</tr>
<tr>
<td>Width</td>
<td>612</td>
</tr>
<tr>
<td>Depth</td>
<td>1008</td>
</tr>
<tr>
<td>llx</td>
<td>18</td>
</tr>
<tr>
<td>lly</td>
<td>17</td>
</tr>
<tr>
<td>urx</td>
<td>597</td>
</tr>
<tr>
<td>ury</td>
<td>992</td>
</tr>
</tbody>
</table>

**Flags**

- **-f1 CodeSet:Font**
  Takes font information from `FontDirectory` instead of the default.

- **-FFontDirectory**
  Specifies a media name to use to determine the amount of imageable area on the paper. The name provided is matched against entries in the `MediaSizes` file. For instance, `-M legal` would request a legal size of paper as the imageable area. If this option is not used, the default size is letter size, which is 8.5 inches wide by 11.0 inches deep.

- **-pPrologue**
  Uses the contents of `Prologue` instead of the default PostScript prologue.

- **-oList**
  Prints pages whose numbers are given in the list separated by commas. The list contains single numbers and ranges in the format `N1-N2`, where `N1` and `N2` represent page numbers. A missing `N1` means the range begins with the lowest-numbered page; a missing `N2` means the range ends with the highest-numbered page.

**Examples**

The following statements are equivalent:

```
pic -Tpsc File | troff -Tpsc | psc

pic -Tpsc File | troff -Tpsc | psdit
```

**Environment Variables**

- **PSLIBDIR**
  Path name of a directory to use instead of the `/usr/lib/ps` file for the `psc` and `psdit` command prologue.

- **TRANSCRIPT**
  Absolute path name of a file to use instead of `/usr/lib/ps/transcript.conf` for the MBCS handling.

**Files**

- `/usr/lib/font/devpsc/*`
  Contains the `troff` default description files for a PostScript virtual device.

- `/usr/lib/ps/psdit.pro`
  Contains the default PostScript prologue.

- `/usr/lib/ps/MediaSizes`
  Contains the default file used for media sizes.

- `/usr/lib/ps/transcript.conf`
  Contains the default value used for PostScript codeset and font name.
Related Information

The \texttt{enscript} command, \texttt{managefonts} command, \texttt{qprt} command, \texttt{pic} command, \texttt{psroff} command, \texttt{troff} command.

The \texttt{PE} macro.

\texttt{me} Macro Package for the \texttt{nroff} and \texttt{troff} Commands

---

\textbf{pshare Command}

\section*{Purpose}
Enables or reports the availability of shared login ports.

\section*{Syntax}
\texttt{pshare [-a] [ Device ]}

\section*{Description}
The \texttt{pshare} command enables shared ports. Shared ports are bidirectional. If you do not specify a \textit{Device} parameter, the \texttt{pshare} command reports the names of all currently enabled shared ports. To enable a shared port, the \texttt{getty} command attempts to create a \texttt{lock} file in the \texttt{/etc/locks} directory that contains the ASCII process ID of the process. If another process is already using the port, the \texttt{getty} command waits until the port is available and tries again. The system enables a port by updating an entry in the \texttt{/etc/inittab} file and then sending a signal to the \texttt{init} process. After receiving the signal and reading the updated status entry, the process takes the appropriate action.

Use the \textit{Device} parameter to specify the ports to be enabled. Permitted values include:
- Full device name, such as the \texttt{/dev/tty1} device
- Simple device name, such as the \texttt{tty1} device
- A number (for example, 1 to indicate the \texttt{/dev/tty1} device)

\textbf{Note:} You must have root user authority to run this command.

\section*{Flags}
\texttt{-a} Enables all ports as shared.

\section*{Examples}
To enable the workstation attached to the \texttt{/dev/tty2} port as a shared port, enter:
\texttt{pshare /dev/tty2}

\texttt{/etc/inittab} Controls system initialization.

\section*{Files}
\texttt{/etc/locks} Contains \texttt{lock} files for the \texttt{pshare} and \texttt{pdelay} commands.
\texttt{/usr/sbin/pshare} Contains the \texttt{pshare} command.
psplot Command

Purpose
Converts files in plot format to PostScript format.

Syntax
psplot [ -g Prologue ] [ File... ]

Description
The psplot command reads files in plot format and converts them to PostScript format on the standard output. If no files are specified, the standard input is used. The conversion is almost one-to-one, with one PostScript function call for each plot primitive. You can modify the behavior of the file by changing the definitions of the PostScript functions in the prologue.

Flags
-g Prologue Uses the contents of the Prologue file instead of the default PostScript prologue. If this flag is not specified, the default prologue file is used.

International Character Support
The NLSvec file provides details related to character translation.

Environment Variable

PSLIBDIR Path name of a directory to use for the psplot command prologue file. The path denoted by the PSLIBDIR environment variable is used instead of the path denoted by the XPSLIBDIR environment variable.

TRANSCRIPT Absolute path name of a file to use instead of /usr/lib/ps/transcript.conf for the MBCS handling.

Files
/usr/lib/ps/psplot.pro Contains the default prologue file.

Related Information
The ps4014 command, lpr command, lp command.

NLSvec File.

psrev Command

Purpose
Reverses the page order of a PostScript file and selects a page range for printing.
Syntax
psrev [-R] [-sPagespec,...] [ File ]

Description
The psrev command reverses the page order of the file specified by the File variable and prints the pages specified by the Pagespec parameter. The file must conform to PostScript file structuring conventions. If no value for the File is specified, the psrev command reads from standard input. The psrev command writes the resulting file to the standard output.

Flags
-R
-SPagespec

Examples
The following are examples of using the psrev command showing page ranges and an individual page in nonreversed order:
psrev -R -s2-4,6
psrev -R -s2-4,6-8

Files
/var/tmp/RV*

Related Information
The enscript command.

psroff Command
Purpose
Converts files from troff format to PostScript format.

Syntax
psroff [ -t ] [ -d Queue ] [ -n Number ] [ -x Title ] [ -D FontDirectory ] [ -F FontFamily ] [ -P Flag ] [ -t troffFlags ] [ File ] ...

Description
The psroff command is a shell script that runs the troff command in an environment to produce output on a PostScript printer. It uses the psdit command to convert troff intermediate output to PostScript format, and spools this output for printing. If no files are specified, the standard input is used.

To include arbitrary PostScript language commands or files in a troff document, see the psdit command.

PostScript Font Information
The PostScript Fonts for Transcript table shows the fonts available for the TranScript commands. The fonts are available by long name when using the enscript command, and by short name when using the psroff or troff commands. The following table shows the psroff commands (short names) used to declare a
default set of fonts. The alphabetic characters are case-sensitive:

*PostScript Fonts for Transcript*

<table>
<thead>
<tr>
<th>Long Name (Short Name)</th>
<th>Font Family</th>
</tr>
</thead>
<tbody>
<tr>
<td>AvantGarde-Book (ag)</td>
<td>AvantGarde</td>
</tr>
<tr>
<td>AvantGarde-Demi (Ag)</td>
<td>AvantGarde</td>
</tr>
<tr>
<td>AvantGarde-DemiOblique (AG)</td>
<td>AvantGarde</td>
</tr>
<tr>
<td>AvantGarde-BookOblique (aG)</td>
<td>AvantGarde</td>
</tr>
<tr>
<td>Bookman-Demi (Bo)</td>
<td>Bookman</td>
</tr>
<tr>
<td>Bookman-DemIftaic (BO)</td>
<td>Bookman</td>
</tr>
<tr>
<td>Bookman-Light (bo)</td>
<td>Bookman</td>
</tr>
<tr>
<td>Bookman-LightIftaic (bO)</td>
<td>Bookman</td>
</tr>
<tr>
<td>Courier (C)</td>
<td>Courier</td>
</tr>
<tr>
<td>Courier-Bold (CB)</td>
<td>Courier</td>
</tr>
<tr>
<td>Courier-BoldOblique (CO)</td>
<td>Courier</td>
</tr>
<tr>
<td>Courier-Oblique (CO)</td>
<td>Courier</td>
</tr>
<tr>
<td>Garamond-Bold (Ga)</td>
<td>Garamond</td>
</tr>
<tr>
<td>Garamond-BoldIftaic (GA)</td>
<td>Garamond</td>
</tr>
<tr>
<td>Garamond-Light (ga)</td>
<td>Garamond</td>
</tr>
<tr>
<td>Garamond-LightIftaic (gA)</td>
<td>Garamond</td>
</tr>
<tr>
<td>Helvetica (H)</td>
<td>Helvetica</td>
</tr>
<tr>
<td>Helvetica-Bold (HB)</td>
<td>Helvetica</td>
</tr>
<tr>
<td>Helvetica-Oblique (HO)</td>
<td>Helvetica</td>
</tr>
<tr>
<td>Helvetica-BoldOblique (HD)</td>
<td>Helvetica</td>
</tr>
<tr>
<td>Helvetica-Narrow (hn)</td>
<td>Helvetica</td>
</tr>
<tr>
<td>Helvetica-Narrow-Bold (Hn)</td>
<td>Helvetica</td>
</tr>
<tr>
<td>Helvetica-Narrow-BoldOblique (HN)</td>
<td>Helvetica</td>
</tr>
<tr>
<td>Helvetica-Narrow-Oblique (hN)</td>
<td>Helvetica</td>
</tr>
<tr>
<td>LubalinGraph-Book (lu)</td>
<td>Lubalin</td>
</tr>
<tr>
<td>LubalinGraph-BookOblique (IU)</td>
<td>Lubalin</td>
</tr>
<tr>
<td>LubalinGraph-Demi (Lu)</td>
<td>Lubalin</td>
</tr>
<tr>
<td>LubalinGraph-DemiOblique (LU)</td>
<td>Lubalin</td>
</tr>
<tr>
<td>NewCenturySchlbk (NC)</td>
<td>NewCentury</td>
</tr>
<tr>
<td>NewCenturySchlbk-Bold (Nc)</td>
<td>NewCentury</td>
</tr>
<tr>
<td>NewCenturySchlbk-Italic (nc)</td>
<td>NewCentury</td>
</tr>
<tr>
<td>NewCenturySchlbk-Roman (nc)</td>
<td>NewCentury</td>
</tr>
<tr>
<td>Optima (op)</td>
<td>Optima</td>
</tr>
<tr>
<td>Optima-Bold (Op)</td>
<td>Optima</td>
</tr>
<tr>
<td>Optima-BoldOblique (OP)</td>
<td>Optima</td>
</tr>
<tr>
<td>Optima-Oblique (oP)</td>
<td>Optima</td>
</tr>
<tr>
<td>Palatino-Bold (PB)</td>
<td>Palatino</td>
</tr>
<tr>
<td>Palatino-BoldIftaic (PX)</td>
<td>Palatino</td>
</tr>
</tbody>
</table>
Flags

-DFontDirectory
Finds font family directories in the specified font directory, rather than the standard font directory, which was configured in the installation procedure. It may be necessary to use both this flag and the -F flag to imitate the -F flag in the troff command.

-dQueue
Causes the output to be queued to the queue specified by the Queue parameter. If the -d flag is not used, the psroff command queues output on the default queue, the first queue known to the qdaemon. This flag is recognized by the spooler print.

-FFontFamily
Uses the specified font family for the R/I/B/BI fonts, rather than the Times default family. The Times, Courier, and Helvetica font families are defined at your site, and others are available as well. Ensure that the printer you use contains the font family you pick. This flag overrides the troff command -F flag. If you want to use the troff command -F flag, you should run the troff command directly or use the -D flag instead.

-nNumber
Causes the number of output copies specified by the Number parameter to be produced. The default is one. This flag is recognized by the spooler print.

-FFlag
Passes the Flag parameter to the spooler. This flag is useful when a conflict exists between a spooler flag and a flag with the psroff command.

-t
Sends the PostScript output to the standard output, rather than spooling it to a printer. This flag overrides the troff command -t flag. If you want the troff command -t flag, you should run the troff command directly.

-tTitle
Sets the job name for use on the first banner page. The default is to use the name of the first input file. This flag is recognized by the spooler print.

Parameters

troffFlags
Specifies standard flags available with the troff command.

File
Specifies the troff intermediate output file. The default is the standard input.

Files

/usr/share/lib/tmac/tmac.*
Contains the standard macro files.

/usr/lib/font/devpsc/*
Contains the troff description files for PostScript virtual device.

/usr/lib/ps/*.afm
Contains Adobe Font Metrics (AFM) files for use with the enscript command.

/usr/lib/ps/font.map
Contains the list of font names with their abbreviations.

/usr/lib/ps/ditroff.font
Contains font family files for the troff command.
Related Information

The `col` command, `enscript` command, `eqn` command, `lp` command, `managefonts` command, `nroff` command, `pic` command, `psdit` command, `refer` command, `tbl` command, `troff` command.

---

**pstart Command**

**Purpose**

Enables or reports the availability of login ports (normal, shared, and delayed).

**Syntax**

```plaintext
pstart [-a] [ Device ]
```

**Description**

The `pstart` command enables all ports (normal, shared, and delayed) listed in the `/etc/inittab` file. The system enables a port by updating an entry in the `/etc/inittab` file and then sending a signal to the `init` process. When the `init` process receives the signal and reads the updated status entry, it takes the appropriate action.

Use the `Device` parameter to specify the ports to be enabled. Permitted values include:

- A full device name, such as the `/dev/tty1` device
- A simple device name, such as the `tty1` device
- A number (for example, 1 to indicate the `/dev/tty1` device)

If you do not specify a `Device` parameter, the `pstart` command reports the names of all enabled ports and whether they are currently enabled as normal, shared, or delayed.

Note: You must have root user authority to run this command.

**Flag**

- `-a` Enables all ports (normal, shared, and delayed ports).

**Examples**

1. To display the names of all ports (normal, shared, and delayed) currently enabled and how they are enabled, enter:

   ```plaintext
   pstart
   ```

2. To enable all normal, shared, and delayed ports listed in the `/etc/inittab` file, enter:

   ```plaintext
   pstart -a
   ```

**Files**

- `/etc/locks` Contains lock files for the `pshare` and `pdelay` commands.
- `/usr/sbin/pstart` Contains the `pstart` command file.

**Related Information**

The `init` command, `pdelay` command, `pdisable` command, `penable` command, `phold` command, `pshare` command.

The `/etc/inittab` file.
pstat Command

Purpose
Interprets the contents of the various system tables and writes it to standard output.

Syntax
```
pstat [ -a ] [ -A ] [ -f ] [ -i ] [ -p ] [ -P ] [ -S ] [ -t ] [ -u ProcSlot ] [ -T ] [ -U ThreadSlot ] [ KernelFile ] [ CoreFile ]
```

Description
The `pstat` interprets the contents of the various system tables and writes it to standard output. You must have root user or `system` group authority to run the `pstat` command.

Flags
- `-a` Displays entries in the process table.
- `-A` Displays all entries in the kernel thread table.
- `-f` Displays the file table.
- `-i` Displays the i-node table and the i-node data block addresses.
- `-p` Displays the process table.
- `-P` Displays runnable kernel thread table entries only.
- `-s` Displays information about the swap or paging space usage.
- `-S` Displays the status of the processors.
- `-t` Displays the tty structures.
- `-u ProcSlot` Displays the user structure of the process in the designated slot of the process table. An error message is generated if you attempt to display a swapped out process.
- `-T` Displays the system variables. These variables are briefly described in var.h.
- `-U ThreadSlot` Displays the user structure of the kernel thread in the designated slot of the kernel thread table. An error message is generated if you attempt to display a swapped out kernel thread.

Examples
1. To display the i-nodes of the system dump saved in the `dumpfile` core file, enter:
   ```
pstat -i dumpfile
   ```
   Symbols are retrieved from the `/usr/lib/boot/unix` file.
2. To display the file table and the user structure for the process in process table slot 0 (zero) of the system currently running, enter:
   ```
pstat -f -u 0
   ```
3. To display the tty structures for a system dump, whose core file is `dumpfile` and whose kernel is the `/usr/lib/boot/unix.back` file, enter:
   ```
pstat -t /usr/lib/boot/unix.back dumpfile
   ```
4. To display all threads in the kernel thread table and the user structure of the thread in thread table slot 2, enter:
   ```
pstat -A -U 2
   ```

Files
- `/usr/sbin/pstat` Contains the `pstat` command.
- `/dev/mem` Default system-image file.
- `/usr/include/sys/*.h` Contains header files for table and structure information.
Related Information

The `ps` command, `stty` command.

ptx Command

Purpose
Generates a permuted index.

Syntax

```
ptx [\[-f\]-r] [\[-t\]-b Breakfile] [\[-g Number\]-w Number] \[-i Ignore\] \[-o Only\] \[-\] \[-\] \[-\] \[-\] [Infile] [Outfile]
```

Description

The `ptx` command reads the specified English-language text (the `Infile` parameter), creates a rearranged index from it, and writes to the specified file (`Outfile`). Standard input and standard output are the defaults.

The `ptx` command searches the specified file (`Infile`) for keywords, sorts the lines, and generates the file `Outfile`. The `Outfile` file can then be processed with the `nroff` or `troff` command to produce a rearranged index.

The `ptx` command follows three steps:
1. Performs the permutation, generates one line for each keyword in an input line, and rotates the keyword to the front of the line.
2. Sorts the permuted file.
3. Rotates the sorted lines so that the keyword comes at the middle of each line.

The resulting lines in the `Outfile` file are in the following form:

```
.xx "before keyword" "keyword" "after keyword"
```

where `.xx` is an `nroff` or `troff` macro provided by the user or by the `ptx` command. The `mptx` macro package provides the `.xx` macro definition.

The `after keyword` fields incorporate as much of the line as can fit around the keyword when it is printed. The first field and last field, at least one of which is always the empty string, are wrapped to fit in the unused space at the opposite end of the line.

Notes:
1. Line-length counts do not account for overstriking or proportional spacing.
2. Lines that contain a ~ (tilde) do not work, because the `ptx` command uses that character internally.
3. The `ptx` command does not discard non-alphanumeric characters.

Flags

- `-b BreakFile` Uses the characters in the specified break file to separate words. Tab characters, new-line characters, and spaces are always used as break characters.
- `-f` Folds uppercase and lowercase characters for sorting.
- `-g Number` Uses the specified number as the number of characters that the `ptx` command reserves for each gap among the four parts of the line as it is printed. The default `Number` variable value is 3.
-i Ignore

Does not use any words specified in the Ignore file as keywords. If the -i and -o flags are not used, the /usr/lib/eign file is the default Ignore file.

-o Only

Uses only the words specified in the Only file as keywords.

-r

Considers any leading non-blank characters of each input line as reference identifiers separate from the text of the line. Attaches the identifier as a fifth field on each output line.

-t

Prepares the output for the phototypesetter.

-w Number

Uses the specified number as the length of the output line. The default line length is 72 characters for the nroff command and 100 for the troff command.

—

(double dash) Indicates the end of flags.

Parameters

Infile

Specifies the English-language text. Standard input is the default file. The ptx command searches the specified file for keywords, sorts the lines, and generates the file Outfile.

Outfile

Specifies the file to which the ptx command writes the index created from the Infile file. Standard output is the default file. The Outfile file can be processed with the nroff or troff command to produce a rearranged index.

Files

/usr/lib/eign

Contains the default Ignore file.

/usr/share/lib/tmac/tmac.ptx

Contains the macro file.

Related Information

The nroff command, troff command.

The mm macro package, mptx macro package.

pwchange Command

Purpose

Change user authentication and privacy keys dynamically.

Syntax

pwchange [-e] [-d DebugLevel] [-p Protocol] [-u KeyUsage] [-s] [-l] [OldPassword] [NewPassword] [ IPAddress | HostName | EngineID ]

Description

The pwchange command is provided to facilitate dynamic changes of user authentication and privacy keys. Dynamic configuration of authentication and privacy keys is done by doing set commands to objects of syntax keyChange. The keyChange syntax provides a way of changing keys without requiring that the actual keys (either new or old) be flowed directly across the wire, which would not be secure. Instead, if an object, such as usmUserAuthKeyChange (for example) is to be set, the keyChange value must be derived from the old and new passwords and the engineID of the agent at which the key will be used. The pwchange command is used to generate the keyChange values.

The pwchange command generates different output, depending on which protocol and what key usage is selected. Keychange values are typically twice as long as the key to be changed.
Flags

- **d DebugLevel**
  This flag indicates what level of debug information is desired. Debug tracing is either on or off: 1 causes debug tracing to be generated to the screen of the command issuer (sysout). Debug tracing is off (0) by default.

- **e**
  This flag indicates that the agent for which the keychange value is being defined is identified by engineID rather than by IP address or host name.

- **p Protocol**
  This flag indicates the protocols for which the keychange values should be generated. Valid values are:

  **HMAC-MD5**
  Generates keychange values for use with the HMAC-MD5 authentication protocol.

  **HMAC-SHA**
  Generates keychange values for use with the HMAC-SHA authentication protocol.

  **all**
  Generates both HMAC-MD5 and HMAC-SHA keychange values.

  The default is that keychange values for the HMAC-MD5 protocol are generated.

- **s**
  This flag indicates that output should be displayed with additional spaces to improve readability. By default, data is displayed in a condensed format to facilitate cut-and-paste operations on the keychange values onto command lines in shell scripts.

- **u KeyUsage**
  This flag indicates the usage intended for the keychange value. Valid values are:

  **auth**
  An authentication keychange value.

  **priv**
  A privacy keychange value.

  **all**
  Both authentication and privacy keychange values.

  **Note:** There is no difference between a keychange value generated for authentication and a keychange value generated for privacy. However, the length of privacy keychange values depends on whether the keychange value is localized.

Parameters

**EngineID**
Specifies the engineID (1-32 octets, 2-64 hex digits) of the destination host at which the key is to be used. The engineID must be a string of 1-32 octets (2-64 hex digits). The default is that the agent identification is not an engineID.

**HostName**
Specifies the destination host at which the key is to be used.

**IPAddress**
Specifies the IP address in dotted decimal notation of the agent at the destination host at which the key is to be used.

**NewPassword**
Specifies the password that will be used in generating the new key. The password must be between eight and 255 characters long.
OldPassword

Specifies the password that was used in generating the key originally. The password must be between eight and 255 characters long.

Examples

The `pwchange` command generates different output depending on which protocol and what key usage is selected. Key change values are typically twice as long as the key to be changed.

1. The following command demonstrates how `pwchange` can be used:

   ```
   pwchange oldpassword newpassword 9.67.113.79
   ```

   The output of this command looks similar to:
   ```
   Dump of 32 byte HMAC-MD5 authKey keyChange value:
   3eca6ff34b59010d262845210a401656
   78dd964e31e9f890480a233dbe1114d
   ```

   The value to be set should be passed as a hex value with the `clsnmp` command (all on one line):

   ```
   clsnmp set usmUserAuthKeyChange.12.0.0.2.0.0.0.0.9.67.113.79.2.117.49 \'3eca6ff34b59010d262845210a40165678dd964e31e9f890480a233dbe1114d\'h
   ```

   **Note:** The backslash in the preceding example is required before the single quotation mark to enable AIX to correctly interpret the hexadecimal value.

   The index of the usmUserTable is made up of the EngineID and the ASCII representation of the user name. In this case it is 2 characters long and translates to 117.49.

   **Note:** `pwchange` incorporates a random component in generating keys and keyChange values. The output from multiple commands with the same input does not produce duplicate results.

Related Information

The `clsnmp` command, `pwtokey` command, `snmpdv3` daemon.

The `/etc/clsnmp.conf` file, `/etc/snmpdv3.conf` file.

---

**pwck Command**

**Purpose**

Verifies the correctness of local authentication information.

**Syntax**

```bash
pwck
```

**Description**

The `pwck` command verifies the correctness of the password information in the user database files by checking the definitions for all users. The `pwck` command internally calls the `pwdck` command with `-n` and **ALL** options.

**Exit Status**

<table>
<thead>
<tr>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>The command completed successfully.</td>
</tr>
<tr>
<td>&gt;0</td>
<td>An error occurred.</td>
</tr>
</tbody>
</table>
Examples
1. To verify that all the users and administrators exist in the user database, and have any errors reported (but not fixed), enter:
   `pwck`

Files
/nusr/bin/pwck
Contains the `pwck` command.

Related Information
The `pwdck` command.

pwd Command

Purpose
Displays the path name of the working directory.

Syntax
`pwd [ -L | -P ]`

Description
The `pwd` command writes to standard output the full path name of your current directory (from the root directory). All directories are separated by a `/` (slash). The root directory is represented by the first `/`, and the last directory named is your current directory.

Flags
- `L` Displays the value of the PWD environment variable if the PWD environment variable contains an absolute path name of the current directory that does not contain the file names `. (dot)` or `..` (dot-dot). Otherwise, the `-L` flag behaves the same as the `-P` flag.
- `P` Displays the absolute path name of the current directory. The absolute path name displayed with the `-P` flag does not contain file names that, in the context of the path name, refer to files of type symbolic link.

Exit Status
This command returns the following exit values:

<table>
<thead>
<tr>
<th>Exit Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful completion.</td>
</tr>
<tr>
<td>&gt;0</td>
<td>An error occurred.</td>
</tr>
</tbody>
</table>

Examples
Entering:

    `pwd`

displays the current directory as:

    `/home/thomas`
Files

/usr/bin/pwd
Contains the pwd command.

Related Information
The \texttt{cd} command.
The \texttt{getcwd} subroutine.
Directories in \textit{Operating system and device management}.

\section*{pwdadm Command}

\subsection*{Purpose}
Administers users' passwords.

\subsection*{Syntax}
pwdadm \texttt{[\texttt{-R} load_module] [ \texttt{-f} Flags | \texttt{-q} | \texttt{-c} ] User}

\subsection*{Description}
The \texttt{pwdadm} command administers users' passwords. The root user or a member of the security group can supply or change the password of the user specified by the \texttt{User} parameter. The invoker of the command must provide a password when queried before being allowed to change the other user's password. When the command executes, it sets the \texttt{ADMCHG} attribute. This forces the user to change the password the next time a \texttt{login} command or an \texttt{su} command is given for the user.

\textbf{Note:} The behavior described for this command is for a local user. For users defined in a remote domain, attributes will be retrieved and stored in the remote domain rather than in the local files.

Root users and members of the security group should not change their personal password with this command. The \texttt{ADMCHG} attribute would require them to change their password again the next time a \texttt{login} command or an \texttt{su} command is given for the user. Only the root user or a user with PasswdAdmin authorization can change password information for administrative users, who have the \texttt{admin} attribute set to true in the \texttt{/etc/security/user} file.

Only the root user, a member of the security group, or a user with PasswdManage authorization can supply or change the password of the user specified by the \texttt{User} parameter.

When this command is executed, the \texttt{password} field for the user in the \texttt{/etc/passwd} file is set to ! (exclamation point), indicating that an encrypted version of the password is in the \texttt{/etc/security/passwd} file. The \texttt{ADMCHG} attribute is set when the root user or a member of the security group changes a user's password with the \texttt{pwdadm} command.

A new password must be defined according to the rules in the \texttt{/etc/security/user} file, unless the \texttt{-f NOCHECK} flag is included. Only 7-bit characters are supported in passwords. By including the \texttt{-f} flag with the \texttt{pwdadm} command, the root user or a member of the security group can set attributes that change the password rules. If there is no password entry in the \texttt{/etc/security/passwd} file when the \texttt{-f} flag is used, the \texttt{password} field in the \texttt{/etc/passwd} file is set to ! (exclamation point) and an * (asterisk) appears in the \texttt{password=} field to indicate that no password has been set.
The -q flag permits the root user or members of the security group to query password information. Only the status of the lastupdate attribute and the flags attribute appear. The encrypted password remains hidden.

The -c flag clears all password flags for the user.

**Flags**

- **-c**
  Clears all password flags for the user.

- **-f Flags**
  Specifies the flags attribute of a password. The Flags variable must be from the following list of comma-separated attributes:

  - **NOCHECK**
    Signifies that new passwords need not follow the guidelines established in the /etc/security/user file for password composition.

  - **ADMIN**
    Specifies that password information may be changed only by the root user. Only the root user can enable or disable this attribute.

  - **ADMCHG**
    Resets the ADMCHG attribute without changing the user's password. This forces the user to change passwords the next time a login command or an su command is given for the user. The attribute is cleared when the user specified by the User parameter resets the password.

- **-q**
  Queries the status of the password. The values of the lastupdate attribute and the flags attribute appear.

- **-R load_module**
  Specifies the loadable I&A module that is used to change the user's attributes.

**Security**

Access Control: Only the root user and members of the security group should have execute (x) access to this command. The command should have the trusted computing base attribute and be setuid to the root user to have write (w) access to the /etc/passwd file, the /etc/security/passwd file, and other user database files.

**Files Accessed:**

<table>
<thead>
<tr>
<th>Mode</th>
<th>File</th>
</tr>
</thead>
<tbody>
<tr>
<td>rw</td>
<td>/etc/passwd</td>
</tr>
<tr>
<td>rw</td>
<td>/etc/security/passwd</td>
</tr>
<tr>
<td>r</td>
<td>/etc/security/user</td>
</tr>
</tbody>
</table>

**Auditing Events:**

<table>
<thead>
<tr>
<th>Event</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>PASSWORD_Change</td>
<td>user</td>
</tr>
<tr>
<td>PASSWORD_Flags</td>
<td>user, flags</td>
</tr>
</tbody>
</table>

**Examples**

1. To set a password for user susan, a member of the security group enters:
   ```
   pwdadm susan
   ```
   When prompted, the user who invoked the command is prompted for a password before Susan's password can be changed.

2. To query the password status for user susan, a member of the security group enters:
   ```
   pwdadm -q susan
   ```
This command displays values for the \texttt{lastupdate} attribute and the \texttt{flags} attribute. The following example shows what appears when the \texttt{NOCHECK} and \texttt{ADMCHG} flags attributes are in effect:

\begin{verbatim}
susan:
lastupdate=
flags= NOCHECK,ADMCHG
\end{verbatim}

\textbf{Files}

\begin{itemize}
\item [/usr/bin/pwdadm] Contains the \texttt{pwdadm} command.
\item [/etc/passwd] Contains the basic user attributes.
\item [/etc/security/passwd] Contains password information.
\item [/etc/security/login.cfg] Contains configuration information.
\end{itemize}

\textbf{Related Information}

The \texttt{passwd} command.

For more information about the identification and authentication of users, discretionary access control, the trusted computing base, and auditing, refer to \textit{Securing the network} in \textit{Security}.

\section*{pwdck Command}

\textbf{Purpose}

Verifies the correctness of local authentication information.

\textbf{Syntax}

\texttt{pwdck \{-p \|-n \|-t \|-y\} \{ ALL \| User \ldots \}}

\textbf{Description}

The \texttt{pwdck} command verifies the correctness of the password information in the user database files by checking the definitions for \texttt{ALL} the users or for the users specified by the \texttt{User} parameter. If more than one user is specified, there must be a space between the names.

\textit{Note:} This command writes its messages to \texttt{stderr}.

You must select a flag to indicate whether the system should try to fix erroneous attributes. The following attributes are checked for locally defined users in the \texttt{/etc/passwd} file:

\begin{itemize}
\item \texttt{entry} Ensures that each entry is readable and that it contains at least two : (colons). If you indicate that the system should fix errors, the entire entry is discarded.
\item \texttt{passwd} Ensures that the password field is an ! (exclamation point). If you indicate that the system should fix errors, it transfers the information in the password field to the \texttt{/etc/security/passwd} file, updates the \texttt{lastupdate} attribute in the \texttt{/etc/security/passwd} file, and then replaces the password field in the \texttt{/etc/passwd} file with an !. In general, passwords are required if the \texttt{minalpha}, \texttt{minother}, or \texttt{minlen} password restriction is set to a nonzero value in the \texttt{/etc/security/user} file.
\item \texttt{user} Ensures that the user name is a unique string of 8 bytes or less. It cannot begin with a + (plus sign), a : (colon), a - (minus sign), or a ~ (tilde). It cannot contain a : (colon) in the string and cannot be the \texttt{ALL}, \texttt{default}, or * keywords. If you indicate that the system should fix errors, it removes this user's entry line from the \texttt{/etc/passwd} file. If the user name starts with a + or a - symbol, the user is not locally defined, and checks are not performed.
\end{itemize}

Attributes checked in the \texttt{/etc/security/passwd} file are:

\begin{itemize}
\item \texttt{line} Ensures that each line is readable and is part of a stanza. Any invalid line is discarded.
\end{itemize}
password Ensures that the password attribute exists and is not blank, if passwords are required on the system. If you indicate that the system should fix errors, the password is set to * (asterisk), and the lastupdate attribute is discarded.

In general, passwords are required if either of the minalpha or minother password restrictions are set to nonzero values in the /etc/security/user file. If a user’s flags attribute specifies the NOCHECK keyword, a password is not required for this user, and the check is ignored.

lastupdate Ensures that the lastupdate attribute exists for a valid non-blank password, and that its time is prior to the current time. If you indicate that the system should fix errors, the lastupdate attribute is discarded or updated, depending on the password attribute. The lastupdate attribute is discarded if the password attribute doesn’t exist, or equals a blank or an * (asterisk). Otherwise, the lastupdate time is set to the current time.

flags Ensures that the flags attribute contains only the keywords ADMIN, ADMchg, and NOCHECK. If you indicate that the system should fix errors, it deletes any undefined flags.

Attributes checked in the /etc/security/user file are:

auth1 Ensures that each SYSTEM;username entry defined for a local user has an username entry in the /etc/security/passwd file. If you indicate that the system should fix errors, a stanza is added to the /etc/security/passwd file for each missing entry, in the following format:

username:
password = *

If a user’s entry and a default entry both are missing from the /etc/security/user file, the system assumes the following values and the check on auth1 is performed:

auth1 = SYSTEM;user

auth2 Ensures that each authname;username entry defined for a local user has an username entry in the /etc/security/passwd file. If you indicate that the system should fix errors, an entry is added for each missing entry.

If a user’s entry and a default entry both are missing from the /etc/security/user file, the system assumes the following values and the check on auth2 is performed:

auth2 = NONE

When ALL is specified, the pwdck command ensures that each stanza in the /etc/security/passwd file corresponds to an authentication name of a local user as a SYSTEM;username entry in the /etc/security/user file. If you indicate that the system should fix errors, a stanza which does not correspond to an username entry in the /etc/security/user file is discarded from the /etc/security/passwd file.

The pwdck command locks the /etc/passwd file and the /etc/security/passwd file when it updates them. If either of these files are locked by another process, the pwdck command waits a few minutes for the files to be unlocked, and terminates if this does not happen.

The pwdck command checks to see if the /etc/passwd file and the /etc/security/passwd file are modified by another process while the current pwdck process is running. If you indicate that the system should fix errors, the pwdck command updates the /etc/passwd file and the /etc/security/passwd file, and may overwrite any changes made by the other process.

The pwdck command also checks to see if the database management security files (/etc/passwd.nm.idx, /etc/passwd.id.idx, /etc/security/passwd.idx, and /etc/security/lastlog.idx) files are up-to-date or newer than the corresponding system security files. Please note, it is alright for the /etc/security/lastlog.idx to be not newer than /etc/security/lastlog. If the database management security files are out-of-date, a warning message appears indicating that the root user should run the mkpasswd command.

Generally, the sysck command calls the pwdck command as part of the verification of a trusted-system installation. In addition, the root user or a member of the security group can enter the command.
Flags

- **n**  Reports errors but does not fix them.
- **p**  Fixes errors but does not report them.
- **t**  Reports errors and asks if they should be fixed.
- **y**  Fixes errors and reports them.

Security

Access Control: This command should grant execute (x) access to the root user and members of the security group. The command should be **setuid** to the root user, to read and write the authentication information, and have the **trusted computing base** attribute.

Files Accessed:

<table>
<thead>
<tr>
<th>Mode</th>
<th>File</th>
</tr>
</thead>
<tbody>
<tr>
<td>rw</td>
<td>/etc/passwd</td>
</tr>
<tr>
<td>r</td>
<td>/etc/security/user</td>
</tr>
<tr>
<td>rw</td>
<td>/etc/security/passwd</td>
</tr>
<tr>
<td>r</td>
<td>/etc/security/login.cfg</td>
</tr>
</tbody>
</table>

Auditing Events:

<table>
<thead>
<tr>
<th>Event</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>PASSWORD_Check</td>
<td>user, error/fix, status</td>
</tr>
<tr>
<td>PASSWORD_Ckerr</td>
<td>file/user, error, status</td>
</tr>
</tbody>
</table>

Examples

1. To verify that all local users have valid passwords, enter:

   ```
   pwdck -y ALL
   ```

   This reports errors, and fixes them.

2. To ensure that user ariel has a valid stanza in the `/etc/security/passwd` file, enter:

   ```
   pwdck -y ariel
   ```

Files

- **/usr/bin/pwdck**  Contains the **pwdck** command.
- **/etc/passwd**  Contains the basic user attributes.
- **/etc/security/passwd**  Contains actual passwords and security information.
- **/etc/security/user**  Contains the extended attributes of users.
- **/etc/security/login.cfg**  Contains configuration information and password restrictions.

Related Information

The **grpck** command, **mkpasswd** command, **sysck** command, **usrck** command.

Securing the network in *Security* describes the identification and authentication of users, discretionary access control, the trusted computing base, and auditing.
pwtokey Command

Purpose
Converts passwords into localized and nonlocalized authentication and privacy keys.

Syntax
pwtokey [ -e ] [ -d DebugLevel ] [ -p Protocol ] [ -u KeyUsage ] [ -s ] Password [ EngineID | HostName | IPAddress ]

Description
AIX provides a facility called pwtokey that allows conversion of passwords into localized and nonlocalized authentication and privacy keys. The pwtokey procedure takes as input a password and an identifier of the agent and generates authentication and privacy keys. Since the procedure used by the pwtokey facility is the same algorithm used by the clsnmp command, the person configuring the SNMP agent can generate appropriate authentication and privacy keys to put in the snmpd.conf file for a user, given a particular password and the IP address at which the agent will run.

If the IP address or the hostname is specified, the SNMP agent must be an AIX agent. The engineID will be created using a vendor-specific formula that incorporates the IP address of the agent and an enterprise ID representing AIX.

Flags
- **-d DebugLevel**
  This flag indicates what level of debug information is desired. Debug tracing is either on or off, so a value of 1 causes debug tracing to be generated to the screen of the command issuer (sysout), and a value of 0 specifies that no debug tracing be generated. Debug tracing is off (0) by default.

- **-e**
  This flag indicates that the agent for which the key is being defined is identified by engineID rather than by IP address or host name.

- **-p Protocol**
  This flag indicates the protocols for which the keys should be generated. Valid values are:

  **HMAC-MD5**
  Generates keys for use with the HMAC-MD5 authentication protocol.

  **HMAC-SHA**
  Generates keys for use with the HMAC-SHA authentication protocol

  **all**
  Generates both HMAC-MD5 and HMAC-SHA keys.

  The default is that keys for the HMAC-MD5 protocol are generated.

- **-s**
  This flag indicates that output data should be displayed with additional spaces to improve readability. By default, data is displayed in a condensed format to facilitate cut-and-paste operations on the keys into configuration files or command lines.
-u KeyUsage

This flag indicates the usage intended for the key. Valid values are:

- **auth**: An authentication key.
- **priv**: A privacy key.
- **all**: Both authentication and privacy keys.

**Note**: There is no difference between a key generated for authentication and a key generated for privacy. However, the length of privacy keys depends on whether the key is localized or not.

### Parameters

**EngineID**

Specifies the engineID of the SNMP agent at which the key will be used. The engineID is determined at SNMP agent initialization from the snmpd.boots file. The engineID must be a string of 1-32 octets (2-64 hex digits). The default is that the agent identification is not an engineID.

**HostName**

Specifies the SNMP agent at which the key will be used on an SNMP request.

**IPAddress**

Specifies the IP address in dotted decimal notation of the SNMP agent at which the key will be used on an SNMP request.

**Password**

Specifies the text string to be used in generating the keys. The password must be in the range of 8-255 characters long. In general, while any printable characters can be used in the passwords, the AIX shell may interpret some characters rather than passing them to the pwtokey command. Include passwords in single quotes to avoid interpretation of the characters by the AIX shell.

**Note**: This password is not related to the community name (or "password") used with community-based security (SNMPv1 and SNMPv2c). This password is used only to generate keys for user-based security, an entirely different security scheme.

### Examples

1. **This example shows a simple invocation of the pwtokey command:**

   ```shell
   pwtokey testpassword 9.67.113.79
   ``

   The output from this command looks similar to the following:

   ```plaintext
   Display of 16 byte HMAC-MD5 authKey:
   775b109f79a6b71f94cca5d22451cc0e
   
   Display of 16 byte HMAC-MD5 localized authKey:
   de25243dc2765f0ce273e4bdf941701
   ``

   As this example shows, **pwtokey** generates two keys—one that is localized (has been tailored to be usable only at the agent identified) and one that has not been localized. Typically, the localized key is used in the configuration for the SNMP agent. The nonlocalized key is used in the configuration for the clsnmp command.

2. **The pwtokey can be invoked requesting HMAC-SHA keys for both authentication and privacy, as in the following example:**

   ```shell
   pwtokey -p HMAC-SHA -u all testpassword 9.67.113.79
   ```
The output of this command looks similar to the following:

Display of 20 byte HMAC-SHA authKey:
\texttt{b267809aee4b8ef450a7872d6e348713f04b9c50}

Display of 20 byte HMAC-SHA localized authKey:
\texttt{e5438092d1098a43e27e507e50d32c0edaa39b7c}

Display of 20 byte HMAC-SHA privKey:
\texttt{b267809aee4b8ef450a7872d6e348713f04b9c50}

Display of 16 byte HMAC-SHA localized privKey:
\texttt{e5438092d1098a43e27e507e50d32c0e}

The output for the privacy keys is the same as the output for the authentication keys, except that the localized privacy key has been truncated to 16 bytes, as is required for DES.

\textbf{Note:} If encryption is used, it is more secure to use different passwords for authentication and privacy.

\textbf{Related Information}

The command, \texttt{pwchange} command, \texttt{snmpdv3} daemon.

The \texttt{/etc/clsnmp.conf} file, \texttt{/etc/snmpdv3.conf} file.

\textbf{pxed Command}

\textbf{Purpose}

Implements a Preboot Execution Environment (PXE) Proxy Dynamic Host Configuration Protocol (DHCP) server.

\textbf{Syntax}

To start the \texttt{pxed} daemon using the system resource controller:

\texttt{startsrc -s pxed [-a]}

To start the \texttt{pxed} daemon without using the system resource controller:

\texttt{pxed [-f ConfigurationFile]}

\textbf{Description}

The Preboot Execution Environment defines a protocol and mechanism through which network-connected client systems can automatically download boot images from a network server to start their operating system. As an extension to the BOOTP and DHCP protocols, it provides the configuration ability for administrators that are not necessarily DHCP or network administrators to manage the operating systems installed on the PXE-capable client systems.

Like a DHCP server, the PXE Proxy DHCP server provides information needed by a PXE client to locate and download its appropriate boot files from a network server. However, the PXE Proxy DHCP server does not administer client IP addresses or other DHCP client options.

The PXE Proxy DHCP server is intended to be used when the management of the system boot images must be separated from the management of the DHCP addresses and DHCP client network configurations. The \texttt{pxed} daemon can be configured to run on a system that is the DHCP server or is not the DHCP server.
Flags

- The argument to be supplied.
- *f ConfigurationFile* Specifies the path and name of the configuration file that is to be used by the server. If unspecified, the default is /etc/pxed.cnf.

Exit Status

This command returns the following exit values:

- 0 Successful completion.
- >0 An error occurred.

Security

Access Control: You must have root authority to run this command.

The PXE protocol allows for a nonprivileged user to be the administrator of the PXE client boot images because the *pxed* daemon listens to client messages on ports other than the well-known, protected DHCP server port. However, to configure such an environment, the DHCP server must be running on the same server system as the *pxed* daemon, and the file permissions on the *pxed* daemon must be changed for non-root execution.

Files

- **/usr/sbin/pxed** Contains the PXE Proxy DHCP server daemon.
- **/usr/sbin/db_file.dhcpo** Implements a database to be used by the PXE Proxy DHCP server and the DHCP server to store, retrieve, and manage configuration information.
- **/etc/pxed.cnf** The default configuration file for the *pxed* daemon.

Related Information

The *dhcpsd* daemon, *binld* daemon.

qadm Command

Purpose

Performs system administration functions for the printer spooling system.

Syntax

```
qadm { -G } | { [-D Printer ] [ -K Printer ] [ -U Printer ] [ -X Printer ] }
```

Description

The *qadm* command is a front-end command to the *enq* command. This command brings printers, queues, and the spooling system up or down and also cancels jobs. The *qadm* command translates the requested flags into a format that can be run by the *enq* command.

The *qadm* command works only on local print jobs. Remote print is not supported.

**Note:** You must either have root user authority or belong to the printq group to run this command.

You can use the Printer Queues application in Web-based System Manager (wsm) to change printer characteristics.
You could also use the System Management Interface Tool (SMIT) `smit qadm` fast path to run this command.

**Flags**

- `-D Printer` Brings down the printer you name in the `Printer` variable. The `qdaemon` process stops sending jobs to the device. Entering the `qchk -P Printer` command, where `Printer` matches the `Printer` variable in the `-D` flag, reports the device is down. The `qadm` command allows current jobs to finish before stopping the printer.

- `-G` Gracefully brings down the queuing system. This flag temporarily interrupts the `qdaemon` process after all currently running jobs on all queues are finished. Use of this flag is the only way to bring the system down without causing such problems as jobs hanging up in the queue.

- `-K Printer` Brings down the printer you name in the `Printer` variable, ending all current jobs immediately. Jobs remain in the queue and run again when the printer is brought back up.

- `-U Printer` Brings up the printer you name in the `Printer` variable. The `qdaemon` process sends jobs to the printer again. Entering the `qchk -P Printer` command, where `Printer` matches the `Printer` variable in the `-U` flag, reports the device is ready.

- `-X Printer` Cancels all the jobs of the user that executed the command. If you have root user privileges or are a member of the printq group, then all jobs on the queue system will be cancelled.

  **Note:** When `-U` and `-D` flags are used together, the `-U` flag has higher priority.

**Examples**

1. To bring the queuing system down gracefully, enter:

   ```
   qadm -G
   ```

2. To cancel all of a particular user’s jobs on printer `lp0`, or all jobs on printer `lp0` if you are have root user authority, enter:

   ```
   qadm -X lp0
   ```

3. To bring up the printer `lpd0` attached to queue `lp0`, enter:

   ```
   qadm -U lp0:lpd0
   ```

**Files**

- `/usr/sbin/qdaemon` Contains the `qdaemon` daemon.
- `/var/spool/lpd/qdir/*` Contains the job description files.
- `/var/spool/lpd/stat/*` Contains information on the status of the devices.
- `/var/spool/qdaemon/*` Contains the temporary copies of enqueued files.
- `/etc/qconfig` Contains the configuration file.
- `/etc/qconfig.bin` Contains the digested, binary version of the `/etc/qconfig` file.

**Related Information**

The `enq` command, `qcan` command, `qdaemon` command, `qchk` command, `qpri` command, `qprt` command.

The `/etc/qconfig` file.

Starting and Stopping a Print Queue in the Printers and printing.

Print spooler in the Printers and printing.
qcan Command

Purpose
Cancels a print job.

Syntax
qcan [-X] [-x JobNumber] [-P Printer]

Description
The qcan command cancels either a particular job number or all jobs in a print queue.

You can use the Printer Queues application in Web-based System Manager (wsm) to change printer characteristics.

You could also use the System Management Interface Tool (SMIT) smit qcan fast path to run this command.

In AIX 4.3.2 and above, qstatus was enhanced to improve the administration of local queues showing duplicate 3-digit job numbers. You can use the -W flag with the enq, qchk, lpstat, and lpq status commands to display more job number digits.

If your queue display shows duplicate 3-digit job numbers, use qchk -W to list job numbers with greater precision. You can then cancel a specific job.

For example, qchk might display job number 123 twice while, qchk -W would display job number 1123 and 2123. If you want to cancel job number 2123, specifying qcan -x 123, causes the qdaemon to cancel the first matching job number it finds in its internal list, which may be 1123. By having the additional information that the -W flag provides, you can cancel a specific job number.

Flags
-P Printer Specifies the Printer where either all jobs or the selected job number will be canceled.
-x JobNumber Specifies that only the job number specified by the JobNumber variable be canceled.
-X Cancels all jobs or all jobs for the specified printer. If you have root user authority, all jobs on that queue are deleted. If you do not have root user authority, only jobs you submitted will be canceled. This flag is only valid for local print jobs.

Examples
1. To cancel all jobs queued on printer lp0, enter:
   
   qcan -x -P lp0

2. To cancel job number 123 on whatever printer the job is on, enter:
   
   qcan -x 123

Files
/usr/sbin/qdaemon Contains the qdaemon daemon.
/var/spool/lpd/qdir/* Contains the job description files.
Related Information
The `enq` command, `qadm` command, `qchk` command, `qpri` command, `qprt` command.

The `/etc/qconfig` file.

Canceling a print job (`qcan command`) in Operating system and device management.

Print spooler in the Printers and printing.

For information on installing the Web-based System Manager, see Chapter 2: Installation and System Requirements in AIX 5L Version 5.3 Web-based System Manager Administration Guide.

qchk Command

Purpose
Displays the status of a print queue.

Syntax
```
```

Description
The `qchk` command displays the current status information regarding specified print jobs, print queues, or users. Use the appropriate flag followed by the requested name or number to indicate specific status information. If you run the `qchk` command with no flags, the status of the default queue is returned.

You can use the Printer Queues application in Web-based System Manager (wsm) to change printer characteristics.

You could also use the System Management Interface Tool (SMIT) `smit qchk` fast path to run this command.

Flags

`-# JobNumber` Requests the status of the job number specified by the `JobNumber` variable. The `qchk` command looks for `JobNumber` on the default queue when the `-#JobNumber` flag is used alone. To search for `JobNumber` on all queues `-#` flag must be used with the `-A` flag. The `-#` flag may also be used in conjunction with the `-P Queue` flag.

Notes:
1. Specify the `-P Queue` to override the default destination printer.
2. If jobs 1, 2, and 3 are in the printer queue, and you specify that you want the status of job 3 while job 1 is running, the status information will show job 1 and job 3, not only job 3.
3. If you specify a job number that does not exist, the system displays the current job number on the queue instead of an error message.
-A Requests the status of all queues.
-L Specifies information be displayed in long-form mode. This flag cannot be used with the -W flag. If the -L flag and the -W flag are used simultaneously, the first one specified takes precedence.
-P Printer Requests the status of the printer specified by the Printer variable.
-q Requests the status of the default print queue.
-u UserName Requests the status of all print jobs sent by the user specified by the UserName variable.
-W Specifies information be displayed in wide-form mode with longer queue names, device names, and job numbers. Larger job number information is available on AIX 4.3.2 and later. This flag cannot be used with the -L flag. If the -L flag and the -W flag are used simultaneously, the first one specified takes precedence.
-w Delay Updates requested status information at intervals, in seconds, as specified by the Delay variable until all print jobs are finished.

Examples
1. To display the default print queue, enter:
   qchk -q
2. To display the long status of all queues until empty, while updating the screen every 5 seconds, enter:
   qchk -A -L -w 5
3. To display the status for printer lp0, enter:
   qchk -P lp0
4. To display the status for job number 123, enter:
   qchk -# 123
5. To display the status of all print jobs while restricting the queue status to only printer lp0, enter:
   qchk -A -P lp0
6. To display the wide status of the default print queue for AIX 4.2.1 or later, enter:
   qchk -W -q

Files
/usr/sbin/qdaemon Contains the qdaemon daemon.
/var/spool/lpd/qdir/* Contains the job description files.
/var/spool/lpd/stat/* Contains information on the status of the devices.
/var/spool/qdaemon/* Contains the temporary copies of enqueued files.
/etc/qconfig Contains the configuration file.
/etc/qconfig.bin Contains the digested, binary version of the /etc/qconfig file.

Related Information
Print spooler in the Printers and printing.
The enq command, qadm command, qcan command, qpri command, qprt command.
The /etc/qconfig file.

For information on installing the Web-based System Manager, see Chapter 2: Installation and System Requirements in AIX 5L Version 5.3 Web-based System Manager Administration Guide.
Command for checking print job status (qchk command) in the Operating system and device management.

qdaemon Command

Purpose
Schedules jobs enqueued by the enq command.

Syntax
qdaemon

description
The qdaemon command is a background process (usually started by the startsrc command) that schedules printing jobs enqueued by the enq command.

The /etc/qconfig file should not be edited while there are active jobs in any queue. Editing includes both manual editing and use of the mkque, rmque, chque, mkquedev, rmquedev, or chquedev commands. It is recommended that all changes to the /etc/qconfig file be made using these commands. However, if manual editing is desired, first issue the enq -G command to bring the queuing system and the qdaemon to a stop after all jobs are processed. Then edit the /etc/qconfig file and restart the qdaemon with the new configuration.

security
Privilege Control: Only the root user and members of the printq group should have execute (x) access to this command.

Auditing Event Information
ENQUE_exec Queue name, job name, host name, file name, user name

files
/usr/sbin/qdaemon Contains the qdaemon daemon.
/var/spool/lpd/qdir/* Contains the job description files.
/var/spool/lpd/qdir/@local/fullmsg Contains a flag file whose existence activates qdaemon messages to contain complete information.
/var/spool/lpd/stat/* Contains information on the status of the devices.
/var/spool/lpd/qdaemon/ Contains the temporary copies of enqueued files.
/etc/qconfig Contains the configuration file.
/etc/qconfig.bin Contains the digested, binary version of the /etc/qconfig file.

related Information
The cancel command, chque command, chquedev command, disable command, enable command, qstatus command, lp command, lpd command, lpq command, lpr command, lprm command, lpstat command, lsallq command, lsallqdev command, lsque command, lsquedev command, mkque command, mkquedev command, qprt command, qadm command, qchk command, qcan command, qpri command, rmque command, rmquedev command, startsrc command.

The /etc/qconfig file.

Printing administration in the Printers and printing.

Print spooler in the Printers and printing.

System Resource Controller in *Operating system and device management.*

Backend and qdaemon interaction in the *Printers and printing.*

### qhdl Command

#### Purpose
Holds and releases a spooled print job.

#### Syntax

```
qhdl [ -r ] { -# JobNumber | -P Queue | -r [ -P Queue | -u User ] }
```

#### Description
The `qhdl` command holds print jobs in a spooled state. The job to be held is designated by job number, queue, or user name. The `-r` flag releases the hold on the print job.

In AIX 4.3.2 and above, `qstatus` was enhanced to improve the administration of local queues showing duplicate 3-digit job numbers. You can use the `-W` flag with the `enq`, `qchk`, `lpstat`, and `lpq` status commands to display more job number digits.

If your queue display shows duplicate 3-digit job numbers, use `qchk -W` to list job numbers with greater precision. You can then hold a specific job.

For example, `qchk` might display job number 123 twice while, `qchk -W` would display job number 1123 and 2123. If you want to hold job number 2123, specifying `qhdl -# 123`, causes the qdaemon to hold the first matching job number it finds in its internal list, which may be 1123. By having the additional information that the `qstatus -W` provides, you can hold a specific job number.

#### Flags

- `-# JobNumber` Specifies the print job number to be held.
- `-P Queue` Specifies the print queue to be held.
- `-r` Releases the print job by number, queue, or user name.
- `-u User` Specifies the name of user whose print jobs are to be held.

#### Examples

1. To hold the print job number 300, enter:
   ```
   qhdl -#300
   ```
2. To hold all print jobs on queue lp0, enter:
   ```
   qhdl -P lp0
   ```
3. To hold all jobs that belong to user fred, enter:
   ```
   qhdl -u fred
   ```
4. To release job number 300, enter:
   ```
   qhdl -#300 -r
   ```
5. To release all the jobs on queue lp0, enter:
   ```
   qhdl -P lp0 -r
   ```
6. To release all jobs that belong to user fred, enter:
Files

- /usr/sbin/qdaemon: Contains the qdaemon daemon.
- /var/spool/lpd/qdir/*: Contains the job description files.
- /var/spool/lpd/stat/*: Contains information on the status of the devices.
- /var/spool/lpd/qdaemon/*: Contains the temporary copies of enqueued files.
- /etc/qconfig: Contains the configuration file.
- /etc/qconfig.bin: Contains the digested, binary version of the /etc/qconfig file.

Related Information

The `qprt` command, `qmov` command, `enq` command, `qstatus` command, and `lpq` command can be used to manage print jobs.

Print administration in the Printers and printing.

Print spooler in the Printers and printing.

qmov Command

Purpose

Moves spooled print jobs to another queue.

Syntax

```
qmov -m NewQueue { -# JobNumber [ -P Queue ] | -P Queue | -u User [ -P Queue ] }
```

Description

The `qmov` command moves spooled print jobs to another print queue. The print job to be moved is identified by job number, queue, or user name. The format of the command requires the queue where the job is to be moved to as the first argument and the name of the job to move as the second argument.

In AIX 4.3.2 and above, `qstatus` was enhanced to improve the administration of local queues showing duplicate 3-digit job numbers. You can use the `-W` flag with the `enq`, `qchk`, `lpstat`, and `lpq` status commands to display more job number digits.

If your queue display shows duplicate 3-digit job numbers, use `qchk -W` to list job numbers with greater precision. You can then move a specific job.

For example, `qchk` might display job number 123 twice while, `qchk -W` would display job number 1123 and 2123. If you want to move job number 2123, specifying `qmov -# 123`, causes the qdaemon to move the first matching job number it finds in its internal list, which may be 1123. By having the additional information that the `qstatus -W` provides, you can move a specific job number.

Flags

- `-# JobNumber`: Specifies the job number of the print job to be moved.
- `-m NewQueue`: Specifies the name of the destination print queue.
- `-P Queue`: Specifies the present print queue of the job to be moved.
- `-u User`: Specifies the name of the user whose print jobs are to be moved.
Examples
1. To move job number 280 to queue lp0, enter:
   qmov -mlp0 -#280
2. To move all print jobs on queue lp1 to queue lp0, enter:
   qmov -mlp0 -Plp1
3. To move all of Mary’s print jobs to queue lp0, enter:
   qmov -mlp0 -u mary

Files
/usr/sbin/qdaemon Contains the qdaemon daemon.
/var/spool/lpd/qdir/* Contains the job description files.
/var/spool/lpd/stat/* Contains information on the status of the devices.
/var/spool/qdaemon/* Contains the temporary copies of enqueued files.
/etc/qconfig Contains the configuration file.
/etc/qconfig.bin Contains the digested, binary version of the /etc/qconfig file.

Related Information
The enq command, qhld command, qprt command.

Printing administration in the Printers and printing.
Print spooler in the Printers and printing.

qosadd Command

Purpose
Adds a QoS (Quality of Service) Service Category or Policy Rule.

Syntax
To add a Service Category:
qosadd [-s ServiceCategory] [-t OutgoingTOS] [-b MaxTokenBucket] [-f FlowServiceType] [-m MaxRate] service

To add a Policy Rule:

Description
The qosadd command adds the specified Service Category or Policy Rule entry in the policyd.conf file and installs the changes in the QoS Manager.

Flags
Flags with service add:

-s The name of the ServiceCategory attribute, which is mandatory.
-t The OutgoingTOS attribute, specified as an 8 bit binary number.
-b The MaxTokenBucket attribute, specified in Kb (Kilobits).
The **FlowServiceType** attribute, which is ControlledLoad or Guaranteed.

The **MaxRate** attribute, which is specified in Kbps (Kilobits per second).

Flags with policy add:

- **-s** The name of the **ServiceCategory** attribute, which is mandatory.
- **-r** The name of the **ServicePolicyRules** attribute, which is mandatory.
- **-I** The **PolicyRulePriority** attribute, which is a positive integer.
- **-n** The **ProtocolNumber** attribute, which is defined in the /etc/protocols file.
- **-A** The **SrcAddrRange** attribute, which is the Source IP address range from a1 to a2 where a2 >= a1.
- **-a** The **DestAddrRange** attribute, which is the Destination IP address range from i1 to i2 where i2 >= i1.
- **-P** The **SrcPortRange** attribute, which is the Source Port range from a1 to a2 where a2 >= a1.
- **-p** The **DestPortRange** attribute, which is the Destination Port range from i1 to i2 where i2 >= i1.

## Exit Status

<table>
<thead>
<tr>
<th>Positive Integer</th>
<th>Successful completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>An error occurred.</td>
</tr>
</tbody>
</table>

### Examples

1. To add the sc01 service, type:
   
   qosadd -s sc01 -t 10000001 -b 81 -f ControlledLoad -m 41 service

2. To add the pr01 policy, type:
   
   qosadd -s sc01 -r pr01 -l 1 -n 17 -A 9.3.25.1-9.3.25.10 -a 9.3.25.33-9.3.25.33 -p 9001-9001 -P 9000-9000 policy

3. To add the sc02 service, type:
   
   qosadd -s sc02 -t 10000001 -b 81 service

4. To add the pr02 policy, type:
   
   qosadd -s sc02 -r pr02 -l 2 -n 17 policy

### Related Information

The **qosstat** command, **qosmod** command, **qosremove** command, **qoslist** command.

### qoslist Command

#### Purpose

Lists a specific QoS (Quality of Service) Service Category or Policy Rule or lists all of them.

#### Syntax

To list a Service Category:

```bash
qoslist [ServiceCategory] service
```

To list a Policy Rule:

```bash
qoslist [ServicePolicyRule] policy
```
Description
The qoslist command lists the specified Service Category or Policy Rule. The qoslist command lists all Service Categories or Policy Rules if no specific name is given.

Exit Status
0 Successful completion
Positive Integer An error occurred.

Examples
1. To list the sc01 service, type:
   qoslist sc01 service
2. To list the pr01 policy, type:
   qoslist pr01 policy
3. To list all of the QoS ServiceCategories, type:
   qoslist service
4. To list all of the QoS PolicyRules, type:
   qoslist policy

Related Information
The qosstat, qosmod, qosremove, qosadd command.

qosmod Command

Purpose
Modifies an existing QoS (Quality of Service) Service Category or Policy Rule.

Syntax
To modify an existing Service Category:

qosmod [-s ServiceCategory] [-t OutgoingTOS] [-D MaxTokenBucket] [-f FlowServiceType] [-m MaxRate] service

To modify an existing Policy Rule:


Description
The qosmod command modifies the specified Service Category or Policy Rule entry in the policyd.conf file and installs the changes in the QoS Manager.

The qosmod command clears out all the statistics of the old policy. When a qosstat command is executed immediately after qosmod, the user may not see all the data connections that were using the older rule shifted to the modified rule. This is because the reclassification of the data connection is delayed until a data packet arrives on that connection.

Note: Modifying the priority or filter spec of the rule only results in reclassification of the data connections which use that particular rule. Connections using other rules maintain their existing classification.
Flags

Flags with service modify:
- **s** The name of the **ServiceCategory** attribute, which is mandatory.
- **t** The **OutgoingTOS** attribute, specified as an 8-bit binary number.
- **b** The **MaxTokenBucket** attribute, specified in Kb (Kilobits).
- **f** The **FlowServiceType** attribute, which is ControlledLoad or Guaranteed.
- **m** The **MaxRate** attribute, which is specified in Kbps (Kilobits per second).

Flags with policy modify:
- **s** The name of the **ServiceCategory** attribute, which is mandatory.
- **r** The name of the **ServicePolicyRules** attribute, which is mandatory.
- **l** The **PolicyRulePriority** attribute, which is a positive integer.
- **n** The **ProtocolNumber** attribute, which is defined in the `/etc/protocols` file.
- **A** The **SrcAddrRange** attribute, which is the Source IP address range from a1 to a2, where a2 >= a1.
- **a** The **DestAddrRange** attribute, which is the Destination IP address range from i1 to i2, where i2 >= i1.
- **P** The **SrcPortRange** attribute, which is the Source Port range from a1 to a2, where a2 >= a1.
- **p** The **DestPortRange** attribute, which is the Destination Port range from i1 to i2, where i2 >= i1.

Exit Status

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<tr>
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<td>Successful completion</td>
</tr>
<tr>
<td>Positive Integer</td>
<td>An error occurred.</td>
</tr>
</tbody>
</table>

Examples

1. To modify the sc01 service, type:
   ```
   qosmod -s sc01 -t 10001100 -b 84 -f Guaranteed service
   ```
2. To modify the pr01 policy, type:
   ```
   qos -s sc01 -r pr01 -l 10 -n 6 -A 9.3.25.15-9.3.25.20 -a 9.3.25.39-9.3.25.39 -p 9015-9020 policy
   ```
3. To modify the sc02 service, type:
   ```
   qosmod -s sc02 -t 10001111 service
   ```
4. To modify the pr02 policy, type:
   ```
   qosmod -s sc02 -r pr02 -l 13 -n 6 policy
   ```

Related Information


qosremove Command

**Purpose**

Removes a QoS (Quality of Service) Service Category or Policy Rule.
Syntax
To remove a Service Category:

qosremove [ServiceCategory] service

To remove a Policy Rule:

qosremove [ServicePolicyRule] policy

To remove all the Policies and Service categories installed in the kernel:

qosremove all

Description
The qosremove command removes the specified Service Category or Policy Rule entry in the policyd.conf file and the associated policy or service in the QoS Manager.

Exit Status

<table>
<thead>
<tr>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful completion</td>
</tr>
<tr>
<td>Positive Integer</td>
<td>An error occurred.</td>
</tr>
</tbody>
</table>

Examples
1. To remove the sc01 service, type:
   qosremove sc01 service
2. To remove the pr01 policy, type:
   qosremove pr01 policy

Related Information
The qosstat command, qosmod command, qoslist command, qosadd command.

qosstat Command

Purpose
Show Quality of Service (QoS) status.

Syntax
qosstat [-A] [-F] [-S]

Description
The qosstat command displays information about the installed Qos policies. Using qosstat without any flags returns filter/flow specification and statistical information for each installed policy.

Flags
- A Returns the policy rule handle for each installed policy. A unique handle is assigned by the qoS manager for each policy installed.
- F Returns the flow and filter specification for each policy installed.
- S Returns the statistical information for each policy installed.
Examples

1. qosstat

Policy Rule handle 1:

Filter specification for rule index 1:

<table>
<thead>
<tr>
<th>PolicyRulePriority</th>
<th>protocol</th>
<th>source IP addr</th>
<th>destination IP addr</th>
<th>source port</th>
<th>destination port</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>TCP</td>
<td>INADDR_ANY</td>
<td>INADDR_ANY</td>
<td>80</td>
<td>ANY_PORT</td>
</tr>
</tbody>
</table>

Flow Class for rule index 1:

<table>
<thead>
<tr>
<th>service class</th>
<th>peak rate</th>
<th>average rate</th>
<th>bucket depth</th>
<th>TOS (in profile)</th>
<th>TOS (out profile)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diff-Serv</td>
<td>1000000000 bytes/sec</td>
<td>128 bytes/sec</td>
<td>4096 bytes</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Statistics for rule index 1:

- total number of connections: 0
- total bytes transmitted: 0
- total packets transmitted: 0
- total in-profile bytes transmitted: 0
- total in-profile packets transmitted: 0

Policy Rule Handle 2:

Filter specification for rule index 2:

<table>
<thead>
<tr>
<th>PolicyRulePriority</th>
<th>protocol</th>
<th>source IP addr</th>
<th>destination IP addr</th>
<th>source port</th>
<th>destination port</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>TCP</td>
<td>INADDR_ANY</td>
<td>INADDR_ANY</td>
<td>100</td>
<td>ANY_PORT</td>
</tr>
</tbody>
</table>

Flow Class for rule index 2:

<table>
<thead>
<tr>
<th>service class</th>
<th>peak rate</th>
<th>average rate</th>
<th>bucket depth</th>
<th>TOS (in profile)</th>
<th>TOS (out profile)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diff-Serv</td>
<td>1000000000 bytes/sec</td>
<td>128 bytes/sec</td>
<td>4096 bytes</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Statistics for rule index 2:

- total number of connections: 0
- total bytes transmitted: 0
- total packets transmitted: 0
- total in-profile bytes transmitted: 0
- total in-profile packets transmitted: 0

2. qosstat -A

Policy Rule Handle 1:

rule index: 1

Policy Rule Handle 2:

rule index: 2

3. qosstat -F

Policy Rule Handle 1:

Filter specification for rule index 1:

<table>
<thead>
<tr>
<th>PolicyRulePriority</th>
<th>protocol</th>
<th>source IP addr</th>
<th>destination IP addr</th>
<th>source port</th>
<th>destination port</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>TCP</td>
<td>INADDR_ANY</td>
<td>INADDR_ANY</td>
<td>80</td>
<td>ANY_PORT</td>
</tr>
</tbody>
</table>

Flow Class for rule index 1:

<table>
<thead>
<tr>
<th>service class</th>
<th>peak rate</th>
<th>bucket depth</th>
<th>TOS (in profile)</th>
<th>TOS (out profile)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diff-Serv</td>
<td>1000000000 bytes/sec</td>
<td>4096 bytes</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
average rate: 128 bytes/sec
bucket depth: 4096 bytes
TOS (in profile): 0
TOS (out profile): 0

Policy Rule Handle 2:
Filter specification for rule index 2:
  PolicyRulePriority: 0
  protocol: TCP
  source IP addr: INADDR_ANY
  destination IP addr: INADDR_ANY
  source port: 100
  destination port: ANY_PORT
Flow Class for rule index 2:
  service class: Diff-Serv
  peak rate: 100000000 bytes/sec
  average rate: 128 bytes/sec
  bucket depth: 4096 bytes
  TOS (in profile): 0
  TOS (out profile): 0

4. qosstat -S
Statistics for rule index 1:
  total number of connections: 0
  total bytes transmitted: 0
  total packets transmitted: 0
  total in-profile bytes transmitted: 0
  total in-profile packets transmitted: 0

Policy Rule Handle 2:
Statistics for rule index 2:
  total number of connections: 0
  total bytes transmitted: 0
  total packets transmitted: 0
  total in-profile bytes transmitted: 0
  total in-profile packets transmitted: 0

Related Information
TCP/IP Quality of Service (QoS) in the Networks and communication management.

qpri Command

Purpose
Prioritizes a job in the print queue.

Syntax
qpri [a] JobNumber [a] PriorityNumber

Description
The qpri command prioritizes a job in a print queue by specifying the job number and giving it a priority number.

The qpri command works only on local print jobs and the local side of remote queues. Remote print jobs are not supported. Also, you must have root user authority or belong to the printq group to run this command.

You can use the Printer Queues application in Web-based System Manager (wsm) to change printer characteristics.
You could also use the System Management Interface Tool (SMIT) `smit qpri` fast path to run this command.

In AIX 4.3.2 and above, `qstatus` was enhanced to improve the administration of local queues showing duplicate 3-digit job numbers. You can use the `-W` flag with the `enq`, `qchk`, `lpstat`, and `lpq` status commands to display more job number digits.

If your queue display shows duplicate 3-digit job numbers, use `qchk -W` to list job numbers with greater precision. You can then alter the priority of a specific job.

For example, `qchk` might display job number 123 twice while, `qchk -w` would display job number 1123 and 2123. If you want to alter the priority of job number 2123, specifying `qpri -# 123`, causes the `qdaemon` to alter the priority of the first matching job number it finds in its internal list, which may be 1123. By having the additional information that the `qstatus -W` provides, you can alter the priority of a specific job number.

**Flags**

- `-# JobNumber` Specifies the job number on which to change priority.
- `-a PriorityNumber` Specifies the new priority number for the print job specified by the `JobNumber` variable. The range of priority numbers is 1 through 20, except for the root user or a member of the printq group, who can select priority numbers from 1 through 30.

**Example**

To change job number 123 to priority number 18, enter:

```
qpri -# 123 -a 18
```

**Files**

- `/usr/sbin/qdaemon` Contains the `qdaemon` daemon.
- `/var/spool/lpd/qdir` Contains the job description files.
- `/var/spool/lpd/stat` Contains information on the status of the devices.
- `/var/spool/lpd/qdaemon` Contains the temporary copies of enqueued files.
- `/etc/qconfig` Contains the configuration file.
- `/etc/qconfig.bin` Contains the digested, binary version of the `/etc/qconfig` file.

**Related Information**

The `enq` command, `qadm` command, `qcan` command, `qchk` command, `qpri` command.

The `/etc/qconfig` file.

Command for prioritizing a print job (qpri command) in Operating system and device management.

For information on installing the Web-based System Manager, see Chapter 2: Installation and System Requirements in AIX 5L Version 5.3 Web-based System Manager Administration Guide.

**qpri Command**

**Purpose**

Starts a print job.
Syntax


Description

The `qprt` command creates and queues a print job to print the file specified by the `File` parameter. To print a file from standard input, specify a `-` (dash) instead of a file name. If you specify multiple files, then they all together make up one print job. The `qprt` command prints the files in the order you specify them.

To print a file, you must have read access to it. Using the `-r` flag you can remove a file after printing it. To remove a file, you must have write access to the directory that contains it. If you want the `qprt` command to notify you when a print job completes, specify the `-n` flag.

You can use the `-B` flag in conjunction with the `-D`, `-H`, and `-T` flags to customize burst pages. Burst pages mark the beginning, end, or both of a print job. To mark the beginning and end of a print job with burst pages, use the `-B aa` flag.

All flags are optional and you can specify them in any order. The `qprt` command ignores spaces between a flag and its argument. You can group flags without arguments after a single `-` (dash). All flags and their arguments must precede the `File` parameter.

You can use the Printer Queues application in Web-based System Manager (wsm) to change printer characteristics.

You could also use the System Management Interface Tool (SMIT) `smit qprt` fast path to run this command.

Some of the flags and arguments listed in this command are invalid for particular printer types. If you experience problems using an option, you can use SMIT to preview a `qprt` command statement. See the "System management interface tool (SMIT)" in Operating system and device management. Alternatively, consult your printer manual to find out what options your printer supports.

Flags

-#{j|h|v}

  Specifies a special functionality. The possible values for the `Value` variable are:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>j</td>
<td>Displays a job number for the specified print job.</td>
</tr>
<tr>
<td>H</td>
<td>Queues the print job but holds it in a HELD state.</td>
</tr>
<tr>
<td>v</td>
<td>Validates the specified printer backend flag values. As part of the validation process, the command performs legality checking for illegal flag values, type checking, range checking, list checking, and other types of validation. Typically, the validation of backend flag values is useful because illegal flags are identified when the print job is submitted rather than at a later stage when the print job is processed.</td>
</tr>
</tbody>
</table>
- OutputBin

Specifies the output bin destination for a print job. If you do not specify this flag, it uses the default value from the printer driver.

The possible values for OutputBin are:

0  Top printer bin.
1 - 49  High Capacity Output (HCO) bins 1 - 49.
>49  Printer specific output bins.

Note: Valid output bins are printer dependent.

-a PreviewOption

Previews parameter values for a print job without actually printing any files. You can specify a 0 or a 1 for the PreviewOption variable. If you specify 0, the qprt command preview displays normal print processing. If you specify a 1, the command returns a list of the flag values and the filter pipeline that would be used to convert the input data type to the data type expected by the printer. These flag values are the default command line flag values from the configuration database, overridden by any flag parameters specified on the command line.

Only flags that are valid for the InputDataType variable specified (or defaulted) for the -d flag are shown. Flag values related only to the spooling of your print job, instead of the actual printing, are not shown. The default values for the spooling flags are included with the flag descriptions. The flag values are not checked to verify that they are supported by the printer.

The pipeline of filters shows the filter commands (and the flag values passed to the filter commands) that would process the data from your print files before it is sent to the printer. You can review the description for each of the filter commands to determine the type of filtering that is performed.

-A Level

Sets the level of diagnostic output. Diagnostic output is useful for diagnosing errors encountered by a filter pipeline that is processing a print file, a header page, or a trailer page. Diagnostic output is mailed to the user who submitted the print job. You can specify one of the following levels:

0  Discards any standard error output produced.
1  Returns flag values, the standard error output, and the complete pipeline that produced any standard error output.
2  Returns the flag values, standard error output (if any), and complete pipelines, regardless of whether an error is detected. If an error is detected, the print job is terminated.
3  Similar to a value of 2, except that the file is not printed.

A value of 1 is recommended. A value of 0 is useful if a filter in a pipeline produces output to standard error, even if no error is encountered (for example, status information). A value of 2 or 3 is useful for diagnosing a problem, even if the problem does not cause any output to standard error.

-b BottomMargin

Specifies the bottom margin, the number of blank lines to be left at the bottom of each page.
-B Value Prints burst pages. The Value variable consists of a two-character string. The first character applies to header pages. The second character applies to trailer pages. The following values are valid:

- a Always print the (header or trailer) page for each file in each print job.
- n Never print the (header or trailer) page.
- g Print the (header or trailer) page once for each print job (group of files).

For example, the -B ga flag prints a header page at the beginning of each print job and a trailer page after each file in each print job.

Note: In a remote print environment, the default is determined by the remote queue on the server.

-c Copies each print file and prints from the copy. Specify this flag if you plan to modify the print file or files after the qprt command is issued, but before the print job completes.

If this flag is not specified and the print job is printed on the same node where it was submitted, copies of the print file or files are not made. Printing occurs directly from the file or files you specified with the File parameter.

-C Mails messages generated by your print job to you, even if you are logged in. By default, the qprt command displays messages on the console.

The -C flag only applies to local print jobs. If you want to be notified when a job sent to a remote printer is completed, use the -n flag to receive a mail message.

Note: You cannot redirect certain messages from the qdaemon and the printer backend in any way. They are sent directly to the /dev/console file.

-d InputDataType Identifies the input data type of the file or files to print. Based on the input data type and the data type expected by the printer, the print files are passed through filters (if necessary) before being sent to the printer. You can specify any of the following input data types:

- a Extended ASCII
- c PCL
- d Diablo 630
- g Hewlett-Packard GL
- p Pass-through (sent to printer unmodified)
- s PostScript

If the printer you select does not support the specified input data type, and if filters are not available to convert the data type of your print file or files to a data type supported by the printer, the print job terminates with an error message.

-D "User" Labels the output for delivery to User. Normally the output is labeled for delivery to the user name of the person issuing the qprt command request. The value of User must be a single word meeting the same requirements of a regular user ID.

-e EmphasizedOpt Sets emphasized print to one of the following:

- + Use emphasized print.
- ! Do not use emphasized print.

-E DblHigh Sets double-high print to one of the following:

- + Use double-high print.
- ! Do not use double-high print.
-f Filter
Identifies the filter to pass your print files through before sending them to the printer. The identifiers are similar to the filter flags available with the `lpr` command. The available filter identifiers are `p`, which invokes the `pr` filter, `n`, which processes output from the `troff` command, and `l`, which allows control characters to be printed.

-F Name
Specifies the list of X font files containing the image of characters to be used for printing. Items in the list must be separated by commas. The `Name` parameter value can be full path names, font alias names, or XLFD names. The `-F` Name flag is effective only for MBCS printer queues.

-g Begin
Sets the page number to begin printing. This flag is recognized only if the print files are to be formatted (for example, with the `-d a` flag). It is not recognized for pass-through (the `-d p` flag), PostScript (the `-d s` flag), and other types of data that are already formatted.

-G Coord
Indicates how to print pages on laser printers that cannot print to the edge of the paper. Use one of the following for the `Coordinate` variable:

+ Whole page coordinate system
! Print page coordinate system

-h "Header"
Specifies the header text for use by the `pr` command when the `-f p` flag is also specified. If this flag is not specified, the `pr` command uses the print file name as the header.

This flag is useful if you also specified the `-c` flag. With the `-c` flag, the print file name used by the `pr` command as the default header is the name of a temporary file generated by the spooler, instead of the file name you specified with the `qprt` command.

-H "HostName"
Sets the host name on the header page.

-i Indent
Indents each line the specified number of spaces. You must include the `Indent` variable in the page width specified by the `-w` flag.

-I FontID
(uppercase `i`) Specifies a font identifier. Specifying a font identifier overrides the pitch (the `-p` flag) and type style (the `-s` flag). The `-I` FontID command is effective for single byte code set print queues only.

-I FontPath
(uppercase `i`) Specifies the comma-separated list of font paths required for the `-F` flag when the font files are designated with a font alias name or an XLFD name. The `FontPath` flag is effective only for MBCS printer queues.

-j Init
Initializes the printer before each file is printed. You can specify any of the following:

0 No initialization
1 Full initialization
2 Emulator selection only

-J Restore
Restores the printer at the end of the print job. You can specify one of the following:

+ Restore at the end of the print job.
! Do not restore at the end of the print job.

-k Color
Specifies the print color. Typical values are black, red, blue, green, and so on. Consult your printer manual for colors supported and the ribbon position assigned to a particular color.

-K Condense
Sets condensed print to one of the following:

+ Use condensed print.
! Do not use condensed print.

-L Length
(lowercase `L`) Sets the page length. If the `Length` variable is 0, page length is ignored, and the output treated as one continuous page. The page length includes the top and bottom margins and indicates the printable length of the paper.
-L LineWrap
Sets line wrap for lines wider than the page width to one of the following:
+ Wrap long lines to the next line.
! Truncate long lines at the right margin.

-m "Message"
Displays the specified message on the console when the print job is assigned a printer and is ready to begin printing. The print job does not proceed until the message is acknowledged at the console.

-M MessageFile
Identifies a file containing message text. This text is displayed on the console when the print job is assigned a printer and is ready to begin printing. The print job does not proceed until the message is acknowledged at the console.

-n
Notifies you when the print job completes. If the -D "User" flag is also specified, the specified user is notified as well. By default, you are not notified when the print job completes.

-N NumberCopies
Specifies the number of copies to print. If this flag is not specified, one copy is printed.

-O PaperHand
Sets the type of input paper handling to one of the following:
1 Manual (insert one sheet at a time)
2 Continuous forms
3 Sheet feed

-p Pitch
Sets the number of characters per inch. Typical values for Pitch are 10 and 12. The actual pitch of the characters printed is also affected by the values for the -K (condensed) flag and the -W (double-wide) flag.

If you are printing an ASCII file on a PostScript printer, this flag determines the character point size. You can specify positive numbers greater than or equal to 1.

-P Queue[:QueueDevice]
Specifies the print queue name and the optional queue device name. If this flag is not specified, the following conditions occur:

• If the LPDEST environment variable is set, the qprt command uses the queue name specified by the LPDEST variable. If set, this value is always used, even if the PRINTER variable is also set.

• If the PRINTER variable is set and no LPDEST variable is set, the qprt command uses the queue name specified by the PRINTER environment variable. Any destination command-line options override both the LPDEST and PRINTER environment variables.

• If neither the LPDEST nor the PRINTER variable is set, the qprt command uses the system default queue name. (The system default queue name is the name of the first queue defined in the /etc/qconfig file.) If the QueueDevice variable is not specified, the first available printer configured for the queue is used.

Note: If multiple printers are configured for the same print queue and one or more of the printers is not suitable for printing your files, you should use the QueueDevice variable. Otherwise, the spooler assigns the first available printer.
-q **Quality**

Sets the print quality to one of the following:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Fast font</td>
</tr>
<tr>
<td>1</td>
<td>Draft quality</td>
</tr>
<tr>
<td>2</td>
<td>Near letter quality</td>
</tr>
<tr>
<td>3</td>
<td>Enhanced quality</td>
</tr>
<tr>
<td>300</td>
<td>300 dots per inch (dpi)</td>
</tr>
<tr>
<td>600</td>
<td>600 dpi</td>
</tr>
</tbody>
</table>

-Q **Value**

Sets the paper size. The **Value** for paper size is printer-dependent. Typical values are: 1 for letter-size paper, 2 for legal, and so on. Consult your printer manual for the values assigned to specific paper sizes.

-r

Removes the print files after the print job completes. If this flag is not specified, the print files are not removed.

-R **Priority**

Sets the priority for the print job. Higher values for the **Priority** variable indicate a higher priority for the print job. The default priority value is 15. The maximum priority value is 20 for most users and 30 for users with root user privilege and members of the system group (group 0).

**Note:** You cannot use this flag when requesting remote print jobs.

-s **NameType**

Specifies a type style with the **NameType** variable. Examples are courier and prestige. The particular type style choices differ depending on the printer type.

-S **Speed**

Sets high-speed printing to one of the following:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>Use high-speed printing.</td>
</tr>
<tr>
<td>!</td>
<td>Do not use high-speed printing.</td>
</tr>
</tbody>
</table>

-t **TopMargin**

Sets the top margin, the number of blank lines left at the top of each page.

-T "**Title**"

Specifies a print job title with the **Text** variable. If this flag is not specified, the first file name on the **qprt** command line is used as the print job title. The print job title is displayed on the header page and on responses to inquiries about queue status.

-u **PaperSrc**

Sets the paper source to one of the following:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Primary</td>
</tr>
<tr>
<td>2</td>
<td>Alternate</td>
</tr>
<tr>
<td>3</td>
<td>Envelopes</td>
</tr>
</tbody>
</table>

-U **Directional**

Sets unidirectional printing to one of the following:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>Use unidirectional printing.</td>
</tr>
<tr>
<td>!</td>
<td>Do not use unidirectional printing.</td>
</tr>
</tbody>
</table>

-v **LinesPerIn**

Sets the line density to a number of lines per inch. Typical values for the **LinesPerIn** variable are 6 and 8.

-V **Vertical**

Sets vertical printing to one of the following:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>Use vertical printing.</td>
</tr>
<tr>
<td>!</td>
<td>Do not use vertical printing.</td>
</tr>
</tbody>
</table>

-w **PageWidth**

Sets the page width in number of characters. The page width must include the number of indentation spaces specified with the ** probable** flag.

-W **DblWide**

Sets double-wide print to one of the following:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>Use double-wide print.</td>
</tr>
<tr>
<td>!</td>
<td>Do not use double-wide print.</td>
</tr>
</tbody>
</table>
-x LineFeed Specifies automatic line feed or automatic carriage return:
0 Do not change line feeds, vertical tabs, and carriage returns.
1 Add a line feed for each carriage return.
2 Add a carriage return for each line feed and each vertical tab.

-X CodePage Provides the code page name. Valid values for the CodePage variable are
ISO8859-1 through ISO8859-9, IBM-943, IBM-eucJP, IBM-eucKR, IBM-eucTW, and UTF-8. The code page in the user’s locale definition is the default.

-y DblStrike Sets double-strike print to one of the following:
+ Use double-strike print.
! Do not use double-strike print.

-Y Duplex Sets duplexed output. Duplexed output uses both the front and back of each sheet of paper for printing. You can set one of the following:
0 Simplex
1 Duplex, long edge binding
2 Duplex, short edge binding

-z Rotate Rotates page printer output the number of quarter-turns clockwise as specified by the Value variable. The length (-l) and width (-w) values are automatically adjusted accordingly.
0 Portrait
1 Landscape right
2 Portrait upside-down
3 Landscape left

-Z FormFeed Sends a form feed to the printer after each print file. You can specify either of the following:
+ Send a form feed command.
! Do not send a form feed command to the printer. Use this option carefully since it can result in the next print job beginning on the last output page generated by this print job. Printers printing on continuous forms cannot determine the top of the form for subsequent pages.

Examples
1. To queue the myfile file to print on the first available printer configured for the default print queue using the default values, enter:
   qprt myfile

2. To queue a file on a specific queue, to print the file without using nondefault flag values, and to validate the flag values at the time of the print job submission, enter:
   qprt -f p -e + -P fastest -r -n -C -#v somefile

   This command line passes the somefile file through the pr command (the -f p flag) and prints it using emphasized mode (the -e + flag) on the first available printer configured for the queue named fastest (the -P fastest flag). The -#v flag verifies that all flags associated with this command are valid before passing the print job to the printer backend. After the file is printed, it is removed (the -r flag), and the user who submitted the print job is notified (the -n flag) by mail (the -C flag) that the print job completed.

3. To print myfile on legal size paper, enter:
   qprt -Q2 myfile
4. To enqueue the myfile file and return the job number, enter:
   `qprt -#j myfile`
5. To queue MyFile and hold it, enter:
   `qprt -#H MyFile`

Files

/etc/qconfig
Contains the queue and queue device configuration file.

/usr/bin/qprt
Contains the qprt command.

Related Information

The `enq`, `lp`, `lpr`, `pr`, `qadm`, `qcan`, `qchk`, `qprt`, `smit`, `troff` commands. The /etc/qconfig file.

Printing administration, Print spooler, Printer-specific information, Virtual printer definitions and attributes, Initial printer configuration, Command for starting a print job (qprt command) in Printers and printing.

Printing files from a remote system in Networks and communication management.

For information on installing the Web-based System Manager, see Chapter 2: Installation and System Requirements in AIX 5L Version 5.3 Web-based System Manager Administration Guide.

qstatus Command

Purpose
Provides printer status for the print spooling system.

Syntax

Description
The qstatus command performs the actual status function for the print-spooling system. This command is never entered on the command line; it is called by the enq command. The qstatus command generates status information on specified jobs, printers, queues, or users.

The display generated by the qstatus command contains two entries for remote queues. The first entry contains the client’s local queue and local device name and its status information. The second entry follows immediately; it contains the client’s local queue name (again), followed by the remote queue name. Any jobs submitted to a remote queue are displayed first on the local side and are moved to the remote device as the job is processed on the remote machine.

Since the status commands communicate with remote machines, the status display may occasionally appear to hang while waiting for a response from the remote machine. The command will eventually time-out if a connection cannot be established between the two machines.

Flags
All flags are optional. If flags are not specified, the qstatus command returns the status of the following:
• The printer specified by the LPDEST variable, if the LPDEST environment variable is set. If set, this value is always used, even if the PRINTER variable is also set.
• The printer specified by the `PRINTER` environment variable, if the `PRINTER` variable is set and no `LPDEST` variable is set.
• The default printer, if neither the `LPDEST` nor the `PRINTER` variable is set.

**Note:** Any destination command line options override both the `LPDEST` and the `PRINTER` environment variables.

-# `JobNumber` Displays current status information for the job specified by the `JobNumber` variable. Normally, the status of all queued jobs is displayed.
  1. Specify the `-P Queue` to override the default destination printer.
  2. If jobs 1, 2, and 3 are in the printer queue, and you specify that you want the status of job 3 while job 1 is running, the status information will show job 1 and job 3, not only job 3.
  3. If you specify a job number that does not exist, the system displays the current job number on the queue instead of an error message.

-A Displays status information on all queues defined in the `/etc/qconfig` file.

-e Excludes status information from queues that are not under the control of the `qdaemon` command. The status from such queues may appear in different formats. The `-e` flag can be used with any combination of flags.

-L Displays a long, detailed version of status information as requested on the command line. This flag cannot be used with the `-W` flag. If the `-L` flag and the `-W` flag are used simultaneously, the first one specified takes precedence.

-P `Printer` Displays current status information for the printer specified by the `Printer` variable. Normally, the default printer is used, or the value of either the `LPDEST` or `PRINTER` environment variable is used. The `LPDEST` variable always takes precedence over the `PRINTER` variable.

-q Displays the current status of the default queue. The default queue is specified by the `LPDEST` variable, or if a `LPDEST` value does not exist, by the `PRINTER` environment variable. If neither variable exists, the `qstatus` command uses the first queue listed in the `/etc/qconfig` file.

-u `UserName` Displays current status information for all jobs submitted by the user specified by the `UserName` variable. Normally, the status of all queued jobs is displayed.

-W Displays a wide version of status information with longer queue names, device names, and job numbers. Longer job number information is available on AIX 4.3.2 and later. This flag cannot be used with the `-L` flag. If the `-L` flag and the `-W` flag are used simultaneously, the first one specified takes precedence.

-w `DelaySeconds` Displays requested queue information at intervals specified by the `DelaySeconds` variable. When the queue is empty, the display ends.

**Examples**

1. To display the default print queue, enter:
   ```
   qstatus -q
   ```

2. To display the long status of all queues until empty, while updating the screen every 5 seconds, enter:
   ```
   qstatus -A -L -W 5
   ```

3. To display the status for printer `lp0`, enter:
   ```
   qstatus -P lp0
   ```

4. To display the status for job number 123, enter:
   ```
   qstatus -# 123 -P lp0
   ```

5. To display the status of all queues in wide format for AIX 4.2.1 or later, enter:
   ```
   qstatus -A -W
   ```
Files
/var/spool/lpd/qdir/* Contains the job description files.
/etc/qconfig Contains the configuration file.
/etc/qconfig.bin Contains the digested, binary version of the /etc/qconfig file.
/usr/lib/lpd/rembak Contains the remote back end.
/usr/lib/lpd/qstatus Contains the command file.
/var/spool/lpd/stat/* Contains the status files for the qstatus command.

Related Information
The enq command, lpd command, lpr command, qdaemon command, qchk command, rembak command.
The /etc/qconfig file.
Print spooler in the Printers and printing.
Remote Printing Overview in the Printers and printing.

quiz Command

Purpose
Tests your knowledge.

Syntax
quiz { -i File | -t | Category1 Category2 }

Description
The quiz command gives associative knowledge tests on various selectable subjects. It asks about items chosen from Category1 and expects answers from Category2. If you do not specify the categories, the quiz command lists the available categories, provides instructions, and returns to the shell prompt.

The game provides the correct answer whenever you press the Enter key. When questions run out or when you press the Interrupt (Ctrl-C) or End Of File (Ctrl-D) key sequences, the game reports a score and ends.
Flags

-i File  Substitutes the named File for the standard index file.

Note: In the following syntax description, brackets are normally used to indicate that an item is optional. However, a bold-faced bracket or brace should be entered as a literal part of the syntax. A vertical list of items indicates that one must be chosen. The lines in File must have the following syntax:

line = category [:category] . . .
category = alternate [ | alternate ] . . .
alternate = [primary]
primary = character
[category]
option
option = {category}

In an index file, the first category of each line must specify the name of an information file. The information file contains the names of files with quiz material. The remaining categories specify the order and contents of the data in each line of the information file. The quiz data in an information file follows the same syntax.

A \ (backslash) is an escape character that allows you to quote syntactically significant characters or to insert a new-line character (\n) into a line. When either a question or its answer is blank, the quiz command does not ask the question. The construct alab does not work in an information file. Use a{b}.

-t  Provides a tutorial. Repeats missed questions and introduces new material gradually.

Examples

1. To start a Latin-to-English quiz, enter:
   
   /usr/games/quiz latin english

   The game displays Latin words and waits for you to enter what they mean in English.

2. To start an English-to-Latin quiz, enter:
   
   /usr/games/quiz english latin

3. To set up a Latin-English quiz, add the following line to the index file:
   
   /usr/games/lib/quiz/latin:latin:english

   This line specifies that the /usr/games/lib/quiz/latin file contains information about the categories Latin and English.

   You can add new categories to the standard index file, /usr/games/lib/quiz/index, or to an index file of your own. If you create your own index file, run the quiz command with the -i-file flag and enter your list of quiz topics.

4. The following is a sample information file:
   
   cor:heart
   sacerdos:priest{ess}
   quando:when|since|because
   optat:{(s)he |it }{desires|wishes}\n   desire|wish
   alb[us|a|um]:white

   This information file contains Latin and English words. The : (colon) separates each Latin word from its English equivalent. Items enclosed in { } (braces) are optional. A | (vertical bar) separates two items when entering either is correct. The [ ] (brackets) group items separated by vertical bars.

   The first line accepts only the answer heart in response to the Latin word cor. The second accepts either priest or priestess in response to sacerdos. The third line accepts when, since, or because for quando.
The \ (backslash) at the end of the fourth line indicates that this entry continues on the next line. In other words, the fourth and fifth lines together form one entry. This entry accepts any of the following in response to optat:

she desires it desires desire
she wishes it wishes wish
he desires desires
he wishes wishes

If you start a Latin-to-English quiz, the last line of the sample information file instructs the **quiz** command to ask you the meaning of the Latin word _albus_. If you start an English-to-Latin quiz, the **quiz** command displays _white_ and accepts _albus_, _alba_, or _album_ for the answer.

If any of the characters `{ (left brace), } (right brace), [ (left bracket), ] (right bracket) or | (vertical bar) appear in a question item, the **quiz** command gives the first alternative of every | group and displays every optional group. Thus, the English-to-Latin question for the fourth definition in this sample is _she desires_.

### Files

<table>
<thead>
<tr>
<th>Path</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>/usr/games/lib/quiz/index</td>
<td>Default index file for quiz categories.</td>
</tr>
<tr>
<td>/usr/games/lib/quiz/*</td>
<td>Used to specify the contents of a given file.</td>
</tr>
<tr>
<td>/usr/games</td>
<td>Location of the system's games.</td>
</tr>
</tbody>
</table>

### Related Information


### quot Command

#### Purpose

Summarizes file system ownership.

#### Syntax

```
quot [-c] [-f] [-h] [-n] [-v] [ FileSystem ... ]
```

```
```

#### Description

The **quot** command summarizes file system ownership by displaying the number of 512-byte blocks currently owned by each user in the specified file system (FileSystem). If no file system is specified, the **quot** command displays the same information for each of the file systems in the `/etc/filesystems` file.

#### Flags

- `-a` Generate a report on all mounted systems.
- `-c` Displays a three-column report. The first column specifies the file size in 512-byte blocks. The second column specifies the number of files of that size. Finally, the third column specifies the cumulative total of 512-byte blocks in all files of that size or smaller.
  
  **Note:** Files greater than or equal to 500 blocks are grouped under a block size of 499. However, their exact block count contributes to the cumulative total of blocks.

- `-f` Displays the total number of blocks, the total number of files, and the user name associated with these totals.
-h Estimates the number of blocks used by the file. This estimation is based on the file size and may return greater than actual block usage when used on files with holes.

-n Produces a list of all files and their owners by running the following pipeline:

`ncheck filesystem | sort +on | quot -n filesystem`

-v Displays output in three columns containing the number of blocks not accessed in the last 30, 60, and 90 days.

**Security**

Access Control: This command is owned by the bin user and bin group.

**Examples**

1. To display the number of files and bytes owned by each user in the `/usr` file system, enter:

```
quot -f /usr
```

The system displays the following information:

```
/usr:
63056  3217  bin
20832  390   root
1184   42   uucp
  56    5   adm
   8    1   guest
   8    1    sys
```

2. To display file size statistics, the number of files of each size, and a cumulative total, enter:

```
quot -c /usr
```

The system displays the following information:

```
/usr:
  8   103  824
 16    2  856
499    0  856
```

3. To generate a report of all mounted file systems, type:

```
quot -a
```

4. To generate a report of the `/var` file system, type:

```
#quot -v /var
```

```
/var:
45695  root  12852 11878   11774
2569   guest  2567   1280    960
2121   adm    92    91     91
1343   bin    465   233    193
 14   uucp    0     0      0
   5   daemon  0     0      0
   1   invscout  1    1     1
   1   nuucp    1    1     1
   1    sys    0     0      0
```

**Files**

`/etc/passwd` Contains user names.

`/etc/filesystems` Contains file system names and locations.

**Related Information**

The `du` command, `ls` command.
quota Command

Purpose
Displays disk usage and quotas.

Syntax
quota [ -u [ User ] ] [ -g [ Group ] ] [ -v | -q ]

Description
The quota command displays disk usage and quotas. By default, or with the -u flag, only user quotas are displayed. The quota command reports the quotas of all file systems listed in the /etc/filesystems file. If the quota command exits with a non-zero status, one or more file systems are over quota.

A root user may use the -u flag with the optional User parameter to view the limits of other users. Users without root user authority can view the limits of groups of which they are members by using the -g flag with the optional Group parameter.

Notes:
1. In a JFS file system, if a particular user has no files in a file system on which that user has a quota, this command displays quota: none for that user. The user's actual quota is displayed when the user has files in the file system, or when the -v flag is specified. For JFS2, a user's actual quota is displayed in all cases.
2. For JFS2 file systems, there are two situations which affect the information displayed for the root user by the quota command. First, since the root user is never limited by quotas in any way, limits for the root user are always displayed as zero (unlimited). Second, though the file systems's quota files (quota.user and quota.group) are owned by root, allocation for these files is not managed by the quota subsystem and is not included in the allocation displayed for the root user.

Flags
- g Displays the quotas of the user's group.
- u Displays user quotas. This flag is the default option.
- v Displays quotas on file systems with no allocated storage.
- q Prints a terse message, containing only information about file systems with usage over quota.

Note: The -q flag takes precedence over the -v flag.

Security
Access Control: This command is owned by the root user and the bin group.
Privilege Control: This program is setuid in order to allow non-privileged users to view personal quotas.

Examples
1. To display your quotas as user keith, type:
   quota

   The system displays the following information:
   User quotas for user keith (uid 502):
   Filesystem blocks quota limit grace Files quota limit grace
   /u 20 55 60 20 60 65

2. To display quotas as the root user for user davec, type:
   quota -u davec
The system displays the following information:

User quotas for user davec (uid 2702):

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>blocks</th>
<th>quota limit</th>
<th>grace</th>
<th>files</th>
<th>quota limit</th>
<th>grace</th>
</tr>
</thead>
<tbody>
<tr>
<td>/u</td>
<td>48</td>
<td>50</td>
<td>60</td>
<td>7</td>
<td>60</td>
<td>60</td>
</tr>
</tbody>
</table>

Files

- `quota.user` Specifies user quotas.
- `quota.group` Specifies group quotas.
- `/etc/filesystems` Contains file system names and locations.

Related Information

- Quota system in Security.

The `edquota` command, `quotacheck` command, `quotaon` and `quotaoff` commands, `repquota` command.

**quotacheck Command**

**Purpose**
Checks file system quota consistency.

**Syntax**

```
quotacheck [ -d ] [ -g ] [ -p ] [ -u ] [ -v ] { -a | Filesystem... }
```

**Description**

The `quotacheck` command examines a file system specified by the `FileSystem` parameter, builds a table of current disk usage, and compares the information in the table to that recorded in the file system’s disk quota files. If any inconsistencies are detected, the quota files are updated. By default, both user and group quotas are checked.

The optional `-g` flag specifies that only group quotas are checked. The optional `-u` flag specifies that only user quotas are checked. Specifying both `-g` and `-u` flags is equivalent to the default behavior which checks both user and group quotas. The `-a` flag specifies that all file systems in the `/etc/filesystem` file with disk quotas enabled are checked.

The optional `-d` flag deletes Usage statistics for any user or group ID that does not exist in `/etc/passwd` or `/etc/group`, and which has no allocation in the file system. The affected users or groups will no longer have statistics displayed by the `repquota` command. For JFS2 file systems only, the optional `-p` flag removes (purges) Limits Class information from the affected quota records, which can result in smaller quota file sizes. The `-p` flag has no effect on JFS file systems and is ignored.

The `quotacheck` command normally operates silently. If the `-v` flag is specified, the `quotacheck` command reports discrepancies between the calculated and recorded disk quotas.

For JFS, the `quotacheck` command determines the quota file names from the `/etc/filesystems` file (by default, the files are named `quota.user` and `quota.group` and are located at the root of the file system); for JFS2, the names and location of these files are predetermined and cannot be changed. If these files do not exist, the `quotacheck` command creates them.

**Note:** Do not run the `quotacheck` command against an active file system. If the file system has any current activity, running `quotacheck` may result in incorrect disk usage information.
Flags

- **-a**: Checks all file systems with disk quotas enabled in `/etc/filesystems`.
- **-d**: Deletes Usage statistics for undefined IDs with no allocation.
- **-g**: Checks group quotas only.
- **-p**: Removes (purges) Limits Class information for undefined IDs with no allocation (JFS2 only, ignored by JFS).
- **-u**: Checks user quotas only.
- **-v**: Reports discrepancies between the calculated and recorded disk quotas.

Security

Access Control: Only a user with root user authority can execute this command.

Examples

1. To check the user and group quotas in the `/usr` file system, type:
   ```bash
quotacheck /usr
   ```
2. To check only the group quotas in the `/usr` file system, type:
   ```bash
calinf
   ```

Files

- **quota.user**: Specifies user quotas.
- **quota.group**: Specifies group quotas.
- **/etc/filesystems**: Contains file system names and locations.
- **/etc/group**: Contains basic group attributes.
- **/etc/passwd**: Contains user names.

Related Information

The `edquota`, `quota`, `quotamon` and `quotoff` commands, and `repquota` command.

**Quota system** in *Security*.

**quotaon or quotaoff Command**

Purpose

Turns on and off file system quotas.

Syntax

```bash
quotaon [-g] [-u] [-v] [-a] { FileSystem ... }
quotaoff [-g] [-u] [-v] [-a] { FileSystem ... }
```

Description

The `quotaon` command enables disk quotas for one or more file systems specified by the `FileSystem` parameter. The specified file system must be defined with quotas in the `/etc/filesystems` file, and must be mounted. The `quotaon` command looks for the `quota.user` and `quota.group` files in the root directory of the associated file system, and will return an error if not found.

**Note:** For JFS only, the default quota file names (`quota.user` and `quota.group`) may be overridden in the `/etc/filesystems` file. The quota files can be external to the quota enabled file system by specifying full paths in the `/etc/filesystems` file. For JFS2 file systems, the file names may not be overridden.
and must reside in the root directory of the file system. By default, both user and group quotas are enabled. The -u flag enables only user quotas; the -g flag enables only group quotas. Specifying both -g and -u flags is equivalent to the default (no option specified). The -a flag specifies that all file systems with disk quotas, as indicated by the /etc/filesystems file, are enabled.

The quotaoff command disables disk quotas for one or more file systems. By default, both user and group quotas are disabled. The -a, -g, and -u flags operate as with the quotaon command. The -v flag prints a message for each quota type (user or group) in every file system in which quotas are turned on or off with the quotaon and quotaoff commands, respectively.

An error (EPERM) will be returned if the quota.user and quota.group files are not owned by user root and group system. Ownership changes on these files are not permitted while quotas are active.

Flags
-a Enables or disables all file systems that are read-write and have disk quotas, as indicated by the /etc/filesystems file. When used with the -g flag, only group quotas in the /etc/filesystems file are enabled or disabled; when used with the -u flag, only user quotas in the /etc/filesystems file are enabled or disabled.
-g Specifies that only group quotas are enabled or disabled.
-u Specifies that only user quotas are enabled or disabled.
-v Prints a message for each file system in which quotas are turned on or off.

Security
Access Control: Only the root user can execute this command.

Examples
1. To enable user quotas for the /usr file system, enter:
   quotaon -u /usr
2. To disable user and group quotas for all file systems in the /etc/filesystems file and print a message, enter:
   quotaoff -v -a

Files
quota.user Specifies user quotas.
quota.group Specifies group quotas.
/etc/filesystems Contains file system names and locations.

Related Information
The quota command, edquota command, repquota command, quotacheck command.

The Disk quota system overview in Security introduces the disk quota system.

Quota system in Security.

raddbm Command

Purpose
Modifies entries in the local database of RADIUS user-authentication information.
Syntax

```
raddbm [ -a Command ] [ -d Database_filename ] [ -e EAP_type ] [ -i Config_filename ] [ -l Load_filename ] [ -n ] [ -p ] [ -t pwd_expire_wks ] [ -u User_ID ] [ -w ]
```

Description

The `raddbm` command is used to create and modify a local database of user-authentication information. The RADIUS server can be configured to use this database as the source of information it uses to authenticate users.

The local database is stored in a file. Data in the file is in a binary tree format to make searches faster. The database file name is specified in the RADIUS `/etc/radius/radiusd.conf` configuration file and has the default value of `dbdata.bin`. You can modify the file name by editing `radiusd.conf` through SMIT.

Each entry has the following fields:

- **USERID**
  - Specifies the user's ID.
- **PASSWORD**
  - Specifies the user's password.
- **PASSWORD_EXPIRATION**
  - Specifies the password expiration time in number of weeks.
- **EAP_TYPE**
  - Specifies the EAP type allowed for authentication.

Passwords in the database file are not stored in clear text in order to prevent simple password compromise, but the algorithm used to hide the passwords is not considered to be cryptographically secure. The file, `dbdata.bin`, is protected by `root:security` as the owner and group.

Several operations on the local database are supported by the `raddbm` command, including the following:

- **Add a user to the database.**
  - To add a user, the command form is:
    ```
raddbm -a ADD -u User_ID -e EAP_type -t pwd_expire_wks
    ```

  The user's password is prompted from standard input.

  The `-e` and `-t` flags are optional. If no value for the `-e` flag is entered, the default value of `none` is used for EAP_TYPE, meaning EAP packets are ignored for this user. If no value for the `-t` flag is entered, the default value of `0` is used for PASSWORD_EXPIRATION, meaning that password expiration is never checked. The `-p` flag is optional since the `raddbm` command always prompts for a new password when adding a new user.

- **Change a user in the database.**
  - To change the user's information in the local database, type the following:
    ```
raddbm -a CHANGE -u User_ID -p -e EAP_type -t pwd_expire_wks
    ```

  The `-e`, `-p`, and `-t` flags are optional, but at least one must be specified. If the `-p` flag is used, the `raddbm` command will prompt for the password.

- **Delete a user from the database.**
  - To delete a user's entry from the database, type the following:
    ```
raddbm -a DELETE -u User_ID
    ```

- **List users in the database.**
  - To list a user's entries in the database, type the following:
    ```
raddbm -a LIST
    raddbm -a LIST -u User_ID
    raddbm -a LIST -u User_ID -w
    ```

  The `-w` and `-u` flags are optional. If the `-w` flag is specified, all fields in the user's entry are displayed (except the password, which is for security reasons is never displayed).
If the -u flag is specified, the user’s information is displayed in colon-separated format. If the -u flag is not specified, all entries in the database are displayed in column format.

- Create a new database.
  The RADIUS server ships an empty database in /etc/radius/dbdata.bin. If a user wants to create a new database, at least one user must be added at the time of creation. The form of the command is the following:
  ```
  raddbm -a ADD -u User_ID -e EAP_type -t pwd_expire_wks -n
  ```
  The user’s password is prompted from standard input.
  The -e and -t flags are optional. They default to EAP_type=NONE and no password expiration checking.

- Load a list of users into the database.
  A list of users can be loaded directly into the database using the -l flag. A file must be created for each user that has records in it of the form:
  ```
  "userid" "password"
  ```
  The double quotes must be present.
  The file can then be used with the -l flag in the following way:
  ```
  raddbm -l filename
  ```
  Placing user passwords in plain text format in a file is strongly discouraged. This option is provided mainly for testing purposes.

**Flags**

- ?  Displays the help screen.
- -a Command  Specifies the action to perform. Values are ADD, LIST, DELETE, or CHANGE.
- -d Database_filename  Specifies the database file name. Used to override the default database file specified in the radiusd.conf RADIUS configuration file.
- -e EAP_type  Specifies the EAP type the user is allowed to use for authentication. Currently, only MD5-challenge or none is supported. The default is none.
- -i Config_filename  Specifies the RADIUS configuration file name. Used to override the default /etc/radius/radiusd.conf configuration file.
- -l Load_filename  Specifies the file name of the user name and password file to load.
- -n  Creates a new database file. Valid only with the ADD command option. If this option is used, all previous information in the database is lost.
- -p  Indicates that the user’s password is to be changed. For security reasons, the password is prompted from standard input instead of read from the command line.
- -t pwd_expire_wks  Specifies the number of weeks the user’s password is valid. This flag is valid with the ADD and CHANGE commands. The default is 0, indicating no password expiration. Valid values are from 0 to 52.
- -u User_ID  Specifies the user’s ID. A valid user ID must be less than 253 characters in length, and can contain letters, numbers, and some special characters. It cannot contain blanks. Duplicate user IDs are not allowed.
- -w  Generates a long listing of user information.

**Exit Status**

This command has the following exit values:

- 0  The command completed successfully.
- >0  An error occurred.

**Security**

Only the root user or a member of the security group can execute this command.
Examples

1. To create a new local RADIUS database, you must add at least one user. To create the database, type the following:
   raddbm -a ADD -u user01 -n

   Note: The -n option will overwrite the existing database, destroying the previous contents. The database file created will be named the default name as specified in the /etc/radius/radiusd.conf RADIUS configuration file.

2. To add a user to the database, type the following:
   raddbm -a ADD -u user01

   The default values of EAP_TYPE = “none” and PASSWORD_EXPIRATION = “0” are used.

3. To delete a user from the database, type the following:
   raddbm -a DELETE -u user01

4. To change a user's password, type the following:
   raddbm -a CHANGE -u user01 -p

   The command prompts for the new password.

5. To display a long listing of all entries in the default database, type the following:
   raddbm -a LIST -w

   Passwords are not displayed.

6. To display a particular user's database entry, type the following:
   raddbm -a LIST -u user01 -w

7. To add a list of users from a file, first create the file of users and passwords that has one entry per line and has the form:
   "userid" "password"

   Then type the following:
   raddbm -l Load_filename

Restrictions
The RADIUS daemon must be stopped before the raddbm command is run. Use the stopsrc -s radiusd command to stop the daemon. After you have modified the database, restart the daemon with the startsrc -s radiusd command.

Implementation Specifics
This command is part of the radius.base filesset.

Location
/usr/radius/bin/raddbm

Standard Input
For security reasons, when a user is added to the database, the user's password is read from standard input instead of from the command line.

Standard Error
If the call to the raddbm command fails, an information message is written to standard error.
Files

/usr/radius/bin/raddbm
/etc/radius/raddbm.bin
/etc/radius/radiusd.conf

Location of the raddbm command.
The default database file as specified in the radiusd.conf file.
Specifies the RADIUS configuration values, including the default database file name.

Related Information

Secure system installation and configuration in the Security.

ranlib Command

Purpose
Converts archive libraries to random libraries.

Syntax
ranlib [ -t ] [ -X {32|64|32_64}] Archive ...

Description
The ranlib command converts each Archive library to a random library. A random library is an archive library that contains a symbol table.

If given the -t option, the ranlib command only touches the archives and does not modify them. This is useful after copying an archive or using the -t option of the make command in order to avoid having the ld command display an error message about an out-of-date symbol table.

Flags
- t
  Touches the named archives without modifying them.
- X mode
  Specifies the type of object file ranlib should examine. The mode must be one of the following:
  32  Processes only 32-bit object files
  64  Processes only 64-bit object files
  32_64  Processes both 32-bit and 64-bit object files

The default is to process 32-bit object files (ignore 64-bit objects). The mode can also be set with the OBJECT_MODE environment variable. For example, OBJECT_MODE=64 causes ranlib to process any 64-bit objects and ignore 32-bit objects. The -X flag overrides the OBJECT_MODE variable.

Examples
To randomize the archive file genlib.a, enter:
ranlib genlib.a

Files

/usr/ccs/bin/ranlib

Contains the ranlib command.

Related Information

The Subroutines Overview in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.
The `ld` command, `ar` command, `lorder` command, and `make` command.

---

**raso Command**

**Purpose**
Manages Reliability, Availability, Serviceability parameters.

**Syntax**
raso 

- `[p]` | `[r]` | `[o]` Tunable `= Newvalue`

- `[p]` | `[r]` | `[d]` Tunable

- `[p]` | `[r]` | `-D`

- `[p]` | `[r]` | `-a`

- `h` [ Tunable ]

- `L` [ Tunable ]

- `x` [ Tunable ]

*Note:* Multiple `-o`, `-d`, `-x`, and `-L` flags can be specified.

**Description**

*Note:* The `raso` command requires root authority.

The `raso` command is used to configure Reliability, Availability, Serviceability tuning parameters. The `raso` command sets or displays the current or next-boot values for all RAS tuning parameters. The `raso` command can also be used to make permanent changes or to defer changes until the next reboot. The specified flag determines whether the `raso` command sets or displays a parameter. The `-o` flag can be used to display the current value of a parameter or to set a new value for a parameter.

**Understanding the Effect of Changing Tunable Parameters**

Misuse of the `raso` command can cause performance degradation or operating system failure. Before modifying any tunable parameter, you should first carefully read about all of the parameter's characteristics in the Tunable Parameters section in order to fully understand the parameter's purpose. You should then ensure that the Diagnosis and Tuning sections for this parameter actually apply to your situation and that changing the value of this parameter could help improve the performance of your system. If the Diagnosis and Tuning sections both contain only "N/A", it is recommended that you do not change the parameter unless you are specifically directed to do so by AIX development.

**Flags**

- `-a`

  Displays the current, reboot (when used in conjunction with the `-r` flag), or permanent (when used in conjunction with the `-p` flag) values for all tunable parameters, with one tunable parameter per line displayed in pairs as `Tunable = Value`. For the permanent option, a value is only displayed for a parameter if its reboot and current values are equal. Otherwise `NONE` is displayed as the value.
-d Tunable

 Resets Tunable to the default value. If Tunable needs to be changed (that is, it is currently not set to its default value) and is of type Bosboot or Reboot, or if it is of type Incremental and has been changed from its default value, and the -r flag is not used in combination, Tunable is not changed and a warning displays.

-D

 Resets all tunables to their default values. If any tunables that need to be changed are of type Bosboot or Reboot, or if any tunables that need to be changed are of type Incremental and have been changed from their default value, and -r is not used in combination, these tunables are not changed and a warning displays.

-h Tunable

 Displays help about the raso command if no Tunable parameter is specified. Displays help about the Tunable parameter if a Tunable parameter is specified.

-L Tunable

 Lists the characteristics of one or all tunables, with one tunable displayed per line using the following format:

```
NAME  | CUR | DEF | BOOT | MIN | MAX | UNIT | TYPE | DEPENDENCIES
mtrc_commonbufsize | 3974 | 3974 | 3974 | 1   | 5067 | 4KB pages | D |
mtrc_enabled | 1    | 1    | 1    | 0   | 1    | boolean | B |
mtrc_rarebufsize | 2649 | 2649 | 2649 | 1   | 3378 | 4KB pages | D |
```

Where:
- CUR = current value
- DEF = default value
- BOOT = boot value
- MIN = minimal value
- MAX = maximal value
- UNIT = tunable unit of measure
- TYPE = parameter type: D (for Dynamic), S (for Static), R (for Reboot), B (for Bosboot), M (for Mount), I (for Incremental) and C (for Connect)
- DEPENDENCIES = list of dependent tunable parameters, one per line

-o Tunable [ =Newvalue ]

 Displays the value or sets Tunable to Newvalue. If Tunable needs to be changed (the specified value is different than current value) and is of type Bosboot or Reboot, or if Tunable if it is of type Incremental and its current value is larger than the specified value, and if the -r flag is not used in combination, Tunable is not changed and a warning displays.

If the -r flag is used in combination without a new value, the nextboot value for Tunable is displayed. If the -p flag is used in combination without a new value, a value is displayed only if the current and next boot values for Tunable are the same. Otherwise, NONE is displayed as the value.

-p

 When the -p flag is used in combination with the -o, -d, or -D flag, changes apply to both the current and reboot values (in addition to the current value being updated, the /etc/tunables/nextboot file is updated). These combinations cannot be used on Reboot and Bosboot type parameters because the current values for these parameters cannot be changed.

When the -p flag is used with the -a or -o flag without specifying a new value, values are displayed only if the current and next boot values for a parameter are the same. Otherwise, NONE is displayed as the value.
When the `-r` flag is used in combination with the `-o`, `-d`, or `-D` flag, changes apply to reboot values (the `/etc/tunables/nextboot` file is updated). If any parameter of type Bosboot is changed, you are prompted to run the `bosboot` command.

When the `-r` flag is used with the `-a` or `-o` flag and a new value is not specified, the next boot values for tunables are displayed instead of the current values.

Lists the characteristics of one or all tunables, with one tunable displayed per line using the following format (spreadsheet format):

```
Tunable  Current  Default  Reboot  Minimum  Maximum  Unit  Type  Dependencies
```

where *Tunable* is the tunable parameter, *Current* is the current value of the tunable parameter, *Default* is the default value of the tunable parameter, *Reboot* is the reboot value of the tunable parameter, *Minimum* is the minimum value of the tunable parameter, *Maximum* is the maximum value of the tunable parameter, *Unit* is the tunable unit of measure, *Type* is the parameter type, and *Dependencies* is the list of dependent tunable parameters.

Any change (with the `-o`, `-d`, or `-D` flags) to a parameter of type Mount will display a warning message that the change is only effective for future mountings.

Any change (with the `-o`, `-d`, or `-D` flags) to a parameter of type Connect will result in `inetd` being restarted and a warning message that the change is only effective for future socket connections.

Any attempt to change (with the `-o`, `-d`, or `-D` flags) a parameter of type Bosboot or Reboot without specifying the `-r` flag displays an error message.

Any attempt to change (with the `-o`, `-d`, or `-D` flags, but without the `-r` flag) the current value of a parameter of type Incremental with a new value that is smaller than the current value displays an error message.

## Tunable Parameters

All the tunable parameters manipulated by the tuning commands (*no*, *nfso*, *vmo*, *ioo*, *schedo*, and *raso*) have been classified into these categories:

- **Dynamic**: If the parameter can be changed at any time
- **Static**: If the parameter can never be changed
- **Reboot**: If the parameter can only be changed during reboot
- **Bosboot**: If the parameter can only be changed by running bosboot and rebooting the machine
- **Mount**: If changes to the parameter are only effective for future file systems or directory mounts
- **Incremental**: If the parameter can only be incremented, except at boot time
- **Connect**: If changes to the parameter are only effective for future socket connections

For parameters of type Bosboot, whenever a change is performed, the tuning commands automatically prompt the user to ask if they want to execute the `bosboot` command. For parameters of type Connect, the tuning commands automatically restart the `inetd` daemon.
Note that the current set of parameters managed by the `schedo` command only includes Dynamic and Reboot types.

**Compatibility Mode**

When running in pre 5.2 compatibility mode (controlled by the `pre520tune` attribute of `sys0`, see [NFS tuning on the client](#) in the Performance management), reboot values for parameters, except those of type *Bosboot*, are not really meaningful because in this mode they are not applied at boot time.

In pre 5.2 compatibility mode, setting reboot values to tuning parameters continues to be achieved by imbedding calls to tuning commands in scripts called during the boot sequence. Parameters of type *Reboot* can therefore be set without the `-r` flag, so that existing scripts continue to work.

This mode is automatically turned ON when a machine is MIGRATED to AIX 5.2. For complete installations, it is turned OFF and the reboot values for parameters are set by applying the content of the `/etc/tunables/nextboot` file during the reboot sequence. Only in that mode are the `-r` and `-p` flags fully functional. See [Kernel Tuning](#) in the AIX 5L Version 5.3 Performance Tools Guide and Reference for more information.

**Tunable Parameters**

**kern_heap_noexec**

**Purpose:**
Specifies whether no-execute protection should be enabled for the kernel heap. With protection enabled, any attempt to execute code in the kernel heap results in a kernel exception.

**Values:**
Default: 0
Range: 0 or 1
Type: *Bosboot*

**Diagnosis:**
N/A

**Tuning:**
This tunable is only supported on a 64-bit kernel and POWER4 or later hardware.

**kernel_noexec**

**Purpose:**
Specifies whether no-execute protection should be enabled for kernel data regions. With protection enabled, any attempt to execute code in the protected regions results in a kernel exception.

**Values:**
Default: 1
Range: 0 or 1
Type: *Bosboot*

**Diagnosis:**
N/A

**Tuning:**
This tunable is only supported on a 64-bit kernel and POWER4 or later hardware.
mbuf_heap_noexec

**Purpose:**
Specifies whether no-execute protection should be enabled for the mbuf heap. With protection enabled, any attempt to execute code in the mbuf heap results in a kernel exception.

**Values:**
- Default: 0
- Range: 0 or 1
- Type: Bosboot

**Diagnosis:**
N/A

**Tuning:**
This tunable is only supported on a 64-bit kernel and POWER4 or later hardware.

mtrc_enabled

**Purpose:**
Defines the Lightweight Memory Trace (LMT) state.

**Values:**
- Default: 1
- Range: 0 or 1
- Type: Bosboot

**Diagnosis:**
N/A

**Tuning:**
Value of 1 means LMT is enabled.

mtrc_commonbuFSIZE

**Purpose:**
Specifies the memory trace buffer size for common events of Lightweight Memory Trace (LMT), which provides system trace information for First Failure Data Capture (FFDC). Recorded events are saved in system dump and/or reported through user commands.

**Values:**
- Default: Value based on data generation under a reference system-wide activity and hardware and system characteristics.
- Range: 1 (unit of 4KB pagesize) up to a value based on hardware and system characteristics.
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning:**
User-controlled dynamic buffer size changes are supported only on a 64-bit kernel.
mtc_rarebufsize

**Purpose:**
Specifies the memory trace buffer size for rare events of Lightweight Memory Trace (LMT), which provides system trace information for First Failure Data Capture (FFDC). Recorded events are saved in system dump and/or reported through user commands.

**Values:**
- Default: Value based on data generation under a reference system-wide activity and hardware and system characteristics.
- Range: 1 (unit of 4KB pagesize) up to a value based on hardware and system characteristics.
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning:**
User-controlled dynamic buffer size changes are supported only on a 64-bit kernel.

---

tprof_cyc_mult

**Purpose:**
Specifies the Performance Monitor PM_CYC and software event sampling frequency multiplier as a means to control the trace sampling frequency.

**Values:**
- Default: 1
- Range: 1 to 100
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning:**
N/A

---

tprof_evt_mult

**Purpose:**
Specifies the Performance Monitor PM_* event sampling frequency multiplier as a means to control the trace sampling frequency.

**Values:**
- Default: 1
- Range: 1 to 10000
- Type: Dynamic

**Diagnosis:**
N/A

**Tuning:**
N/A
tprof_inst_threshold

**Purpose:**
Specifies the minimum number of completed instructions between Performance Monitor event samples as a means to control the trace sampling frequency.

**Values:**
- Default: 1000
- Range: 1 to 2G-1
- Type: Dynamic

**Diagnosis**
N/A

**Tuning**
N/A

**Examples**
1. To list the current and reboot value, range, unit, type, and dependencies of all tunable parameters managed by the raso command, type the following:
   
   raso -L

2. To turn off the Lightweight Memory Trace, type the following:
   
   raso -r -o mtrace_enabled=0

3. To display help for mtrc_commonbufsize, type the following:
   
   raso -h mtrc_commonbufsize

4. To set tprof_inst_threshold to 10000 after the next reboot, type the following:
   
   raso -r -o tprof_inst_threshold=10000

5. To permanently reset all raso tunable parameters to their default values, type the following:
   
   raso -p -D

6. To list the reboot level for all Virtual Memory Manager tuning parameters, type the following:
   
   raso -r -a

7. To list (in spreadsheet format) the current and reboot value, range, unit, type, and dependencies of all tunable parameters managed by the raso command, type the following:
   
   raso -x

**Related Information**

"Use of the tprof program to analyze programs for CPU use" in the *AIX 5L Version 5.3 Performance Tools Guide and Reference.*

---

**ras_logger Command**

**Purpose**
Log an error using the errors template.

**Syntax**

```
/usr/lib/ras/ras_logger [-y template-file]
```
Description
The `ras_logger` command logs one error, provided in standard input, using the error’s template to determine how to log the data. The format of the input is the following:

```markdown
error_label
resource_name
64_bit_flag
detail_data_item1
detail_data_item2
...
```

The `error_label` field is the error’s label defined in the template. The `resource_name` field is up to 16 characters in length. The `64_bit_flag` field’s values are 0 for a 32-bit error and 1 for a 64-bit error. The `detail_data` fields correspond to the `Detail_Data` items in the template.

Flags

- **-y template-file**
  Specifies a template file other than the `/var/adm/ras/errtmplt` default file.

Examples

1. Log an error. The template is the following:

   ```
   + FOO:
     Catname = "foo.cat"
     Err_Type = TEMP
     Class = 0
     Report = TRUE
     Log = TRUE
     Alert = FALSE
     Err_Desc = {1, 1, "Error FOO"}
     Prob_Causes = {1, 2, "Just a test"}
     User_Causes = {1, 2, "Just a test"}
     User_Actions = {1, 3, "Do nothing"}
     Detail_Data = 4, [2, 1, "decimal"], DEC
     Detail_Data = W, [2, 1, "hex data"], HEX
     Detail_Data = 100, [2, 1, "long string"], ALPHA
   ```

   The `ras_logger` input in the `tfile` file appears as follows:

   ```
   FOO
   resource
   0
   15
   A0
   hello world
   ```

   Run the `/usr/lib/ras/ras_logger <tfile` command. This will log the FOO error with `resource` as the resource name. The detail data will consist of 4 bytes set to decimal 15, 4 bytes of hex data set to 0xa0, and the string “hello world”. Note that if the value of the 64-bit flag was 1, the hexadecimal data would be 8 bytes set to 0xa0.

2. Multi-item decimal values. The template is the following:

   ```
   + FOO:
     Catname = "foo.cat"
     Err_Type = TEMP
     Class = 0
     Report = TRUE
     Log = TRUE
     Alert = FALSE
     Err_Desc = {1, 1, "Error FOO"}
     Prob_Causes = {1, 2, "Just a test"}
     User_Causes = {1, 2, "Just a test"}
   ```
User_Actions = {1, 3, "Do nothing"}
Detail_Data = 8, {2, 1, "decimal"}, DEC
Detail_Data = W, {2, 1, "hex data"}, HEX
Detail_Data = 100, {2, 1, "long string"}, ALPHA

The ras_logger command inputs the following into the tfile file:

F00
resource 0
15 -15
A0
hello world

Note: The decimal data is normally shown by the errpt command as two separate values using 4 bytes each. The input therefore contains 15 and -15. This is how it is shown by the errpt command.

Related Information
The errpt and errlogger commands.

---

rc Command

Purpose
Performs normal startup initialization.

Syntax
rc

Description
The rc command has an entry in the /etc/inittab file. The init command creates a process for the rc command entry in the /etc/inittab file. The rc command performs normal startup initialization for the system. The contents of /etc/rc are installation specific. If all of the necessary operations complete successfully, the file exits with a zero return code that allows the init command to start loggers to complete normal initialization and startup.

Notes:
1. Many bringup functions such as activating page spaces and mounting filesystems are done by the rc command.
2. The root file system is implicitly mounted.

Related Information
The fsck command, init command, mount command.

---

rc.mobip6 Command

Purpose
Enables the system to function as a mobile IPv6 home agent or correspondent node.

Syntax
rc.mobip6 { start [-H] [-S] | stop [-N] [-F] }
Description
The /etc/rc.mobip6 file is a shell script that, when executed, enables the system to function as a mobile IPv6 home agent or correspondent node. If mobile IPv6 has been configured using system management to start at each system restart, the script will be executed automatically at restart.

Flags
-F  Disables IPv6 forwarding.
-H  Enables the system as a Mobile IPv6 home agent and correspondent node. If this flag is not used, the system will be enabled as a correspondent node only.
-N  Stops the ndpd-router daemon.
-S  Enables checking of IP security authentication.

Exit Status
0    The command completed successfully.
>0   An error occurred.

Security
You must have root authority or be a member of the system group to execute this command.

Examples
1. The following example enables the system as a mobile IPv6 home agent and correspondent node:
   /etc/rc.mobip6 start -H
2. The following example enables the system as a mobile IPv6 correspondent node and enables IP security checking:
   /etc/rc.mobip6 start -S
3. The following example disables all mobile IPv6 and IPv6 gateway functionality on the system:
   /etc/rc.mobip6 stop -N -F
4. The following example disables all mobile IPv6 functionality but allows the system to continue functioning as an IPv6 gateway:
   /etc/rc.mobip6 stop

Files
/etc/rc.mobip6  Contains the rc.mobip6 command.

Related Information
The kmodctrl command, mobip6reqd command, mobip6ctrl command, ndpd-router command.

The Mobile IPv6 in Networks and communication management.

rc.powerfail Command
Purpose
Handles RPA (RS/6000® Platform Architecture) specific EPOW (Environmental and POwer Warning) events and shuts down the system if needed, as part of EPOW event handling.
Syntax

```
rc.powerfail [ -h ] | [ [ -s ] | [ -t [ mm ] ] [ -c [ ss ] ] ]
```

Description

The `rc.powerfail` command is started by the `/etc/inittab` file when `init` receives a SIGPWR signal from the kernel. The `rc.powerfail` command uses `ioctl()` to determine the state of the system. The `rc.powerfail` command should be called only when an EPOW event has occurred.

The various EPOW events handled by `rc.powerfail` and the corresponding event handling done by `rc.powerfail` are listed in the following table:

<table>
<thead>
<tr>
<th>EPOW class</th>
<th>Event handling done by <code>rc.powerfail</code></th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><code>rc.powerfail</code> warns the users currently logged onto the system through a <code>cron</code> entry which will be walled every 12 hours until the situation disappears.</td>
<td>Redundant Fan Faults. Internal Thermal Problems.</td>
</tr>
<tr>
<td>2</td>
<td><code>rc.powerfail</code> warns the users currently logged onto the system through a <code>cron</code> entry which will be walled every 12 hours until the situation disappears.</td>
<td>Redundant AC input fault.</td>
</tr>
<tr>
<td>3</td>
<td><code>rc.powerfail</code> initiates the system shutdown in 10 minutes unless the user has specified some other wait time through the <code>-t</code> option.</td>
<td>Ambient temperature approaching specification limit.</td>
</tr>
<tr>
<td>4</td>
<td><code>rc.powerfail</code> is expected to process this event in 20 seconds. In these cases, <code>rc.powerfail</code> warns the users currently logged onto the system and then immediately halts the system.</td>
<td>Loss of AC input: All the power sources have lost power.</td>
</tr>
<tr>
<td>5, 7</td>
<td>Since they should be handled in micro seconds, <code>rc.powerfail</code> will not be handling these events. If <code>rc.powerfail</code> gets control in these conditions, it will continue to wait out the wait time period.</td>
<td>All the fan systems have failed, non redundant power fault.</td>
</tr>
</tbody>
</table>

As previously mentioned, in case of EPOW class 3 events, the `rc.powerfail` command is given approximately 10 minutes prior to shutting down the system. The user can alter this time by using the `-t` option on the `/etc/inittab` file’s powerfail entry. Prior to the last 60 seconds, any users still logged-on are sent a message telling them how much time remains until shutdown. If, at any time in the last 60 seconds, the event clears, the system shutdown halts and the users are notified that all errors have cleared. If a shutdown is not desired, the user may add the `-s` option to the command in the `/etc/inittab` file.

Also in case of EPOW class 3 events, `rc.powerfail` will allow executing environment-specific scripts (if any) to be executed before system shutdown. These scripts will be located under `/usr/lib/epow/scripts`, and `rc.powerfail` will wait for 10 seconds, by default, for their completion. This wait time can be altered using the `-c` option. The value provided through the `-c` option will be taken as the wait time for these scripts, in seconds.

Flags

- **-h**
  - Gives an information message containing the power status codes and the resulting action.

- **-s**
  - Does not do a system shutdown if there is a power failure in systems with either a battery backup or fan fault. The logged-on users still receive all the appropriate messages, but the actual system shutdown is left up to the system administrator. This flag has no effect if a critical power failure is detected.
-t mm  Gives the number of whole minutes until system shutdown in the case of a primary power loss with battery backup or fan fault. This number should be equal to half the length of time guaranteed by the battery backup. This flag has no effect if a critical power failure is detected.

-c ss  Gives the number of seconds to wait for the completion of any environment specify third party scripts to be executed by rc.powerfail, at EPOW 3 situations.

Exit Status
If the system shuts down, no exit value is returned. Otherwise, the `rc.powerfail` command returns the following exit values:

<table>
<thead>
<tr>
<th>Exit Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Normal condition.</td>
</tr>
<tr>
<td>1</td>
<td>Syntax error.</td>
</tr>
<tr>
<td>2</td>
<td><code>halt -q</code> failed</td>
</tr>
<tr>
<td>3</td>
<td><code>shutdown -F</code> failed.</td>
</tr>
<tr>
<td>4</td>
<td>An error has occurred. Shut your system down immediately using <code>shutdown -F</code>.</td>
</tr>
<tr>
<td>5</td>
<td>An undefined state. Call your Service Representative.</td>
</tr>
</tbody>
</table>

Security
Access Control: root only.

Examples
1. To look at the cause of a power status equal to 3, enter:
   ```
   rc.powerfail -h
   ```

2. To block system shutdown when non-critical power failures or fan faults occur, enter:
   ```
   chitab "powerfail::powerfail:/etc/rc.powerfail -s >dev/console 2>&1"
   ```
   The next SIGPWR received by `init` will not cause a system shutdown if a non-critical power failure occurs.

3. To change the time until shutdown to 30 minutes, enter:
   ```
   chitab "powerfail::powerfail:/etc/rc.powerfail -t 30 >/dev/console 2>&1"
   ```
   Assuming the condition is not critical, the next SIGPWR received by `init` will have a 30 minute delay until system shutdown.

Files
/etc/inittab  Controls the initialization process.

Related Information
The `machstat` command, `init` command, `chitab` command, `halt` command, `shutdown` command.

rcp Command

Purpose
Transfers files between a local and a remote host or between two remote hosts.
Syntax

```
rcp [ -p ] [ -F ] [ -k realm ] [ { User@Host:File | Host:File | File } { User@Host:File | Host:File | File | User@Host:Directory | Host:Directory | Directory } ] [ -r ] { User@Host:Directory | Host:Directory | Directory } }
```

Description

The `/usr/bin/rcp` command is used to copy one or more files between the local host and a remote host, between two remote hosts, or between files at the same remote host.

Remote destination files and directories require a specified `Host:` parameter. If a remote host name is not specified for either the source or the destination, the `rcp` command is equivalent to the `cp` command. Local file and directory names do not require a `Host:` parameter.

**Note:** The `rcp` command assumes that a : (colon) terminates a host name. When you want to use a : in a filename, use a / (slash) in front of the filename or use the full path name, including the /.

If a `Host` is not prefixed by a `User@` parameter, the local user name is used at the remote host. If a `User@` parameter is entered, that name is used.

If the path for a file or directory on a remote host is not specified or is not fully qualified, the path is interpreted as beginning at the home directory for the remote user account. Additionally, any metacharacters that must be interpreted at a remote host must be quoted using a \ (backslash), a " (double quotation mark), or a ' (single quotation mark).

File Permissions and Ownership

By default, the permissions mode and ownership of an existing destination file are preserved. Usually, if a destination file does not exist, the permissions mode of the destination file is equal to the permissions mode of the source file as modified by the `umask` command (a special command in the Korn shell) at the destination host. If the `rcp` command `-p` flag is set, the modification time and mode of source files are preserved at the destination host.

The user name entered for the remote host determines the file access privileges the `rcp` command uses at that host. Additionally, the user name given to a destination host determines the ownership and access modes of the resulting destination file or files.

Using Standard Authentication

The remote host allows access if one of the following conditions is satisfied:

- The local host is included in the remote host `/etc/hosts.equiv` file and the remote user is not the root user.
- The local host and user name is included in a `SHOME/.rhosts` file on the remote user account.

Although you can set any permissions for the `SHOME/.rhosts` file, it is recommended that the permissions of the `.rhosts` file be set to 600 (read and write by owner only).

In addition to the preceding conditions, the `rcp` command also allows access to the remote host if the remote user account does not have a password defined. However, for security reasons, the use of a password on all user accounts is recommended.

For Kerberos 5 Authentication

The remote host allows access only if all of the following conditions are satisfied:

- The local user has current DCE credentials.
- The local and remote systems are configured for Kerberos 5 authentication (On some remote systems, this may not be necessary. It is necessary that a daemon is listening to the klogin port).
The remote system accepts the DCE credentials as sufficient for access to the remote account. See the `kvalid_user` function for additional information.

**rcp and Named Pipelines**

Do not use the `rcp` command to copy named pipelines, or FIFOs, (special files created with the `mknod -p` command). The `rcp` command uses the `open` subroutine on the files that it copies, and this subroutine blocks on blocking devices like a FIFO pipe.

**Restrictions**

The SP™ Kerberos V4 rcp execution path does not support remote-to-remote copy as Kerberos does not support forwarding credentials. The message you would receive under these circumstances is the message indicating you do not have tickets and must use `kinit` to login. The message would be issued from the remote source machine. Please see the example below for using Kerberos to perform a remote-to-remote copy.

**Flags**

- `-p` Preserves the modification times and modes of the source files in the copies sent to the destination only if the user has root authority or is the owner of the destination. Without this flag, the `umask` command at the destination modifies the mode of the destination file, and the modification time of the destination file is set to the time the file is received.

  When this flag is not used, the umask being honored is the value stored in the appropriate database. It is not the value that is set by issuing the `umask` command. The permission and ownership values that result from the `umask` command do not affect those stored in the database.

- `-r` Recursively copies, for directories only, each file and subdirectory in the source directory into the destination directory.

- `-F` Causes the credentials to be forwarded. In addition, the credentials on the remote system will be marked forwardable (allowing them to be passed to another remote system). This flag will be ignored if Kerberos 5 is not the current authentication method. Authentication will fail if the current DCE credentials are not marked forwardable.

- `-k realm` Allows the user to specify the realm of the remote station if it is different from the local systems realm. For these purposes, a realm is synonymous with a DCE cell. This flag will be ignored if Kerberos 5 is not the current authentication method.

**Security**

The remote host allows access only if at least one of the following conditions is satisfied:

- The local user ID is listed as a principal in the authentication database and had performed a `kinit` to obtain an authentication ticket.

- If a `HOME/.klogin` file exists, it must be located in the local user’s `HOME` directory on the target system. The local user must be listed as well as any users or services allowed to `rsh` into this account. This file performs a similar function to a local `.rhosts` file. Each line in this file should contain a principal in the form of “principal.instance@realm.” If the originating user is authenticated as one of the principals named in `.klogin`, access is granted to the account. The owner of the account is granted access if there is no `.klogin` file.

For security reasons, any `HOME/.klogin` file must be owned by the remote user and only the AIX owner ID should have read and write access (permissions = 600) to `.klogin`. 
Parameters

**Host**: Specifies the host name (**Host**) and file name (**File**) of the remote destination file, separated by a : (colon).

**Note:** Because the rcp command assumes that a : (colon) terminates a host name, you must insert a \ (backslash) before any colons that are embedded in the local file and directory names.

**User@Host**: Specifies the user name (**User**) that the rcp command uses to set ownership of the transferred file, the host name (**Host**), and file name (**File**) of the remote destination file. The user name entered for the remote host determines the file access privileges the rcp command uses at that host.

**File**: Specifies the file name of the local destination file.

**Host**: Specifies the host name (**Host**) and directory name (**Directory**) of the remote destination directory.

**Note:** Because the rcp command assumes that a : (colon) terminates a host name, you must insert a \ (backslash) before any colons that are embedded in the local file and directory names.

**User@Host**: Specifies the user name (**User**) the rcp command uses to set ownership of the transferred file, the host name (**Host**), and directory name (**Directory**) of the remote destination directory. The user name entered for the remote host determines the file access privileges the rcp command uses at that host.

**Directory**: The directory name of the local destination directory.

Exit Status

This command returns the following exit values:

0 Successful completion.

>0 An error occurred.

Examples

In the following examples, the local host is listed in the `/etc/hosts.equiv` file at the remote host.

1. To copy a local file to a remote host, enter:
   
   ```
   rcp localfile host2:/home/eng/jane
   ```
   
   The file `localfile` from the local host is copied to the remote host `host2`.

2. To copy a remote file from one remote host to another remote host, enter:
   
   ```
   rcp host1:/home/eng/jane/newplan host2:/home/eng/mary
   ```
   
   The file `/home/eng/jane/newplan` is copied from remote host `host1` to remote host `host2`.

3. To send the directory subtree from the local host to a remote host and preserve the modification times and modes, enter:
   
   ```
   rcp -p -r report jane@host2:report
   ```
   
   The directory subtree `report` is copied from the local host to the home directory of user `jane` at remote host `host2` and all modes and modification times are preserved. The remote file `/home/jane/.rhosts` includes an entry specifying the local host and user name.

4. This example shows how the root user can issue an rcp on a remote host when the authentication is Kerberos 4 on both the target and server. The root user must be in the authentication database and must have already issued `kinit` on the local host. The command is issued at the local host to copy the file, stuff, from node r05n07 to node r05n05 on an SP.
The root user sets the KRBTKTFILE environment variable to the name of a temporary ticket-cache file and then obtains a service ticket by issuing the `rcmdtgt` command. The `rcp` uses the service ticket to authenticate from host r05n07 to host r05n05.

**Files**

$HOME/.klogin
Specifies remote users that can use a local user account.

/usr/lpp/ssp/rcmd/bin/rcp
Link to AIX Secure /usr/bin/rsh that calls the SP Kerberos 4 `rcp` routine if applicable.

**Prerequisite Information**

Refer to the chapter on security in IBM Parallel System Support Programs for AIX: Administration Guide for an overview. You can access this publication at the following Web site: http://www.rs6000.ibm.com/resource/aix_resource

Refer to the "RS/6000 SP Files and Other Technical Information" section of IBM Parallel System Support Programs for AIX: Command and Technical Reference for additional Kerberos information. You can access this publication at the following Web site: http://www.rs6000.ibm.com/resource/aix_resource

**Related Information**

The `cp` command, `ftp` command, `rlogin` command, `rsh` command, `telnet` command, `tftp` command, `umask` command.

SP Commands: `k4init`, `k4list`, `k4destroy`, `lsauthpar`, `chauthpar`, `Kerberos`

Environment variable: KRBTKTFILE

The `rshd` and `krshd` daemon.

The `kvalid_user` function.

The `.rhosts` file format, `hosts.equiv` file format.

Communications and networks in *Networks and communication management*.

Authentication and the secure `rcmds` in *Networks and communication management*.

**rcvdist Command**

**Purpose**

Sends a copy of incoming messages to additional recipients.

**Syntax**

`rcvdist [-form] File ] User ...`
Description

The `rcvdist` command forwards copies of incoming messages to users in addition to the original recipient. The `rcvdist` command is not started by a user. The `rcvdist` command is placed in the `.maildelivery` file called by the `/usr/lib/mh/lslocal` command.

The `rcvdist` command sends a copy of an incoming message to the user or users specified by the `User` parameter. The default string is located in the `rcvdistcomps` file. This file formats the output from the command and sends it through the `send` command to the ID or alias specified.

You can copy the `rcvdistcomps` file into your local mail directory and change the string to suit your needs. The Message Handler (MH) package uses the `rcvdistcomps` file in your local mail directory first. Otherwise, you can use the `-form` flag to specify a file name that contains the string you want.

Flags

- `-form File` Specifies the file that formats the command output. The default is the `rcvdistcomps` file.
- `-help` Lists the command syntax, available switches (toggles), and version information.

Note: For MH, the name of this flag must be fully spelled out.

Files

$HOME/.maildelivery Provides the user with MH instructions for local mail delivery.
$HOME/.forward Provides the user with the default message filter.

Related Information

The `all`, `rcvpack`, `rcvstore`, `rcvty`, `sendmail`, and `slocal` command.

The `.mh_alias` file format.

Mail applications in Networks and communication management.

rcvpack Command

Purpose

Saves incoming messages in a packed file.

Syntax

rcvpack [ File ]

Description

The `rcvpack` command places incoming messages in the packed file specified by the `File` parameter. The `rcvpack` command is not started by the user. The `rcvpack` command is placed in the $HOME/.maildelivery file called by the `/usr/lib/mh/lslocal` command.

The `rcvpack` command appends a copy of the incoming message to the specified file and runs the `packf` command on the file. Specifying the `rcvpack` command in the `.maildelivery` file runs the `rcvpack` command on all incoming messages.
Flags

- **-help** Lists the command syntax, available switches (toggles), and version information.

  **Note:** For MH, the name of this flag must be fully spelled out.

Files

- `$HOME/.maildelivery` Provides the user with MH instructions for local mail delivery.
- `$HOME/.forward` Provides the user with the default message filter.

Related Information

- The **inc** command, **pack** command, **rcvdist** command, **rcvstore** command, **rcvtty** command, **sendmail** command.

  The **.mh_alias** file format.

  Mail applications in *Networks and communication management*.

rcvstore Command

Purpose

Incorporates new mail from standard input into a folder.

Syntax

```
rcvstore [ +Folder ] [ -create | -nocreate ] [ -sequence Name ] [ -public | -nopublic ] [ -zero | -nozero ]
```

Description

The **rcvstore** command adds incoming messages to a specified message directory (a folder). The **rcvstore** command is not started by the user. The **rcvstore** command is placed in the `$HOME/.maildelivery` file called by the `/usr/lib/mh/slocal` command.

The **rcvstore** command accepts messages from standard input and places them in a specified folder. Run the **rcvstore** command on all incoming messages by specifying the **rcvstore** command in the `.maildelivery` file.

You can specify **rcvstore** command flags in the `$HOME/.maildelivery` file or, as with most MH commands, in the `$HOME/.mh_profile` file.

Flags

- **-create** Creates the specified folder in your mail directory if the folder does not exist. This flag is the default.
- **+Folder** Places the incorporated messages in the specified folder. The default is +inbox.
- **-help** Lists the command syntax, available switches (toggles), and version information.

  **Note:** For MH, the name of this flag must be fully spelled out.

- **-nocreate** Does not create the specified folder if the folder does not exist.
- **-nopublic** Restricts the specified sequence of messages to your usage. The **-nopublic** flag does not restrict the messages in the sequence, only the sequence. This flag is the default if the folder is write-protected against other users.
-nozero

-Appends the messages incorporated by the rcvstore command to the specified sequence of messages. This flag is the default.

-public

-Makes the specified sequence of messages available to other users. The -public flag does not make protected messages available, only the sequence. This flag is the default if the folder is not write-protected against other users.

-sequence Name

-Adds the incorporated messages to the sequence of messages specified by the Name parameter.

-zero

-Clears the specified sequence of messages before placing the incorporated messages into the sequence. This flag is the default.

Profile Entries

Folder-Protect:
Sets the protection level for your new folder directories.

Msg-Protect:
Sets the protection level for your new message files.

Path:
Specifies the UserMHDirectory (the user's MH directory) variable.

Unseen-Sequence:
Specifies the sequences of commands used to keep track of your unseen messages.

Rcvstore:
Specifies flags for the rcvstore program.

Files

$HOME/.mh_profile
Contains the MH user profile.

$HOME/.maildelivery
Provides the user with MH instructions for local mail delivery.

$HOME/.forward
Provides the user with the default message filter.

Related Information

The inc command, rcvdist command, rcvpack command, rcvttty command, sendmail command, slocal command.

The .mh_alias File Format.

Mail applications in Networks and communication management.

rcvttty Command

Purpose

Notifies the user of incoming messages.

Syntax

rcvttty [ Command ]

Description

The rcvttty command sends the user a message that incoming mail has arrived. The rcvttty command is not started by the user. The rcvttty command is placed in the /maildelivery file called by the /usr/lib/mh/slocal file.

The rcvttty command sends a one-line scan listing to your terminal. If you specify a command in the Command parameter, the rcvttty command executes that command using the incoming message as the standard input and sending the output to the terminal. For the rcvttty command to write output to your terminal, the write permissions for your terminal must be set to all.
Run the **rcvtt** command on all incoming messages by specifying **rcvtt** in the `.maildelivery` file.

### Flags

- **-help**  
  Lists the command syntax, available switches (toggles), and version information.

**Note:** For MH, the name of this flag must be fully spelled out.

### Files

- **$HOME/.maildelivery**  
  Provides the user with instructions for local mail delivery.

- **$HOME/.forward**  
  Provides the user with the default message filter.

- **$HOME/.mh_profile**  
  Contains the MH user profile.

### Related Information

- The **rcvdist** command, **rcvpack** command, **rcvstore** command, **sendmail** command, **slocal** command.

- The **.mh_alias** file format.

- Mail applications in *Networks and communication management*.

### rdist Command

This document describes the old AIX **rdist** command located in the `/usr/bin/rdist` file as well as the new `/usr/sbin/rdist` command which is used with the new **rdisd** daemon.

#### /usr/bin/rdist Command

**Purpose**

Remote file distribution client program.

**Syntax**

To Use a Distribution File

```bash
rdist [ -n ] [ -q ] [ -b ] [ -D ] [ -R ] [ -h ] [ -i ] [ -v ] [ -w ] [ -y ] [ f FileName ] [ -d Argument=Value ] [ -m Host ] ... [ Name ] ...
```

To Interpret Arguments as a Small Distribution File

```bash
rdist [ -n ] [ -q ] [ -b ] [ -D ] [ -R ] [ -h ] [ -i ] [ -v ] [ -w ] [ -y ] [-c Name ... [ Login@ ] Host [ :Destination ]
```

**Description**

**Attention:** Do not attempt to use the **rdist** command to send a file larger than 2 Gigabytes in size to a pre-AIX 4.2 or non-AIX machine. Doing so will result in undefined behaviors and, in rare cases, the loss of data.

The **rdist** command maintains identical copies of files on multiple hosts. The **rdist** command preserves the owner, group, mode, and modified time of files, if possible, and can update programs that are running. The **rdist** command can receive direction from the following sources:

- The default **distribution file** **distfile** file in your `$HOME` directory.
- A different distribution file, specified by the `-f` flag.
• Command-line arguments that augment or override variable definitions in the distribution file.

• Command-line arguments that serve as a small distribution file.

If you do not use the -f flag, the rdist command looks for the distfile file in your $HOME directory. If it doesn't find a distfile file, it looks for Distfile file.

The value specified by the Name parameter is read as the name of a file to be updated or a subcommand to execute. If you do not specify a value for the Name parameter on the command line, the rdist command updates all the files and directories listed in the distribution file. If you specify - (minus sign) for the Name parameter, the rdist command uses standard input. If the name of a file specified by the Name parameter is the same as the name of a subcommand, the rdist command interprets the Name parameter as a subcommand.

The rdist command requires that a .rhosts file be configured on each host. See ".rhosts File Format for TCP/IP" in AIX 5L Version 5.3 Files Reference for details.

Notes:

1. If the rdist command is not present in the /usr/bin/rdist directory on a remote machine, create a link from the /usr/bin/rdist directory to the actual location of the rdist command. This location is usually the /usr/ucb/rdist directory.

2. Currently, the rdist command can handle only 7-bit ASCII file names.

Flags

-b Performs a binary comparison and updates files if they differ.

-c Directs the rdist command to interpret the remaining arguments as a small distribution file. Available arguments are:

Name Specifies single name or list of names separated by blanks. The value can be either a file or a subcommand.

[Login@]Host Specifies the machine to be updated and, optionally, the login name to be notified of the update.

Destination Specifies a file on the remote machine if a single name is specified in the Name argument; specifies a directory if more than one name is specified.

Note: Do not use the -c flag with the -f, -d, or -m flag.

-d Argument=Value Defines the Argument variable as having the value specified by the Value variable. The -d flag defines or overrides variable definitions in the distfile file. The Value variable can be specified as an empty string, one name, or a list of names surrounded by parentheses and separated by tabs or spaces.

-D Turns on the debugging output.

-f File Name Specifies the name of the distribution file. If you do not use the -f flag, the default value is the distfile or Distfile file in your $HOME directory.

-h Copies the file that the link points to rather than the link itself.

-i Ignores unresolved links. The rdist command maintains the link structure of files being transferred and warns users if it cannot find all the links.

-m Host Limits which machines are to be updated. You can use the -m Host option multiple times to limit updates to a subset of the hosts listed in the distfile file.

-n Prints the subcommands without executing them. Use the -n flag to debug the distfile file.

-q Operates in quiet mode. The -q option suppresses printing of modified files on standard output.
-R Removes extraneous files. If a directory is being updated, any files that exist on the remote host but not in the master directory are removed. Use the -R flag to maintain identical copies of directories.

-v Verifies that the files are up-to-date on all hosts; files that are out-of-date are then displayed. However, the rdist -v command neither changes files nor sends mail. This flag overrides the -b flag when they are used together.

-w Appends the entire path name of the file to the destination directory name. Normally, the rdist command uses only the last component of a name for renaming files, preserving the directory structure of the copied files. When the -w flag is used with a file name that begins with a ~ (tilde), everything except the home directory is appended to the destination name. File names that do not begin with a / (slash) or a ~ (tilde) use the destination user’s home directory as the root directory for the rest of the file name.

-y Prevents recent copies of files from being replaced by files that are not as recent. Files are normally updated when their time stamp and size differ. The -y flag prevents the rdist command from updating files more recent than the master file.

Distribution File (distfile File)
The distribution file specifies the files to copy, destination hosts for distribution, and operations to perform when updating files to be distributed with the rdist command. Normally, the rdist command uses the distfile file in your $HOME directory. You can specify a different file if you use the -f flag.

Entry Formats
Each entry in the distribution file has one of the following formats:

VariableName = NameList
Defines variables used in other entries of the distribution file (SourceList, DestinationList, or SubcommandList).

[Label:] SourceList -> DestinationList SubcommandList
Directs the rdist command to distribute files named in the SourceList variable to hosts named in the DestinationList variable. Distribution file commands perform additional functions.

[Label:] SourceList :: TimeStampFile SubcommandList
Directs the rdist command to update files that have changed since a given date. Distribution file subcommands perform additional functions. Each file specified with the SourceList variable is updated if the file is newer than the time-stamp file. This format is useful for restoring files.

Labels are optional and used to identify a subcommand for partial updates.

Entries

VariableName
Identifies the variable used in the distribution file.

NameList
Specifies a list of files and directories, hosts, or subcommands.

SourceList
Specifies files and directories on the local host for the rdist command to use as the master copy for distribution.

DestinationList
Indicates hosts to receive copies of the files.

SubcommandList
Lists distribution file subcommands to be executed.

The rdist command treats new-line characters, tabs, and blanks as separators. Distribution file variables for expansion begin with a $ (dollar sign) followed by a single character or a name enclosed in {} (braces). Comments begin with a # (pound sign) and end with a new-line character.
Source and Destination List Format

The distribution file source and destination lists comprise zero or more names separated by blanks, as shown in the following format:

\[Name1\] [Name2] [Name3] ...

The `rdist` command recognizes and expands the following shell metacharacters on the local host in the same way as for the `csh` command.

- [ (left bracket)
- ] (right bracket)
- { (left brace)
- } (right brace)
- ( (left parenthesis)
- ) (right parenthesis)
- * (asterisk)
- ? (question mark)

To prevent these characters from being expanded, precede them with a \ (backslash). The `rdist` command also expands the – (tilde) in the same way as for the `csh` command, but does so separately on the local and destination hosts.

Distribution File Subcommands

Multiple commands to the shell must be separated by a ; (semicolon). Commands are executed in the user's home directory on the host being updated. The `special` subcommand can be used to rebuild private databases after a program has been updated.

The distribution file subcommand list may contain zero or more of the following subcommands:

- **install Options [OptionalDestName];**
  
  Copies out-of-date files and directories. The `rdist` command copies each source file or directory to each host in the destination list. The available options as specified by the `Options` variable are the `rdist` command flags -b, -h, -i, -R, -v, -w, and -y. These options only apply to the files specified by the `SourceList` variable. When you use the -R flag, nonempty directories are removed if the corresponding file name is absent on the master host. The `OptionalDestName` parameter renames files.
  
  If no `install` subcommand appears in the subcommand list or the destination name is not specified, the source file name is used. Directories in the path name are created if they do not exist on the remote host. The login name used on the destination host is the same as the local host unless the destination name is of the format login@host.

- **notify NameList;**
  
  Mails the list of updated files and any errors that may have occurred to the listed names (the `NameList` parameter). If no @ (at sign) appears in the name, the destination host is appended to the name (name@host).

- **except NameList;**
  
  Causes the `rdist` command to update all the files specified by the `SourceList` entry except for those files specified by the `NameList` variable.

- **except_pat NameList;**
  
  Prevents the `rdist` command from updating any files that contain a string that matches a member of the list specified by the `NameList` variable.
special NameList "String";  

Specifies shell commands (the "String" variable) to be executed on the remote host after the file specified by the NameList variable is updated or installed. If the NameList variable is omitted, the shell commands are executed for every file updated or installed. The shell variable FILE is set to the current file name before the rdist command executes the "String" variable. The "String" value must be enclosed in " " (double quotation marks) and can cross multiple lines in the distribution file.

Exit Status

This command returns the following exit values:

- 0     Successful completion.
- >0    Specifies that an error occurred.

Examples

Examples of the Format: VariableName = NameList

1. To indicate which hosts' files to update, enter a line similar to the following:
   
      HOSTS = ( matisse root@arpa )

   where the HOSTS variable is defined to be matisse and root@arpa. The rdist command updates files on the hosts matisse and root@arpa. You could use this variable as a destination list.

2. To indicate a name to use as a value for a SourceList entry, enter a line similar to the following:
   
      FILES = ( /bin /lib/usr/bin /usr/games
               /usr/include/*.{h,.{stand,sys,vax*,pascal,machine}/*.h}
               /usr/lib /usr/man/man? /usr/ucb /usr/local/rdist )

   where the FILES value is defined to be the files to be used for the SourceList entry.

3. To indicate which files to exclude from the updating process, enter a line similar to the following:
   
      EXLIB = ( Mail.rc aliases aliases.dir aliases.pag crontab dshrc
                sendmail.cf sendmail.fc sendmail.hf sendmail.st uucp vfont)

   where the EXLIB value is defined as a list of files to exclude from the updating process.

4. To copy all files from /usr/src/bin to arpa expanding the namelist variable so that all files except those present in the namelist variable and having .o as an extension are copied:
   
      /usr/src/bin -> arpa
      except_pat(\e*e.o*e $<namelist> /SCCS*e $<namelist>)
      or
      /usr/src/bin -> arpa
      except_pat(\.\.o*e $<namelist> /SCCS*e $<namelist>)

5. To copy all files from /usr/src/bin to arpa except those with an .o extension:
   
      /usr/src/bin -> arpa
      except_pat(\.o$ /SCCS$)

Examples of the Format: [label:] SourceList - DestinationList SubcommandList

1. To copy a source list of files to a destination list of hosts, enter a line similar to the following:
   
      ${FILES} -> ${HOSTS}
      install -R
      except /usr/lib/${EXLIB};
      except /usr/games/lib;
      special /usr/sbin/sendmail "*/usr/sbin/sendmail.bz";
The \[Label\] entry of the line is optional and not shown here. The $ (dollar sign) and the {} (braces) cause the file names FILES, HOSTS, and EXLIB to be expanded into the lists designated for them in the previous examples. The rest of the example comprises the subcommand list.

2. To use the \[Label\] entry, enter the line as follows:

```
srcsL:
/usr/src/bin -> arpa
    except_pat $ (\e.o.e$ /SCCS\e$ ) ;
```

The label is srcsL and can be used to identify this entry for updating. The /usr/src/bin file is the source to be copied and host arpa is the destination of the copy. The third line contains a subcommand from the subcommand list.

3. To use a time-stamp file, enter a line similar to the following:

```
${FILES} :: stamp.cory
    notify root@cory
```

The $ (dollar sign) and {} (braces) cause the name specified by FILES to be expanded into the list designated for it. The time-stamp file is stamp.cory. The last line is a subcommand from the subcommand list.

Files

<table>
<thead>
<tr>
<th>Path</th>
<th>Description</th>
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<tbody>
<tr>
<td>/usr/bin/rdist</td>
<td>Contains the rdist command.</td>
</tr>
<tr>
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<td>Contains a list of subcommands to be read by the rdist command.</td>
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<tr>
<td>/tmp/rdist</td>
<td>Contains an update list. This is a temporary file.</td>
</tr>
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Related Information

The \csh\ command, \ksh\ command, \sh\ command.

The .rhosts file format.

Communications and networks in Networks and communication management.

/usr/sbin/rdist Command

This document describes the old AIX rdist command located in the /usr/bin/rdist file as well as the new /usr/sbin/rdist command which is used with the new rdstd daemon.

Purpose

Client program for distributing files remotely.

Syntax

To Use a Distribution File

```
/usr/sbin/rdist [-F] [ -A num ] [ -a num ] [ -c var=value ] [ -I < local logopts> ] [ -L <remote logopts> ] [ -l distfile ] [ -M maxproc -m host ] [ -O distops ] [ -T timeout ] [ -P <rdist-path> ] [ -P <transport-path> ] [ name ... ]
```

To Interpret Arguments as a Small Distribution File

```
/usr/sbin/rdist -Fn -c name ... [ login@ ] host [ :dest ]
```

To Invoke the Old rdist as a Server

```
/usr/sbin/rdist -Server
```

For Version Information

```
/usr/sbin/rdist -V
```
Description

**rdist** is a program to maintain identical copies of files over multiple hosts. It preserves the owner, group, mode, and modification time of files if possible and can update programs that are running. The **rdist** command can receive direction from the following sources:

- The distribution file **distfile** in the current directory.
- The standard input if **distfile** is specified as `-`.
- If the `-f` flag is not used, **rdist** looks for the file named **distfile** and **Distfile**.
- If the `-c` flag is used, the trailing arguments are interpreted as a small **distfile**. The equivalent **distfile** is as follows.
  
  ```
  ( filename ... ) -> [user@]host
  install [dest name];
  ```

If no **name** arguments are specified, **rdist** will update all of the files and directories listed in **distfile**. Otherwise, the argument is taken to be the name of a file to be updated or the label of a command to execute. If the label and file names conflict, it is assumed to be a label. These may be used together to update specific files using specific commands.

The **-Server** option provides backward compatibility for older versions of **rdist** which used this option to put **rdist** into server mode. If **rdist** is started with the **-Server** command line option, it will attempt to run the old version of **rdist**. This option will only work if the old **rdist** is located at `/usr/bin/rdist`.

**rdist** uses an arbitrary transport program to access each target host. The transport program can be specified on the command line with the **-P** flag. If the **-P** flag is not used, **rsh** is taken as the transport program. If the **rsh** method is used and the target host is the string **localhost** and the remote user name is the same as the local user name, **rdist** will attempt to run the following command:

```
/bin/sh -c rdistd -S
```

Otherwise **rdist** will run the following command:

```
rsh host -l remuser rdistd -S
```

In the example above, the **host** parameter is the name of the target host, **remuser** is the name of the user to make the connection as and, **rdistd** is the **rdist** server command on the target host.

The transport program must be compatible with the above syntax for **rsh**. If not, the transport program should be wrapped in a shell script which understands this command line syntax.

On each target host **rdist** will attempt to run the following command:

```
rdistd -S
```

or

```
<rdistd path> -S
```

In the example above, the **-p** flag was specified. If **-p** flag is not included, or the `<rdistd path>` is a simple filename, **rdistd** or `<rdistd path>` must be somewhere in the **PATH** of the user running **rdist** on the remote (target) host.

The **rdist** command uses the following environment variables:

| **TMPDIR** | Name of temporary directory to use. Default is `/tmp`. |
Flags

-A num  Update or install files only if a minimum number of free files (inodes) exists on a filesystem.
-a num  Update or install files only if a minimum amount of free space exists on a filesystem.
-d var = value  Assign value to variable var. This option is used to define or override variable definitions in the distfile. Value can be the empty string, one name, or a list of names surrounded by parentheses and separated by tabs and/or spaces.
-F  Update all clients sequentially without forking child processes.
-f distfile  Use distfile as the distribution file. If distfile is specified as -, read from standard input.
-l logopts  Sets local logging options. See the Message Logging section for more information on the syntax for logopts.
-L logopts  Sets remote logging options. logopts is the same as for local logging except the values are passed to the remote server (rdistd). See the Message Logging section for more information on the syntax of logopts.
-M num  Limit the maximum number of simultaneously running child rdist processes to num. The default is 4.
-m machine  Limits the updating of files to the given machine. Multiple -m arguments can be given to limit updates to a subset of the hosts listed in the distfile.
-n  Display but do not execute commands. Use the -n flag to debug distfile.
-o distopts

Specifies the dist options to enable. distopts is a comma separated list of options listed below. The valid values for distopts are:

chkfiles If the target filesystem is NFS, do not check or update files.

chkreadonly If a file on the target host resides on a read only filesystem, no checking or updating of the file is attempted.

chksym If the target on the remote host is a symbolic link, but is not on the master host, the remote target will be left a symbolic link.

compare Perform a binary comparison and update files if they differ.

follow Copy the file that the symbolic link points to rather than the link itself.

ignlinks Ignore links which do not resolve. The normal behavior of rdist is to warn the user about unresolved links.

nochkowner If the file already exists, do not check user ownership. The file ownership is only set when the file is updated.

nochkgrou  If the file already exists, do not check group ownership. The file ownership is only set when the file is updated.

nochkmode Avoid checking file and directory permission modes. The permission mode is only set when the file is updated.

nodescend Do not descend recursively into a directory. Only the existence, ownership, and mode of the directory are checked.

noexec Do not check or update executable files that are in a.out format.

numchkgrou  Use the numeric group id (gid) to check group ownership instead of the group name.

numchkwonner Use the numeric user id (uid) to check user ownership instead of the user name.

quiet Supress printing files that are being modified on the standard output.

remove Remove any files in directories that exist on the remote host that do not exist in the master directory on the local host.

savetargets Save files that are updated instead of removing them. Target files that are updated are first renamed from filename to filename.OLD.

sparse Enable checking for sparse files. This option adds some additional processing overhead so it should only be enabled for targets likely to contain sparse files.
-o distopts *(dist options, continued):*

**verify** Any file on any host that is out of date will be displayed but no file will be changed nor any mail sent.

**whole** The whole file name is appended to the destination directory name. Normally, only the last component of a name is used when renaming files. This will preserve the directory structure of the files being copied instead of flattening the directory structure. For example, rdisting a list of files such as /path/dir1/f1 and /path/dir2/f2 to /tmp/dir would create files /tmp/dir/path/dir1/f1 and /tmp/dir/path/dir2/f2 instead of /tmp/dir/dir1/f1 and /tmp/dir/dir2/f2.

**younger** Files are normally updated if their *mtime* and *size* disagree. This option causes rdist not to update files that are younger than the master copy. This can be used to prevent newer copies on other hosts from being replaced. A warning message is printed for files which are newer than the master copy.

-<rdist-path> Search for the rdistd server in the given path on the target host.

-P <rdist-path> Use the transport program as given in transport-path. The transport-path may be a colon separated list of possible pathnames. In this case, the first component of the path to exist is used.

-t timeout Sets the timeout period (in seconds) for waiting for responses from the remote rdist server. The default is 900 seconds.

-V Prints the version information and exits.

### Message Logging

The rdist command provides a set of message facilities, each of which contains a list of message types specifying which types of messages to send to that facility. The local client (rdist) and the remote server (rdistd) each maintain separate copies of what types of messages to log to what facilities.

The -l logopts flag specifies what logging options to use locally on the client. The -L logopts flag specifies what logging options to pass to the remote rdistd server.

The form of logopts should be the following:

```
facility=types:facility= types...
```

The valid facility names are as follows:

**stdout** Messages to standard output.

**file** Messages are sent to a file. The file name can be specified by the format `file = filename = types`.

**syslog** Messages are sent to the syslogd facility.

**notify** Messages are sent to the internal rdistnotify facility. This facility is used in conjunction with the notify keyword in a distfile to specify what messages are mailed to the notify address.

*types* should be a comma separated list of message types. Each message type specified enables that message level. This is unlike the syslog system facility which uses an ascending order scheme. The following are the valid types:

**change** Log messages for things that change.

**info** Log general information.
notice  Log messages for general info about things that change. This includes things like making
directories which are needed in order to install a specific target, but which are not explicitly
specified in the distfile.
nerror  Log messages for normal errors that are not fatal.
ferror  Log messages for fatal errors.
warning  Log warnings about errors which are not as serious as nerror type messages.
verbose  Log messages for more information than normal, but less than debugging level.
debug  Log debugging information.
all     Log all but debug messages.

The Distribution File

The distribution file specifies the files to copy, destination hosts for distribution, and operations to perform
when updating files to be distributed with the rdist command.

Entry Formats
Each entry in the distribution file has one of the following formats:

VariableName = NameList                     Defines variables used in other entries of the distribution
 file (SourceList, DestinationList, or SubcommandList).

[Label:] SourceList -> DestinationList SubcommandList Directs the rdist command to distribute
 files named in the SourceList variable to hosts named in the DestinationList
 variable. Distribution file commands perform additional functions.

[Label:] SourceList :: TimeStampFile SubcommandList Directs the rdist command to update files that have
 changed since a given date. Distribution file subcommands perform additional functions. Each file
 specified with the SourceList variable is updated if the file
 is newer than the time-stamp file.

Labels are optional. They are used to identify a command for partial updates.

Entries

VariableName             Identifies the variable used in the distribution file.
NameList                 Specifies a list of files and directories, hosts, or
                         subcommands.
SourceList               Specifies files and directories on the local host for the
                          rdist command to use as the master copy for distribution.
DestinationList          Indicates hosts to receive copies of the files.
SubcommandList           Lists distribution file subcommands to be executed.

The rdist command treats newline characters, tabs, and blanks as separators. Distribution file variables for
expansion begin with a dollar sign followed by a single character or a name enclosed in braces.
Comments begin with a pound sign and end with a newline character.

Source and Destination List Format
The distribution file source and destination lists comprise zero or more names separated by blanks, as
shown in the following format:
[Name1] [Name2] [Name3] ...
The `rdist` command recognizes and expands the following shell metacharacters on the local host in the same way as for the `csh` command.

- `[ left bracket
- `] right bracket
- `{ left brace
- `} right brace
- `( left parenthesis
- `)` right parenthesis
- `* asterisk
- `? question mark

To prevent these characters from being expanded, precede them with a backslash. The `rdist` command also expands the tilde in the same way as for the `csh` command, but does so separately on the local and destination hosts. When the `-o whole` option is used with a file name that begins with a tilde, everything except the home directory is appended to the destination name. File names which do not begin with a forward slash or a tilde use the destination user’s home directory as the root directory for the rest of the file name.

**Distribution File Subcommands**

Multiple commands to the shell must be separated by a semicolon. Commands are executed in the user’s home directory on the host being updated. The special subcommand can be used to rebuild private databases after a program has been updated.

The distribution file subcommand list may contain zero or more of the following subcommands:

- `install Options[OptionalDestName];` Copies out-of-date files and directories. The `rdist` command copies each source file or directory to each host in the destination list. The available options as specified by the `Options` variable are the `rdist` command flags `b`, `-h`, `-i`, `-R`, `-v`, `-w`, and `-y`. These options only apply to the files specified by the `SourceList` variable. When you use the `-R` flag, nonempty directories are removed if the corresponding file name is absent on the master host. The `OptionalDestName` parameter renames files.

  If no install subcommand appears in the subcommand list or the destination name is not specified, the source file name is used. Directories in the path name are created if they do not exist on the remote host. The login name used on the destination host is the same as the local host unless the destination name is of the format `login@host`.

- `notify NameList;` Mails the list of updated files and any errors that may have occurred to the listed names (the `NameList` parameter). If no `@` (at sign) appears in the name, the destination host is appended to the name (`name@host`).

- `except NameList;` Causes the `rdist` command to update all the files specified by the `SourceList` entry except for those files specified by the `NameList` variable.

- `except_pat NameList;` Prevents the `rdist` command from updating any files that contain a string that matches a member of the list specified by the `NameList` variable.
special NameList "String";

Specifies shell commands (the "String" variable) to be executed on the remote host after the file specified by the NameList variable is updated or installed. If the NameList variable is omitted, the shell commands are executed for every file updated or installed. The shell variable FILE is set to the current file name before the rdist command executes the "String" variable, the variable REMFILE will contain the full pathname of the remote file that was just updated and the variable BASEFILE will contain the basename of the remote file that was just updated. The "String" value must be enclosed in double quotation marks and can cross multiple lines in the distribution file.

cmds

special NameList "String";

The cmdspecial command is similar to the special command, except it is executed only when the entire command is completed instead of after each file is updated. The shell variable FILES will contain the list of files. Each file name in the FILES shell variable is separated by a colon.

NFS checks are disabled if a hostname ends in a plus sign. This is equivalent to disabling the -o chknfs option just for this one host.

Exit Status

This command returns the following exit values:

0 Successful completion.
>0 An error occurred.

Examples

1. To indicate which hosts' files to update, enter a line similar to the following:
   
   HOSTS = ( matisse root@arpa )

   In the above example, the HOSTS variable is defined to be matisse and root@arpa. The rdist command updates files on the hosts matisse and root@arpa. You could use this variable as a destination list.

2. To indicate a name to use as a value for a SourceList entry, enter a line similar to the following:
   
   FILES = ( /bin /lib/usr/bin /usr/games
   /usr/include/*.{h,stand,sys,vax*,pascal,machine}/*.{h}
   /usr/lib /usr/man/man? /usr/ucb /usr/local/rdist )

   In the above example, the FILES value is defined to be the files to be used for the SourceList entry.

3. To indicate which files to exclude from the updating process, enter a line similar to the following:
   
   EXLIB = ( Mail.rc aliases aliases_dir aliases.pag crontab dshrc
   sendmail.cf sendmail.fc sendmail.hf sendmail.st uucp vfont)

   In the above example, the EXLIB value is defined as a list of files to exclude from the updating process.

4. To copy all files from /usr/src/bin to arpa expanding the namelist variable so that all files except those present in the namelist variable and having .o as an extension are copied:
   
   /usr/src/bin ->arpa
   except_pat(\.o|SCCS|<namelist>)
   or
   /usr/src/bin ->arpa
   except_pat(.*o|<namelist>)
   /SCCS\e <namelist>

5. To copy all files from /usr/src/bin to arpa except those with an .o extension:
Examples of the Format: [label:] SourceList - DestinationList

SubcommandList

1. To copy a source list of files to a destination list of hosts, enter a line similar to the following:

   ${FILES} ->${HOSTS}
   install -R
   except /usr/lib/${EXLIB} ;
   except /usr/games/lib ;
   special /usr/sbin/sendmail "/usr/sbin/sendmail.bz" ;

   The [Label:] entry of the line is optional and not shown here. Thedollar sign and the braces cause the
   file names FILES, HOSTS, and EXLIB to be expanded into the lists designated for them in the
   previous examples. The rest of the example comprises the subcommand list.

2. To use the [Label:] entry, enter the line as follows:

   srcsL:
   /usr/src/bin -> arpa
   except_pat (\e\e.o\$ /SCCS\$ ) ;

   The label is srcsL: and can be used to identify this entry for updating. The /usr/src/bin file is the
   source to be copied and host arpa is the destination of the copy. The third line contains a
   subcommand from the subcommand list.

3. To use a time-stamp file, enter a line similar to the following:

   ${FILES} :: stamp.cory
   notify root@cory

   The dollar sign and braces cause the name specified by FILES to be expanded into the list designated
   for it. The time-stamp file is stamp.cory. The last line is a subcommand from the subcommand list.

Files

/usr/sbin/rdist Contains the rdist command at version 6.1.5.
distfile Contains the input commands.
$ TMPDIR/rdist* The temporary file for update lists.

Related Information
The csh command, rcmd() system call, rdistd command rsh command, sh command, stat() system call.

rdistd Command

Purpose
Server program for distributing files remotely.

Syntax

   rdistd -S
   rdistd [-V]

Description

rdistd is the server program for the rdist command. It is normally run by rdist through rsh.

The -S flag ensures that rdistd is not accidentally started since it normally resides in a normal user’s
PATH environment variable.
Flags

-\(V\)    Print version information and exit.

Exit Status

This command returns the following exit values:

0       Successful completion.

>0      An error occurred.

Files

\(/usr/sbin/rdistd\) Contains the \texttt{rdistd} server
\(/usr/bin/rdistd\) Symbolic link to \texttt{/usr/sbin/rdistd}

Related Information

“\texttt{rdist Command}” on page 571, and “\texttt{rsh or remsh Command}” on page 754.

rdump Command

Purpose
Backs up files onto a remote machine’s device.

Note: User must have root authority to run this command.

Syntax

\texttt{rdump} \([\text{-B}] \text{ Blocks } \[\text{-B}] \text{ Blocks } \[\text{-c}] \text{ Blocks } \[\text{-d}] \text{ Density } \[\text{-L}] \text{ Length } \[\text{-s}] \text{ Size } \[\text{-u}] \text{ Machine:Device } [\text{FileSystem}] [\text{DeviceName}] \]

Description

The \texttt{rdump} command copies file systems by i-node from your local machine to a remote machine. The files are copied, using the \texttt{backup} command format, to a device on the remote machine. The device is accessed by using a remote server on the remote machine. You must have root authority to execute the \texttt{rdump} command. You must also define a local machine running the \texttt{rdump} command in the \texttt{/etc/rhosts} file of the target remote machine.

To back up a file system, specify the \texttt{Level} and \texttt{FileSystem} parameters to indicate the files you want to back up. You can use the \texttt{-Level} parameter to back up either all files on the system (a full backup) or only the files that have been modified since a specific full backup (an incremental backup). The possible levels are 0 to 9. If you do not supply a level, the default level is 9. A level 0 backup includes all files on the file system. A level \(n\) backup includes all files modified since the last level \((n-1)\) backup. The levels, in conjunction with the \texttt{-u} flag, provide a method of maintaining a hierarchy of incremental backups for each file system.

Notes:

1. Use the \texttt{-u} flag when you perform an incremental backup (the \texttt{-Level} parameter) to ensure that information regarding the last date, time, and level of each incremental backup is written to the \texttt{etc/dumpdates} file.

2. If the \texttt{rmt} command on the remote machine is not in \texttt{/usr/sbin/rmt}, then a link will need to be created on the remote machine from \texttt{/usr/sbin/rmt} to its actual location (usually \texttt{/etc/rmt}).
Flags

-\texttt{b Blocks} Specifies the number of blocks to write in a single output operation. If you do not specify the \texttt{Blocks} variable, the \texttt{rdump} command uses a default value appropriate for the physical device selected. Larger values of the \texttt{Blocks} variable result in larger physical transfers to tape devices.

-\texttt{B} Terminates the command without querying the user when an error occurs. If you specify the -\texttt{B} flag, the \texttt{rdump} command returns a nonzero value.

-\texttt{c} Specifies that the tape is a cartridge format, not a 9-track format.

-\texttt{d Density} Specifies the density of the tape in bits-per-inch (bpi). This value is used in calculating the amount of tape used per volume. If you do not specify a value for the \texttt{Density} variable, the default density is 1600 bpi. When using the -\texttt{c} flag without specifying a tape density, the default density is 8000 bpi.

-\texttt{f Machine:Device} Specifies the \textit{Machine} variable as the hostname of the remote machine. To send output to the named device, specify the \textit{Device} variable as a file name (such as the \texttt{/dev/rmt0} file). The \textit{Device} variable should specify only tape devices.

-\texttt{L Length} Specifies the length of the tape in bytes. This flag overrides the -\texttt{c}, -\texttt{d}, and -\texttt{s} flags. You can specify the size with a suffix of b, k, m, or g to represent Blocks (512 bytes), Kilo (1024 bytes), Mega (1024 Kilobytes), or Giga (1024 Megabytes), respectively. To represent a tape length of 2 Gigabytes, type the following: -\texttt{L 2g}. This flag only applies to AIX 4.2 and above.

-\texttt{s Size} Specifies the size of the tape in feet using the \textit{Size} variable. If you do not specify a tape size, the default size is 2300 feet. When using the -\texttt{c} flag without specifying a tape size, the default size is 1700 feet. When the tape drive reaches the specified size, the \texttt{rdump} command waits for the tape to be changed.

-\texttt{u} Updates the time, date, and level of the remote backup in the \texttt{/etc/dumpdates} file. This file provides the information needed for maintaining incremental backups.

-\texttt{w} Currently disabled.

-\texttt{W} Displays the file systems found in the \texttt{/etc/dumpdates} files.

-\texttt{-Level} Specifies the remote backup level (0 to 9). The default value of the \textit{Level} variable is 9.

-\texttt{?} Displays the usage message.

Parameters

\textit{DeviceName} Specifies the physical device name (the block or raw name).

\textit{FileSystem} Specifies the name of the directory on which the file system is usually mounted. The \texttt{rdump} command reads the \texttt{/etc/filesystems} file for the physical device name. If you do not specify a file system, the default is the root (\texttt{/}) file system.

Exit Status

This command returns the following exit values:

0 Indicates that the command completed successfully.

>0 Indicates that an error occurred.

Examples

1. To back up files in the \texttt{/usr} directory on your local machine to a remote machine, type:

   \texttt{rdump -u -0 -f canine:/dev/rmt0 /usr}

   The -\texttt{u} flag tells the system to update the current backup level records in the \texttt{/etc/dumpdates} file. The -\texttt{-Level} flag set to backup level 0 specifies that all the files in the \texttt{/usr} directory are to be backed up. The ID of the remote machine is \texttt{canine} and the device is the \texttt{/dev/rmt0} device.
2. To back up files in the /usr directory on your local machine to a remote machine using an 8mm, 2.3GB tape, type:
   
   rdump -fcanine:/dev/rmt0 -L 2200m /usr

   **Note:** 2.2GB is used here instead of 2.3GB to avoid hitting the actual end of the tape.

3. To back up files in the /usr directory on your local machine to a remote machine using 0.25-inch tape, type:

   rdump -fcanine:/dev/rmt0 -c /usr

   When using the -c flag, the `rdump` command defaults to the correct size and density values for 0.25-inch tape.

**Files**

- `/etc/dumpdates` Contains logs of the most recent remote dump dates.
- `/etc/filesystems` Contains information on file systems.
- `/dev/rhd4` Contains the device where the default file system (root) is located.
- `/usr/sbin/rdump` Contains the `rdump` command.

**Related Information**

The `find` command, `dd` command, `backup` command, `restore` command, `rrestore` command.

The `dumpdates` file, `filesystems` file, `rmt` special file.

Backup methods, Directories, Files in *Operating system and device management*.

File systems in *Operating system and device management*.

---

**read Command**

**Purpose**

Reads one line from standard input.

**Syntax**

```
read [ -p ] [ -r ] [ -s ] [ -u [ n ] ] [ VariableName?Prompt ] [ VariableName ... ]
```

**Description**

The `read` command reads one line from standard input and assigns the values of each field in the input line to a shell variable using the characters in the `IFS` (Internal Field Separator) variable as separators. The `VariableName` parameter specifies the name of a shell variable that takes the value of one field from the line of input. The first shell variable specified by the `VariableName` parameter is assigned the value of the first field, the second shell variable specified by the `VariableName` parameter is assigned the value of the second field, and so on, until the last field is reached. If the line of standard input has more fields than there are corresponding shell variables specified by the `VariableName` parameter, the last shell variable specified is given the value of all the remaining fields. If there are fewer fields than shell variables, the remaining shell variables are set to empty strings.

**Note:** If you omit the `VariableName` parameter, the variable `REPLY` is used as the default variable name.
The setting of shell variables by the `read` command affects the current shell execution environment.

**Flags**

- `-p` Reads input from the output of a process run by the Korn Shell using `|&` (pipe, ampersand).
  
  **Note:** An end-of-file character with the `-p` flag causes cleanup for this process to so that another can be spawned.

- `-r` Specifies that the read command treat a `\` (backslash) character as part of the input line, not as a control character.

- `-s` Saves the input as a command in the Korn Shell history file.

- `-u [n]` Reads input from the one-digit file descriptor number, `n`. The file descriptor can be opened with the `ksh exec` built-in command. The default value of the `n` is 0, which refers to the keyboard. A value of 2 refers to standard error.

**Parameters**

`VariableName?Prompt` specifies the name of one variable, and a prompt to be used. When the Korn Shell is interactive, it will write the prompt to standard error, and then perform the input. If `Prompt` contains more than one word, you must enclose it in single or double quotes.

`VariableName...` specifies one or more variable names separated by white space.

**Exit Status**

This command returns the following exit values:

- `0` Successful completion.
- `>0` Detected end-of-file character or an error occurred.

**Examples**

1. The following script prints a file with the first field of each line moved to the end of the line:
   ```
   while read -r xx yy do
     print printf "%s %s/n" $yy $xx
   done < InputFile
   ```
2. To read a line and split it into fields, and use "Please enter: " as a prompt, type:
   ```
   read word1?"Please enter: " word2
   ```
   The system displays:
   ```
   Please enter:
   You enter:
   hello world
   ```
   The value of the `word1` variable should have "hello" and `word2` should have "world."
3. To create a co-process, then use `print -p` to write to the co-process, and use `read -p` to read the input from the co-process, type:
   ```
   (read; print "hello $REPLY")
   print -p "world"
   read-p line
   ```
   The value of the `line` variable should have "hello world."
4. To save a copy of the input line as a command in the history file, type:
   ```
   read -s line < input_file
   ```
If input_file contains "echo hello world," then "echo hello world" will be saved as a command in the history file.

Related Information
The `printf` command.

The `ksh` command.

readlvcopy Command

Purpose
Reads a specific mirror copy of a logical volume.

Syntax
```
```

Description

Flags
- `-d device` Logical volume special device file to be read from
- `-c copy` Requested mirror copy to read from. Valid values are 1, 2, or 3 for the first, second, or third copy of the data. Data is read even if the logical partition has been marked stale. The default is the first copy of the data.
- `-C copy` Requested mirror copy to read from. Valid values are 1, 2, or 3 for the first, second, or third copy of the data. Stale logical partitions are not read.
- `-b` Read mirror copy marked as online backup.
- `-n number_of_blocks` Number of 128K blocks to read
- `-o outfile` Destination file. The default is `stdout`
- `-s skip` Number of 128K blocks to skip into `device`.
- `-S seek` Number of 128K blocks to seek into `outfile`

Related Information
The `chlvcopy` command.

reboot or fastboot Command

Purpose
Restarts the system.

Syntax
```
{ reboot | fastboot } [ -l ] [ -n ] [ -q ] [ -t mmddHHMM [ yy ] ]
```

Description
The `reboot` command can be used to perform a reboot operation if no other users are logged into the system. The `shutdown` command is used when the system is running and multiple users are logged into the system. Both commands write an entry to the error log that states that the system was deliberately temporarily disabled.
The reboot command causes the disks to be synchronized with the sync command and allows the system to perform other shutdown activities such as resynchronizing the hardware time-of-day clock. A reboot operation is then started. By default, the system starts and the disks are automatically checked. If successful, the system comes up in the default runlevel.

To force the reboot, press keys that are specifically reserved for rebooting, according to your machine type. If all else fails, turn the machine off, wait at least 60 seconds for the disks to stop spinning, and turn it back on.

The system restarts itself when power is turned on or after the system crashes if the autorestart attribute value is true. To find the value of the autorestart attribute, use the lsattr command and enter lsattr -D -l sys0. The default value is true. To reset the autorestart attribute value to false, use the chdev command and enter:

```
chdev -l sys0 -a autorestart=false.
```

After performing diagnostic tests, the system ROM looks for a bootstrap record. The system loops until it finds one. Normally, the bootstrap record reads the boot program from diskette or fixed disk. If the debugger was configured into the kernel, it is entered first, but an implicit go is performed if nothing is entered within about 30 seconds. A carriage return also performs the go.

The reboot command normally logs the reboot operation using the syslog command and places a shutdown record in /var/adm/wtmp, the login accounting file. These actions are inhibited if the -l, -n, or -q flags are present.

The fastboot command restarts the system by calling the reboot command. The fsck command runs during system startup to check file systems. This command provides BSD compatibility.

### Flags

- **-l** Does not log the reboot or place a shutdown record in the accounting file. The -l flag does not suppress accounting file update. The -n and -q flags imply -l.
- **-n** Does not perform the sync command. Use of this flag can cause file system damage.
- **-q** Restarts without first shutting down running processes.
  **Note:** A file system synchronization will not occur if the -q flag is used. If you want the file system to be synchronized, manually run the sync command or use the shutdown -r command.
- **-t** Shuts down the system immediately and then restarts the system on the specified date. A valid date has the following format:

```
mmddHHMM [ yy ]
```

where:

- **mm** Specifies the month.
- **dd** Specifies the day.
- **HH** Specifies the hour.
- **MM** Specifies the minute.
- **yy** Specifies the year (optional).

### Examples

To shut down the system without logging the reboot, enter:

```
reboot [-l]
```
Files

/etc/rc Specifies the system startup script.
/var/adm/wtmp Specifies login accounting file.

Related Information
The chdev, fasthalt, fsck, halt, lsattr, rc, shutdown, sync, syslogd command.

The utmp, wtmp, failedlogin File Format.

recreatevg Command

Purpose
Recreates a volume group that already exists on a specified set of disks. Imports and varies on the volume group.

Syntax
recreatevg [\[-y\] VGname ] [\[-p\] ] [\[-f\] ] [\[-Y\] Lv_Prefix | \[-l\] LvNameFile ] [\[-L\] Label_Prefix ] [\[-n\] ] PVname...

Description
The recreatevg command recreates a volume group on a set of disks that are duplicated from another set of disks belonging to a specific volume group. This command overcomes the problem of duplicated Logical Volume Manager (LVM) data structures and identifiers caused by a disk duplication process. This command allocates new physical volume identifiers (PVID) for the member disks, as the PVIDs are also duplicated by the disk duplication. Similarly, duplicated logical volume members are given new names with the user-specified prefixes.

Notes:
1. The recreatevg command removes all logical volumes that are fully or partially existed on the physical volumes that are not specified on the command line.
2. The recreatevg command gives a warning if the log logical volume for a file system does not exist on the disks specified on the command line.
3. The recreatevg command fails if the input list does not match the list compiled from the Volume Group Descriptor Area (VGDA).
4. The set of disks in the list must have consistent VGDA data. The recreatevg command does not fix VGDA problems.
5. When recreating a concurrent-capable volume group, the volume group will not be varied on when the recreatevg command completes. The new volume group must be varied on manually.

Flags
-\[-f\]
Recreates a volume group from a subset of disks. Only those disks and the logical volumes that reside on this subset of disks will be contained within the recreated volume group. All other disks and logical volumes in the orginal volume group will be deleted from the recreated volume group.

-\[-l\] LvNameFile
Changes logical volume names to the name specified by LvNameFile. Entries must be in the format LV:NEWLV1. All logical volumes that are not included in LvNameFile are recreated with default system generated names. NEWLV1 name may be the same as LV name in the LvNameFile stanza (LV:NEWLV1) to leave the logical volume with the same name.
Changes the labels of logical volumes on the VG being recreated to this prefix. You must modify the /etc/filesystems stanza manually if a simple modification of the mount point is not enough to define the stanza uniquely. Specifying / (slash) as the Label_Prefix, will leave the label in the logical volume unchanged.

Specifies that after recreatevg the volume group is imported but varied off. Default is imported and vary on.

Disables the automatic generation of the new PVIDs. If the -p flag is used, you must ensure that there are no duplicated PVIDs on the system. All the disks that are hardware mirrored must have their PVIDs changed to a unique value.

Allows the volume group name to be specified rather than having the name generated automatically. Volume group names must be unique system wide and can range from 1 to 15 characters. The name cannot begin with a prefix already defined in the PdDv class in the Device Configuration database for other devices. The new volume group name is sent to standard output.

Causes the logical volumes on the volume group being recreated to be renamed with this prefix. The total length of the prefix and the logical volume name must be less than or equal to 15 characters. If the length exceeds 15 characters, the logical volume is renamed with a default name. The name cannot begin with a prefix already defined in the PdDv class of the Device Configuration Database, nor be a name already used by another device. Specifying NA as the Lv_Prefix, will leave all the logical volume names unchanged.

Security
Access Control: You must have root authority to run this command.

Examples
1. To recreate a volume group that contains three physical volumes, type:
   recreatevg hdisk1 hdisk2 hdisk3
   The volume group on hdisk1, hdisk2, and hdisk3 is recreated with an automatically generated name, which is displayed.
2. To recreate a volume group on hdisk1 with the new name testvg, type:
   recreatevg -y testvg hdisk1
3. To recreate a volume group on hdisk14, recreate all logical volumes in that volume group, and rename them with the prefix newlv, type:
   recreatevg -Y newlv hdisk14

Files
/usr/sbin Directory where the recreatevg command resides.

Related Information
The chvg command, chlv command.

recsh Command

Purpose
Invokes the recovery shell.

Syntax
recsh
Description
When the libc.a library is moved or renamed, an error message Killed will be displayed from the shell as there is no libc.a library available for the system to load and run the utilities. The recsh command invokes recovery shell, which provides the ability to rename libc.a library if it is accidently moved. It uses an alternative libc.a library that is shipped with the system.

Note: This is a recovery shell and users should not use recsh as default shell.

Examples
1. If libc.a is renamed accidentally then the system will be in an unstable state where in execution of any utility will not be possible. To recover at this point, type:
   recsh; cp -p libc.a.new /usr/lib/libc.a; exit

Location
/usr/bin/recsh

Files
/usr/bin/recsh Specifies the path name to the recovery shell.

Related Information
The bsh command in AIX 5L Version 5.3 Commands Reference, Volume 1.
The ksh command in AIX 5L Version 5.3 Commands Reference, Volume 3.
The sh command in AIX 5L Version 5.3 Commands Reference, Volume 5.

redefinevg Command

Purpose
Redefines the set of physical volumes of the given volume group in the device configuration database.

Syntax
redefinevg { -d Device | -i Vgid } VolumeGroup

Description
During normal operations the device configuration database remains consistent with the Logical Volume Manager (LVM) information in the reserved area on the physical volumes. If inconsistencies occur between the device configuration database and the LVM, the redefinevg command determines which physical volumes belong to the specified volume group and re-enters this information in the device configuration database. The redefinevg command checks for inconsistencies by reading the reserved areas of all the configured physical volumes attached to the system.

Note: To use this command, you must either have root user authority or be a member of the system group.

Flags
-d Device The volume group ID, Vgid, is read from the specified physical volume device. You can specify the Vgid of any physical volume belonging to the volume group that you are redefining.
-i Vgid  The volume group identification number of the volume group to be redefined.

Example
To redefine rootvg physical volumes in the Device Configuration Database, enter a command similar to the following:
redefinevg -d hdisk0 rootvg

Files
/usr/sbin/synclvodm  Contains the synclvodm command.

Related Information
The varyonvg command, varyoffvg command, lsvg command.

reducevg Command

Purpose
Removes physical volumes from a volume group. When all physical volumes are removed from the volume group, the volume group is deleted.

Syntax
reducevg [ -d ] [ -f ] VolumeGroup  PhysicalVolume  ...

Description
Attention: You can use the reducevg command while the volume group is in concurrent mode. However, if you run this command while the volume group is in concurrent mode and the end result is the deletion of the volume group, then the reducevg command will fail.

The reducevg command removes one or more physical volumes represented by the PhysicalVolume parameter from the VolumeGroup. When you remove all physical volumes in a volume group, the volume group is also removed. The volume group must be varied on before it can be reduced.

All logical volumes residing on the physical volumes represented by the PhysicalVolume parameter must be removed with the rmlv command or the -d flag before starting the reducevg command.

Notes:
1. To use this command, you must either have root user authority or be a member of the system group.
2. Sometimes a disk is removed from the system without first running reducevg VolumeGroup PhysicalVolume. The VGDA still has this removed disk in it’s memory, but the PhysicalVolume name no longer exists or has been reassigned. To remove references to this missing disk you can still use reducevg, but with the Physical Volume ID (PID) instead of the disk name: reducevg VolumeGroup PVID.
3. The reducevg command is not allowed on a snapshot volume group.

For volume groups created on AIX 5.3 and varied on without the varyonvg -M flag, reducevg will dynamically raise the logical track group size for the volume group if necessary to match the common max transfer size of the remaining physical volumes.

You can use the Volumes application in Web-based System Manager (wsm) to change volume characteristics.
You could also use the System Management Interface Tool (SMIT) `smit reducevg` fast path to run this command.

**Flags**

- **-d**  
  Deallocates the existing logical volume partitions and then deletes resultant empty logical volumes from the specified physical volumes. User confirmation is required unless the `-f` flag is added.

  **Attention:** The `reducevg` command with the `-d` flag automatically deletes all logical volume data on the physical volume before removing the physical volume from the volume group. If a logical volume spans multiple physical volumes, the removal of any of those physical volumes may jeopardize the integrity of the entire logical volume.

- **-f**  
  Removes the requirement for user confirmation when the `-d` flag is used.

**Examples**

1. To remove physical volume `hdisk1` from volume group `vg01`, enter:
   
   ```
   reducevg vg01 hdisk1
   ```

2. To remove physical volume `hdisk1` and all residing logical volumes from volume group `vg01` without user confirmation, enter the following command. **Attention:** The `reducevg` command with the `-d` flag automatically deletes all logical volume data before removing the physical volume.

   ```
   reducevg -d -f vg01 hdisk1
   ```

   The physical volume `hdisk1` and all residing logical volumes are removed.

**Files**

- **/etc**  
  Directory where the `reducevg` command resides.

- **/tmp**  
  Directory where the temporary files are stored and while the command is running.

**Related Information**

The `extendvg` command, `rmlv` command.

The `Logical volume storage` in *Operating system and device management*.

For information on installing the Web-based System Manager, see Chapter 2: Installation and System Requirements in *AIX 5L Version 5.3 Web-based System Manager Administration Guide*.

The `System management interface tool` in *Operating system and device management*.

**refer Command**

**Purpose**

Finds and inserts literature references in documents.

**Syntax**

```plaintext
```
Description

The `refer` command is a preprocessor for the `nroff` or the `troff` command. The `refer` command finds and formats references for footnotes or endnotes. It is also the basis for a series of programs designed to index, search, sort, and print standalone bibliographies or other data entered in the appropriate form.

Given an incomplete citation with sufficiently precise keywords, the `refer` command searches a bibliographic database for references containing these keywords anywhere in the title, author, journal, and so on. The input file (or else standard input) is copied to standard output, except for lines enclosed by the .[ (period, left bracket) and .] (period, right bracket) delimiters. Lines enclosed by the delimiters are assumed to contain keywords and are replaced by information from the bibliographic database. The user can search different databases, override particular fields, or add new fields. The reference data, from whatever source, is assigned to a set of `troff` command strings. Macro packages, such as the `ms` macro package, print the finished reference text from these strings. By default, references are flagged by footnote numbers.

To use your own references, put them in the format described in the [Example] section. These references can be accessed either by using the `-p` flag or by setting the `REFER` environment variable to those reference files. The references can be searched more rapidly by running the `indxbib` command on them before using the `refer` command. If you do not index, a linear search is made. When the `refer` command is used with any of the preprocessor commands (`eqn`, `neqn`, or `tbl` command), the `refer` command should be issued first, to minimize the volume of data passed through pipes.

**Note:** Anytime you edit a reference file, you must reissue the `indxbib` command on that file. If you do not use the `indxbib` command, remove any .ia, .ib, .ic, and .ig files associated with that reference file; otherwise, you will get a **too many hits** error message from the `refer` command.

The `refer` command and associated programs expect input from a file of references composed of records separated by blank lines. A record is a set of fields (lines), each containing one kind of information. Fields start on a line beginning with the % (percent sign), followed by a key letter, a space character, and finally the contents of the field, and continue until the next line, starting with a % (percent sign). The output ordering and formatting of fields is controlled by the macros specified for the `nroff` and `troff` commands (for footnotes and endnotes), or the `roffbib` command (for standalone bibliographies). For a list of the most common key letters and their corresponding fields, see the `addbib` command.

Flags

- `-b` Bare mode: do not put any flags in text (either numbers or labels).
- `-e` Instead of leaving the references where encountered, accumulates them until a sequence of the following form is encountered:
  [.\n    $LIST$
  ]
  then writes out all references collected so far.
- `-P` Places punctuation marks after the reference signal, rather than before. The punctuation marks are locale-specific and are defined in the `refer` message catalog.
- `-S` Produces references in the natural or social science format.
- `-a Number` Reverses the first specified number of author names (Jones, J. A. instead of J. A. Jones). If the `Number` variable is omitted, all author names are reversed.
- `-B Label.Macro` Specifies bibliography mode. Takes a file composed of records separated by blank lines and turns that file into `troff` command input. The specified label is turned into the specified macro, with the `Label` variable value defaulting to %X and the `.Macro` variable value defaulting to .AP (annotation paragraph).
- `-c Keys` Capitalizes, with SMALL CAPS, the fields whose key letters are in the `Keys` variable. For example, Jack becomes JACK.
-f Number
Sets the footnote number to the specified number instead of the default of 1. With labels rather than numbers, this flag has no effect. See the -k flag and the -l flag.

-k Label
Instead of numbering references, uses labels as specified in a reference data line beginning with %Label. By default, the Label variable value is L.

-l Letter, Digit
Instead of numbering references, uses labels made from the senior author’s last name and the year of publication. Only the first specified letters of the last name and the last specified digits of the date are used. If either the Letter variable or the Digit variable is omitted, the entire name or date, respectively, is used.

-n
Does not search the default /usr/share/dict/papers/Ind file. If the REFER environment variable is set, the specified file is searched instead of the default file. In this case, the -n flag has no effect.

-p Reference
Takes the Reference variable as a file of references to be searched. The default file is searched last.

-s Keys
Sorts references by fields whose key letters are specified by the Keys variable string. Renames reference numbers in text accordingly. Implies the -e flag. The key letters specified by the Keys variable can be followed by a number to indicate how many such fields are used, with q + (plus sign) indicating a very large number. The default value is AD, which sorts first by senior author and then by date. For example, to sort on all authors and then title, enter -sA+T.

It is important to note that blank spaces at the end of lines in bibliography fields cause the records to sort and reverse incorrectly. Sorting large numbers of references can cause a core dump.

Example
Following is an example of a refer command entry:

%A M.E. Lesk
%T Some Applications of Inverted Indexes on the UNIXSystem
%B UNIXProgrammer's Manual
%B 2b
%B Bell Laboratories
%V 2b
%C Murray Hill, NJ
%D 1978

Files
/usr/share/dict/papers/Ind Contains the default reference file.
/usr/lbin/refer Contains companion programs.

Related Information
The eqn command, addbib command, indxbib command, lookbib command, neqn command, nroff command, roffbib command, sortbib command, tbl command, troff command.

refile Command

Purpose
Moves files between folders.
Syntax

Description
The refile command moves messages between folders. If you do not specify a source folder, the refile command uses the current folder as the source. If you specify a destination folder that does not exist, the system requests permission to create it.

The refile command also copies messages from one folder to another. When moving a message, by default, the system does not keep a copy of the message in the original folder. To leave a copy behind, use the -preserve flag.

Flags
-draft          Copies the current draft message from your mail directory.
-file File      Copies the specified file. The file must be in valid message format. Use the inc command to format and file new messages correctly.
+Folder         Copies the messages to the specified folder. Any number of folders can be specified.
-help           Lists the command syntax, available switches (toggles), and version information.

Note: For MH, the name of this flag must be fully spelled out.

-link            Leaves the messages in the source folder or file after they are copied.
Messages
   Specifies the messages to be copied. You can specify several messages, a range of messages, or a single message. Use the following references to specify messages:

   Number
      Number of the message.

   Sequence
      A group of messages specified by the user. Recognized values include:
      all       All the messages in a folder.
      cur or . (period)
      Current message. This is the default.
      first     First message in a folder.
      last      Last message in a folder.
      next      Message following the current message.
      prev      Message preceding the current message.

/DT> If the -link and all flags are used together, the current message in the current folder does not change. Otherwise, if a message is specified, the refiled message becomes the current message.

-nolink          Removes the messages from the source folder or file after they are copied. This flag is the default.
-nopreserve      Renumbers the messages that are copied. Renumbering begins with a number one higher than the last message in the destination folder. This flag is the default.
-preserve         Preserves the message numbers of copied messages. If messages with these numbers already exist, the refile command issues an error message and does not alter the contents of the folders.
-src +Folder      Identifies the source folder. By default, the system uses the current folder.
Profile Entries
The following entries are part of the UserMHDirectory/.mh_profile file:

Current-Folder:  Sets the default current folder.
Folder-Protect:  Sets the protection level for your new folder directories.
Path:  Specifies the UserMhDirectory.
rmmproc:  Specifies the program used to remove messages from a folder.

Examples
1. To refile the current message from the current folder and place it in a new folder called meetings, enter:

   refile +meetings

   The system responds with a message similar to the following:
   Create folder "/home/jeanne/Mail/meetings"?

   Enter y to create the folder. A copy of the original message is not retained in the current folder.

2. To copy the current message from the current folder and to the meetings folder, enter:

   refile -link +meetings

   The original message remains in the current folder.

3. To refile the current message draft into the test folder, enter:

   refile -draft +test

   A copy of the message draft is not retained in the current folder.

4. To refile the current message from the current folder and into several folders, enter:

   refile +tom +pat +jay

   A copy of the message is not retained in the current folder.

Files
$HOME/.mh_profile  Sets the MH user profile.
/usr/bin/refile  Contains the refile command.

Related Information
The folder command, folders command.

The .mh_alias file format, .mh_profile file format.

Mail applications in Networks and communication management.

refresh Command
Purpose
Requests a refresh of a subsystem or group of subsystems.
Syntax

refresh [-H Host] [-g Group] [-p SubsystemPID] [-s Subsystem]

Description

The refresh command sends the System Resource Controller a subsystem refresh request that is forwarded to the subsystem. The refresh action is subsystem-dependent.

Note: The refresh command is unsuccessful if the communication method for the subsystems is signals.

Flags

-g Group Specifies a group of subsystems to refresh. The refresh command is unsuccessful if the Group name is not contained in the subsystem object class.

-h Host Specifies the foreign Host machine on which this refresh action is requested. The local user must be running as "root". The remote system must be configured to accept remote System Resource Controller requests. That is, the srcmstr daemon (see /etc/inittab) must be started with the -r flag and the /etc/hosts.equiv or .rhosts file must be configured to allow remote requests.

-p SubsystemPID Specifies a particular instance of the subsystem to refresh.

-s Subsystem Specifies a subsystem to refresh. The Subsystem name can be the actual subsystem name or the synonym name for the subsystem. The refresh command is unsuccessful if Subsystem name is not contained in the subsystem object class.

Examples

1. To refresh a group, like tcpip, enter:

   refresh -g tcpip

2. To refresh a subsystem, like xntpd, enter:

   refresh -s xntpd

Files

/etc/objrepos/SRCsubsys Specifies the SRC Subsystem Configuration Object Class.

/etc/services Defines the sockets and protocols used for Internet services.

/dev/SRC Specifies the AF_UNIX socket file.

/dev/.SRC-unix Specifies the location for temporary socket files.

Related Information

The startsrc command, the stopsrc command.

The System Resource Controller in Operating system and device management.

refrsrccommand

Purpose

Refreshes the resources within the specified resource class.

Syntax

refrsrc [-h] [-TV] resource_class
Description
The `refrsrc` command refreshes the resources within the specified resource class. Use this command to
force the Resource Monitoring and Control (RMC) subsystem to detect new instances of resources in
cases where the configuration could be altered by operating system commands (`mkfs`, for example).

This command makes a request to the RMC subsystem to refresh the configuration of the resources within
a resource class. The request is actually performed by the linked resource manager.

Any application that is monitoring resources in the specified resource class may receive events as the
configuration is refreshed.

Flags

-h Writes the command’s usage statement to standard output.

-T Writes the command’s trace messages to standard error. For your software-service organization’s
use only.

-V Writes the command’s verbose messages to standard output.

Parameters

resource_class Specifies the resource class name.

Security
The user needs read permission for the `Resource_class` specified in `refrsrc` to run `refrsrc`. Permissions
are specified in the access control list (ACL) file on the contacted system. See `RSCT Administration Guide`
for information about the ACL file and how to modify it.

Exit Status

0 The command has run successfully.
1 An error occurred with RMC.
2 An error occurred with the command-line interface (CLI) script.
3 An incorrect flag was specified on the command line.
4 An incorrect parameter was specified on the command line.
5 An error occurred with RMC that was based on incorrect command-line input.

Environment Variables

CT_CONTACT
When the CT_CONTACT environment variable is set to a host name or IP address, the command
contacts the Resource Monitoring and Control (RMC) daemon on the specified host. If the
environment variable is not set, the command contacts the RMC daemon on the local system
where the command is being run. The resource class or resources that are displayed or modified
by the command are located on the system to which the connection is established.

CT_MANAGEMENT_SCOPE
Determines the management scope that is used for the session with the RMC daemon to monitor
and control the resources and resource classes. The management scope determines the set of
possible target nodes where the resources and resource classes can be monitored and controlled.
The valid values are:

0 Specifies `local` scope.
1 Specifies `local` scope.
Specifications

peer domain scope.
management domain scope.

If this environment variable is not set, local scope is used.

Implementation Specifics

This command is part of the Reliable Scalable Cluster Technology (RSCT) fileset for AIX.

Standard Output

When the -h flag is specified, this command’s usage statement is written to standard output.

The command output and all verbose messages are written to standard output.

Standard Error

All trace messages are written to standard error.

Examples

1. To refresh the configuration of the resources in class IBM.FileSystem, enter:
   refrsrc IBM.FileSystem

Location

/usr/sbin/rsct/bin/refrsrc

Contains the refrsrc command

Related Information

Books: RSCT Administration Guide, for information about RMC operations

Commands: IsrsrC, Issrscdef

Information Files: rmccli, for general information about RMC commands

refsensor Command

Purpose

Refreshes a sensor defined to the resource monitoring and control (RMC) subsystem.

Syntax

refsensor [-a | -n host1[,host2...]] [-h ] [-v | -V] name [ attr1=value1 [attr2=value2] ... ]

Description

The refsensor command refreshes a sensor resource that is defined to the resource monitoring and control (RMC) subsystem. A sensor is an RMC resource that has attributes that can be monitored. The sensor can be refreshed using refsensor in one of two ways: either by running the sensor command that is defined for the sensor resource or by specifying values for specific sensor attributes. The sensor must be monitored for refsensor to run successfully.

To have refsensor update specific sensor attributes, specify one or more attr=value parameters. Only the attributes specified will be updated. No other sensor attributes will be updated. The sensor attributes that can be specified as parameters are:

Float32 The type float32 attribute for this sensor resource.
The type `float64` attribute for this sensor resource.

The type `int32` attribute for this sensor resource.

The type `int64` attribute for this sensor resource.

The type `quantum` attribute for this sensor resource.

The type `string` attribute for this sensor resource.

The type `uint32` attribute for this sensor resource.

The type `uint64` attribute for this sensor resource.

For example, to update the sensor attributes `Int32` and `Float32` only for the sensor named `Sensor1`, enter:
```
refsensor Sensor1 Int32=45 Float32=7.8
```

No other sensor attributes will be updated.

When the `refsensor` command runs, it does not affect the interval, if any, that is defined for running the sensor command. That is, if a monitored sensor is being updated every 60 seconds, running `refsensor` does not cause the interval timer to be reset back to 60 seconds.

The `refsensor` command runs on any node. If you want `refsensor` to run on all of the nodes in a domain, use the `-a` flag. If you want `refsensor` to run on a subset of nodes in a domain, use the `-n` flag.

**Flags**

`-a` Refreshes sensors that match the specified name on all nodes in the domain. The `CT_MANAGEMENT_SCOPE` environment variable determines the cluster scope. If `CT_MANAGEMENT_SCOPE` is not set, first the management domain scope is chosen if it exists, then the peer domain scope is chosen if it exists, and then local scope is chosen, until the scope is valid for the command. The command will run once for the first valid scope found. For example, if both a management domain and a peer domain exist, `refsensor` `-a` with `CT_MANAGEMENT_SCOPE` not set will run in the management domain. In this case, to run in the peer domain, set `CT_MANAGEMENT_SCOPE` to 2.

`-n host` Specifies the node on which the sensor should be refreshed. By default, the sensor is refreshed on the local node. This flag is only appropriate in a management domain or a peer domain.

`-h` Writes the command’s usage statement to standard output.

`-v | -V` Writes the command’s verbose messages to standard output.

**Parameters**

`name` Specifies the name of the sensor to be refreshed.

`attr=value` Specifies which sensor attributes will be refreshed and the values to which they will be set.

**Security**

The user needs write permission for the `IBM.Sensor` resource class in order to run `refsensor`. Permissions are specified in the access control list (ACL) file on the contacted system. See `RSCT Administration Guide` for details on the ACL file and how to modify it.

**Exit Status**

0 The command has run successfully.
An incorrect combination of flags and parameters has been entered.
The sensor is not monitored and cannot be refreshed.
No sensor resources were found.
Based on other errors that can be returned by the RMC subsystem.

**Environment Variables**

**CT_CONTACT**
When the `CT_CONTACT` environment variable is set to a host name or IP address, the command contacts the resource monitoring and control (RMC) daemon on the specified host. If this environment variable is not set, the command contacts the RMC daemon on the local system where the command is being run. The resource class or resources that are displayed or modified by the command are located on the system to which the connection is established.

**CT_MANAGEMENT_SCOPE**
Determines the management scope that is used for the session with the RMC daemon to monitor and control the resources and resource classes. The management scope determines the set of possible target nodes where the resources and resource classes can be monitored and controlled.

The valid values are:

- 0  Specifies *local* scope.
- 1  Specifies *local* scope.
- 2  Specifies *peer domain* scope.
- 3  Specifies *management domain* scope.

If this environment variable is *not* set, *local* scope is used.

**Implementation Specifics**
This command is part of the Reliable Scalable Cluster Technology (RSCT) fileset for AIX.

**Examples**
1. To refresh the sensor called `Sensor1` so that its defined sensor command is run, enter:
   
   ```
   refsensor Sensor1
   ```

2. To refresh the sensor called `Sensor1` so that `Int32` is set to 50, `Float32` is set to 123.45, and `String` is set to “test input”, enter:
   
   ```
   refsensor Sensor1 Int32=50 Float32=123.45 String="test input"
   ```

**Location**

```
/usr/sbin/rsct/bin/refsensor
```
Contains the `refsensor` command

**Related Information**
Books: *RSCT Administration Guide*, for information about the ACL authorization file

Commands: `chsensor`, `lssensor`, `mksensor`, `rmsensor`

Information Files: `rmccli`, for information about `attr=value` syntax
regcmp Command

Purpose
Compiles patterns into C language char declarations.

Syntax
regcmp [ - ] File [ File ... ]

Description
The regcmp command compiles the patterns in File and places output in a File.i file, or a File.c file when the - option is specified. The resulting compiled patterns are initialized char declarations. Each entry in File must be a C variable name followed by one or more blanks, followed by a pattern enclosed in " " (double quotation marks).

The output of the regcmp command is C source code. A resulting File.i file can be included in C programs, and a resulting File.c file can be a file parameter to the cc command.

A C language program that uses the output of the regcmp command should use the regex subroutine to apply it to a string.

In most cases, the regcmp command makes unnecessary the use of the regcmp subroutine in a C language program, saving execution time and program size.

Flag
- Places the output in a File.c file. The default is to put the output in File.i.

Examples
1. To compile the patterns in stdin1 and the patterns in stdin2, enter:
   regcmp stdin1 stdin2

   This creates the stdin1.i and stdin2.i files.
2. To creates stdin1.c and stdin2.c files, enter:
   regcmp - stdin1 stdin2

   Note: Assuming that the same stdin1 and stdin2 files are used in both examples, the resulting stdin1.i and stdin1.c files are identical, and the resulting stdin2.i and stdin2.c files are identical.

File
/usr/ccs/bin/regcmp Contains the regcmp command.

Related Information
The regcmp or regex subroutine.

The Subroutines Overview in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.
rembak Command

Purpose
Sends a print job to a queue on a remote server.

Syntax

Description
The rembak command sends a job to be queued on a remote server. The request can either be a print job, a status request, a job cancel request, or a request to kill the remote queuing system. The server and the queue flags are required. All the other flags are optional, depending on what needs to be done.

This command should only be called by the qdaemon command. It is not intended to be entered on the command line by a user. See the enq command for details on how to issue a print job request, or use the System Manager Interface Tool (SMIT) to request a print job.

Flags
-# JobNumber
  Specifies the JobNumber to cancel.
-C
  Sends control file first. The lpd protocol allows two handshaking sequences for processing a print job. The default consists of sending the data files(s) first followed by the control file. The other sequence is to send the control file first followed by the data file(s). If -C is specified, rembak will send the control file first followed by the data file(s).
-D DebugOutputfile
  Turns on the debugging option for rembak. If no output file name is specified, or if there are any problems creating or writing to the output file, the debugging option is ignored. If the output file specified already exists, new debugging output is appended to the end of it.
-L
  Indicates a long (verbose) status request from the remote queue.
-N Filter
  Indicates the machine type of the remote server. The filter name is specified by the s_statfilter attribute in the /etc/qconfig file. Values for the filter variable include the following:
  /usr/lib/lpd/aixshort
    Indicates the server is another AIX machine.
  /usr/lib/lpd/aixv2short
    Indicates the server is an RT with an AIX Version 2 operating system.
  /usr/lib/lpd/bsdshort
    Indicates the server is a bsd machine
  /usr/lib/lpd/attshort
    Indicates the server is an AT&T machine
-o Option
  Specifies an Option to be sent to the backend on the remote server. (These Options are passed through the rembak command.)
-p
  Indicate that the port range used by rembak is restricted to ports below 1023.
-P Queue
  Specifies the name of the Queue on the remote server where the print job is sent.
-q
  Indicates a short (abbreviated) status request from the remote queue.
-R
  Restarts the remote queuing system.

  Note: The -R flag is not supported when sending a request to an operating system. The lpd daemon does not support such a request. The -R flag is supported only for compatibility with other systems.
-S Server
  Specifies the name of the remote print Server where the print request is sent.
-T  **Timeout**

Sets a timeout period, in minutes, for `rembak` to wait for acknowledgements from the remote server. If no value is specified, a default timeout of 90 seconds is used. This default is also used if Timeout is 0 or a negative value.

-**u UserName@HostName**

Cancels a print job for `UserName` that was submitted from the `HostName` machine.

**Note:** The queuing system does not support multibyte host names.

-**X**

Specifies that the `rembak` command send the `-o Option` to the remote server, even if the remote server is a non-AIX machine. If the remote is a non-AIX machine, then the `Option` is sent without the `-o` flag. Thus, `-o -abc` is sent as `-abc`.

To use the `-X` flag on a remote queue, the following line for the specific queue must be included in the `/etc/qconfig` file:

```
backend = /usr/lib/lpd/rembak -X
```

The `qprt`, `lpr` and other queuing commands are not guaranteed to work when `-X` is specified on a queue. Use the `enq` command.

-**x**

Cancels a job request. Use the `-# JobNumber` flag or the `-u UserName` flag to cancel a request.

**Examples**

1. To print the files `spinach`, `asparagus`, and `broccoli` on the queue `popeye` on the remote server `olive`, which is an RT with an AIX Version 2 operating system, enter:

   ```
   rembak -S olive -P popeye -N /usr/lib/lpd/aixv2short spinach asparagus broccoli
   ```

2. To issue a verbose status request to `olive` for the queue `popeye`, enter:

   ```
   rembak -S olive -P popeye -N /usr/lib/lpd/aixv2short -L
   ```

3. To cancel job number 23 on a remote server submitted by user `sweetpea` from machine `bluto`, which is a Version 3 machine, enter:

   ```
   rembak -S olive -P popeye -N /usr/lib/lpd/aixv2short -x -#23 -u sweetpea@bluto
   ```

**Files**

-**/usr/lib/lpd/rembak** Contains the `rembak` command.
-**/etc/hosts.lpd** Contains host names that are allowed to do print requests.
-**/etc/hosts.equiv** Contains host names that are allowed to do print requests.

**Related Information**

The `cancel` command, `chque` command, `chquedev` command, `disable` command, `enable` command, `enc` command, `ip` command, `ipd` command, `lq` command, `lp` command, `lpr command`, `lprm` command, `lpstat` command, `lsallq` command, `lsallqdev` command, `lsque` command, `lsquedev` command, `mkque` command, `mkquedev` command, `qadm` command, `qcan` command, `qchk` command, `qdaemon` command, `qpri` command, `qprt` command, `qstatus` command, `rmque` command, `rmquedev` command.

The `/etc/qconfig` file.

`Printing administration` in the *Printers and printing*.

`Print spooler` in the *Printers and printing*.

`Remote Printing Overview` in the *Printers and printing*.
**remove Command**

**Purpose**
Deletes files from `var/adm/acct/sum` and `var/adm/acct/nite` subdirectories.

**Syntax**
```
/usr/sbin/acct/remove
```

**Description**
The `remove` command deletes all `/var/adm/acct/sum(x)/wtmp*`, `/var/adm/acct/sum(x)/pacct*`, and `/var/adm/acct/nite(x)/lock*` files. The `remove` command must be scheduled with the `cron` daemon. Also, the `remove` command should be run at the end of every accounting period, rather than every night.

**Security**
Access Control: This command should grant execute (x) access only to members of the `adm` group.

**Files**
- `/usr/sbin/acct` The path to the accounting commands.
- `/var/adm/acct/nite` Contains accounting data files.
- `/var/adm/acct/nitex` Contains accounting data files when user names greater than 8 characters are used.
- `/var/adm/acct/sum` Cumulative directory for daily accounting records.
- `/var/adm/acct/sumx` Cumulative directory for daily accounting records when user names greater than 8 character are used.

**Related Information**
For more information about the Accounting System, the preparation of daily and monthly reports, and the accounting files, see the [System accounting] in Operating system and device management.

[Setting up an accounting subsystem] in Operating system and device management explains the steps you must take to establish an accounting system.

---

**removevsd Command**

**Purpose**
Removes a set of virtual shared disks.

**Syntax**
```
removevsd [-v vsd_names | -a] [-f]
```

**Description**
Use this command to remove the logical volumes associated with the virtual shared disks. Volume groups are not removed with this command.

If the virtual shared disk is configured on any of the nodes on the system partition, this command is unsuccessful, unless the `-f` flag is specified.

You can use the System Management Interface Tool (SMIT) to run this command. To use SMIT, enter:
smit delete_vsd

and select the **Remove a Virtual Shared Disk** option.

**Flags**

−v  Specifies the virtual shared disk name or names that are to be removed by this command.
−a  Specifies that the command should remove all virtual shared disks in the RSCT peer domain.
−f  Forces the system to unconfigure the virtual shared disks and remove them. If −f is not specified and any of the virtual shared disks that are to be removed are configured, the command is unsuccessful.

**Parameters**

vsd_name  Specifies a virtual shared disk. If the virtual shared disk is not in the stopped state, you will get an error message.

**Security**

You must have **root** authority to run this command.

**Restrictions**

You must issue this command from a node that is online in the peer domain. To bring a peer domain online, use the **startrpdomain** command. To bring a particular node online in an existing peer domain, use the **startrpnode** command. For more information on creating and administering an RSCT peer domain, refer to **RSCT Administration Guide**.

**Examples**

To unconfigure and remove all defined virtual shared disks in a system or system partition, enter:

```
removevsd -a -f
```

**Location**

/opt/rsct/vsd/bin/removevsd

**Related Information**

Commands: **createvsd**

---

**renice Command**

**Purpose**

Alters the nice value of running processes.

**Syntax**

```
renice [ -n Increment ] [ -g | -p | -u ] ID ...
```

**Description**

The **renice** command alters the nice value of one or more running processes. The **nice value** is the decimal value of the system scheduling priority of a process. By default, the processes affected are specified by their process IDs. When you specify a process group, the request applies to all processes in the process group.
The nice value is determined in an implementation-dependent manner. If the requested increment raises or lowers the nice value of the executed utility beyond implementation-dependent limits, the limit whose value was exceed is used.

If you do not have root user authority, you can only reset the priority of processes you own and can only increase their priority within the range of 0 to 20, with 20 being the lowest priority. If you have root user authority, you can alter the priority of any process and set the priority to any value in the range -20 to 20. The specified Increment changes the priority of a process in the following ways:

- \textbf{1 to 20} \quad \text{Runs the specified processes slower than the base priority.}
- \textbf{0} \quad \text{Sets priority of the specified processes to the base scheduling priority.}
- \textbf{-20 to -1} \quad \text{Runs the specified processes quicker than the base priority.}

The \texttt{renice} command maps these values to those actually used by the kernel.

\textbf{Notes:}
1. If you do not have root user authority, you cannot increase the nice value of processes (even if you had originally decreased their priorities).
2. You cannot use the \texttt{renice} command to change a process to run at a constant priority. To do this, use the \texttt{setpriority} system call.

\textbf{Flags}
- \texttt{-g} \quad \text{Interprets all IDs as unsigned decimal integer process group IDs.}
- \texttt{-n Increment} \quad \text{Specifies the number to add to the nice value of the process. The value of \textit{Increment} can only be a decimal integer from -20 to 20. Positive increment values cause a lower nice value. Negative increment values require appropriate privileges and cause a higher nice value.}
- \texttt{-p} \quad \text{Interprets all IDs as unsigned integer process IDs. The -p flag is the default if you specify no other flags.}
- \texttt{-u} \quad \text{Interprets all IDs as user name or numerical user IDs.}

\textbf{Exit Status}
This command returns the following exit values:

- \textbf{0} \quad \text{Successful completion}
- \textbf{>0} \quad \text{An error occurred.}

\textbf{Examples}
1. To alter the system scheduling priority so that process IDs 987 and 32 have lower scheduling priorities, enter:
   \texttt{renice -n 5 -p 987 32}
2. To alter the system scheduling priority so that group IDs 324 and 76 have higher scheduling priorities (if the user has the appropriate privileges to do so), enter:
   \texttt{renice -n -4 -g 324 76}
3. To alter the system scheduling priority so that numeric user ID 8 and user \texttt{sas} have lower scheduling priorities, enter:
   \texttt{renice -n 4 -u 8 sas}

\textbf{Files}
\texttt{/usr/sbin/renice} \quad \text{Contains the \texttt{renice} command.}
Related Information
The `nice` command.

The `getpriority` system call, `setpriority` system call.

The `Commands` in *Operating system and device management* describes how commands are processed.

The `Processes` in *Operating system and device management* discusses what processes are and input and output redirection.

The `Shells` in *Operating system and device management* describes what shells are, the different types of shells, and how shells affect the way commands are interpreted.

`Controlling contention for the microprocessor` in *Performance management*.

---

**reorgvg Command**

**Purpose**
Reorganizes the physical partition allocation for a volume group.

**Syntax**

```
reorgvg [ [-i] ] VolumeGroup [ LogicalVolume ... ]
```

**Description**

**Attention:** This command is not allowed if the volume group is varied on in concurrent mode.

The `reorgvg` command reorganizes the placement of allocated physical partitions within the `VolumeGroup`, according to the allocation characteristics of each logical volume. Use the `LogicalVolume` parameter to reorganize specific logical volumes; highest priority is given to the first logical volume name in the `LogicalVolume` parameter list and lowest priority is given to the last logical volume in the parameter list. The volume group must be varied on and must have free partitions before you can use the `reorgvg` command.

The relocatable flag of each logical volume must be set to **y** with the `chlv`-r command for the reorganization to take effect; otherwise, the logical volume is ignored.

**Notes:**

1. The `reorgvg` command does not reorganize the placement of allocated physical partitions for any striped logical volumes.
2. At least one free physical partition must exist on the specified volume group for the `reorgvg` command to run successfully.
3. To use this command, you must either have root user authority or be a member of the `system` group.
4. If you enter the `reorgvg` command with the volume group name and no other arguments, the entire volume group is reorganized.
5. The `reorgvg` command is not allowed on a snapshot volume group or a volume group that has a snapshot volume group.

You can use the Volumes application in Web-based System Manager (wsm) to change volume characteristics.
You could also use the System Management Interface Tool (SMIT) `smit reorgvg` fast path to run this command.

**Flags**

- `-i` Specifies physical volume names read from standard input. Only the partitions on these physical volumes are organized.

**Examples**

1. To reorganize logical volumes `lv03`, `lv04`, and `lv07` on volume group `vg02`, enter:
   ```
   reorgvg vg02 lv03 lv04 lv07
   ```
   Only the listed logical volumes are reorganized on `vg02`.

2. To reorganize only the partitions located on physical volumes `hdisk04` and `hdisk06` that belong to logical volumes `lv203` and `lv205`, enter:
   ```
   echo "hdisk04 hdisk06" | reorgvg -i vg02 lv203 lv205
   ```
   The partitions located on physical volumes `hdisk04` and `hdisk06` of volume group `vg02`, that belong to logical volumes `lv203` and `lv205`, are reorganized.

**Files**

/`etc` Directory where the `reorgvg` command resides.
/`tmp` Directory where the temporary files are stored while the command is running.

**Related Information**

The `chlv` command, `lslv` command, `mklv` command.

The Logical volume storage in the Operating system and device management.

For information on installing the Web-based System Manager, see Chapter 2: Installation and System Requirements in AIX 5L Version 5.3 Web-based System Manager Administration Guide.

The System management interface tool in Operating system and device management.

Logical volume and disk I/O performance in Performance management.

**repl Command**

**Purpose**

 Replies to a message.

**Syntax**

```bash
repl [ +Folder | -draftfolder ] [ +Folder | -nodraftfolder ] [ Message | -draftmessage ] [ -cc Names... ] [ -nodoc Names... ] [ -annotate | -noinplace | -inplace | -noannotate ] [ -query | -noquery ] [ -fcc +Folder ] [ -form FormFile ] [ -editor Editor ] [ -noedit ] [ -format | -noformat ] [ -width Number ] [ -whatnowproc Program | -nowhatnowproc ]
```
Description

The `repl` command starts an interface enabling you to compose a reply to a message. By default, the command drafts a reply to the current message in the current folder. If you do not specify the `--draftfolder` flag, or if the `Draft-Folder:` entry in the `$HOME/.mh_profile` file is undefined, the `repl` command searches your MH directory for a draft file. If you specify a folder, that folder becomes the current folder.

When you enter the `repl` command, the system places the `To:`, `cc:`, and `In-Reply-To:` fields in the draft and prompts you to enter the text of the reply. To exit the editor, press Ctrl-D. After exiting the editor, the `repl` command starts the MH `whatnow` command. You can see a list of available `whatnow` subcommands by pressing the Enter key at the `What now?` prompt. With these subcommands, you can re-edit, list, and send a reply, or end the processing of the `repl` command.

**Note:** A line of dashes or a blank line must be left between the header and the body of the message for the message to be identified when it is sent.

The `repl` command uses the definitions in the `/etc/mh/replcomps` file to format the reply message. You can create a `replcomps` file in your MH directory or use the `--form` flag to define an alternate reply format. To leave a copy of the original message in the reply message, use the `--filter` flag.

To annotate the original message with redistribution information, use the `--annotate` flag. This flag annotates the original message with the `Resent:` field and the current date and time. A message is annotated only if you send the reply before you exit `repl` command processing.

Flags

- **-annotate**
  Annotates the message being replied to with the time and date of the reply. You can use the `--inplace` flag to preserve links to an annotated message.

- **-cc Names**
  Specifies the users who will be listed in the `cc:` field of the reply. You can specify the following variables for `Names`: all, to, cc, and me. The default is `-cc all`.

- **-draftfolder +Folder**
  Places the draft message in the specified folder. If `+Folder` is not specified, then `Current-Folder` is assumed.

- **-draftmessage Message**
  Specifies the draft message. If you specify `-draftfolder` without the `-draftmessage` flag, the default message is new. If you specify this flag without the `-draftfolder` flag, the system creates the draft in the default file, `UserMHdirectory/draft`.

- **-editor Editor**
  Identifies the initial editor for composing the reply. If you do not specify the `-editor` flag, the `comp` command selects the default editor specified by the `Editor:` entry in your `$HOME/.mh_profile` file.

- **-fcc +Folder**
  Places a file copy of the reply in the specified folder. If you do not specify this flag, the `repl` command will not produce a file copy.

- **-filter File**
  Reformats the message being replied to and places the reformatted message in the body of the reply. You must specify a `File` variable with this flag. The `-filter` flag uses the format file acceptable to the `mhl` command.

- **+Folder**
  Identifies the folder that contains the message to reply to. If a folder is not specified, then `Current-Folder` is used.

- **-form FormFile**
  Specifies a reply format. The `repl` command treats each line in the specified format file as a format string.

- **-format**
  Removes duplicate addresses from the `To:`, `cc:`, and `Bcc:` fields and standardizes these fields using the columns specified by the `-width` flag. The `-format` flag indicates if Internet style is to be used, which serves as the default.

- **-help**
  Lists the command syntax, available switches (toggles), and version information.

  **Note:** For MH, the name of this flag must be fully spelled out.

- **-inplace**
  Forces annotation to be done in place in order to preserve links to the annotated message.
Message

Specifies a message. If you specify both a message to reply to and a message draft, you must use the -draftmessage flag. Use the following to define a message:

Number

Number of the message.

cur or  . (period)

Current message. The default reply message.

first

First message in a folder.

last

Last message in a folder.

new

New message that is created. The default draft message is new.

next

Message following the current message.

prev

Message preceding the current message.

-noannotate

Prevents annotation. This flag is the default.

-noccc Names

Allows you to specify the users who will not be listed in the cc: field of the reply.

You can specify the following for Names: all, to, cc, and me.

-nodraftfolder

Places the draft in the file UserMhDirectory/draft.

-noedit

Suppresses the initial edit.

-noformat

Suppresses both removal of duplicate addresses from the To:, cc:, and Bcc: fields, and standardization of these fields.

-noinplace

Prevents annotation in place. This flag is the default.

-noquery

Automatically builds the To: and cc: fields. This flag is the default.

-nowhatnowproc

Prevents interactive processing for the repl command. This flag prevents editing.

-query

Queries you for permission to include each address in the To: and cc: fields.

-whatnowproc Program

Starts the specified command string as the program to guide you through the reply tasks. The default is the whatnow program.

-width Number

Sets the width of the address fields. The default is 72 columns.

Profile Entries

The following entries are entered in the UserMhDirectory/mh_profile file:

<table>
<thead>
<tr>
<th>Entry</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternate-Mailboxes:</td>
<td>Specifies the mailboxes.</td>
</tr>
<tr>
<td>Current-Folder:</td>
<td>Sets the default current folder.</td>
</tr>
<tr>
<td>Draft-Folder:</td>
<td>Sets the default folder for drafts.</td>
</tr>
<tr>
<td>Editor:</td>
<td>Sets the default editor.</td>
</tr>
<tr>
<td>fileproc:</td>
<td>Specifies the program used to refile messages.</td>
</tr>
<tr>
<td>mhlproc:</td>
<td>Specifies the program used to filter the message for which you are creating a reply.</td>
</tr>
<tr>
<td>Msg-Protect:</td>
<td>Sets the protection level for the new message files.</td>
</tr>
<tr>
<td>Path:</td>
<td>Specifies the user's MH directory.</td>
</tr>
<tr>
<td>whatnowproc:</td>
<td>Specifies the program used to prompt What now? questions.</td>
</tr>
</tbody>
</table>

Examples

1. To reply to the current message in the current folder, enter:

   repl

   The system responds with text similar to the following:
To: patrick@venus
cc: tom@thomas
Subject: Re: Meeting on Monday
In-reply-to: (Your message of Thu, 21 Jul 88 13:39:34 CST.)
<8807211839.AA01868>

You can now enter your reply. When you finish entering the body of your reply, press the Ctrl-D key sequence to exit the editor. The system responds with the following:

What now?

Enter send to send the reply. If you want to see a list of subcommands, press the Enter key. In this example, you are sending a reply to the current message in the current folder.

2. To send a reply to message 4 in the inbox folder, enter:

repl Inbox 4

The system responds with a message similar to the following:

To: dawn@chaucer
cc: jay@venus
Subject: Re: Status Report
In-reply-to: (Your message of Thu, 21 Jul 88 13:39:34 CST.)
<8807211839.AA01868>

You can now enter your reply. When you finish entering the body of your reply, press the Ctrl-D key sequence to exit the editor. The system responds with the following:

What now?

Enter send to send the reply. If you want to see a list of subcommands, press the Enter key.

3. To keep track of your reply to the current message in the current folder, use the -annotate flag to place a copy of the date and time in the message you are replying to, as follows:

repl -annotate

The system responds with a message similar to the following:

To: patrick@venus
cc: tom@thomas
Subject: Re: Meeting on Friday
In-reply-to: (Your message of Mon, 17 Apr 89 13:39:34 CST.)
<8904171839.AA01868>

You can now enter your reply. When you finish entering the body of your reply, press the Ctrl-D key sequence to exit the editor. The system responds with the following:

What now?

Enter send to send the reply. If you quit the editor without sending the reply, the annotation does not occur.

Files

$HOME/.mh_profile Specifies the user's MH profile.
/etc/mh/replcomps Contains the MH default reply template.
UserMhDirectory/replcomps Contains the user's default reply form.
/usr/bin/repl Contains the repl command.
UserMhDirectory/draft Contains the current message draft.

Alphabetical Listing of Commands 615
Related Information
The \texttt{anno} command, \texttt{comp} command, \texttt{dist} command, \texttt{forw} command, \texttt{mhl} command, \texttt{send} command, \texttt{whatnow} command.

The \texttt{mh\_alias} file format, \texttt{mh\_profile} file format.

Mail applications in \textit{Networks and communication management}.

---

**replacepv Command**

**Purpose**
Replaces a physical volume in a volume group with another physical volume.

**Syntax**

\texttt{replacepv} \[ \texttt{-f} \] \{ \texttt{SourcePhysicalVolume} \ | \texttt{SourcePhysicalVolumeID} \} \texttt{DestinationPhysicalVolume}

\texttt{replacepv} \[ \texttt{-R} \] \texttt{dir\_name} \[ \texttt{DestinationPhysicalVolume} \]

**Description**
The \texttt{replacepv} command replaces allocated physical partitions and the data they contain from the \texttt{SourcePhysicalVolume} to \texttt{DestinationPhysicalVolume}. The specified source physical volume cannot be the same as \texttt{DestinationPhysicalVolume}.

**Notes:**
1. The \texttt{DestinationPhysicalVolume} size must be at least the size of the \texttt{SourcePhysicalVolume}.
2. The \texttt{replacepv} command cannot replace a \texttt{SourcePhysicalVolume} with stale logical volume unless this logical volume has a non-stale mirror.
3. The \texttt{replacepv} command is not allowed on a snapshot volume group or a volume group that has a snapshot volume group.

The allocation of the new physical partitions follows the policies defined for the logical volumes that contain the physical partitions being replaced.

**Flags**

\texttt{-f} \hspace{1cm} Forces to replace a \texttt{SourcePhysicalVolume} with the specified \texttt{DestinationPhysicalVolume} unless the \texttt{DestinationPhysicalVolume} is part of another volume group in the Device Configuration Database or a volume group that is active.

\texttt{-R \texttt{dir\_name}} \hspace{1cm} Recovers \texttt{replacepv} if it is interrupted by <ctrl-c>, a system crash, or a loss of quorum. When using the \texttt{-R} flag, you must specify the directory name given during the initial run of \texttt{replacepv}. This flag also allows you to change the \texttt{DestinationPhysicalVolume}.

**Security**
Access Control: You must have root authority to run this command.

**Examples**
1. To replace physical partitions from \texttt{hdisk1} to \texttt{hdisk6}, enter:

\texttt{replacepv \textit{hdisk1} \textit{hdisk6}}
Files

/usr/sbin Directory where the replacepv command resides.
/tmp Directory where the temporary files are stored while the command is running.

Related Information

The migratepv command.

Logical volume storage in Operating system and device management.

For information on installing the Web-based System Manager, see Chapter 2: Installation and System Requirements in AIX 5L Version 5.3 Web-based System Manager Administration Guide.

System management interface tool in Operating system and device management.


repquota Command

Purpose
Summarizes quotas for a file system.

Syntax
repquota [-v] [-c] [-g] [-u] [-l] [ -a | FileSystem ... ]

Description
The repquota command prints a summary of quotas and disk usage for a file system specified by the FileSystem parameter. If the -a flag is specified instead of a file system, the repquota command prints the summary for all file systems enabled with quotas in the /etc/filesystems file. By default, both user and group quotas are printed.

For each user or group, the repquota command prints:
- Number of existing user or group files
- Amount of disk space being used by the user or group
- User or group quotas

Flags

- -a Specifies that quotas are printed for all file systems enabled with quotas in the /etc/filesystems file.
- -c Changes the output of the command to a colon-delineated format.
- -g Specifies that only group quotas are printed.
- -l Enables long user names to be printed on the repquota report. The default behavior of the report will be to truncate the name at 9 characters. If the -l option is specified, the full user name will be used.
- -u Specifies that only user quotas are printed.
- -v Prints a header line before the summary of quotas for each file system.

Security
Access Control: Only the root user can execute this command.
Examples
To print a summary of user quotas in the /u file system, enter:

```
repquota -u /u
```

The system prints the following information:

<table>
<thead>
<tr>
<th>User</th>
<th>Block limits</th>
<th>File limits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>used</td>
<td>soft</td>
</tr>
<tr>
<td>root</td>
<td>--</td>
<td>3920</td>
</tr>
<tr>
<td>davec</td>
<td>+</td>
<td>28</td>
</tr>
<tr>
<td>keith</td>
<td>--</td>
<td>48</td>
</tr>
</tbody>
</table>

The + printed in the first column next to davec indicates that the user has exceeded established block limits. If there were a + in the second column, it would indicate that the user had exceeded established file limits.

Files

- `quota.user` Specifies user quotas.
- `quota.group` Specifies group quotas.
- `/etc/filesystems` Contains file system names and locations.
- `/etc/group` Contains basic group attributes.
- `/etc/passwd` Contains user names and locations.

Related Information

The `quota` command, `quotaon` and `quotaoff` commands, `edquota` command, `quotacheck` command.

The Disk quota system overview in Security.

Setting up the disk quota system in Security.

reset Command

Purpose
Initializes terminals.

Syntax

```
reset [e C][k C][l C][h C][s][n][j ][q][m] [Identifier] [TestBaudRate] :Type ] ... [ Type ]
```

Description

The `reset` command is a link to the `tset` command. If the `tset` command is run as the `reset` command, it performs the following actions before any terminal-dependent processing is done:

- Set Cooked and Echo modes to on
- Turn off cbreak and Raw modes
- Turn on new-line translation
- Restore special characters to a sensible state.

Any special character that is found to be NULL or -1 is reset to its default value. All flags to the `tset` command can be used with the `reset` command.
The reset command is most useful when a program dies and leaves a terminal in an undesirable state. The sequence <LF>reset<LF> (where <LF> is Ctrl-J, the line feed) may be required to get the reset command to run successfully since carriage-return might not work in this state. The <LF>reset<LF> sequence frequently will not be echoed.

Flags

- The name of the terminal decided upon is output to standard output. This is intended to be captured by the shell and placed in the TERM environment variable.
- e C Set the erase character to the character specified by the C variable on all terminals. The default is the backspace character on the terminal, usually ^ (cedilla). The character C can either be typed directly or entered using the ^ (cedilla).
- i Suppresses transmission of terminal initialization strings.
- i C Is similar to the -e flag, but uses the interrupt character rather than the erase character. The C variable defaults to ^C. The ^ character can also be used for this option.
- k C Is similar to the -e flag, except uses the line-kill character rather than the erase character. The C variable defaults to ^X. The kill character is left alone if -k is not specified. The ^ character can also be used for this option.
- m Identifier TestbaudRate:Type Specifies which terminal type (in the Type parameter) is usually used on the port identified in the Identifier parameter. A missing identifier matches all identifiers. You can optionally specify the baud rate in the TestBaudRate parameter.
- n On systems with the Berkeley 4.3 tty driver, specifies that the new tty driver modes should be initialized for this terminal. For a CRT, the CRTERASE and CRTKILL modes are set only if the baud rate is 1200 bps or greater. See the tty file for more information.
- Q Suppresses printing of the Erase set to and Kill set to messages.
- s Prints the sequence of csh commands that initialize the TERM environment variable, based on the name of the terminal decided upon.

Files

/usr/share/lib/terminfo/?/* Contains the terminal capability database.

Related Information

The csh command, sh command, stty command, tset command.

The environ file, terminfo file format.

TERM Values for Different Displays and Terminals section of TTY terminal device in Networks and communication management.

resize Command

Purpose
Sets the TERMCPAP environment variable and terminal settings to the current window size.

Syntax
resize [ -c | -u ] [ -s [ Rows Columns ] ]
Description

The `resize` command utility prints a shell command for setting the `TERM` and `TERMCAP` environment variables to indicate the current size of the xterm window from which the command is run. For this output to take effect, the `resize` command must either be evaluated as part of the command line (usually done with a shell alias or function) or else be redirected to a file that can then be read in. From the C shell (usually known as `/bin/csh`), the following alias could be defined in the user's `.cshrc` file:

```bash
% alias rs 'set noglob; `eval resize`'
```

After resizing the window, the user would enter:

```bash
% rs
```

Users of versions of the Bourne shell (usually known as `/bin/sh`) that do not have command functions will need to send the output to a temporary file and then read it back in with the `. (dot)` command:

```bash
$ resize >/tmp/out
$ . /tmp/out
```

Flags

- `-c` Indicates that C shell commands should be generated even if the user's current shell is not `/bin/csh`.
- `-u` Indicates that Bourne shell commands should be generated even if the user's current shell is not a Bourne shell.
- `-s [Rows Columns]` Indicates that Sun console escape sequences will be used instead of the special xterm escape code. If the `Rows` and `Columns` parameters are given, the `resize` command will ask the xterm window to resize itself. However, the window manager may choose to disallow the change.

Note: The `-c` or `-u` must appear to the left of `-s` if both are specified.

File

`/etc/termcap` Provides modification for the base termcap entry.

Related Information

The `csh` command, `set` command, `xterm` command.

restart-secdapcIntd Command

Purpose

The `restart-secdapcIntd` script is used to stop the currently running `secdapcIntd` daemon process and then restart it.

Syntax

```
```

Description

The `restart-secdapcIntd` script stops the `secdapcIntd` daemon if it is running, and then restarts it. If the `secdapcIntd` daemon is not running, it simply starts it.
Flags
By default, the `secdapclntd` daemon reads the configuration information specified in the `/etc/security/ldap/ldap.cfg` file at startup. If the following options are given in command line when starting `secdapclntd` process, the options from the command line will overwrite the values in the `/etc/security/ldap/ldap.cfg` file.

- **C CacheSize** Sets the maximum cache entries used by the `secdapclntd` daemon to CacheSize number of entries. Valid range is 100-10,000 entries for user cache. The default is 1000. The group cache entries will be 10% of the user cache entries.
- **o ldapTimeOut** Timeout period in seconds for LDAP client requests to the server. This value determines how long the client will wait for a response from the LDAP server. Valid range is 0 - 3600 (1 hour). Default is 60 seconds. Set this value to 0 to disable the timeout and force the client to wait indefinitely.
- **p NumOfThread** Sets the number of thread used by the `secdapclntd` daemon to NumOfThread threads. Valid range is 1-1000. The default is 10.
- **t CacheTimeout** Sets the cache to expire in CacheTimeout seconds. Valid range is 60-3600 seconds. The default is 300 seconds.
- **T HeartBeatIntv** Sets the time interval of heartbeat between this client and the LDAP server. Valid values are 60-3,600 seconds. Default is 300.

Examples
1. To restart the `secdapclntd` daemon, type:
   `/usr/sbin/restart-secdapclntd`
2. To restart the `secdapclntd` with using 30 threads and cache timeout value of 500 seconds, type:
   `/usr/sbin/restart-secdapclntd -p 30 -t 500`

Files
`/etc/security/ldap/ldap.cfg` Contains information needed by the secdapclntd daemon to connect to the server.

Related Information
The `secdapclntd` daemon

The `mksecdap`, `stop-secdapclntd`, `start-secdapclntd`, `ls-secdapclntd` and `flush-secdapclntd` commands.

The `/etc/security/ldap/ldap.cfg` file.

restbase Command

Purpose
Reads the base-customized information from the boot image, and restores it into the Device Configuration database used during system boot phase 1.

Syntax
`restbase [ -o File ] [ -d Path ] [ -v ]`

Description
The `restbase` command reads the base-customized information from the boot disk and puts it in the specified Device Configuration database directory. By default, the base information is read from the boot disk. If no Device Configuration database directory is specified, then the `restbase` command restores this
information into the `/etc/objrepos` directory. You can use the `-o` flag to specify a file, other than the boot disk, from which to read the base-customized information.

**Attention:** The `restbase` command is intended to be executed only during phase 1 of system boot. Do not execute it in a run-time environment or you could destroy the Device Configuration database.

## Flags

- `-o File` Specifies a file that contains base-customized data.
- `-d Path` Specifies a directory containing the base Device Configuration database.
- `-v` Causes verbose output to be written to standard output.

## Examples

1. To restore base-customized information and see verbose output, enter:
   ```
   restbase -v
   ```
2. To restore base information into an alternate device database, enter:
   ```
   restbase -d /tmp/objrepos
   ```

## Files

- `/usr/lib/objrepos/PdDv` Contains entries for all known device types supported by the system.
- `/etc/objrepos/CuDv` Contains entries for all device instances defined in the system.
- `/etc/objrepos/CuAt` Contains customized device-specific attribute information.
- `/etc/objrepos/CuDep` Describes device instances that depend on other device instances.
- `/etc/objrepos/CuDvDr` Stores information about critical resources that need concurrency management through the use of the Device Configuration Library routines.

## Related Information

The `bosboot` command, `savebase` command.

### Device Configuration Subsystem: Programming Introduction


### Object Data Manager (ODM) Overview for Programmers

`Object Data Manager (ODM) Overview for Programmers` in *AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs*.

### List of Device Configuration Commands

`List of Device Configuration Commands` in *AIX 5L Version 5.3 Kernel Extensions and Device Support Programming Concepts*.

## restore Command

### Purpose

Extracts files from archives created with the `backup` command.

### Syntax

**To Restore Files Archived by File Name**

```
restore [-x] [dMnqve] [-b Number] [f Device] [-s SeekBackup] [-p] [-x VolumeNumber] [ File ...
```
To List Files Archived by File Name
restore [-T [a|b|c|v]] [-b Number] [-f Device] [-s SeekBackup] [-p ]

To Restore Files Archived by File System
restore [-r [B|h|q|v]] [-b Number] [-f Device] [-s SeekBackup] [-p ]

To Restore Files Archived by File System
restore [-R [B|h|q|v]] [-b Number] [-f Device] [-s SeekBackup] [-p ]

To Restore Files Archived by File System
restore [-i [h|m|h|q|v]] [-b Number] [-f Device] [-s SeekBackup] [-p ] [ File ... ]

To List Files Archived by File System
restore [-t | -T [B|a|b|c|v]] [-b Number] [-f Device] [-s SeekBackup] [-p ] [ File ... ]

To Restore File Attributes Archived by File Name
restore [-Pstring] [B|d|q] [-b Number] [-s SeekNumber] [-p ] [-f Device] [ File ... ]

To Restore File Attributes Archived by File System
restore [-Pstring] [h|q|v] [-b Number] [-s SeekNumber] [-p ] [-f Device] [ File ... ]

Description
The restore command reads archives created by the backup command and extracts the files stored on them. These archives can be in either file-name or file-system format. An archive can be stored on disk, diskette, or tape. Files must be restored using the same method by which they were archived. This requires that you know the format of the archive. The archive format can be determined by examining the archive volume header information that is displayed when using the -T flag. When using the -x, -r, -T, or -t flags, the restore command automatically determines the archive format.

Note: restore actively sparses files that are being restored. If a file has block aligned and sized areas that are NULL populated, then restore does not cause physical space for those filesystem blocks to be allocated. The size in bytes of the file remain the same, but the actual space taken within the filesystem is only for the non-NULL areas.

Individual files can be restored from either file-name or file-system archives by using the -x flag and specifying the file name. The file name must be specified as it exists on the archive. Files can be restored interactively from file-system archives using the -i flag. The names of the files on an archive can be written to standard output using the -T flag.

Users must have write access to the file system device or have Restore authorization in order to extract the contents of the archive.

The diskette device, /dev/rfd0, is the default media for the restore command. To restore from standard input, specify a - (dash) with the -f flag. You can also specify a range of devices, such as /dev/rmt0-2.

Notes:
1. If you are restoring from a multiple-volume archive, the restore command reads the volume mounted, prompts you for the next volume, and waits for your response. After inserting the next volume, press the Enter key to continue restoring files.
2. If an archive, created using the backup command, is made to a tape device with the device block size set to 0, it may be necessary for you to have explicit knowledge of the block size that was used when the tape was created in order to restore from the tape.
3. Multiple archives can exist on a single tape. When restoring multiple archives from tape, the `restore` command expects the input device to be a no-retension-on-open, no-rewind-on-close tape device. Do not use a no-rewind tape device for restoring unless either the `-B`, `-s`, or `-X` flag is specified. For more information on using tape devices, see the `rmt` special file.

File-System Archives

File-system archives are also known as i-node archives due to the method used to archive the files. A file-system name is specified with the `backup` command, and the files within that file system are archived based on their structure and layout within the file system. The `restore` command restores the files on a file-system archive without any special understanding of the underlying structure of the file system.

When restoring file-system archives, the `restore` command creates and uses a file named `restore_symtable`. This file is created in the current directory. The file is necessary for the `restore` command to do incremental file-system restores.

**Note:** Do not remove the `restore_symtable` file if you perform incremental file-system backups and restores.

The `File` parameter is ignored when using either the `-r` or the `-R` flag.

File-Name Archives

File-name archives are created by specifying a list of file names to archive to the `backup` command. The `restore` command restores the files from a file-name archive without any special understanding of the underlying structure of the file system. The `restore` command allows for metacharacters to be used when specifying files for archive extraction. This provides the capability to extract files from an archive based on pattern matching. A pattern filename should be enclosed in single quotations, and patterns should be enclosed in brackets (...).

About Sparse Files

Operating system filesystems, files containing long strings of NULLs can be stored much more efficiently than other files. To be specific, if a string of NULLs spans an entire allocation block, that whole block is not stored on disk at all. Files where one or more blocks are omitted in this way are called sparse files. The missing blocks are also known as holes.

**Note:** Sparse files are not the same as compressed files. Sparse files are exactly the same as their non-sparse equivalents when they are read.

Sparse files are generally created by database applications. Since whenever a database file is created it is formatted with NULLs. These fragments may be either filled with allocated or unallocated NULLs.

Flags

- `-a` Specified with the `t` and/or `T` option, the `-a` option displays the list of files in the archive, along with their permissions.

- `-B` Specifies that the archive should be read from standard input. Normally, the `restore` command examines the actual medium to determine the backup format. When using a `|` (pipe), this examination cannot occur. As a result, the archive is assumed to be in file-system format, and the device is assumed to be standard input (`-f` -).
-b Number

For backups done by name, specifies the number of 512-byte blocks; for backups done by i-node, specifies the number of 1024-byte blocks to read in a single output operation. When the restore command reads from tape devices, the default is 100 for backups by name and 32 for backups by i-node.

The read size is the number of blocks multiplied by the block size. The default read size for the restore command reading from tape devices is 51200 (100 * 512) for backups by name and 32768 (32 * 1024) for backups by i-node. The read size must be an even multiple of the tapes physical block size. If the read size is not an even multiple of the tapes physical block size and it is in fixed block mode (nonzero), the restore command tries to determine a valid value for Number. If successful, the restore command changes Number to the new value, writes a message about the change to standard output, and continues. If unsuccessful in finding a valid value for Number, the restore command writes an error message to standard error and exits with a nonzero return code. Larger values for the Number parameter result in larger physical transfers from the tape device.

The value of the -b flag is always ignored when the restore command reads from diskette. In this case, the command always reads in clusters that occupy a complete track.

-d

Indicates that, if the File parameter is a directory, all files in that directory should be restored. This flag can only be used when the archive is in file-name format.

-e

Restores the non sparse files as non sparse as they were archived by the name format of backup command for both packed and unpacked files. It is necessary to know the sparseness/non-sparseness of the file(s) before archiving the files, since enabling this flag restores the sparse files as non-sparse.

This flag should be enabled only if files are to be restored are non sparse consisting of more than 4K NULLs. If the -e flag is specified during restore, it successfully restores all normal files normally and non-sparse database files as non sparse.

-E

The -E option requires one of the following arguments. If you omit the -E option, warn is the default behavior.

- force Fails the restore operation on a file if the fixed extent size or space reservation of the file cannot be preserved.

- ignore Ignores any errors in preserving extent attributes.

- warn Issues a warning if the space reservation or the fixed size of the file cannot be preserved.

-f Device

Specifies the input device. To receive input from a named device, specify the Device variable as a path name (such as /dev/rmt0). To receive input from the standard output device, specify a - (minus sign). The - (minus) feature enables you to pipe the input of the restore command from the dd command.

You can also specify a range of archive devices. The range specification must be in the following format:

/dev/deviceXXX-YYY

where XXX and YYY are whole numbers, and XXX must always be less than YYY; for example, /dev/rfd0-3.

All devices in the specified range must be of the same type. For example, you can use a set of 8mm, 2.3GB tapes or a set of 1.44MB diskettes. All tape devices must be set to the same physical tape block size.

If the Device variable specifies a range, the restore command automatically goes from one device in the range to the next. After exhausting all of the specified devices, the restore command halts and requests that new volumes be mounted on the range of devices.
-h
Restores only the actual directory, not the files contained in it. This flag can only be used when the archive is in file-system format. This flag is ignored when used with the -r or -R flags.

-i
Allows you to interactively restore selected files from a file-system archive. The subcommands for the -i flag are:

  cd Directory
  Changes the current directory to the specified directory.

  add [File]
  Specifies that the File parameter is added to the list of files to extract. If File is a directory, that directory and all the files contained in it are added to the extraction list (unless the -h flag is used). If File is not specified, the current directory is added to the extraction list.

  delete [File]
  Specifies that the File parameter is to be removed from the list of files to be extracted. If File is a directory, that directory and all the files contained in it are removed from the extraction list (unless the -h flag is used).

  ls [Directory]
  Displays the directories and files contained within the Directory parameter. Directory names are displayed with a / (slash) after the name. Files and directories, within the specified directory, that are on the extraction list are displayed with an * (asterisk) before the name. If verbose mode is on, the i-node number of the files and directories is also displayed. If the Directory parameter is not specified, the current directory is used.

  extract
  Restores all the directories and files on the extraction list.

  pwd
  Displays the full path name of the current directory.

  verbose
  Causes the ls subcommand to display the i-node number of files and directories. Additional information about each file is also displayed as it is extracted from the archive.

  setmodes
  Sets the owner, mode, and time for all directories added to the extraction list.

  quit
  Causes restore to exit immediately. Any files on the extraction list are not restored.

  help
  Displays a summary of the subcommands.

-li
Specified with the -t and -T option. When specified, displays a detailed list of files, which includes the timestamp, file permissions, file size, owner, and group. The -i option overrides the -a option.

-M
Sets the access and modification times of restored files to the time of restoration. If a restored file is an archive created by the ar command, the modification times in all the member headers are also set to the time of restoration. You can specify the -M flag only when you are restoring individually named files and only if the -x or -X flags are also specified. When the -M flag is not specified, the restore command maintains the access and modification times as they appear on the backup medium.

The -M flag is used when the data is in the AIX 4.2 backup by-i-node or by-name format.

-m
Renames restored files to the file’s i-node number as it exists on the archive. This is useful if a few files are being restored and you want these files restored under a different file name. Since any restored archive members are renamed to their i-node numbers, directory hierarchies and links are not preserved. Directories and hard links are restored as regular files. The -m flag is used when the archive is in file-system format.

-n
By default the restore command will restore any ACLs, PCLs, or named extended attributes in the archive. The -n option causes the restore command to skip over any ACLs, PCLs, or named extended attributes in the archive and not restore them.
Places the tape head at the beginning of the archive that is specified by the \texttt{-s} option.

The \texttt{-s} option requires that you specify a no-rewind, no-retension tape device.

\textbf{-Pstring}

Restores only the file attributes. Does not restore the file contents. If the file specified does not exist in the target directory path, the files is not created. This flag restores file attributes selectively depending on the flags specified in the string parameter. String parameter can be a combination of the following characters:

\begin{itemize}
  \item \texttt{A} restore all attributes.
  \item \texttt{a} restore only the permissions of the files.
  \item \texttt{o} restore only the ownership of the files.
  \item \texttt{t} restore only the timestamp of the files.
  \item \texttt{c} restore only the ACL attributes of the files.
\end{itemize}

\textbf{Note:} Among the existing options for the `restore` command, options \texttt{v, h, b, s, f, B, d, and q} are valid with the \texttt{P} option. The \texttt{P} option can be used with both file-name and filesystem archives. If the \texttt{File} argument is a symbolic link, then the metadata of the target file will be modified and not that of the symbolic link.

\textbf{Warning:} Usage of \texttt{-P} flag will overwrite the attributes of files owned by another user when executed by the superuser.

\textbf{-Q}

For backups done by name, specifies that the command should exit upon encountering any type of error rather than attempt to recover and continue processing the archive.

\textbf{-q}

Specifies that the first volume is ready to use and that the `restore` command should not prompt you to mount the volume and hit Enter. If the archive spans multiple volumes, the `restore` command prompts you for the subsequent volumes.

\textbf{-r}

Restores all files in a file-system archive. The \texttt{-r} flag is only used to restore complete level 0 backups or to restore incremental backups after a level 0 backup is restored.

The `restoresymtable` file is used by `restore` to pass information between incremental restores. This file should be removed once the last incremental backup is restored. The \texttt{File} parameter is ignored when using the \texttt{-r} flag.

\textbf{-R}

Requests a specific volume of a multiple-volume, file-system archive. The \texttt{-R} flag allows a previously interrupted restore to be restarted. The \texttt{File} parameter is ignored when using the \texttt{-R} flag. Once restarted, the `restore` command behavior is the same as with the \texttt{-r} flag.

\textbf{-s SeekBackup}

Specifies the backup to seek and restore on a multiple-backup tape archive. The \texttt{-s} flag is only applicable when the archive is written to a tape device. To use the \texttt{-s} flag properly, a no-rewind-on-close and no-retension-on-open tape device, such as \texttt{/dev/rmt0.1} or \texttt{/dev/rmt0.5}, must be specified. If the \texttt{-s} flag is specified with a rewind tape device, the `restore` command displays an error message and exits with a nonzero return code. If a no-rewind tape device is used and the \texttt{-s} flag is not specified, a default value of 1 is used. The value of the \texttt{SeekBackup} parameter must be in the range of 1 to 100 inclusive. It is necessary to use a no-rewind-on-close, no-retension-on-open tape device because of the behavior of the \texttt{-s} flag. The value specified with \texttt{-s} is relative to the position of the tapes read/write head and not to an archives position on the tape. For example, to restore the first, second, and fourth backups from a multiple-backup tape archive, the respective values for the \texttt{-s} flag would be \texttt{-s 1}, \texttt{-s 1}, and \texttt{-s 2}.

\textbf{-t}

Displays information about the backup archive. If the archive is in file-system format, a list of files found on the archive is written to standard output. The name of each file is preceded by the i-node number of the file as it exists on the archive. The file names displayed are relative to the root (/) directory of the file system that was backed up. If the \texttt{File} parameter is not specified, all the files on the archive are listed. If the \texttt{File} parameter is used, then just that file is listed. If the \texttt{File} parameter refers to a directory, all the files contained in that directory are listed. If the archive is in file-name format, information contained in the volume header is written to standard error. This flag can be used to determine if the archive is in file-name or file-system format.
Displays information about the backup archive. If the archive is in file-name format, the information contained in the volume header is written to standard error, and a list of files found on the archive is written to standard output. The File parameter is ignored for file-name archives. If the archive is in file-system format, the behavior is identical to the -T flag.

Displays additional information when restoring. If the archive is in file-name format and either the -x or -T flag is specified, the size of the file as it exists on the archive is displayed in bytes. Directory, block, or character device files are archived with a size of 0. Symbolic links are listed with the size of the symbolic link. Hard links are listed with the size of the file, which is how they are archived. Once the archive is read, a total of these sizes is displayed. If the archive is in file-system format, directory and nondirectory archive members are distinguished.

Restores individually named files specified by the File parameter. If the File parameter is not specified, all the archive members are restored. If the File parameter is a directory and the archive is in file-name format, only the directory is restored. If the File parameter is a directory and the archive is in file-system format, all the files contained in the directory are restored. The file names specified by the File parameter must be the same as the names shown by the restore -T command. Files are restored with the same name they were archived with. If the file name was archived using a relative path name (/filename), the file is restored relative to the current directory. If the archive is in file-system format, files are restored relative to the current directory.

The restore command automatically creates any needed directories. When using this flag to restore file-system backups, you are prompted to enter the beginning volume number.

The restore command allows for shell-style pattern matching metacharacters to be used when specifying files for archive extraction. The rules for matching metacharacters are the same as those used in shell pathname "globbing," namely:

* (asterisk) Matches zero or more characters, but not a '.' (period) or '/' (slash).

? (question mark) Matches any single character, but not a '.' (period) or '/' (slash).

[] (brackets) Matches any one of the characters enclosed within the brackets. If a pair of characters separated by a dash are contained within the brackets, the pattern matches any character that lexically falls between the two characters in the current local. Additionally, a '.' (period) or a '/' (slash) within the brackets will not match a a '.' (period) or a '/' (slash) in a file name.

\ (backslash) Matches the immediately following character, preventing its possible interpretation as a metacharacter.

-Begins restoring from the specified volume of a multiple-volume, file-name backup. Once started, the restore command behavior is the same as with the -x flag. The -X flag applies to file-name archives only.

Continues restoring when tape errors are encountered. Normally, the restore command asks you whether or not to continue. In either case, all data in the read buffer is replaced with zeroes. The -y flag applies only when the archive is in file-system format.

Displays a usage message.

Exit Status
This command returns the following exit values:

0 Successful completion.
>0 An error occurred.
Examples

1. To list the names of files in either a file-name or file-system archive on the diskette device `/dev/rfd0`, type:

   restore -Tq

   The archive is read from the `/dev/rfd0` default restore device. The names of all the files and directories contained in the archive are displayed. For file-system archives, the file name is preceded by the i-node number of the file as it exists on the archive. The `-q` flag tells the `restore` command that the first volume is available and is ready to be read. As a result, you are not prompted to mount the first volume.

2. To restore a specific file, type:

   restore -xvqf myhome.bkup system.data

   This command extracts the file `system.data` into the current directory from the archive `myhome.bkup`. The archive in this example is in the current directory. File and directory names must be specified as they are displayed when using the `-T` flag. The `-v` flag displays additional information during the extraction. This example applies to both file-name and file-system archives.

3. To restore a specific directory and the contents of that directory from a file-name archive, type:

   restore -xdvqf /dev/rmt0 /home/mike/tools

   The `-x` flag tells `restore` to extract files by their file name. The `-d` tells `restore` to extract all the files and subdirectories in the `/home/mike/tools` directory. File and directory names must be specified as they are displayed when using the `-T` flag. If the directories do not exist, they are created.

4. To restore a specific directory and the contents of that directory from a file-system archive, type:

   restore -xvqf /dev/rmt0 /home/mike/tools

   This command extracts files by file name. File and directory names must be specified as they are displayed when using the `-T` flag. If the directories do not exist, they are created.

5. To restore an entire file-system archive, type:

   restore -rvqf /dev/rmt0

   This command restores the entire file system archived on the tape device, `/dev/rmt0`, into the current directory. This example assumes you are in the root directory of the file system to be restored. If the archive is part of a set of incremental file-system archives, the archives should be restored in increasing backup-level order beginning with level 0 (for example, 0, 1, 2).

6. To restore the fifth and ninth backups from a single-volume, multiple-backup tape, type:

   restore -xvqs 5 -f/dev/rmt0.1
   restore -xvqs 4 -f/dev/rmt0.1

   The first command extracts all files from the fifth archive on the multiple-backup tape specified by `/dev/rmt0.1`. The .1 designator specifies the tape device will not be retensioned when it is opened and that it will not be rewound when it is closed. It is necessary to use a no-rewind-on-close, no-retension-on-open tape device because of the behavior of the `-s` flag. The second command extracts all the files from the fourth archive (relative to the current location of the tape head on the tape). After the fifth archive has been restored, the tape read/write head is in a position to read the archive. Since you want to extract the ninth archive on the tape, you must specify a value of 4 with the `-s` flag. This is because the `-s` flag is relative to your position on the tape and not to an archives position on the tape. The ninth archive is the fourth archive from your current position on the tape.

7. To restore the fourth backup, which begins on the sixth tape on a 10-tape multiple-backup archive, put the sixth tape into the tape drive and type:

   restore -xcs 2 -f /dev/rmt0.1 /home/mike/manual/chap3
Assuming the fourth backup is the second backup on the sixth tape, specifying -s 2 advances the tape head to the beginning of the second backup on this tape. The restore command then restores the specified file from the archive. If the backup continues onto subsequent volumes and the file has not been restored, the restore command instructs you to insert the next volume until the end of the backup is reached. The -f flag specifies the no-rewind, no-retension tape device name.

**Note:** The -s flag specifies the backup number relative to the tape inserted in the tape drive, not to the overall 10-tape archive.

8. To improve the performance on streaming tape devices, pipe the dd command to the restore command by typing:

```
dd if=/dev/rmt0 bs=64b | restore -xf -b64
```

The dd command reads the archive from the tape using a block size of 64 512-byte blocks and writes the archive to standard output. The restore command reads the standard input using a block size of 64 512-byte blocks. The value of the block size used by the dd command to read the archive from the tape must be an even multiple of the block size that was used to create the tape with the backup command. For example, the following backup command could be used to create the archive that this example extracts:

```
find /home -print | backup -ivqf/dev/rmt0 -b64
```

This example applies to archives in file-name format only. If the archive was in file-system format, the restore command should include the -B flag.

9. To improve the performance of the restore command on the 9348 Magnetic Tape Unit Model 12, you can change the block size by typing:

```
chdev -l DeviceName -a BlockSize=32k
```

10. To restore non sparse database files, type:

```
restore -xef /dev/rmt0
```

11. To restore files that were sparse before archive as sparse, type:

```
restore -xf /dev/rmt0
```

12. To restore only the permissions of the files from the archive, type:

```
restore -Pa -vf /dev/rmt0
```

13. To restore only the ACL attributes of the files from the archive, type:

```
restore -Pc -vf /dev/rmt0
```

14. To view the table of contents along with the file permissions, type:

```
restore -Ta -vf /dev/rmt0
```

15. To view the table of contents of file-name archive along with the timestamps and file permissions, type:

```
restore -Tl -vf /dev/rmt0
```

16. To view the table of contents of file-system archive along with the timestamps and file permissions, type:

```
restore -tl -vf /dev/rmt0
```

### Files

- `/dev/rfd0` Specifies the default restore device.
- `/usr/sbin/restore` Contains the `restore` command.

### Related Information

The `ar` command, `backup` command, `mkfs` command, `fsck` command, `dd` command.

The `filesystems` file, `backup` file, `rmt` special file.

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The **Backup methods** in *Operating system and device management*.

The **File systems** in *Operating system and device management* explains file system types, management, structure, and maintenance.

The **System management interface tool** in *Operating system and device management*.

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**restorevgfiles Command**

**Purpose**
Restores files from a backup source.

**Syntax**
```
restorevgfiles [ -b blocks ] [ -f device ] [ -a ] [ -n ] [ -s ] [ -d path ] [ -D ] [ file_list ]
```

**Description**
The `restorevgfiles` command restores files from tape, file, CD-ROM, or their volume group backup source. The `restorevgfiles` command also works for multi-volume backups such as multiple CDs, DVDs, or tapes.

The `restorevgfiles` and `listvgbackup -r` commands perform identical operations and should be considered interchangeable. The `restorevgfiles` command automatically applies the `-r` flag. The `-r` flag, while redundant, is retained for compatibility purposes and will cause no unusual behavior if specified. For a complete description of the `-r` flag, see the `listvgbackup` command.

**Flags**
- `-b blocks` Specifies the number of 512-byte blocks to read in a single input operation, as defined by the `blocks` parameter. If the `blocks` parameter is not specified, the number of blocks read will default to 100.
- `-f device` Specifies the type of device containing the backup (file, tape, CD-ROM, or other source) as defined by the `device` parameter. When `-f` is not specified, `device` will default to `/dev/rmt0`.
- `-a` Verifies the physical block size of the tape backup, as specified by the `-b block` flag. You may need to alter the block size if necessary to read the backup. The `-a` flag is valid only when a tape backup is used.
- `-n` Does not restore ACLs, PCLs, or extended attributes.
- `-s` Specifies that the backup source is a user volume group and not `rootvg`.
- `-d path` Specifies the directory path to which the files will be restored, as defined by the `path` parameter. If the `-d` parameter is not used, the current working directory is used. This can be a problem if the current working directory is root. We recommend writing to a temporary folder instead of to root.
- `-D` Produces debug output.

**Parameters**
- `file_list` Identifies the list of files to be restored. The full path of the files relative to the current directory should be specified in the space-separated list. All files in the specified directory will be restored unless otherwise directed. If you are restoring all files in a directory, we recommend writing to a temporary folder instead of to root.

**Examples**
1. To read the backup stored at `/dev/cd1` and restore all files to the `/data/myfiles` directory, enter:
   ```
   restorevgfiles -f /dev/cd1 -s -d /data/myfiles
   ```
2. To read the user vg backup from the default device at 20 512-byte blocks at a time and restore the /myapp/app.h file to the current directory, enter:
   
   restorevgfiles -b 20 -s .,/myapp/app.h

3. To read the backup stored at /dev/cd1 and restore the /myapp/app.c file to the /data/testcode directory, enter:
   
   restorevgfiles -f /dev/cd1 -s -d /data/testcode .,/myapp/app.c

Files

/usr/bin/restorevgfiles | Contains the restorevgfiles command

Related Information

The listvgbackup command.

restvg Command

Purpose
Restores the user volume group and all its containers and files.

Syntax

restvg [ -b Blocks ] [ -d FileName ] [ -f Device ] [ -r ] [ -s ] [ -n ] [ -P PPsize ] [ DiskName ... ]

Description

The restvg command restores the user volume group and all its containers and files, as specified in the /tmp/vgdata/vgname/vgname.data file (where vgname is the name of the volume group) contained within the backup image created by the savevg command.

The restvg command restores a user volume group. The bosinstall routine reinstalls the root volume group (rootvg). If the restvg command encounters a rootvg volume group in the backup image, the restvg command exits with an error.

If a yes value has been specified in the EXACT_FIT field of the logical_volume_policy stanza of the /tmp/vgdata/vgname/vgname.data file, the restvg command uses the map files to preserve the placement of the physical partitions for each logical volume. The target disks must be of the same size or larger then the source disks specified in the source_disk_data stanzas of the vname.data file.

Note: To view the files in the backup image or to restore individual files from the backup image, the user must use the restore command with the -T or -x flag, respectively. (Refer to the restore command for more information.)

Flags

-b Blocks | Specifies the number of 512-byte blocks to read in a single input operation. If this parameter is not specified the default of 100 is used by the restore command. Larger values result in larger physical transfers to tape devices.
DiskName...

Specifies the names of disk devices to be used instead of the disk devices listed in the vname.data file. Target disk devices must be defined as empty physical volumes; that is, they must contain a physical volume identifier and must not belong to a volume group. If the target disk devices are new, they must be added to the system using the mkdev command. If the target disk devices belong to a volume group, they must be removed from the volume group using the reducevg command.

-d FileName

The -d flag is an optional flag, which, if specified, must be followed by a filename. This file will be used as the vname.data file instead of the one contained within the backup image being restored. The filename can be specified by either a relative or an absolute pathname.

-f Device

Specifies the device name of the backup media. The default is /dev/rmt0.

-l

Displays useful information about a volume group backup.

This flag requires the -f device flag. This flag causes restvg to display information such as volume group, date and time backup was made, uname output from backed up system, oslevel, recommended maintenance and technology level, backup size in megabytes, and backup shrink size in megabytes. The shrink size is the size of the data on all filesystems. The full size is the total size of each filesystem (unused + data). The -l flag also displays the logical volume and filesystem information of the backed up volume group, equivalent to running "lsvg -l vname".

-n

Specifies that the existing MAP files are ignored. The -n flag overrides the value of the exact_fit field in the logical_volume_policy stanza of the vname.data file.

-P PPsize

Specifies the number of megabytes in each physical partition. If not specified, restvg uses the best value for the PPsize, dependent upon the largest disk being restored to. If this is not the same as the size specified in the vname.data file, the number of partitions in each logical volume will be appropriately altered with respect to the new PPsize.

If a PPsize is specified that is smaller than appropriate for the disk sizes, the larger PPsize will be used.

If a PPsize is specified that is larger than appropriate for the disk sizes, the specified larger PPsize will be used.

-q

Specifies that the usual prompt not be displayed before the restoration of the volume group image. If this flag is not specified, the prompt displays the volume group name and the target disk-device names.

-r

Recreates a volume groups structure only. This allows restvg to create (for the specified backup FileName or Device) the volume group, logical volumes, and filesystems, from the backup, without restoring any files or data. This is useful for users who use third party software for restoring data and just need all the AIX logical volume structure in place.

Note: be used with either the -f Device flag or the -d FileName flag. This is because restvg requires a backup image or vname.data file to get all the information it needs to recreate the logical volume structure of the volume group desired.
Specifies that the logical volumes be created at the minimum size possible to accommodate the file systems. This size is specified by the value of LV_MIN_LPS field of the lv_data stanza of the vgname.data file (where vgname is the name of the volume group).

The -s flag overrides the values of the SHRINK and EXACT_FIT fields in the logical_volume_policy stanza of the vgname.data file. The -s flag causes the same effect as values of SHRINK=yes and EXACT_FIT=no would cause.

Examples
1. To restore the volume group image from the /dev/rmt1 device, onto the hdisk2 and hdisk3 disks, enter:
   restvg -f /dev/rmt1 hdisk2 hdisk3
2. To restore the volume group image saved in /mydata/myvg file onto the disks specified in the vgname.data file contained within the backup image, enter:
   restvg -f /mydata/myvg
3. To recreate the volume group logical volume structure without restoring any files using only the vgname.data file /home/my_dir/my_vg.data, enter:
   restvg -r -d /home/my_dir/my_vg.data
   Note: vgname.data files can be created for a volume group by using the mkvgdata command.
4. To recreate the volume group logical volume structure without restoring any files using the vgname.data file inside of the volume group backup located on the tape in /dev/rmt0, enter the following:
   restvg -r -f /dev/rmt0
5. To display volume group information about the volume group backed up on the tape in /dev/rmt0, enter:
   restvg -l -f /dev/rmt0

Related Information
The mkvgdata, restore, savevg, mkdev, reducevg, and resumedvsd commands.

resumevsd Command

Purpose
Activates an available virtual shared disk.

Syntax
resumevsd [-p | -b | -l server_list] {--a | vsd_name ...}

Description
The resumevsd command brings the specified virtual shared disks from the suspended state to the active state. The virtual shared disks remains available. Read and write requests which had been held while the virtual shared disk was in the suspended state are resumed.

You can use the System Management Interface Tool (SMIT) to run this command. To use SMIT, enter:

smit vsd_mgmt

and select the Resume a Virtual Shared Disk option.
Under normal circumstances, you should not issue this command. The recoverable virtual shared disk subsystem uses this command to manage shared disks in a controlled manner. If you issue this command, the results may be unpredictable.

**Flags**

- `−p` Specifies that the primary server node defined for the global volume group is to be the active server. The `−p` flag is not valid for CVSD.
- `−b` Specifies that the secondary server node defined for the global volume group is to be the active server. The `−b` flag is not valid for CVSD.
- `−a` Specifies that all the virtual shared disks that have been defined are to be resumed.
- `−l` Passes the `server_list` to the driver.

**Parameters**

`vsd_name` Specifies a virtual shared disk.

**Security**

You must have `root` authority to run this command.

**Restrictions**

You must issue this command from a node that is online in the peer domain. To bring a peer domain online, use the `startrpdomain` command. To bring a particular node online in an existing peer domain, use the `startrpnode` command. For more information on creating and administering an RSCT peer domain, refer to *RSCT Administration Guide*.

Under normal circumstances, you should not issue this command. The recoverable virtual shared disk subsystem uses this command to manage shared disks in a controlled manner. If you issue this command, the results may be unpredictable.

**Examples**

To bring the virtual shared disk `vsd1vg1n1` from the suspended state to the active state, enter:

```
resumevsd vsd1vg1n1
```

**Location**

`/opt/rsct/vsd/bin/resumevsd`

**Related Information**

Commands: `cfgvsd`, `lsvd`, `preparevsd`, `startvsd`, `stopvsd`, `suspendvsd`, `ucfgvsd`

---

**rev Command**

**Purpose**

Reverses characters in each line of a file.

**Syntax**

```
rev [ File ... ]
```
Description
The `rev` command copies the named files to standard output, reversing the order of characters in every line. If you do not specify a file, the `rev` command reads standard input.

Examples
To reverse characters in each line of a file, type:
```
rev file
```
If the `file` file contains the text:
```
abcdefghi
123456789
```
then the `rev` command displays:
```
ihgfedcba
987654321
```

Files
```
/usr/bin/rev
```
Contains the `rev` command.

Related Information
`Input and output redirection` in Operating system and device management.

revnetgroup Command

Purpose
Reverses the listing of users and hosts in network group files in NIS maps.

Syntax
```
/usr/sbin/revnetgroup { -h | -u } [ File ]
```

Description
The `revnetgroup` command reverses the order in which hosts and users are listed in the `/etc/netgroup` file. The `revnetgroup` command is called from the `/var/yp/Makefile` file to produce output for creating either the `netgroup.byuser` or `netgroup.byhost` NIS map. Each line in the output file begins with a key formed by concatenating the host or user name with the domain name. Following the key is a list of groups to which the host or user belongs. The list is preceded by a tab, and each group is separated by a comma.

Note: The list of groups does not use the names of universal groups (groups that include all users in the network). Universal groups are listed under `*` (asterisk).

The `revnetgroup` command takes an optional file name if the default `/etc/netgroup` file is not desired. This feature provides users with flexibility to create custom network group maps.

Flags
```
-h Produces output for creating the netgroup.byhost map.
-u Produces output for creating the netgroup.byuser map.
```
Examples

1. To cause the /etc/netgroup file to list user names before host names, modify the appropriate stanza in the /var/yp/Makefile to read:
   
   revnetgroup -u

2. To create a new network group file, called newgroup, in the /etc directory, modify the appropriate stanza in the /var/yp/Makefile to read:
   
   revnetgroup -h newgroup

   The -h flag used in this example causes the new /etc/newgroup file to list host names before user names.

Files

/etc/netgroup Contains lists of users and hosts in network groups.
/var/yp/Makefile Contains rules for making NIS maps.

Related Information

The makedbm command, ypinit command, yppush command.

Network File System (NFS) Overview for System Management in Networks and communication management.

Network Information Service (NIS) in AIX 5L Version 5.3 Network Information Services (NIS and NIS+) Guide.

NIS Reference

rexda Daemon

Purpose

Executes programs for remote machines.

Syntax

/usr/sbin/rpc.rexd

Description

The rexd daemon executes programs for remote machines when a client issues a request to execute a program on a remote machine. The inetd daemon starts the rexd daemon from the /etc/inetd.conf file.

Noninteractive programs use standard file descriptors connected directly to TCP connections. Interactive programs use pseudo-terminals, similar to the login sessions provided by the login command. The rexd daemon can use the network file system (NFS) to mount the file systems specified in the remote execution request. Diagnostic messages are normally printed on the console and returned to the requester.

Note: A root user cannot execute commands using rexd client programs such as the on command.

Files

/tmp_rex/rexd Contains temporary mount points for remote file systems.
/etc/exports Lists the directories that the server can export.
inetd.conf Starts RPC daemons and other TCP/IP daemons.
Contains an entry for each user that has permission to log in to the machine.

Related Information
The `on` command.
The `inetd` daemon.

Network File System (NFS) Overview for System Management in *Networks and communication management*.

List of NFS commands in *Networks and communication management*.

**rexc Command**

**Purpose**
Executes commands one at a time on a remote host.

**Syntax**

```
rexe [a] [d] [n] [i] Host Command
```

**Description**
The `/usr/bin/rexe` command executes a command on the specified remote host.

The `rexe` command provides an automatic login feature by checking for a `$HOME/.netrc` file that contains the user name and password to use at the remote host. If such an entry is not found or if your system is operating in secure mode (see the `securetcpip` command), the `rexe` command prompts for a valid user name and password for the remote host. In both cases, `rexe` causes `rexe`d on the remote system to use the default *compat* login authentication method for the user. `rexe`d does not look at the /etc/security/user file on the remote system for alternative authentication methods. You can also override the automatic login feature by specifying the `-n` flag on the `rexe` command line.

**Flags**

- `-a` Indicates the standard error of the remote command is the same as standard output. No provision is made for sending arbitrary signals to the remote process.
- `-d` Enables socket-level debugging.
- `-i` Prevents reading the stdin.
- `-n` Prevents automatic login. With the `-n` flag specified, the `rexe` command prompts for a user name and password to use at the remote host, rather than searching for a `$HOME/.netrc` file.

**Parameters**

- **Command** Specifies the command, including any flags or parameters, to be executed on the remote host.
- **Host** Specifies in alphanumeric form the name of the host where the command is to be executed.

**Examples**

1. To execute the `date` command on a remote host, enter:

```
rexe host1 date
```
The output from the date command is now displayed on the local system. In this example, the $HOME/.netrc file on the local host contains a user name and password valid at the remote host. If you do not have a valid entry in the $HOME/.netrc file for the remote host, you will be prompted for your login ID and password. After you have entered the requested login information, the output from the date command is displayed on the local system.

2. To override the automatic login feature and execute the date command on a remote host, enter:

   rexec -nhost1 date

   Enter your name and password when prompted.
   The output from the date command is now displayed on the local system.

3. To list the directory of another user on a remote host, enter:

   rexec host1 ls -l /home/karen

   The directory listing of user karen on remote host host1 is displayed on the local system.
   If you do not have a valid entry in the $HOME/.netrc file for the remote host, you will be prompted for your login id and password. After you have entered the requested login information, the directory listing of user karen on remote host host1 is displayed on the local system.

Related Information

- Communications and networks in Networks and communication management.
- The ftp command, rlogin command, rsh command, securetcpip command.
- The rexec daemon.
- The .netrc file format.

rexecd Daemon

Purpose

Provides the server function for the rexec command.

Syntax

   Note: The rexec daemon is normally started by the inetd daemon. It can also be controlled from the command line, using SRC commands.

   /usr/sbin/rexecd [-sc]

Description

The /usr/sbin/rexecd daemon is the server for the rexec command. This daemon processes commands issued by a foreign host and returns the output of those commands to that foreign host. The rexec daemon sends and receives data over a Transmission Control Protocol/Internet Protocol (TCP/IP) connection.

Changes to the rexec daemon can be made using Web-based System Manager, the System Management Interface Tool (SMIT) or System Resource Controller (SRC), by editing the /etc/inetd.conf or /etc/services file. Entering rexec at the command line is not recommended. The rexec daemon is started by default when it is uncommented in the /etc/inetd.conf file.

The inetd daemon get its information from the /etc/inetd.conf file and the /etc/services file.
After changing the /etc/inetd.conf file, run the `refresh -s inetd` or `kill -1 InetdPID` command to inform the inetd daemon of the changes to its configuration file.

**Flags**

- `-s` Enables socket-level debugging.
- `-c` Prevents reverse name resolution. When the `-c` flag is not specified, the rexec daemon will fail if the reverse name resolution of the client fails.

**Service Request Protocol**

When the rexec daemon receives a request, it initiates the following protocol:

1. The server reads characters from the socket up to a null (`\0`) byte and interprets the resulting string as an ASCII number (decimal).
2. If the number received is nonzero, the rexec daemon interprets it as the port number of a secondary stream to be used for standard error output. The rexec daemon then creates a second connection to the specified port on the client machine.
3. The rexec daemon retrieves a null-terminated user name of up to 16 characters on the initial socket.

**Security**

The rexec daemon is a PAM-enabled application with a service name of rexec. System-wide configuration to use PAM for authentication is set by modifying the value of the `auth_type` attribute, in the `usw` stanza of `/etc/security/login.cfg`, to PAM_AUTH as the root user.

The authentication mechanisms used when PAM is enabled depend on the configuration for the rexec service in `/etc/pam.conf`. The rexec daemon requires `/etc/pam.conf` entries for the `auth`, `account`, and `session` module types. Listed below is a recommended configuration in `/etc/pam.conf` for the rexec service:

```
# AIX rexec configuration
#
reexec auth    required /usr/lib/security/pam_aix
reexec account required /usr/lib/security/pam_aix
reexec session required /usr/lib/security/pam_aix
```

**Related Information**

The `kill`, `lssrc` command, `refresh`, `reexec`, `startsrc`, and `stopsrc` command.

The `inetd` daemon.

The `reexec` subroutine.

The `/etc/inetd.conf` file format.

Transmission Control Protocol/Internet Protocol in *Networks and communication management*.

For information on installing the Web-based System Manager, see Chapter 2: Installation and System Requirements in *AIX 5L Version 5.3 Web-based System Manager Administration Guide*.

TCP/IP daemons in *Networks and communication management*.
rgb Command

Purpose
Creates the database used by the X-Window system server for colors.

Syntax
rgb [ DatabaseName ] [ <InputFileName> ]

Description
The rgb command reads lines from standard input and inserts them into its database to associate color names with specific red, green, and blue (RGB) values.

The rgb command produces two output files: DatabaseName.dir and DatabaseName.pag. If you do not specify a database file name, the default names rgb.dir and rgb.pag are used.

Each color entry is in the form:
Red Green Blue Colorname

where the Red, Green, and Blue elements are integer values ranging from 0-255. The actual color is determined by how the elements are combined. Each element can range from no intensity (0) to full intensity (255). The Colorname parameter can be descriptive or fanciful. For example, the sequence 250 250 250 could be named white or snow. Two or more entries can share the same element numbers or names.

Parameters
DatabaseName Specifies the database to create for the output data.
<InputFileName> Specifies the name of the input file.

Examples
1. The following example shows a portion of an input file:

    248 248 255   ghost white
    245 245 245   white smoke
    255 250 240   floral white
    253 245 230   old lace
    250 240 230   linen
    255 218 185   peach puff
    255 248 220   cornsilk
    255 250 205   lemon chiffon
    245 255 250   mint cream
    240 255 255   azure

2. The following example generates the output files Newcolor.dir and Newcolor.pag.

   rgb Newcolor < rgb.txt

   where Newcolor is the DatabaseName and rgb.txt is the InputFileName.

Files
ripquery Command

Purpose
Queries the RIP gateways.

Syntax

Description
The ripquery command is used to request all routes known by a RIP gateway by sending a RIP REQUEST or POLL command. The routing information in any routing packets returned is displayed numerically and symbolically. The ripquery command is intended to be used as a tool for debugging gateways, not for network management. SNMP is the preferred protocol for network management.

Flags
-1 Send the query as a version 1 packet.
-2 Send the query as a version 2 packet (default).
-[a5] authkey Specifies the authentication password to use for queries. If -a is specified, an authentication type of SIMPLE will be used, if -5 is specified, an authentication type of MD5 will be used, otherwise the default is an authentication type of NONE. Authentication fields in incoming packets will be displayed, but not validated.
-n Prevents the address of the responding host from being looked up to determine the symbolic name.
-[N] dest[mask] Specifies that the query should be for the specified dest[mask] instead of complete routing table. The specification of the optional mask implies a version 2 query. Up to 23 requests about specific destinations may be included in one packet.
-p Uses the RIP POLL command to request information from the routing table. This is the default. If there is no response to the RIP POLL command, the RIP REQUEST command is tried. gated responds to a POLL command with all the routes learned via RIP.
-r Uses the RIP REQUEST command to request information from the gateway’s routing table. Unlike the RIP POLL command, all gateways should support the RIP REQUEST. If there is no response to the RIP REQUEST command, the RIP POLL command is tried. gated responds to a REQUEST command with all the routes he announces out the specified interface.
-v Version information about ripquery is displayed before querying the gateways.
-w time Specifies the time in seconds to wait for the initial response from a gateway. The default value is 5 seconds.

Related Information
The gated Daemon.

rksh Command

Purpose
Invokes the restricted version of the Korn shell.
Syntax
rksh [-i] [ { + | - } [aefhknmtuvx} ] [ -o Option ... ] [ -c String ] [-s] File [ Parameter ]

Note: Preceding a flag with + (plus) rather than - (minus) turns off the flag.

Description
The rksh command invokes a restricted version of the Korn shell. It allows administrators to provide a controlled shell environment to the users. There is also a restricted version of rksh available for the enhanced Korn shell, called rksh93.

With a restricted shell a user cannot:
• Change the current working directory.
• Set the value of the SHELL, ENV, or PATH variable.
• Specify the pathname of a command that contains a / (slash).
• Redirect output of a command with > (right caret), >| (right caret, pipe symbol), <-> (left caret, right caret), or » (two right carets).

For more information about the restricted Korn shell, refer to Restricted Korn shell in Operating system and device management.

Flags
-a Exports automatically all subsequent parameters that are defined.
-c String Causes the Korn shell to read commands from the String variable. This flag cannot be used with the -s flag or with the File[Parameter] parameter.
-e Executes the ERR trap, if set, and exits if a command has a nonzero exit status. This mode is disabled while reading profiles.
-f Disables file name substitution.
-h Designates each command as a tracked alias when first encountered.
-i Indicates that the shell is interactive. An interactive shell is also indicated if shell input and output are attached to a terminal (as determined by the ioctl subroutine). In this case, the TERM environment variable is ignored (so that the kill 0 command does not kill an interactive shell) and the INTR signal is caught and ignored (so that a wait state can be interrupted). In all cases, the QUIT signal is ignored by the shell.
-k Places all parameter assignment arguments in the environment for a command, not just those arguments that precede the command name.
-m Runs background jobs in a separate process and prints a line upon completion. The exit status of background jobs is reported in a completion message. On systems with job control, this flag is turned on automatically for interactive shells.
-n Reads commands and checks them for syntax errors, but does not execute them. This flag is ignored for interactive shells.
-o Option
Prints the current option settings and an error message if you do not specify an argument. You can use this flag to enable any of the following options:

*allexport*
Same as the -a flag.

*errexit*
Same as the -e flag.

*bgnice*
Runs all background jobs at a lower priority. This is the default mode.

*emacs*
Enter an emacs-style inline editor for command entry.

*gmacs*
Enter a gmacs-style inline editor for command entry.

*ignoreeof*
Does not exit the shell when it encounters an end-of-file character. You must use the `exit` command, or override the flag and exit the shell by pressing the Ctrl-D key sequence more than 11 times.

*keyword*
Same as the -k flag.

*markdirs*
Appends a / (slash) to all directory names that are a result of filename substitution.

*monitor*
Same as the -m flag.

*noclobber*
Prevents redirection from truncating existing files. When you specify this option, use the redirection symbol > (right caret, pipe symbol) to truncate a file.

*noexec*
Same as the -n flag.

*noglob*
Same as the -f flag.

*nolog*
Prevents function definitions from being saved in the history file.

*nounset*
Same as the -u flag.

*privileged*
Same as the -p flag.

*verbose*
Same as the -v flag.

*trackall*
Same as the -h flag.

*vi*
Enter the insert mode of a vi-style inline editor for command entry. Entering escape character 033 puts the editor into the move mode. A return sends the line.

*viraw*
Processes each character as it is typed in vi mode.

*xtrace*
Same as the -x flag.

You can set more than one option on a single `rksh` command line.

* -s
Causes the `rksh` command to read commands from the standard input. Shell output, except for the output of the special commands, is written to file descriptor 2. This parameter cannot be used with the -c flag or with the `File[Parameter]` parameter.

* -t
Exits after reading and executing one command.

* -u
Treats unset parameters as errors when substituting.

* -v
Prints shell input lines as they are read.

* -x
Prints executed commands and their arguments.
Files

/usr/bin/rksh
Contains the path name to the restricted Korn shell.

/tmp/sh*
Contains temporary files that are created when a shell is opened.

Related Information

The `env` command.

The `ksh` and `rksh93` commands.

The `Communications and networks` in *Networks and communication management*.

Restricted Korn shell and Shells in *Operating system and device management*.

rlogin Command

Purpose

Connects a local host with a remote host.

Syntax

```
rlogin RemoteHost [ -e Character ] [ -8 ] [ -l User ] [ -f ] [ -F ] [ -k realm ]
```

Description

The `/usr/bin/rlogin` command logs into a specified remote host and connects your local terminal to the remote host.

The remote terminal type is the same as that given in the `TERM` local environment variable. The terminal or window size is also the same, if the remote host supports them, and any changes in size are transferred. All echoing takes place at the remote host, so except for delays, the terminal connection is transparent. The Ctrl-S and Ctrl-Q key sequences stop and start the flow of information, and the input and output buffers are flushed on interrupts.

Remote Command Execution

When using the `rlogin` command, you can create a link to your path using a host name as the link name. For example:

```
ln -s /usr/bin/rsh HostName
```

Entering the host name specified by the `HostName` parameter with an argument (command) at the prompt, automatically uses the `rsh` command to remotely execute the command specified on the command line of the remote host specified by the `HostName` parameter.

Entering the host name specified by the `HostName` parameter without an argument (command) at the prompt, automatically uses the `rlogin` command to log in to the remote host specified by the `HostName` parameter.

In addition to the preceding conditions, the `rlogin` command also allows access to the remote host if the remote user account does not have a password defined. However, for security reasons, the use of a password on all user accounts is recommended.

The `rlogin` command execs (using the `exec` command) the `/usr/sbin/login` file to validate a user. This 1) allows all user and device attributes to take effect on telnet connections and 2) causes remote logins to
count against the maximum number of login sessions allowable at a time (determined by the maxlogins attribute). Attributes are defined in the /etc/security/user and /etc/security/login.cfg files.

**POSIX Line Discipline**

The rlogind and telnetd daemons use POSIX line discipline to change the line discipline on the local TTY. If POSIX line discipline is not used on the local TTY, echoing other line disciplines may result in improper behavior. TCP/IP must have POSIX line discipline to function properly.

**Flags**

- **-8** Allows an 8-bit data path at all times. Otherwise, unless the start and stop characters on the remote host are not Ctrl-S and Ctrl-Q, the rlogin command uses a 7-bit data path and parity bits are stripped.

- **-e Character** Changes the escape character. Substitute the character you choose for Character.

- **-f** Causes the credentials to be forwarded. This flag will be ignored if Kerberos 5 is not the current authentication method. Authentication will fail if the current DCE credentials are not marked forwardable.

- **-F** Causes the credentials to be forwarded. In addition, the credentials on the remote system will be marked forwardable (allowing them to be passed to another remote system). This flag will be ignored if Kerberos 5 is not the current authentication method. Authentication will fail if the current DCE credentials are not marked forwardable.

- **-k realm** Allows the user to specify the realm of the remote station if it is different from the local systems realm. For these purposes, a realm is synonymous with a DCE cell. This flag will be ignored if Kerberos 5 is not the current authentication method.

- **-l User** Changes the remote user name to the one you specify. Otherwise, your local user name is used at the remote host.

**Security**

There are multiple authentication methods, each requiring different things to be set in order to allow the connection.

**For Standard Authentication**

The remote host allows access only if one or both of the following conditions is satisfied:

- The local host is included in the remote /etc/hosts.equiv file, the local user is not the root user, and the -l User flag is not specified.

- The local host and user name is included in the $HOME/.rhosts file in the remote user account.

Although you can set any permissions for the $HOME/.rhosts file, it is recommended that the permissions of the .rhosts file be set to 600 (read and write by owner only).

**For Kerberos 5 Authentication**

The remote host allows access only if all of the following conditions are satisfied:

- The local user has current DCE credentials.

- The local and remote systems are configured for Kerberos 5 authentication (On some remote systems, this may not be necessary. It is necessary that a daemon is listening to the klogin port).

- The remote system accepts the DCE credentials as sufficient for access to the remote account. See the kvalid_user function for additional information.

Unless otherwise modified by the -e flag, the standard escape character is a tilde (~). The escape character is only recognized by the remote host if it occurs at the beginning of a line. Otherwise, the escape character is sent to the remote host as a normal character. To send the escape character to the remote host as a normal character at the beginning of a line, press the escape character twice. Pressing the escape character and a period (for example, ~.) immediately disconnects the local terminal from the remote host.
Examples

1. To log in to a remote host with your local user name, enter:
   
rlogin host2
   
   You are prompted to enter your password and then are logged in to the remote host host2.
   To logoff the remote host, and close the connection, enter ~. (tilde, period).

2. To log in to a remote host with a different user name, enter:
   
rlogin host2 -l dale
   
   You are prompted to enter your password and then are logged in to the remote host host2 with the
   user name dale.
   To logoff the remote host, and close the connection, enter ~. (tilde, period).

3. To log in to a remote host with your local user name and change the escape character, enter:
   
rlogin host2 -e \n
   You are prompted to enter your password and then are logged in to the remote host host2. The
   escape character has been changed to \ (backslash).
   To logoff the remote host, and close the connection, enter \ (backslash, period).

Related Information

The ftp command, login command, rcp command, rexec command, rsh command, telnet command.

The rlogind and krlogind daemon.

The kvalid_user function.

The hosts.equiv file format, .rhosts file format.

Communications and networks in Networks and communication management.

Authentication and the secure rcmds in Networks and communication management.

rlogind Daemon

Purpose

Provides the server function for the rlogin command.

Syntax

Note: The rlogind daemon is normally started by the inetd daemon. It can also be controlled from
the command line, using SRC commands.

/usr/sbin/rlogind [-a] [-c] [-d] [-n] [-s]

Description

The /usr/sbin/rlogind daemon is the server for the rlogin remote login command. The server provides a
remote login facility.

Changes to the rlogind daemon can be made using Web-based System Manager, the System
Management Interface Tool (SMIT) or System Resource Controller (SRC), by editing the /etc/inetd.conf or
The inetd daemon get its information the /etc/inetd.conf file and the /etc/services file.

After changing the /etc/inetd.conf or /etc/services file, run the refresh -s inetd or kill -1 InetdPID command to inform the inetd daemon of the changes to its configuration file.

Service Request Protocol
When the rlogind daemon receives a service request, the daemon initiates the following protocol:

1. The rlogind daemon checks the source port number for the request. If the port number is not in the range 512-1023, the rlogind daemon terminates the connection.

2. The rlogind daemon uses the source address of the initial connection request to determine the name of the client host. If the name cannot be determined, the rlogind daemon uses the dotted-decimal representation of the client host address.

Error Messages
The following error messages are associated with the rlogind daemon:

| Try again. | A fork command made by the server has failed. |
| /usr/bin/shell: | No shell. The shell specified for the shell variable cannot be started. The shell variable may also be a program. |

Flags
-a Disables pty speed enhancement feature.
-c Suppresses the reverse hostname lookup.
-l Prevents any authentication based on the user’s HOME/.rhosts file. However, a root user is automatically logged in when there is a .rhosts file in root's home directory as specified by the /etc/passwd file.
-n Disables transport-level keep-alive messages. The messages are enabled by default.
-s Turns on socket level debugging.

Security
The rlogind daemon is a PAM-enabled application with a service name of rlogin. System-wide configuration to use PAM for authentication is set by modifying the value of the auth_type attribute, in the usw stanza of /etc/security/login.cfg, to PAM_AUTH as the root user.

The authentication mechanisms used when PAM is enabled depend on the configuration for the rlogin service in /etc/pam.conf. The rlogind daemon requires /etc/pam.conf entries for the auth, account, password, and session module types. Listed below is a recommended configuration in /etc/pam.conf for the rlogin service:

```
# AIX rlogin configuration
#
# rlogin auth  sufficient /usr/lib/security/pam_rhosts_auth
rlogin auth required /usr/lib/security/pam_aix
rlogin account required /usr/lib/security/pam_aix
rlogin password required /usr/lib/security/pam_aix
rlogin session required /usr/lib/security/pam_aix
```
Examples

Note: The arguments for the rlogind daemon can be specified by using SMIT or by editing the /etc/inetd.conf file.

1. To start the rlogind daemon, enter the following:

   startsrc -t rlogin

   This command starts the rlogind subserver.

2. To stop the rlogind daemon normally, enter the following:

   stopsrc -t rlogin

   This command allows all pending connections to start and existing connections to complete but prevents new connections from starting.

3. To force stop the rlogind daemon and all rlogind connections, enter the following:

   stopsrc -t -f rlogin

   This command terminates all pending connections and existing connections immediately.

4. To display a short status report about the rlogind daemon, enter the following:

   lssrc -t rlogin

   This command returns the daemon's name, process ID, and state (active or inactive).

Related Information

The kill command, lssrc command, refresh command, rlogin command, startsrc command, stopsrc command.

The rshd daemon, inetd daemon, syslogd daemon.

The pty special file.

The $HOME/.rhosts file format, /etc/hosts.equiv file format, /etc/inetd.conf file format.

TCP/IP daemons in Networks and communication management.

For information on installing the Web-based System Manager, see Chapter 2: Installation and System Requirements in AIX 5L Version 5.3 Web-based System Manager Administration Guide.

rm Command

Purpose

Removes (unlinks) files or directories.

Syntax

rm [ -f ] [ -v ] [ -R ] [ -i ] [ -e ] File ...

Description

The rm command removes the entries for the specified File parameter from a directory. If an entry is the last link to a file, the file is then deleted. If you do not have write permission for a file and the standard input is a terminal, you are prompted with the file name and ask to confirm that you want to delete the file.
If you type a y (for yes), the file is deleted, type any other character and the file is not deleted. You do not need read or write permission for the file you want to remove. However, you must have write permission for the directory containing the file.

If the file is a symbolic link, the link is removed, but the file or directory that the symbolic link refers to remains. You do not need write permission to delete a symbolic link, if you have write permission in the directory.

If either of the files . (dot) or .. (dot, dot) are specified as the base name portion of the File parameter, the rm command writes a diagnostic message to standard error and does nothing more with such parameters.

The rm command writes a prompt to standard error and reads a line from standard input if the -f flag is not specified, and either the File parameter does not have write permission and the standard input is a workstation, or the -i flag is specified. If the response is not affirmative, the rm command does nothing more with the current file and proceeds to the next file.

The files owned by other users cannot be removed if the sticky bit of the directory is set and the directory is not owned by the user.

Note: The rm command supports the — (dash, dash) parameter as a delimiter that indicates the end of the flags.

An attempt to remove a file or directory that has been exported for use by the NFS version 4 server will fail with a message saying that the resource is busy. The file or directory must be unexported for NFS version 4 use before it can be removed.

Flags

-e Displays a message after each file is deleted.
-f Does not prompt before removing a write-protected file. Does not display an error message or return error status if a specified file does not exist. If both the -f and -i flags are specified, the last one specified takes affect.
-i Prompts you before deleting each file. When you use the -i and -r flags together, the rm command also prompts before deleting directories. If both the -i and -f flags are specified, the last one specified takes affect.
-r Permits recursive removal of directories and their contents when the File parameter is a directory. This flag is equivalent to the -R flag.
-R Permits recursive removal of directories and their contents when the File parameter is a directory. This flag is equivalent to the -r flag.

Exit Status
This command returns the following exit values:

0 If the -f flag was not specified, all the named directory entries were removed; otherwise, all the existing named directory entries were removed.

>0 An error occurred.

Examples
1. To delete a file, enter:

   rm myfile
If there is another link to this file, then the file remains under that name, but the name *myfile* is removed. If *myfile* is the only link, the file itself is deleted.

2. To delete a file without first receiving a confirmation prompt, enter:

```
rm -f core
```

No confirmation prompt is issued before the `rm -f` command attempts to remove the file named `core`. However, an error message displays if the `core` file is write-protected and you are not the owner of the file or you do not have root authority. No error message displays when the `rm -f` command attempts to remove nonexistent files.

3. To delete files one by one, enter:

```
rm -i mydir/*
```

After each file name is displayed, enter *y* to delete the file, or press the Enter key to keep it.

4. To delete a directory tree, enter:

```
rm -ir manual
```

This command recursively removes the contents of all subdirectories of the `manual` directory, prompting you regarding the removal of each file, and then removes the `manual` directory itself, for example:

```
You:  rm -ir manual
You:  y
You:  y
System: rm: Remove manual/draft1?
You:  y
System: rm: Remove manual/draft1/chapter1?
You:  y
System: rm: Remove manual/draft1/chapter2?
You:  y
You:  y
System: rm: Remove manual/draft2?
You:  y
System: rm: Remove manual?
You:  y
```

Here, the `rm` command first asks if you want it to search the `manual` directory. Because the `manual` directory contains directories, the `rm` command next asks for permission to search `manual/draft1` for files to delete, and then asks if you want it to delete the `manual/draft1/chapter1` and `manual/draft1/chapter2` files. The `rm` command next asks for permission to search the `manual/draft2` directory. Then asks for permission to delete the `manual/draft1`, `manual/draft2`, and `manual` directories. If you deny permission to remove a subdirectory (for example, `manual/draft2`), the `rm` command does not remove the `manual` directory. Instead, you see the message: `rm: Directory manual not empty`.

**Files**

`/usr/bin/rm` Contains the `rm` command.

**Related Information**

The `ln` command.

The `unlink` subroutine.

[Directories] in *Operating system and device management.*
File and directory access modes in Operating system and device management.

File and directory links in Operating system and device management.

---

**rm_niscachemgr Command**

**Purpose**

Stops the nis_cachemgr daemon and comments the entry in the /etc/rc.nfs file.

**Syntax**

```bash
rm_niscachemgr [-I | -B | -N]
```

**Description**

The `rm_niscachemgr` command comments the entry for the nis_cachemgr daemon in the /etc/rc.nfs file. The `rm_niscachemgr` daemon stops the nis_cachemgr daemon by using the `stopsrc` command.

**Note:** The mk_nisd, mk_cachemgr, mk_nispasswdd, rm_nisd, rm_cachemgr, and rm_nispasswdd commands do two things:

- Alter the entries of daemon startup calls in /etc/rc.nfs.
- Alter the default behavior of the daemon src entities.

For example, if the rpc.nisd daemon is supposed to start with the -Y flag, this will not be explicitly set in the /etc/rc.nfs entry for starting the rpc.nisd daemon. Instead, a chssys is executed to place the default options which are added (if any) to the daemons during startup. To verify that these options exist, use the lssrc -S -s subsystem command to show the default options.

**Flags**

- `-I` Comments the entry for the nis_cachemgr daemon in the /etc/rc.nfs file.
- `-B` Comments the entry for the nis_cachemgr daemon in the /etc/rc.nfs file and stops the nis_cachemgr daemon. This flag is the default.
- `-N` Stops the nis_cachemgr daemon using the stopsrc command. This flag does not change the /etc/rc.nfs file.

**Note:** An important effect of running this command is that the domain name of the NIS+ environment will be reset to NULL. It is assumed that if the administrator turns off the nis_cachemgr, the NIS+ configuration is no longer active. By resetting the domain name, unnecessary lookups are prevented. If the administrator does not desire this effect, they should run chypdom after rm_niscachemgr has been run.

**Examples**

To comment the entry in the /etc/rc.nfs file that starts the nis_cachemgr daemon, enter:

```
rm_niscachemgr -I
```

This command will not stop the currently executing daemon.

**Files**

- `/etc/rc.nfs` Contains the startup script for the NFS and NIS daemons.
Related Information

The `smit` command

The `nis_cachemgr` daemon.

Network Information Service (NIS+) in *AIX 5L Version 5.3 Network Information Services (NIS and NIS+)* Guide

Network File System (NFS) Overview for System Management in *Networks and communication management*

How to Start the NFS Daemons, How to Stop the NFS Daemons, Exporting a File System Using Secure NFS, Mounting a File System Using Secure NFS in *AIX 5L Version 5.3 Network Information Services (NIS and NIS+) Guide*

For information on installing the Web-based System Manager, see Chapter 2: Installation and System Requirements in *AIX 5L Version 5.3 Web-based System Manager Administration Guide*.

System management interface tool in *Operating system and device management*.

NIS+ Reference

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**rm_nisd Daemon**

**Purpose**

Stops the `rpc.nisd` daemon and comments the entry in the `/etc/rc.nfs` file.

**Syntax**

```
rm_nisd [-I] [-B] [-N]
```

**Description**

The `rm_nisd` daemon comments the entry for the `rpc.nisd` daemon in the `/etc/rc.nfs` file. The `rm_nisd` daemon stops the `rpc.nisd` daemon by using the `stopsrc` command.

**Note:** The `mk_nisd`, `mk_cachemgr`, `mk_nispasswdd`, `rm_nisd`, `rm_cachemgr`, and `rm_nispasswdd` commands do two things:

- Alter the entries of daemon startup calls in `/etc/rc.nfs`
- Alter the default behavior of the daemon `src` entities.

For example, if the `rpc.nisd` daemon is supposed to start with the `-Y` flag, this will not be explicitly set in the `/etc/rc.nfs` entry for starting the `rpc.nisd` daemon. Instead, a `chssys` is executed to place the default options which are added (if any) to the daemons during startup. To verify that these options exist, use the `lssrc -S -s subsystem` command to show the default options.

**Flags**

- `-I` Comments the entry for the `rpc.nisd` daemon in the `/etc/rc.nfs` file.
- `-B` Comments the entry for the `rpc.nisd` daemon in the `/etc/rc.nfs` file and stops the `rpc.nisd` daemon. This flag is the default.
- `-N` Stops the `rpc.nisd` daemon using the `stopsrc` command. This flag does not change the `/etc/rc.nfs` file.
Examples
To comment the entry in the /etc/rc.nfs file that starts the rpc.nisd daemon, enter:
rm_nisd -I
This command will not stop the currently executing daemon.

Files
/etc/rc.nfs Contains the startup script for the NFS and NIS daemons.

Related Information
The smit command.
The rpc.nisd daemon.

Network Information Service (NIS+) Overview for System Management in AIX 5L Version 5.3 Network Information Services (NIS and NIS+) Guide
Network File System (NFS) Overview for System Management in AIX 5L Version 5.3 Network Information Services (NIS and NIS+) Guide
How to Start the NFS Daemons How to Stop the NFS Daemons in Networks and communication management
For information on installing the Web-based System Manager, see Chapter 2: Installation and System Requirements in AIX 5L Version 5.3 Web-based System Manager Administration Guide.
System management interface tool in Operating system and device management.
NIS+ Reference

rm_nispasswdd Daemon

Purpose
Stops the rpc.nispasswdd daemon and comments the entry in the /etc/rc.nfs file.

Syntax
rm_nispasswdd [-I] [-B] [-N]

Description
The rm_nispasswdd daemon comments the entry for the rpc.nispasswdd daemon in the /etc/rc.nfs file. The rm_nispasswdd daemon stops the rpc.nispasswdd daemon by using the stopsrc command.

Note: The mk_nisd, mk_cachemgr, mk_nispasswdd, rm_nisd, rm_cachemgr, and rm_nispasswdd commands do two things:
• Alter the entries of daemon startup calls in /etc/rc.nfs.
• Alter the default behavior of the daemon src entities.
For example, if the `rpc.nisd` daemon is supposed to start with the `-Y` flag, this will not be explicitly set in the `/etc/rc.nfs` entry for starting the `rpc.nisd` daemon. Instead, a `chssys` is executed to place the default options which are added (if any) to the daemons during startup. To verify that these options exist, use the `issrc -S -s subsystem` command to show the default options.

**Flags**

- `-I` Comments the entry for the `rpc.nispasswdd` daemon in the `/etc/rc.nfs` file.
- `-B` Comments the entry for the `rpc.nispasswdd` daemon in the `/etc/rc.nfs` file and stops the `rpc.nispasswdd` daemon. This flag is the default.
- `-N` Stops the `rpc.nispasswdd` daemon using the `stopsrc` command. This flag does not change the `/etc/rc.nfs` file.

**Examples**

To comment the entry in the `/etc/rc.nfs` file that starts the `rpc.nispasswdd` daemon, enter:

```
rm_nispasswdd -I
```

This command will not stop the currently executing daemon.

**Files**

- `/etc/rc.nfs` Contains the startup script for the NFS and NIS daemons.

**Related Information**

The `smit` command.

The `rpc.nispasswdd` daemon.

[Network Information Service (NIS+) Overview for System Management](#) in AIX 5L Version 5.3 Network Information Services (NIS and NIS+) Guide

[Network File System (NFS) Overview for System Management](#) in Networks and communication management

[How to Start the NFS Daemons](#) and [How to Stop the NFS Daemons](#) in Networks and communication management


For information on installing the Web-based System Manager, see [Chapter 2: Installation and System Requirements](#) in AIX 5L Version 5.3 Web-based System Manager Administration Guide.

**rmail Command**

**Purpose**

Handles remote mail received through Basic Networking Utilities (BNU).

**Syntax**

```
rmail User
```
Description

The `rmail` command interprets incoming mail received through the `uucp` command. It collapses From header lines in the form generated by the `bellmail` command into a single line of the form:

```
return-path!sender
```

The `rmail` command passes the processed mail on to the `sendmail` command. The `User` parameter must specify a user recognized by the `sendmail` command.

Related Information

The `bellmail` command, `sendmail` command, `uucp` command.

Mail management in *Networks and communication management*.

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rmaudrec Command

Purpose

Removes records from the audit log.

Syntax

```
rmaudrec [-a | -n node_name1[,node_name2]...] [-S subsystem_name] 
-s selection_string [-h] [-V]
```

Description

The `rmaudrec` command is used to delete records in the audit log. The audit log is a facility for recording information about the system's operation. It can include information about the normal operation of the system as well as failures and other errors. It augments the error log functionality by conveying the relationship of the error relative to other system activities. All detailed information about failures is still written to the AIX error log.

Records are created in the audit log by subsystems that have been instrumented to do that. For example, the event response subsystem runs in the background to monitor administrator-defined conditions and then invokes one or more actions when a condition becomes true. Because this subsystem runs in the background, it is difficult for the operator or administrator to understand the total set of events that occurred and the results of any actions that were taken in response to an event. Because the event response subsystem records its activity in the audit log, the administrator can easily view its activity as well as that of other subsystems. In addition, records may sometimes need to be removed explicitly, which can be done using this command.

Each record in the audit log contains named fields. Each field contains a value that provides information about the situation corresponding to the record. For example, the field named `Time` indicates the time at which the situation occurred. Each record has a set of common fields and a set of subsystem-specific fields. The common fields are present in every record in the audit log. The subsystem-specific fields vary from record to record. Their names are only significant when used with a subsystem name because they may not be unique across all subsystems. Each record is derived from a template that defines which subsystem-specific fields are present in the record and defines a format string that is used to generate a message describing the situation. The format string may use record fields as inserts. A subsystem typically has many templates.

The field names can be used as variables in a `selection string` to choose which records are deleted. The selection string is matched against each record using the referenced fields of each record to perform the match. Any records that match will be removed. The selection string is specified with the `-s` flag.
A selection string is an expression composed of field names, constants, and operators. The syntax of a selection string is very similar to an expression in the C programming language. For information on how to specify selection strings, see the RSCT: Administration Guide.

The common field names are:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>Specifies the time when the situation occurred that the record corresponds to. The value is a 64-bit integer and represents the number of microseconds since Unix Epoch (00:00:00 GMT January 1, 1970). See the constants below for specifying the time in more user-friendly formats.</td>
</tr>
<tr>
<td>Subsystem</td>
<td>Specifies the subsystem that generated the record. This is a string.</td>
</tr>
<tr>
<td>Category</td>
<td>Indicates the importance of the situation corresponding to the audit record, as determined by the subsystem that generated the record. The valid values are: 0 (informational) and 1 (error).</td>
</tr>
<tr>
<td>SequenceNumber</td>
<td>Specifies the unique 64-bit integer that is assigned to the record. No other record in the audit log will have the same sequence number.</td>
</tr>
<tr>
<td>TemplateId</td>
<td>Specifies the subsystem-dependent identifier that is assigned to records that have the same content and format string. This value is a 32-bit unsigned integer.</td>
</tr>
<tr>
<td>NodeName</td>
<td>Specifies the name of the node from which the record was obtained. This field name cannot be used in a selection string.</td>
</tr>
</tbody>
</table>

In addition to the constants in expressions that are described in the RSCT: Administration Guide, you can use the following syntax for dates and times with this command:

```
#mmddhhmmyyyy
```

This format consists of a sequence of decimal characters that are interpreted according to the pattern shown. The fields in the pattern are, from left to right: mm = month, dd = day, hh = hour, mm = minutes, yyyy = year. For example, #010523042002 corresponds to January 5, 11:04 PM, 2002. The fields can be omitted from right to left. If not present, the following defaults are used: year = the current year, minutes = 0, hour = 0, day = 1, and month = the current month.

```
{-#mmddhhmmyyyy
```

This format is similar to the previous one, but is relative to the current time and date. For example, the value #-0001 corresponds to one day ago and the value #-010001 corresponds to one month and one hour ago. Fields can be omitted starting from the right and are replaced by 0.

The audit records considered for deletion and matched against the selection string can be restricted to a specific subsystem by using the -S flag. If this flag is specified, the subsystem-specific field names can be used in the selection string in addition to the common field names.

The nodes from which audit log records are considered for deletion can be restricted to a set of specific nodes by using the -n flag. If this flag is specified, the search will be limited to the set of nodes listed. Otherwise, the search will be performed for all nodes defined within the current management scope as determined by the CT_MANAGEMENT_SCOPE environment variable.

It is advisable to first use the Isaudrec command with the same -s and -n flag values to list the records that will be deleted. This minimizes the possibility of the selection string matching more records than intended.

**Flags**

- `-a` Specifies that records from all nodes in the domain are to be removed. If both the -n and the -a flags are omitted, records from the local node only are removed.
-n node_name1[,node_name2]...
   Specifies the list of nodes containing audit log records that will be examined and considered for
deletion if they meet the other criteria, such as matching the specified selection string. Node group
names can also be specified, which are expanded into a list of node names. If both the -n and the
-a flags are omitted, records from the local node only will be deleted.

-S subsystem_name
   Specifies a subsystem name. If this flag is present, only records identified by subsystem_name are
considered for deletion. The records to be deleted can be further restricted by the -s flag. If the
subsystem name contains any spaces, it must be enclosed in single or double quotation marks.

   For backward compatibility, the subsystem name can be specified using the -n flag only if the -a
and the -S flags are not specified.

-s selection_string
   Specifies a selection string. This string is evaluated against each record in the audit log. If the
evaluation results in a non-zero result (TRUE), the record is removed from the audit log. If the
selection string contains any spaces, it must be enclosed within single or double quotation marks.

   For information on how to specify selection strings, see the RSCT: Administration Guide.

   The names of fields within the record can be used in the expression. If the -S flag is not specified,
only the names of common fields can be used. See the Description for a list of the common field
names and their data types. If the -S flag is specified, the name of any field for the specified
subsystem as well as the common field names can be used.

   If this flag is not specified, no records will be removed from the audit log.

-h   Writes the command’s usage statement to standard output.

-V   Writes the command’s verbose messages to standard error.

Parameters

field_name1 [field_name2...]
   Specifies one or more fields in the audit log records to be displayed. The order of the field names
on the command line corresponds to the order in which they are displayed. If no field names are
specified, Time, Subsystem, Severity, and Message are displayed by default. If the management
scope is not local, NodeName is displayed as the first column by default. See the Description for
information about these and other fields.

Security

In order to remove records from an audit log when the -S flag is omitted, a user must have write access to
the target resource class on each node from which records are to be removed. When the -S flag is
specified, the user must have write access to the audit log resource corresponding to the subsystem
identified by the -S flag on each node from which records are to be removed.

Authorization is controlled by the RMC access control list (ACL) file that exists on each node.

Exit Status

0   The command ran successfully.
1   An error occurred with RMC.
2   An error occurred with a command-line interface script.
3   An incorrect flag was entered on the command line.
4   An incorrect parameter was entered on the command line.
5   An error occurred that was based on incorrect command-line input.
Environment Variables

CT_CONTACT
Determines the system where the session with the resource monitoring and control (RMC) daemon is established. When CT_CONTACT is set to a host name or IP address, the command contacts the RMC daemon on the specified host. If CT_CONTACT is not set, the command contacts the RMC daemon on the local system where the command is being run. The target of the RMC daemon session and the management scope determine the resource classes or resources that can be affected by this command.

CT_MANAGEMENT SCOPE
Determines (in conjunction with the -a and -n flags) the management scope that is used for the session with the RMC daemon. The management scope determines the set of possible target nodes where audit log records can be deleted. If the -a and -n flags are not specified, local scope is used. When either of these flags is specified, CT_MANAGEMENT_SCOPE is used to determine the management scope directly. The valid values are:

- 0: Specifies local scope.
- 1: Specifies local scope.
- 2: Specifies peer domain scope.
- 3: Specifies management domain scope.

If this environment variable is not set, local scope is used.

Implementation Specifics
This command is part of the Reliable Scalable Cluster Technology (RSCT) fileset for AIX.

Standard Output
When the -h flag is specified, this command's usage statement is written to standard output.

Standard Error
If the -V flag is specified and the command completes successfully, a message indicating the number of records that were deleted will be written to standard error.

Examples
1. To remove all records from the audit log on every node in the management scope defined by the CT_MANAGEMENT_SCOPE environment variable, enter:
   `rmaudrec -s "Time > 0"`
   or
   `rmaudrec -s "SequenceNumber >= 0"`
2. To remove all records more than a week old on every node in the management scope defined by the CT_MANAGEMENT_SCOPE environment variable, enter:
   `rmaudrec -s "Time < #0007"`
3. To remove all records that are more than a day old and created by the abc subsystem on nodes mynode and younnode, enter:
   `rmaudrec -S abc -s "Time < #0001" -n mynode,yournode`

Location
/usr/sbin/rsct/bin/rmaudrec Contains the rmaudrec command
rmC2admin Command

Purpose
Remove the configuration files for a distributed C2 System host.

Syntax
rmC2admin [ -m ]

Description
The rmC2admin command replaces the distributed C2 System symbolic links with the actual files. The directory /etc/data.shared will be removed. When the -m flag is used, the hd10sec file system and /etc/data.master directory will be removed as well. This option should only be used after all other hosts in the C2 System have replaced their administrative host with another system or removed the C2 configuration files as well.

The entries for the system initialization scripts in /etc/inittab will also be removed, and rebooting this system will result in the system not being configured for C2 mode.

Executing this command in multi-user mode will result in the user definitions from the C2 System being retained. Executing this command in single-user mode will result in the user definitions from the C2 System being removed and the root user being the only valid user ID.

The system should be rebooted immediately after executing this command so that the changes may take effect.

Flags
- m The host was configured as the administrative master

Exit Status
0 The C2 System administrative host information has been successfully removed.
1 The system was not configured to operate in C2 mode.
2 The system was not installed with the C2 option.
3 An error occurred removing the C2 System administrative host information.
4 An invalid command line option was used.

Files
/usr/sbin/rmC2admin Contains the rmC2admin command.
rmCCadmin Command

Purpose
Remove the configuration files for a distributed Common Criteria enabled System host.

Syntax
rmCCadmin [-m]

Description
The rmCCadmin command replaces the distributed Common Criteria enabled System symbolic links with the actual files. The directory /etc/data.shared will be removed. When the -m flag is used, the hd10sec file system and /etc/data.master directory will be removed as well. This option should only be used after all other hosts in the Common Criteria enabled System have replaced their administrative host with another system or removed the Common Criteria enabled configuration files as well.

The entries for the system initialization scripts in /etc/inittab will also be removed, and rebooting this system will result in the system not being configured for Common Criteria enabled mode.

Executing this command in multi-user mode will result in the user definitions from the Common Criteria enabled System being retained. Executing this command in single-user mode will result in the user definitions from the Common Criteria enabled System being removed and the root user being the only valid user ID.

The system should be rebooted immediately after executing this command so that the changes may take effect.

Flags
-m The host was configured as the administrative master

Exit Status
0 The Common Criteria enabled System administrative host information has been successfully removed.
1 The system was not configured to operate in Common Criteria enabled mode.
2 The system was not installed with the Common Criteria enabled option.
3 An error occurred removing the Common Criteria enabled System administrative host information.
4 An invalid command line option was used.

Files
/usr/sbin/rmCCadmin Contains the rmCCadmin command.

Related Information
The chCCadmin command, isCChost command, lsCCadmin command, mkCCadmin command.

Alphabetical Listing of Commands 661
**rmcctrl File**

**Purpose**
Manages the resource monitoring and control (RMC) subsystem.

**Syntax**
rmcctrl { -a | -A | -d | -k | -K | -m {R | E | D} | -M {R | E | D} | -p | -P | -q | -Q | -s | -z | -h }

**Description**
The `rmcctrl` command controls the operation of the resource monitoring and control (RMC) subsystem. The subsystem is under the control of the system resource controller (SRC) with a subsystem name of `ctrmc` and a subsystem group name of `rsct`. The RMC subsystem definition is added to the subsystem object class and then started when Reliable Scalable Cluster Technology (RSCT) is installed. In addition, an entry is made in the `/etc/inittab` file so that the RMC subsystem is started automatically when the system is booted up.

**Note:** While the RMC subsystem can be stopped and started by using the `stopsrc` and `startsrc` commands, it is recommended that the `rmcctrl` command be used to perform these functions.

**Flags**
- **-a** Adds the RMC subsystem to the subsystem object class and places an entry at the end of the `/etc/inittab` file.
- **-A** Adds and starts the RMC subsystem.
- **-d** Deletes the RMC subsystem from the subsystem object class and removes the RMC entry from the `/etc/inittab` file.
- **-k** Stops the RMC subsystem.
- **-K** Stops the RMC subsystem and all resource managers.
- **-m** Specifies the RMC subsystem client message policy. This policy applies to messages sent between the RMC subsystem and any command listed in the RSCT for AIX 5L: Technical Reference, when the command is run on a different node than the RMC subsystem (in other words, the `CT_CONTACT` environment variable is set). These messages are sent using TCP/IP. This flag is only supported on RSCT version 2.3.1.0 or later. The “Enabled” policy must be used if the commands are from an earlier version of RSCT.
  - **R** Indicates that the client message policy is “Required”. “Required” means that the connection remains open only if message authentication can (and will) be used.
  - **E** Indicates that the client message policy is “Enabled”. “Enabled” is the default; message authentication is used if both sides of the connection support it.
  - **D** Indicates that the client message policy is “Disabled”. “Disabled” means that message authentication is not used.
- **-M** Specifies the RMC subsystem daemon message policy. This policy applies to messages sent between the RMC subsystem daemons within a management domain cluster. These messages are sent using the User Datagram Protocol (UDP). This flag is only supported on RSCT release 2.3.5.0 or later and RSCT release 2.4.1.0 or later. When specified, the indicated message policy takes effect the next time the RMC subsystem is started.
  - **R** Indicates that the daemon message policy is “Required”. “Required” means that two daemons communicate only if message authentication can (and will) be used.
Indicates that the daemon message policy is "Enabled". "Enabled" is the default; message authentication is used if the sending and receiving daemons support it.

Indicates that the daemon message policy is "Disabled". "Disabled" means that message authentication is not used. Disabling message authentication may result in the loss of function if all of the nodes in the cluster are not configured the same.

-\( p \) Enables remote client connections.
-\( P \) Disables remote client connections.
-\( q \) Enables remote client connections the next time the RMC subsystem is started.
-\( Q \) Disables remote client connections the next time the RMC subsystem is started.
-\( s \) Starts the RMC subsystem.
-\( z \) Stops the RMC subsystem and all resource managers, but the command does not return until the RMC subsystem and the resource managers are actually stopped.
-\( h \) Writes the command's usage statement to standard output.

**Security**
Privilege control: only the root user should have execute (\( x \)) access to this command.

**Exit Status**
0  The command has run successfully.
1  The command was not successful.

**Standard Output**
When the -\( h \) flag is specified, this command's usage statement is written to standard output.

**Examples**
1. To add the RMC subsystem, enter:
   \( \text{rmcctrl} -a \)
2. To start the RMC subsystem, enter:
   \( \text{rmcctrl} -s \)
3. To stop the RMC subsystem, enter:
   \( \text{rmcctrl} -k \)
4. To delete the RMC subsystem, enter:
   \( \text{rmcctrl} -d \)

**Location**
\( /usr/sbin/rsct/bin/rmcctrl \) Contains the \( \text{rmcctrl} \) command

---

**rmcifscred Command**

**Purpose**
Removes the CIFS credentials stored in the \( /etc/cifs_fs/cifcred \) file for the specified server and user entry.

**Syntax**
\( \text{rmcifscred} \) [\( -h \) \( \text{RemoteHost} \) [\( -u \) \( \text{user} \)] ]
Description
The `rmcifscred` command takes a server and user name as input. If this input has credentials listed in `/etc/cifs_fs/cifscred`, the credentials are removed. Subsequent mounting to the specified server by the specified user requires manually inputting the password.

Flags

- `-h RemoteHost`
  Specifies the name of the remote host (CIFS server). This can be provided as a host name, an IP address, or as a fully qualified domain name.

- `-u user`
  Specifies the user name whose credentials for the specified server are to be removed from the `cifscred` file.

Exit Status

0
The command completed successfully.

>0
An error occurred.

Examples

1. To remove the credentials stored in `/etc/cifs_fs/cifscred` for user1 to mount on server1, enter:
   ```bash
   rmcifscred -h server1 -u user1
   ```

Location

`/usr/sbin/rmcifscred`

Files

`/etc/cifs_fs/cifscred`
Stores the CIFS credentials.

Related Information

The `chcifscred` command, `chcifsmnt` command, `lscifscred` command, `lscifsmnt` command, `mkcifscred` command, `mkcifsmnt` command, `rmcifsmnt Command`.

rmcifsmnt Command

Purpose
Removes a CIFS mount from the `/etc/filesystems` file and unmounts the entry if it is mounted.

Syntax

`rmcifsmnt [-f] MountPoint [-B | -N]`

Description
The `rmcifsmnt` command removes a CIFS entry from `/etc/filesystems`. If the entry is mounted, the `rmcifsmnt` command then unmounts it.
Flags

\-B  Removes the corresponding entry from the 
/\etc/filesystems file, and unmounts the file system. This 
is the default.

\-f MountPoint  Specifies the path name of the CIFS mount. 
Unmounts the file system, but does not remove the entry 
from the /\etc/filesystems file.

Exit Status

0  The command completed successfully.

>0  An error occurred.

Examples

1. To remove the CIFS mount that is mounted over /mnt and unmount it, enter:
   
   rmcifsmnt \-f /mnt

Location

/\usr/sbin/rmcifsmnt

Files

/\etc/filesystems  Stores the CIFS entry.

Related Information

The \chcifsmnt command, \chcifsmnt command, \lsifsmnt command, \lsifsmnt command, \mkcifsmnt command, \mkcifsmnt command, \rmcifsmnt Command on page 663.

rmclass Command

Purpose

Remove a Workload Management class.

Syntax

rmclass \[ \-d Config_Dir \] \[ \-S SuperClass \] Name

Description

The \rmclass command removes the superclass or the subclass identified by the Name parameter from 
the class definition file, the class limits file and the class shares file. The class must already exist. The 
predefined Default, System, and Shared classes cannot be removed.

In addition, when removing a superclass Super, the directory /\etc/wlm/Config_Dir/Super and all the WLM 
property files it contains (if they exist) are removed. Removing a superclass fails if any user created 
subclass still exists (subclass other than Default and Shared).

Note: Only root can remove a superclass. Only root or authorized users whose user ID or group ID 
matches the user name or group name specified in the attributes adminuser and admingroup of a 
superclass can remove a subclass of this superclass.
Normally, **rmclass** deletes the class and its attributes in the relevant WLM property files, and the modifications are applied to the in-core class definitions (active classes) only after an update of WLM using the **wlmcntrl** command.

If an empty string is passed as the configuration name (Config_dir) with the -d flag, the class is deleted only in the WLM in-core data structures, and no property file is updated. So, if the class is still defined in a WLM configuration, it is recreated after an update or restart of WLM. This flag should be mainly used to remove classes dynamically created in the in-core WLM data structures only by applications using the WLM API, for example, to do some cleanup after application failure.

**Note:** This command cannot apply to a set of time-based configurations (do not specify a set with the -d flag). If the current configuration is a set, the -d flag must be given to indicate which regular configuration the command should apply to.

**Flags**

- **-d Config_Dir**
  Uses /etc/wlm/Config_dir as alternate directory for the properties files. If this flag is not used, the configuration files in the directory pointed to by /etc/wlm/current are used. If an empty string is passed as the configuration name (""), the class is deleted only in the WLM in-core data structures and no configuration file is modified.

- **-S SuperClass**
  Specifies the name of the superclass when removing a subclass. There are two ways of specifying the subclass Sub of superclass Super:
  1. Specify the full name of the subclass as Super.Sub and do not use -S.
  2. Specify the -S flag to give the superclass name and use the short name for the subclass:
     
     rmclass options -S Super Sub

**Files**

- **classes**
  Contains the names and definitions of the classes.

- **limits**
  Contains the resource limits.

- **shares**
  Contains the resource shares.

**Related Information**

The **wlmcntrl** command, **lsclass** command, **chclass** command, and **mkclass** command.

---

**rmcomg Command**

**Purpose**

Removes a communication group that has already been defined from a peer domain.

**Syntax**

rmcomg [-q] [-h] [-TV] communication_group

**Description**

The **rmcomg** command removes the definition of the existing communication group with the name specified by the communication_group parameter for the online peer domain. The communication group is used to define heartbeat rings for use by topology services and to define the tunables for each heartbeat ring. The communication group determines which devices are used for heartbeating in the peer domain.
The `rmcomg` command must be run on a node that is currently online in the peer domain where the communication group is defined. More than half of the nodes must be online to remove a communication group from the domain.

The communication group must not be referred to by an interface resource. Use the `chcomg` command to remove references made by interface resources to a communication group.

**Flags**

- `-q` Specifies quiet mode. The command does not return an error if the communication group does not exist.
- `-h` Writes the command’s usage statement to standard output.
- `-T` Writes the command’s trace messages to standard error. For your software service organization’s use only.
- `-V` Writes the command’s verbose messages to standard output.

**Parameters**

`communication_group` Specifies the name of the defined communication group that is to be removed from the peer domain.

**Security**

The user of the `rmcomg` command needs write permission for the `IBM.CommunicationGroup` resource class. By default, `root` on any node in the peer domain has read and write access to this resource class through the configuration resource manager.

**Exit Status**

0 The command ran successfully.
1 An error occurred with RMC.
2 An error occurred with a command-line interface script.
3 An incorrect flag was entered on the command line.
4 An incorrect parameter was entered on the command line.
5 An error occurred that was based on incorrect command-line input.
6 The communication group does not exist.

**Environment Variables**

**CT_CONTACT**

Determines the system where the session with the resource monitoring and control (RMC) daemon occurs. When `CT_CONTACT` is set to a host name or IP address, the command contacts the RMC daemon on the specified host. If `CT_CONTACT` is not set, the command contacts the RMC daemon on the local system where the command is being run. The target of the RMC daemon session and the management scope determine the resource classes or resources that are processed.

**Restrictions**

This command must be run on a node that is defined and online to the peer domain where the communication group is to be removed.
Implementation Specifics
This command is part of the Reliable Scalable Cluster Technology (RSCT) fileset for AIX.

Standard Input
When the -f "-" or -F "-" flag is specified, this command reads one or more node names from standard input.

Standard Output
When the -h flag is specified, this command’s usage statement is written to standard output. All verbose messages are written to standard output.

Standard Error
All trace messages are written to standard error.

Examples
In this example, nodeA is defined and online to ApplDomain. To remove the communication group definition ComGrp1 for the peer domain ApplDomain, run this command on nodeA:

```
rmcomg ComGrp1
```

Location
```
/usr/sbin/rsct/bin/rmcomg
```
Contains the rmcomg command

Related Information
Books: RSCT: Administration Guide, for information about peer domain operations

Commands: chcomg, Iscomg, lsrpdomain, lsrpnode, mkcomg, preprpnode

Information Files: rmccli, for general information about RMC-related commands

---

rmcondition Command

Purpose
Removes a condition.

Syntax
```
rmcondition [-f] [-q] [-h] [-TV] condition[:node_name]
```

Description
The `rmcondition` command removes the condition specified by the `condition` parameter. The condition must already exist to be removed. When the condition must be removed even if it has linked responses, use the `-f` flag to force the condition and the links with the responses to be removed. If the `-f` flag is not specified and links with responses exist, the condition is not removed. This command does not remove responses.

If a particular condition is needed for system software to work properly, it may be locked. A locked condition cannot be modified or removed until it is unlocked. If the condition you specify on the `rmcondition` command is locked, it will not be removed; instead an error will be generated informing you that the condition is locked. To unlock a condition, you can use the `-U` flag of the `chcondition` command. However, since a condition is typically locked because it is essential for system software to work properly, you should exercise caution before unlocking it.

---

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Flags

-\( f \) Forces the condition to be removed even if it is linked to responses. The links with the responses are removed as well as the condition, but the responses are not removed.

-\( q \) Does not return an error when \textit{condition} does not exist.

-\( h \) Writes the command’s usage statement to standard output.

-\( T \) Writes the command’s trace messages to standard error. For your software service organization’s use only.

-\( V \) Writes the command’s verbose messages to standard output.

Parameters

\textit{condition} Specifies the name of a condition to be removed.

\textit{node\_name} Specifies the node where the condition is defined. If \textit{node\_name} is not specified, the local node is used. \textit{node\_name} is a node within the scope determined by the \text{CT\_MANAGEMENT\_SCOPE} environment variable.

Security

The user needs write permission for the \textit{IBM.Condition} resource class to run \texttt{rmcondition}. Permissions are specified in the access control list (ACL) file on the contacted system.

Exit Status

0 \hspace{1em} The command ran successfully.
1 \hspace{1em} An error occurred with RMC.
2 \hspace{1em} An error occurred with a command-line interface script.
3 \hspace{1em} An incorrect flag was entered on the command line.
4 \hspace{1em} An incorrect parameter was entered on the command line.
5 \hspace{1em} An error occurred that was based on incorrect command-line input.

Environment Variables

\texttt{CT\_CONTACT} Determines the system where the session with the resource monitoring and control (RMC) daemon occurs. When \texttt{CT\_CONTACT} is set to a host name or IP address, the command contacts the RMC daemon on the specified host. If \texttt{CT\_CONTACT} is not set, the command contacts the RMC daemon on the local system where the command is being run. The target of the RMC daemon session and the management scope determine the resource classes or resources that are processed.

\texttt{CT\_MANAGEMENT\_SCOPE} Determines the management scope that is used for the session with the RMC daemon in processing the resources of the event-response resource manager (ERRM). The management scope determines the set of possible target nodes where the resources can be processed. The valid values are:

0 \hspace{1em} Specifies \textit{local} scope.
1 \hspace{1em} Specifies \textit{local} scope.
2 \hspace{1em} Specifies \textit{peer domain} scope.
3 \hspace{1em} Specifies \textit{management domain} scope.
If this environment variable is not set, local scope is used.

**Standard Output**
When the `-h` flag is specified, this command's usage statement is written to standard output. All verbose messages are written to standard output.

**Standard Error**
All trace messages are written to standard error.

**Examples**
These examples apply to standalone systems:
1. To remove the condition definition named "FileSystem space used", run this command:
   ```bash
rmcondition "FileSystem space used"
   ```
2. To remove the condition definition named "FileSystem space used" even if the condition is linked with responses, run this command:
   ```bash
   rmcondition -f "FileSystem space used"
   ``

This example applies to management domains:
1. In this example, the current node is the management server. To remove the condition definition named "nodeB FileSystem space used" that is defined on managed node nodeB, run this command:
   ```bash
   rmcondition "FileSystem space used:nodeB"
   ```

This example applies to peer domains:
1. To remove the condition definition named "nodeA FileSystem space used" that is defined on node nodeA, run this command from any node in the domain:
   ```bash
   rmcondition "nodeA FileSystem space used:nodeA"
   ```

**Location**
/usr/sbin/rsct/bin/rmcondition

Contains the `rmcondition` command

**Related Information**
Commands: `chcondition, lscondition, lscondresp, mkcondition`

Files: `rmccli`

---

**rmcondresp Command**

**Purpose**
Deletes the link between a condition and one or more responses.

**Syntax**
To delete the link between a condition and one or more responses:

```bash
rmcondresp [-q] [-h] [-TV] condition[:node_name] [response [response...]]
```

To delete all of the links to one or more responses:

```bash
rmcondresp [-q] -r [-h] [-TV] response1 [response2...][:node_name]
```
To lock or unlock the condition/response association:

```
rmcondresp { -U | -L } [-h] [-TV] condition[:node_name] response
```

**Description**

The `rmcondresp` command deletes the link between a condition and one or more responses. A link between a condition and a response is called a *condition/response association*. The response is no longer run when the condition occurs. Use the `-r` flag to specify that the command parameters consist only of responses. This deletes all links to conditions for these responses. If only a condition is specified, links to all responses for that condition are deleted.

If a particular condition/response association is needed for system software to work properly, it may be locked. A locked condition/response association cannot be removed by the `rmcondresp` command. If the condition/response association you specify on the `rmcondresp` command is locked, it will not be removed; instead an error will be generated informing you that this condition/response association is locked. To unlock a condition/response association, you can use the `-U` flag. However, because a condition/response association is typically locked because it is essential for system software to work properly, you should exercise caution before unlocking it.

**Flags**

- `-q` Does not return an error when either *condition* or *response* does not exist.
- `-r` Indicates that all command parameters are responses. There are no conditions specified. This command removes condition/response associations from all conditions that are linked to the specified responses.
- `-h` Writes the command’s usage statement to standard output.
- `-T` Writes the command’s trace messages to standard error. For your software service organization’s use only.
- `-V` Writes the command’s verbose messages to standard output.
- `-U` Unlocks a condition/response association so it can be started, stopped, or removed. If a condition/response association is locked, this is typically because it is essential for system software to work properly. For this reason, you should exercise caution before unlocking it. When unlocking a condition/response association using the `-U` flag, no other operation can be performed by this command.
- `-L` Locks a condition/response association so it cannot be started, stopped, or removed. When locking a condition/response association using the `-L` flag, no other operation can be performed by this command.

**Parameters**

- `condition` Specifies the name of the condition linked to the response. The condition is always specified first unless the `-r` flag is used.
- `response` Specifies the name of a response or more than one response. The links from the specified responses to the specified condition are removed.
- `node_name` Specifies the node where the condition is defined. If the `-r` flag is used, it is the node where the response is defined. *node_name* is a node within the scope determined by the CT_MANAGEMENT_SCOPE environment variable.

**Security**

The user needs write permission for the `IBM.Association` resource class to run `rmcondresp`. Permissions are specified in the access control list (ACL) file on the contacted system.
Exit Status

0  The command ran successfully.
1  An error occurred with RMC.
2  An error occurred with a command-line interface script.
3  An incorrect flag was entered on the command line.
4  An incorrect parameter was entered on the command line.
5  An error occurred that was based on incorrect command-line input.

Environment Variables

CT_CONTACT
Determines the system where the session with the resource monitoring and control (RMC) daemon occurs. When CT_CONTACT is set to a host name or IP address, the command contacts the RMC daemon on the specified host. If CT_CONTACT is not set, the command contacts the RMC daemon on the local system where the command is being run. The target of the RMC daemon session and the management scope determine the resource classes or resources that are processed.

CT_MANAGEMENT_SCOPE
Determines the management scope that is used for the session with the RMC daemon in processing the resources of the event-response resource manager (ERRM). The management scope determines the set of possible target nodes where the resources can be processed. The valid values are:

0  Specifies local scope.
1  Specifies local scope.
2  Specifies peer domain scope.
3  Specifies management domain scope.

If this environment variable is not set, local scope is used.

Standard Output
When the -h flag is specified, this command’s usage statement is written to standard output. All verbose messages are written to standard output.

Standard Error
All trace messages are written to standard error.

Examples
These examples apply to standalone systems:

1. To delete the link between the condition "FileSystem space used" and the response "Broadcast event on-shift", run this command:
   rmcondresp "FileSystem space used" "Broadcast event on-shift"
2. To delete the links between the condition "FileSystem space used" and all of its responses, run this command:
   rmcondresp "FileSystem space used"
3. To delete the links between the condition "FileSystem space used" and the responses "Broadcast event on-shift" and "E-mail root anytime", run this command:
   rmcondresp "FileSystem space used" "Broadcast event on-shift" "E-mail root anytime"
4. To delete the links between the response "Broadcast event on-shift" and all of the conditions that use it, run this command:
   rmcondresp -r "Broadcast event on-shift"

These examples apply to management domains:
1. To delete the link between the condition "FileSystem space used" on the management server and the response "Broadcast event on-shift", run this command on the management server:
   rmcondresp "FileSystem space used" "Broadcast event on-shift"

2. To delete the links between the condition "FileSystem space used" on the managed node nodeB and the responses "Broadcast event on-shift" and "E-mail root anytime", run this command on the management server:
   rmcondresp "FileSystem space used":nodeB \ "Broadcast event on-shift" "E-mail root anytime"

These examples apply to peer domains:
1. To delete the links between the condition "FileSystem space used" on nodeA in the domain and the responses "Broadcast event on-shift" and "E-mail root anytime", run this command on any node in the domain:
   rmcondresp "FileSystem space used":nodeA \ "Broadcast event on-shift" "E-mail root anytime"

2. To delete the links between all conditions on nodeA in the domain and the response "Broadcast event on-shift", run this command on any node in the domain:
   rmcondresp -r "Broadcast event on-shift":nodeA

Location
/usr/sbin/rsct/bin/rmcondresp
Contains the rmcondresp command

Related Information
Commands: lscondresp, mkcondition, mkcondresp, mkresponse, startcondresp, stopcondresp

Files: rmccli

rmcosi Command

Purpose
Removes a Common Operating System Image (COSI).

Syntax
rmcosi [-f] [v] COSI

Description
The rmcosi command removes a Common Operating System Image (COSI) created with the mkcosi command. If the common image to be removed is being used by thin servers, the operation fails unless the force flag (-f) is specified. The -f flag terminates any thin server sessions with the common image so that the COSI can be removed. This command depends on the bos.sysmgt.nim.master fileset being present on the system.
Flags

-fforcesthenremovalofthecommonimage.Ifthecommon
imageisbeingusedbythin servers,thethin serverswill
be taken offline so that the common image can be
removed.

-vEnables verbose debug output when the rmcosi
command runs.

Exit Status

0The command completed successfully.

>0An error occurred.

Security

Access Control: You must have root authority to run the rmcosi command.

Examples

1. To common image named cosi1, enter:
rmcosi cosi1

Location

/usr/sbin/rmcosi

Files

/etc/niminfo Contains variables used by NIM.

Related Information

The chcosi command, cpcosi command, lscosi command, mkcosi command, mkts command, nim
command, nim_clients_setup command, nim_master_setup command, nimconfig command.

rmdel Command

Purpose

Removes a delta from a SCCS file.

Syntax

rmdel [-v] S ID File ...

Description

The rmdel command removes the delta specified by the S ID variable from each Source Code Control
System (SCCS) file indicated in the File parameter. You can remove only the most recently created delta
in a branch, or the latest trunk delta if it has no branches. In addition, the SID you specify must not be a
version currently being edited for the purpose of making a delta. To remove a delta, you must either own
the SCCS file and the directory, or you must have created the delta you want to remove.
If you specify a directory for the *File* parameter, the **rmdel** command performs the requested actions on all SCCS files (those with the *s.* prefix). If you specify a - (dash) for the *File* parameter, the **rmdel** command reads standard input and interprets each line as the name of an SCCS file. The **rmdel** command continues to read input until it reaches an end-of-file character.

After a delta has been removed, it is not included in any g-file created by the **get** command. However, the delta table entry remains in the *s.* file with an *R* by the entry to show that the delta has been removed.

**Flags**

- `-r SID` Removes the specified delta SID from the SCCS file. This flag is required.

**Exit Status**

This command returns the following exit values:

- `0` Successful completion.
- `>0` An error occurred.

**Examples**

To remove delta 1.3 from the *s.test.c* SCCS file, type:

```
rmdel -r 1.3 s.test.c
```

**Files**

- `/usr/bin/rmdel` Contains the **rmdel** command.
- *s.files* Files processed by the **rmdel** command.

**Related Information**

The **delta** command, **get** command, **prs** command.

The **sccsfile** file format.

**Source Code Control System (SCCS) Overview** in *AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.*

**List of SCCS Commands** in *AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.*

---

**rmdev Command**

**Purpose**

Removes a device from the system.

**Syntax**

```
```

**Description**

**Note:** The -l flag cannot be specified if -p is specified. If the -R flag is specified along with the -p flag, it will be ignored.
The `rmdev` command unconfigures or both unconfigures and undefines the device specified with the device logical name using the `-l Name` flag. The default action unconfigures the device but retains its device definition in the Customized Devices object class.

If you specify the `-S` flag, the `rmdev` command sets the device to the Stopped state for devices that support the Stopped state. If you specify the `-d` flag, the `rmdev` command deletes the device definition from the Customized Devices object class (undefines). If you do not specify the `-d` flag, the `rmdev` command sets the device to the Defined state (unconfigures). If you specify the `-R` flag, the `rmdev` command acts on any children of the device as well.

Use the `-p` flag along with the parent device’s logical name to unconfigure or delete all of the children devices. The children are unconfigured or deleted in the same recursive fashion as described for the `-R` flag, but the specified device itself is not unconfigured or deleted.

**Attention:** To protect the Configuration database, the `rmdev` command is not interruptible. Stopping this command before it is complete could result in a corrupted database.

You can also use the Devices application in Web-based System Manager, or the System Management Interface Tool (SMIT) `smit rmdev` fast path to run this command.

### Flags

- `-d` Removes the device definition from the Customized Devices object class. This flag cannot be used with the `-S` flag.
- `-f File` Reads the necessary flags from the `File` parameter.
- `-h` Displays the command usage message.
- `-l Name` Specifies the logical device, indicated by the `Name` parameter, in the Customized Devices object class. This flag cannot be used with the `-p` flag.
- `-p Name` Specifies the parent logical device (indicated by the `Name` parameter) in the Customized Devices object class, with children that must be removed. This flag may not be used with the `-l` flag.
- `-q` Suppresses the command output messages from standard output and standard error.
- `-R` Unconfigures the device and its children. When used with the `-d` or `-S` flags, the children are undefined or stopped, respectively.
- `-S` Makes the device unavailable by only calling the Stop method if the device has a Stop method. This flag cannot be used with the `-d` flag.

### Security

Privilege Control: Only the root user and members of the system group should have execute (x) access to this command.

Auditing Events:

<table>
<thead>
<tr>
<th>Event</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEV_Stop</td>
<td>Device name</td>
</tr>
<tr>
<td>DEV_Unconfigure</td>
<td>Device name</td>
</tr>
<tr>
<td>DEV_Remove</td>
<td>Device name</td>
</tr>
</tbody>
</table>

### Examples

1. To unconfigure the `cd0` CD-ROM device while retaining its device definition in the Customized Devices object class, type the following:

   ```bash
   rmdev -l cd0
   ```

   The system displays a message similar to the following:
To remove the cd0 CD-ROM device definition from the Customized Devices object class, type the following:

```
rmd -d -l cd0
```

The system displays a message similar to the following:
```
  cd0 deleted
```

To unconfigure the scsi1 SCSI adapter and all of its children while retaining their device definitions in the Customized Devices object class, type the following:

```
rmd -R -l scsi1
```

The system displays a message similar to the following:
```
  rmt0 Defined
  hdisk1 Defined
  scsi1 Defined
```

To unconfigure the children of the scsi1 SCSI adapter, but not the adapter itself, while retaining their device definitions in the Customized Devices object class, type the following:

```
rmd -p scsi1
```

The system displays a message similar to the following:
```
  rmt0 Defined
  hdisk1 Defined
```

To unconfigure the children of the pci1 PCI bus and all other devices under them while retaining their device definitions in the Customized Devices object class, type the following:

```
rmd -p pci1
```

The system displays a message similar to the following:
```
  rmt0 Defined
  hdisk1 Defined
  scsi1 Defined
  ent0 Defined
```

**Files**

```
/usr/sbin/rmdev
```

Contains the `rmdev` command.

**Related Information**

The `chdev` command, `isattr` command, `lsconn` command, `lsdev` command, `lsparent` command, `mkdev` command.

For information on installing the Web-based System Manager, see Chapter 2: Installation and System Requirements in AIX 5L Version 5.3 Web-based System Manager Administration Guide.

**rmdir Command**

**Purpose**

Removes a directory.

**Syntax**

```
rmdir [ [p] ] Directory...
```
Description

The `rmdir` command removes the directory, specified by the `Directory` parameter, from the system. The directory must be empty before you can remove it, and you must have write permission in its parent directory. Use the `ls -al` command to check whether the directory is empty. The directory must not be exported for use by the NFS version 4 server.

**Note:** The `rmdir` command supports the — (dash, dash) parameter as a delimiter that indicates the end of the flags.

**Flags**

- `-p`\*\*\*\**Directory**  
Removes all directories along the path name specified by the `Directory` parameter. Parent directories must be empty and the user must have write permission in the parent directories before they can be removed.

**Exit Status**

This command returns the following exit values:

- `0`  
Each directory entry specified by a `Directory` parameter was removed successfully.

- `>0`  
An error occurred.

**Examples**

1. To empty and remove a directory, type:

   ```
   rm mydir/* mydir/.*  
rmdir mydir
   ```

   This command removes the contents of the `mydir` file and then removes the empty directory. The `rm` command displays an error message about trying to remove the directories . (dot) and .. (dot, dot), and then the `rmdir` command removes them.

   Note that the `rm mydir/* mydir/.*` command first removes files with names that do not begin with a dot, and then removes those with names that do begin with a dot. You may not realize that the directory contains file names that begin with a dot because the `ls` command does not usually list them unless you use the `-a` flag.

2. To remove the `/home`, `/home/demo`, and `/home/demo/mydir` directories, type:

   ```
   rmdir -p /home/demo/mydir
   ```

   This command removes first the `/mydir` directory and then the `/demo` and `/home` directories, respectively. If a directory is not empty or does not have write permission when it is to be removed, the command terminates.

**Files**

- `/usr/bin/rmdir`  
Contains the `rmdir` command.

**Related Information**

- [Files](#) in *Operating system and device management.*
- [Directories](#) in *Operating system and device management.*
- [File and directory access modes](#) in *Operating system and device management.*
The `ls` command, `mkdir` command, `rm` command.

The `rmdir` subroutine, `unlink` subroutine.

---

**rmf Command**

**Purpose**
Removes folders and the messages they contain.

**Syntax**
```
rmf [ +Folder ] [ -interactive | -nointeractive ]
```

**Description**
The `rmf` command deletes the messages within the specified folder and then deletes the folder. By default, the `rmf` command confirms your request before deleting a folder. If the folder contains files that are not messages, the `rmf` command does not delete the files and returns an error.

**Attention:** The `rmf` command irreversibly deletes messages that do not have other links.

By default, the `rmf` command removes the current folder. When the current folder is removed, `inbox` becomes the current folder. If the `+Folder` flag is not specified, and the `rmf` command cannot find the current folder, the command requests confirmation before removing the `+inbox` folder.

The `rmf` command does not delete any folder or any messages in a folder to which you have read-only access. The `rmf` command deletes only your private sequences and your current message information from the profile.

The `rmf` command does not delete folders recursively. You cannot remove subfolders by requesting the removal of a parent folder. If you remove a subfolder, the parent of that folder becomes the current folder.

**Flags**
- `+Folder` Specifies the folder to be removed.
- `-help` Lists the command syntax, available switches (toggles), and version information.
  
  **Note:** For Message Handler (MH), the name of this flag must be fully spelled out.

- `-interactive` Requests confirmation before removing the folder. If the `+Folder` flag is not specified, this is the default.

- `-nointeractive` Removes the folder and its messages without requesting confirmation. This is the default.

**Profile Entries**
The following entries are entered in the `UserMhDirectory/.mh_profile` file:

- `Current-Folder:` Sets the default current folder.
- `Path:` Specifies the user's MH directory.

**Examples**

**Attention:** The `rmf` command irreversibly deletes messages that do not have other links.

1. To remove the current folder called `status`, enter:

    `rmf`
The system responds with a message similar to the following:

Remove folder "status"?

If you do want the folder removed, enter yes. The system responds with a message similar to the following:

[+inbox now current]

2. To remove the meetings folder noninteractively, enter:

```
rmf +meetings
```

**Files**

- `/home/.mh_profile` Defines the MH user profile.
- `/usr/bin/rmf` Contains the `rmf` command.

**Related Information**

The `rmm` command.

The `mh_alias` file format, `mh_profile` file format.

Mail applications in *Networks and communication management*.

---

**rmfilt Command**

**Purpose**

Removes a filter rule from the filter table.

**Syntax**

```
rmfilt -v 4/6 -n fid | all [-f]
```

**Description**

Use the `rmfilt` command to remove filter rules from the filter rule table. Actions by this command will not effect the IP Security subsystem until the `mkfilt` command is executed. IPsec filter rules for this command can be configured using the `genfilt` command, IPsec smit (IP version 4 or IP version 6), or Web-based System Manager in the Virtual Private Network submenu.

The `rmfilt` command removes a filter rules from the filter rule table. Only manual filter rules can be removed.

**Flags**

- `-f` Force to remove auto-generated filter rules. -f flag works with `-n all` to remove all the filter rules (user-defined and auto-generated filter rules) except rule number 1 for IP version 4.

- `-n` The ID of the filter rule you want to remove from the filter rule table. For IP version 4, the value of 1 is invalid for this flag, that is a reserved filter rule. If `all` is specified, all the user defined filter rules will be removed until the `-f` flag is specified.

**rmfs Command**

**Purpose**
Removes a file system.

**Syntax**
```
rmfs [\[-r\] [\[-i\] ] FileSystem
```

**Description**
The `rmfs` command removes a file system. If the file system is a journaled file system (JFS or JFS2), the `rmfs` command removes both the logical volume on which the file system resides and the associated stanza in the `/etc/filesystems` file. If the file system is not a JFS or JFS2 file system, the command removes only the associated stanza in the `/etc/filesystems` file. The `FileSystem` parameter specifies the file system to be removed.

You can use the File Systems application in Web-based System Manager (wsm) to change file system characteristics.

You could also use the System Management Interface Tool (SMIT) `smit rmfs` fast path to run this command.

**Flags**
- `-r` Removes the mount point of the file system.
- `-i` Displays warning and prompts the user before removing file system.

**Exit Status**
This command returns the following exit values:

<table>
<thead>
<tr>
<th>Exit Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>File system is successfully removed.</td>
</tr>
<tr>
<td>&gt;0</td>
<td>File system is not successfully removed.</td>
</tr>
</tbody>
</table>

**Security**
Access Control: Only the root user or a member of the `system` group can run this command.

**Examples**
To remove the `/test` file system, enter:
```
rdfs /test
```

This removes the `/test` file system, its entry in the `/etc/filesystems` file, and the underlying logical volume.

**Files**
- `/etc/rmfs` Contains the `rmfs` command.
- `/etc/filesystems` Lists the known file systems and defines their characteristics.
Related Information
The \texttt{chfs}, \texttt{crfs}, \texttt{lsfs}, \texttt{mkfs}, \texttt{rmlv} commands.

File systems in \textit{Operating system and device management}.

For information on installing the Web-based System Manager, see

System management interface tool in \textit{Operating system and device management}.

---

\textbf{rmgroup Command}

\textbf{Purpose}
Removes a group.

\textbf{Syntax}
\texttt{rmgroup [-R load\_module] Name}

\textbf{Description}
The \texttt{rmgroup} command removes a group specified by the \textit{Name} parameter. This command deletes all the group attributes as well. To remove a group, the group name must already exist. Users who are group members are not removed from the system.

If the group is the primary group for any user, you cannot remove it unless you redefine the user’s primary group with the \texttt{chuser} command. The \texttt{chuser} command alters the \texttt{/etc/passwd} file. Only the root user or a user with GroupAdmin authorization can remove an administrative group or a group with administrative users as members.

For groups that were created with an alternate Identification and Authentication (I&A) mechanism, the \texttt{-R} flag can be used to specify the I&A load module used. Load modules are defined in the \texttt{/usr/lib/security/methods.cfg} file.

You can use the Users application in Web-based System Manager (wsm) to change user characteristics.

You could also use the System Management Interface Tool (SMIT) \texttt{smit rmgroup} fast path to run this command.

\textbf{Flag}
\begin{itemize}
  \item \texttt{-R load\_module} Specifies the loadable I&A module used to remove a group.
\end{itemize}

\textbf{Security}
Access Control: This command should grant execute (x) access only to the root user and members of the security group. This command should be installed as a program in the trusted computing base (TCB). The command should be owned by the root user with the \texttt{setuid} (SUID) bit set.

Files Accessed:

\begin{tabular}{ll}
  \texttt{r} & \texttt{/etc/passwd} \\
  \texttt{rw} & \texttt{/etc/group} \\
  \texttt{rw} & \texttt{/etc/security/group}
\end{tabular}
Auditing Events:

<table>
<thead>
<tr>
<th>Event</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROUP_Remove</td>
<td>group</td>
</tr>
</tbody>
</table>

Limitations
Removing a group may not be supported by all loadable I&A modules. If the loadable I&A module does not support removing a group, an error is reported.

Examples
1. To remove the finance group, type:
   
   `rmgroup finance`

2. To remove the LDAP I&A loadable module group monsters, type:
   
   `rmgroup -R LDAP monsters`

Files

- `/usr/sbin/rmgp` Contains the `rmgroup` command.
- `/etc/group` Contains the basic attributes of groups.
- `/etc/security/group` Contains the extended attributes of groups.

Related Information
The `chfn` command, `chgrp` command, `chsh` command, `chgroup` command, `chuser` command, `lsgrp` command, `lsuser` command, `mg` command, `mkuser` command, `lppgr` command, `lppuser` command, `sets` command, `setg` command.

Securing the network in Security.

For information on installing the Web-based System Manager, see Chapter 2: Installation and System Requirements in AIX 5L Version 5.3 Web-based System Manager Administration Guide.

rmitab Command

Purpose
Removes records in the `/etc/inittab` file.

Syntax

```
rmitab Identifier
```

Description
The `rmitab` command removes an `/etc/inittab` record. You can specify a record to remove by using the `Identifier` parameter. The `Identifier` parameter specifies a field of one to fourteen characters used to uniquely identify an object. If the `Identifier` field is not unique, the command is unsuccessful.

Examples
To remove the tty entry for tty2, enter:

```
rmitab "tty002"
```
Related Information
The `smit` command, `chitab` command, `lsitab` command, `mkitab` command, `init` command, `/etc/inittab` file.

**rmkeyserv Command**

**Purpose**
Stops the `keyserv` daemon and comments the entry in the `/etc/rc.nfs` file.

**Syntax**
```
/usr/sbin/rmkeyserv [ -I | -B | -N ]
```

**Description**
The `rmkeyserv` command comments the entry for the `keyserv` daemon in the `/etc/rc.nfs` file. The `rmkeyserv` daemon stops the `keyserv` daemon by using the `stopsrc` command.

You can use the File Systems application in Web-based System Manager (wsm) to change file system characteristics.

You could also use the System Management Interface Tool (SMIT) `smit rmkeyserv` fast path to run this command.

**Flags**
- `-I` Comments the entry for the `keyserv` daemon in the `/etc/rc.nfs` file.
- `-B` Comments the entry for the `keyserv` daemon in the `/etc/rc.nfs` file and stops the `keyserv` daemon. This flag is the default.
- `-N` Stops the `keyserv` daemon using the `stopsrc` command. This flag does not change the `/etc/rc.nfs` file.

**Examples**
To comment the entry in the `/etc/rc.nfs` file that starts the `keyserv` daemon, enter:
```
rmkeyserv -I
```
This command will not stop the currently executing daemon.

**Files**
```
/etc/rc.nfs
```
Contains the startup script for the NFS and NIS daemons.

**Related Information**
The `smit` command.
The `keyserv` daemon.

Network File System (NFS) Overview for System Management in Networks and communication management.

How to Start the NFS Daemons, How to Stop the NFS Daemons in Networks and communication management.

For information on installing the Web-based System Manager, see Chapter 2: Installation and System Requirements in AIX 5L Version 5.3 Web-based System Manager Administration Guide.

Network Information Service (NIS) in AIX 5L Version 5.3 Network Information Services (NIS and NIS+) Guide.

**rmlpcmd Command**

**Purpose**
Removes one or more least-privilege (LP) resources from the resource monitoring and control (RMC) subsystem.

**Syntax**
To remove one or more LP resources:
- From the local node:
  ```bash
  rmlpcmd [−h] [−TV] resource_name1 [ , resource_name2 , ... ]
  ```
- From all nodes in a domain:
  ```bash
  rmlpcmd −a [−h] [−TV] resource_name1 [ , resource_name2 , ... ]
  ```
- From a subset of nodes in a domain:
  ```bash
  rmlpcmd −n host1 [,host2,...] [−h] [−TV] resource_name1 [ , resource_name2 , ... ]
  ```

**Description**
The `rmlpcmd` command removes one or more LP resources from the RMC subsystem. An LP resource is a root command or script to which users are granted access based on permissions in the LP access control lists (ACLs). You can use the `rmlpcmd` command to remove LP resources from particular nodes or all nodes in a domain. If you want to remove locked LP resources, you must first use the `chlpcmd` command to unset the resource’s Lock attribute.

This command runs on any node. If you want this command to run on all of the nodes in a domain, use the -a flag. If you want this command to run on a subset of nodes in a domain, use the -n flag. Otherwise, this command runs on the local node.

**Flags**
- `−a`
  Removes one or more LP resources from all nodes in the domain. The `CT_MANAGEMENT_SCOPE` environment variable’s setting determines the cluster scope. If `CT_MANAGEMENT_SCOPE` is not set, the LP resource manager uses scope settings in this order:
    1. The management domain, if it exists
    2. The peer domain, if it exists
    3. Local scope

  The `rmlpcmd` command runs once for the first valid scope that the LP resource manager finds. For example, suppose a management domain and a peer domain exist and the `CT_MANAGEMENT_SCOPE` environment variable is not set. In this case, `rmlpcmd −a` runs in the management domain. To run `rmlpcmd −a` in the peer domain, you must set `CT_MANAGEMENT_SCOPE` to 2.

- `−n host1[,host2,...]`
  Specifies one or more nodes in the domain from which the LP resource is to be removed. By default, the LP resource is removed from the local node. The -n flag is valid only in a
management or peer domain. If the CT_MANAGEMENT_SCOPE variable is not set, the LP resource manager uses scope settings in this order:
1. The management domain, if it exists
2. The peer domain, if it exists
3. Local scope

The rmlpcmd command runs once for the first valid scope that the LP resource manager finds.

- **h**  Writes the command's usage statement to standard output.
- **T**  Writes the command's trace messages to standard error.
- **V**  Writes the command's verbose messages to standard output.

**Parameters**

resource_name1[,resource_name2,...]
Specifies one or more LP resources to be removed.

**Security**

To run the rmlpcmd command, you need read and write permission in the Class ACL of the IBM.LPCommands resource class. Permissions are specified in the LP ACLs on the contacted system. See the lpacl file for general information about LP ACLs and the RSCT Administration Guide for information about modifying them.

**Exit Status**

0  The command has run successfully.
1  An error occurred with RMC.
2  An error occurred with the command-line interface (CLI) script.
3  An incorrect flag was specified on the command line.
4  An incorrect parameter was specified on the command line.
5  An error occurred with RMC that was based on incorrect command-line input.
6  The resource was not found.

**Environment Variables**

**CT_CONTACT**

Determines the system that is used for the session with the RMC daemon. When CT_CONTACT is set to a host name or IP address, the command contacts the RMC daemon on the specified host. If CT_CONTACT is not set, the command contacts the RMC daemon on the local system where the command is being run. The target of the RMC daemon session and the management scope determine the LP resources that are processed.

**CT_MANAGEMENT_SCOPE**

Determines the management scope that is used for the session with the RMC daemon to process the LP resource. The management scope determines the set of possible target nodes where the resource can be processed. The valid values are:

0  Specifies local scope.
1  Specifies local scope.
2  Specifies peer domain scope.
3  Specifies management domain scope.

If this environment variable is not set, local scope is used.
Implementation Specifics
This command is part of the Reliable Scalable Cluster Technology (RSCT) fileset for AIX.

Standard Output
When the -h flag is specified, this command's usage statement is written to standard output. When the -V flag is specified, this command's verbose messages are written to standard output.

Standard Error
All trace messages are written to standard error.

Examples
1. To remove an LP resource named LP1, enter:
   \texttt{rmlpcmd LP1}
2. To remove LP resources LP1 and LP2, enter:
   \texttt{rmlpcmd LP1 LP2}

Location
/usr/sbin/rsct/bin/rmlpcmd  Contains the \texttt{rmlpcmd} command

Related Information
Books: \textit{RSCT Administration Guide}, for information modifying LP ACLs.

Commands: chlpcmd, lphistory, lslpcmd, mklpcmd, runlpcmd

Information Files: lpacl, for general information about LP ACLs

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\textbf{rmlv Command}

\textbf{Purpose}
Removes logical volumes from a volume group.

\textbf{Syntax}
\texttt{rmlv [ -B ] [ -f ]  [ -p Physical Volume ] LogicalVolume ...}

\textbf{Description}
\textbf{Attention:} This command destroys all data in the specified logical volumes.

The \texttt{rmlv} command removes a logical volume. The LogicalVolume parameter can be a logical volume name or logical volume ID. The logical volume first must be closed. If the volume group is varied on in concurrent mode, the logical volume must be closed on all the concurrent nodes on which volume group is varied on. For example, if the logical volume contains a file system, it must be unmounted. However, removing the logical volume does not notify the operating system that the file system residing on it have been destroyed. The command \texttt{rmfs} updates the \texttt{/etc/filesystems} file.

\textbf{Notes:}
1. To use this command, you must either have root user authority or be a member of the system group.
2. The \texttt{rmlv} command is not allowed on a snapshot volume group or a volume group that has a snapshot volume group.
You can use the Volumes application in Web-based System Manager (wsm) to change volume characteristics.

You could also use the System Management Interface Tool (SMIT) `smit rmlv` fast path to run this command.

**Flags**

- `-B`  
  Issues a `chlvcopy -B -s` for the parent logical volume if the logical volume was created using the `-l` flag. If it is a regular logical volume then the `-B` flag is ignored.

- `-f`  
  Removes the logical volumes without requesting confirmation.

- `-p PhysicalVolume`  
  Removes only the logical partition on the `PhysicalVolume`. The logical volume is not removed unless there are no other physical partitions allocated.

**Attention:** If the logical volume spans multiple physical volumes, the removal of only logical partitions on the `PhysicalVolume` can jeopardize the integrity of the entire logical volume.

**Examples**

**Attention:** The command used in this example destroys all data in the logical volumes.

To remove logical volume `lv05` without requiring user confirmation, enter the following command:

```
rmlv -f lv05
```

The logical volume is removed from the volume group.

**Files**

- `/etc`  
  Directory where the `rmlv` command resides.

- `/tmp`  
  Directory where the temporary files are stored while the command is running.

- `/etc/filesystems`  
  Lists the known file systems and defines their characteristics.

**Related Information**

The `varyonvg` command, `unmount` command, `rmfs` command.

The **Logical volume storage** in *Operating system and device management* explains the Logical Volume Manager, physical volumes, logical volumes, volume groups, organization, ensuring data integrity, and allocation characteristics.

The **System management interface tool** in *Operating system and device management* explains the structure, main menus, and tasks that are done with SMIT.

For information on installing the Web-based System Manager, see `Chapter 2: Installation and System Requirements` in *AIX 5L Version 5.3 Web-based System Manager Administration Guide*.

**rmlvcopy Command**

**Purpose**

Removes copies from a logical volume.
Syntax

rmlvcopy LogicalVolume Copies [ PhysicalVolume ... ]

Description

The rmlvcopy command removes copies from each logical partition in the LogicalVolume. Copies are the physical partitions which, in addition to the original physical partition, make up a logical partition. You can have up to two copies in a logical volume. The Copies parameter determines the maximum number of physical partitions that remain. The LogicalVolume parameter can be a logical volume name or logical volume ID. The PhysicalVolume parameter can be the physical volume name or the physical volume ID. If the PhysicalVolume parameter is used, then only copies from that physical volume will be removed.

You can use the Volumes application in Web-based System Manager (wsm) to change volume characteristics.

You could also use the System Management Interface Tool (SMIT) smit rmlvcopy fast path to run this command.

Notes:

1. To use this command, you must either have root user authority or be a member of the system group.
2. If LVM has not recognized that a disk has failed it is possible that LVM will remove a different mirror. Therefore if you know that a disk has failed and LVM does not show those disks as missing you should specify the failed disks on the command line or you should use replacepv to replace the disk or reducevg to remove the disk.
3. The rmlvcopy command is not allowed on a snapshot volume group or a volume group that has a snapshot volume group.

Examples

To reduce the number of copies of each logical partition belonging to logical volume lv0112, enter:

rmlvcopy lv0112 2

Each logical partition in the logical volume now has at most two physical partitions.

Files

/etc/rmlvcopy Contains the rmlvcopy command.
/tmp/* Directory where the temporary files are stored while the command is running.

Related Information

The mklv command, mklvcopy command.

The Logical volume storage in Operating system and device management explains the Logical Volume Manager, physical volumes, logical volumes, volume groups, organization, ensuring data integrity, and allocation characteristics.

For information on installing the Web-based System Manager, see Chapter 2: Installation and System Requirements in AIX 5L Version 5.3 Web-based System Manager Administration Guide.

The System management interface tool in Operating system and device management explains the structure, main menus, and tasks that are done with SMIT.
rmm Command

Purpose
Removes messages from active status.

Syntax
rmm [\(+\)Folder] [Messages]

Description
The rmm command removes messages from active status by renaming them. To rename a message, the system prefaces the current message number with a , (comma). Inactive files are unavailable to the Message Handler (MH) package. However, system commands can still manipulate inactive files.

Note: The rmm command does not change the current message.

Inactive messages should be deleted periodically. An entry can be placed in your crontab file to automatically delete all files beginning with a comma.

Flags
\(+\)Folder Specifies the folder containing the messages to rename.
Messages Specifies the messages to rename. You can specify several messages, a range of messages, or a single message. Use the following references to specify a message:

Number
Number of the message

Sequence
A group of messages specified by the user. Recognized values include:
all All messages in a folder
cur or . (dot) Current message. This is the default.
first First message in a folder
last Last message in a folder
next Message following the current message
prev Message preceding the current message

-help Lists the command syntax, available switches (toggles), and version information.

Note: For MH, the name of this flag must be fully spelled out.

Examples
1. To remove the current message in the current folder, enter:
   
rmm

2. To remove messages 2 through 5 from the sales folder, enter:
   
rmm \(+\)sales 2-5
Profile Entries
The following entries are entered in the UserMhDirectory/.mh_profile:

Current-Folder: Sets the default current folder.
Path: Specifies the UserMhDirectory.
rmmproc: Specifies the program used to remove messages from a folder.

Files
$HOME/.mh_profile Contains the MH user profile.
/usr/bin/rmm Contains the rmm command.

Related Information
The crontab command, rmf command.
The .mh_alias file format, .mh_profile file format.
Mail applications in Networks and communication management.

rmnamsv Command

Purpose
Unconfigures TCP/IP-based name service on a host.

Syntax
rmnamsv [ -F FileName ]

Description
The rmnamsv high-level command unconfigures a TCP/IP-based name service on a host. You can unconfigure name service for a host functioning as a client.

To unconfigure name service for a client, the rmnamsv command calls the namerslv low-level command to unconfigure entries in the /etc/resolv.conf file or to rename the /etc/resolv.conf file to a default or user-specified file name.

You can use the Network application in Web-based System Manager to change network characteristics.

You could also use the System Management Interface Tool (SMIT) smit rmnamserv fast path to run this command.

Flags
-F FileName Renames the system configuration database to the file name specified by FileName.
-f Specifies that the default file name (/etc/resolv.conf.sv) should be used to rename the /etc/resolv.conf file.

Files
/etc/resolv.conf Contains the default system configuration database.
Related Information

For information on installing the Web-based System Manager, see Chapter 2: Installation and System Requirements in AIX 5L Version 5.3 Web-based System Manager Administration Guide.

The namerslv command.

rmnfs Command

Purpose
Changes the configuration of the system to stop running NFS daemons.

Syntax
/usr/sbin/rmnfs [-I] [-N] [-B]

Description
The rmnfs command changes the current configuration of the system so that the /etc/rc.nfs file is not executed on system restart. In addition, you can direct the command to stop NFS daemons that are currently running.

Flags
- B Removes the entry in the inittab file and stops NFS daemons that are currently executing. This flag is the default.
- I Removes the entry in the inittab file that starts NFS daemons on system restart.
- N Stops immediately NFS daemons and does not change the inittab file.

Examples
To stop all of the NFS daemons immediately, enter:
rmnfs -N

This command will not change the inittab file.

Related Information
The chnfs command, mknfs command, rmnfsexp command, rmnfsmt command.

List of NFS commands in Networks and communication management.

Network File System (NFS) Overview for System Management in Networks and communication management.

rmnfsexp Command

Purpose
Unexports a directory from NFS clients.

Syntax
Description
The `rmnfsexp` command removes an entry from the exports list for NFS clients. The `rmnfsexp` command starts the `exportfs` command to unexport the specified directory. If an entry exists in the `/etc/exports` file, that entry is removed.

Flags
- `-d Directory` Specifies the directory to be unexported.
- `-f Exports_File` Specifies the full pathname of the exports file to use if other than the `/etc/exports` file.
- `-I` This flag directs the command to remove the entry from the `/etc/exports` file without executing the `exportfs` command.
- `-B` Removes the entry in the `/etc/exports` file for the directory specified and executes the `exportfs` command to remove the export.
- `-N` Unexports the directory immediately by invoking the `exportfs` command. The `/etc/exports` file is not modified with this flag.

Examples
1. To unexport a directory immediately, type:
   `rmnfsexp -d /usr -N`
   In this example, the `/usr` directory is unexported immediately.
2. To unexport a directory immediately and after every system restart, type:
   `rmnfsexp -d /home/guest -B`
3. To unexport a directory immediately from an exports file other than the `/etc/exports` file, type:
   `rmnfsexp -d /usr -f /etc/exports.other -N`

Files
- `/etc/exports` Lists the directories that the server can export.
- `/etc/xtab` Lists currently exported directories.
- `/etc/netgroup` Contains information about each user group on the network.

Related Information
The `chnfsexp` command, `exportfs` command, `mknfsexp` command.

List of NFS commands in Networks and communication management.

Network File System (NFS) Overview for System Management in Networks and communication management.

rmnfsmnt Command

Purpose
Removes an NFS mount.

Syntax
`/usr/sbin/rmnfsmnt [-f] PathName [-I | -B | -N]`
Description
The `rmnfsmnt` command removes the appropriate entry from the `/etc/filesystems` file and unmounts the file system specified. When used with the `-N` flag, the `rmnfsmnt` command unmounts the file system and does not modify the `/etc/filesystems` file.

Flags

- `-B` Removes the entry in the `/etc/filesystems` file and unmounts the directory. If no entry exists in the `/etc/filesystems` file, the flag makes no changes to the file. If the file system is not currently mounted, the flag does not attempt to unmount it. This flag is the default.
- `-I PathName` Specifies the path name of the NFS-mounted file system.
- `-I` Removes the entry specified by the path name from the `/etc/filesystems` file.
- `-N` Unmounts the specified directory and does not modify the `/etc/filesystems` file.

Examples

1. To unmount a file system, enter:
   ```
   rmnfsmnt -f /usr/man -N
   ```
   In this example, the `/usr/man` file system is unmounted.

2. To remove a mount for a file, enter:
   ```
   rmnfsmnt -f /usr/local/man -B
   ```
   In this example, the mount for the `/usr/local/man` file is removed.

File

`/etc/filesystems` Lists the remote file systems to mount during the system restart.

Related Information

The `chnfsmnt` command, `mknfsmnt` command, `mount` command, `umount` command.

Network File System (NFS) Overview for System Management in Networks and communication management.

List of NFS commands in Networks and communication management.

rmnfproxy Command

Purpose
Removes a previously configured and mounted instance of a proxy-enabled Cachefs.

Syntax
```
/usr/sbin/rmnfsproxy Cachefs_mount_point
```

Description
The specified Cachefs mount is unmounted. The corresponding NFS client mount is also unmounted. Finally, all cached information created in the local file system is removed.

Note: If the Cachefs instance is NFS-exported, the instance must first be unexported before running `rmnfproxy`. 
Parameters

*Cachefs_moun_point* Specifies where the proxy-enabled Cachefs instance to be removed was mounted.

Exit Status

0 The command completed successfully.

>0 An error occurred.

Examples

1. To remove a previously configured /proj1_cached Cachefs instance, enter:
   
   mknfsproxy -c /cache/project1 -d /proj1_cached -m hard,vers=4,intr foo:/project1

Location

/usr/sbin/rmnfsproxy

Related Information

The `mount` command, `mknfsproxy` command.

rmnotify Command

Purpose

Removes a notify method definition from the Notify object class.

Syntax

rmnotify -n NotifyName

Description

The rmnotify command removes a notify method definition from the notify object class.

Flags

- `-n NotifyName` Specifies the notify method definition to be removed. The rmnotify command is unsuccessful if the NotifyName name does not already exist in the Notify object class.

Files

/etc)objrepos/SRCnotify Specifies the SRC Notify Method object class.

Related Information

The `lssrc` command, `mknotify` command, `mkssys` command, `rmssys` command.

System Resource Controller in *Operating system and device management*.

System Resource Controller (SRC) Overview for Programmers in *AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs*. 

Alphabetical Listing of Commands 695
rmpath Command

Purpose
Removes from the system a path to an MPIO capable device.

Syntax
rmpath [ -l Name ] [ -p Parent ] [ -w Connection ] [ -d ]

rmpath -h

Description
The rmpath command unconfigures, and possibly undefines, one or more paths associated with the specified target device (-l Name). The set of paths that are removed are determined by the combination of the -l Name, -p Parent and -w Connection flags. If the command will result in all paths associated with the device being unconfigured or undefined, the command will exit with an error and without unconfiguring or undefining any path. In this situation, rmdev command must be used instead to unconfigure or undefine the target device itself.

The default action unconfigures each specified path, but does not completely remove it from the system. If the -d flag is specified, the rmpath command unconfigures (if necessary) and removes, or deletes, the path definition(s) from the system.

When the rmpath command finishes, it displays a status message. When unconfiguring paths, it is possible for this command to be able to unconfigure some paths and not others (e.g., paths that are in the process of doing I/O cannot be unconfigured).

The rmpath command provides status messages about the results of operation. Messages in one of the following formats will be generated:

path [ defined | deleted ]
This message is displayed when a single path was successfully unconfigured or undefined. If the path is successfully configured the message path available displays. If the path is not successfully configured and there is no explicit error code returned by the method, the message path defined displays.

paths [defined | deleted]
This message is displayed if multiple paths were identified and all paths were successfully unconfigured or undefined. If the -d flag is not specified, the message would be paths defined. If the -d flag is specified, the message would be paths deleted.

some paths [ defined | deleted ]
This message is displayed if multiple paths were identified, but only some of them were successfully unconfigured or undefined. If the -d flag is not specified, the message would be some paths defined. If the -d flag is specified, the message would be some paths deleted.

no paths processed
This message is generated if no paths were found matching the selection criteria.

Flags

-d Indicates that the specified paths are to be deleted from the system.
-h
Displays the command usage message.
-1 Name
Specifies the logical device name of the target device whose path is to be removed. The paths to be removed are qualified via the -p and -w flags.
-p Parent
Indicates the logical device name of the parent device to use in qualifying the paths to be removed. Since all paths to a device cannot be removed by this command, either this flag, the -w flag, or both must be specified.
-w Connection
Indicates the connection information to use in qualifying the paths to be removed. Since all paths to a device cannot be removed by this command, either this flag, the -p flag, or both must be specified.

Security

Privilege Control: Only the root user and members of the system group have execute access to this command.

Auditing Events:

<table>
<thead>
<tr>
<th>Event</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEV_Change</td>
<td>rmpath,Unconfigure,&lt;unconfigure method arguments&gt;</td>
</tr>
<tr>
<td>DEV_Change</td>
<td>rmpath,Undefined,&lt;undefined method arguments&gt;</td>
</tr>
</tbody>
</table>

Examples

1. To unconfigure the path from scsi0 to hdisk1 at connection 5,0, type:
   rmpath -l hdisk1 -p scsi0 -w "5,0"
   The message generated would be similar to:
   path defined

2. To unconfigure all paths from scsi0 to hdisk1, type:
   rmpath -l hdisk1 -p scsi0
   If all paths were successfully unconfigured, the message generated would be similar to:
   paths defined
   However, if only some of the paths were successfully unconfigured, the message would be similar to:
   some paths defined

3. To undefine the path definition between scsi0 and hdisk1 at connection 5,0, type:
   rmpath -d -l hdisk1 -p scsi0 -w "5,0"
   The message generated would be similar to the following:
   path deleted

4. To unconfigure all paths from scsi0 to hdisk1, type:
   rmpath -d -l hdisk1 -p scsi0
   The message generated would be similar to:
   paths deleted
Files
/usr/sbin/rmpath
Contains the rmpath command.

Related Information
The chpath command, lspath command, mkpath command.

rmprtsv Command

Purpose
Unconfigures a print service on a client or server machine.

Syntax
rmprtsv { -c | -s } [ -T | -U | -A ] [ -h "HostName ..." | -H FileName ] [ -q "QEntry ..." ] [ -q QEntry ]

Description
The rmprtsv high-level command unconfigures a print service on a client or server machine.

To unconfigure print service for a client, the rmprtsv command calls the rmque and rmquedev commands to disable the client spool queue and to remove the appropriate entries in the /etc/qconfig file.

To unconfigure print service for a server, the rmprtsv command performs the following procedure:
1. Calls the stopsrc command to deactivate the lpd and qdaemon servers.
2. Calls the ruser low-level command to unconfigure remote users on the print server.
3. Calls the rmque and rmquedev commands to unconfigure the spooler and its device queues, and delete the appropriate entries in the server's /usr/lib/lpd/qconfig file.

Flags
-A
Removes specified entries from the /etc/qconfig file but does not fully unconfigure print service.
-c
Unconfigures print service for a client machine. Use the -q flag with the -c flag.
-H FileName
Specifies the name of a file containing a list of host names to be left configured for print service.
-h "HostName..."
Specifies a list of remote host names not allowed to use the print server. Note that the queuing system does not support multibyte host names.
-q "QEntry..."
Specifies a list of entries to remove from the /etc/qconfig file.
-s
Unconfigures print service for a server machine. The -h, -H and -q flags should be used with the -s flag.
-T
Stops print service but does not fully unconfigure print service.
-U
Removes specified remote users on the print server but does not fully unconfigure print service.
-v "DeviceName..."
Specifies a list of the names of the device stanzas in the qconfig file. Must be used with the -q QEntry flag.

Files
/etc/qconfig
Contains configuration information for the printer queueing system.
rmps Command

Purpose
Removes an inactive paging space.

Syntax
rmps PagingSpace

Description
The rmps command removes an inactive paging space. The PagingSpace parameter specifies the name of the paging space to be removed, which is actually the name of the logical volume on which the paging space resides.

For an NFS paging space, the PagingSpace parameter specifies the name of the paging space to be removed. The device and its definition, which corresponds to this paging space, will be removed from the system. Nothing will be changed on the NFS server where the file that is used for paging actually resides.

Active pages can be removed by first deactivating them with the swapoff command.

You can use the File Systems application in Web-based System Manager (wsm) to change file system characteristics.

Examples
To remove PS01 paging space, enter:
rmps PS01

This removes the PS01 paging space.

Files
/etc/swapspaces Specifies the paging space devices activated by the swapon -a command.

Related Information
The rmque command, rmquedev command, ruser command.
The lpd daemon, qdaemon daemon.

The lsps command, mkps command, chps command, rmlv command, swapon command.

The Paging space in Operating system and device management explains paging space and its allocation policies.

The File systems in Operating system and device management explains file system types, management, structure, and maintenance.

The Logical volume storage in Operating system and device management explains the Logical Volume Manager, physical volumes, logical volumes, volume groups, organization, ensuring data integrity, and understanding the allocation characteristics.
For information on installing the Web-based System Manager, see Chapter 2: Installation and System Requirements in AIX 5L Version 5.3 Web-based System Manager Administration Guide.

The System management interface tool in Operating system and device management explains the structure, main menus, and tasks that are done with SMIT.

### rmqos Command

**Purpose**
Changes the configuration of the system to remove QoS support.

**Syntax**
```
/usr/sbin/rmqos [-I] [-N] [-B]
```

**Description**
The `rmqos` command changes the current configuration of the system to remove Quality of Service (QoS) support.

**Flags**
- `-B`  
  Removes the entry in the `inittab` file that enables QoS at system startup and stops the QoS daemons. This flag is the default.
- `-I`  
  Removes the entry in the `inttab` file that enables QoS at system startup but does not affect the currently running QoS subsystem.
- `-N`  
  Disables QoS support immediately but does not change the `inittab` file.

**Files**
- `inittab`  
  Controls the initialization process of the system.
- `/etc/rc.qos`  
  Contains the startup script for the QoS daemons.

**Related Information**
The `mkqos` command.

TCP/IP Quality of Service (QoS) in the Networks and communication management.

### rmque Command

**Purpose**
Removes a printer queue from the system.

**Syntax**
```
rmque -q Name
```

**Description**
The `rmque` command removes a queue from the system configuration by deleting the queue stanza named by the `-q` flag from the `/etc/qconfig` file. All queue devices must be deleted using the `rmquedev` command before entering this command.
You can use the Printer Queues application in Web-based System Manager (wsm) to change printer characteristics.

You could also use the System Management Interface Tool (SMIT) smit rmque fast path to run this command.

**Note:** Do not edit the /etc/qconfig file while there are active jobs in any queue. Editing includes both manual editing and use of the chque, mkque, rmque, mkquedev, rmquedev, or chquedev commands. It is recommended that all changes to the /etc/qconfig file be made using these commands. However, if manual editing is desired, first issue the enq -G command to bring the queuing system and the qdaemon to a halt after all jobs are processed. Then edit the /etc/qconfig file and restart the qdaemon with the new configuration.

### Flags

- `-q Name` Specifies the name of the queue to be removed.

### Examples

To remove printer queue lp0, enter:

```
rmque -q lp0
```

### Files

- `/usr/bin/rmque` Contains the `rmque` command.
- `/etc/qconfig` Contains the configuration file.

### Related Information

The `chque` command, `lsque` command, `mkque` command, `rmquedev` command, `smit` command.

The `/etc/qconfig` file.

Printing administration in Printers and printing.

Print spooler in Printers and printing.

Deleting a print queue in Printers and printing.

For information on installing the Web-based System Manager, see Chapter 2: Installation and System Requirements in AIX 5L Version 5.3 Web-based System Manager Administration Guide.

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### rmquedev Command

**Purpose**

Removes a printer or plotter queue device from the system.

**Syntax**

```
rmquedev [-d Name] [-q Name]
```
Description

The `rmquedev` command removes a printer or plotter queue device from the system configuration by deleting the device stanza named by the `-d` flag from the `/etc/qconfig` file. It also modifies the `Device=DeviceName1,DeviceName2,DeviceName3` line of the queue stanza, deleting the entry for the device Name.

You can use the Printer Queues application in Web-based System Manager (wsm) to change printer characteristics.

You could also use the System Management Interface Tool (SMIT) `smit rmquedev` fast path to run this command.

**Note:** Do not edit the `/etc/qconfig` file while there are active jobs in any queue. Editing includes both manual editing and use of the `chque`, `mkque`, `rmque`, `mkquedev`, `rmquedev`, or `chquedev` commands. It is recommended that all changes to the `/etc/qconfig` file be made using these commands. However, if manual editing is desired, first issue the `enq -G` command to bring the queuing system and the qdaemon to a halt after all jobs are processed. Then edit the `/etc/qconfig` file and restart the qdaemon with the new configuration.

Flags

- `-d Name` Specifies the Name of the device stanza to be deleted from the `qconfig` file.
- `-q Name` Specifies the Name of the device to be modified in the preceding queue stanza.

Examples

To delete the `1oc` device stanza from the `/etc/qconfig` file and modify the "DEVICE =" stanza in the preceding queue stanza `lpq`, enter:

```
rmquedev -q lpq -d 1oc
```

Files

- `/usr/bin/rmquedev` Contains the `rmquedev` command.
- `/etc/qconfig` Configuration file.

Related Information

The `chquedev` command, `lsquedev` command, `mkquedev` command, `rmque` command, `smit` command.

The `/etc/qconfig` file.

- Printing administration in the `Printers and printing`.
- Print spooler in the `Printers and printing`.
- Deleting a print queue in the `Printers and printing`.

For information on installing the Web-based System Manager, see Chapter 2: Installation and System Requirements in AIX 5L Version 5.3 Web-based System Manager Administration Guide.
rmramdisk Command

Purpose
Removes RAM disks created by the mkramdisk command.

Syntax
rmramdisk ram_disk_name

Description
The rmramdisk command removes the specified RAM disk and the device special files that were created for that RAM disk. RAM disks are also removed when the system is rebooted. Device special files can only be removed via the rmramdisk command.

Parameters
*ram_disk_name*  Name of the specific RAM disk to be removed from memory. If not specified, an error is returned. The names of the RAM disks are in the form of *rramdisk*x where *x* is the logical RAM disk number (0 through 63).

Exit Status
This command returns the following exit values:

- **0**: Successful completion.
- **>0**: An error occurred.

Examples

```
# ls -l /dev/*ramdisk2
brw-------  1 root  system  38,  0 Aug 01 05:52 /dev/ramdisk2
crw-------  1 root  system  38,  0 Aug 01 05:52 /dev/rramdisk2
```

To remove the ramdisk2, enter:

```
# rmramdisk ramdisk2
```

```
# ls -l /dev/*ramdisk2
ls: /dev/*/ramdisk2: No such file or directory
```

Files

* /usr/sbin/rmramdisk*  Contains the rmramdisk command.

Related Information

The mkramdisk command, and *ls* command.

rmresponse Command

Purpose
Removes a response.
Syntax
rmresponse [-f] [-q] [-h] [-TV] response[:node_name]

Description
The rmresponse command removes the response specified by the response parameter. The response must already exist in order to be removed. When the response must be removed even if it is linked with conditions, specify the -f flag. This forces the response and the links with the conditions to be removed. If the -f flag is not specified and links with conditions exist, the response is not removed. This command does not remove conditions.

If a particular response is needed for system software to work properly, it may be locked. A locked response cannot be modified or removed until it is unlocked. If the response you specify on the rmresponse command is locked, it will not be removed; instead an error will be generated informing you that the response is locked. To unlock a response, you can use the -U flag of the chresponse command. However, since a response is typically locked because it is essential for system software to work properly, you should exercise caution before unlocking it.

Flags
-f Forces the response to be removed even if it is linked with conditions. The links with the conditions are removed as well as the response, but the conditions are not removed.
-q Does not return an error when response does not exist.
-h Writes the command’s usage statement to standard output.
-T Writes the command’s trace messages to standard error. For your software service organization’s use only.
-V Writes the command’s verbose messages to standard output.

Parameters
response Specifies the name of a defined response to be removed.
node_name Specifies the node in a cluster where the response is defined. If node_name is not specified, the local node is used. node_name is a node within the scope determined by the CT_MANAGEMENT_SCOPE environment variable.

Security
The user needs write permission for the IBM.EventResponse resource class to run rmresponse. Permissions are specified in the access control list (ACL) file on the contacted system.

Exit Status
0 The command ran successfully.
1 An error occurred with RMC.
2 An error occurred with a command-line interface script.
3 An incorrect flag was entered on the command line.
4 An incorrect parameter was entered on the command line.
5 An error occurred that was based on incorrect command-line input.
Environment Variables

CT_CONTACT
Determines the system where the session with the resource monitoring and control (RMC) daemon occurs. When CT_CONTACT is set to a host name or IP address, the command contacts the RMC daemon on the specified host. If CT_CONTACT is not set, the command contacts the RMC daemon on the local system where the command is being run. The target of the RMC daemon session and the management scope determine the resource classes or resources that are processed.

CT_MANAGEMENT_SCOPE
Determines the management scope that is used for the session with the RMC daemon in processing the resources of the event-response resource manager (ERRM). The management scope determines the set of possible target nodes where the resources can be processed. The valid values are:

0  Specifies local scope.
1  Specifies local scope.
2  Specifies peer domain scope.
3  Specifies management domain scope.

If this environment variable is not set, local scope is used.

Standard Output
When the -h flag is specified, this command’s usage statement is written to standard output. All verbose messages are written to standard output.

Standard Error
All trace messages are written to standard error.

Examples
These examples apply to standalone systems:
1. To remove the response definition named "Broadcast event on-shift", run this command:
   `rmresponse "Broadcast event on-shift"
2. To remove the response definition named "Broadcast event on-shift" even if the response is linked with conditions, run this command:
   `rmresponse -f "Broadcast event on-shift"

This example applies to management domains:
1. In this example, the current node is the management server. To remove the response definition named "Broadcast event on-shift" on managed node nodeB, run this command:
   `rmresponse "Broadcast event on-shift":nodeB`

This example applies to peer domains:
1. To remove the response definition named "Broadcast event on-shift" defined on node nodeA, run this command from any node in the domain:
   `rmresponse "Broadcast event on-shift":nodeA`

Location
/usr/sbin/rsct/bin/rmresponse
Contains the rmresponse command
Related Information
Commands: chresponse, lscondresp, lsresponse, mkcondresp, mkresponse

Files: rmccli

rmrole Command

Purpose
Removes a role. This command applies only to AIX 4.2.1 and later.

Syntax
rmrole Name

Description
The rmrole command removes the role identified by the Name parameter from the /etc/security/roles file. The role name must already exist.

You can use Web-based System Manager Users application or the System Management Interface Tool (SMIT) to run this command.

Security
Files Accessed:

<table>
<thead>
<tr>
<th>Mode</th>
<th>File</th>
</tr>
</thead>
<tbody>
<tr>
<td>rw</td>
<td>/etc/security/roles</td>
</tr>
<tr>
<td>r</td>
<td>/etc/security/user.roles</td>
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</tbody>
</table>

Auditing Events:

<table>
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<tr>
<th>Event</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROLE_Remove</td>
<td>role</td>
</tr>
</tbody>
</table>

Examples
1. To remove the ManageObjects role, enter:
   rmrole ManageObjects

Files

/etc/security/roles Contains the attributes of roles.
/etc/security/user.roles Contains the role attribute of users.

Related Information
The chrole command, lsrole command, mkrole command, chuser command, lsuser command, mkuser command.

Securing the network in Security.
Users, roles, and passwords in Security.
For information on installing the Web-based System Manager, see Chapter 2: Installation and System Requirements in AIX 5L Version 5.3 Web-based System Manager Administration Guide.

rmpdomain Command

Purpose
Removes a peer domain that has already been defined.

Syntax
rmpdomain [−f] [−q] [−h] [−TV] peer_domain

Description
The rmpdomain command removes the peer domain definition that is specified by the peer_domain parameter. The peer domain that is to be removed must already be defined. This command must be run on a node that is defined in the peer domain. When rmpdomain is run on a node that is online to the peer domain, it removes the peer domain definition on all nodes defined to the peer domain that are reachable from that node. If a node defined to the peer domain is not reachable, that node's local peer domain definition is not removed. To remove the local peer domain definition when the peer domain is not online or when the node is not online to the peer domain, run the rmpdomain command on that node and specify the -f flag.

The most efficient way to remove a peer domain definition is to make sure the peer domain is online. Then, from a node that is online to the peer domain, run the rmpdomain command. If there are nodes that are not reachable from the node on which the rmpdomain command was run, on each of those nodes, run the rmpdomain command using the -f flag. This can be done at a later time if the node itself is not operational.

The -f flag must also be used to override a subsystem's rejection of the peer domain removal. A subsystem may reject the request if a peer domain resource is busy, for example. Specifying the -f flag in this situation indicates to the subsystems that the peer domain definition must be removed.

The rmpdomain command does not require configuration quorum. Therefore, this command is still successful if it is issued to a minority sub-cluster. Later, the majority sub-cluster may become active. If so, the domain is still removed.

Flags
-\texttt{f} Forces the peer domain to be removed. The force flag= is required to remove a peer domain definition:
  - from the local node when the node is not online to the peer domain.
  - when a subsystem may reject the request, as when resources are allocated, for example.
-\texttt{q} Specifies quiet mode. The command does not return an error if the peer domain does not exist.
-\texttt{h} Writes the command's usage statement to standard output.
-\texttt{T} Writes the command's trace messages to standard error. For your software service organization’s use only.
-\texttt{V} Writes the command's verbose messages to standard output.

Parameters
\texttt{peer\_domain} Specifies the name of the defined peer domain that is to be removed.
Security
The user of the \texttt{rmrpdomain} command needs write permission to the \texttt{IBM.PeerDomain} resource class on each node that is to be defined to the peer domain. By default, \texttt{root} on any node in the peer domain has read and write access to this resource class through the configuration resource manager.

Exit Status
0 The command ran successfully.
1 An error occurred with RMC.
2 An error occurred with a command-line interface script.
3 An incorrect flag was entered on the command line.
4 An incorrect parameter was entered on the command line.
5 An error occurred that was based on incorrect command-line input.
6 The peer domain definition does not exist.

Environment Variables
\texttt{CT\_CONTACT} Determines the system where the session with the resource monitoring and control (RMC) daemon occurs. When \texttt{CT\_CONTACT} is set to a host name or IP address, the command contacts the RMC daemon on the specified host. If \texttt{CT\_CONTACT} is not set, the command contacts the RMC daemon on the local system where the command is being run. The target of the RMC daemon session and the management scope determine the resource classes or resources that are processed.

Restrictions
The node on which this command is run must be defined to the peer domain and should be able to reach all of the nodes that are defined to the peer domain. The node's local peer domain definition will not be removed if the node is not reachable.

Implementation Specifics
This command is part of the Reliable Scalable Cluster Technology (RSCT) fileset for AIX.

Standard Input
When the \texttt{-f "-" or -F "-"} flag is specified, this command reads one or more node names from standard input.

Standard Output
When the \texttt{-h} flag is specified, this command's usage statement is written to standard output. All verbose messages are written to standard output.

Standard Error
All trace messages are written to standard error.

Examples
1. To remove the peer domain definition of \texttt{ApplDomain} where \texttt{nodeA}, \texttt{nodeB}, and \texttt{nodeC} are defined and online to \texttt{ApplDomain}, and all are reachable to each other, run this command on \texttt{nodeA}, \texttt{nodeB}, or \texttt{nodeC}:

\begin{verbatim}
rmrpdomain ApplDomain
\end{verbatim}
2. To remove the local peer domain definition of `ApplDomain` on `nodeD` when `nodeD` is not online to the peer domain, the peer domain is offline, or the peer domain does not exist, run this command on `nodeD`:

   ```
   rmrpdomain -f ApplDomain
   ```

3. To remove the peer domain definition of `ApplDomain` where `nodeA`, `nodeB`, and `nodeC` are defined and online to `ApplDomain`, all are reachable to each other, and to prevent a subsystem from rejecting the request, run this command on `nodeA`, `nodeB`, or `nodeC`:

   ```
   rmrpdomain -f ApplDomain
   ```

**Location**

`/usr/sbin/rsct/bin/rmrpdomain`

Contains the `rmrpdomain` command

**Files**

The `/etc/services` file is modified.

**Related Information**

Books: `RSCT: Administration Guide`, for information about peer domain operations

Commands: `addrpnode`, `lsrpdomain`, `lsrpnode`, `mkrpdomain`, `preprpnode`, `rmrpnode`, `startrpdomain`, `stoprpdomain`

Information Files: `rmccli`, for general information about RMC-related commands

Files: `/etc/services`

---

### rmrpnode Command

**Purpose**

Removes one or more nodes from a peer domain definition.

**Syntax**

```
rmrpnode [-f] [-q] [-h] [-TV] node_name1 [node_name2 ...]
```

```
rmrpnode -F { file_name | "" } [-f] [-q] [-h] [-TV]
```

**Description**

The `rmrpnode` command removes one or more nodes from the online peer domain where the command is run. The command must be run on a node that is online to the peer domain in which the nodes are to be removed. The nodes that are to be removed must be offline to the peer domain and must be reachable from the node where the command is run. To take nodes offline, use the `stoprpnode` command.

Specifying the `-f` flag forces the specified nodes to be removed from the peer domain. If the `-f` flag is not specified, more than half of the nodes must be online to remove one or more nodes from the domain.

**Flags**

- `-f` Forces the specified nodes to be removed from the peer domain.
- `-q` Specifies quiet mode. The command does not return an error if the specified nodes are not in the peer domain.
-F \{ file_name \[-\] \-

Reads a list of node names from file_name. Each line of the file is scanned for one node name. The pound sign (#) indicates that the remainder of the line (or the entire line if the # is in column 1) is a comment.

Use -F "-" to specify STDIN as the input file.

-h	Writes the command's usage statement to standard output.

-T	Writes the command's trace messages to standard error. For your software service organization's use only.

-V	Writes the command's verbose messages to standard output.

Parameters

node_name1 [node_name2 ...]

Specifies the peer domain node names of the nodes to be removed from the peer domain definition. You can remove one or more nodes using the rmrpnode command. You must specify the node names in exactly the same format as they were specified with the addrpnode command or the mkrpdomain command. To list the peer domain node names, run the lsrpnode command.

Security

The user of the rmrpnode command needs write permission for the IBM.PeerNode resource class on each node that is to be removed from the peer domain. By default, root on any node in the peer domain has read and write access to this resource class through the configuration resource manager.

Exit Status

0	The command ran successfully.
1	An error occurred with RMC.
2	An error occurred with a command-line interface script.
3	An incorrect flag was entered on the command line.
4	An incorrect parameter was entered on the command line.
5	An error occurred that was based on incorrect command-line input.
6	The node does not exist in the peer domain.

Environment Variables

CT_CONTACT
Determines the system where the session with the resource monitoring and control (RMC) daemon occurs. When CT_CONTACT is set to a host name or IP address, the command contacts the RMC daemon on the specified host. If CT_CONTACT is not set, the command contacts the RMC daemon on the local system where the command is being run. The target of the RMC daemon session and the management scope determine the resource classes or resources that are processed.

Restrictions

This command must be run on a node that is online in the peer domain in which the nodes are to be removed. The nodes to be removed must also be offline to the peer domain.
Implementation Specifics
This command is part of the Reliable Scalable Cluster Technology (RSCT) fileset for AIX.

Standard Input
When the -F "-" flag is specified, this command reads one or more node names from standard input.

Standard Output
When the -h flag is specified, this command's usage statement is written to standard output. All verbose messages are written to standard output.

Standard Error
All trace messages are written to standard error.

Examples
To remove the peer domain definitions of nodes nodeB and nodeC from the peer domain ApplDomain, when nodeA is defined and online to ApplDomain, and nodeB and nodeC are reachable from nodeA, run this command from nodeA:
```
rmrpnode nodeB nodeC
```

Location
```
/usr/sbin/rsct/bin/rmrpnode
```
Contains the rmrpnode command

Related Information
Books: RSCT: Administration Guide, for information about peer domain operations

Commands: addrpnode, lsrpnode, preprpnode, startrpnode, stoprpnode

Information Files: rmccli, for general information about RMC-related commands

rmrset Command

Purpose
Remove an rset from the system registry.

Syntax
```
rmrset rsetname
```

Description
The rmrset command removes an rset or exclusive rset (xrset) from the system registry. When used to delete an xrset, the rmrset command changes the state of the corresponding CPUs on the system to general use mode. Deleting an xrset requires root privilege.

Parameters
```
rsetname
```
The name of the rset to be removed from the system registry. The name consists of a namespace and an rsname separated by a "/" (slash). Both the namespace and rsname may contain up to 255 characters. See the rs_registername() service for additional information about character set limits of rset names.
Security
The user must have root authority, or CAP_NUMA_ATTACH capability and write access permission to the specified rset.

Examples
1. To remove test/cpus0to7 from system registry, type:
   
   rmrset test/cpus0to7

Files
/usr/bin/rmrset Contains the rmrset command.

Related Information
The attachrset, detachrset, execrset, lsrset and mkrset commands.

rmrsrc Command

Purpose
Removes a defined resource.

Syntax

rmrsrc -s "selection_string" [-a] [-h] [-TV] resource_class

rmrsrc -r "resource_handle" [-a] [-h] [-TV]

Description
The rmrsrc command removes — or “undefines” — the specified resource instance (or instances). The rmrsrc command makes a request to the resource monitoring and control (RMC) subsystem to undefine a specific resource instance. The resource manager of the resource removes the resource.

The first format of this command requires a resource class name parameter and a selection string specified using the -s flag. All resources in the specified resource class that match the specified selection string are removed. If the selection string identifies more than one resource to be removed, it is the same as running this command once for each resource that matches the selection string.

The second format of this command allows the actual resource handle linked with a specific resource to be specified as the parameter. It is expected that this form of the command would be more likely used from within a script.

Flags

- a  Specifies that this command applies to all nodes in the cluster. The cluster scope is determined by the CT_MANAGEMENT_SCOPE environment variable. If it is not set, first the management domain scope is chosen if it exists, then the peer domain scope is chosen if it exists, and then local scope is chosen, until the scope is valid for the command. The command will run once for the first valid scope found. For example, if both a management and peer domain exist, rmrsrc -a with CT_MANAGEMENT_SCOPE not set will apply to the management domain. In this case, to apply to the peer domain, set CT_MANAGEMENT_SCOPE to 2.

- r "resource_handle"
  Specifies a resource handle. The resource handle must be specified using the format: "0xnnnn

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The resource handle uniquely identifies a particular resource instance that should be removed.

-s "selection_string"

Specifies a selection string. All selection strings must be enclosed within either double or single quotation marks. If the selection string contains double quotation marks, enclose the entire selection string in single quotation marks. For example:

-s 'Name == "testing"'
-s 'Name =? "test"'

Only persistent attributes can be listed in a selection string. For information on how to specify selection strings, see RSCT Administration Guide.

-h

Writes the command’s usage statement to standard output.

-T

Writes the command’s trace messages to standard error. For your software service organization’s use only.

-V

Writes the command’s verbose messages to standard output.

Parameters

resource_class

Specifies the resource class name. The resource instances for this resource class that match the selection string criteria are removed.

Security

The user needs write permission for the resource_class specified in rmrsrc to run rmrsrc. Permissions are specified in the access control list (ACL) file on the contacted system. See RSCT Administration Guide for information about the ACL file and how to modify it.

Exit Status

0 The command has run successfully.
1 An error occurred with RMC.
2 An error occurred with the command-line interface (CLI) script.
3 An incorrect flag was specified on the command line.
4 An incorrect parameter was specified on the command line.
5 An error occurred with RMC that was based on incorrect command-line input.
6 No resources were found that match the selection string.

Environment Variables

CT_CONTACT

When the CT_CONTACT environment variable is set to a host name or IP address, the command contacts the Resource Monitoring and Control (RMC) daemon on the specified host. If the environment variable is not set, the command contacts the RMC daemon on the local system where the command is being run. The resource class or resources that are displayed or modified by the command are located on the system to which the connection is established.

CT_MANAGEMENT_SCOPE

Determines the management scope that is used for the session with the RMC daemon to monitor
and control the resources and resource classes. The management scope determines the set of possible target nodes where the resources and resource classes can be monitored and controlled. The valid values are:

0      Specifies *local* scope.
1      Specifies *local* scope.
2      Specifies *peer domain* scope.
3      Specifies *management domain* scope.

If this environment variable is *not set*, *local* scope is used.

**Implementation Specifics**

This command is part of the Reliable Scalable Cluster Technology (RSCT) fileset for AIX.

**Standard Output**

When the `-h` flag is specified, this command’s usage statement is written to standard output.

The command output and all verbose messages are written to standard output.

**Standard Error**

All trace messages are written to standard error.

**Examples**

1. To remove the resource with the Name c175n05 from resource class IBM.Host, enter:
   
   ```
   rmrsrc -s 'Name == "c175n05"' IBM.Host
   ```

2. To remove the resource linked with resource handle: "0x4017 0x0001 0x00000000 0x0069684c 0x0d52332b3 0xf3f54b45", enter:
   
   ```
   rmrsrc -r "0x4017 0x0001 0x00000000 0x0069684c 0x0d52332b3 0xf3f54b45"
   ```

**Location**

`/usr/sbin/rsct/bin/rmrsrc` Contains the `rmrsrc` command

**Related Information**

Books: *RSCT Administration Guide*, for information about RMC operations

Commands: `lsrsrc`, `mkrsrc`

Information Files: `rmccli`, for general information about RMC commands

---

**rmsensor Command**

**Purpose**

Removes a sensor from the resource monitoring and control (RMC) subsystem.

**Syntax**

```
rmsensor [-a | -n host1[,host2...]] [-h] [-v | -V] name1 [name2...]
```
Description
The `rmsensor` command removes the sensor specified by name from the sensor resource class in the resource monitoring and control (RMC) subsystem.

If the sensor is being monitored, monitoring will be stopped, but the ERM resources defined for monitoring are not removed. To remove them as well, use the `rmcondition`, `rmresponse`, or `rmcondresp` command against the monitoring resources that were used for this sensor.

The `rmsensor` command runs on any node. If you want `rmsensor` to run on all of the nodes in a domain, use the `-a` flag. If you want `rmsensor` to run on a subset of nodes in a domain, use the `-n` flag.

Flags
- `-a` Removes sensors that match the specified name on all nodes in the domain. The CT_MANAGEMENT_SCOPE environment variable determines the cluster scope. If CT_MANAGEMENT_SCOPE is not set, first the management domain scope is chosen if it exists, then the peer domain scope is chosen if it exists, and then local scope is chosen, until the scope is valid for the command. The command will run once for the first valid scope found. For example, if both a management domain and a peer domain exist, `rmsensor -a` with CT_MANAGEMENT_SCOPE not set will run in the management domain. In this case, to run in the peer domain, set CT_MANAGEMENT_SCOPE to 2.

- `-n host1[,host2...]` Specifies the node from which the sensor should be removed. By default, the sensor is removed from the local node. This flag is only appropriate in a management domain or a peer domain.

- `-h` Writes the command’s usage statement to standard output.

- `-v | -V` Writes the command’s verbose messages to standard output.

Parameters

`name1 [name2...]` Specifies one or more names of sensors to remove.

Security
The user needs write permission for the IBM.Sensor resource class in order to run `rmsensor`. Permissions are specified in the access control list (ACL) file on the contacted system. See RSCT Administration Guide for details on the ACL file and how to modify it.

Exit Status

0 The command has run successfully.

1 An incorrect combination of flags and parameters has been entered.

6 No sensor resources were found.

n Based on other errors that can be returned by the RMC subsystem.

Environment Variables

CT_CONTACT
When the CT_CONTACT environment variable is set to a host name or IP address, the command contacts the resource monitoring and control (RMC) daemon on the specified host. If this environment variable is not set, the command contacts the RMC daemon on the local system where the command is being run. The resource class or resources that are displayed or modified by the command are located on the system to which the connection is established.
CT_MANAGEMENT_SCOPE
Determines the management scope that is used for the session with the RMC daemon to monitor and control the resources and resource classes. The management scope determines the set of possible target nodes where the resources and resource classes can be monitored and controlled.

The valid values are:
0 Specifies local scope.
1 Specifies local scope.
2 Specifies peer domain scope.
3 Specifies management domain scope.

If this environment variable is not set, local scope is used.

Implementation Specifics
This command is part of the Reliable Scalable Cluster Technology (RSCT) fileset for AIX.

Examples
1. To remove the sensor sensor1, enter:
   rmsensor sensor1

Location
/usr/sbin/rsct/bin/rmsensor Contains the rmsensor command

Related Information
Commands: chsensor, lssensor, mksensor, refsensor, rmcondition, rmresponse, or rmcondresp
Books: RSCT Administration Guide, for information about the ACL authorization file

rmserver Command

Purpose
Removes a subserver definition from the Subserver Type object class.

Syntax
rmserver [-t Type]

Description
The rmserver command removes an existing subserver definition from the Subserver Type object class.

Flags
-t Type Specifies the subserver name that uniquely identifies the existing subserver to be removed. The rmserver command is unsuccessful if the Type name is not known in the Subserver Type object class.

Security
Auditing Events: If the auditing subsystem has been properly configured and is enabled, the rmserver command will generate the following audit record (event) every time the command is executed:
Event Information
SRC_Delserver Lists in an audit log the name of the subserver definition that was deleted.

See “Setting Up Auditing” in *Operating system and device management* for details about selecting and grouping audit events, and configuring audit event data collection.

**Files**

/etc/objrepos/SRCsubsvr Specifies the SRC Subserver Configuration object class.

**Related Information**

System Resource Controller in *Operating system and device management*.

System Resource Controller (SRC) Overview for Programmers in *AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs*.

The `auditpr` command, `chserver` command, `mkserver` command, `startsro` command, `stopsrc` command.

Auditing overview in *Security*.

---

### rmsock Command

**Purpose**

Removes a socket that does not have a file descriptor.

**Syntax**

`rmsock Address TypeofAddress`

**Description**

The `rmsock` command removes a socket that does not have a file descriptor. It accepts a socket, tcpcb, inpcb, ripcb, or rawcb address and converts it to a socket address. All opened files in every process are then checked to find a match to the socket. If a match is not found, an abort action is performed on that socket regardless of the existence of the socket `linger` option. The port number held by the socket is released. If a match is found, its file descriptor and status of the owner process are displayed to the user. The results are passed to `syslogd` and recorded in the `/var/adm/rmsock.log` file.

If the socket to be removed is not held by any active processes, but there are processes in the exiting state, `rmsock` will not remove the socket specified because the socket could be held by the processes in the exiting state. Any socket that is held by the exiting processes will be cleaned up when those processes exit completely.

**Examples**

1. To remove a socket from its socket address, type:
   
   ```
   rmsock 70054edc socket
   ```

   You do not need to specify the type of the socket. It can be a tcpcb, udp, raw, or routing socket.

2. To remove a socket from its inpcb address, type:
   
   ```
   rmsock 70054edc inpcb
   ```

3. To remove a socket from its tcpcb address, type:
   
   ```
   rmsock 70054ecc tcpcb
   ```
Files

/usr/sbin
/var/adm/rmsock.log

Related Information

The syslogd daemon.

rmss Command

Purpose
Simulates a system with various sizes of memory for performance testing of applications.

Syntax

rmss [-c MemSize]
rmss [-r]
rmss [-p]

Description

The rmss command simulates a system with various sizes of real memory, without having to extract and replace memory boards. By running an application at several memory sizes and collecting performance statistics, you can determine the memory needed to run an application with acceptable performance. The rmss command can be invoked for either of two purposes:

- To change the memory size and then exit, using the -c, -p, and -r flags. This lets you experiment freely with a given memory size.
- To function as a driver program, using the -s, -f, -d, -n, and -o flags. In this mode, the rmss command executes a specified command multiple times over a range of memory sizes, and displays important statistics describing command performance at each memory size. The command can be an executable or shell script file, with or without command line arguments.

Attention: When rmss is used on a multiple memory pool system, it may fail with:

Failure: VMM unable to free enough frames for stealing.
Choose a larger memory size or retry with less system activity.

Or a similar message. This failure can occur when rmss has stolen all the frames from a memory pool, and is unable to steal frames from other pools. A workaround is to decrease memory by increments.

The number and size of memory pools on a system can be retrieved with the command:

echo "mempool *" | kdb

The -c, -p, and -r flags are mutually exclusive. The -c flag changes the memory size; the -p flag displays the current memory size; and the -r flag resets the memory size to the real memory size of the machine.

The -s, -f, -d, -n, and -o flags are used in combination when the rmss command is invoked as a driver program to execute and measure the performance of a command (where a command is an executable or a shell script file) over a range of memory sizes. When invoked this way, the rmss command displays
performance statistics, such as the response time of the command and the number of page-ins that occurred while the command ran, for each memory size. These statistics, which are also written to a file, are described in this example.

The `-s` and `-f` flags specify the starting and ending points of the range, while the `-d` flag specifies the increment between memory sizes within the range. The `-n` flag is used to specify the number of times to run the command at each memory size, and the `-o` flag is used to specify the name of an output file into which to write the `rmss` report. The `Command` parameter specifies the command to be run and measured at each memory size.

Notes:
1. The `rmss` command reports “usable” real memory. On machines where there is bad memory or where the system is using the memory, `rmss` reports the amount of real memory as the amount of physical real memory minus the memory that is bad or in use by the system. For example, using the `rmss -r` flag might report:

```
Simulated Memory Size changed to 79.9062MB
```

This could be a result of some pages being marked bad or a result of a device that is reserving some pages for its own use (and thus not available to the user).

2. The `rmss` command may underestimate the number of page-ins that are required to run an application if the application, combined with background processes such as daemons, accesses a lot of different files (including directory files). The number of different files that must be accessed to cause such results is approximately 250 files per 8MB of simulated memory size. The following table gives the approximate number of different files that, when accessed at the given simulated memory size, may result in the `rmss` command underestimating page-in requirements.

<table>
<thead>
<tr>
<th>Simulated Memory Size (MB)</th>
<th>Access to Different Files</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>250</td>
</tr>
<tr>
<td>16</td>
<td>500</td>
</tr>
<tr>
<td>24</td>
<td>750</td>
</tr>
<tr>
<td>32</td>
<td>1000</td>
</tr>
<tr>
<td>48</td>
<td>1500</td>
</tr>
<tr>
<td>64</td>
<td>2000</td>
</tr>
<tr>
<td>128</td>
<td>4000</td>
</tr>
<tr>
<td>256</td>
<td>8000</td>
</tr>
</tbody>
</table>

You can use the `filemon` command to determine the number of files accessed while your command runs, if you suspect that it may be accessing many different files.

Flags

- `-c MemSize` Changes the simulated memory size to the `MemSize` value, which is an integer or decimal fraction in units of megabytes. The `MemSize` variable must be between 4MB and the real memory size of the machine. There is no default for the `-c` flag. **Note:** It is difficult to change the simulated memory size to less than 8MB, because of the size of inherent system structures such as the kernel.

- `-d MemSize` Specifies the increment between memory sizes to be simulated. The `MemSize` value is an integer or decimal fraction in units of megabytes. If the `-d` flag is omitted, the increment will be 8MB.
-f MemSize  Specifies the final memory size. You should finish testing the simulated system by executing the command being tested at a simulated memory size given by the MemSize variable, which is an integer or decimal fraction in units of megabytes. The MemSize variable must be between 4MB and the real memory size of the machine. If the -f flag is omitted, the final memory size will be 8MB.

Note: It is difficult to finish at a simulated memory size of less than 8MB because of the size of inherent system structures such as the kernel.

-n NumIterations  Specifies the number of times to run and measure the command, at each memory size. There is no default for the -n flag. If the -n flag is omitted, during rmss command initialization, the rmss command will determine how many iterations of the command being tested are necessary to accumulate a total run time of 10 seconds, and then run the command that many times at each memory size.

Note: The rmss command always executes the command once at each memory size prior to the executions that are measured. This prepares the simulation for the actual test.

-o OutputFile  Specifies the file into which to write the rmss report. If the -o flag is omitted, then the rmss report is written to the file rmss.out. In addition, the rmss report is always written to standard output.

-p  Displays the current simulated memory size.

-r  Resets the simulated memory size to the real memory size of the machine.

-s MemSize  Specifies the starting memory size. Start by executing the command at a simulated memory size specified by the MemSize variable, which is an integer or decimal fraction in units of megabytes. The MemSize variable must be between 4MB and the real memory size of the machine. If the -s flag is omitted, the starting memory size will be the real memory size of the machine.

Note: It is difficult to start at a simulated memory size of less than 8MB, because of the size of inherent system structures such as the kernel.

Command  Specifies the command to be run and measured at each memory size. The Command parameter may be an executable or shell script file, with or without command line arguments. There is no default command.

Security
Access Control: You must have root authority to run this command.

Examples
1. To change the memory size to 13.5MB, enter:
   
   rmss -c 13.5

2. To print the current memory size, enter:
   
   rmss -p

3. To reset the memory size to the real memory size of the machine, enter:
   
   rmss -r

4. To investigate the performance of the command cc -O foo.c on memory sizes 32, 24, 16, and 8MB; run and measure the command once at each memory size; and then write the report to the cc.rmss.out file, enter:
   
   rmss -s 32 -f 8 -d 8 -n 1 -o cc.rmss.out cc -O foo.c

5. To investigate the performance of the sequence of commands in the foo.sh shell script file on memory sizes starting at the real memory size of the machine and ending at 8MB, by increments of 8MB; let the rmss command determine the number of iterations to run and measure the foo.sh at file each memory size; and then write the rmss report to the rmss.out file (with all defaults used in this invocation of the rmss command), enter the following:
   
   rmss foo.sh

6. To investigate the performance of the executable bar on memory sizes from 8MB to 16MB, by increments of 0.5MB; run and measure bar twice at each memory size; and write the report to the bar.rmss.out file, enter:

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7. When any combination of the -s, -f, -d, -n, and -o flags is used, the `rmss` command runs as a driver program, which executes a command multiple times over a range of memory sizes, and displays statistics describing the command's performance at each memory size.

An example of the report printed out by the `rmss` command follows:

```
Hostname: xray.austin.ibm.com
Real memory size: 48.00 Mb
Command: cc -O foo.c
Simulated memory size initialized to 24.00 Mb.
Number of iterations per memory size = 1 warmup + 1 measured = 2.
```

<table>
<thead>
<tr>
<th>Memory size (megabytes)</th>
<th>Avg. Pageins</th>
<th>Avg. Response Time (sec.)</th>
<th>Avg. Pagein Rate (pageins/sec.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>24.00</td>
<td>0.0</td>
<td>113.7</td>
<td>0.0</td>
</tr>
<tr>
<td>22.00</td>
<td>5.0</td>
<td>114.8</td>
<td>0.0</td>
</tr>
<tr>
<td>20.00</td>
<td>0.0</td>
<td>113.7</td>
<td>0.0</td>
</tr>
<tr>
<td>18.00</td>
<td>3.0</td>
<td>114.3</td>
<td>0.0</td>
</tr>
<tr>
<td>16.00</td>
<td>0.0</td>
<td>114.6</td>
<td>0.0</td>
</tr>
<tr>
<td>14.00</td>
<td>139.0</td>
<td>116.1</td>
<td>1.2</td>
</tr>
<tr>
<td>12.00</td>
<td>816.0</td>
<td>126.9</td>
<td>6.4</td>
</tr>
<tr>
<td>10.00</td>
<td>1246.0</td>
<td>135.7</td>
<td>9.2</td>
</tr>
<tr>
<td>8.00</td>
<td>2218.0</td>
<td>162.9</td>
<td>13.6</td>
</tr>
</tbody>
</table>

This report was generated by the following command:

```
rmss -s 24 -f 8 -d 2 -n 1 cc -O foo.c
```

The top part of the report gives general information, including the machine that the `rmss` command was running on, the real memory size of that machine, the time and date, and the command that was being measured. The next two lines give informational messages that describe the initialization of the `rmss` command. Here, the `rmss` command displays that it has initialized the simulated memory size to 24MB, which was the starting memory size given with the -s flag. Also, the `rmss` command prints out the number of iterations that the command will be run at each memory size. The command is to be run twice at each memory size: once to warmup, and once when its performance is measured. The number of iterations was specified by the -n flag.

The lower part of the report provides the following for each memory size the command was run at:

- The memory size, along with the average number of page-ins that occurred while the command was run
- The average response time of the command
- The average page-in rate that occurred when the command was run.

**Note:** The average page-ins and average page-in rate values include all page-ins that occurred while the command was run, not just those initiated by the command.

### Related Information

The `filemon` command, and `svmon` command.

### rmssys Command

#### Purpose

Removes a subsystem definition from the subsystem object class.

#### Syntax

```
rmssys -s Subsystem
```
Description
The rmssys command removes an existing subsystem definition from the subsystem object class. It also removes any subservers and notify method definitions that exist for the subsystem being removed.

Flags
-s Subsystem
Specifies the name that uniquely identifies the subsystem to be removed. The rmssys command is unsuccessful if the subsystem name is not known in the subsystem object class. The rmssys command removes any subserver definitions from the Subserver Type object class that are defined for this subsystem, as well as any notify method definitions from the Notify object class that are defined for this subsystem.

Security
Auditing Events: If the auditing subsystem has been properly configured and is enabled, the rmssys command will generate the following audit record (event) every time the command is executed:

<table>
<thead>
<tr>
<th>Event</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRC_Delssys</td>
<td>Lists in an audit log the name of the subsystem being removed.</td>
</tr>
</tbody>
</table>

See "Setting Up Auditing" in Security for details about selecting and grouping audit events, and configuring audit event data collection.

Files
/etc/objrepos/SRCsubsys
Specifies the SRC Subsystem Configuration object class.
/etc/objrepos/SRCsubsvr
Specifies the SRC Subserver Configuration object class.
/etc/objrepos/SRCnotify
Specifies the SRC Notify Method object class.
/dev/SRC
Specifies the AF_UNIX socket file.
/dev/.SRC-unix
Specifies the location for temporary socket files.

Related Information
The auditpr command, mkssys command, lssrc command, chssys command, rmserver command, refresh command, startsrc command, stopsrc command, traceson command, tracesoff command.

System Resource Controller in Operating system and device management.

System Resource Controller (SRC) Overview for Programmers in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.

Auditing overview in Security.

rmt Command

Purpose
Allows remote access to magnetic tape devices.

Syntax
rmt

rmt

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Description

The rmt command allows remote access to magnetic tape devices. The remote dump and restore programs use the rmt command as a remote magnetic tape protocol module. The rmt command is normally started with a rexec or rcmd subroutine.

The rmt command accepts requests specific to the manipulation of magnetic tapes, performs the commands, and then responds with a status indication. All responses are in ASCII and in one of two forms. Successful commands receive responses of Axxx, where xxx is an ASCII representation of a decimal number. Unsuccessful commands receive responses of Eyyy error-message, where yyy is one of the possible error numbers described in the errno.h file and error-message is the corresponding error string as printed from a call to the perror subroutine. The protocol is comprised of the following subcommands.

Subcommands

ODOck

DeviceMode

Opens the device specified by the Device parameter using the mode indicated by the Mode parameter. The value of the Device parameter is a full path name, and that of the Mode parameter is an ASCII representation of a decimal number suitable for passing to the open subroutine. An open device is closed before a new open operation is performed.

CDevice

Closes the open device. The device specified with the Device parameter is ignored.

LWhenceOffset

Performs an lseek operation using the specified parameters. The lseek subroutine returns the response value.

WCount

Writes data onto the open device. From the connection, the rmt command reads the number of bytes specified by the Count parameter, ending if a premature end-of-file is encountered. The write subroutine returns the response value.

RCount

Reads, from the open device, the number of bytes of data specified by the Count parameter. The rmt command then performs the requested read operation and responds with Azzz, where zzz is the number of bytes read if the operation was successful. The data read is then sent. Otherwise, an error in the standard format is returned.

IOperationCount

Performs an STIOCTOP ioctl subroutine using the specified parameters. The parameters are interpreted as the ASCII representations of the decimal values to place in the mt op and mt count fields of the structure used in the ioctl subroutine. The return value is the value of the Count parameter when the operation is successful.

Any other subcommand causes the rmt command to exit.

Note: For the R and W subcommands, if the Count parameter specifies more bytes than the connection can handle, the data will be truncated to a size that can be handled.

Exit Status

This command returns the following exit values:

0   Successful completion.
>0  An error occurred.

Files

/usr/sbin/rmt
Contains the rmt command.
/usr/include/sys/errno.h
Describes the possible error numbers.
rmtcpip Command

Purpose
Removes the TCP/IP configuration for a host machine.

Syntax
rmtcpip

Description
The rmtcpip command removes TCP/IP configuration on a host machine. The basic functions of this command is:

- Removes the network interface configurations
- Restores /etc/rc.tcpip to the initial installed state
- Restores /etc/hosts to the initial installed state
- Removes the /etc/resolv.conf file
- Removes the default and static routes
- Sets the hostname to localhost
- Sets the hostid to 127.0.0.1
- Resets configuration database to the initial installed state

Notes:
1. Any daemon which is commented out by default in /etc/rc.tcpip, but running at the time this command is issued, is stopped.
2. Your version of the /etc/hosts file is saved as /etc/hosts.save prior to the /etc/hosts file being restored to the originally installed state.
3. Your version of the /etc/resolv.conf file is saved as /etc/resolv.conf.save prior to the removal of the /etc/resolv.conf file.

Security
This command can only be run by root.

Related Information
The hostent command, hostname command, hostid command, mktcpip command.

The /etc/resolv.conf file format.

rmts Command

Purpose
Removes a thin server.

Syntax
rmts [-f] ThinServer
Description
The `rmts` command removes a thin server specified by `ThinServer` and created with the `mkts` command. If the thin server is running, the `rmts` command does not remove the thin server. Instead, it prints a message indicating that the thin server could not be removed. In this case, use the `-f` flag to terminate the thin server’s session with a common image.

Flags
- `-f` Forces the removal of the thin server if the thin server is up and running.
- `-v` Enables verbose debug output when the `rmts` command runs.

Exit Status
- `0` The command completed successfully.
- `>0` An error occurred.

Security
Access Control: You must have root authority to run the `rmts` command.

Examples
1. To remove a thin server named `lobo`, enter:
   ```
   rmts lobo
   ```

Location
`/usr/sbin/rmts`

Files
`/etc/niminfo` Contains variables used by NIM.

Related Information
The `dbts` command, `lst` command, `mkcosi` command, `mkts` command, `nim` command, `nim_clients_setup` command, `nim_master_setup` command, `nimconfig` command, `swts` command.

---

rmtun Command

Purpose
Deactivates operational tunnel(s) and optionally removes tunnel definition(s).

Syntax
```
rmtun -v 4|6 -t tid_list | all [-d]
```

Description
Use the `rmtun` command to deactivate an active tunnel(s) and optionally remove tunnel definition(s). It also will remove the auto-generated filter rules created for the tunnel by the `gentun` command when the tunnel definition is removed from the tunnel database.
**Flags**

- **all**
  - Deactivates and optionally removes all the tunnel(s).

- **tid_list**
  - The list of the tunnel(s) you want to deactivate. The tunnel IDs can be separated by "," or "-". You can use "-" to specify a range of IDs. For example, 1,3,5-7 specified there are five tunnel IDs in the list, 1, 3, 5, 6 and 7.

- **-d**
  - Specifies that the tunnels are to be removed from the tunnel database. This is an optional flag.

- **-t**
  - The list of the tunnel(s) you want to deactivate. If `-d` is specified, all the tunnel definitions in the list will also be removed from the tunnel database.

- **-v**
  - The IP version of the tunnel. For the IP version 4 tunnel, use the value of `4`. For the IP version 6 tunnel, use the value of `6`.

**Related Information**

The `chtun` command, `exptun` command, `gentun` command, `imptun` command, `lstun` command, and `mktun` command.

---

**rmuser Command**

**Purpose**

Removes a user account.

**Syntax**

```
ruser [ -R load_module ] [ -p ] Name
```

**Description**

The `rmuser` command removes the user account identified by the `Name` parameter. This command removes a user's attributes without removing the user's home directory and files. The user name must already exist. If the `-p` flag is specified, the `rmuser` command also removes passwords and other user authentication information from the `/etc/security/passwd` file.

For users that are created with an alternate Identification and Authentication (I&A) mechanism, the `-R` flag with the appropriate load module must be used to remove that user. The load modules are defined in the `/usr/lib/security/methods.cfg` file.

Only the root user or users with UserAdmin authorization can remove administrative users. Administrative users are those users with `admin=true` set in the `/etc/security/user` file.

You can use the Users application in Web-based System Manager (wsm) to change user characteristics.

You could also use the System Management Interface Tool (SMIT) `smit rmuser` fast path to run this command.

**Flags**

- **-p**
  - Removes user password information from the `/etc/security/passwd` file.

- **-R load_module**
  - Specifies the loadable I&A module used to remove the user.
Security
Access Control: This command should grant execute (x) access only to the root user and members of the security group. This command should be installed as a program in the trusted computing base (TCB). The command should be owned by the root user with the `setuid` (SUID) bit set.

Files Accessed:

<table>
<thead>
<tr>
<th>Mode</th>
<th>File</th>
</tr>
</thead>
<tbody>
<tr>
<td>rw</td>
<td>/etc/passwd</td>
</tr>
<tr>
<td>rw</td>
<td>/etc/security/passwd</td>
</tr>
<tr>
<td>rw</td>
<td>/etc/security/user</td>
</tr>
<tr>
<td>rw</td>
<td>/etc/security/user.roles</td>
</tr>
<tr>
<td>rw</td>
<td>/etc/security/limits</td>
</tr>
<tr>
<td>rw</td>
<td>/etc/security/environ</td>
</tr>
<tr>
<td>rw</td>
<td>/etc/security/audit/config</td>
</tr>
<tr>
<td>rw</td>
<td>/etc/group</td>
</tr>
<tr>
<td>rw</td>
<td>/etc/security/group</td>
</tr>
</tbody>
</table>

Auditing Events:

<table>
<thead>
<tr>
<th>Event</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>USER_Remove</td>
<td>user</td>
</tr>
</tbody>
</table>

Examples
1. To remove the user davis account and its attributes from the local system, enter:
   `rmuser davis`
2. To remove the user davis account and all its attributes, including passwords and other user authentication information in the `/etc/security/passwd` file, type:
   `rmuser -p davis`
3. To remove the user davis, who was created with the LDAP load module, type:
   `rmuser -R LDAP davis`

Files

- `/usr/sbin/rmuser`: Contains the `rmuser` command.
- `/etc/passwd`: Contains the basic attributes of users.
- `/etc/security/passwd`: Defines resource quotas and limits for each user.
- `/etc/security/limits`: Contains the extended attributes of users.
- `/etc/security/user`: Contains the administrative role attributes of users.
- `/etc/security/environ`: Contains environment attributes of users.
- `/etc/security/audit/config`: Contains audit configuration information.
- `/etc/group`: Contains the basic attributes of groups.
- `/etc/security/group`: Contains the extended attributes of groups.

Related Information
The `chfn` command, `chgrpmem` command, `chsh` command, `chgroup` command, `chuser` command, `lsgrp` command, `lsuser` command, `mgroup` command, `mkuser` command, `passwd` command, `pwdadm` command, `rmgroup` command, `setgroups` command, `setsenv` command.
For more information about the identification and authentication of users, discretionary access control, the trusted computing base, and auditing, refer to Securing the network in Security.

For more information about administrative roles, refer to Users, roles, and passwords in Security.

For information on installing the Web-based System Manager, see Chapter 2: Installation and System Requirements in AIX 5L Version 5.3 Web-based System Manager Administration Guide.

---

**rmvfs Command**

**Purpose**
Removes entries in the `/etc/vfs` file.

**Syntax**
```
rmvfs VfsName
```

**Description**
The `rmvfs` command removes a `VfsName` entry from the `/etc/vfs` file. The `VfsName` parameter is the name of a virtual file system. The `rmvfs` command takes one argument, the name of the virtual file system type to be removed from the file. If this `VfsName` entry exists, it is removed from the file.

**Examples**
To remove the `newvfs` entry, enter:
```
rmvfs newvfs
```

**Files**

`/etc/vfs` Contains descriptions of virtual file system types.

**Related Information**
The `chvfs` command, `crvfs` command, `lsvfs` command, `mount` command.

The File systems in Operating system and device management explains file system types, management, structure, and maintenance.

---

**rmvирпгТ Command**

**Purpose**
Removes a virtual printer.

**Syntax**
```
rmvирпгТ -q PrinterQueueName -d QueueDeviceName
```

**Description**
The `rmvирпгТ` command removes the virtual printer assigned to the `PrinterQueueName` and `QueueDeviceName` variable value. The `rmvирпгТ` command also removes the System Management Interface Tool (SMIT) Object Database Manager (ODM) objects associated with the specified queue and queue device.
You can use the Printer Queues application in Web-based System Manager to change printer characteristics.

You can also use the System Management Interface Tool (SMIT) `smit rmvirprt` fast path to run this command.

**Note:** When the command `rmvirprt` is run from the command line, it does not remove the queue or queue device, nor does it check for any jobs running or queued on the specified queue and queue device. However, if SMIT is used to run this command interactively, the corresponding queue, queue device, and, optionally, printer device, are removed along with the virtual printer, if there are no jobs running or queued.

**Flags**

- `-d QueueDeviceName` Specifies the name of the queue device to which the virtual printer is assigned.
- `-q PrinterQueueName` Specifies the name of the print queue to which the virtual printer is assigned.

**Examples**

To remove the attribute values for the `mypro` virtual printer associated with the `proq` print queue, type:

```
rmvirprt -d mypro -q proq
```

**Files**

- `/etc/qconfig` Contains the configuration file.
- `/usr/sbin/rmvirprt` Contains the `rmvirprt` command.
- `/var/spool/lpd/pio/@local/custom/*` Contains the customized virtual printer attribute files.
- `/var/spool/lpd/pio/@local/ddi/*` Contains the digested virtual printer attribute files.

**Related Information**

The `chvirprt` command, `lsvirprt` command, `mkvirprt` command, `smit` command.

Printing administration in the *Printers and printing*.

Print spooler in the *Printers and printing*.

For information on installing the Web-based System Manager, see Chapter 2: Installation and System Requirements in *AIX 5L Version 5.3 Web-based System Manager Administration Guide*.

**rmyp Command**

**Purpose**

Removes the configuration for NIS.

**Syntax**

```
/usr/sbin/rmyp { -s | -c }
```

**Description**

The `rmyp` command removes everything from the system that is used to make NIS work. For example, the `rmyp` command removes all of the NIS maps and all of the entries in the `/etc/rc.nfs` file for the NIS daemons.
You can use the Network application in Web-based System Manager (wsm) to change network characteristics.

You could also use the System Management Interface Tool (SMIT) `smit rmyp` fast path to run this command. You can use the `smct` command (SMIT) to run this command. To use SMIT, enter:

```
smit rmyp
```

### Flags

- `-s` Removes the server configuration from the system.
- `-c` Removes the client configuration from the system.

### Related Information

The `chslave` command, `mkclient` command, `mkslave` command, `smit` command.

The `ypbind` daemon, `yppasswdd` daemon, `ypserv` daemon, `ypupdated` daemon.

Network File System (NFS) Overview for System Management in `Networks and communication management`.

For information on installing the Web-based System Manager, see `Chapter 2: Installation and System Requirements` in `AIX 5L Version 5.3 Web-based System Manager Administration Guide`.

System management interface tool in `Operating system and device management`.

Network Information Service (NIS) in `AIX 5L Version 5.3 Network Information Services (NIS and NIS+) Guide`.

### NIS Reference

---

### rndc Command

#### Purpose

Name server control utility.

#### Syntax

```
rndc [-c config-file] [-k key-file] [-s server] [-p port] [-V] [-y key_id] [command]
```

#### Description

`rndc` controls the operation of a name server. It supersedes the `ndc` utility that was provided in old BIND releases. If `rndc` is invoked with no command line options or arguments, it prints a short summary of the supported commands and the available options and their arguments.

`rndc` communicates with the name server over a TCP connection, sending commands authenticated with digital signatures. In the current versions of `rndc` and `named`, the only supported authentication algorithm is HMAC-MD5, which uses a shared secret on each end of the connection. This provides TSIG-style authentication for the command request and the name server's response. All commands sent over the channel must be signed by a `key_id` known to the server.

`rndc` reads a configuration file to determine how to contact the name server and decide what algorithm and key it should use.
Flags

- `c config-file` Use `config-file` as the configuration file instead of the default, `/etc/rndc.conf`.
- `k key-file` Use `key-file` as the key file instead of the default, `/etc/rndc.key`. The key in `/etc/rndc.key` will be used to authenticate commands sent to the server if the `config-file` does not exist.
- `s server` `server` is the name or address of the server which matches a `server` statement in the configuration file for `rndc`. If no server is supplied on the command line, the host named by the default-server clause in the option statement of the configuration file will be used.
- `p port` Send commands to TCP port `port` instead of BIND 9’s default control channel port, 953.
- `V` Enable verbose logging.
- `y keyid` Use the key `keyid` from the configuration file. `keyid` must be known by named with the same algorithm and secret string in order for control message validation to succeed. If no `keyid` is specified, `rndc` will first look for a key clause in the server statement of the server being used, or if no server statement is present for that host, then the default-key clause of the options statement. Note that the configuration file contains shared secrets which are used to send authenticated control commands to name servers. It should therefore not have general read or write access.

For the complete set of commands supported by `rndc`, see the BIND 9 Administrator Reference Manual or run `rndc` without arguments to see its help message.

Limitations

The `rndc` command only works with the `named9` daemon. The shared-secret for a `key_id` cannot be provided without using the configuration file.

Related Information

The `rndc.conf(5)`, `named8`, `named.conf(5)` and `ndc(8)`, daemons.


`rndc-confgen` Command

Purpose

Generates configuration files for the `rndc` command.

Syntax

```
```

Description

The `rndc-confgen` command generates configuration files for the `rndc` command. It can be used as a convenient alternative to writing the `rndc.conf` file and the corresponding controls and key statements in `named.conf` by hand. The `rndc-confgen` command can be run with the `-a` flag to set up a `rndc.key` file. Doing this will avoid the need for a `rndc.conf` file and a controls statement.

Note: The `rndc-confgen` command only works with the `named9` daemon.

Flags

- `a` Performs automatic `rndc` configuration. This creates a file `rndc.key` in `/etc` (or whatever `sysconfdir` was specified as when BIND was built) that is read by both `rndc` and `named` on startup. The `rndc.key` file defines a default command channel and authentication key allowing `rndc` to communicate with `named` with no further configuration.
-b keysize Specifies the size of the authentication key in bits. Must be between 1 and 512 bits. The default is 128.

-c keyfile Used with the -a flag to specify an alternate location for rndc.key.

-h Prints a short summary of the options and arguments to rndc-confgen.

-k keyname Specifies the key name of the rndc authentication key. This must be a valid domain name. The default is rndc-key.

-p port Specifies the command channel port where named listens for connections from rndc. The default is 953.

-r randomfile Specifies a source of random data for generating the authorization. If the operating system does not provide a /dev/random or equivalent device, the default source of randomness is keyboard input. randomdev specifies the name of a character device or file containing random data to be used instead of the default. The special value keyboard indicates that keyboard input should be used.

-s address Specifies the IP address where named listens for command channel connections from rndc. The default is the loopback address 127.0.0.1.

Examples
1. To allow rndc to be used with no manual configuration, run the following:
   ```
   rndc-confgen -a
   ```
2. To print a sample rndc.conf file and corresponding controls and key statements to be manually inserted into named.conf, run the following:
   ```
   rndc-confgen
   ```

Related Information
"rndc Command" on page 730 and "named Daemon" on page 1.

---

**roffbib Command**

**Purpose**
Prints a bibliographic database.

**Syntax**
```
roffbib [ [-m Macro ] | [-X] ] [ FormatFlags ] [ Database... ]
```

**Description**
The roffbib command prints out all records that are in a bibliographic database format rather than in a format for footnotes or endnotes. Generally, the command is used as a filter for the sortbib command.

The roffbib command accepts most of the flags used by the nroff command and the troff command, in particular, the -e, -h, -n, -o, -r, -s, and -T flags.

If abstracts or comments are entered following the %X key field, they are formatted into paragraphs for an annotated bibliography. Several %X fields can be given if several annotation paragraphs are desired.

**Parameters**

- **FormatFlags**
  Accepts most of the nroff command flags, especially the -e, -h, -n, -o, -r, -s, and -T flags.

- **Database**
  Stores a bibliographic database of all records.
Flags

- **m Macro** Specifies a file that contains a user-defined set of macros. There should be a space between the -m flag and the macro. This set of macros replaces the ones defined in the /usr/share/lib/tmac/tmac.bib file. Users can rewrite macros to create customized formats.

-x Suppresses the printing of abstracts or comments that are entered following the %X field key.

Examples

Following is an example of the roffbib command used in conjunction with the sortbib command.

sortbib Database | roffbib

Files

/usr/share/lib/tmac/tmac.bib Contains macros used by the nroff and troff commands.

Related Information

The addbib command, idxbib command, lookbib command, nroff command, refer command, sortbib command, troff command.

rollback Command

Purpose

Reverts a JFS2 file system to a point-in-time snapshot.

Syntax

rollback [-s] [-v] [-c] snappedFS snapshotObject

Description

The rollback command is an interface to revert a JFS2 file system to a point-in-time snapshot. The snappedFS parameter must be unmounted before executing rollback and remains inaccessible for the duration of the command. Any snapshots taken after the snapshotObject are removed along with their associated logical volumes.

If the rollback command is interrupted for any reason, the snappedFS parameter remains inaccessible until the command is restarted and completes. A restarted rollback must target the same snapshotObject as the initial command.

Flags

- **c** If specified, rollback continues even if read or write errors are observed when restoring the snappedFS from the snapshot. The default behavior is to issue an error message and stop when these errors occur.

- **s** If specified, any logical volumes associated with snapshots removed by rollback will be preserved. The snapshots are still deleted.

- **v** This is the verbose option and causes a count of restored blocks to be printed as the rollback progresses.

Parameters

snappedFS The JFS2 system to roll back.
The logical volume of the snapshot to revert to.

Examples
To roll back the /home/janet/sb file system to the snapshot on logical volume /dev/snapsb, type:

rollback /home/janet/sb /dev/snapsb

Location
/usr/sbin/rollback

Contains the rollback command.

Related Information
The backsnap command, snapshot command.

route Command

Purpose
Manually manipulates the routing tables.

Syntax
route [ -f ] [ -n ] [ -q ] [ -v ] Command [ Family ] [ -net | -host ] Destination [ -prefixlen ] Address ] [ Gateway ] [ Argument ]

Description
The route command allows you to make manual entries into the network routing tables. The route command distinguishes between routes to hosts and routes to networks by interpreting the network address of the Destination variable, which can be specified either by symbolic name or numeric address. The route command resolves all symbolic names into addresses, using either the /etc/hosts file or the network name server.

Routes to a particular host are distinguished from those to a network by interpreting the Internet address associated with the destination. The optional keywords -net and -host force the destination to be interpreted as a network or a host, respectively. If the destination has a local address part of INADDR_ANY or if the destination is the symbolic name of a network, then the route is assumed to be to a network; otherwise, it is presumed to be a route to a host.

For example, 128.32 is interpreted as -host 128.0.0.32; 128.32.130 is interpreted as -host 128.32.0.130; -net 128.32 is interpreted as 128.32.0.0; and -net 128.32.130 is interpreted as 128.32.130.0.

If the route is by way of an interface rather than through a gateway, the -interface argument should be specified. The specified gateway is the address of the host on the common network, indicating the interface to be used for transmission.

The -netmask argument must be followed by an address parameter (to be interpreted as a network mask). One can override the implicit network mask generated in the -inet case by making sure this option follows the Destination parameter.

All symbolic names specified for a destination or gateway are looked up first as a host name, using the gethostbyname subroutine. If this fails, the getnetbyname subroutine is then used to interpret the name as a network name.
**Note:** Route uses a routing socket and the new message types RTM_ADD, RTM_DELETE, and RTM_CHANGE. As such, only the root user may modify the routing tables.

If the `flush` or `-f` command is specified, route will “flush,” or clear, the routing tables of all gateway entries. One can choose to flush only those routes whose destinations are of a given address family, by specifying an optional keyword describing which address family.

The `netstat -r` command displays the current routing information contained in the routing tables.

**Flags**

- `-f` Purges all entries in the routing table that are not associated with network interfaces.
- `-n` Displays host and network names numerically, rather than symbolically, when reporting results of a flush or of any action in verbose mode.
- `-q` Specifies quiet mode and suppresses all output.
- `-v` Specifies verbose mode and prints additional details.
- `-net` Indicates that the `Destination` parameter should be interpreted as a network.
- `-netmask` Specifies the network mask to the destination address. Make sure this option follows the `Destination` parameter.
- `-host` Indicates that the `Destination` parameter should be interpreted as a host.
- `-prefixlen n` Specifies the length of a destination prefix (the number of bits in the netmask).

The route default is a host (a single computer on the network). When neither the `-net` parameter nor the `-host` parameter is specified, but the network portion of the address is specified, the route is assumed to be to a network. The host portion of the address is 0 (zero).

**Parameters**

**Arguments**

Specifies one or more of the following arguments. Where `n` is specified as a variable to an argument, the value of the `n` variable is a positive integer.

- `-active_dgd` Enables Active Dead Gateway Detection on the route.
- `-cloning` Clones a new route.
- `-genmask` Extracts the length of TSEL, which is used for the generation of cloned routes.
- `-interface` Manipulates interface routing entries.
- `-rtt n` Specifies round-trip time.
- `-rttvar n` Specifies round-trip time variance.
-sendpipe $n$
   Specifies send-window size.

-recvpipe $n$
   Specifies receive-window size.

-allowgroup $gid$
   Specifies a group ID that is allowed to use the route. The group ID will be added to a
   list of allowed groups or deleted from a list of denied groups.

-denygroup $gid$
   Specifies a group ID that is not allowed to use the route. The group ID will be added
   to a list of denied groups or deleted from a list of allowed groups.

-stopsearch
   Stops searching if a routing table lookup matches the route, but it is not allowed to use
   the route due to group routing restrictions.

-mtu $n$
   Specifies maximum transmission unit for this route. Will override interface mtu for TCP
   applications as long as it does not exceed maximum mtu for the interface. This flag
   has no affect on mtu for applications using UDP.

-hopcount $n$
   Specifies maximum number of gateways in the route.

-policy $n$
   Specifies the policy to be used for Multipath Routing. $n$ is number between 1 and 5
   where these numbers mean the following:
   1. Weighted Round-Robin
   2. Random
   3. Weighted Random
   4. Lowest Utilization
   5. Hash-based

   If the policy is not explicitly set and multipath routing is used, then the global no
   command option called mpr_policy determines the policy that will be used. The
default policy is Weighted Round Robin which behaves just like Round-Robin when
the weights are all 1. Although the Default policy is Weighted Round-Robin, when the
policy is not set, then the network option mpr_policy takes precedence. On the other
hand, if the policy is explicitly set to WRR then this setting overrides the mpr_policy
setting. For more information about these policies, see the no command.

-weight $n$
   Specifies the weight of the route that will be used for the Weighted policies with the
   Multipath Routing feature.
-expire \( n \)  
Specifies expiration metrics used by routing protocol.

-ssthresh \( n \)  
Specifies outbound gateway buffer limit.

-lock  
Specifies a meta-modifier that can individually lock a metric modifier. The -lock meta-modifier must precede each modifier to be locked.

-lockrest  
Specifies a meta-modifier that can lock all subsequent metrics.

-if ifname  
Specifies the interface (en0, tr0 ...) to associate with this route so that packets will be sent using this interface when this route is chosen.

-xresolve  
Emits a message on use (for external lookup).

-iface  
Specifies that the destination is directly reachable.

-static  
Specifies the manually added route.

-nostatic  
Specifies the pretend route that is added by the kernel or daemon.

-reject  
Emits an ICMP unreachable when matched.

-blackhole  
Silently discards packets during updates.

,proto1  
Sets protocol specific routing flag number 1.

,proto2  
Sets protocol specific routing flag number 2.

**Command**  
Specifies one of six possibilities:

add  
Adds a route.

flush or -f  
Removes all routes.

delete  
Deletes a specific route.

change  
Changes aspects of a route (such as its gateway).

monitor  
Reports any changes to the routing information base, routing lookup misses, or suspected network partitionings.

get  
Lookup and display the route for a destination.

set  
Set the policy and weight attributes of a route.

**Family**  
Specifies the address family. The -inet address family is the default. The -inet6 family specifies that all subsequent addresses are in the inet6 family.

**Destination**  
Identifies the host or network to which you are directing the route. The Destination parameter can be specified either by symbolic name or numeric address.

**Gateway**  
Identifies the gateway to which packets are addressed. The Gateway parameter can be specified either by symbolic name or numeric address.

---

**Examples**

1. To establish a route so that a computer on one network can send a message to a computer on a different network, type:

```plaintext
route add 192.100.201.7 192.100.13.7
```
The 192.100.201.7 address is that of the receiving computer (the Destination parameter). The 192.100.13.7 address is that of the routing computer (the Gateway parameter).

2. To establish a route so you can send a message to any user on a specific network, type:
   ```sh
   route add -net 192.100.201.0 192.100.13.7
   ```
   The 192.100.201.0 address is that of the receiving network (the Destination parameter). The 192.100.13.7 address is that of the routing network (the Gateway parameter).

3. To establish a default gateway, type:
   ```sh
   route add 0 192.100.13.7
   ```
   The value 0 or the default keyword for the Destination parameter means that any packets sent to destinations not previously defined and not on a directly connected network go through the default gateway. The 192.100.13.7 address is that of the gateway chosen to be the default.

4. To clear the host gateway table, type:
   ```sh
   route -f
   ```

5. To add a route specifying weight and policy information, type:
   ```sh
   route add 192.158.2.2 192.158.2.5 -weight 5 -policy 4
   ```

6. To set the weight and policy attributes of a preexisting route, type:
   ```sh
   route set 192.158.2.2 192.158.2.5 -weight 3 -policy
   ```

**Related Information**

- The `netstat` command.
- The `routed` daemon.
- The `gethostbyname` subroutine, `getnetbyname` subroutine.
- The `/etc/hosts` file format.
- TCP/IP routing, TCP/IP routing gateways, TCP/IP addressing in *Networks and communication management*.

**routed Daemon**

**Purpose**
Manages network routing tables.

**Syntax**

**Note:** Use SRC commands to control the `routed` daemon from the command line. Use the `rc.tcpip` file to start the daemon at each system startup.

```sh
/usr/sbin/routed [-d] [-g] [-t] [-s] [-q] [LogFile]
```

**Description**

The `/usr/sbin/routed` daemon manages the network routing tables in the kernel. Unlike the `gated` daemon, which supports all TCP/IP gateway protocols, the `routed` daemon only implements the Routing Information Protocol (RIP). Do not use the `routed` daemon when Exterior Gateway Protocol (EGP), Simple Network Management Protocol (SNMP), or Distributed Computer Network Local-Network Protocol (HELLO) routing is needed. Use the `gated` daemon for these protocols.
Note: Results are unpredictable when the gated and routed daemons run on the same host.

The routed daemon finds interfaces to directly connected hosts and networks that are configured into the system and marked as up. (Mark networks as up using the ifconfig command.) If multiple interfaces are present, the routed daemon assumes that the local host forwards packets between networks. The routed daemon transmits a RIP request packet on each interface, using a broadcast message if the interface supports it.

The routed daemon then listens for RIP routing requests and response packets from other hosts. When the routed daemon supplies RIP information to other hosts, it sends RIP update packets every 30 seconds (containing copies of its routing tables) to all directly connected hosts and networks.

When the routed daemon receives a Routing Information Protocol (RIP) request packet to supply RIP routing information, the routed daemon generates a reply in the form of a response packet. The response packet is based on the information maintained in the kernel routing tables and contains a list of known routes. Each route is marked with a hop-count metric, which is the number of gateway hops between the source network and the destination network. The metric for each route is relative to the sending host. A metric of 16 or greater is considered infinite or beyond reach.

The routed daemon writes information about its actions to a LogFile. This log file contains information about any changes to the routing tables. The file also contains a history of recent route-change messages both sent and received.

Updating Routing Tables

The routed daemon uses information contained in RIP response and update packets from other hosts to update its routing tables when at least one of the following conditions exists:

• No routing table entry exists for the destination network or host, and the metric associated with the route is finite; that is, the metric is less than 16.

• The source host of the packet is the router in the existing routing table entry. That is, updated information is being received from the same internetwork router through which packets for the destination are being routed.

• The existing entry in the routing table has not been updated in the last 90 seconds, and the route is at least as efficient as the current route.

• The new route is shorter than the one to the same destination currently stored in the routing tables. The routed daemon determines relative route length by comparing the new metric with the one stored in the routing table.

When the routed daemon updates its internal routing tables, it generates a RIP update packet to all directly connected hosts and networks. Before updating the kernel routing tables, the routed daemon pauses briefly to allow any unstable conditions to stabilize.

Besides processing incoming RIP packets, the routed daemon also checks the internal routing table entries periodically. The metric for any entry that has not been updated for three minutes is set to infinity and marked for deletion. The deletion is delayed for 60 seconds so that information about the route that is not valid can be distributed throughout the network. A host that acts as a RIP router supplies its routing tables to all directly connected hosts and networks every 30 seconds.

Using Gateways

Besides its ability to manage routes to directly connected hosts and networks, the routed daemon also uses distant and external gateways. These gateways cannot be identified by RIP queries, so the routed daemon reads the /etc/gateways file for information about these distant and external gateways.
The `/etc/gateways` file contains information about routes through distant and external gateways to hosts and networks that should be advertised through RIP. These routes can be either static routes to specific destinations or default routes for use when a static route to a destination is unknown. The format of the `/etc/gateways` file is:

```
{ net | host } name1 gateway name2 metric { passive | active | external }
```

When a gateway specified in the `/etc/gateways` file supplies RIP routing information, it should be marked as active. Active gateways are treated like network interfaces. That is, RIP routing information is distributed to the active gateway. If no RIP routing information is received from the gateway for a period of time, the `routed` daemon deletes the associated route from the routing tables.

A gateway that does not exchange RIP routing information should be marked as passive. Passive gateways are maintained in the routing tables indefinitely. Information about passive gateways is included in any RIP routing information transmitted.

An external gateway is identified to inform the `routed` daemon that another routing process will install such a route and that the `routed` daemon should not install alternative routes to that destination. External gateways are not maintained in the routing tables and information about them is not included in any RIP routing information transmitted.

**Note:** Routes through external gateways must be to networks only.

The `routed` daemon can also perform name resolution when routing to different networks. For example, the following command adds a route to the network called `netname` through the gateway called `host1`. The `host1` gateway is one hop count away.

```
route add net netname host1 1
```

To perform network name resolution, the `routed` daemon uses the `/etc/networks` file to get information on the network addresses and their corresponding names. To perform host name resolution, the `routed` daemon must take additional steps before the routing is complete. First the daemon checks for the existence of the `/etc/resolv.conf` file. This file indicates whether the host is running under a domain name server, and if so, gives the IP address of the host machine running the `named` daemon.

If the `/etc/resolv.conf` file does not exist, the `routed` daemon uses the `/etc/hosts` file to find the host for which it is routing.

The `routed` daemon should be controlled using the System Resource Controller (SRC) or the System Management Interface Tool (SMIT). Entering the `routed` daemon at the command line is not recommended.

**Manipulating the routed Daemon with the System Resource Controller**

The `routed` daemon is a subsystem controlled by the System Resource Controller (SRC). The `routed` daemon is a member of the SRC `tcpip` system group. This daemon is disabled by default and can be manipulated by the following SRC commands:

- `startsrc`: Starts a subsystem, group of subsystems, or subserver.
- `stopsrc`: Stops a subsystem, group of subsystems, or subserver.
- `traceson`: Enables tracing of a subsystem, group of subsystems, or subserver.
- `tracesoff`: Disables tracing of a subsystem, group of subsystems, or subserver.
- `lssrc`: Gets the status of a subsystem, group of subsystems, or subserver.
Signals

The following signals have the specified effect when sent to the `routed` process using the `kill` command:

**SIGINT**
- Restarts the `routed` daemon and flushes the routing table.

**SIGHUP, SIGTERM, or SIGQUIT**
- Broadcasts RIP packets with hop counts set to infinity. These signals disable the local host as a router. After a second SIGHUP, SIGTERM, or SIGQUIT signal, the `routed` daemon terminates.

**SIGUSR1**
- Turns packet tracing on or, if packet tracing is already on, steps up the tracing one level. The first level traces transactions only. The second level traces transactions plus packets. The third level traces the packet history, reporting packet changes. The fourth level traces packet contents. This command increments the level of tracing through four levels.

**SIGUSR2**
- Turns packet tracing off.

Flags

- `-d`
  - Enables additional debugging information, such as bad packets received, to be logged.

- `-g`
  - Runs the routing daemon on a gateway host. The `-g` flag is used on internetwork routers to offer a route to the default destination.

- `-q`
  - Prevents the `routed` daemon from supplying routing information regardless of whether it is functioning as an internetwork router. The `-q` flag indicates "quiet". Do not use the `-q` flag and the `-s` flag together.

- `-s`
  - Supplies routing information regardless of whether it is functioning as an internetwork router. The `-s` flag indicates "supply". Do not use the `-q` flag and the `-s` flag together.

- `-t`
  - Writes all packets sent or received to standard output or to the file specified in the `LogFile` parameter. The `routed` daemon remains under control of the controlling terminal that started it. Therefore, an interrupt from the controlling terminal keyboard stops the `routed` process.

Examples

1. To start the `routed` daemon manually, type:

   ```
   startsrc -s routed -a "-s"
   ```

   **Note:** The `routed` daemon is not started by default at each system startup. Use the `rc.tcpip` file format and a System Resource Controller (SRC) command to start the `routed` daemon. You can also start the `routed` daemon using the System Management Interface Tool (SMIT).

   The `-s` flag causes the `routed` daemon to return routing information regardless of whether the `routed` daemon is an internetwork router.

2. To stop the `routed` daemon, type the following:

   ```
   stopsrc -s routed
   ```

3. To get a short-status report from the `routed` daemon, type the following:

   ```
   lssrc -s routed
   ```

   This command returns the name of the daemon, the process ID of the daemon, and the state of the daemon (active or inactive).

4. To enable tracing for `routed` daemon, type the following:

   ```
   traceson -s routed
   ```

   This command enables socket-level debugging. Use the `trpt` command to look at the output of this example command.

5. To trace and log all the packet routing information into the temporary file `logfile`, type the following:

   ```
   startsrc -s routed -a "-t /tmp/logfile"
   ```
Related Information

The \texttt{route} command.

The \texttt{gated} daemon.

The \texttt{/etc/gateways} file format, \texttt{/etc/networks} file format.

TCP/IP routing, TCP/IP daemons, TCP/IP protocols in \textit{Networks and communication management}.

---

**rpc.nisd Daemon**

**Purpose**

Implements the NIS+ service.

**Syntax**

\texttt{/usr/sbin/rpc.nisd [ \(-A\) [ \(-C\) [ \(-D\) [ \(-F\) [ \(-h\) [ \(-v\) [ \(-Y\) [ \(-c\) \text{Seconds} \] [ \(-d\) \text{Dictionary} ] [ \(-L\) \text{Load} ] [ \(-S\) \text{Level} ] ] ] ] ] ] ]}

**Description**

The \texttt{rpc.nisd} daemon is a remote procedure call service that implements the NIS+ service. This daemon must be running on all servers that serve a portion of the NIS+ namespace. \texttt{rpc.nisd} is usually started from a system startup script.

**Flags**

- \texttt{-A}  
  Sets the \texttt{rpc.nisd} daemon in authentication verbose mode. The daemon logs all the authentication-related activities to \texttt{syslogd} with \texttt{LOG_INFO} priority.

- \texttt{-C}  
  Open diagnostic channel on \texttt{/dev/console}.

- \texttt{-D}  
  Sets the \texttt{rpc.nisd} daemon in debug mode (doesn’t fork).

- \texttt{-F}  
  Forces the server to do a checkpoint of the database when it starts up. Forced checkpoints may be required when the server is low on disk space. The \texttt{-F} flag removes updates from the transaction log that have been propagated to all the replicas.

- \texttt{-h}  
  Prints a list of options.

- \texttt{-v}  
  Sets the \texttt{rpc.nisd} daemon in verbose mode. With the \texttt{-v} flag, the \texttt{rpc.nisd} daemon sends a running narration of its operations to the \texttt{syslog} daemon (see \texttt{syslog} at \texttt{LOG_INFO} priority). This flag is most useful for debugging problems with the NIS+ service (see also the \texttt{-A} flag).

- \texttt{-Y}  
  Sets the server in NIS (YP) compatibility mode. When operating in this mode, the NIS+ server responds to NIS Version 2 requests using the Version 2 protocol. Because the YP protocol is not authenticated, only those items that do not have read access to anybody are visible through the Version 2 protocol. The Version 2 protocol supports only the standard Version 2 maps in this mode (see the \texttt{-B} flag).

- \texttt{-c \text{Seconds}}  
  Sets the number of seconds between pushing out for updates to the server’s replicas. The default is 120 seconds (two minutes).

- \texttt{-d \text{Dictionary}}  
  Specifies an alternate dictionary for the NIS+ database. The primary use of the \texttt{-d} flag is for testing. Note that the string is not interpreted; instead, it is passed on to the \texttt{db_initialize} function.

- \texttt{-L \text{Load}}  
  Specifies the maximum number of child processes that the server may spawn. The value of \texttt{Load} must be at least 1 for the callback functions to work correctly. The default is 128.
-S Level

Sets the authorization security level of the rpc.nisd daemon. The value of the Level parameter must be between 0 and 2. The default is 2. The following values indicate these security levels:

0
At security level 0 the rpc.nisd daemon does not enforce any access controls. Any client is allowed to perform any operation, including updates and deletions. The 0 security level is intended for testing and initial setup of the NIS+ namespace.

1
At security level 1 the rpc.nisd daemon accepts both AUTH_SYS and AUTH_DES credentials for authenticating and authorizing clients to perform NIS+ operations. Level 1 is not a secure mode of operation because AUTH_SYS credentials are easy to forge. You should not use this security level on networks where any unknown user might have access.

2
At security level 2 the rpc.nisd daemon accepts only AUTH_DES credentials for authentication and authorization. 2 is the highest level of security provided by the NIS+ service and the default.

Environment

NETPATH Limits the transports available for NIS+ to use.

Examples

1. To set up the NIS+ service, enter:
   
   rpc.nisd

2. To set the NIS+ service in YP compatibility mode with DNS forwarding, enter:
   
   rpc.nisd -YB

Files

/var/nis/parent.object
Contains an XDR-encoded NIS+ object describing the namespace above a root server. This parent namespace can be another NIS+ namespace or a foreign namespace such as the one served by the Domain Name Server. The /var/nis/parent.object only exists on servers serving the root domain namespace.

/var/nis/root.object
Contains an XDR-encoded NIS+ object that describing the root of the namespace. The /var/nis/root.object file only exists on servers serving the root of the namespace.

/etc/init.d/rpc
Contains the initialization script for NIS+.

Related Information

The nis_cachemgr daemon, the nisinit command, the nissetup command, and the rpc.nispasswdd daemon.

rpc.nispasswdd Daemon

Purpose

NIS+ password update daemon.

Syntax

/usr/sbin/rpc.nispasswdd [ [-a Attempts] [-c Minutes] [-D] [-g] [-v]]
Description
The `rpc.nispasswdd` daemon is an ONC+ RPC service that services password update requests from `nispasswd` and `yppasswd`. It updates password entries in the NIS+ `passwd` table.

The `rpc.nispasswdd` daemon is normally started from a system startup script after the NIS+ server, `rpc.nisd`, has been started. `rpc.nispasswdd` determines whether it is running on a machine that is a master server for one or more NIS+ directories. If it discovers that the host is not a master server, then it promptly exits. It also determines if `rpc.nisd` is running in NIS(YP) compatibility mode (the `-Y` flag and registers as `yppasswdd` for NIS(YP) clients as well.

The `rpc.nispasswdd` daemon will syslog all failed password update attempts, which allows an administrator to determine whether someone was trying to "crack" the passwords.

`rpc.nispasswdd` has to be run by a superuser.

Flags

- `-a Attempts`  Sets the maximum number of attempts allowed to authenticate the caller within a password update request session. Failed attempts are `syslogd` and the request is cached by the daemon. After the maximum number of allowed attempts the daemon severs the connection to the client. The default value is set to 3.

- `-c Minutes`   Sets the number of minutes a failed password update request should be cached by the daemon. This is the time during which if the daemon receives further password update requests for the same user and authentication of the caller fails, then the daemon will simply not respond. The default value is set to 30 minutes.

- `-D`          Runs in debugging mode.

- `-g`          Generates DES credential. By default the DES credential is not generated for the user if they do not have one. By specifying this flag, if the user does not have a credential, then one will be generated for them and stored in the NIS+ cred table.

- `-v`          Sets verbose mode. With this flag, the daemon sends a running narration of what it is doing to the syslog daemon. This flag is useful for debugging problems.

Exit Status

0  Success
1  An error has occurred.

Files

/etc/init.d/rpc  Initialization script for NIS+

Related Information

The `passwd` command, `yppasswd` command.

The `rpc.nisd` daemon, `syslogd` daemon.

**rpc.pcnfsd Daemon**

**Purpose**

Handles service requests from PC-NFS (Personal Computers Network File System) clients.
Syntax
/usr/sbin/rpc.pcnfsd

Description
The `rpc.pcnfsd` daemon handles requests from PC-NFS clients for authentication services on remote machines. These services include authentication for mounting and for print spooling. The PC-NFS program allows personal computers running DOS to be networked with machines running NFS. The `rpc.pcnfsd` daemon supports Versions 1 and 2 of the `pcnfsd` protocol.

When a PC-NFS client makes a request, the `inetd` daemon starts the `rpc.pcnfsd` daemon (if the `inetd.conf` file contains the appropriate entry). The `rpc.pcnfsd` daemon reads the `/etc/pcnfsd.conf` configuration file, if present, then services RPC requests directed to program number 150001. After the `rpc.pcnfsd` daemon is started, all print requests go to the default print spooling directory `/var/spool/pcnfs`.

Authentication
When it receives a `PCNFSD_AUTH` or `PCNFSD2_AUTH` request, the `rpc.pcnfsd` daemon logs in a user by first validating the user name and password, and then returning the corresponding user ID (UID), group ID (GIDS), home directory, and `umask` specifications. A record of logins is appended to the `/var/adm/wtmp` file. To disable the login record feature, add the following line to the `/etc/pcnfsd.conf` file:

```
wtmp off
```

Printing
The `rpc.pcnfsd` daemon uses the Network File System (NFS) to transfer print data between clients and servers. The client system first issues a `PCNFSD_PR_INIT` or `PCNFSD2_PR_INIT` request. The server then returns a spool directory path for the client to use.

Note: The spool directory must be exported by NFS, using the `exportfs` command and the `/etc/exports` file.

The `rpc.pcnfsd` daemon creates a subdirectory for each of its clients. The default parent directory is `/var/spool/pcnfs`, and the subdirectory is the host name of the client system. To use a different parent directory, add the following line to the `/etc/pcnfsd.conf` file:

```
spooldir Pathname
```

When the spool directory is mounted and the print data is transferred to a file in this directory, the client issues a `PCNFSD_PR_START` or `PCNFSD2_PR_START` request. The `rpc.pcnfsd` daemon handles this (and most other print-related requests) by constructing an `enq` command. The daemon adopts the identity of the personal computer user to execute the print request command. Because constructing and executing the command involves user ID privileges, the `rpc.pcnfsd` daemon must be run as a root process.

All print requests from clients include the name of the printer to be used. The printer name is represented by queue and device definitions in the `/etc/qconfig` file. Additionally, the `rpc.pcnfsd` daemon provides a method for defining PC-NFS virtual printers recognized only by `rpc.pcnfsd` clients. Each PC-NFS virtual printer is defined in the `/etc/pcnfsd.conf` file with a line similar to the following:

```
printer Name AliasFor Command
```

In this format, `Name` specifies the name of the printer to be defined, and `AliasFor` is the name of the existing printer that will do the work. For example, a request to show the queue for `Name` translates into a queue command on the `AliasFor` printer. To define a printer `Name` with no existing printer, use a single `-` (minus sign) in place of the `AliasFor` parameter. The `Command` parameter specifies a command run when a file is printed on the `Name` printer. This command is executed by the Bourne shell, using the `-c` option. For complex operations, replace the `Command` parameter with an executable shell script.
The following list of tokens and substitution values can be used in the *Command* parameter:

<table>
<thead>
<tr>
<th>Token</th>
<th>Substitution Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$FILE</td>
<td>The full path name of the print data file. After the command has executed, the file is unlinked.</td>
</tr>
<tr>
<td>$USER</td>
<td>The user name of the user logged-in to the client.</td>
</tr>
<tr>
<td>$HOST</td>
<td>The host name of the client system.</td>
</tr>
</tbody>
</table>

**Examples**

The following example `/etc/pcnfsd.conf` file configures a virtual printer on the first line and a null device for testing on the second line:

```bash
printer rotated lw /bin/enscript -2r $FILE
printer test - /usr/bin/cp $FILE /usr/tmp/$HOST-$USER
```

The first line stipulates that if a client system prints a job on the rotated printer, the *enscript* utility is called to preprocess the `$FILE` file. The `-2r` option causes the file to be printed in two-column, rotated format on the default PostScript printer. If a client requests a list of the print queue for the rotated printer, the *rpc.pcnfsd* daemon translates this request into a request for a similar listing for the `lw` printer.

The second line establishes a printer test. Files sent to the test printer are copied into the `/usr/tmp` directory. Requests to the test printer to list the queue, check the status, or perform similar printer operations, are rejected because `- (minus sign)` is specified in place of the *AliasFor* parameter.

**Files**

- `/etc/inetd.conf` Contains the TCP/IP configuration file that starts RPC daemons and other TCP/IP daemons.
- `/etc/pcnfsd.conf` Contains the *rpc.pcnfsd* daemon configuration file.
- `/var/spool/pcnfs` Contains the default print-spooling directory.

**Related Information**

The `enq` command, `last` command.

The `inetd` daemon.

The `umask` subroutine.

Network File System (NFS) Overview for System Management in *Networks and communication management*.

Printing administration in the *Printers and printing*.

List of NFS commands in *Networks and communication management*.

**rpcgen Command**

**Purpose**

Generates C code to implement an RPC protocol.

**Syntax**

To Generate Four Types of Output Files for a File

```
/usr/bin/rpcgen InputFile
```
To Generate a Specific Output File for a File
rpcgen { -c -h -l -m } [ -o OutputFile ] [ InputFile ]

To Generate a Server-Side File for TCP or UDP
rpcgen { -s Transport ... } [ -o OutputFile ] [ InputFile ]

Description
The rpcgen command generates C code to implement a Remote Procedure Call (RPC) protocol. The input to the rpcgen command is a language similar to C language known as RPC Language.

The first syntax structure is the most commonly used form for the rpcgen command where it takes an input file and generates four output files. For example, if the InputFile parameter is named proto.x, then the rpcgen command generates the following:

- proto.h            Header file
- proto_xdr.c        XDR routines
- proto_svc.c        Server-side stubs
- proto_clnt.c       Client-side stubs

Use the other syntax structures when you want to generate a particular output file rather than all four output files.

The cpp command, a C preprocessor, is run on all input files before they are actually interpreted by the rpcgen command. Therefore, all the cpp directives are legal within an rpcgen input file. For each type of output file, the rpcgen command defines a special cpp symbol for use by the rpcgen programmer:

- RPC_HDR    Defined when compiling into header files
- RPC_XDR    Defined when compiling into XDR routines
- RPC_SVC    Defined when compiling into server-side stubs
- RPC_CLNT   Defined when compiling into client-side stubs

In addition, the rpcgen command does some preprocessing of its own. Any line beginning with a % (percent sign) passes directly into the output file, uninterpreted by the rpcgen command.

To create your own XDR routines, leave the data types undefined. For every data type that is undefined, the rpcgen command assumes that a routine exists by prepending xdr_ to the name of the undefined type.

Notes:
1. Nesting is not supported. As a work-around, structures can be declared at top-level with their names used inside other structures in order to achieve the same effect.
2. Name clashes can occur when using program definitions since the apparent scoping does not really apply. Most of these can be avoided by giving unique names for programs, versions, procedures, and types.
3. To program to the TIRPC interfaces, and allow the use of multi-threaded RPC applications use the tirpcgen command. It will also be necessary to define the preprocessor variable _AIX_TIRPC in the Makefile as well as the libtli.a (-ltli) specification. tirpcgen is a temporary name for a new rpcgen command that will replace rpcgen in a future version the operating system.

Flags
-c                  Compiles into XDR routines.
-h                  Compiles into C-data definitions (a header file).
-l
Compiles into client-side stubs.

-m
Compiles into server-side stubs, but does not generate a main routine. This option is useful for doing call-back routines and for writing a main routine to do initialization.

-o OutputFile
Specifies the name of the output file. If none is specified, standard output is used.

-s Transport
Compiles into server-side stubs, using given transport. The supported transports are udp and tcp. This flag can be run more than once to compile a server that serves multiple transports.

Related Information
The [cpp] command.

Network File System (NFS) Overview for System Management in Networks and communication management.

Remote Procedure Call (RPC) Overview for Programming in AIX 5L Version 5.3 Communications Programming Concepts.

List of NFS commands in Networks and communication management.

**rpcinfo Command**

**Purpose**
Reports the status of Remote Procedure Call (RPC) servers.

**Syntax**

To Display a List of Statistics
/usr/bin/rpcinfo [ -m | -s ] [ Host ]

To Display a List of Registered RPC Programs
/usr/bin/rpcinfo -p [ Host ]

To Report Transport
/usr/bin/rpcinfo -T transport Host Prognum [ Versnum ]

To Display a List of Entries
/usr/bin/rpcinfo -l [ -T transport ] Host Prognum Versnum

To Report Program Status
/usr/bin/rpcinfo [-n PortNum] [-u] Host Prognum [ Versnum ]

To Report Response Status
/usr/bin/rpcinfo [-n PortNum] [-t] Host Prognum [ Versnum ]

To Display All Hosts Running a Specified Program Version
/usr/bin/rpcinfo [-b] [ -T transport ] Prognum Versnum

To Delete Registration of a Service
/usr/bin/rpcinfo [-d] [ -T transport ] Prognum Versnum

**Description**
The rpcinfo command makes an RPC call to an RPC server and reports the status of the server. For instance, this command reports whether the server is ready and waiting or not available.
The program parameter can be either a name or a number. If you specify a version, the **rpcinfo** command attempts to call that version of the specified program. Otherwise, the **rpcinfo** command attempts to find all the registered version numbers for the program you specify by calling version 0 (zero) and then attempts to call each registered version. (Version 0 is presumed not to exist. If it does exist, the **rpcinfo** command attempts to obtain this information by calling an extremely high version number instead.)

**Flags**

- **-b**
  Makes an RPC broadcast to procedure 0 of the specified prognum and versnum and reports all hosts that respond. If transport is specified, it broadcasts its request only on the specified transport. If broadcasting is not supported by any transport, an error message is printed. Using broadcasting (-b flag) should be limited because of the possible adverse effect on other systems.

- **-d**
  Deletes registration for the RPC service of the specified prognum and versnum. If transport is used, unregister the service only on that transport, otherwise unregister the service on all the transports where it was registered. This option can be exercised only by the root user.

- **-l**
  Displays a list of entries with the specified prognum and versnum on the specified host. Entries are returned for all transports in the same protocol family as those used to contact the remote portmap daemon. This flag only applies to AIX 4.2.1 or later.

- **-m**
  Displays a table of portmap operations statistics on the specified host. The table contains statistics for each version of portmap (Versions 2, 3, and 4), the number of times each procedure was requested and successfully serviced, the number and type of remote call requests that were made, and information about RPC address lookups that were handled. This information is used for monitoring RPC activities on the host. This flag only applies to AIX 4.2.1 or later.

- **-n Portnum**
  Use the Portnum parameter as the port number for the -t and -u options instead of the port number given by the portmap. Using the -n options avoids a call to the remote portmap to find out the address of the service. This option is made obsolete by the -a option.

- **-p**
  Probes the portmap service on the host using Version 2 of the portmap protocol and displays a list of all registered RPC programs. If a host is not specified, it defaults to the local host.

- **-s**
  Displays a concise list of all registered RPC programs on the host. If host is not specified, the default is the local host. This flag only applies to AIX 4.2.1 or later.

- **-t**
  Makes an RPC call to procedure 0 of prognum on the specified host using TCP, and reports whether a response was received. This option is made obsolete when using the -T option as shown in the third syntax.

- **-T**
  Specifies the transport where the service is required. This flag only applies to AIX 4.2.1 or later.

- **-u**
  Makes an RPC call to procedure 0 of prognum on the specified host using UDP, and reports whether a response was received. This option is made obsolete when using the -T option as shown in the third syntax.

**Examples**

1. To show all of the RPC services registered on a local machine, enter:

   \[
   \text{rpcinfo -p}
   \]

2. To show all of the RPC services registered on a specific machine, enter:

   \[
   \text{rpcinfo -p zelda}
   \]

   In this example, the **rpcinfo** command shows all RPC services registered on a machine named zelda.

3. To show all machines on the local network that are running a certain version of a specific server, enter:

   \[
   \text{rpcinfo -b ypserv 2}
   \]

   In this example, the **rpcinfo** command shows a list of all machines that are running version 2 of the **ypserv** daemon.

4. To delete the registration of a service, enter:
In this example, the `rpcinfo` command deletes version 1 of the `sprayd` daemon.

**Files**

`/etc/rpc`  
Contains a list of server names and their corresponding RPC program numbers and aliases.

`/etc/services`  
Contains an entry for each service available through the Internet network.

**Related Information**

The `portmap` daemon.

Network File System (NFS) Overview for System Management in *Networks and communication management*.

List of NFS commands in *Networks and communication management*.

---

**rrestore Command**

**Purpose**

Copies previously backed up file systems from a remote machine’s device to the local machine.

**Syntax**

```
restore [ -b Number | -h | -i | -m | -n Number | -p | -s Number | -t | -v | -y | -x | -r | -R ] [-f Machine:Device [ FileSystem ... ] [ File ... ]
```

**Description**

The `restore` command restores Version 3 by i-node backups from a remote machine’s device to a file system on the local machine. The `restore` command creates a server on the remote machine to the backup medium.

The `restore` command only accepts backup formats created when a file system is backed up by i-node.

**Note:** A user must have root authority to execute this command.

**Flags**

- `-b Number`  
  Specifies the number of blocks to read in a single input operation. If you do not specify this flag, the `restore` command selects a default value appropriate for the physical device you have selected. Larger values of the `Number` variable result in larger physical transfers from tape devices.

- `-f Machine:Device`  
  Specifies the input device on the remote machine. Specify the `Device` variable as a file name (such as the `/dev/rmt0` file) to get input from the named device. For more information on using tape devices see the `rmt` special file.

- `-h`  
  Restores only the actual directory named by the `File` parameter, not the files contained in that directory. This option is ignored when either the `-r` or `-R` flag is specified.
-i
Starts the interactive mode. This flag allows you to restore selected files from the directory represented by the File parameter. The subcommands for the -i flag are:

**ls [Directory]**
Displays directory names within the specified Directory parameter with a / (slash) after the name, and displays files to be restored with an * (asterisk) before the name. If the -v flag is used, the i-node number of each file and directory is also displayed. If the Directory parameter is not specified, the current directory is used.

cd Directory
Changes the current directory to the Directory parameter.

pwd
Displays the full path name of the current directory.

add [File]
Specifies the File parameter to restore. If the File parameter is a directory, that directory and all its files are restored (unless the -h flag is used). Files to be restored are displayed with an * (asterisk) before the name by the ls subcommand. If the File parameter is not specified, the current directory is used.

delete [File]
Specifies the File parameter to ignore in restore. If the File parameter is a directory, the directory and all its files are not restored (unless the -h flag is used). If the File parameter is not specified, the current directory is used.

extract Restores all files displayed with an * (asterisk) before the name by the ls subcommand.

setmodes
Sets owner, modes, and times for the files being restored rather than using this information as it resides on the backup medium.

verbose
Displays the i-node numbers of all restored files with the ls subcommand. Information about each file is also displayed as it is restored. The next invocation of the verbose subcommand turns verbose off.

help
Displays a summary of the subcommands.

quit
Stops execution of the restore command immediately, even if all files requested have not been restored.

-m
Restores files by i-node number rather than by path name.

-r
Restores an entire file system.

Attention: If you do not follow this procedure carefully, you can ruin an entire file system. If you are restoring a full (level 0) backup, run the mkfs command to create an empty file system before doing the restore. To restore an incremental backup at level 2, for example, run the mkfs command, restore the appropriate level 0 backup, restore the level 1 backup, and finally restore the level 2 backup. As an added safety precaution, run the fsck command after you restore each backup level.

-R
Causes the restore command to request a specific volume in a multivolume set of backup medium when restoring an entire file system. The -R flag provides the ability to interrupt and resume the restore command.

-s Number
Specifies which backup to restore from a multibackup medium. Numbering starts with 1.

-t
Displays the table of contents for the backed up files. The restore command displays the file name. The names are relative to the root (/) directory of the file system backed up. The only exception is the root (/) directory itself.

-v
Reports the progress of the restoration as it proceeds.

-x
Restores individually named files. If no names are given, all files on that medium are restored. The names must be in the same form as the names shown by the ls flag.
Prevents the **restore** command from asking whether it should stop the restore if a tape error is encountered. The **restore** command attempts to skip over bad blocks.

**-?**
Displays the usage message.

**Exit Status**
This command returns the following exit values:

0  Successful completion.

>0  An error occurred.

**Examples**
1. To list files from a remote tape device, enter:

   ```
rrestore -f machine1:/dev/rmt0 -t
   ```

   This command reads information from the /dev/rmt0 device on remote machine1. The file names are shown.

2. To restore files, enter:

   ```
rrestore -x -f machine1:/dev/rmt0 /home/mike/file1
   ```

   This command extracts the /home/mike/file1 file from the backup medium on the /dev/rmt0 device on remote machine1.

3. To restore all the files in a directory, enter:

   ```
rrestore -f host:/dev/rmt0 -x /home/mike
   ```

   This command restores the directory /home/mike and all the files it contains.

4. To restore a directory, but not the files in the directory, enter:

   ```
rrestore -f host:/dev/rmt0 -x -h /home/mike
   ```

5. To restore all the files in a directory from a specific backup on a multibackup medium, enter:

   ```
rrestore -s3 -f host:/dev/rmt0.1 -x /home/mike
   ```

   This command restores the /home/mike directory and all the files it contains from the third backup on the backup medium.

**Files**

/dev/rfd0   Specifies the default restore device.

/usr/sbin/rrestore  Contains the **restore** command.

**Related Information**

- **backup** command, **rdump** command, **restore** command, **mkfs** command, **fsck** command, **dd** command.
- **filesystems** file, **backup** file, **rmt** special file.
- **Backup methods** in *Operating system and device management*.
- **File systems** in *Operating system and device management*.
- **Directories** in *Operating system and device management*.
Rsh Command

Purpose
Invokes the restricted version of the Bourne shell.

Syntax
```
Rsh [ -i ] [ { + | - } { [ a ] [ e ] [ f ] [ h ] [ k ] [ n ] [ t ] [ u ] [ v ] [ x ] } ]
[ -c String ] [ -s ] [ File Parameter ]
```

Note: Preceding a flag with a + (plus sign) rather than a - (minus sign) turns it off.

Description
The Rsh command invokes a restricted version of the Bourne shell, which is useful for installations that require a more controlled shell environment. The restricted shell allows you to create user environments with a limited set of privileges and capabilities.

For more information about the Bourne shell, see "Bourne shell" in Operating system and device management.

Flags
The Bourne shell interprets the following flags only when the shell is invoked at the command line.

Note: Unless you specify either the -c or -s flag, the shell assumes that the next parameter is a command file (shell script). It passes anything else on the command line to that command file. See the discussion of positional parameters in "Variable substitution in the Bourne shell" in Operating system and device management for more information.

- a  Marks for export all variables to which an assignment is performed. If the assignment precedes a command name, the export attribute is effective only for that command's execution environment, except when the assignment precedes one of the special built-in commands. In this case, the export attribute persists after the built-in command has completed. If the assignment does not precede a command name, or if the assignment is a result of the operation of the getopts or read command, the export attribute persists until the variable is unset.

- c String  Runs commands read from the String variable. Sets the value of special parameter $0 from the value of the String variable and the positional parameters ($1, $2, and so on) in sequence from the remaining Parameter operands. The shell does not read additional commands from standard input when you specify this flag.

- e  Exits immediately if all of the following conditions exist for a command:
  - It exits with a return value greater than 0.
  - It is not part of the compound list of a while, until, or if command.
  - It is not being tested using AND or OR lists.
  - It is not a pipeline preceded by the ! (exclamation point) reserved word.

- f  Disables file name substitution.

- h  Locates and remembers the commands called within functions as the functions are defined. (Usually these commands are located when the function is executed; see the hash command.)

- i  Makes the shell interactive, even if input and output are not from a workstation. In this case the shell ignores the TERMEDIATE signal, so that the kill 0 command does not stop an interactive shell, and traps an INTERRUPT signal, so you can interrupt the function of the wait command. In all cases, the shell ignores the QUIT signal.

- k  Places all keyword parameters in the environment for a command, not just those preceding the command name.
-n Reads commands but does not execute them. The -n flag can be used to check for shell-script syntax errors. An interactive shell may ignore this option.
-s Reads commands from standard input. Any remaining parameters specified are passed as positional parameters to the new shell. Shell output is written to standard error, except for the output of built-in commands.
-t Exits after reading and executing one command.
-u Treats an unset variable as an error and immediately exits when performing variable substitution. An interactive shell does not exit.
-v Displays shell input lines as they are read.
-x Displays commands and their arguments before they are executed.

Note: Using a + (plus sign) rather than a - (minus sign) unsets flags. The $- special variable contains the current set of flags.

Files

/user/bin/bsh Specifies the path name to the Bourne shell.
/user/bin/Rsh Specifies the path name to the restricted Bourne shell, a subset of the Bourne shell.
/tmp/sh* Contains temporary files that are created when a shell is opened.

Related Information

The env command, sh command, bsh command.

The /etc/passwd file, null special file, environment file.

The profile file format.

Bourne shell in Operating system and device management.

Bourne shell built-in commands in Operating system and device management.

Variable substitution in the Bourne shell in Operating system and device management.

rsh or remsh Command

Purpose

Executes the specified command at the remote host or logs into the remote host.

Syntax

{ rsh | remsh } RemoteHost [ -a ] [ -n ] [ -l User ] [ -f ] [ -F ] [ -k realm ] [ -S ] [ -u ] [ Command ]

Description

The /usr/bin/rsh command executes the command specified by the Command parameter at the remote host specified by the RemoteHost parameter; if the Command parameter is not specified, the rsh command logs into the remote host specified by the RemoteHost parameter. The rsh command sends standard input from the local command line to the remote command and receives standard output and standard error from the remote command.

Note: Because any input to the remote command must be specified on the local command line, you cannot use the rsh command to execute an interactive command on a remote host. If you need to execute an interactive command on a remote host, use either the rlogin command or the rsh
command without specifying the *Command* parameter. If you do not specify the *Command*
parameter, the *rsh* command executes the *rlogin* command instead.

**Access Files**
If you do not specify the `-l` flag, the local user name is used at the remote host. If `-l User` is entered, the
specified user name is used at the remote host.

**Using Standard Authentication**
The remote host allows access only if at least one of the following conditions is satisfied:

- The local user ID is not the root user, and the name of the local host is listed as an equivalent host in
  the remote `/etc/hosts.equiv` file.
- If either the local user ID is the root user or the check of `/etc/hosts.equiv` is unsuccessful, the remote
  user’s home directory must contain a `$HOME/.rhosts` file that lists the local host and user name.

Although you can set any permissions for the `$HOME/.rhosts` file, it is recommended that the permissions
of the `.rhosts` file be set to 600 (read and write by owner only).

In addition to the preceding conditions, the *rsh* command also allows access to the remote host if the
remote user account does not have a password defined. However, for security reasons, use of a password
on all user accounts is recommended.

**For Kerberos 5 Authentication**
The remote host allows access only if all of the following conditions are satisfied:

- The local user has current DCE credentials.
- The local and remote systems are configured for Kerberos 5 authentication (On some remote systems,
  this may not be necessary. It is necessary that a daemon is listening to the klogin port).
- The remote system accepts the DCE credentials as sufficient for access to the remote account. See the
  `kvalid_user` function for additional information.

**Remote Command Execution**
While the remote command is executing, pressing the Interrupt, Terminate, or Quit key sequences sends
the corresponding signal to the remote process. However, pressing the Stop key sequence stops only the
local process. Usually, when the remote command terminates, the local *rsh* process terminates.

To have shell metacharacters interpreted on the remote host, place the metacharacters inside " " (double
quotes). Otherwise, the metacharacters are interpreted by the local shell.

When using the *rsh* command, you can create a link to a path (to which you have permission to write),
using a host name specified by the *HostName* parameter as the link name. For example:

```
ln -s /usr/bin/rsh HostName
```

Having established this link, you can specify the *HostName* parameter and a command specified by the
*Command* parameter from the command line, and the *rsh* command remotely executes the command on
the remote host. The syntax is:

```
HostName Command
```

For example, if you are linked to remote host *opus* and want to perform the *date* command, enter:

```
opus date
```

Because you can not specify the `-l User` flag, the remote command is successful only if the local user has
a user account on the remote host. Otherwise, the *rsh* command returns a *Login incorrect* error
message. When you specify the *HostName* parameter without a command, the *rsh* command calls the
*rlogin* command, which logs you into the remote host. Again, for successful login, the local user must
have a user account on the remote host.
Flags

- Indicates the standard error of the remote command is the same as standard output. No provision is made for sending arbitrary signals to the remote process.
- Causes the credentials to be forwarded. This flag will be ignored if Kerberos 5 is not the current authentication method. Authentication will fail if the current DCE credentials are not marked forwardable.
- Causes the credentials to be forwarded. In addition the credentials on the remote system will be marked forwardable (allowing them to be passed to another remote system). This flag will be ignored if Kerberos 5 is not the current authentication method. Authentication will fail if the current DCE credentials are not marked forwardable.
- realm Indicates that the remote host allows access only if at least one of the following conditions is satisfied:
  - The local user ID is listed as a principal in the authentication database and had performed a kinit to obtain an authentication ticket.
  - If a /etc/hosts.equiv file exists, it must be located in the local user’s SHOME directory on the target system. The local user must be listed as well as any users or services allowed to rsh into this account. This file performs a similar function to a local .rhosts file. Each line in this file should contain a principal in the form of principal.instance@realm. If the originating user is authenticated as one of the principals named in .klogin, access is granted to the account. The owner of the account is granted access if there is no .klogin file.

For security reasons, any /etc/hosts.equiv file must be owned by the remote user and only the AIX owner id should have read and write access (permissions = 600) to .klogin.

Exit Status

This command returns the following exit values:

0 Successful completion.
>0 An error occurred.

Examples

In the following examples, the local host, host1, is listed in the /etc/hosts.equiv file at the remote host, host2.

1. To check the amount of free disk space on a remote host, enter:
   rsh host2 df

   The amount of free disk space on host2 is displayed on the local system.

2. To append a remote file to another file on the remote host, place the >> metacharacters in quotation marks, and enter:
   rsh host2 cat test1 ">>" test2
The file test1 is appended to test2 on remote host host2.

3. To append a remote file at the remote host to a local file, omit the quotation marks, and enter:
   rsh host2 cat test2 >> test3

   The remote file test2 on host2 is appended to the local file test3.

4. To append a remote file to a local file and use a remote user's permissions at the remote host, enter:
   rsh host2 -l jane cat test4 >> test5

   The remote file test4 is appended to the local file test5 at the remote host, with user jane's permissions.

5. This example shows how the root user can issue an rcp on a remote host when the authentication is Kerberos 4 on both the target and server. The root user must be in the authentication database and must have already issued kinit on the local host. The command is issued at the local host to copy the file, stuff, from node r05n07 to node r05n05 on an SP.
   
   ```
   /usr/lpp/ssp/rcmd/bin/rsh r05n07 'export KRBTKTFILE=/tmp/rcmdtgt$$; \
   /usr/lpp/ssp/rcmd/bin/rcmdtgt; \
   /usr/lpp/ssp/rcmd/bin/rcp /tmp/stuff r05n05:/tmp/stuff;'
   ```

   The root user sets the KRBTKTFILE environment variable to the name of a temporary ticket-cache file and then obtains a service ticket by issuing the rcmdtgt command. The rcp uses the service ticket to authenticate from host r05n07 to host r05n05.

Files

$HOME/.klogin
   Specifies remote users that can use a local user account.

/usr/lpp/ssp/rcmd/bin/rsh
   Link to AIX Secure /usr/bin/rsh that calls the SP Kerberos 4 rsh routine if applicable.

/usr/lpp/ssp/rcmd/bin/remsh
   Link to AIX Secure /usr/bin/rsh that calls the SP Kerberos 4 rsh routine if applicable.

Prerequisite Information

Refer to the chapter on security in IBM Parallel System Support Programs for AIX: Administration Guide for an overview. You can access this publication at the following Web site: http://www.rs6000.ibm.com/resource/aix_resource

Refer to the "RS/6000 SP Files and Other Technical Information" section of IBM Parallel System Support Programs for AIX: Command and Technical Reference for additional Kerberos information. You can access this publication at the following Web site: http://www.rs6000.ibm.com/resource/aix_resource

Related Information

The ftp command, rcp command, rexec command, rlogin command, telnet, tn, or tn3270 command.

SP Commands: k4init, k4list, k4destroy, lsauthpar, chauthpar, Kerberos

Environment variable: KRBTKFILE

The rshd and krshd daemon.

The kvalid_user function.

The hosts.equiv file format, .rhosts file format.
rshd Daemon

Purpose
Provides the server function for remote command execution.

Syntax

Note: The rshd daemon is usually started by the inetd daemon. It can also be controlled from the command line, using SRC commands.

/usr/sbin/rshd [-c] [-s]

Description
The /usr/sbin/rshd daemon is the server for the rcp and rsh commands. The rshd daemon provides remote execution of shell commands. These commands are based on requests from privileged sockets on trusted hosts. The shell commands must have user authentication. The rshd daemon listens at the socket defined in the /etc/services file.

Changes to the rshd daemon can be made using the System Management Interface Tool (SMIT) or System Resource Controller (SRC), by editing the /etc/inetd.conf or /etc/services file. Entering rshd at the command line is not recommended. The rshd daemon is started by default when it is uncommented in the /etc/inetd.conf file.

The inetd daemon get its information from the /etc/inetd.conf file and the /etc/services file.

After changing the /etc/inetd.conf or /etc/services file, run the refresh -s inetd or kill -1 InetdPID command to inform the inetd daemon of the changes to its configuration file.

Service Request Protocol
When the rshd daemon receives a service request, it initiates the following protocol:

1. The rshd daemon checks the source port number for the request. If the port number is not in the range 512 through 1023, the rshd daemon terminates the connection.

2. The rshd daemon reads characters from the socket up to a null byte. The string read is interpreted as an ASCII number (base 10). If this number is nonzero, the rshd daemon interprets it as the port number of a secondary stream to be used as standard error. A second connection is created to the specified port on the client host. The source port on the local host is also in the range 512 through 1023.

3. The rshd daemon uses the source address of the initial connection request to determine the name of the client host. If the name cannot be determined, the rshd daemon uses the dotted decimal representation of the client host's address.

4. The rshd daemon retrieves the following information from the initial socket:
   - A null-terminated string of at most 16 bytes interpreted as the user name of the user on the client host.
   - A null-terminated string of at most 16 bytes interpreted as the user name to be used on the local server host.
   - Another null-terminated string interpreted as a command line to be passed to a shell on the local server host.

5. The rshd daemon attempts to validate the user using the following steps:
a. The rshd daemon looks up the local user name in the /etc/passwd and /etc/security/passwd file and checks to see if the password, and therefore the user, has expired. It also verifies that the encrypted password string is valid and tries to switch to the home directory (using the chdir subroutine). If either the lookup or the directory change fails, the rshd daemon terminates the connection.

b. If the local user ID is a nonzero value, the rshd daemon searches the /etc/hosts.equiv file to see if the name of the client workstation is listed. If the client workstation is listed as an equivalent host, the rshd daemon validates the user.

c. If the $HOME/.rhosts file exists, the rshd daemon tries to authenticate the user by checking the .rhosts file.

d. If either the $HOME/.rhosts authentication fails or the client host is not an equivalent host, the rshd daemon terminates the connection.

6. After rshd validates the user, the rshd daemon returns a null byte on the initial connection and passes the command line to the user's local login shell. The shell then inherits the network connections established by the rshd daemon.

The rshd daemon should be controlled using the System Management Interface Tool (SMIT) or by changing the /etc/inetd.conf file. Typing rshd at the command line is not recommended.

Manipulating the rshd Daemon with the System Resource Controller

The rshd daemon is a subserver of the inetd daemon, which is a subsystem of the System Resource Controller (SRC). The rshd daemon is a member of the tcpip SRC subsystem group. This daemon is enabled by default in the /etc/inetd.conf file and can be manipulated by the following SRC commands:

```
startsrc  Starts a subsystem, group of subsystems, or a subserver.
stopsrc   Stops a subsystem, group of subsystems, or a subserver.
issrc     Gets the status or a subsystem, group or subsystems, or a subserver.
```

Flags

- Supresses the reverse hostname lookup.
-s  Turns on socket-level debugging.

Security

The rshd daemon is a PAM-enabled application with a service name of rsh. System-wide configuration to use PAM for authentication is set by modifying the value of the auth_type attribute, in the usw stanza of /etc/security/login.cfg, to PAM_AUTH as the root user.

The authentication mechanisms used when PAM is enabled depend on the configuration for the rsh service in /etc/pam.conf. The rshd daemon requires /etc/pam.conf entries for the auth, account, and session module types. Listed below is a recommended configuration in /etc/pam.conf for the rsh service:

```
# AIX rsh configuration
#
rsh auth sufficient /usr/lib/security/pam_rhosts_auth
rsh account required /usr/lib/security/pam_aix
rsh session required /usr/lib/security/pam_aix
```

Examples

Note: The arguments for the rshd daemon can be specified by using SMIT or by editing the /etc/inetd.conf file.
1. To start the `rshd` daemon, type the following:

   \texttt{startsrc \textasciitilde t shell}

   This command starts the \texttt{rshd} subserver.

2. To stop the `rshd` daemon, type the following:

   \texttt{stopsrc \textasciitilde t shell}

   This command allows all pending connections to start and existing connections to complete but prevents new connections from starting.

3. To force stop the `rshd` daemon and all `rshd` connections, type the following:

   \texttt{stopsrc \textasciitilde f shell}

   This command terminates all pending connections and existing connections immediately.

4. To display a short status report about the `rshd` daemon, type the following:

   \texttt{lssrc \textasciitilde t shell}

   This command returns the daemon's name, process ID, and state (active or inactive).

**Related Information**

The \texttt{kill} command, \texttt{lssrc} command, \texttt{refresh} command, \texttt{rsh} command, \texttt{startsrc} command, \texttt{stopsrc} command.

The \texttt{inetd} daemon.

The \texttt{$HOME/.rhosts} file format, \texttt{etc/hosts.equiv} file format, \texttt{etc/inetd.conf} file format, \texttt{etc/services} file format.

The \texttt{rcmd} subroutine.

**TCP/IP daemons** in *Networks and communication management.*

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**rstatd Daemon**

**Purpose**

Returns performance statistics obtained from the kernel.

**Syntax**

\texttt{/usr/sbin/rpc.rstatd}

**Description**

The `rstatd` daemon is a server that returns performance statistics obtained from the kernel. The `rstatd` daemon is normally started by the `inetd` daemon.

**Files**

\texttt{/etc/inetd.conf}   \texttt{TCP/IP configuration file that starts RPC daemons and other TCP/IP daemons.}
\texttt{etc/services}   \texttt{Contains an entry for each server available through Internet.}
Related Information

The **nfsstat** command.

The **inetd** daemon.

Network File System (NFS) Overview for System Management in *Networks and communication management*.

List of NFS commands in *Networks and communication management*.

---

**rtl_enable Command**

**Purpose**

Relinks shared objects to enable the runtime linker to use them. This command only applies to AIX 4.2 or later.

**Syntax**

```
rtl_enable [ -R | -o Name ] [ -s ] [ -l ] File [ ldFlag ... ] [ -F ObjsLibs ... ]
```

**Description**

The `rtl_enable` command relinks a module, or an archive containing modules, with the `-G` flag, to enable runtime linking. A module is an XCOFF file containing a loader section. A shared object is a module with the F_SHROBJ flag set in the XCOFF header.

In its simplest form, the `rtl_enable` command creates a new file with the name `File.new`. If `File` is a module, `File.new` will be the same kind of module. If `File` is an archive, `File.new` will be an archive whose members have the same names as the members of `File`. The `rtl_enable` command relinks the modules in the new archive to enable run-time linking. The `rtl_enable` command archives other members unchanged into the output file.

The `rtl_enable` command uses the loader section in `File` (or its members) to create import and export files, to determine the `libpath` information, and to determine the entry point.

**Flags**

- **-F ObjsLibs ...**
  Adds `ObjsLibs` to the beginning of the generated `ld` command. The `ObjsLibs` parameter is either an object file or a library (specified with the `ld` command’s `-l` (lowercase L) flag). If you are enabling an archive, adds the `ObjsLibs` to the `ld` command for all shared objects in the archive.

- **-l** (Lowercase L) Leaves the import and export files in the current directory instead of deleting them. Import files have the suffix `.imp` and export files, the suffix `.exp`. The `rtl_enable` command adds the suffixes to the input file name if `File` is a module. It adds the suffixes to the names of members that are modules if `File` is an archive.

- **-o Name**
  Specifies an alternate output file name instead of `File.new`. Do not use this flag with the `-R` flag.

- **-R**
  Replaces the input file instead of creating a new file. It will not overwrite the input file if any errors occur. Do not use this flag with the `-o` flag.

- **-s**
  Generates a script of commands in the current directory that you can use to create a new output file or archive, but does not relink anything. It names the script `Base.sh`, where `Base` is the basename of the input file with any suffix stripped off. It writes generated import and export files in the current directory as well. You can modify the script and the import and export files to customize the output objects.

Alphabetical Listing of Commands 761
Parameters

File
Specifies the input file.

ldFlag ...
Copies the specified ld command flags to the end of the generated ld command, overriding default options.

Note: Do not use the -o flag in the ldFlag parameter to name the output file. To specify an alternate output file name, use the rtl_enable command’s -o Name flag.

Exit Status
This command returns the following exit values:

0 Successful completion.
>0 An error occurred.

Note: Depending on the error, some output files may have been created.

Security
Access Control: Any User
Auditing Events: N/A

Examples
To create a new version of libc.a with runtime linking enabled, enter:
1. Create a directory for runtime version by entering:
   mkdir /tmp/rtllibs
2. Make /tmp/rtllibs your current directory by entering:
   cd /tmp/rtllibs
3. To create the runtime version of libc.a with the same name, enter:
   rtl_enable -o libc.a /lib/libc.a

To use this version of libc.a when linking programs, use -L /tmp/rtllibs with the ld command.

Files
/usr/bin/rtl_enable Contains the rtl_enable command. This is a symbolic link to /usr/ccs/bin/rtl_enable.

Related Information
Commands: ld

Shared Objects and Runtime Linking in AIX 5L Version 5.3 General Programming Concepts: Writing and Debugging Programs.

runacct Command

Purpose
Runs daily accounting.
Syntax
/usr/sbin/acct/runacct [ mmd [ State ] ]

Description
The runacct command is the main daily accounting shell procedure. Normally initiated by the cron
daemon, the runacct command processes connect, fee, disk, queuing system (printer), and process
accounting data files for the current day to produce the binary daily report, /var/adm/acct/nite(x)/dayacct.
The runacct command also prepares summary files for the prdaily procedure to prepare the ASCII daily
report, /var/adm/acct/sum(x)/rprt/mmd, or for billing purposes.

The acctmerg command adds the dayacct report to the cumulative summary report for the accounting
period, /var/adm/acct/sum(x)/tacct. The tacct report is used by the monacct command to produce the
monthly report, /var/adm/acct/fiscal(x).

This command has two parameters that must be entered from the keyboard should you need to restart the
runacct procedure. The date parameter, mmd, enables you to specify the day and month for which you
want to rerun the accounting. The State parameter enables a user with administrative authority to restart
the runacct procedure at any of its states. For more information on restarting runacct procedures and on
recovering from failures, refer to "Restarting runacct Procedures".

The runacct command protects active accounting files and summary files in the event of run-time errors,
and records its progress by writing descriptive messages into the /var/adm/acct/nite(x)/active file. When
the runacct procedure encounters an error, it sends mail to users root and adm, and exits.

The runacct procedure also creates two temporary files, lock and lock1, in the directory
/var/adm/acct/nite(x), which it uses to prevent two simultaneous calls to the runacct procedure. It uses
the lastdate file (in the same directory) to prevent more than one invocation per day.

The runacct command breaks its processing into separate, restartable states. As it completes each state,
it writes the name of the next state in the /var/adm/acct/nite(x)/state file. The runacct procedure
processes the various states in the following order:

<table>
<thead>
<tr>
<th>State</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>SETUP</td>
<td>Moves the active accounting files to working files and restarts the active files.</td>
</tr>
<tr>
<td>WTMPFIX</td>
<td>Verifies the integrity of the wtmp file, correcting date changes if necessary.</td>
</tr>
<tr>
<td>CONNECT1</td>
<td>Calls the acctcon1 command to produce connect session records.</td>
</tr>
<tr>
<td>CONNECT2</td>
<td>Converts connect session records into total accounting records (tacct.h format).</td>
</tr>
<tr>
<td>PROCESS</td>
<td>Converts process accounting records into total accounting records (tacct.h format).</td>
</tr>
<tr>
<td>MERGE</td>
<td>Merges the connect and process total accounting records.</td>
</tr>
<tr>
<td>FEES</td>
<td>Converts the output of the chargefee command into total accounting records (tacct.h format) and merges them with the connect and process total accounting records.</td>
</tr>
<tr>
<td>DISK</td>
<td>Merges disk accounting records with connect, process, and fee total accounting records.</td>
</tr>
<tr>
<td>QUEUEACCT</td>
<td>Sorts the queue (printer) accounting records, converts them into total accounting records (tacct.h format), and merges them with other total accounting records.</td>
</tr>
<tr>
<td>MERGETACCT</td>
<td>Merges the daily total accounting records in the daytacct report file with the summary total accounting records in the /var/adm/acct/sum(x)/tacct report file.</td>
</tr>
<tr>
<td>CMS</td>
<td>Produces command summaries in the file /var/adm/acct/sum(x)/cms.</td>
</tr>
<tr>
<td>USEREXIT</td>
<td>If the /var/adm/siteacct shell file exists, calls it at this point to perform site-dependent processing.</td>
</tr>
<tr>
<td>CLEANUP</td>
<td>Deletes temporary files and exits.</td>
</tr>
</tbody>
</table>

Restarting runacct Procedures
To restart the runacct command after a failure, first check the /var/adm/acct/nite(x)/active file for
diagnostic messages, then fix any damaged data files, such as pacct or wtmp. Remove the lock files and
lastdate file (all in the /var/adm/acct/nite(x) directory), before restarting the runacct command. You must
specify the \texttt{mmdd} parameter if you are restarting the \texttt{runacct} command. It specifies the month and day for which the \texttt{runacct} command is to rerun the accounting. The \texttt{runacct} procedure determines the entry point for processing by reading the \texttt{/var/adm/acct/nite(x)/statefile} file. To override this default action, specify the desired \texttt{state} on the \texttt{runacct} command line.

It is not usually a good idea to restart the \texttt{runacct} command in the SETUP state. Instead, perform the setup actions manually and restart accounting with the WTMPFIX state, as follows:

\begin{verbatim}
/usr/lib/acct/runacct mmdd WTMPFIX
\end{verbatim}

If the \texttt{runacct} command fails in the PROCESS state, remove the last \texttt{ptacct} file, because it will be incomplete.

\textbf{Flags}

\begin{itemize}
\item \texttt{-X} Processes all available characters for each user name instead of truncating to the first 8 characters. The \texttt{-X} flag will also cause the \texttt{runacct} command and all commands it calls to use the \texttt{/var/adm/acct/sumx} and \texttt{/var/adm/acct/nitex} directories instead of the \texttt{/var/adm/acct/sum} and \texttt{/var/adm/acct/nite} directories.
\end{itemize}

\textbf{Security}

Access Control: This command should grant execute (x) access only to members of the \texttt{adm} group.

\textbf{Examples}

1. To start daily accounting procedures for system resources, add the following command line to a \texttt{crontab} file so the \texttt{runacct} command will be run automatically by the \texttt{cron} daemon:

\begin{verbatim}
0 4 * * 1-6 /usr/sbin/acct/runacct 2> /var/adm/acct/nite/accterr
\end{verbatim}

To start daily accounting procedures with long user name support add the following line to the \texttt{crontab} file:

\begin{verbatim}
0 4 * * 1-6 /usr/sbin/acct/runacct -X 2> /var/adm/acct/nitex/accterr
\end{verbatim}

This example shows the instructions that the \texttt{cron} daemon will read and act upon. The \texttt{runacct} command will run at 4 a.m. (04) every Monday through Saturday (1-6) and write all standard error output (2>) to the \texttt{/var/adm/acct/nite(x)/accterr} file. This command is only one of the accounting instructions normally given to the \texttt{cron} daemon. See \textit{"Setting up an accounting subsystem"} in \textit{Operating system and device management} for more information on typical \texttt{cron} accounting entries.

2. To start daily accounting procedures for system resources from the command line (start the \texttt{runacct} command), enter the following:

\begin{verbatim}
nohup /usr/sbin/acct/runacct 2> /var/adm/acct/nite/accterr &
\end{verbatim}

Although it is preferable to have the \texttt{cron} daemon start the \texttt{runacct} procedure automatically (see example 1), you can give the command from the keyboard. The \texttt{runacct} command will run in the background (\&), ignoring all INTERRUPT and QUIT signals (the \texttt{nohup} command), and write all standard error output (2>) to the \texttt{/var/adm/acct/nite/accterr} file.

3. To restart the system accounting procedures for a specific date, enter a command similar to the following:

\begin{verbatim}
nohup /usr/sbin/acct/runacct 0601 2>> /var/adm/acct/nite/accterr &
\end{verbatim}

This example restarts \texttt{runacct} for the day of June 1 (0601). The \texttt{runacct} command reads the file \texttt{/var/adm/acct/nite(x)/statefile} to find out the state with which to begin. The \texttt{runacct} command will run
in the background (&), ignoring all INTERRUPT and QUIT signals (nohup). Standard error output (2) is added to the end (>>) of the /var/adm/acct/nite(x)/accterr file.

4. To restart the system accounting procedures for a particular date at a specific state, enter a command similar to the following:

```
nohup /usr/sbin/acct/runacct 0601 MERGE 2>> /
/var/adm/acct/nite(x)/accterr &
```

This example restarts the runacct command for the day of June 1 (0601), starting with the MERGE state. The runacct command will run in the background (&), ignoring all INTERRUPT and QUIT signals (the nohup command). Standard error output (2) is added to the end (>>) of the /var/adm/acct/nite(x)/accterr file.

Files

- `/var/adm/wtmp`: Log in/log off history file.
- `/var/adm/acct/nite(x)/daytacct`: Disk usage accounting file.
- `/var/adm/qacct`: Active queue accounting file.
- `/var/adm/fee`: Record of fees charged to users.
- `/var/adm/acct/sum(x)*`: Concatenated version of pacct files.
- `/var/adm/acct/nite(x)/ptacct*`: Concatenated version of pacct files.
- `/var/adm/acct/nite(x)/lock*`: Prevents simultaneous invocation of runacct.
- `/var/adm/acct/nite(x)/lastdate`: Contains last date runacct was run.
- `/var/adm/acct/nite(x)/statefile`: Contains current state to process.

Related Information

The acctcms command, acctcom command, acctcon1 or acctcon2 command, acctmerg command, acctprc1 acctprc2, or accton command, crontab command, fwtmp command.

The cron daemon.

The acct subroutine.

The acct file format, utmp, wtmp, failedlogin file format.

For more information about the Accounting System, the preparation of daily and monthly reports, and the accounting files, see the System accounting in Operating system and device management.

Setting up an accounting subsystem in Operating system and device management describes the steps you must take to establish an accounting system.

See the Accounting commands in Operating system and device management for a list of accounting Commands that run automatically or entered from the Keyboard commands.

---

runact Command

Purpose

Runs an action on a resource class.

Syntax

```
[in_element_0=value ... in_element_n=value] [rsp_element...]
```
runact -C domain_name_1, domain_name_2, domain_name_n [-f resource_data_input_file] [-l | -t | -d | -D delimiter] [-x] [-h] [-TV] resource_class action [in_element_0=value ... in_element_n=value] [rsp_element...]

Description

The runact command requests that the RMC subsystem run the specified action on the specified resource class.

Before you run this command, use the lsactdef command to list the resource class actions that are supported by this resource class. Also, use the lsactdef command to list the required input action elements that must be specified when invoking an action. The lsactdef command also identifies the data type for each input element. The value specified for each input element must match this data type.

Flags

- c Invokes the action on the resource class.
- C domain_name_1, domain_name_2, domain_name_n Invokes a class action on a globalized resource class on the specified RSCT peer domains that are defined on the management server. Globalized classes are used in peer domains and management domains for resource classes that contain information about the domain. To invoke the class action on a globalized resource class on all peer domains defined on the management server, set CT_MANAGEMENT_SCOPE=3 and use the -c flag.
- f resource_data_input_file Specifies the name of the file that contains resource action input elements and values. Use the lsactdef command with the -i flag to generate a template for this input file.
- d Specifies delimiter-formatted output. The default delimiter is a colon (:). Use the -D flag if you want to change the default delimiter.
- D delimiter Specifies delimiter-formatted output that uses the specified delimiter. Use this flag to specify a delimiter other than the default colon (:). An example is when the data to be displayed contains colons. Use this flag to specify a delimiter of one or more characters.
- l Specifies “long” format — one entry per line. This is the default display format.
- t Specifies table format. Each attribute is displayed in a separate column, with one resource per line.
- x Suppresses header printing.
- h Writes the command’s usage statement to standard output.
- T Writes the command’s trace messages to standard error. For your software-service organization’s use only.
- V Writes the command’s verbose messages to standard output.

Parameters

resource_class Specifies the name of the resource class with the actions that you want to invoke.
action Specifies the name of the action to be invoked.

in_element_n=value Specifies the action input element names and values. If you use the -f flag, don’t enter any in_element_n=value pairs on the command line.
in_element_n is any of the input structured data element names. There should be one in_element_n=value pair for each of the defined structured data (SD) input elements for the specified action. Use lsactdef with the -s i flag to list the input elements for a particular resource class and action. Use lsactdef with the i flag to generate an input file template, which, after appropriate editing, can be used as the input file.

value must be the appropriate data type for the specified element. For example, if NodeNumber is defined as a uint32 data type, enter a positive numeric value.

rsp_element Specifies one or more of action response structured data element names. If you specify one or more element names, only those elements are displayed in the order specified. If you do not specify any element names, all elements of the response are displayed.

Security
This command requires root authority.

Exit Status
0 The command has run successfully.
1 An error occurred with RMC.
2 An error occurred with the command-line interface (CLI) script.
3 An incorrect flag was specified on the command line.
4 An incorrect parameter was specified on the command line.
5 An error occurred with RMC that was based on incorrect command-line input.

Environment Variables

CT_CONTACT
When the CT_CONTACT environment variable is set to a host name or IP address, the command contacts the Resource Monitoring and Control (RMC) daemon on the specified host. If the environment variable is not set, the command contacts the RMC daemon on the local system where the command is being run. The resource class or resources that are displayed or modified by the command are located on the system to which the connection is established.

CT_MANAGEMENT_SCOPE
Determines the management scope that is used for the session with the RMC daemon to monitor and control the resources and resource classes. The management scope determines the set of possible target nodes where the resources and resource classes can be monitored and controlled. The valid values are:

0 Specifies local scope.
1 Specifies local scope.
2 Specifies peer domain scope.
3 Specifies management domain scope.
If this environment variable is not set, local scope is used.

Implementation Specifics
This command is part of the Reliable Scalable Cluster Technology (RSCT) fileset for AIX.
Standard Output
When the -h flag is specified, this command's usage statement is written to standard output.

The command output and all verbose messages are written to standard output.

Standard Error
All trace messages are written to standard error.

Examples
1. To invoke the TestClassAction resource class action on the resource class IBM.Foo, enter:
   
   runact -c IBM.Foo TestClassAction Int32=99

   The output will look like this:
   Resource Class Action Response for: TestClassAction
   sd_element 1:
       Int32 = 99

Location
/usr/sbin/rsct/bin/runact       Contains the runact command

Related Information
Books: RSCT Administration Guide, for information about RMC operations

Commands: lsactdef

Information Files:
  • resource_data_input
  • rmccli, for general information about RMC commands

runcat Command

Purpose
Pipes output data from the mkcatdefs command to the gencat command.

Syntax
runcat CatalogName SourceFile [ CatalogFile ]

Description
The runcat command invokes the mkcatdefs command and pipes the message catalog source data (the output from mkcatdefs) to the gencat program.

The file specified by the SourceFile parameter contains the message text with your symbolic identifiers. The mkcatdefs program uses the CatalogName parameter to generate the name of the symbolic definition file by adding _msg.h to the end of the CatalogName value, and to generate the symbolic name for the catalog file by adding MF_ to the beginning of the CatalogName value. The definition file must be included in your application program. The symbolic name for the catalog file can be used in the library functions (such as the catopen subroutine).
The CatalogFile parameter is the name of the catalog file created by the gencat command. If you do not specify this parameter, the gencat command names the catalog file by adding .cat to the end of the CatalogName value. This file name can also be used in the catopen library function.

Example
To generate a catalog named test.cat from the message source file test.msg, enter:
runcat test test.msg

File
/usr/bin/runcat Contains the runcat command.

Related Information
The dspcat command, dspmsg command, gencat command, mkcatdefs command.

The catclose subroutine, catgets subroutine, catopen subroutine.


runlpcmd Command

Purpose
Runs a least-privilege (LP) resource.

Syntax
To run an LP resource:
• On the local node:
  runlpcmd −N resource_name | RunCmdName [−h] [−TV] ["flags_and_parms"]
• On all nodes in a domain:
  runlpcmd −a −N resource_name | RunCmdName [−h] [−TV] ["flags_and_parms"]
• On a subset of nodes in a domain:
  runlpcmd −n host1 [,host2,...] −N resource_name | RunCmdName [−h] [−TV] ["flags_and_params"]

Description
The runlpcmd command runs an LP resource, which is a root command or script to which users are granted access based on permissions in the LP access control lists (ACLs). You can use the runlpcmd command to call the LP command corresponding to a particular RunCmdName value with access permissions that match the permissions of the calling user. When runlpcmd is called with the -N flag, the LP command that is specified by the resource_name parameter is run. Specify all parameters and flag needed for command invocation using the flags_and_parms parameter. If this parameter is not specified, an empty string is passed to the LP command. This is the default.

If the CheckSum attribute value is 0, runlpcmd returns an error if the ControlFlags value is set to check for CheckSum; otherwise, no errors are returned. If the ControlFlag attribute of the LP command was set to validate the CheckSum before the LP command was run, runlpcmd performs such a check. The command is run only if the calculated CheckSum matches the value of the corresponding CheckSum attribute. If the two do not match, the command is rejected. If, however, the ControlFlags attribute is set to the default value, CheckSum validation is not performed.
You can specify the RunCmdName parameter along with with the -N resource_name flag and parameter combination. However, one restriction applies when you use the RunCmdName parameter. If more than one resource matches the RunCmdName value and the permissions of the calling user, runlpcmd returns an error. If one match exists for the RunCmdName value and the permissions of the calling user, runlpcmd RunCmdName returns successfully. In order to circumvent this restriction, runlpcmd also lets users run LP commands by specifying their unique names, using the -N resource_name flag and parameter combination.

Before calling the LP command, runlpcmd checks to see if a FilterScript value exists. If so, it passes the FilterArg value and the flags_and_parms parameter string specified on the command line to FilterScript. If FilterScript returns a 0, runlpcmd calls the LP command. If FilterScript execution resulted in a non-zero value, runlpcmd returns an error. If FilterScript was empty, runlpcmd performs some checks, as specified in ControlFlags, and then calls the LP command directly.

The output of this command may include "RC=return_code" as the last line.

This command runs on any node. If you want this command to run on all of the nodes in a domain, use the -a flag. If you want this command to run on a subset of nodes in a domain, use the -n flag. Otherwise, this command runs on the local node.

**Flags**

- **-a** Changes one or more resources on all nodes in the domain. The CT_MANAGEMENT_SCOPE environment variable’s setting determines the cluster scope. If CT_MANAGEMENT_SCOPE is not set, the LP resource manager uses scope settings in this order:
  1. The management domain, if it exists
  2. The peer domain, if it exists
  3. Local scope

The runlpcmd command runs once for the first valid scope that the LP resource manager finds. For example, suppose a management domain and a peer domain exist and the CT_MANAGEMENT_SCOPE environment variable is not set. In this case, runlpcmd -a runs in the management domain. To run runlpcmd -a in the peer domain, you must set CT_MANAGEMENT_SCOPE to 2.

- **-n host1[,host2,...]** Specifies the node or nodes in the domain on which the LP resource is to be changed. By default, the LP resource is changed on the local node. The -n flag is valid only in a management or peer domain. If the CT_MANAGEMENT_SCOPE variable is not set, the LP resource manager uses scope settings in this order:
  1. The management domain, if it exists
  2. The peer domain, if it exists
  3. Local scope

The runlpcmd command runs once for the first valid scope that the LP resource manager finds.

- **-N resource_name** Specifies the name of the LP resource that you want to run on one or more nodes in the domain.

- **-h** Writes the command’s usage statement to standard output.

- **-T** Writes the command’s trace messages to standard error.

- **-V** Writes the command’s verbose messages to standard output.

**Parameters**

RunCmdName

Specifies the name of the LP resource that you want to run on one or more nodes in the domain.
"flags_and_parms"

Specifies the flags and parameters that are required input for the LP command or script. If this parameter is not specified, an empty string is passed to the LP command. This is the default.

**Security**

To run the `runlpcmd` command, you need:

- read permission in the Class ACL of the `IBM.LPCommands` resource class.
- execute permission in the Resource ACL.

As an alternative, the Resource ACL can direct the use of the Resource Shared ACL if this permission exists in the Resource Shared ACL.

Permissions are specified in the LP ACLs on the contacted system. See the `lpact` file for general information about LP ACLs and the *RSCT Administration Guide* for information about modifying them.

**Exit Status**

<table>
<thead>
<tr>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>The command has run successfully.</td>
</tr>
<tr>
<td>1</td>
<td>An error occurred with RMC.</td>
</tr>
<tr>
<td>2</td>
<td>An error occurred with the command-line interface (CLI) script.</td>
</tr>
<tr>
<td>3</td>
<td>An incorrect flag was specified on the command line.</td>
</tr>
<tr>
<td>4</td>
<td>An incorrect parameter was specified on the command line.</td>
</tr>
<tr>
<td>5</td>
<td>An error occurred with RMC that was based on incorrect command-line input.</td>
</tr>
<tr>
<td>6</td>
<td>The resource was not found.</td>
</tr>
</tbody>
</table>

**Environment Variables**

**CT_CONTACT**

Determines the system that is used for the session with the RMC daemon. When `CT_CONTACT` is set to a host name or IP address, the command contacts the RMC daemon on the specified host. If the environment variable is not set, the command contacts the RMC daemon on the local system where the command is being run. The target of the RMC daemon session and the management scope determine the LP resources that are processed.

**CT_MANAGEMENT_SCOPE**

Determines the management scope that is used for the session with the RMC daemon to process the LP resources. The management scope determines the set of possible target nodes where the resources can be processed. The valid values are:

<table>
<thead>
<tr>
<th>Scope</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Specifies <em>local</em> scope.</td>
</tr>
<tr>
<td>1</td>
<td>Specifies <em>local</em> scope.</td>
</tr>
<tr>
<td>2</td>
<td>Specifies <em>peer domain</em> scope.</td>
</tr>
<tr>
<td>3</td>
<td>Specifies <em>management domain</em> scope.</td>
</tr>
</tbody>
</table>

If this environment variable is not set, *local* scope is used.

**Implementation Specifics**

This command is part of the Reliable Scalable Cluster Technology (RSCT) fileset for AIX.

**Standard Output**

When the `-h` flag is specified, this command’s usage statement is written to standard output. When the `-V` flag is specified, this command’s verbose messages are written to standard output.
Standard Error
All trace messages are written to standard error.

Examples
To run the LP resource called LP1, which has required input flags and parameters -a -p User Group, enter:

runlpcmd LP1 "-a -p User Group"

Location
/usr/sbin/rsct/bin/runlpcmd Contains the runlpcmd command

Related Information
Books: RSCT Administration Guide, for information about modifying LP ACLs.

Commands: chlpcmd, lphistory, lslpcmd, mklpcmd, rmlpcmd

Information Files: lpacl, for general information about LP ACLs

rup Command

Purpose
Shows the status of a remote host on the local network.

Syntax
/usr/bin/rup [H L T] [ Host ... ]

Description
The rup command displays the status of a remote host by broadcasting on the local network and then displaying the responses it receives. Specify a flag if you want to sort the output. If you do not specify a flag, the rup command displays responses in the order they are received. If you specify multiple hosts on the command line, the rup command ignores any flags and displays output in the order you specified the hosts. You must use the sort command to sort the output.

In addition, when you provide a value for the Host parameter, the rup command queries the hosts you specify, rather than broadcasting to all hosts. A remote host responds only if it is running the rstatd daemon, which is normally started from the inetd daemon.

Notes:
1. Broadcasting does not work through gateways. Therefore, if you do not specify a host, only hosts on your network can respond to the rup command.
2. Load-average statistics are not kept by the kernel. The load averages are always reported as 0 (zero) by this command.

Flags
-h Sorts the display alphabetically by host name.
-l Sorts the display by load average.
-t Sorts the display by length of runtime on the network.
Examples
1. To find out the status of all hosts on the network and to sort the list alphabetically by host name, enter:

   /usr/bin/ruptime

   -h

2. To display a list of all hosts on the network according to each machine’s load average, enter:

   /usr/bin/ruptime

   -l

3. To display the status of a host, enter:

   /usr/bin/ruptime brutus

   In this example, the ruptime command displays the status of the host named brutus.

4. To display the status of all hosts on the network sorted by each machine’s length of runtime, enter:

   /usr/bin/ruptime

   -t

Files
/etc/inetd.conf

Defines how the inetd daemon handles Internet service requests.

Related Information
The sort command, the List of NFS commands in Networks and communication management.

The inetd daemon, rstatd daemon.

Network File System (NFS) Overview for System Management in Networks and communication management.

ruptime Command

Purpose
Shows the status of each host on a network.

Syntax
ruptime [-a] [-r] [-l] [-t] [-u]

Description
The /usr/bin/ruptime command displays the status of each host that is on a local network and is running the rwhod daemon. The status lines are sorted by host name unless the -l, -t, or -u flag is indicated. The status information is provided in packets broadcast once every 3 minutes by each network host running the rwhod daemon. Any activity (such as power to a host being turned on or off) that takes place between broadcasts is not reflected until the next broadcast. Hosts for which no status information is received for 11 minutes are reported as down.

Output is in the following format: hostname, status, time, number of users, and load average. Load average represents the load averages over 1-, 5-, and 15-minute intervals prior to a server’s transmission. The load averages are multiplied by 10 to represent the value in decimal format.

Flags
- a   Includes all users. Without this flag, users whose sessions are idle an hour or more are not included.
-l  Sorts the list by the load average.
-r  Reverses the sort order. The -r flag should be used with the -l, -t or -u flag.
-t  Sorts the list by the uptime.
-u  Sorts the list by the number of users.

Examples
1. To get a status report on the hosts on the local network, enter:
   
   ```
   ruptime
   ```

   Information similar to the following is displayed:
   ```
   host1  up  5:15,  4 users,  load 0.09, 0.04, 0.04
   host2  up  7:45,  3 users,  load 0.08, 0.07, 0.04
   host7  up  7:43,  1 user,   load 0.06, 0.12, 0.11
   ```

2. To get a status report sorted by load average, enter:
   
   ```
   ruptime -l
   ```

   Information similar to the following is displayed:
   ```
   host2  up  7:45,  3 users,  load 0.08, 0.07, 0.04
   host1  up  5:18,  4 users,  load 0.07, 0.07, 0.04
   host7  up  7:43,  1 user,   load 0.06, 0.12, 0.11
   ```

Files
/var/spool/rwho/whod.* Indicates data files received from remote rwhod daemons.

Related Information
The rwho command.

The rwhod daemon.

Communications and networks in Networks and communication management.

ruser Command

Purpose
Directly manipulates entries in three separate system databases that control foreign host access to programs.

Syntax

To Add or Delete a Database File Name Entry
```
ruwer { -a | -d } { "UserName ..." | -p "HostName ..." | -r "HostName ..." }
```  

To Delete or Display All Name Entries in a Database File
```
ruwer { -X | -s } { -F | -P | -R }
```
Description

The **ruser** low-level command adds or deletes entries in three separate system databases. Which database you are manipulating is determined by using the `-p`, `-r`, or `-f` flags. In addition, the **ruser** command can show one or all entries in one of the databases. Each database is a list of names. The three databases are as follows:

- `/etc/ftpusers` file
- `/etc/hosts.equiv` file
- `/etc/hosts.lpd` file

**Note:** The `-p` and `-r` options can be used together to add a name to databases at the same time, but the `-f` option cannot be used with either.

You can use the Users application in Web-based System Manager to change user characteristics.

You could also use the System Management Interface Tool (SMIT) **smit users** fast path to run this command or type:

```
smi rprint
```

**Flags**

- `-a` Adds a name to the database. The `-a` flag must be used with either the `-p`, `-r`, or `-f` flag.
- `-d` Deletes a name from the database. Must be used with either the `-p`, `-r`, or `-f` flag.
- `-F` Deletes or shows all entries in the `/etc/ftpusers` file. Use this flag with the `-X` flag to delete all entries. Use this flag with the `-s` flag to show all entries.
- `-f "UserName ..."` Adds or deletes the user name specified by the `UserName` variable to the `/etc/ftpusers` database that contains a list of local user names that cannot be used by remote FTP clients. The `-f` flag must be used with either the `-a` or `-d` flag.
- `-P` Deletes or shows all entries in the `/etc/hosts.lpd` file. Use this flag with the `-X` flag to delete all entries. Use this flag with the `-s` flag to show all entries.
- `-p "HostName ..."` Adds or deletes the host name, specified by the `HostName` variable, in the database that specifies which foreign host may print on your machine. The `-p` flag must be used with either the `-a` or `-d` flag.
- `-R` Deletes or shows all entries in the `/etc/hosts.equiv` file. Use this flag with the `-X` flag to delete all entries. Use this flag with the `-s` flag to show all entries.
- `-r "HostName ..."` Adds or deletes the host name, specified by the `HostName` variable, in the `/etc/hosts.equiv` database that specifies which foreign host may perform the remote commands (`rlogin`, `rcp`, `rsh`, or `print`) on your machine. The `-r` flag must be used with either the `-a` or `-d` flag.
- `-s` Shows all entries in the database. Use this flag with either the `-P`, `-R`, or `-F` flag.
- `-X` Deletes all names from the database. Use this flag with either the `-P`, `-R`, or `-F` flag.

**Examples**

1. To add an entry in the `/etc/hosts.lpd` database, which specifies which foreign host may print on the local machine, type the command in the following format:

```
ruser -a -p "host1"
```

In this example, the foreign host is `host1`.

2. To delete an entry in the database that controls printing only (`/etc/hosts.lpd`), and also delete the same name from the database that controls remote access for the `rlogin`, `rcp`, and `rsh` commands (`/etc/hosts.equiv`), type:

```
ruser -d -r "host2" -p "host1"
```
In this example, the host from which the database entry is deleted is host1.

Related Information
The lpd daemon, rshd daemon, rlogind daemon.
The ftusers file format, hosts.equiv file format, hosts.lpd file format.

For information on installing the Web-based System Manager, see Chapter 2: Installation and System Requirements in AIX 5L Version 5.3 Web-based System Manager Administration Guide.

rusers Command

Purpose
Reports a list of users logged on to remote machines.

Syntax
/usr/bin/rusers [ -a ] [ -l ] [ -u | -i | -h | -i ] [ Host ] ...

Description
The rusers command produces a list of users who are logged on to remote machines. The rusers command does this by broadcasting to each machine on the local network and printing the responses it receives. Normally, the system prints the responses in the order they are received. To change this order, specify one of the flags. In addition, when you provide a Host parameter, the rusers command queries the host or hosts you specify, rather than broadcasting to all hosts.

By default, each entry contains a list of users for each machine. Each of these entries includes the names of all users logged in that machine. In addition, when the user does not type into the system for a minute or more, the rusers command reports the user’s idle time.

A remote host responds only if it is running the rusersd daemon, which is normally started up from the inetd daemon.

Note: Broadcasting does not work through gateways. Therefore, if you do not specify a host, only hosts on your network can respond to the rusers command.

Flags
- -a Gives a report for a machine even if no users are logged in.
- -h Sorts alphabetically by host name.
- -i Sorts by idle time.
- -l Gives a longer listing similar to the who command.
- -u Sorts by number of users.

Examples
1. To produce a list of the users on your network that are logged in remote machines, enter:
   rusers
2. To produce a list of users sorted alphabetically by host name, enter:
   rusers -h
3. To produce a list of users on a host, enter:
In this example, the `rusers` command produces a list of users on the host named `pluto`.

4. To produce a list of users logged in remote machines and sorted according to each machine's length of idle time, enter:

   `rusers -i`

5. To produce a list of users logged in remote machines and sorted by the number of users logged in, enter:

   `rusers -u`

**Files**

`/etc/inetd.conf`  
TCP/IP configuration file that starts RPC daemons and other TCP/IP daemons.

**Related Information**

The `rwho` command, `who` command.

The `inetd` daemon, `rusersd` daemon.

Network File System (NFS) Overview for System Management in *Networks and communication management*.

List of NFS commands in *Networks and communication management*.

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**rusersd Daemon**

**Purpose**

Responds to queries from the `rusers` command.

**Syntax**

`/usr/lib/netsvc/rusers_rpc.rusersd`

**Description**

The `rusersd` daemon is a server that responds to queries from the `rusers` command by returning a list of users currently on the network. This daemon is normally started by the `inetd` daemon.

**Files**

`/etc/inetd.conf`  
TCP/IP configuration file that starts RPC daemons and other TCP/IP daemons.

`/etc/utmp`  
Contains information on users logged in to the system.

**Related Information**

The `rusers` command.

The `inetd` daemon.

Network File System (NFS) Overview for System Management in *Networks and communication management*. 
rvsdrestrict Command

Purpose
rvsdrestrict – Displays and sets the run level of the Recoverable virtual shared disk subsystem. This command must be issued before the RVSD subsystem will start.

Syntax
rvsdrestrict \{-l | -s \{RVSD4.1 | RESET\}\}

Description
The rvsdrestrict command is used to restrict the level at which the Recoverable virtual shared disk subsystem will run. If a node has a lower level of the RVSD software installed than what is set with this command, then the RVSD subsystem will not start on that node.

This command does not dynamically change RVSD subsystem run levels across the peer domain. An RVSD subsystem instance will only react to this information after being restarted. If your peer domain runs at a given level, and you want to override this level, you must:
1. Stop the RVSD subsystem on all nodes.
2. Override the level.
3. Restart the RVSD subsystem.

Flags
- \-l \hspace{1em} Lists the current RVSD subsystem run level.
- \-s \hspace{1em} Sets the RVSD subsystem run level.

Parameters
None.

Security
You must have root authority to run this command.

Exit Status
0 \hspace{1em} Indicates the successful completion of the command.
nonzero \hspace{1em} Indicates that an error occurred.

Restrictions
You must issue this command from a node that is online in the peer domain. To bring a peer domain online, use the startrpdomain command. To bring a particular node online in an existing peer domain, use the startrpnode command. For more information on creating and administering an RSCT peer domain, refer to the RSCT: Administration Guide.

Standard Output
Current RVSD subsystem run level.
Examples
1. To set the RVSD subsystem run level to RVSD4.1, you would issue the command:
   rvsdrestrict -s RVSD4.1

Location
/opt/rsct/vsd/bin/rvsdrestrict

Related Information
Commands: cfgvsd, lsvsd, preparevsd, startvsd, stopvsd, suspendvsd, ucfgvsd

rwall Command

Purpose
Sends messages to all users on the network.

Syntax
To Send a Message to Specified Hosts
/usr/sbin/rwall HostName ...

To Send a Message to Specified Networks
/usr/sbin/rwall -n NetworkGroup ...

To Send a Message to Specified Hosts on a Network
/usr/sbin/rwall -h HostName ... -n NetworkGroup

Description
The rwall command sends messages to all users on the network. To do this, the rwall command reads a message from standard input until it reaches an end-of-file character. The rwall command takes this message, which begins with the line Broadcast Message..., and broadcasts it to all users logged in to the specified host machines. Users receive messages only if they are running the rwalld daemon, which is started by the inetd daemon.

Note: The time out is fairly short. This enables the rwall command to send messages to a large group of machines (some of which may be down) in a reasonable amount of time. Thus the message may not get through to a heavily loaded machine.

Flags
-h Sends the message to machines specified by the HostName parameter.
-n Sends the message to specific network groups only. Network groups are defined in the netgroup file.

Examples
1. To send a message to a host named neptune, enter:
   /usr/sbin/rwall neptune
   Type in your message. When you are done, enter:
   Ctrl D
2. To send a message to a host named neptune and every host in the cosmos netgroup, enter:
rwall -n cosmos -h neptune

Type in your message. When you are done, enter:
Ctrl D

Files

/etc/inetd.conf
TCP/IP configuration file that starts RPC daemons and other TCP/IP daemons.

/etc/netgroup
Contains information about each user group on the network.

Related Information

The rwall command.

The inetd daemon, rwalld daemon.

Network File System (NFS) Overview for System Management in Networks and communication management.

List of NFS commands in Networks and communication management.

rwalld Daemon

Purpose
Handles requests from the rwall command.

Syntax
/usr/lib/netsvc/rwall/rpc.rwalld

Description
The rwalld daemon handles requests from the rwall command. The inetd daemon invokes the rwalld daemon.

Files

/etc/inetd.conf
Specifies the TCP/IP configuration.

Related Information

The rwall command.

The inetd daemon.

Network File System (NFS) Overview for System Management in Networks and communication management.

List of NFS commands in Networks and communication management.

rwho Command

Purpose
Shows which users are logged in to hosts on the local network.
Syntax
`rwho [ -a ]`

Description
The `/usr/bin/rwho` command displays the user name, host name, and start date and time of each session for everyone on the local network who is currently logged in to a host running the `rwhod` daemon. If a workstation is inactive for at least 3 minutes, the `rwho` command reports the idle time as a number of minutes in the last column. After an hour of inactivity, a user is not included unless the `-a` flag is specified.

Note: Since this command displays a lot of output, use this command with caution if the local network has a large number of users.

Status information is broadcast once every 3 minutes by each network host running the `rwhod` daemon. Any activity (such as a user logging on or off) that takes place between broadcasts is not reflected until the next broadcast.

Flags
- `-a` Includes all users. Without this flag, users whose sessions are idle an hour or more are not included in the report.

Example
To get a report of all users currently logged in to hosts on the local network, enter:
```
rwho
```
Information similar to the following is displayed:
```
bob    host2:pts5 Nov 17 06:30 :20
bob    host7:console Nov 17 06:25 :25
fran   host1:pts0 Nov 17 11:20 :51
fran   host1:pts8 Nov 16 15:33 :42
fran   host4:console Nov 17 16:32
server host2:console Nov 17 06:58 :20
alice  host2:pts6 Nov 17 09:22
```

Files
```
/var/spool/rwho/whod.*
```
Indicates data files received from remote `rwhod` daemons.

Related Information
The `ruptime` command, `rwho` command, `who` command.

The `gethostname` subroutine.

The `services` file format.

Communications and networks in *Networks and communication management*.

**rwhod Daemon**

**Purpose**
Provides the server function for the `rwho` and `ruptime` commands.
Syntax

Note: Use SRC commands to control the rwhod daemon from the command line. Use the rc.tcpip file to start the daemon with each system startup.

/usr/sbin/rwhod

Description

The /usr/sbin/rwhod daemon maintains the database used by the rwho and runtime commands. Once started, the rwhod daemon operates as both producer and consumer of status information.

As a producer of status information, the rwhod daemon queries the state of the local host approximately every 3 minutes. It then constructs status messages and broadcasts them to the local network.

As a consumer of status information, the rwhod daemon listens for status messages from rwhod servers on remote hosts. When the rwhod daemon receives a status message, it validates the received status message. It then records the message in the /var/spool/rwho directory. (The rwho and runtime commands use the files in the /var/spool/rwho directory to generate their status listings.)

The rwhod daemon broadcasts and receives status messages using the rwho socket as specified in the /etc/services file.

When creating these messages, the rwhod daemon calculates the entries for the average CPU load for the previous 1-, 5-, and 15-minute intervals. Before broadcasting these messages, the rwhod daemon converts them to the byte order that the network can use.

When the rwhod daemon receives messages on the rwho socket, it discards any that do not originate from an rwho socket. Additionally, it discards any messages that contain unprintable ASCII characters. When the rwhod daemon receives a valid message, it places the message in a whod.HostName file in the /var/spool/rwho directory, overwriting any file with the same name.

The rwhod daemon should be controlled using the System Resource Controller (SRC). Entering rwhod at the command line is not recommended.

Manipulating the rwhod Daemon with the System Resource Controller

The rwhod daemon is a subsystem controlled by the System Resource Controller (SRC). The rwhod daemon is a member of the tcpip system group. This daemon is disabled by default and can be manipulated by the following SRC commands:

- stopsrc
- traceson
- tracesoff
- lssrc

**stopsrc**

Stops a subsystem, group of subsystems, or a subserver.

**traceson**

Enables tracing of a subsystem, group of subsystems, or a subserver.

**tracesoff**

Disables tracing of a subsystem, group of subsystems, or a subserver.

**lssrc**

Gets the status of a subsystem, group of subsystems, or a subserver.

Examples

1. To start the rwhod daemon, enter the following:

   `startsrc -s rwhod`

   This command starts the daemon. You can use this command in the rc.tcpip file or on the command line. The -s flag specifies that the subsystem that follows is to be started.

2. To stop the rwhod daemon normally, enter the following:

   `stopsrc -s rwhod`
This command stops the daemon. The -s flag specifies that the subsystem that follows is to be stopped.

3. To get a short status report from the rwhod daemon, enter the following:
   lssrc -s rwhod
   This command returns the name of the daemon, the process ID of the daemon, and the state of the daemon (active or inactive).

4. To enable tracing for rwhod daemon, enter the following:
   traceson -s rwhod
   This command enables socket level debugging. Use the trpt command to look at the output of this example command.

Files

/etc/utmp
Contains status information on users that are logged in to the local host.
/var/spool/rwho/*
Contains files used by the rwho and ruptime commands to generate their status list.
/var/spool/rwho/whod.HostName
Contains the latest status information for the host specified by the HostName parameter.

Related Information
The ruptime command, rwho command, who command.
The gethostname subroutine.
The services file format.
TCP/IP daemons in Networks and communication management.
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<td>□</td>
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<td>Applicable to your tasks</td>
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</tbody>
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