IBM® TotalStorageVirtualization Family SAN Volume Controller

Host Attachment Guide

Version 1 Release 1

SC26-7563-00

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Note:
Before using this information and the product it supports, read the information under “Notices” on page 45.

First Edition (June 2003)

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About this guide

This guide provides information about attaching the SAN Volume Controller to an open-systems host with fibre-channel adapters.

You can attach the following host systems to a SAN Volume Controller:

- Hewlett-Packard
- IBM @server xSeries™ (xSeries)
- IBM RS/6000® and pSeries
- Intel with Linux
- Microsoft® Windows® 2000
- Microsoft Windows NT® 4.0
- Sun

Each chapter describes how to attach a SAN Volume Controller to a specific open-system host with fibre-channel adapters.

Who should use this guide

Customers or IBM service support representatives can use this manual to attach the SAN Volume Controller to a storage area network. You should use this publication along with the publications for your host system.

Emphasis

boldface	Text in **boldface** represents menu items and command names.
italics	Text in *italics* is used to emphasize a word. In command syntax, it is used for variables for which you supply actual values, such as a default directory or the name of a cluster.
`monospace`	Text in `monospace` identifies the data or commands that you type, samples of command output, examples of program code or messages from the system, or names of command flags, parameters, arguments, and name-value pairs.

Related information

SAN Volume Controller library:

Table 1 on page x lists and describes the publications that make up the SAN Volume Controller library. Unless otherwise noted, these publications are available in Adobe portable document format (PDF) on a compact disc (CD) that comes with the SAN Volume Controller. If you need additional copies of this CD, the order number is SK2T-8811. These publications are also available as PDF files from the following Web site:

http://www.ibm.com/storage/support/2145/

Table 1. Publications in the SAN Volume Controller library

Title	Description	Order number
IBM TotalStorage Virtualization Family SAN Volume Controller: CIM Agent Developer's Reference	This reference guide describes the objects and classes in a Common Information Model (CIM) environment.	SC26-7545
IBM TotalStorage Virtualization Family SAN Volume Controller: Command-Line Interface User's Guide	This guide describes the commands that you can use from the SAN Volume Controller command-line interface (CLI).	SC26-7544
IBM TotalStorage Virtualization Family SAN Volume Controller: Configuration Guide	This guide provides guidelines for configuring your SAN Volume Controller.	SC26-7543
IBM TotalStorage Virtualization Family SAN Volume Controller: Host Attachment Guide	This guide provides guidelines for attaching SAN Volume Controller to your host system.	SC26-7563
IBM TotalStorage Virtualization Family SAN Volume Controller: Installation Guide	This guide includes the instructions the service representative uses to install the SAN Volume Controller.	SC26-7541
IBM TotalStorage Virtualization Family SAN Volume Controller: Planning Guide	This guide introduces the SAN Volume Controller and lists the features you can order. It also provides guidelines for planning the installation and configuration of the SAN Volume Controller.	GA22-1052
IBM TotalStorage Virtualization Family SAN Volume Controller: Service Guide	This guide describes how to maintain the SAN Volume Controller. It also includes a parts listing.	SC26-7542
IBM TotalStorage Virtualization Family SAN Volume Controller: Translated Safety Notices	This guide contains the danger and caution notices for the SAN Volume Controller. The notices are shown in English and in numerous other languages.	SC26-7577

Other IBM publications:

Table 2 on page xi lists and describes other IBM publications that contain additional information that is related to the SAN Volume Controller.

Table 2. Other IBM publications

Title	Description	Order number
IBM TotalStorage: Subsystem Device Driver User's Guide	This guide describes the IBM TotalStorage Subsytem Device Driver and how to use it with the SAN Volume Controller.	SC26-7540

Related topics:

- "Ordering IBM publications"
- "How to send your comments"

Ordering IBM publications

The IBM publications center:

The publications center is a worldwide central repository for IBM product publications and marketing material.

The IBM publications center offers customized search functions to help you find the publications that you need. Some publications are available for you to view or download free of charge. You can also order publications. The publications center displays prices in your local currency. You can access the IBM publications center through the following Web site:

www.ibm.com/shop/publications/order/

Publications notification system:

The IBM publications center Web site offers you a notification system for IBM publications. Register and you can create your own profile of publications that interest you. The publications notification system sends you a daily e-mail that contains information about new or revised publications that are based on your profile.

If you want to subscribe, you can access the publications notification system from the IBM publications center at the following Web site:

www.ibm.com/shop/publications/order/

Related topics:

- "Related information" on page ix

How to send your comments

Your feedback is important to help us provide the highest quality information. If you have any comments about this book or any other SAN Volume Controller documentation, you can submit them in one of the following ways:

- e-mail

  Submit your comments electronically to the following e-mail address:

  starpubs@us.ibm.com

Be sure to include the name and order number of the book and, if applicable, the specific location of the text you are commenting on, such as a page number or table number.

- Mail or fax

  Fill out the Readers' Comments form (RCF) at the back of this book. Return it by mail or fax (1-800-426-6209), or give it to an IBM representative. If the RCF has been removed, you can address your comments to:

  International Business Machines Corporation
  RCF Processing Department
  M86/050
  5600 Cottle Road
  San Jose, CA 95193-0001
  U.S.A.

Related topics:

- "Related information" on page ix

Web sites

Table 3. Web sites

Type of information	Web site
SAN Volume Controller support	http://www.ibm.com/storage/support/2145/
Technical support for storage products	http://www.ibm.com/storage/support/
Virtual network computing	http://www.realvnc.com/download.html

Chapter 1. Introduction

This section contains:

- An overview of the SAN Volume Controller including Host systems that the SAN Volume Controller supports.
- General information about host adapter support requirements.
- A table that shows where to find host-specific information about connecting using fibre-channel technology.
- An overview of the IBM TotalStorage™ SAN Volume Controller including:
  - Host systems that the SAN Volume Controller supports
  - Fibre-channel (SCSI-FCP) attached hosts
- General information about attaching to an open-systems host with fibre-channel adapters

Host systems that the SAN Volume Controller supports

The SAN Volume Controller provides heterogeneous host attachments so that you can consolidate storage capacity and workloads for open-systems hosts. The SAN Volume Controller supports a maximum of 64 separate hosts and a maximum of 128 host fibre-channel ports, identified by their World-Wide Port Numbers (WWPNs).

Hosts are attached to the SAN Volume Controller via a swtiched fibre channel fabric. The fabric must be zoned according to rules contained in the IBM Total Storage SAN Volume Controller: Configuration Guide.

Fibre-channel (SCSI-FCP) attached open-systems hosts

Each SAN Volume Controller fibre-channel adapter has two ports. You can configure the port to operate with the SCSI-FCP upper layer protocol.

Fibre-channel adapters that are configured for SCSI-FCP (fibre-channel protocol) support:

- A maximum of 128 host logins per fibre-channel port
- A maximum of 512 SCSI-FCP host logins or SCSI-3 initiators per SAN Volume Controller
- A maximum of 4096 LUNs per target (one target per host adapter), depending on host type
- Switched fabric topology

The SAN Volume Controller supports the following host systems for shortwave fibre-channel attachment and longwave fibre-channel attachment:

- IBM RS/6000, pSeries™, RS/6000 SP™, and pSeries SP server that run an IBM AIX® operating system
- Hewlett-Packard servers that run an HP/UX operating system
- Intel-based servers that run a Microsoft Windows 2000 operating system
- Intel-based servers that run a Microsoft Windows NT operating system
- Intel-based servers that run a Red Hat Linux Advanced Server operating system
- Sun servers that run a Solaris operating system

For information about host systems, operating system levels, host bus adapters, cables, and fabric that IBM supports, see:http://www.ibm.com/storage/support/2145/

SAN Volume Controller host adapter support and requirements

The SAN Volume Controller supports 128 WWPNs and up to 64 separate hosts. The SAN Volume Controller supports any combination of adapter types. See *IBM TotalStorage Virtualization Family SAN Volume Controller: Planning Guide* for a summary of SAN Volume Controller host and device adapter features.

Targets and LUNs

For fibre-channel attachment, each fibre-channel host adapter can architecturally attach up to 2^{64} LUNs. The SAN Volume Controller supports a maximum of 1024 LUNs with a maximum of 512 configured to any one host. Not all hosts will support 512 LUNs.

Each virtual disk created on the SAN Volume Controller can be mapped to multiple Host Bus Adapter (HBA) fibre channel ports in a given host. There may also be multiple paths across the Storage Area Network. For these reasons the SAN Volume Controller needs the IBM Subsystem Device Driver (SDD) to be running on each host. The SDD software handles the many paths that are available to the virtual disk and presents a single storage device to the operating system.

FlashCopy® and Remote Copy restrictions

When you copy a source volume to a target volume with FlashCopy or Remote Copy, the source and target volumes should be on different host systems. That is, if you require concurrent read/write access of both volumes. A copy operation with the target volume and the source on the same host system creates a target volume with the same identification as the source volume. The host system sees two identical volumes.

When the copy operation creates the same identification for the target volume as for the source volume, you cannot distinguish one from the other. Therefore, you might not be able to access the original data.

The target volume and the source volume can be on the same host system for a Remote Copy or FlashCopy operation only under the following conditions:

- For AIX, when the host is using a logical volume manager (LVM) with **recreatevg** command.
- For HP, when the host is using LVM with the **vfchigid -f** command.
- For AIX and Sun, when the host is *not* using an LVM.
- For any host system, when the host system can distinguish between a source and a target volume. that has the same identification.

Chapter 2. Attaching to a Hewlett-Packard 9000 host

This chapter describes how to attach a Hewlett-Packard host system to a SAN Volume Controller with the following adapter cards:

- A5158A
- A6795A

For up to date information about the servers, operating systems, and fabric connections that IBM supports for the Hewlett Packard host, see: http://www.ibm.com/storage/support/2145/

Note: The steps to install and configure adapter cards are examples. Your configuration might be different.

Attachment requirements

This section lists the requirements for attaching the SAN Volume Controller to your host system:

- Check the LUN limitations for your host system. The maximum configuration for HP-UX is 8 virtual disks per I/O group per host.
- Ensure that you have the documentation for your host system and the *IBM TotalStorage Virtualization Family SAN Volume Controller: Configuration Guide*.
- See ssddom02.storage.ibm.com/techsup/webnav.nsf/support/2145 for details about the release level for your operating system.

The following tasks must be performed to configure a SAN Volume Controller.

1. An IBM Systems Services Representative (SSR) installs the SAN Volume Controller by using the procedures in the *IBM TotalStorage Virtualization Family SAN Volume Controller: Installation Guide*.
2. Configure the fibre-channel host system with the worldwide port name identifiers. For the list of worldwide port names, see “Locating the worldwide port name (WWPN)”, on page 39.
3. Define the fibre-port configuration if it was not done when the SAN Volume Controller or fibre-channel adapters were installed.
4. Configure the host system for the SAN Volume Controller using the instructions in your host system publications.
5. Install the IBM Subsystem Device Driver for HP-UX to enable the management of multiple paths to SAN Volume Controller virtual disks. SDD does not support HP-UX in a clustering environment. Also note that SDD is not supported in the HP-UX 32-bit mode operating environment.

Note: To have failover protection on an open system, SDD requires a minimum of two fibre-channel adapters. The maximum number of fibre-channel adapters supported is 4 for a total of 4 fibre-channel ports.

Installing the adapter drivers for the HP-UX 11.0 and HP-UX 11.i operating systems

The following section tells you how to download and configure the following adapter drivers:

- A5158A
- A6795A

Perform the following steps to install the adapter, download the adapter, and configure the adapter.

1. Go to http://www.ibm.com/storage/support/2145/.
2. From the page for 2145 SAN Volume Controller™, click **Fibre channel host bus adapter firmware and driver level matrix**.
3. Find the section for the current version of the driver and firmware and driver you want.
4. Obtain the driver and firmware from Hewlett-Packard and install them according to the documentation provided.

Verifying the adapter installation

After installing the fibre-channel adapters and drivers, you can verify their status using the `fcmsutil /dev/td`*x* command, where *x* is the number of the adapter, normally beginning with 0.

After storage has been configured and mapped to the host, you can discover the disks by running `ioscan -f -n`. The disks are discovered as IBM 2145 disks, and the number of devices discovered depends on the number of adapters and zoned paths to the SAN Volume Controller.

After discovering the disks, run `insf -e` to build the device nodes in the `/dev/dsk` and `/dev/rdsk` directories. When this is done, you can build your host disk devices using SDD. For more information, see *IBM TotalStorage: Subsystem Device Driver User's Guide*.

Known problems and limitations

It is recommended that you manually set the domain IDs prior to building the multiswitch fabric and prior to rezoning for the following reasons:

- When two switches are joined while active, they will determine if the domain ID is already in use as before, but if there is a conflict it cannot be changed in an active switch. A conflict will cause an active switch to fail.
- The domain ID is used to identify switch ports when you implement zoning using the domain and switch port number. If domain IDs are negotiated at every fabric start up, there is no guarantee that switch IDs will persist from one session to the next. If the switch ID changes, any zoning definitions will become invalid.
- If the domain ID is changed after a SAN is set up, some host systems may have difficulty logging back in with the switch, and a host reconfiguration might be required to detect devices on the switch again.

Chapter 3. Attaching to an IBM RS/6000 or IBM @server pSeries host

This chapter describes the host system requirements and provides procedures to attach a SAN Volume Controller to the following host systems:

- RS/6000 with fibre-channel adapters
- pSeries with fibre-channel adapters
- RS/6000 ScalablePOWER Parallel (SP) Complex with fibre-channel adapters
- pSeries SP Complex with fibre-channel adapters

For up-to-date information about the servers, operating systems, host adapters, and fabric connections that IBM supports, see the following website: http://www.ibm.com/storage/support/2145/

Attachment requirements

This section lists the requirements for attaching the SAN Volume Controller to your host system:

- Ensure that you have the installation script files. These files are on the Compact Disc (CD) that you receive with the SAN Volume Controller.
- Ensure that you have the correct updates and APARs for your operating system:
  - For AIX 5.1, ensure that you have obtained and installed maintenance level AIX 5100-04. Type the command: **oslevel -r** to determine the current AIX level.
  - For AIX 5.2, ensure that you have obtained and installed maintenance level AIX 5200-01. Type the command: **oslevel -r** to determine the current AIX level.

  These fixes are necessary to correct a problem in which `errpt -c` causes a core dump.
- Ensure that you have 1 MB minimum of hard disk space available to install the AIX host attachment package.
- Ensure that you have the documentation for your host system and the *IBM TotalStorage Virtualization Family SAN Volume Controller: Installation Guide*.
- For details about the release level for your operating system, see the following website: http://www.ibm.com/storage/support/2145/

The following tasks must be performed to configure a SAN Volume Controller:

1. The IBM Systems Services Representative (SSR) installs the SAN Volume Controller by using the procedures in the *IBM TotalStorage Virtualization Family SAN Volume Controller: Installation Guide*.
2. Define the fibre-port configuration if you did perform the installation of the SAN Volume Controller or fibre-channel adapters.
3. Configure the host system for the SAN Volume Controller. Use the instructions in your host system publications.
4. Check the LUN limitations for the RS/6000 and pSeries. See “Setting the queue depth for the AIX operating system” on page 6 for more information.
5. Install the IBM Subsystem Device Driver for AIX to enable the management of multiple paths to SAN Volume Controller virtual disks.

Note: The SDD supports RS/6000 and pSeries host systems in a clustering environment. To have failover protection on an open system, the SDD requires a minimum of two fibre-channel adapters. The maximum number of fibre channel ports supported in a single host (or logical partition) is four. This can be four single-port adapters or two dual-port adapters or a combination as long as the maximum number of ports attached to the SAN Volume Controller does not exceed four.

Setting the queue depth for the AIX operating system

When configuring more than 12 vpaths you must adjust the default queue depth. To determine the new queue depth, divide 256 by the number of vpaths, rounding down to the next whole number, or when configuring more than 256 vpaths, set the queue depth to one.

To change the vpath queue depth setting, you must change the queue_depth attribute of the underlying hdisk devices. You must stop I/O to the subsystem and unconfigure the vpaths, then set the queue depth for each hdisk by typing:

```
chdev -l hdiskx -a queue_depth=n
```

where *x* is the hdisk number and *n* is the new queue depth setting.

Once you have changed the queue depth for all of the hdisks, use the cfgmgr command to reconfigure the vpaths to use the new queue depth setting.

Installing the 2145 host attachment package

This section provides the instructions to install the host attachment package for the SAN Volume Controller. Install the host attachment package on each host system that is attached to the SAN Volume Controller.

Preparing for installation

Perform the following steps before you install the host attachment package:

1. Attach the SAN Volume Controller to your host system.
2. Turn on the host system and all attachments.
3. Ensure that you have root access.
4. Ensure that you have administrator knowledge.
5. Ensure that you have knowledge of the System Management Interface Tool (SMIT).
6. Ensure that you have installed the prerequisite package devices.fcp.disk, which is required by the host attachment package.

Note: You are not required to vary off the volume group before you install the new version.

Installing the package

Perform the following steps by using SMIT to install the host attachment package, devices.fcp.disk.ibm2145.rte, from a CD. You must have superuser authority to complete the instructions.

Note: The following procedure is an example. The example uses /dev/cd0 for the address of the CD drive. Your address might be different.

Note: You can see the version of the host attachment package currently installed on your computer, if any, by entering the command:`lslpp -l devices.fcp.disk.ibm2145.rte`.

1. From your desktop window, type `smit install_update` to go directly to the installation panel.
2. Select **Install and Update from the Latest Available Software** and press Enter.
3. Press F4 to open the Input Device/Directory for Software window.
4. Select the CD drive that you are using for the installation, for example, /dev/cd0, or enter the absolute path and package name for the host attachment package.
5. Press Enter.

   The Install and Update from the Latest Available Software window opens.
6. Select **Software to Install** and press F4.
7. Select **Software Packages** and press F7.

   The Install and Update from the Latest Available Software panel displays with the name of the software you selected to install.
8. Check the default option settings to ensure that they are what you need.
9. Press Enter to install the software.

   SMIT prompts you for confirmation.
10. Press Enter to continue.

    The installation process might take several minutes. A message is displayed when the installation process is complete, and you are prompted to restart the host system.
11. Press F10 when the installation process is complete.
12. Exit from SMIT.
13. Remove the CD.
14. Restart the host system.

After you install the package

If you want to replace a previous version of the host attachment package and have data that exists on all configured SAN Volume Controller disks, perform the following steps:

1. Run the **umount** command to unmount the file system. For example, type `umount` *x*, where *x* is the file system name. If you are on an SP host, go to step 2, otherwise go to step 4.
2. Type `suspendvsd` to suspend the virtual shared disks associated with the volume groups.
3. Type `stopvsd` to stop the virtual shared disks associated with the volume groups.
4. Run the **varyoffvg** command for the 2145 volume group. For example, type `varyoffvg VGname`.
5. Type `rmdev -dl hdisk#` on the command line to remove or unconfigure the SAN Volume Controller devices.
6. Install devices.fcp.disk.ibm2145.rte.
7. Run cfgmgr so that the host can accept your changes.

8. After your host restarts, verify that the volume groups are set to autovaryon and that the file systems are set to automount. If the volume groups *are not* set to autovaryon and the file systems *are not* set to automount, you must perform the following tasks:
   a. Type the **varyonvg** command to varyon the volume groups.
   b. Type the **mount** command to mount the file systems.
9. Install the IBM Subsystem Device Driver (SDD) for AIX to enable the management of multiple paths to SAN Volume Controller virtual disks. The SAN Volume Controller does not support MPIO.

Verifying the configuration

To verify the configuration of the SAN Volume Controller on the AIX host system, type the following command:

```
lsdev -Ct 2145
```

Figure 1 shows an example of the results of the lsdev command if the configuration is successful.

```
hdisk235 Available 31-08-01 SAN Volume Controller Device
hdisk236 Available 31-08-01 SAN Volume Controller Device
hdisk237 Available 31-08-01 SAN Volume Controller Device
...
...
```

Figure 1. Example of a list of devices displayed by the lsdev command for a successful configuration

Figure 2 shows an example of the results of the lsdev command if the configuration was not successful.

```
hdisk3 Available 30-68-01, Other FCSCSI disk device
hdisk4 Available 30-68-01, Other FCSCSI disk device
hdisk5 Available 30-68-01, Other FCSCSI disk device
...
...
```

Figure 2. Example of a list of other devices displayed by the lsdev command for an unsuccessful configuration

Making SAN changes

The 6227 and 6228 host adapter cards do not support dynamic SAN configuration changes. Do not change the domain ID of the switch port of the switch connected to the SAN Volume Controller, otherwise, you might lose the connection to the SAN Volume Controller.

Before you change the switch port connected to the SAN Volume Controller or the switch domain ID, perform the following steps to remove the fibre-channel adapter:

1. Run the **umount** command to unmount the files on the file system.

   For example, type `umount` *x*, where *x* is the file system name. If you are on an SP host, go to step 2, otherwise go to step 4 on page 9.
2. Type `suspendvsd` to suspend the virtual shared disks with the volume groups.
3. Type `stopvsd` to stop the virtual shared disks associated with the volume groups.

4. Run the **varyoffvg** command for the 2145 volume group.
   For example, type `varyoffvg VGname`
5. Type `rmdev -dl fcsx -R` on the command line to remove the fibre-channel adapter.
6. Type `cfgmgr` to reinstall the adapter and rediscover the 2145 hdisks.
7. Type `importvg VGname` to import the volume groups.
8. Type `varyonvg` to vary on the the volume groups.
9. Remount the file system.

Import the volume groups by running the **importvg VGname** command. Then, varyon the volume group and remount the file system.

Configuring SAN Volume Controller devices with multiple paths per LUN

The SAN Volume Controller supports multiple path configurations for a LUN. This means that you can have multiple hdisks available on the AIX server for each physical LUN. To configure multiple paths for all LUNs, add all of the adapters and fibre channel cables, then use the **cfgmgr** command once for each adapter to discover all of the fibre channel devices. If you add fibre channel devices after running cfgmgr, you must run it again to discover the new devices.

Known issues and limitations

On heavily loded systems, you might see lower than expected performance without any errors being logged. One possible cause is that the host is low on DMA resources.

On a heavily loaded system you might see errors indicating that the host bus adapter (HBA) was unable to activate an I/O request on the first attempt. The most likely cause of these errors is that the host is low on DMA resources.

To reduce the incidence of these messages you can increase the resources by modifying the maximum transfer size attribute for the adapter as follows:

1. Type the following command to view the current setting:
   `lsattr -El <HBA> -a max_xfer_size`

   where *HBA* is the name of the adapter logging the error. For this example the HBA is fcs0.
2. Type the following command to increase the size of the setting:
   `chdev -l fcs0 -P -a max_xfer_size=0x100000`

   Note: To view the range of allowable values for the attribute, type: `lsattr -Rl fcs0 -a max_xfer_size`
   Restart the host to put these changes into effect.

Sample error log

The errors shown in the following sample error log indicate that the HBA was unable to open an I/O request on the first attempt because the DMA resources were too low.

```
LABEL:  FCS_ERR6
IDENTIFIER: D0EAC662
```

```
Date/Time:       Wed Dec  4 16:41:48 MST
Sequence Number: 1949119
Machine Id:      0021DF9A4C00
Node Id:         lode1
Class:           H
Type:            TEMP
Resource Name:   fcs0
Resource Class:  adapter
Resource Type:   df1000f9
Location:        3V-08
VPD:
        Part Number.................03N2452
        EC Level....................D
        Serial Number...............1809102EC
        Manufacturer................0018
        FRU Number..................09P0102
        Network Address.............10000000C92BB50F
        ROS Level and ID............02C03891
        Device Specific.(Z0)........1002606D
        Device Specific.(Z1)........00000000
        Device Specific.(Z2)........00000000
        Device Specific.(Z3)........02000909
        Device Specific.(Z4)........FF401050
        Device Specific.(Z5)........02C03891
        Device Specific.(Z6)........06433891
        Device Specific.(Z7)........07433891
        Device Specific.(Z8)........20000000C92BB50F
        Device Specific.(Z9)........CS3.82A1
        Device Specific.(ZA)........C1D3.82A1
        Device Specific.(ZB)........C2D3.82A1

Description
MICROCODE PROGRAM ERROR

Probable Causes
ADAPTER MICROCODE

Failure Causes
ADAPTER MICROCODE

 Recommended Actions
 IF PROBLEM PERSISTS THEN DO THE FOLLOWING
 CONTACT APPROPRIATE SERVICE REPRESENTATIVE

Detail Data
SENSE DATA
0000 0000 0000 0029 0002 0039 0000 0000 0061 1613 0090 D5FD 0000 C98B 0000 012C
0000 0000 0000 0003 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0608 0000 0000 0010 0000 0000 0000 0000 0000 2710 0000 07D0 0000 076C
0000 0064 0000 000F 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000
```

Chapter 4. Attaching to an Intel host running Linux

This chapter describes how to attach an Intel server running Linux with Red Hat Linux Advanced Server 2.1 with kernel 2.4.9e16 to a SAN Volume Controller with the following fibre-channel adapters:

- QLogic QLA2310FL adapter card
- QLogic QLA2340FL adapter card
- QLogic QLA2342FL adapter card

For up to date information about the servers, operating systems, host adapters, and fabric connections that IBM supports, see http://www.ibm.com/storage/support/2145/.

Note: The steps to install and configure adapter cards are examples. Your configuration might be different.

Attachment requirements

This section lists the requirements for attaching the SAN Volume Controller to your host system:

- Check the LUN limitations for your host system; see “Defining the number of disk devices on Linux” on page 13.
- Ensure that you have the documentation for your host system and the *IBM TotalStorage Virtualization Family SAN Volume Controller: Installation Guide*.
- Ensure that you are running a supported kernel of Red Hat Linux Advanced Server Edition.
- See http://www.ibm.com/storage/support/2145/ for details about the release level for your operating system.

The following tasks must be performed to configure a SAN Volume Controller:

1. An IBM Systems Services Representative (SSR) installs the SAN Volume Controller by using the procedures in the *IBM TotalStorage Virtualization Family SAN Volume Controller: Installation Guide*.
2. Define the fibre-channel host system with the worldwide port name identifiers. For the list of worldwide port names see “Locating the worldwide port name (WWPN)”, on page 39.
3. Define the fibre-port configuration if you did not do it during the installation of the SAN Volume Controller or fibre-channel adapters.
4. Configure the host system for the SAN Volume Controller by using the instructions in your host system publications.
5. Install the IBM Subsystem Device Driver for Linux to enable the management of multiple paths to SAN Volume Controller virtual disks.

Installing the QLogic adapter card

This section tells you how to attach an Intel host system running Linux to a SAN Volume Controller with the QLogic QLA23xx adapter card.

Perform the following steps to install the QLogic QLA23xx adapter card.

Note: The following steps are an example configuration. The configuration for your adapter might differ.

1. Install the QLogic QLA23xx adapter card in the host system.
2. Connect the cable to the SAN Volume Controller port.
3. Restart the server.
4. Press Ctrl+Q to get to the FAST!Util menu panel.
5. From the **Configuration Settings** menu, click **Host Adapter Settings**.
6. Set the parameters and values from the **Host Adapter Settings** menu as follows:
   a. Basic Input/Output System (BIOS): **Disabled**
   b. Frame size: **2048**
   c. Loop reset delay: **5 (minimum)**
   d. Adapter hard loop ID: **Disabled**
7. From the **Advanced Adapter Settings** menu, press the Down Arrow to highlight **LUNs per target**. Press Enter. Set the following parameters:
   a. Execution throttle: **100**
   b. Fast command posting: **Enabled**
   c. >4 GB addressing: **Disabled for 32 bit systems**
   d. LUNs per target: **0**
   e. Enable LIP reset: **No**
   f. Enable LIP full login: **Yes**
   g. Enable target reset: **Yes**
   h. Login retry count: **30**
   i. Port down retry count: **30**
   j. Driver load RISC code: **Enabled**
   k. Enable database updates: **No**
   l. Disable database load: **No**
   m. IOCB allocation: **256**
   n. Extended error logging: **Disabled (might be enabled for debugging)**
8. From the **Extended Firmware Settings** menu, set the following parameters:
   a. RIO operation mode: **0**.
   b. Connection Options: **1 for switched fabric attachment, 2 for direct attachment**.
   c. Fibre Channel Tape Support: **Disabled**.
   d. Interrupt Delay Timer: **0**.
   e. Data Rate: **2**.
9. Press Esc to return to the **Configuration Settings** menu.
10. Scroll down to **Extended Firmware Settings**. Press Enter.
11. Scroll down to **Connection Options**. Press Enter to open the Option and Type of Connection window.
12. Select the option:

    1 Point-to-point

    Note: If you connect the SAN Volume Controller directly to the host system, the option you select must match the port connections on the SAN Volume Controller.

13. Press Esc.
14. To save the changes, click **Yes**. Press Enter.
15. Restart the server.

Downloading the current QLogic adapter driver

Perform the following steps to download the current adapter driver onto the QLogic adapter card:

1. Go to http://www.ibm.com/storage/support/2145/.
2. Click **Interoperability matrix**.
3. Click **SAN Volume Controller interoperability matrix**.
4. Find the section for the current version of the driver and firmware and driver you want.
5. Go to the Qlogic web site..
6. Click **Drivers / Software** from the **Quick Links** list.
7. Select **IBM** from the **OEM-approved Drivers/Firmware** section.
8. Navigate to the adapter you want to download, then click **Download**.

Installing the QLogic adapter drivers

The following steps show an example of how to install the QLogic adapter drivers:

1. Type: `mkdir /usr/src/qlogic`
2. Type:

   `mv` *`download location/driver source`* `/usr/src/qlogic`
3. Type `cd /usr/src/qlogic`
4. Type: `tar -xzf [driver source]`
5. Run the driver setup program provided by Qlogic. Type:

   `./drvrsetup`

   This step unpacks the driver source code.
6. Read and follow the instructions for compiling and installing the driver that are contained in the driver readme file included with the distribution: README.ql2x00.

Defining the number of disk devices on Linux

The maximum number of devices that are supported on a Linux host system is 128. The standard Linux kernel uses a major and minor number address mechanism. A special device file represents each disk device. For each default, there is a maximum of 16 partitions per disk. The major and minor numbers are each 8-bits.

Fibre-channel attached devices are handled as SCSI devices. There are eight major numbers that are reserved for SCSI devices. The major numbers are 8, 65, 66, 67, 68, 79, 70, and 71.

There are 256 minor numbers available for each of the eight major numbers. The following formula provides the maximum number of devices for Linux host systems:

Number of devices = (number of major numbers) x (number of minor numbers) ÷ (number of partitions)

Number of devices = 8 x 256 ÷ 16 = 128

```
/dev/scsi/host/bus/target/lun
```

Figure 3. Example of the device file systems command for a Linux host

Setting queue depth

For Linux hosts, it is necessary to limit the queue depth for each LUN using the following calculation:

Queue Depth per LUN = Number of SAN Volume Controller nodes * 1000 / Sum for each Linux host of (LUNS x HBA ports)

If the calculation gives a queue depth of 32 or higher, do not change the queue depth setting. The queue depth parameter can be set when the qlogic module is loaded by specifying the parameter ″ql2xmaxqdepth=*x* where *x* is the queue depth.

Where there are other, non-Linux, hosts attached to the SAN Volume Controller it might be necessary to reduce the calculated queue depth to prevent Linux host issues related to queue full conditions.

Example

If a configuration has 20 Linux hosts each with 2 HBA ports and 20 LUNs and 4 SAN Volume Controller nodes the queue depth setting is:

4 * 1000 ÷ 20 * (2 * 20) = 5 per LUN

For a 2300 qlogic adapter, type the following command to load the kernel module:

```
modprobe qla2300 ql2xmaxqdepth=5
```

You can also set the queue depth as an options string in the `etc/modules.conf` file.

Configuring SAN Volume Controller storage

Each of the attached SAN Volume Controller LUNs has a special device file in the Linux directory /dev. There is a maximum of 128 fibre-channel disks that are based on the major numbers that are available. The entries for all 128 devices are added by the operating system automatically.

The range of devices goes from /dev/sda (LUN 0) to /dev/sddx (LUN 127). Figure 4 shows an example of the range for the devices.

```
# ls –l /dev/sda
brw-rw---- 1 root disk 8, 0 Aug 24 2000 /dev/sda
```

Figure 4. Example of range of devices for a Linux host

Partitioning SAN Volume Controller disks

Before you create a file system, partition the disk by using the fdisk utility. You have to specify the special device file of the disk you want to partition when executing fdisk. Figure 5 on page 15 shows an example of the different options for the fdisk utility.

```
# fdisk /dev/sdb

Command  (m for help): m
Command  action
a     toggle a bootable flag
b     edit bsd disklabel
c     toggle the dos compatibility flag
d     delete a partition
l     list known partition types
m     print this menu
n     add a new partition
o     create a new empty DOS partition table
p     print the partition table
q     quit without saving changes
s     create a new empty Sun disklabel
t     change a partitions system id
u     change display/entry units
v     verify the partition table
w     write table to disk and exit
x     extra functionality (experts only)
```

Figure 5. Example of different options for the fdisk utility

Figure 6 shows an example of a primary partition on the disk /dev/sdb.

```
Command (m for help): n

Command  action
e     extended
p     primary partition (1-4)
p
Partition number (1-4): 1
First cylinder (1-953, default 1): Enter
Using default value 1
Last cylinder or +size or +sizeM or +sizeK (1-953, default 953): Enter
Using default value 953

Command (m for help): p

Disk /dev/sdb: 64 heads, 32 sectors, 953 cylinders
Units = cylinders of 2048 * 512 bytes

 Device Boot  Start  End   Blocks  Id  System
 /dev/sdb1     1 953   975856  83  Linux
```

Figure 6. Example of a primary partition on the disk /dev/sdb

Assigning the system ID to the partition

Perform the following steps to assign the Linux system ID to the partition:

1. Assign the system partition ID.
2. Write the information to the partition table on the disk.
3. Exit the fdisk program.

Figure 7 on page 16 shows the assignment of the Linux system ID to the partition (hex code 83).

```
Command  (m for help): t
Partition number (1-4): 1

Hex code (type L to list codes): 83

Command  (m for help): w
The partition table has been altered!

Calling ioctl() to re-read partition table.
SCSI device sdb: hdwr sector= 512 bytes. Sectors= 1953152 [953 MB] [1.0 GB]
 sdb: sdb1
SCSI device sdb: hdwr sector= 512 bytes. Sectors= 1953152 [953 MB] [1.0 GB]
 sdb: sdb1

WARNING: If you have created or modified any DOS 6.x partitions, please see the
fdisk manual page for additional information.
Syncing disks.
[root@yahoo /data]#
```

Figure 7. Example of assigning a Linux system ID to the partition

Creating and using file systems on SAN Volume Controller

After you partition the disk as described in “Partitioning SAN Volume Controller disks” on page 14, the next step is to create a file system. Figure 8 shows an example of how to use the **mke2fs** command to create an EXT2 Linux file system (which is nonjournaled).

```
[root@yahoo /data]# mke2fs /dev/sdb1
mke2fs 1.18, 11-Nov-1999 for EXT2 FS 0.5b, 95/08/09
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
122112 inodes, 243964 blocks
12198 blocks (5.00%) reserved for the super user
First data block=0
8 block groups
32768 blocks per group, 32768 fragments per group
15264 inodes per group
Superblock backups stored on blocks:
32768, 98304, 163840, 229376

Writing inode tables: done
Writing superblocks and filesystem accounting information: done
[root@yahoo /data]#
```

Figure 8. Example of creating a file with the mke2fs command

Figure 9 on page 17 shows an example of the EXT2 Linux file system, which is nonjournaled, by using the **mkfs** command.

```
[root@yahoo /data]# mkfs -t ext2 /dev/sdb1
mke2fs 1.18, 11-Nov-1999 for EXT2 FS 0.5b, 95/08/09
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
122112 inodes, 243964 blocks
12198 blocks (5.00%) reserved for the super user
First data block=0
8 block groups
32768 blocks per group, 32768 fragments per group
15264 inodes per group
Superblock backups stored on blocks:
32768, 98304, 163840, 229376
Writing inode tables: done
Writing superblocks and filesystem accounting information: done
[root@yahoo /data]#
```

Figure 9. Example of creating a file with the mkfs command

Known issues and limitations

In response to errors, the kernel might permanently disable a LUN and log a message stating **device set offline** and the specific device. If this happens, there is no way to bring the LUN online. It might be possible to remove the LUN and add it back through the /proc/scsi/scsi directory or reload the host adapter driver. If those fail, it is necessary to reboot the host.

Chapter 5. Attaching to a Sun host

This section describes how to attach a SAN Volume Controller to a Sun host system with the following fibre-channel adapters:

- JNI FCE-1473 adapter card
- JNI FCE-6460 adapter card

This section also tells you how to change the Sun system kernel. Before you start, you must meet the attachment requirements listed in “Attachment requirements”.

See http://www.ibm.com/storage/support/2145/ for details about the release level for your operating system.

Attachment requirements

This section lists the requirements for attaching the SAN Volume Controller to your host system:

- Ensure that there are enough fibre-channel adapters installed in the server to handle the total LUNs you want to attach.
- Ensure that you have the documentation for your host system and the *IBM TotalStorage Virtualization Family SAN Volume Controller: Installation Guide*. This documentation is on the TotalStorage CD that you receive with the SAN Volume Controller.
- Ensure that you have installed Solaris 8.
- Review device driver installation documents and configuration utility documents for additional Solaris patches that you might need.

The following tasks must be performed to configure a SAN Volume Controller:

1. The IBM Systems Services Representative (SSR) installs the SAN Volume Controller by using the procedures in the *IBM TotalStorage Virtualization Family SAN Volume Controller: Installation Guide*.
2. Define the fibre-channel host system with the worldwide port name identifiers. For the list of worldwide port names, see “Locating the worldwide port name (WWPN)”, on page 39.
3. Define the fibre-port configuration if you did not do it during the installation of the SAN Volume Controller or fibre-channel adapters.
4. Configure the host system for the SAN Volume Controller by using the instructions in your host system publications.
5. Install the IBM Subsystem Device Driver for Solaris to enable the management of multiple paths to SAN Volume Controller virtual disks. SDD does not support the Sun host system in a clustering environment.

Installing the JNI PCI adapter card

This section tells you how to attach a SAN Volume Controller to a Sun host system running Solaris 8 with the JNI PCI adapter card.

Perform the following steps to install the JNI PCI adapter card:

1. Insert the host adapter board into the empty PCI bus slot. Press firmly until seated.
2. Secure the mounting bracket for the adapter to the case with the panel screw.

3. Replace the computer case by tightening the screws on the case or use the clamp to secure the cover.

Downloading the current JNI PCI adapter driver

This section tells you how to download the JNI PCI fibre-channel adapter driver.

1. Restart your host system.
2. Go to the JNI web site.
3. From the navigation menu at the top of the page, click **Drivers**.
4. Locate the link: **Click for IBM Drivers**
5. In the IBM Drivers window, click the link for the driver you want.
6. In the **File Download** menu, click **Save this file to disk**. Click **OK**.
7. In the Save As window, create a temporary folder. For example, create a folder called Temp.

   Note: If you already have a folder called Temp, change to the Temp directory.
8. Click **Save**. A window opens that shows the progress of the download.
9. When the download completes, click **Close**.
10. If you downloaded the driver file from a Sun host system, go to “Installing the JNI PCI adapter driver”. If you downloaded the driver file from a non-Sun host system, transfer the drive file to a Sun host system, and then go to “Installing the JNI PCI adapter driver”.

Installing the JNI PCI adapter driver

Perform the following steps to install the JNI PCI adapter drivers:

1. Go to the JNI web site.
2. From the navigation menu at the top of the page, click **Drivers**.
3. Locate the link: **Click for IBM Drivers**.
4. Locate the correct adapter from the list. Click **readme.txt** to get the following information:
   - Overview
   - Adapter issues
   - Installation issues
   - Configuration variables
   - New functionality
   - Need to know and known issues
   - Tested interoperable devices
   - Contacting JNI
5. Print the readme.txt file.
6. Follow the instructions in the readme.txt file to install the JNI PCI adapter card.
7. Update the parameter list and restart the host system. See “Parameter settings for the JNI FCE-6460 and JNI FCE-1473 adapters” on page 23 for the parameters and recommended settings.

Installing the JNI SBUS adapter card

This section tells you how to attach a SAN Volume Controller to a Sun host system running Solaris 8 with SAN Foundation Kit Version 1.0 (SUNWsan) with the JNI SBUS adapter card.

Perform the following steps to install the JNI SBUS adapter card:

1. Insert the host adapter board into the empty SBUS slot. Press firmly until seated.
2. Secure the mounting bracket for the adapter to the case with the panel screw.
3. Replace the computer case by tightening the screws on the case or use the clamp to secure the cover.

Downloading the current JNI SBUS adapter driver

Perform the following steps to download the JNI SBUS adapter driver:

1. Restart your host system.
2. Go to the JNI web site.
3. From the navigation menu at the top of the page, click **Drivers**.
4. Locate the link: **Click for IBM Drivers**.
5. If you know the name of the operating system but do not know the name of the driver, click the name of an operating system from the **Locate Driver by Operating System** list.
6. In the IBM drivers window, click the link for the driver you want.
7. Click **xxxxxxxx.pkg**, where *xxxxxxxx* is the driver name.
8. In the **File Download** menu, click **Save this file to disk**. Click **OK**.
9. In the Save As window, create a temporary folder. For example, create a folder called Temp.

   Note: If you already have a folder called Temp, change to the Temp directory.
10. Click **Save**. A window opens that shows the progress of the download.
11. When the download completes, click **Close**.
12. If you downloaded the driver file from a Sun host system, go to “Installing the JNI SBUS adapter driver”. If you downloaded the driver file from a non-Sun host system, transfer the driver file to a Sun host system, and then go to “Installing the JNI SBUS adapter driver”.

Installing the JNI SBUS adapter driver

Perform the following steps to install the JNI SBUS adapter driver:

1. Go to the JNI web site.
2. From the navigation menu at the top of the page, click **Drivers**.
3. If you know the driver name, click the link for the name of the driver and proceed to step 6. Otherwise, go to step 4.
4. Locat the link: **Click for IBM Drivers**.
5. In the IBM drivers window, click the link for the driver you want.
6. From the **adapter** menu, find the section for Solaris - JNI. Click **readme.txt** to get the following information:
   - Overview
   - Requirements
   - Features

- Configuration variables
- New functionality
- Need to know and known issues
- Tested interoperable devices
- Contacting JNI

7. Print the readme.txt file.
8. Follow the instructions in the readme.txt file to install the JNI SBUS adapter card.
9. Update the parameter list and restart the host system. See “Parameter settings for the JNI FCE-6460 and JNI FCE-1473 adapters” on page 23 for the parameters and recommended settings.

Configuring host bus adapters

There are two steps required to configure host bus adapters (HBAs) for Solaris:

1. Informing Solaris about the new SCSI target device and LUNs.
2. Configuring the HBA.

Configuring the HBA

First edit /kernel/drv/sd.conf to ensure that there is a SCSI target for each port on the SAN Volume Controller and that the necessary number of LUNs are defined for each target. Add lines such as:

```
name="sd" class="scsi" target=0 lun=0;
name="sd" class="scsi" target=0 lun=1;
name="sd" class="scsi" target=0 lun=2;
name="sd" class="scsi" target=0 lun=3;
name="sd" class="scsi" target=0 lun=4;
name="sd" class="scsi" target=0 lun=5;
name="sd" class="scsi" target=0 lun=6;
name="sd" class="scsi" target=0 lun=7;


name="sd" class="scsi" target=1 lun=0;
name="sd" class="scsi" target=1 lun=1;
name="sd" class="scsi" target=1 lun=2;
name="sd" class="scsi" target=1 lun=3;
name="sd" class="scsi" target=1 lun=4;
name="sd" class="scsi" target=1 lun=5;
name="sd" class="scsi" target=1 lun=6;
name="sd" class="scsi" target=1 lun=7;
```

which adds two SCSI targets for each of eight LUNs. Each I/O group requires four targets.

When you install the JNI driver you will also install the /kernel/drv/jnic146x.conf file. Edit this file to set up the HBA connection to the switch fabric by changing the following lines:

```
FcLoopEnable = 0;
FcFabricEnable = 1;
Automap = 0 (for persistent binding)
```

You must also add a line similar to the following to enable static binding. You must use static binding with the SAN Volume Controller.

```
target0_wwpn = "5005076801300018";
target1_wwpn = "5005076801100018";
target2_wwpn = "5005076801200018";
```

When you restart, examine the /var/adm/messages file to ensure that the JNI HBA is set up as a switch-fabric connection.

Running the LUN configuration method

The configuration method depends on the level of Solaris that you are using. The following instructions use SunOS 5.8 Generic_108528–16. Use a bash shell as root to properly configure your path.

1. After the cluster has rebooted, delete the following files: `/etc/vpathsave.cfg`, `/etc/vpath.cfg`.
2. Reboot the host using the `reboot -- -r` option to reconfigure for new hardware.
3. When the host restarts, use the `format` command to check for disks.
   - If you see disks, proceed to the next step.
   - If you do not see disks, verify the configuration of your HBAs and clustering configuration and try again.

   Note: You may see a ″mode sense error″ listed for each disk when running format for the first time. This is normal, and will not occur once the disks have been labeled.
4. Configure the Software Device Driver by issuing the `cfgpath -c` command.
5. Shut down the host using the `shutdown -i6 -g0 -y` command. This will reboot the host and reconfigure it to find disks.
6. When the host comes back up, issue the `devfsadm` command to scan for disks.
7. After the `devfsadm` command completes, enter `vpathmkdev` to create vpaths for the new disks.
8. Enter `format` and browse the returned list for your vpaths.
9. The devices are now accessible from `/dev/dsk/vpath#`.

Parameter settings for the JNI FCE-6460 and JNI FCE-1473 adapters

See Table 4 for the configuration settings that are recommended for the following adapters:

- JNI FCE-6460
- JNI FCE-1473

For the most current information about fibre-channel adapter parameter settings, see http://www.ibm.com/storage/support/2145/.

Table 4. Recommended configuration file parameters for a JNI FCE-6460, or a JNI FCE-1473 adapter

Parameters	Recommended settings
FcEngHeartbeatInterval	5: Default. When the JNI adapter or driver detects that the fibre-channel link is up (and there is no I/O activity), it sends a test frame (or heartbeat) to itself to verify link integrity. The test frame is sent at the interval specified by this parameter. If the test frame does not complete, there might be a link problem. In this situation, the driver initiates error recovery to reestablish a good link. A value of 0 disables the heartbeat.
FcLinkUpRecoveryTime	1000: Default. Delay (msec) after the link is up before port discovery begins, allowing the link to stabilize and protecting against a possible I/O surge. This timer is reset every time the link comes up. The default value is adequate for most configurations.
BusyRetryDelay	5000: Default. Delay (msec) before retrying after receipt of an I/O operation with a SCSI Busy status from a target. The number of retries is based on the Solaris retry count associated with the I/O operation.

Table 4. Recommended configuration file parameters for a JNI FCE-6460, or a JNI FCE-1473 adapter (continued)

Parameters	Recommended settings
FailoverDelay	30: Delay (seconds) before failing all I/O operations for an offline target. If the delay timer expires, all I/O operations for the failed target is returned to the application. A zero value disables failover.
TimeoutResetEnable	0: False. Boolean parameter for enabling SCSI target resets for timed-out I/O operations. When the timer expires (usually 60 seconds, as specified by the upper layers), the driver issues a target reset to attempt to clear the device (which might be either too busy to respond or stuck).
QfullRetryCount	5: Default. Number of times an I/O operation is retried due to receipt of a SCSI queue full status from a target. The delay between retries is based on the QfullRetryDelay parameter.
QfullRetryDelay	5000: Default. Delay (msec) before retrying after receipt of an I/O operation with a SCSI queue full status from a target. The number of retries is based on the QfullRetryCount parameter.
LunRecoveryInterval	50: Default. Sets the LUN I/O recovery interval (in msec) after the driver reconnects to a disk. It is a global parameter affecting all targets, and determines how long the driver waits after a port is discovered until sending I/O operations to that port. Some devices might require more time to flush an I/O operation that was in progress prior to a link going down; if this is the case, increase the value of this parameter.
FcLinkSpeed	3: Default. Specifies the desired fibre-channel link speed as follows: • 0: default to SEEPROM setting • 1: force 1 gigabit per second • 2: force 2 gigabit per second • 3: auto negotiate link speed
JniCreationDelay	5: Default. Delay (seconds) after driver creation to allow the network to stabilize, discover ports, and build the driver's database. Increase this value if targets are being discovered too late in the restart process.
FlogiRetryCount	3: Default. Total number of fabric login (FLOGI) attempts before giving up logging in to a switch. Failure prevents participation on a fabric topology.
FcFlogiTimeout	10: Default. Specifies the amount of time (in seconds) that the driver waits for a fabric login (FLOGI) to be accepted. The value should be increased only if the switch to which the host adapter is connected requires more time to respond to a FLOGI. The number of retries is configured with the FlogiRetryCount parameter.
PlogiRetryCount	5: Default. Total number of port login (PLOGI) attempts before failing to log in to a SCSI target.
PlogiControlSeconds	30: Default. Defines the number of seconds that the driver waits for a successful port login (PLOGI) attempt. The maximum number of attempts is defined by the PlogiRetryCount parameter. Some devices might take longer to respond to PLOGIs; if this is the case, increase the value of this parameter.
FcEmldEngTcbCount	1789: Default. Total number of concurrent exchanges (also called transfer control blocks) that the adapter allows. To optimize performance, set this parameter to match the memory capacity of the hardware.

Setting the Sun host system parameters

The following sections contain the procedures to set the Sun host system parameters for optimum performance on the SAN Volume Controller with the supported JNI adapters.

JNI adapters

Perform the following steps to set the Sun host system parameters for optimum performance on the SAN Volume Controller with the JNI adapter:

1. Type `cd /etc` to change to the /etc subdirectory.
2. Back up the system file in the subdirectory.
3. Edit the system file, and set the following parameters for servers with configurations that use JNI adapters:

sd_max_throttle

This sd_max_throttle parameter specifies the maximum number of commands that the sd driver can queue to the host adapter driver. The default value is 256, but you must set the parameter to a value less than or equal to a maximum queue depth for each LUN connected. Determine the value by using the following formula:

`256 ÷ (`*`LUNs per adapter`*`)`

where *LUNs per adapter* is the largest number of LUNs assigned to a single adapter.

To set the sd_max_throttle parameter for the SAN Volume Controller LUNs in this example, you would add the following line to the /etc/system file:

```
set sd:sd_max_throttle=5
```

sd_io_time This parameter specifies the time-out value for disk operations. Add the following line to the /etc/system file to set the sd_io_time parameter for the SAN Volume Controller LUNs:

```
set sd:sd_io_time=0x78
```

sd_retry_count

This parameter specifies the retry count for disk operations. Add the following line to the /etc/system file to set the sd_retry_count parameter for the SAN Volume Controller LUNs:

```
set sd:sd_retry_count=5
```

maxphys This parameter specifies the maximum number of bytes that you can transfer for each SCSI transaction. The default value is 126976 (124 KB). If the I/O block size that you requested exceeds the default value, the request is broken into more than one request. The value should be tuned for the application requirements. For maximum bandwidth, set the maxphys parameter by adding the following line to the /etc/system file:

```
set maxphys=1048576 (1 MB)
```

Note: Do not set the value for maxphys greater than 1048576 (1 MB). Doing so can cause the system to hang.

1. Type `cd /etc` to change to the /etc subdirectory.
2. Backup the system file in the subdirectory.
3. Edit the system file and set the following parameters for servers with configurations that only use QLogic adapters.

sd_io_time This parameter specifies the time-out value for disk operations. Add the following line to the /etc/system file to set the sd_io_time parameter for the SAN Volume Controller LUNs:

```
set sd:sd_io_time=0x78
```

sd_retry_count

This parameter specifies the retry count for disk operations. Add the following line to the /etc/system file to set the sd_retry_count parameter for the SAN Volume Controller LUNs:

```
set sd:sd_retry_count=5
```

maxphys

This parameter specifies the maximum number of bytes you can transfer for each SCSI transaction. The default value is 12 6976 (124 KB). If the I/O block size that you requested exceeds the default value, the request is broken into more than one request. The value should be tuned to the application requirements. For maximum bandwidth, set the maxphys parameter by adding the following line to the /etc/system file:

```
set maxphys=1048576 (1 MB)
```

Note: Do not set the value for maxphys greater than 1048576 (1 MB). Doing so can cause the system to hang.

Chapter 6. Attaching to a Windows 2000 host

This section tells you how to attach a SAN Volume Controller to a Windows 2000 host system running Windows 2000 Server, Service Pack 3 or Windows 2000 Advanced Server, Service Pack 3 with the following fibre-channel adapters:

- QLogic QLA2310FL adapter card
- QLogic QLA2340FL adapter card
- QLogic QLA2342FL adapter card

This section also tells you how to install, download, and configure the adapter cards.

For up to date information about the switch and fabric connections that IBM supports, see http://www.ibm.com/storage/support/2145/.

Attachment requirements

This section lists the requirements for attaching the SAN Volume Controller to your host system:

- Check the LUN limitations for your host system.
- Ensure that you have the documentation for your host system and the *IBM TotalStorage Virtualization Family SAN Volume Controller: Installation Guide*.
- See http://www.ibm.com/storage/support/2145/ for details about the release level for your operating system.

The following tasks must be performed to configure a SAN Volume Controller:

1. An IBM Systems Services Representative (SSR) installs the SAN Volume Controller by using the procedures in the *IBM TotalStorage Virtualization Family SAN Volume Controller: Installation Guide*.
2. Define the fibre-channel host system with the worldwide port name identifiers. For the list of worldwide port names see “Locating the worldwide port name (WWPN)”, on page 39.
3. Define the fibre-port configuration if you did not do it during the installation of the SAN Volume Controller or fibre-channel adapters.
4. Configure the host system for the SAN Volume Controller by using the instructions in your host system publications.
5. Install the IBM Subsystem Device Driver (SDD) for Windows to enable the management of multiple paths to SAN Volume Controller virtual disks.

Installing and configuring the Netfinity® FAStT adapter card

Perform the following steps to install and configure the Netfinity FAStT adapter card:

1. Obtain an optical multimode cable with a standard-connector style of duplex connector.
2. Write down the serial number of the adapter card.

   In the unlikely event that the nonvolatile random access memory is damaged, the system will prompt you for the Netfinity FAStT adapter serial number.
3. Check the system board and make any configuration changes necessary to accommodate the Netfinity FAStT adapter.
4. Turn off the peripheral devices and then the host.
5. Disconnect the power cord.
6. Remove the cover to the host.
7. Choose any PCI bus slot that supports 32- or 64-bit adapters.

   You can install the adapter in a 64-bit PCI slot if one is available. If a 64-bit slot is not available, use a 32-bit PCI slot.
8. Align the adapter with the expansion slot, and carefully press the adapter into the slot until you hear the adapter snap into place.
9. Secure the adapter.
10. Connect one end of the fiber cable from the devices to the J1 connector on the adapter.
11. Carefully reinstall and secure the cover.
12. Connect the power cables.
13. Turn on all external fibre-channel devices.
14. Observe the monitor.

    Note: You will not see the BIOS menu because the adapter BIOS is set to disabled by default. Instead, you should see the information in Figure 10.

```
QLogic Corporation
QLA2xxx PCI Fibre Channel ROM BIOS Version X.XX
Copyright (C) QLogic Corporation 1998 All rights reserved.
www.qlc.com

Press <Alt+Q> for FAST!Util

BIOS for Adapter X is disabled.

ROM BIOS not installed
```

Figure 10. Example of what is displayed when starting the Windows 2000 host

15. To see the devices, press Alt+Q, and then use the utility program.

Checking the level of the device driver for theNetfinity FAStT adapter card

Perform the following steps to check the version of the device driver that is installed on your host:

1. For the latest versions of the device drivers, utilities, and documentation, see: www.ibm.com/support/all_download_drivers.html

2. Create backup copies of the following driver diskettes that are included with the FAStT adapter:
   - Netfinity FAStT host adapter for Windows NT
   - Netfinity FAStT host adapter for Windows 2000
3. Read the software installation chapters to determine which device driver you want to install.
4. Place the device driver diskette in the diskette drive.
5. Copy the QLVER.EXE file from the diskette into the directory that contains the QLogic device drivers.

   For example, type: `COPY A:\QLVER.EXE C:\QLC\QLVER.EXE`
6. Change directories to the subdirectory that contains the QLogic drivers.

   For example, type: `CD \QLC`
7. At the command prompt, type: `QLVER *.*`

   This action invokes the QLogic banner, followed by a list of drivers and version numbers.

Documentation that comes with your adapter card

The following files are on the diskette that is shipped with your adapter card:

TXTSETUP.OEM	The driver installation script for the initial Windows NT text setup
QLOGIC	The identification file for the Windows NT setup program
\W2K\OEMSETUP.INF	The driver installation script for the Windows NT setup program
\W2K\QL2200.SYS	The Windows 2000 device driver
\W2K\README.TXT	Helpful hints about the Windows 2000 device driver
\W2K\RELEASE.TXT	The history of release fixes

Installing the device driver for a Netfinity FAStT adapter card

Perform the following steps to install the device driver:

1. Install the Netfinity adapter.
2. Restart Windows 2000.
3. Insert the Netfinity FAStT host adapter device driver for Windows 2000 diskette and follow the instructions that are displayed.

Updating the Windows 2000 device driver

Perform the following steps if you want to replace an existing Windows 2000 device driver with an updated version:

1. Right click **My Computer → Manage → Device Manager**.
2. Click the plus (+) sign to expand the menu for **SCSI and RAID Controllers**.
3. Click the QLogic adapter you want to update.
4. Click on the adapter that you want and select **Properties**.
5. Select the tab for **Driver**.
6. Click **Update Driver** and follow the instructions that appear on the screen.

Installing the QLogic QLA23*xx* adapter card

This section tells you how to attach a SAN Volume Controller to a Windows 2000 host system with the QLogic QLA23*xx* adapter card.

Perform the following steps to install the QLogic QLA23*xx* adapter card:

1. Install the QLogic QLA23*xx* adapter card in the host system.
2. Connect the cable to the SAN Volume Controller port.
3. Restart the host.
4. Press Ctrl+Q to get to the **FAST!Util** menu.
5. From the **Configuration Settings** menu, select **Host Adapter Settings**.

   From the **Host Adapter Settings** menu, set the following parameters and values:

   a. Host adapter BIOS: **Disabled**
   b. Frame size: **2048**
   c. Loop reset delay: **5 (minimum)**
   d. Adapter hard loop ID: **Disabled**
6. From the **Advanced Adapter Settings** menu, press the Down Arrow to highlight **LUNs per target**. Press Enter. Set the parameters and values from the **Advanced Adapter Settings** menu as follows:

   a. Execution throttle: **100**
   b. Fast command posting: **Enabled**
   c. >4 GB addressing: **Disabled for 32 bit systems**
   d. LUNs per target: **0**
   e. Enable LIP reset: **No**
   f. Enable LIP full login: **Yes**
   g. Enable target reset: **Yes**

      Note: Enable LIP reset, Enable LIP full login, and Enable target reset parameters control the behavior of the adapter when Windows 2000 tries to perform a SCSI bus reset. You must perform a target reset to make cluster failovers work. Use the SCSI bus device reset option to clear SCSI reservations.

   h. Login retry count: **30 (minimum)**
   i. Port down retry count: **30 (minimum)**
   j. Driver load RISC code: **Enabled**
   k. Enable database updates: **No**
   l. Disable database load: **No**
   m. IOCB allocation: **256**
   n. Extended error logging: **Disabled (might be enabled for debugging)**
7. Press Esc to return to the **Configuration Settings** menu.
8. From the **Configuration Settings** menu, scroll down to **Extended Firmware Settings**. Press Enter.
9. From the **Extended Firmware Settings** menu, scroll down to **Connection Options** to open the Option and Type of Connection window.
10. Select:

    1 Point-to-point (required setting)
11. Press Esc.

12. Save the changes. Highlight **Yes**.
13. Restart the server.

Downloading the QLogic adapter driver

Perform the following steps to load the current driver onto the QLogic adapter card:

1. Go to http://www.ibm.com/storage/support/2145/.
2. Click **Interoperability matrix**.
3. Click **SAN Volume Controller interoperability matrix**.
4. Find the section for the current version of the driver and firmware and driver you want.
5. Go to the Qlogic web site.
6. Click **Drivers / Software** from the **Quick Links** list.
7. Select **IBM** from the **OEM-approved Drivers/Firmware** section.
8. Navigate to the adapter that you want to download, then click **Download**.

Installing the QLogic adapter driver

Perform the following steps to install the QLogic adapter drivers.

Note: If you are installing the fibre-channel adapter for the first time, you must specify the correct topology. You must also select the appropriate device mapping driver.

1. Go to the Qlogic web site.
2. From the navigation pane, click **Drivers / Software**.
3. In the Download Drivers / Software and HBAs window, click the Down Arrow to open the **Select a Series** menu.
4. Highlight and click **Fibre-Channel HBAs**.
5. In the Download Drivers / Software and HBAs window, click the Down Arrow to open the **Select a Product** menu.
6. Highlight and click the fibre-channel adapter that you want.
7. In the **Drivers and Management Software** menu, click **Windows 2000**.
8. In the Windows 2000 Drivers table, click **Read Me**.

   See the following list for an example of information that you might find in a readme file:

   - Operating system support
   - Supported features
   - Creating the driver diskette
   - Installing the driver
   - Initial operating system installation with the QLogic controller as the boot
   - Adding the QLogic controller to the existing operating system
   - Updating the existing QLogic driver
   - Removing the driver
   - Driver parameters
   - System registry parameters
   - NVRAM parameters
   - Limitations
   - Additional notes

- Using Fast!UTIL menu to change the connection options
- Diskette content
- Contacting QLogic

Configuring for availability and recoverability

The host adapter uses the time-out parameter to bind its recovery actions and responses to the disk subsystem. The value exists in different places in the system configuration. You can retrieve and use it in different ways depending on the type of host adapter that is installed. “Setting the TimeOutValue registry” tells you how to modify the value safely in the Windows 2000 registry.

Setting the TimeOutValue registry

Perform the following steps to set the time-out value registry:

1. From the **Run** menu or command prompt, type:

   `Regedit32.exe`
2. Navigate to the following registry key:

   `HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Disk`
3. Look for the value called `TimeOutValue`. If the value called `TimeOutValue` does not exist, go to step 3a. If the `TimeOutValue` exists, go to step 4.
   a. Click **Edit → Add Value...**
   b. For ValueName, type: `TimeOutValue`.
   c. For data type, type: `REG-DWORD`.
   d. Click **OK**.
   e. For Value data, type: `3c`.
   f. For Base, click **Hex**.
   g. Click **OK**.
4. If the value exists and is less than 0x0000003c (60 decimal), perform the following steps to increase it to 0x3c.
   a. Click **TimeOutValue**.
   b. Click **Edit → DWORD...**.
   c. For Value data, type: `3c`.
   d. For Base, click **Hex**.
   e. Click **OK**.
5. Exit the Regedit32 program.
6. Restart your Windows 2000 server for the changes to take effect.

Chapter 7. Attaching to a Windows NT host

This section tells you how to attach a SAN Volume Controller to a Windows NT host system running Windows NT Service Pack 6A with the following fibre-channel adapters:

- QLogic QLA2310FL adapter card
- QLogic QLA2340FL adapter card
- QLogic QLA2342FL adapter card

This section also tells you how to install, download, and configure the adapter cards.

For up to date information about the switch and fabric connections that IBM supports, see http://www.ibm.com/storage/support/2145/.

Attachment requirements

This section lists the requirements for attaching the SAN Volume Controller to your host system:

- Ensure that you have the documentation for your host system and the *IBM TotalStorage Virtualization Family SAN Volume Controller: Installation Guide*.
- See http://www.ibm.com/storage/support/2145/ for details about the release level for your operating system.

The following tasks must be performed to configure a SAN Volume Controller:

1. An IBM Systems Services Representative (SSR) installs the SAN Volume Controller by using the procedures in the *IBM TotalStorage Virtualization Family SAN Volume Controller: Installation Guide*.
2. Define the fibre-channel host system with the worldwide port name identifiers. For the list of worldwide port names see “Locating the worldwide port name (WWPN)”, on page 39.
3. Define the fibre-port configuration if you did not do it during the installation of the SAN Volume Controller or fibre-channel adapters.
4. Configure the host system for the SAN Volume Controller by using the instructions in your host system publications.
5. Install the IBM Subsystem Device Driver (SDD) for Windows to enable the management of multiple paths to SAN Volume Controller virtual disks.

Installing and configuring the Netfinity FAStT adapter card

Perform the following steps to install and configure the Netfinity FAStT adapter card:

1. Obtain an optical multimode cable with a standard-connector style of duplex connector.
2. Write down the serial number of the adapter card.

   In the unlikely event that the nonvolatile random access memory is damaged, the system will prompt you for the Netfinity FAStT adapter serial number.
3. Check the system board and make any configuration changes necessary to accommodate the Netfinity FAStT adapter.
4. Turn off the peripheral devices and then the host.
5. Disconnect the power cord.
6. Remove the cover to the host.
7. Choose any PCI bus slot that supports 32- or 64-bit adapters.

   You can install the adapter in a 64-bit PCI slot if one is available. If a 64-bit slot is not available, use a 32-bit PCI slot.
8. Align the adapter with the expansion slot, and carefully press the adapter into the slot until you hear the adapter snap into place.
9. Secure the adapter.
10. Connect one end of the fiber cable from the devices to the J1 connector on the adapter.
11. Carefully reinstall and secure the cover.
12. Connect the power cables.
13. Turn on all external fibre-channel devices.
14. Observe the monitor.

    Note: You will not see the BIOS menu because the adapter BIOS is set to disabled by default. Instead, you should see the information in Figure 11.

```
QLogic Corporation
QLA2xxx PCI Fibre Channel ROM BIOS Version X.XX
Copyright (C) QLogic Corporation 1998 All rights reserved.
www.qlc.com

Press <Alt+Q> for FAST!Util

BIOS for Adapter X is disabled.

ROM BIOS not installed
```

Figure 11. Example of what is displayed when starting the Windows NT host

15. To see the devices, press Alt+Q, and then use the utility program.

Checking the level of the device driver for Netfinity FAStT adapter card

Perform the following steps to check the version of the device driver that is installed on your host:

1. Check www.ibm.com/pc/support for the latest versions of the device drivers, utilities, and documentation:
2. Create backup copies of the following driver diskettes that are included with the FAStT adapter:

- Netfinity FAStT host adapter for Windows NT and NetWare
- Netfinity FAStT host adapter for Windows NT

3. Read the software installation chapters to determine which device driver you want to install.
4. Place the device driver diskette in the diskette drive.
5. Copy the QLVER.EXE file from the diskette into the directory that contains the QLogic device drivers.

   For example, type: `COPY A:\QLVER.EXE C:\QLC\QLVER.EXE`
6. Change directories to the subdirectory that contains the QLogic drivers.

   For example, type: `CD \QLC`
7. At the command prompt, type: `QLVER *.*`

   This action invokes the QLogic banner, followed by a list of drivers and version numbers.

Documentation that comes with your adapter card

The following files are on the diskette that is shipped with your adapter card:

TXTSETUP.OEM	The driver installation script for the initial Windows NT text setup
QLOGIC	The identification file for the Windows NT setup program
\W2K\OEMSETUP.INF	The driver installation script for the Windows NT setup program
\W2K\QL2200.SYS	The Windows NT device driver
\W2K\README.TXT	Helpful hints about the Windows NT device driver
\W2K\RELEASE.TXT	The history of release fixes

Installing the device driver for a Netfinity FAStT adapter card

Perform the following steps to install the device driver:

1. Install the Netfinity adapter.
2. Restart Windows NT.
3. Insert the Netfinity FAStT host adapter device driver for Windows NT diskette and follow the instructions that are displayed.

Updating the Windows NT device driver

Perform the following steps if you want to replace an existing Windows NT device driver with an updated version:

1. Right click **My Computer → Manage → Device Manager**.
2. Click the plus (+) sign to expand the menu for **SCSI and RAID Controllers**.
3. Click the QLogic adapter that you want to update.
4. Click on the adapter that you want and select **Properties**.
5. Select the tab for **Driver**.
6. Click **Update Driver** and follow the instructions.

Installing the QLogic QLA23*xx* adapter card

This section tells you how to attach a SAN Volume Controller to a Windows NT host system with the QLogic QLA23*xx* adapter card.

Perform the following steps to install the QLogic QLA23*xx* adapter card:

1. Install the QLogic QLA23*xx* adapter card in the host system.
2. Connect the cable to the SAN Volume Controller port.
3. Restart the host.
4. Press Ctrl+Q to get to the **FAST!Util** menu.
5. From the **Configuration Settings** menu, select **Host Adapter Settings**.

   From the **Host Adapter Settings** menu, set the following parameters and values:

   a. Host adapter BIOS: **Disabled**
   b. Frame size: **2048**
   c. Loop reset delay: **5 (minimum)**
   d. Adapter hard loop ID: **Disabled**
6. From the **Advanced Adapter Settings** menu, press the Down Arrow to highlight **LUNs per target**. Press Enter. Set the parameters and values from the **Advanced Adapter Settings** menu as follows:

   a. Execution throttle: **100**
   b. Fast command posting: **Enabled**
   c. >4 GB addressing: **Disabled for 32 bit systems**
   d. LUNs per target: **0**
   e. Enable LIP reset: **No**
   f. Enable LIP full login: **Yes**
   g. Enable target reset: **Yes**

      Note: Enable LIP reset, Enable LIP full login, and Enable target reset parameters control the behavior of the adapter when Windows NT tries to perform a SCSI bus reset. You must perform a target reset to make cluster failovers work. Use the SCSI bus device reset option to clear SCSI reservations.

   h. Login retry count: **30 (minimum)**
   i. Port down retry count: **30 (minimum)**
   j. Driver load RISC code: **Enabled**
   k. Enable database updates: **No**
   l. Disable database load: **No**
   m. IOCB allocation: **256**
   n. Extended error logging: **Disabled (might be enabled for debugging)**
7. Press Esc to return to the **Configuration Settings** menu.
8. From the **Configuration Settings** menu, scroll down to **Extended Firmware Settings**. Press Enter.
9. From the **Extended Firmware Settings** menu, scroll down to **Connection Options** to open the Option and Type of Connection window.
10. Select:

    1 Point-to-point (required setting)
11. Press Esc.

12. Save the changes. Highlight **Yes**.
13. Restart the server.

Downloading the QLogic adapter driver

Perform the following steps to load the current driver onto the QLogic adapter card:

1. Go to http://www.ibm.com/storage/support/2145/.
2. Click **Interoperability matrix**.
3. Click **SAN Volume Controller interoperability matrix**.
4. Find the section for the current version of the driver and firmware and driver you want.
5. Go to the Qlogic web site.
6. Click **Drivers / Software** from the **Quick Links** list.
7. Select **IBM** from the **OEM-approved Drivers/Firmware** section.
8. Navigate to the adapter that you want to download, then click **Download**.

Installing the QLogic adapter driver

Perform the following steps to install the QLogic adapter drivers.

Note: If you are installing the fibre-channel adapter for the first time, you must specify the correct topology. You must also select the appropriate device mapping driver.

1. Go to the Qlogic web site.
2. From the navigation pane, click **Drivers / Software**.
3. In the Download Drivers / Software and HBAs window, click the Down Arrow to open the **Select a Series** menu.
4. Highlight and click **Fibre-Channel HBAs**.
5. In the Download Drivers / Software and HBAs window, click the Down Arrow to open the **Select a Product** menu.
6. Highlight and click the fibre-channel adapter that you want.
7. In the **Drivers and Management Software** menu, click **Windows NT**.
8. In the Windows NT Drivers table, click **Read Me**.

   See the following list for an example of information that you might find in a readme file:

   - Operating system support
   - Supported features
   - Creating the driver diskette
   - Installing the driver
   - Initial operating system installation with the QLogic controller as the boot
   - Adding the QLogic controller to the existing operating system
   - Updating the existing QLogic driver
   - Removing the driver
   - Driver parameters
   - System registry parameters
   - NVRAM parameters
   - Limitations
   - Additional notes

- Using Fast!UTIL menu to change the connection options
- Diskette content
- Contacting QLogic

Configuring for availability and recoverability

The host adapter uses the time-out parameter to bind its recovery actions and responses to the disk subsystem. The value exists in different places in the system configuration. You can retrieve and use it in different ways depending on the type of host adapter that is installed. “Setting the TimeOutValue registry” tells you how to modify the value safely in the Windows NT registry.

Setting the TimeOutValue registry

Perform the following steps to set the time-out value registry:

1. From the **Run** menu or command prompt, type:

   `Regedit32.exe`
2. Navigate to the following registry key:

   `HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Disk`
3. Look for the value called `TimeOutValue`. If the value called `TimeOutValue` does not exist, go to step 3a. If the `TimeOutValue` exists, go to step 4.
   a. Click **Edit → Add Value...**
   b. For ValueName, type: `TimeOutValue`.
   c. For data type, type: `REG-DWORD`.
   d. Click **OK**.
   e. For Value data, type: `3c`.
   f. For Base, click **Hex**.
   g. Click **OK**.
4. If the value exists and is less than 0x0000003c (60 decimal), perform the following steps to increase it to 0x3c.
   a. Click **TimeOutValue**.
   b. Click **Edit → DWORD...**.
   c. For Value data, type: `3c`.
   d. For Base, click **Hex**.
   e. Click **OK**.
5. Exit the Regedit32 program.
6. Restart your Windows NT server for the changes to take effect.

Appendix. Locating the worldwide port name (WWPN)

This chapter tells you how to locate the WWPN value for a fibre-channel adapter on the following host systems:

- Hewlett-Packard 9000
- IBM @server pSeries or RS/6000
- Linux
- Sun
- Windows 2000
- Windows NT 4.0

Fibre-channel port name identification

The WWPN consists of exactly 16 hexadecimal characters (0 - 9 and A - F). The SAN Volume Controller uses it to uniquely identify the fibre-channel adapter card that is installed in your host system. The SAN Volume Controller automatically finds the WWPN for your host fibre-channel adapter when you attach your host system to the SAN Volume Controller.

Note: If your host uses more than one fibre-channel adapter to connect to your SAN Volume Controller, you must add multiple entries to the host list for this host. You must add one for each fibre-channel adapter. Each adapter will have its own unique WWPN.

The format and content of the fibre-channel port identifier are determined by the manufacturer of the link control facility for the applicable fibre-channel port. The identifier is an eight-byte field, which the fibre-channel protocols use to uniquely identify the fibre-channel port.

You can manually locate a unique worldwide port name for the SAN Volume Controller by performing the steps in the following sections.

Locating the WWPN for a Hewlett-Packard host

To locate the WWPN for a Hewlett-Packard host system, perform the following steps:

1. Go to the root directory.
2. Type: `ioscan -fn | more`
3. Look under the description for the Fibre Channel Mass Storage adapter.
   For example, look for the device path name /dev/td1 or /dev/fcms1.
4. Type: `fcmsutil` */dev/td1* where */dev/td1* is the path.

Locating the WWPN for an IBM @server pSeries or an RS/6000 host

To locate the WWPN for an IBM @server pSeries or RS/6000 host system, perform the following steps:

1. Log in as root.
2. Type `lscfg -vl fcs`*x*, where *x* is the adapter number.
   The network address is the fibre-channel adapter port WWPN value.

Note: The lscfg -vl fcsx ROS level identifies the fibre-channel adapter firmware level.

Locating the WWPN for a Linux host

To locate the WWPN for an Intel server running the Red Hat version of the Linux operating system with a QLogic adapter, perform the following steps:

1. Restart the server.
2. Press Alt+Q to get the **FAST!Util** menu.

   If you have more than one fibre-channel adapter installed, all the fibre-channel adapters are displayed. Scroll down to the adapter you want. Press Enter.
3. From the **FAST!Util** menu, scroll down and select **Select Host Adapter**.
4. Scroll up and highlight **Configuration Settings**. Press Enter.
5. From the **Configuration Settings** menu, click **Host Adapter Settings**.
6. Write down the 16-digit alphanumeric string that is displayed.

When you configure storage on the SAN Volume Controller for fibre-channel attachment, you must specify the worldwide port name (WWPN) of the fibre-channel adapter.

On Linux systems, the required WWPN can be obtained from a file in the /proc filesystem as follows:

1. Type `cd /proc/scsi/qla2300`. This directory will contain consecutively numbered files according to how many fibre-channel adapter ports are contained on the host.
2. Type `cat 1`.

Figure 12 shows an example of what is displayed when you type `cd /proc/scsi/qla2300`.

```
QLogic PCI to Fibre Channel Host Adapter for ISP23xx:
Firmware version: 3.01.18, Driver version 6.05.00b9
.
.
Some lines missed
.
.
SCSI Device Information:
scsi-qla0-adapter-node=200000e08b051f7e; <-- WW Node name
scsi-qla0-adapter-port=210000e08b051f7e; <-- WW Port name
```

Figure 12. Example of what is displayed in the /proc/scsi/qla2300 directory

Locating the WWPN for a Sun host

Note: If you have multiple host adapters installed, you will see more than one WWPN.

Perform the following steps to locate the WWPN for the following adapters:

- JNI PCI adapter
- JNI SBUS adapter

1. After you install the adapter and you restart the host system, view the /var/adm/messages file.
2. Search for the line that contains the applicable phrase for your adapter:

a. For the JNI SBUS adapter, search for `fcawx: Fibre Channel WWNN`, where *x* is the adapter number (0, 1, and so on). You can find the WWPN on the same line immediately after the WWNN.

b. For the JNI PCI adapter, search for `fca-pcix: Fibre Channel WWNN`, where *x* is the adapter number (0, 1, and so on). You can find the WWPN on the same line following the WWNN.

c. For the QLogic QLA2200F adapter, search for `qla2200-hbax-adapter-port-name` where *x* is the adapter number (0, 1, and so on).

Locating the WWPN for a Windows 2000 host

To locate the WWPN for a Windows 2000 host system with a QLogic adapter, perform the following steps:

1. Restart the server.
2. Press Alt+Q to get the **FAST!Util** menu.

   If you have more than one fibre-channel adapter installed, all the fibre-channel adapters are displayed. Scroll down to the adapter you want. Press Enter.
3. From the **FAST!Util** menu, scroll down and select **Select Host Adapter**.
4. Scroll up and highlight **Configuration Settings**. Press Enter.
5. From the **Configuration Settings** menu, click **Host Adapter Settings**.
6. Write down the 16-digit alphanumeric string that is displayed on your screen.

Locating the WWPN for a Windows NT host

To locate the WWPN for a Windows NT host system with a QLogic adapter, perform the following steps:

1. Restart the server.
2. Press Alt+Q to get the **FAST!Util** menu.

   If you have more than one fibre-channel adapter installed, all the adapters are displayed. Scroll down to the adapter you want. Press Enter.
3. From the **FAST!Util** menu, scroll down and select **Select Host Adapter**.
4. Scroll up and highlight **Configuration Settings**. Press Enter.
5. From the **Configuration Settings** menu, click **Host Adapter Settings**.
6. Write down the 16-digit alphanumeric string that is displayed.

Accessibility

Features:

These are the major accessibility features in the SAN Volume Controller master console:

- You can use screen-reader software and a digital speech synthesizer to hear what is displayed on the screen. The following screen readers have been tested: JAWS v4.5 and IBM Home Page Reader v3.0.
- You can operate all features using the keyboard instead of the mouse.

Navigating by keyboard:

You can use keys or key combinations to perform operations and initiate many menu actions that can also be done through mouse actions. You can navigate the SAN Volume Controller Console and help system from the keyboard by using the following key combinations:

- To traverse to the next link, button, or topic, press Tab inside a frame (page).
- To expand or collapse a tree node, press →or ←, respectively.
- To move to the next topic node, press V or Tab.
- To move to the previous topic node, press ^ or Shift+Tab.
- To scroll all the way up or down, press Home or End, respectively.
- To go back, press Alt+←.
- To go forward, press Alt+→.
- To go to the next frame, press Ctrl+Tab.
- To move to the previous frame, press Shift+Ctrl+Tab.
- To print the current page or active frame, press Ctrl+P.
- To select, press Enter.

Accessing the publications:

You can view the publications for the SAN Volume Controller in Adobe Portable Document Format (PDF) using the Adobe Acrobat Reader. The PDFs are provided on a CD that is packaged with the product or you can access them at the following Web site:

www.ibm.com/storage/support/2145/

Related topics:

- “Related information” on page ix

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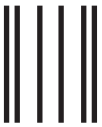

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