



*AIX 5L System Administration I:
Implementation*

(Course Code AU14)

Student Exercises

ERC 7.0

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Exercises Description

Exercise Instructions — This section contains what it is you are to accomplish. There are no definitive details on how to perform the tasks. You are given the opportunity to work through the exercise given what you learned in the unit presentation, utilizing the unit Student Notebook, your past experience and maybe a little intuition.

Exercise Instructions With Hints — This section is an exact duplicate of the Exercise Instructions section except that in addition, specific details and/or hints are provided to help step you through the exercise. A combination of using the Instructions section along with Instructions With Hints section can make for a rewarding combination providing you with no hints when you don't want them and hints when you need them.

Optional Exercises — This section gives you additional exercises to perform relating to the unit of discussion. It is strictly optional and should be performed when you have completed the required exercises. The required exercises pertain to the most pertinent information provided in the unit. This section may help round out the hands-on experience for a related unit.

Exercise 1. Using SMIT

What This Exercise Is About

AIX provides several different interface - ASCII (command-line), Common Desktop Environment (CDE) and X-Window (Motif). This exercise provides an opportunity to become familiar with the different interfaces. You will also begin using the System Management Interface Tool, SMIT.

What You Should Be Able to Do

After completing this exercise, students should be able to:

- Log in from CDE
- Log in from the ASCII interface
- Start CDE from the ASCII interface
- Start X-Window (Motif) from the ASCII interface
- Start SMIT (both ASCII and graphical version)
- Add users with default settings
- Navigate through the SMIT menus
- Use SMIT function keys
- Display the SMIT history files, smit.log and smit.script
- Set the initial interface

Introduction

This exercise is designed to give you experience working with the different interfaces and system management tools supplied with AIX Version 5.1. In most classrooms, there are two students per machine. Each machine will have one graphics terminal, Low Function Terminal (LFT), and another device to access the RS/6000. This device may be an ASCII terminal or it may be a PC with a network connection. If you are not sure, ask your instructor. In many cases, only one person will be able to perform the task at a time. You will need to work together with your teammate. Be sure to take turns at the keyboard.

The first screen you will see will be the log in box presented by the Common Desktop Environment (CDE). This is one of the graphical interfaces available to you.

The first part of this exercise, you will have a chance to see all three interfaces. For all other exercises, you will find instruction for the graphical interface (CDE or Motif) and the ASCII interface. Both sets

of instructions work equally as well. It will be your choice as to which interface you prefer.

Exercise Instructions

Part 1

AIX Interfaces

- ___ 1. The screen that is showing is the Common Desktop Environment (CDE) interface. It is a standard interface available on many UNIX platforms. If you do not have the graphical log in box on your screen, see your instructor for more information.

Log in using **root**. The password is **ibmaix**.

- In the box, enter: **root**
- In the box, enter root's password: **ibmaix** (You will not see the password appear on the screen)

- ___ 2. Open a terminal if one is not already open. In the terminal, you should see dtterm in the title bar and see a # prompt in the window.

- On the tool bar at the bottom, click the small triangle above the pencil and paper icon (fourth icon from the left). This will open a drawer of icons.
- Click ONCE on the Terminal icon. This should bring up a terminal window. All of the commands for this exercise should be type at the command line in this window.

Note: The CDE interface is a desktop management package. The other windows allow you to graphically navigate the directory tree and allow you to drag and drop files and directories easily. The tool bar at the bottom provides additional resources to you. If you have time at the end of the exercise, feel free to experiment with some of the other resources available to you under CDE.

- ___ 3. Type **smit** at the command line (#) prompt. What version of SMIT starts?

•# **smit**

This will give you the graphical version of SMIT. To navigate, you need to use your mouse.

- ___ 4. We will come back to SMIT shortly. Right now, exit from SMIT.

- Click the **Cancel** button at the bottom of the screen.

- ___ 5. Log out of CDE.

- On the blank area of the screen (not in a window), press and hold down the right mouse button. A drop down menu should appear. Continue holding the right mouse button and drag the cursor to the bottom of the menu to the **Log out...** selection. Then, release the mouse button.
- Click **Continue logout**

A new log in box should appear.

___ 6. Now, let's explore the ASCII interface. Log onto the system using the command line interface.

- On the bottom of the graphical log in box, left-click the **Options** button.
- Left-click **Command Line Login**
- Press the **Enter** key.
- Enter your log in name.
- Console login: **root**
- root's Password: **ibmaix** (the password will not appear)
- You should receive a **#** command prompt.

___ 7. Type **smit** at the command line. What version SMIT is started?

- # smit**

The ASCII version is started.

___ 8. Exit from SMIT.

- Press **F10**

___ 9. Now let's take a look at the last interface, the X-Window interface. Start X-Window from the ASCII interface command prompt.

- # xinit** -or- **# startx**

___ 10. X-Window is another graphical interface like CDE. This one doesn't provide the tool bar and other desktop management utilities. Open a second window.

- Move the cursor to an empty area on the screen and press and HOLD the right mouse button.
- While holding the mouse button down, drag the cursor to the first item on the menu - **New Window** and release the button. A new window should appear.

___ 11. Start SMIT. What version of SMIT starts?

- # smit**

This will give you the graphical version of SMIT.

___ 12. Exit from SMIT.

- Left-click the **Cancel** button.

___ 13. This time, start SMIT in the ASCII mode from the graphical interface.

- # smitty**

This command can be used in CDE as well to start an ASCII versions of SMIT. The graphical and ASCII versions the of SMIT can run from the Motif (both CDE and X-Window) interfaces, but the graphical version of SMIT cannot run from the AIX ASCII interface.

___ 14. Exit from SMIT.

- Press **F10**.

___ 15. Exit from X-Window.

- On a blank area of the screen, press and HOLD the right mouse button. While holding the right mouse button, drag the cursor to **End Session** and continue to HOLD the mouse button. A new menu will appear. While continuing to HOLD the right mouse button, drag the cursor to **Quit...** and release the mouse button.
- Click the **OK** button to Quit Mwm (Motif Window Manager).

You should now be back at the ASCII interface.

___ 16. Before leaving the ASCII interface, start up CDE interface from the command line.

- # **xinit /usr/dt/bin/Xsession** (be sure to use a capital **X** with **Xsession**)

You can get to both graphical interfaces from the ASCII command interface if you know the appropriate command. Once you are in one of the graphical interfaces, you cannot access the other graphical interface without closing the interface first.

___ 17. Log out of CDE.

- On the blank area of the screen (not in a window), press and hold down the right mouse button. A drop-down menu should appear. Continue holding the right mouse button and drag the cursor to the bottom of the menu to the **Log out...** selection. Then, release the mouse button.
- Click **Continue logout**

You should now return to the ASCII interface.

___ 18. Log out of the system.

- # **logout**

The CDE log in box will return automatically.

Note:

This gave you a chance to experience all three interfaces. If you want to run graphical applications like Web browsers or word processor, you will need to run one of the graphical interfaces.

The remaining labs in this course will let you decide which interface you would like to use. You will find instructions for **ASCII** and **Motif**. Motif covers both CDE and X-Window. Remember too, that you can run the ASCII commands from a graphical window.

The remaining labs also provide a further break down. You are given the choice of seeing only the **Instructions** or you can work from the **Instructions with Hints** section. Depending on your knowledge and the challenge you prefer, select your section.

If you decide to use the **Instructions with Hints** section, do not blindly follow the commands. Make sure you understand what the command is doing. If you have any questions, ask your instructor for guidance.

Continue to Part 2. Select either the Motif Interface section or the ASCII Interface section.

END OF LAB

Exercise Instructions

Part 2 (Motif Interface)

Using SMIT

- ___ 1. Log into CDE desktop using root and the password `ibmaix`.
- ___ 2. If necessary, open a terminal window. If one already exists, skip to the next step.
- ___ 3. Add five users to the system. They should be named **team100** through **team104**. Take all the defaults. These user names are needed for some of the exercises that follow. Customizing user attributes will be covered later in the course. Assign a password for each user that is the same as the user name. When the five users and their passwords have been entered, exit from SMIT.
- ___ 4. Start SMIT using the option to redirect the **smit.script** and **smit.log** files to the **/home/team100** directory. From the main SMIT menu, select **Processes & Subsystems**. Display all the current processes running on your system. Examine the output. Which command do you think was executed? _____ How can you find out? _____ Return to the main menu.
- ___ 5. In a similar manner, select each of the main SMIT menu entries, examine the submenu, then use the **Cancel** button to go back to the previous menu. **Do not execute any commands that may cause changes to the system.** Because you are logged in as root, you must be very careful.
- ___ 6. Exit from SMIT and return to your “`dtterm`”. Look at the SMIT history files with **pg** or **more**. What information is in each of these files? _____ Why should these files be monitored? _____
- ___ 7. As the system administrator, you can select the default interface that the users will use. In SMIT, find and set the interface to your choice. For the new interface to take effect, you will need to reboot your system.

END OF LAB

Exercise Instructions with Hints

Part 2 (Motif Interface)

Motif Interface

- ___ 1. Log into CDE desktop using **root** and the password **ibmaix**.
 - In the box, enter: **root**
 - In the box, enter root's password: **ibmaix** (You will not see the password appear on the screen)

- ___ 2. If necessary, open a terminal window. If one already exists, skip to the next step.
 - On the tool bar at the bottom, click the small triangle above the pencil and paper icon (fourth icon from the left). This will open a drawer of icons.
 - Click ONCE on the Terminal icon. This should bring up a terminal window. All of the commands for this exercise should be typed at the command line in this window.

- ___ 3. Add five users to the system. They should be named **team100** through **team104**. Take all the defaults. These user names are needed for some of the exercises that follow. Customizing user attributes will be covered later in the course. Assign a password for each user that is the same as the user name. When the five users and their passwords have been entered, exit from SMIT.
 - # **smit**
 - Click **Security & Users**
 - Click **Users**
 - Click **Add a User**
 - At the **User NAME** field type in the user name **team100** and click **OK**.
 - When you see the **OK** highlighted, click **Done** to return to the **Add a User** menu.
 - Add users **team101** through **team104** in the same way.
 - When the five users are added, click **Cancel** to return to the **Users** window.
 - Now click **Change a User's Password**
 - Type the users name, for example **team100** and click **OK**.
 - You will be prompted to provide **team100**'s new password. Make the password the same as the user name and press **enter**. You will be prompted to reenter **team100**'s new password. Do so.
 - When the system accepts the new password it will return you to the **Change a User's Password** screen. Follow the same procedure to set the new password for each of the other users.

- Once all passwords are set, click **Cancel** and then **Exit** to exit SMIT and return to the command line.
- ___ 4. Start SMIT using the options to redirect the **smit.script** and **smit.log** files to the **/home/team100**'s directory. From the main SMIT menu, select **Processes & Subsystems**. Display all the current processes running on your system. Examine the output. Which command do you think was executed? _____ How can you find out? _____ Return to the main menu.
- **# smit -s /home/team100/smit.script -l /home/team100/smit.log**
 - **Processes & Subsystems**
 - **Processes**
 - **Show All Current Processes**
 - A **Show THREADS information?** pop-up box is displayed. Click **NO**.
 - When the command has successfully completed, the output will be displayed. Review the output and when you are finished, click **Done**.
 - Click **Cancel** until you are back at the SMIT **System Management** screen.
- ___ 5. In a similar manner, select each of the main SMIT menu entries, examine the submenu, then use the **Cancel** button to go back to the previous menu. **Do not execute any commands that may cause changes to the system.** Because you are logged in as root, you must be very careful.
- Select each entry
 - Cancel
 - Repeat as appropriate
- ___ 6. Exit from SMIT and return to your "dtterm". Look at the SMIT history files with **pg** or **more**. What information is in each of these files? _____ Why should these files be monitored? _____
- Point and click **Exit**
 - Select Exit SMIT
 - **# more /home/team100/smit.log**
 - **# more /home/team100/smit.script**
- ___ 7. As the system administrator, you can select the default interface that the users will use. In SMIT, find and set the interface to your choice. For the new interface to take effect, you will need to reboot your system.
- **# smit**
 - Select **System Environments**
 - Select **Change System User Interface**
 - At **Select System Login User Interface**, generate list to see your choices.

- It is currently set to **AIX CDE 1.0**. If you prefer the **Command Line** interface, select it and click **OK** and continue to the next bullet. If you do **not** want to change the interface, click **Cancel** until you are out of SMIT and you are finished with the exercise.
- If you changed the interface, you will need to reboot the machine before it takes effect. From this SMIT screen, select **Stop the System**.

* MESSAGE to all users on the system	No Message
INTERACTIVE shutdown	no
RESTART the system after shutdown	yes
* TIME the system goes down	0

- Click **OK**
- Upon reboot, your new interface should appear.

-OR-

This step could be achieved from the command line with:
/usr/dt/bin/dtconfig -d (to disable CDE)
shutdown -Fr

END OF LAB

Exercise Instructions

Part 3 (ASCII Interface)

Using **SMIT (ASCII Interface)**

- ___ 1. Log into using a ASCII Command Line log in using root and the password `ibmaix`.
- ___ 2. Start SMIT.
- ___ 3. Add five users to the system. They should be named **team100** through **team104**. Take all of the defaults. Customizing the attributes will be covered later in the course. Assign a password for each user that is the same as the user name. When the five users and their passwords have been entered, exit from SMIT.
- ___ 4. Start SMIT using the options to redirect the `smit.script` and `smit.log` files to `/home/team100`'s directory. From the main SMIT menu, select Processes & Subsystems. Display all the current process running on your system. Examine the output. Which command do you think was executed? _____ How can you find out? _____ Return to the main menu.
- ___ 5. In a similar manner, select each of the main SMIT menu entries, examine the submenu, then use the **F3** key to back up to the previous menu. **Do not execute any commands that may cause changes to the system.** Because you are logged in as root, you must be very careful.
- ___ 6. Shell out (**F9**) and execute the **date** command. Return to SMIT and do the following:
 - 1) Stop **syslogd** subsystem
 - 2) View the command that was executed
 - 3) List ALL subsystems to see that **syslogd** is inoperative
 - 4) Restart **syslogd**
 - 5) Continue to the next instruction. Do NOT press F3 or exit SMIT
- ___ 7. You should have the COMMAND STATUS screen displayed. Capture an image of this screen. Exit SMIT.
- ___ 8. Look at the SMIT history files using **pg** or **more**. Look for the image you captured in the previous instruction. What information is in each of these files? _____ Why should these files be monitored? _____
- ___ 9. As the system administrator, you can select the default interface that the users will use. In SMIT, find and set the interface to your choice. For the new interface to take effect, you will need to reboot your system.

shutdown -Fr

- ___ 10. Log off the system

END OF EXERCISE

Exercise Instructions with Hints

Part 3 (ASCII Interface)

Using SMIT (ASCII Interface)

- ___ 1. Log into using a ASCII Command Line log in using **root** and the password **ibmaix**.
 - On the bottom of the graphical log in box, left-click the **Options** button.
 - Left-click **Command Line Login**
 - Press the **Enter** key.
 - Enter your log in name.
 - Console login: **root**
 - root's Password: **ibmaix** (the password will not appear)
 - You should receive a # command prompt.

- ___ 2. Start SMIT.
 - **# smit**

- ___ 3. Add five users to the system. They should be named **team100** through **team104**. Take all of the defaults. Customizing the attributes will be covered later in the course. Assign a password for each user that is the same as the user name. When the five users and their passwords have been entered, exit from SMIT.
 - **# smit**

Security & Users
Users
Add a User

 - * User NAME **[teamxx]**
accept all other defaults

Press **Enter** to run.

 - Press **F3** and repeat the process until all five users are added.
 - When all users are added, press **F3** until you reach the **Users** menu.
 - Select **Change a User's Password**

User Name **[teamxx]**

Changing password for "teamxx"
teamxx's New password: **teamxx** (the password will not appear on the screen)
Enter the new password again: **teamxx**

 - Repeat that process until all new accounts have passwords. Then press **F10** and exit from SMIT.

- ___ 4. Start SMIT using the options to redirect the **smit.script** and **smit.log** files to the **/home/team100** directory. From the main SMIT menu, select **Processes & Subsystems**. Display all the current process running on your system. Examine the output. Which command do you think was executed? _____ How can you find out? _____ Return to the main menu.

- **# smit -s /home/team100/smit.script -l /home/team100/smit.log**
 - Select **Processes & Subsystems**
 - **Processes**
 - **Show All Current Processes**
 - A **Show THREADS information?** pop-up box is displayed. Select **no**.
 - **F6** (to view the command)
 - **F3 - Cancel** until you are back at the **System Management** screen.
- ___ 5. In a similar manner, select each of the main SMIT menu entries, examine the submenu, then use the **F3** key to back up to the previous menu. **Do not execute any commands that may cause changes to the system.** Because you are logged in as root, you must be very careful.
- **Select each entry**
 - **F3**
 - **Repeat as appropriate**
- ___ 6. Shell out (**F9**) and execute the **date** command. Return to SMIT and do the following:
- 1) Stop **syslogd** subsystem
 - 2) View the command that was executed
 - 3) List ALL subsystems to see that **syslogd** is inoperative
 - 4) Restart **syslogd**
 - 5) Continue to the next instruction. Do **not** press F3 or exit SMIT
- **F9**; Enter
 - **# date**
 - **<ctrl-d>** to return to SMIT
 - From the main menu select **Processes and Subsystems**
 - **Subsystems**
 - **Stop Subsystem**
 - **Stop a Single Subsystem**
 - **F4** (to see the list of Subsystem Process ID)
 - Select **syslogd**
 - **Enter** (to stop the subsystem)
 - **F6** (to view the command)
 - **F3** back to **Subsystems** menu
 - **List All Subsystems** (**syslogd** should be inoperative)
 - **F3** back to **Subsystems** menu

- Select **Start a Subsystem**
 - **F4** (to see the list of Subsystem Name ID)
 - **Select syslogd**
 - **Enter** (to start the subsystem)
- ___ 7. You should have the COMMAND STATUS screen displayed. Capture an image of this screen. Exit SMIT.
- Press **F8**=(Image) and **Enter**
 - **F10**
- ___ 8. Look at the SMIT history files using **pg** or **more**. Look for the image you captured in the previous instruction. What information is in each of these files? _____
Why should these files be monitored? _____
- **# more /home/team100/smit.log**
 - **# more /home/team100/smit.script**
- ___ 9. As the system administrator, you can select the default interface that the users will use. In SMIT, find and set the interface to your choice. For the new interface to take effect, you will need to reboot your system.
- **# smit**
 - Select **System Environments**
 - Select **Change System User Interface**
 - At **Select System Login User Interface**, generate a list (**F4**) to see your choices.
 - It is currently set to **AIX CDE 1.0**. If you prefer the **Command Line** interface, select it and press **Enter**. (Make sure you select it and then execute it. It will need press **Enter** twice). Continue to the next bullet. If you don't want to change the interface, press **F3** until you are out of SMIT and you are finished with the exercise.
 - Press **F3** twice to get back to the **System Environment** screen.
 - If you did **not** make a change to the interface, select **F3 - Cancel** until you have exited SMIT. You are finished with the exercise. If you changed the interface, you will need to reboot the machine before it takes effect. From this SMIT screen, select **Stop the System**.
- | | |
|--------------------------------------|------------|
| * MESSAGE to all users on the system | No Message |
| INTERACTIVE shutdown | no |
| RESTART the system after shutdown | yes |
| * TIME the system goes down | 0 |
- Press **Enter**.
 - Upon reboot, your new interface should appear.

-OR-

This step could be achieved from the command line with:

```
# /usr/dt/bin/dtconfig -d (to disable CDE)
```

```
# shutdown -Fr
```

END OF LAB

Solutions

Following are the solutions for those instructions that include questions:

- 4 From the main menu, select **Processes & Subsystems**. Display all the current processes running on your system. Examine the output. Which command do you think was executed? _____ How can you find out? _____ Try it. Return to the main menu.

Answer: **ps -ef**. Pressing the **F6=Command** key from the output screen, displays a pop-up box that shows the command that was executed.

- 6 (Motif Interface version) Exit from SMIT and return to your “dtterm”. Look at the SMIT history files with **pg** or **more**. What information is in each of these files? _____ Why should these files be monitored? _____

Answer: The **smit.log** file contains a reference to each menu screen selected, the commands executed, output from the commands, and all screen images. The **smit.script** file contains the high-level commands executed, preceded by a comment showing the date and time when the command was executed. Both files should be monitored regularly and purged periodically so disk space is not wasted. Unlike the SMIT ASCII interface, the Motif interface automatically records all screen images. The F8 key in the Motif interface will show you the SMIT fastpath command instead.

- 8 (ASCII Interface version) Look at the SMIT history files with **pg** or **more**. Look for the image you captured in the previous instruction. What information is in each of these files? _____ Why should these files be monitored? _____

Answer: The **smit.log** file contains a reference to each menu screen selected, the commands executed, output from the commands, and all screen images. The **smit.script** file contains the high-level commands executed, preceded by a comment showing the date and time when the command was executed both files should be monitored regularly and purged periodically so disk space is not wasted.

Exercise 2. Web-based System Manager

What This Exercise Is About

This exercise provides an opportunity to use the Web-based System Manager (WebSM). If your classroom is networked, there is an optional part to allow you to configure your server for WebSM client access.

What You Should Be Able to Do

At the end of the lab, you should be able to:

- Use WebSM
- Configure WebSM for client machine access
- Use WebSM from the client machine via a browser

Introduction

This exercise is designed to give you experience working with WebSM in AIX Version 5.1. If you are sharing the machine, only one person should perform each step. You must work from a graphical interface for this exercise.

If your classroom is networked, you can configure and test WebSM for client machine access. The client machine can be another AIX system that supports JAVA or it can be a PC with a browser that is Java enabled.

Exercise Instructions

- ___ 1. Log in as teamxx.
- ___ 2. Make sure you are in the AIX windows or CDE environment. Access the Web-based System Manager.
- ___ 3. View system processes by both details and tree details. Viewing processes by tree detail provides a pictorial view of the parent/child relationship of the processes. Close the **Process** window when you have completed this task.
- ___ 4. View the **wsm** window that displays the current system date and time.
- ___ 5. Close the wsm Launch Pad window and logout of the system.

Configuring WebSM for Client Access (optional)

Since you have already configured the documentation services, you have already configured the web server. There are only two steps needed to complete the configuration.

- ___ 6. Log in as root and define the web server documentation directory.
- ___ 7. Enable WebSM server.
- ___ 8. DO THIS STEP ON THE CLIENT MACHINE

Start the browser and connect to WebSM. As time permits, get familiar with WebSM.

END OF LAB

Exercise Instructions with Hints

- ___ 1. Log in as teamxx.
- ___ 2. Make sure you are in the AIX windows or CDE environment. Access the Web-Based System Manager.
 - \$ **xinit** (if not in a windows environment)
 - \$ **wsm**
- ___ 3. View system processes by both details and tree details. Viewing processes by tree detail provides a pictorial view of the parent/child relationship of the processes. Close the **Process** window when you have completed this task.
 - From the WebSM Contents area, double-click **Processes**, then double-click on **All Processes**. Once the **Processes** window displays, scroll through the output.
 - There are two ways to display the processes as a 'tree':
 - Click **View** on the menu bar and then click **Tree Details**.
 - OR**
 - On the tool bar, click the Details icon, which is the rightmost one.
 - Once you have reviewed the output, close the window by clicking the back arrow on the title bar.
- ___ 4. View the **WebSM** window that displays the current system date and time.
 - Double-click **System Environment**
 - Double-click **Settings**
 - Double-click **Date and Time**
 - View the Date and Time and then click the **Time Zone** option. Since you are not the root user, you will not be able to make any changes.
 - When done, close both the **Date and Time** window and the **System Environment** window.
- ___ 5. Close the WebSM Launch Pad window and logout of the system.
 - Close the WebSM by clicking the upper left of the title bar and then clicking **Exit** on the pull-down menu.
 - Press and hold the right mouse button in the **root window** area.
 - While still holding the right mouse button, move the mouse to **End Session** or **Logout**.
 - Use the left mouse button to point to **Quit** on the next menu. Click **OK** to close AIX Windows.
 - On the command line, type **exit** to logout of AIX.

Configuring WebSM for Client Access (optional)

Since you have already configured the documentation services, you have already configured the web server. There are only two steps needed to complete the configuration.

___ 6. Log in as root and define the web server documentation directory.

•# /usr/websm/bin/wsmappletcfg -docdir /usr/HTTPServer/htdocs

Note: The directory name supplied is specific to IBM HTTP Server Web Server. If you have used a different web server, you would need to specify a different directory.

-OR-

•# smit web_configure

•Web-based System Manager

•* Documents directory [/usr/HTTPServer/htdocs/]

•Exit from SMIT

___ 7. Enable WebSM server

•# /usr/websm/bin/wsmserver -enable

___ 8. DO THIS STEP ON THE CLIENT MACHINE

Start a browser and connect to WebSM. As time permits, get familiar with WebSM.

•Start your browser

•Use URL **http://hostname/wsm.html**

Note: The hostname is the hostname of the server. You may need to use the IP address instead of the hostname if the hostname cannot be resolved. To learn the hostname and IP address of the server, on the server, type:

hostname

host hostname

You will need to supply the password for root to complete the WebSM startup

-OR-

•On AIX 4.3 or later systems, you can also run:

#wsm -host hostname

END OF LAB

Exercise 3. System Startup and Shutdown

What This Exercise Is About

This exercise will familiarize you with the system startup and shutdown process, and using the System Resource Controller (SRC).

What You Should Be Able to Do

After completing this exercise, students should be able to:

- Start an RS/6000 in Multi-User and Maintenance mode
- Switch to the **root** user and shutdown the system
- Execute the **lssrc**, **stopsrc**, and **startsrc** commands

Introduction

If there are two or more students per system, you must work as a single team throughout this exercise. All instructions involve using the system unit for starting and stopping the system in various modes.

Exercise Instructions

Multi-User Mode

- ___ 1. Log in using the user name and password provided by your instructor. The login name should be a user name such as **teamxx** where **xx** is a double digit number like 01, 02, and so forth. Switch to the **root** user. Display the **alog** file for the **bootlog**. Page through the output to see what devices were configured and the other tasks that were performed.

Note: If this is the first time you login using the user name, you will be prompted to change your password. Keep it the same as the user name.

- ___ 2. Page out the **/etc/inittab** file. Take a moment to become familiar with its contents. What is the run level of **rc**? _____ What does it mean? _____
- ___ 3. As the **root** user, shutdown and reboot the system to the graphical System Management Services mode.
- ___ 4. Take a few moments to explore the options located with each of the three main tasks on the System Management Services screen. Do not make any changes or run any tests. When you are done exploring, exit the SMS program and allow the system to reboot in multi-user mode.

System Resource Controller (SRC)

- ___ 5. Log in as **root**. List the active and inoperative subsystems on your system. Display a screen at a time. Locate the **syslogd** subsystem. It should be marked as active.
- ___ 6. Using the appropriate SRC commands, stop the **syslogd** subsystem. Check that it is inoperative. Restart it. Check that it is active.

Resetting the Run Level (INIT)

- ___ 7. Reset the run level to Single User Mode without rebooting the system.
- shutdown -m**
 - You will see several messages appear
 - When you see: **INIT: Single-User Mode**
 - Password:** enter the root password.
- ___ 8. Verify that subsystems have been stopped.
- ___ 9. Reset the Run Level to Multi-User Mode.
- ___ 10. Ensure that all normal subsystems have been started and are working properly.
- ___ 11. Shutdown and reboot the system one more time.

END OF EXERCISE

Exercise Instructions with Hints

Multi-User Mode

- ___ 1. Log in using the user name and password provided by your instructor. The login name should be a user name such as **teamxx** where **xx** is a double digit number like 01, 02, and so forth. Switch to the **root** user. Display the **alog** file for the **bootlog**. Page through the output to see what devices were configured and the other tasks that were performed.

Note: If this is the first time you login using the user name, you will be prompted to change your password. Keep it the same as the user name.

- Log in as **teamxx** and enter the password
- \$ su root**
- Enter **root's** password
- # alog -o -t boot | pg**

- ___ 2. Page out the **/etc/inittab** file. Take a moment to become familiar with its contents. What is the run level of **rc**? _____ What does it mean? _____

- # pg /etc/inittab**

Booting Using System Management Services

- ___ 3. As the **root** user, shutdown and reboot the system to the graphical System Management Services mode.

- # shutdown -Fr**

•When the first screen appears (PowerPC screen), after the keyboard icon but before the last icon appears, press **F1**. The System Management Service graphical screen will then display.

- ___ 4. Take a few moments to explore the options located with each of the three main tasks on the System Management Services screen. Do not make any changes or run any tests. When you are done exploring, exit the SMS program and allow the system to reboot in multi-user mode.

- Click **Config**. A clock will display as the program is working. This option allows you to view information about the setup of your system unit. Information about ISA adapters will not be displayed. Click **Exit** to return to the main SMS screen.
- Click **Boot (or Multiboot)**. A clock will display as the program is working. This option allows you to view and change to custom boot list. Click **Exit** to return to the main SMS screen.

- Click **Utilities**. This option allows you to perform various tasks and view additional information about your system. Note that this option allows you to change your power-on and privileged passwords. Press **Exit** to return to the main SMS screen.
- Click **Exit** at the SMS screen. This will cause the system to reboot in multi-user mode.

System Resource Controller (SRC)

___ 5. Log in as **root**. List the active and inoperative subsystems on your system. Display a screen at a time. Locate the **syslogd** subsystem. It should be marked as active.

- login: **root**
- root's Password: **<enter root's password>**
- # lssrc -a | pg**

___ 6. Using the appropriate SRC commands, stop the **syslogd** subsystem. Check that it is inoperative. Restart it. Check that it is active.

- # stopsrc -s syslogd**
- # lssrc -s syslogd**
- # startsrc -s syslogd**
- # lssrc -s syslogd**

Resetting the Run Level (INIT)

___ 7. Reset the run level to Single User Mode without rebooting the system.

- # shutdown -m**
- You will see several messages appear
- When you see
INIT: Single-User Mode
PASSWORD:
Enter the root password

___ 8. Verify that several subsystems have been stopped.

- # lssrc -a | pg** This command will fail as the SRC daemon is stopped

___ 9. Reset the Run Level to Multi-User Mode.

- # telinit 2**

___ 10. Ensure that all normal subsystems have been started and are working properly.

- login: **root**
- root's Password: **<enter root's password>**
- # lssrc -a | pg**

___ 11. Shut down and reboot the system one more time.

- # shutdown -Fr**

END OF EXERCISE

Solutions

Following are the solutions for those instructions that include questions that are in the PCI RS/6000 section:

2. Page out the **/etc/inittab** file. Take a moment to become familiar with its contents. What is the run level of **rc**? _____ What does it mean?

Answer: The run level for **rc** is 2. It represents AIX multi-user mode.

Exercise 4. Devices

What This Exercise Is About

This exercise will familiarize the students with listing device configuration information on the system and configuring a defined device.

What You Should Be Able to Do

At the end of the lab, you should be able to:

- List device configuration on a system using SMIT or the appropriate command
- List and change system parameters
- Configure a defined SCSI device

Introduction

This exercise is designed for you to become familiar with the methods you can use to discover what devices are on your system and how they are configured. It deals exclusively with adapters and SCSI types of devices. Future exercises will deal with terminals and printers.

The section, **Configuring A Defined Device**, can only be done if you have an externally attached tape drive or CD-ROM.

Exercise Instructions

Listing Device Configuration

- ___ 1. Log in as a regular user and **su** to the root user. If more than one person is using the same system you will need to work as a team.
- ___ 2. List all the supported devices on the system.
- ___ 3. List the configured devices on the system. Are your SCSI devices available?

- ___ 4. List information about the memory you have on the system. Record the amount of memory you have.
- ___ 5. List the disks on your system. Record how many you have.

Listing And Changing System Parameters

- ___ 6. The kernel is represented by a special logical device, **sys0**. This can be manipulated by commands or through SMIT.

List the attributes of the kernel. The only kernel attributes that can be changed are those that are marked with **True** in the last column of output.

Which attributes cannot be changed? _____

Which attribute describes the number of processes a user can run? _____

- ___ 7. By default the system is configured so that each user can run no more than 128 processes at once. Change this value to 150 processes per user. The new value will take effect immediately.

Configuring A Defined Device

- ___ 8. If you have an externally attached tape drive, continue with this section. Otherwise, skip to step 12.

Issue the **shutdown** command to bring your system down. If you have more than one user on your system, coordinate this task with the other users.

- ___ 9. Turn off the tape drive. Reboot the system.
- ___ 10. Log in and **su** to **root**. Check the status of the tape drive. Is it in a state where it can be used? _____
Why? _____
Record the name of the tape drive.
- ___ 11. Put the tape drive into the available state so it can be used. Use the name for the tape drive that you recorded in the previous instruction.

___ 12. Your machine must have a CD-ROM to continue with this section. Otherwise, you are done with this exercise.

Determine the status and logical name of your CD-ROM.

___ 13. Put the device into a Defined state.

___ 14. Remove the device from the customized database.

___ 15. Configure the CD-ROM for use.

END OF EXERCISE

Exercise Instructions With Hints

Listing Device Configuration

___ 1. Log in as a regular user and **su** to the root user. If more than one person is using the same system you will need to work as a team.

•**\$ su root**

___ 2. List all the supported devices on the system.

•**# lsdev -P -H | pg**

or

•**# smit**

Devices

List Devices

List All Supported Devices

___ 3. List the configured devices on the system. Are your SCSI devices available?

•**# lsdev -C -H | pg**

or

•**# smit**

Devices

List Devices

List All Defined Devices

-F3 to return to the menu

___ 4. List information about the memory you have on the system. Record the amount of memory you have.

•**# lsattr -E -l mem0**

•**# lsattr -El sys0 -a realmem**

-OR

•**# smit**

Devices

List Devices

Show Characteristics of a Defined Device

-Cursor through the devices listed until you see the entries for memory.

Select one of the memory entries and press **Enter**.

-F3 to return to the menu

___ 5. List the disks on your system. Record how many you have.

•# lsdev -C -c disk

-OR-

•# smit

Devices

Fixed Disk

List All Defined Disks

-F3 to return to the menu

Listing and Changing System Parameters

___ 6. The kernel is represented by a special logical device, **sys0**. This can be manipulated by commands or through SMIT.

List the attributes of the kernel. The only kernel attributes that can be changed are those that are marked with **True** in the last column of output.

Which attributes cannot be changed? _____

Which attribute describes the number of processes a user can run? _____

lsattr -E -l sys0

-OR-

smit

System Environments

Change/Show Characteristics of Operating System

___ 7. By default the system is configured so that each user can run no more than 128 processes at once. Change this value to 150 processes per user. The new value will take effect immediately.

•# chdev -l sys0 -a maxuproc=150

-OR-

•# smit

System Environments

Change/Show Characteristics of Operating System

-Maximum number PROCESSES allowed per user **[150]** OK or Enter **F3** to return to the menu **F10** to return to the command line

Configuring A Defined Device

- ___ 8. If you have an externally attached tape drive, continue with this section. Otherwise, skip to step 12.

Issue the **shutdown** command to bring your system down. If you have more than one user on your system, coordinate this task with the other users.

•# shutdown

-OR-

•# shutdown -F

- ___ 9. Turn off the tape drive. Reboot the system.

•Push the tape drive on/off switch to off.

•Power off the system unit, wait 15 seconds and then power it back up.

- ___ 10. Log in and **su** to **root**. Check the status of the tape drive. Is it in a state where it can be used? _____ Why? _____ Record the name of the tape drive.

•# lsdev -C -c tape

-OR-

•# smit

Devices

Tape Drive

List All Defined Tape Drives

-F3 to return to the menu

- ___ 11. Put the tape drive into the available state so it can be used. Use the name for the tape drive that you recorded in the previous instruction.

•Power on the tape drive.

•# mkdev -l rmtx (where x stands for the drive recorded in the previous instruction)

-OR-

•Power on the tape drive.

•# smit

Devices

Tape Drive

Configure a Defined Tape Drive

-Select the appropriate drive **OK** or **Enter**

- ___ 12. Your machine must have a CD-ROM to continue with this section. Otherwise, you are done with this exercise.

Determine the status and logical name of your CD-ROM.

```

•# lsdev -Cc cdrom
  or
•# smit
  Devices
  List Devices
  List All Defined Devices

```

- ___ 13. Put the device into a "Defined" state.

```

•# rmdev -l cd0
•# lsdev -Cc cdrom

cd0 should be "Defined"

  or

•# smit
  Devices
  CD-ROM Drive
  Remove a CD-ROM Drive
  (You will see a pop-up. Select the CD ROM that you wish to remove.)
  CD-ROM Drive                                cd0
  KEEP definition in database                  yes
  OK or ENTER

```

•F3 - Cancel back to the Devices Menu.

•Select **List Devices**
List All Defined Devices
cd0 should be "Defined"

- ___ 14. Remove the device from the customized database.

```

•# rmdev -dl cd0
•# lsdev -Cc cdrom

You should not see cd0 listed.

  or

•# smit
  Devices
  CD-ROM Drive
  Remove a CD-ROM Drive
  (You will see a pop-up. Select the CD ROM that you wish to remove.)
  CD ROM Drive                                cd0
  KEEP definition in database                  no
  OK or ENTER

```

- F3 - Cancel** back to the Devices Menu.
- Select **List Devices**
- List All Defined Devices**
- cd0 should not be found

___ 15. Configure the CD-ROM for use.

- # cfmgr**
- # lsdev -Cc cdrom**
cd0 should be "Available"
or
- # smit devices**
Install/Configure Devices Added After IPL
Input device / directory for software [none]
OK or ENTER
- F3 - Cancel** back to the Devices Menu.
- Select **List Devices**
List All Defined Devices
- cd0 should be "Available"

END OF EXERCISE

Solutions

Following are the solutions for those instructions that include questions:

6. The kernel is represented by a special logical device, **sys0**. This can be manipulated by commands or through SMIT. List the attributes of the kernel. Only some of the kernel attributes can be changed, those that are marked with **True** in the last column of output (if you are using SMIT there will be no + next to the attribute). Which attributes cannot be changed? _____

Answer: keylock, realmem, conslogin. Some PCI systems may also include fwversion, modelname, systemid

Which attribute describes the number of processes a user can run? _____

Answer: maxuproc

10. Log in and su to root. Check the status of the tape drive. Is it in a state where it can be used? _____
Why? _____
Record the name of the tape drive.

Answer: No because the system was not able to communicate with it during the reboot.

Exercise 5. Logical Volume Manager

What This Exercise Is About

The purpose of this exercise is to give students the opportunity to work with the facility that manages physical and logical data storage, the Logical Volume Manager (LVM). The Systems Management Interface Tool (SMIT) will be used extensively throughout this exercise.

What You Should Be Able to Do

By the end of this exercise, students should be able to:

- List and look at the characteristics of the system's volume groups, physical volumes and logical volumes
- Add a volume group
- Add a logical volume
- Extend the logical volume

Introduction

In this exercise you will be working extensively with SMIT to work with storage and file systems. First you will investigate existing volume groups, physical volumes and logical volumes. Once you are comfortable with the layout of your storage you will have the opportunity to add a physical volume to a volume group and then create a logical volume. Finally, you will make some changes to the logical volume characteristics. In many cases, both the SMIT screens and the command will be provided in the **Exercise Instruction With Hints** section. All tasks shown can also be done using the graphics version of SMIT.

Exercise Instructions

Exploring Your Storage Environment

- ___ 1. Log in as **teamxx** and **su** to **root**.
- ___ 2. List all of the system's volume groups. If you use SMIT, before pressing Enter for the output, try using the **F6** key to see the command that is being built.
- ___ 3. List the contents of the **rootvg** volume group. For **List OPTION** use **status**. Find the information that is necessary to answer the following questions about your environment:
 - How many physical volumes are there? _____
 - How many logical volumes are there? _____
 - How many total physical partitions are there for this volume group? _____
 - How many of those physical partitions are free? _____
 - How large are the physical partitions? _____
- ___ 4. List the contents of the **rootvg** once again this time selecting **physical volumes** for the **List OPTION**. Note: the free distribution of physical partitions is shown relative to the position on disk. These positions represent outer edge, outer midway, center, inner midway, inner edge. Make a note of the free partitions and their position on disk. _____
- ___ 5. List all of the physical volumes on the system.
- ___ 6. List the contents of any physical volume on your system. From the output of the **List OPTION status**, answer the following questions:
 - To which volume group does the physical volume belong? _____
 - What is the physical partition size? _____
 - How many total physical partitions are there? _____
 - How many of those physical partitions are used? _____Try other options for listing information about the physical volume you select.
- ___ 7. List all of the logical volumes in the **rootvg**.
- ___ 8. Show the characteristics for the logical volume **hd4**. From the output of **List OPTION status**, answer the following questions:
 - To which volume group does it belong? _____
 - How many copies? _____
 - How many physical partitions is it? _____
 - How large is the logical volume in megabytes? _____

Adding A Volume Group

- ___ 9. The completion of this section depends on having an available disk drive in your system that is not assigned to a volume group. Check for the existence of a disk drive that has not been assigned to a volume group.

If all disk drives are assigned, continue with the next section Adding A Logical Volume.

IMPORTANT — Only one user per system may complete this section. Please consult your teammates before continuing.

Only one physical volume has been defined to be a member of the **rootvg** volume group. Using the available physical volume located on your system, create a new volume group called **datavg**. Verify that the new volume group was successfully created.

Adding A Logical Volume

- ___ 10. Add a logical volume of one partition in size to the **datavg**. (NOTE: If you only have 1 disk on your system, create the logical volume in **rootvg**.) Allocate the partitions on the edge of the disk. Note the system generated name. _____
- ___ 11. Rename the logical volume created above to **yylv** (where **yy** represents the initials of your first and last name) instead of the system generated one, and ensure that the new name has been picked up.
- ___ 12. Extend the **yylv** logical volume by one partition and specify that the added partition be allocated on the edge of the disk. This logical volume will be used in the next exercise.

END OF EXERCISE

Exercise Instructions with Hints

Exploring Your Storage Environment

___ 1. Log in as **teamxx** and **su** to **root**.

•\$ su

___ 2. List all of the system's volume groups. If you use SMIT, before pressing Enter for the output, try using the **F6** key to see the command that is being built.

•# smit

System Storage Management (Physical & Logical Storage)

Logical Volume Manager

Volume Groups

List All Volume Groups

-List only the ACTIVE volume groups? [no]

OK or Enter

-OR-

•# lsvg

___ 3. List the contents of the **rootvg** volume group. For **List OPTION** use **status**. Find the information that is necessary to answer the following questions about your environment:

How many physical volumes are there? _____

How many logical volumes are there? _____ How

many total physical partitions are there for this volume group? _____ How

many of those physical partitions are free? _____ How

large are the physical partitions? _____

•F3 to go back to the **Volume Groups** menu

List Contents of a Volume Group

Select the VOLUME GROUP name [rootvg]

Select the list OPTION [status]

OK or Enter

-OR-

•# lsvg rootvg

___ 4. List the contents of the **rootvg** once again this time selecting **physical** volumes for the **List OPTION**. Note: The free distribution of physical partitions is shown relative to the position on disk. These positions represent outer edge, outer midway, center, inner midway, inner edge. Make a note of the free partitions and their position on disk. _____

•F3 back to the **List Contents of a Volume Group** menu

*VOLUME GROUP name [rootvg]

How many physical partitions is it? _____

How large is the logical volume in megabytes? _____

•F3 back to the **Logical Volumes** menu

Show Characteristics of a Logical Volume

-Use the List Box to view a list of all logical Volumes

```
*LOGICAL VOLUME name      [hd4]
List OPTION                 [status]
OK or Enter
```

-OR-

•# lslv hd4

Adding A Volume Group

___ 9. The completion of this section depends on having an available disk drive in your system that is not assigned to a volume group. Check for a disk drive that has not been assigned to a volume group.

If all disk drives are assigned, continue with the next section Adding A Logical Volume.

IMPORTANT -- Only one user per system may complete this section. Please consult your teammates before continuing.

Only one physical volume has been defined to be a member of the **rootvg** volume group. Using the available physical volume located on your system, create a new volume group called **datavg**. Verify that the new volume group was successfully created.

•# lspv

If there are two volumes with only one assigned to **rootvg**, continue with this step. If there aren't two volumes or both are assigned to **rootvg**, proceed to the next section **Adding A Logical Volume**.

•F3 back to the **Logical Volume Manager** menu.

Volume Groups

Add A Volume Group

```
*VOLUME GROUP name          [datavg]
Physical partition SIZE in megabytes [16]
*PHYSICAL VOLUME names      [hdiskx]
(where x is the number of the physical volume that has not been
assigned to a volume group)
ACTIVATE volume group AUTOMATICALLY
at system restart?          yes
OK or Enter
```

-OR-

- F3 back to the **Set Characteristic of a Logical Volume** menu
Increase the Size of a Logical Volume

*LOGICAL VOLUME name [yylv]
*Number of ADDITIONAL logical partitions [1]
POSITION on physical volume [edge]
(notice that this is already selected as this is
the current location of the existing PPs in the LV)
OK or Enter

-OR-

- # extendlv yy lv 1

END OF EXERCISE

Solutions

Following are the solutions for those instructions that include questions:

3. List the contents of the **rootvg** volume group. For **List OPTION** use **status**. Find the information that is necessary to answer the following questions about your environment:

How many physical volumes are there? _____ Answer: Check the field TOTAL PVs:

How many logical volumes are there? _____ Answer: Check the field LVs:

How many total physical partitions are there for this volume group? _____

Answer: Check the field TOTAL PPs:

How many of those physical partitions are free? _____ Answer: Check the field FREE PPs:

How large are the physical partitions? _____ Answer: Check the field PP SIZE:

6. List the contents of any physical volume on your system. From the output of the **List OPTION status**, answer the following questions:

To which volume group does the physical volume belong? _____ Answer: Check the field VOLUME GROUP:

What is the physical partition size? _____ Answer: Check the field PPSIZE:

How many total physical partitions are there? _____ Answer: Check the field TOTAL PPs:

How many of those physical partitions are used? _____ Answer: Check the field USED PPs:

Try other options for listing information about the physical volume you select.

8. Show the characteristics for the logical volume **hd4**. From the output of **List OPTION status**, answer the following questions:

To which volume group does it belong? _____ Answer: Check the field VOLUME GROUP:

How many copies? _____ Answer: Check the field COPIES:

How many physical partitions is it? _____ Answer: Check the field PPs:

How large is the volume group in megabytes? _____ Answer: Check the field PP SIZE:

Exercise 6. Working with File Systems

What This Exercise Is About

In this exercise the student will be given the opportunity to work with file systems.

What You Should Be Able to Do

After completing this exercise, students should be able to:

- Add and remove an AIX file system
- Create an AIX file system using the bytes per inode and file system fragment capability of AIX Version 4
- Mount and unmount the file system
- Extend a file system
- Add and remove mirrors

Introduction

In this exercise you will be using SMIT extensively to work with file systems. You will be adding a file system to the logical volume you created in the previous exercise and then mounting it so users can access the storage space. You will copy files into this file system and then experiment with unmounting and mounting the file system once again but in different locations. You will also get an opportunity to remove a file system and create a file system. The last portion of the exercise provides exposure to creating a mirrored file system and then changing some characteristics of the mirrored file system.

Exercise Instructions

Creating a Journalled File System

- ___ 1. Log in to the system and **su** to **root**. In order to use the space we set aside when we created the logical volume in the previous exercise, we need to put a file system in it. Create a journalled file system on the logical volume you created in the previous exercise and make the default mount point **/home/teamxx/dir1** where the **xx** represents your team number. (Wherever you see **yylv** substitute your initials for **yy**)
- ___ 2. Now, can the space be used to create an AIX file?

Mount the filesystem. Verify that it is mounted. Check the owner and group of the mount point. Change the owner and group of the mount point to **teamxx** and **staff**. Copy all files and directories that are in the **/usr/samples** directory to the **/home/teamxx/dir1** directory.

- ___ 3. Create a compressed journalled file system in a volume group where there is space and let the system create the logical volume for you. Create it with a size of one physical partition, 512 bytes per inode, a fragment size of 512 (in bytes) and an agsize of eight. Have it mount automatically at system restart. Set its default mount point to **/home/teamxx/dir2**.
- ___ 4. Check to see if it is mounted. It shouldn't be. Mount it. Verify that it is mounted. Change the owner and group of the mount point to **teamxx** and **staff**.
- ___ 5. Add several files to the **/home/teamxx/dir2** directory. (Note: A quick way to do this is through the use of the touch command.)
- ___ 6. List the files in the **/home/teamxx/dir1** directory. Unmount **/home/teamxx/dir1** and list the files again. (Note: If you aren't **root** then **su** to **root**)
- ___ 7. List the files in the **/home/teamxx/dir2** directory. It should have all the files you created in it from instruction 5. Then mount **yylv** on **/home/teamxx/dir2** and list the files in **/home/teamxx/dir2**. What files are there now? _____
Where did they come from? _____
What happened to the files that were originally seen in **/home/teamxx/dir2**?

- ___ 8. Unmount **/dev/yylv**. Mount **/home/teamxx/dir1**. List the files in both **/home/teamxx/dir1** and **/home/teamxx/dir2** to be sure they are set up as originally created.

Changing The File System Size

- ___ 9. Find out the names of the logical volumes on which the file systems are created. (Hint: Use the Mount Point column in the output from the logical volume listing to find the name of the logical volume.) Find the LVs the file systems are on and the PPs in

each file system and write it down.

size of each? _____

- ___ 10. Extend the size of **/home/teamxx/dir2** file system by 10 512-byte blocks. How much did the file system actually get extended? _____

Why didn't the size increase to 16394? _____

Did this change the size of the logical volume with which it is associated?

- ___ 11. Extend the size of the **yylv** logical volume by one physical partition. Did this change the size of the file system? _____

Why not? _____

Make it so the file system takes up all the space allocated to the logical volume.

Removing a File System

- ___ 12. Remove the **lvxx** logical volume, the one with **/home/teamxx/dir2** as the mount point. (where **xx** is the number of the logical volume assigned by the system when you created the file system in instruction 3. Can it be done?

- ___ 13. Unmount **/home/teamxx/dir2** and remove the **lvxx** logical volume. Does this remove all references to the logical volume and its mount point? _____

- ___ 14. Ensure that all references to the **lvxx** logical volume and its mount point have been removed by removing the file system. Do you see any potential problems with removing a logical volume and then removing the file system? _____

Working with Mirrors

- ___ 15. Change the characteristics of the **yylv** logical volume so that mirroring will be turned on to have a single mirror (two copies). Be sure to change from creating a mirror on separate disks to **no** if you do not have two drives in your volume group. Other than that, take all the defaults.

- ___ 16. Show the characteristics of the **yylv** logical volume. Can you tell that it is mirrored?

What information indicates it is mirrored? _____

What else did you notice about the **yylv** logical volume that is different?

What is the LV STATE? _____

Why do you think it is marked stale? _____

What is the scheduling policy for writes? _____

- ___ 17. Change the characteristics of your mirrored logical volume to do sequential writes. Synchronize the copies. Fix the problem based on the message you receive and try again. Be sure it is mounted before continuing to the next instruction.
- ___ 18. Show the characteristics of the **yylv** logical volume. What values have changed?

- ___ 19. Turn off mirroring on the **yylv** logical volume.

END OF EXERCISE

Exercise Instructions with Hints

Creating a Journalled File System

- ___ 1. Log in to the system and **su** to **root**. In order to use the space we set aside when we created the logical volume in the previous exercise, we need to put a file system in it. Create a journalled file system on the logical volume you created in the previous exercise and make the default mount point **/home/teamxx/dir1** where the **xx** represents your team number. (Wherever you see **yylv** substitute your initials for **yy**)

•\$ **su**

•# **smit**

System Storage Management (Physical & Logical Storage)

File Systems

Add / Change / Show / Delete File Systems

Journalled File Systems

Add a Journalled File System on a Previously Defined Logical Volume

Add a Standard Journalled File System

* LOGICAL VOLUME name **yylv**

(where **yy** represents your initials)

* MOUNT POINT **[/home/teamxx/dir1]**

Mount AUTOMATICALLY at system restart? **yes**

OK or Enter

-OR-

**-# crfs -v jfs -d yylv -m /home/teamxx/dir1 -A yes -p rw -t no -a frag=4096
-a nbpi=4096 -a ag=8**

- ___ 2. Now, can the space be used to create an AIX file?

Mount the filesystem. Verify that it is mounted. Check the owner and group of the mount point. Change the owner and group of the mount point to **teamxx** and **staff**. Copy all files and directories that are in the **/usr/samples** directory to the **/home/teamxx/dir1** directory.

•**F3** to go back to the **File Systems** menu

List All Mounted File Systems

• **F3** to go back to the **File Systems** menu

Mount a File System

-FILE SYSTEM name **[/dev/yylv]**

OK or Enter

•**F3** to go back to the **File Systems** menu

List All Mounted File Systems

- **F9** to exit to a shell (or open a window if in AIXWindows)
- **# ls -ld /home/teamxx/dir1**
- **# chown teamxx.staff /home/teamxx/dir1**
- **# cp -r /usr/samples /home/teamxx/dir1**
- **exit** to return to SMIT

-OR-

- **# mount**
- **# mount /dev/yylv**
- **# mount**
- **# ls -ld /home/teamxx/dir1**
- **# chown teamxx.staff /home/teamxx/dir1**
- **# cp -r /usr/samples /home/teamxx/dir1**

- ___ 3. Create a compressed journaled file system in a volume group where there is space and let the system create the logical volume for you. Create it with a size of one physical partition, 512 bytes per inode, a fragment size of 512 (in bytes) and an agsize of eight. Have it mount automatically at system restart. Set its default mount point to **/home/teamxx/dir2**.

- **F3** to go back to the **File Systems** menu.

Add/Change/Show/Delete File Systems

Journaled File Systems

Add a Journaled File System

Add a Compressed Journaled File System

*SIZE of file system (in 512-byte blocks) [16384]

*MOUNT POINT

[/home/teamxx/dir2]

Mount AUTOMATICALLY at system restart? yes

Fragment Size (bytes) 512

Number of bytes per inode 512

Allocation Group Size 8

OK or Enter

-OR-

- **#crfs -v jfs -g rootvg -a size=16384 -m/home/teamxx/dir2 -A yes -p rw -t no -a frag=512 -a compress=LZ -a ag=8**

Note: 16384 is the exact size in 512-byte blocks of 1 8MB PP. Any value from one to 16384 can be put in this field to get the same results of a one PP size of file system.

- ___ 4. Check to see if it is mounted. It shouldn't be. Mount it. Verify that it is mounted. Change the owner and group of the mount point to **teamxx** and **staff**.

•F3 to go back to the **File Systems** menu

List All Mounted File Systems

•F3 to go back to the **File Systems** menu

Mount a File System

-FILE SYSTEM name **[/dev/lvxx]**

(where **xx** is the system generated LV number)

OK or Enter

•F3 to go back to the **File Systems** menu

List All Mounted File Systems

•Exit SMIT

•# **chown teamxx.staff /home/teamxx/dir2**

-OR-

•# **mount**

•# **mount /dev/lvxx**

•# **mount**

•# **chown teamxx.staff /home/teamxx/dir2**

- ___ 5. Add several files to the **/home/teamxx/dir2** directory. (Note: A quick way to do this is through the use of the touch command.)

•# **cd /home/teamxx/dir2**

•# **touch file1 file2 file3 file4 file5 file6 file7**

- ___ 6. List the files in the **/home/teamxx/dir1** directory. Unmount **/home/teamxx/dir1** and list the files again. (Note: If you aren't **root** then **su** to **root**)

•# **cd /home/teamxx/dir1**

•# **ls -a**

•# **cd ..**

(if you aren't **root** then **su** to **root**)

•\$ **su**

root's Password: **ibmaix**

•# **umount /home/teamxx/dir1**

•# **ls -a dir1**

- ___ 7. List the files in the **/home/teamxx/dir2** directory. It should have all the files you created in it from instruction 5. Then mount **yylv** on **/home/teamxx/dir2** and list the files in **/home/teamxx/dir2**. What files are there now? _____

Where did they come from? _____

What happened to the files that were originally seen in **/home/teamxx/dir2**?

- # ls -a dir2
- # mount /dev/yylv /home/teamxx/dir2
- # ls -a dir2

___ 8. Unmount /dev/yylv. Mount /home/teamxx/dir1. List the files in both /home/teamxx/dir1 and /home/teamxx/dir2 to be sure they are set up as originally created.

- # umount /dev/yylv
- # ls -a dir2
- # mount /home/teamxx/dir1
- # ls -a dir1
- # ls -a dir2

Changing The File System Size

___ 9. Find out the names of the logical volumes on which the file systems are created. (Hint: Use the Mount Point column in the output from the logical volume listing to find the name of the logical volume.) Find the LVs the file systems are on and the PPs in each file system and write it down.

size of each? _____

- # smit
- System Storage Management (Physical & Logical Storage)**
- Logical Volume Manager**
- Logical Volumes**
- List All Logical Volumes by Volume Group**
- OR-**
- # lsvg -o | lsvg -i -l
- # df

___ 10. Extend the size of /home/teamxx/dir2 file system by 10 512-byte blocks. How much did the file system actually get extended? _____
Why didn't the size increase to 16394? _____
Did this change the size of the logical volume with which it is associated?

- F3 to go back to the **System Storage Management** menu
- File Systems**
- Add / Change / Show / Delete File Systems**
- Journalled File Systems**

Change / Show Characteristics of a Journaled File System

-Select the correct mount point from the selector screen.

SIZE of file system (in 512-byte blocks) [16394]

OK or Enter

•**F3** to go back to the **System Storage Management** menu

Logical Volume Manager

Logical Volumes

List All Logical Volumes by Volume Group

-OR-

•**# chfs -a size=16394 /home/teamxx/dir2**

•**# lsvg -o | lsvg -i -l**

•**# df**

___ 11. Extend the size of the **yylv** logical volume by one physical partition. Did this change the size of the file system? _____

Why not? _____

Make it so the file system takes up all the space allocated to the logical volume.

•**F3** to go back to the **Logical Volume Manager** menu

Logical Volumes

Set Characteristic of a Logical Volume

Increase the Size of a Logical Volume

LOGICAL VOLUME name [yylv]

Number of ADDITIONAL logical partitions [1]

OK or Enter

•**F3** to go back to the **System Storage Management** menu

File Systems

Add / Change / Show / Delete File Systems

Journaled File System

Change/Show Characteristics of a Journaled File System

-File System Name [/home/teamxx/dir1]

OK or Enter

-OR-

•**# lsvg -l rootvg (or datavg)**

•**# df**

•At this point your logical volume should be three physical partitions in size but your file system only 16384 512-byte blocks in size. Increase the size of the

Logical Volumes**Remove a Logical Volume**

-LOGICAL VOLUME name **[lvxx]**

-The logical volume should not exist

—**Cancel**

-OR-

-# rmlv -f lvxx

- ___ 14. Ensure that all references to the **lvxx** logical volume and its mount point have been removed by removing the file system. Do you see any potential problems with removing a logical volume and then removing the file system?_____

•**F3** to go back to the **System Storage Management** menu

File Systems Add / Change / Show / Delete File Systems Journaled File Systems Remove a Journaled File System

-FILE SYSTEM name **/home/teamxx/dir2**

—Remove Mount Point **yes**

OK or Enter, OK or Enter

-OR-

•**# rmfs -r /home/teamxx/dir2**

•**F3** to go back to the **System Storage Management** menu.

Working with Mirrors

- ___ 15. Change the characteristics of the **yylv** logical volume so that mirroring will be turned on to have a single mirror (two copies). Be sure to change from creating a mirror on separate disks to **no** if you do not have two drives in your volume group. Other than that, take all the defaults.

•**F3** back to the **Logical Volumes** menu.

Set Characteristic of a Logical Volume

Add a Copy to a Logical Volume

*LOGICAL VOLUME name **[yylv]**

```

*NEW TOTAL number of logical partition copies           [2]
PHYSICAL VOLUME names                                 [hdiskn&rbrk
(if you do not have two drives leave it at the default of hdisk0)
Allocate each logical partition copy
on a SEPARATE physical volume?                         [yes]
(If there is only one physical volume in the volume group, you must
choose no)
OK or Enter
    
```

-OR-

•# mklvcopy -s n yy1v 2 hdiskn

- ___ 16. Show the characteristics of the yy1v logical volume.
 Can you tell that it is mirrored? _____
 What information indicates it is mirrored? _____
 What else did you notice about the yy1v logical volume that is
 different? _____
 What is the LV STATE? _____
 Why do you think it is marked stale? _____
 What is the scheduling policy for writes? _____

•F3 back to the **Logical Volumes** menu

Show Characteristics of a Logical Volume

```

LOGICAL VOLUME name                                 [yy1v]

List OPTION                                         [status]
OK or Enter
    
```

-OR-

•# lslv yy1v

- ___ 17. Change the characteristics of your mirrored logical volume to do sequential writes.
 Synchronize the copies. Fix the problem based on the message you receive and try
 again. Be sure it is mounted before continuing to the next instruction.

•Try changing the write policy:

F3 back to the **Logical Volumes** screen

Set Characteristic of a Logical Volume
Change a Logical Volume

```

LOGICAL VOLUME name                                 [yy1v]

SCHEDULING POLICY for writing logical                [sequential]
partition copies
OK or Enter
    
```

- To fix the problem:

F3 back to the **System Storage Management** menu.

File Systems
Unmount a File System

-NAME of file system to unmount [/home/teamxx/dir1]

-OK or Enter

- Try changing the write policy again:

F3 back to the **System Storage Management** menu.

Logical Volume Manager
Logical Volumes
Set Characteristic of a Logical Volume
Change a Logical Volume

*LOGICAL VOLUME name [yylv]
SCHEDULING POLICY for writing logical [sequential]
partition copies
OK or Enter

- To synchronize the copies:

•# syncvg -l yylv

•# mount /home/teamxx/dir1

- Return to SMIT

-OR-

- Try changing the write policy:

chlv -d s yylv

- To fix the problem:

unmount /home/teamxx/dir1

- Try changing the write policy again:

chlv -d s yylv

- To synchronize the copies:

syncvg -l yylv

•# mount /home/teamxx/dir1

___ 18. Show the characteristics of the **yylv** logical volume. What values have changed?

- F3** to go back to the **Logical Volumes** menu.

Show Characteristics of a Logical Volume

*LOGICAL VOLUME name [yylv]

List OPTION

[status]

OK or Enter

-OR-

•# lslv yy1v

___ 19. Turn off mirroring on the **yy1v** logical volume.

•F3 to go back to the **Logical Volumes** menu.

Set Characteristics of a Logical Volume

Remove a Copy from a Logical Volume

*LOGICAL VOLUME name

[yy1v]

*NEW maximum number of logical partition [1]

copies

OK or Enter

-OR-

•# rmlvcopy yy1v 1

END OF EXERCISE

Solutions

Following are the solutions for those instructions that include questions:

2. Now can we use the space to create an AIX file? _____
 Check to see that it is mounted. Mount the filesystem. Verify that it is mounted. Change the owner and group of the mount point to teamxx and staff. As the user teamxx, copy all files that are in the **/usr/samples** directory to the **/home/teamxx/dir1** directory.

Answer: No, because the file system has not yet been mounted. A file system has to be mounted for it to be available to users.

7. List the files in the **/home/teamxx/dir2** directory. It should have all the files you created in it from instruction 5. Then mount **yylv** on **/home/teamxx/dir2** and list the files in **/home/teamxx/dir2**. What files are there now? _____
 Where did they come from? _____
 What happened to the files that were originally seen in **/home/teamxx/dir2**?

Answer: The files that were copied from the **/usr/samples** directory. They are in the **yylv** logical volume which can be mounted at any directory on the system. The files that were originally seen in **/home/teamxx/dir2** are still on the system, they just can't be accessed at this time because the file system pointers are pointing to the files in the **yylv** logical volume.

9. Find out the names of the logical volumes on which the file systems are created. (Hint: Use the Mount Point column in the output from the logical volume listing to find the name of the logical volume.) Find the LVs the file systems are on and the PPs in each file system and write it down.

size of each? _____

Answer: The **/home/teamxx/dir1** logical volume name should be **yylv** (where **yy** represents your initials) and the **/home/teamxx/dir2** logical volume name should be **lv01**. **yylv** should be 2 physical partitions at this point and **lv01** should be 1 physical partition. The 512-byte block equivalent size would be 32768 and 16384 respectively.

10. Extend the size of **/home/teamxx/dir2** file system by 10 - 512-byte blocks. How much did the file system actually get extended? _____
 Why didn't the size increase to 16394? _____
 Did this change the size of the logical volume with which it is associated?

Why? _____

Answer: The file system actually got extended by 16384 512-byte blocks because the system allocates disk space in increments of physical partitions. With a 4MB

physical partition, this equates to 16384 512-byte blocks per physical partition. The total size of the file system should now be 32768 512-byte blocks or 16MB.

Yes, it changed the size of the logical volume because in order for the file system to expand, the logical volume has to expand as well.

11. Extend the size of the **yylv** logical volume by 1 physical partition. Did this change the size of the file system? _____

Why not? _____

Make it so the file system takes up all the space allocated to the logical volume.

Answer: Extending the logical volume does not automatically extend the size of the file system. However, in order for users to get access to that space, the file system needs to then be expanded to fill the rest of the expanded logical volume.

12. Remove the **lvxx** logical volume (where **xx** is the number of the logical volume assigned by the system when you created the file system in instruction 3.) Can it be done? _____

Why not? _____

Answer: No. Because the file system related to the logical volume is mounted.

13. Unmount **/home/teamxx/dir2** and remove the **lvxx** logical volume. Does this remove all references to the logical volume and its mount point? _____

Answer: No, because the **/etc/filesystem** file still has the file system stanza in it which includes reference to the logical volume and the mount point.

14. Remove all references to the logical volume and its mount point by removing the file system. Do you see any potential problems with removing a logical volume and then removing the file system? _____

Answer: Yes, because if you remove the logical volume and forget to either remove the entry in the **/etc/filesystem** file or remove the file system through SMIT, you could create another filesystem that uses the same logical volume name (especially if you allow the system to create the logical volume names) and then remember at a later date that you needed to remove the old file system. If you then do the remove operation through SMIT it uses the high level command **rmfs** which also removes the logical volume. The logical volume it would be removing is the new one which is not what you really wanted to do. For most situations, it is best to remove the file system and let the system remove the logical volume for you rather than removing the logical volume first and relying on remembering to remove the file system right afterwards.

16. Show the characteristics of the **yylv** logical volume. Can you tell that it is mirrored?

What information indicates it is mirrored? _____

What else did you notice about the **yylv** logical volume that is different?

What is the LV STATE? _____

Why do you think it is marked stale? _____

What is the scheduling policy for writes?:blank with=9p.

Answer: Yes, you can tell it is mirrored by looking at the number of copies. If there is only one copy, it is not mirrored. A two or three indicates either single or double mirroring.

The LV STATE should be stale because the exercise did not have you synchronize your copies when you turned mirroring on.

The scheduling policy for writes is set as parallel.

18. Show the characteristics of the **yylv** logical volume. What values have changed?

Answer: The STALE PPs field should now have a value of 0 and the SCHED POLICY field should show sequential.

Exercise 7. Managing File Systems

What This Exercise Is About

The purpose of this exercise is to give students the opportunity to understand more about managing file system space and dealing with file system problems

What You Should Be Able to Do

After completing this exercise, students should be able to:

- Determine which directories and files are using the greatest amount of file system space
- Defragment a file system
- Verify a file system using **fsck**
- Use disk fragments to improve disk usage efficiency
- Use JFS compression

Introduction

In this exercise you will be performing many of the activities required of a system administrator to manage disk space. Most of these activities require use of commands on a command line. This exercise requires the successful completion of exercises 8 and 9.

Throughout this exercise you will be asked to change several times from your regular user name, **teamxx**, to **root** and then back again. It is a good idea to use **exit** to return to the previous user after completion of a task by that user instead of continually executing the **su** command.

In order to do the sections **Using Fragments For Disk Usage Efficiency** and **Using JFS Compression**, it is assumed that you have two disk drives in your system and have completed the section **Adding A Volume Group** from **Exercise 5 - Logical Volume Manager**.

Exercise Instructions

Determining File System Usage

- ___ 1. If you aren't already, log in to your system and then **su** to **root**. Assume you have already determined that the **/home/teamxx/dir1** file system is close to full. Try to determine which of the directories is the biggest user of the space. Then try finding out which is the biggest file in that directory. Use the **sort** command to organize the output in order of highest to lowest use. Finally, determine who is the owner of that file.
- ___ 2. Let's assume that you have concluded that space is needed, therefore the file system needs to be expanded. Expand the filesystem by the size of one physical partition. Verify the usage of this filesystem.

Using Fragments for Disk Usage Efficiency

- ___ 3. For this exercise you will create two file systems, one with a fragment size of 512 bytes and the other with the default fragment size of 4096. For both filesystems use a value of 512 for NBPI. Allocate 50000 512-byte blocks for each file system and put them in the **datavg** volume group. Use **/tmp/frag512** as the mount point for the file system with a fragment size of 512 and **/tmp/frag4096** as the mount point for the one with the default fragment size. If more than one student is performing this part of the exercise separately on the same RS/6000 system, it will be necessary to modify the filesystem names in order to make them unique. Once the filesystems are created, mount them.
- ___ 4. Check both file systems with **df -v** and note any used space.
- ___ 5. To test their efficiency for storing a large number of very small files use the **/home/workshop/mkfile** script. This script creates a file that is 512 bytes in size. This script requires the file size parameter to be passed to it with the suffix of "bytefile". For example: **/home/workshop/mkfile 512** will create a file in your current directory called **512bytefile**. Run this command from the **/tmp** directory creating a 512-byte file.
- ___ 6. To test the number of 512-byte files that can be stored in each file system, run the shell script **/home/workshop/fragcopy**. The shell script has the usage: **fragcopy numfiles dir/sourcefilename dir/targetfilename** The **fragcopy** script will create copies of the **sourcefilename** until either the file system is full or the **numfiles** value is reached. The files will be put in the directory specified in **dir/targetfilename** with the **targetfilename** as the prefix followed by a "." and a number which represents the count of the file currently being created. While **fragcopy** processes, a count will be displayed showing the number of files that have been successfully copied. Have **fragcopy copy /tmp/512bytefile 500** times and have as the **dir/targetfilename** **/tmp/frag512/frag50**.

-
- ___ 7. Look at the contents of the **/tmp/frag512** directory.
- ___ 8. Do the same as above only this time create copies of the **512bytefile** in **/tmp/frag4096**
- ___ 9. Look at the contents for **/tmp/frag4096**
- ___ 10. Now that there are two file systems with the same number of files, see how much disk space each has utilized.
 How many 512-byte blocks have the files used in **/tmp/frag512**? _____
 How many inodes have the files used in **/tmp/frag512**? _____
 How many 512-byte blocks have the files used in **/tmp/frag4096**? _____
 How many inodes have the files used in **/tmp/frag4096**? _____
 What can you conclude from this? _____
- ___ 11. When you are finished reviewing the results, unmount and remove both file systems.

Using JFS Compression

- ___ 12. This exercise shows how to use some simple commands to investigate the effects of compression on both performance and disk space usage.
 Create and mount two compressed journaled file systems, one with a fragment size of 512 and a mount point of **/tmp/compress512**, the other with a fragment size of 2048, an NBPI of 2048 and a mount point of **/tmp/compress**. Make them both 32768 512-byte blocks in size and have them mount automatically at system restart. Put them in the **datavg** volume group.
- ___ 13. Create a third file system that also has a fragment size of 2048, an NBPI of 2048 with a mount point of **/tmp/uncompress** and does not use compression. This will be used for purposes of comparison.
- ___ 14. Check that the journaled file systems have been correctly created.
- ___ 15. Mount the journaled file systems.
- ___ 16. Next, check the performance of the compressed file system by copying a 1 MB file named **bigfile** located in **/home/workshop**, to each file system, and measure the performance. First, check that the logical volume configuration is similar. Then, record copy times.
- ___ 17. Use **du** to check how much space is really used and how efficient the compression is.
- ___ 18. Use **ls -l** to verify the normal size of each file.

Fixing File System Problems

- ___ 19. Using the **defragfs** command, find out the current state of the file system **/home/teamxx/dir1**.
- ___ 20. Defragment the **/home/teamxx/dir1** filesystem.

___ 21. Perform a check on the **/home/teamxx/dir1** file system so that if it finds something wrong you will be prompted as to whether or not to take any action. What kind of message did you get? _____ Unmount the file system and check it again.

END OF EXERCISE

Exercise Instructions with Hints

Determining File System Usage

- ___ 1. If you aren't already, log in to your system and then **su** to **root**. Assume you have already determined that the **/home/teamxx/dir1** file system is close to full. Try to determine which of the directories is the biggest user of the space. Then try finding out which is the biggest file in that directory. Use the **sort** command to organize the output in order of highest to lowest use. Finally, determine who is the owner of that file.

```
•# du /home/teamxx/dir1/samples | sort -nr | pg
```

```
•# du -a /home/teamxx/dir1/samples/snmpd | sort -nr | pg
```

```
•# ls -l /home/teamxx/dir1/samples/snmpd/dpi2/dpi20ref.txt
```

- ___ 2. Let's assume that you have concluded that space is needed, therefore, the file system needs to be expanded. Expand the filesystem by the size of 1 physical partition. Verify the usage of this filesystem.

```
•# smit
```

System Storage Management (Physical & Logical Storage)

File Systems

Add / Change / Show / Delete File Systems

Enhanced Journaled File Systems

Change / Show Characteristics of an Enhanced Journaled File System

-You will be prompted to provide the file system name.

Select **/home/teamxx/dir1**.

File system name **/home/teamxx/dir1**

SIZE of file system (in 512-byte blocks) **65536 Enter**

-Press **F10** to exit SMIT

```
•# df
```

-OR-

```
•# chfs -a size=65536 /home/teamxx/dir1
```

```
•# df
```

Using Fragments for Disk Usage Efficiency

- ___ 3. For this exercise you will create two JFS file systems, one with a fragment size of 512 bytes and the other with the default fragment size of 4096. For both filesystems use a value of 512 for NBPI. Allocate 50000 512-byte blocks for each file system and put them in the **datavg** volume group. Use **/tmp/frag512** as the mount point for the file system with a fragment size of 512 and **/tmp/frag4096** as the mount point for the one with the default fragment size. If more than one student is performing this

part of the exercise separately on the same RS/6000 system, it will be necessary to modify the filesystem names in order to make them unique. Once the filesystems are created, mount them.

•# **smit crjfs**

Add A Standard Journaled File System

Volume group name	datavg
SIZE of file system (in 512-byte blocks)	[50000]
MOUNT POINT	[/tmp/frag512]
Mount AUTOMATICALLY at system restart?	yes
Fragment Size (bytes)	512
Number of bytes per inode	512
OK or Enter	

•**F3** to go back to the **Add a Journaled File System** screen

-Add A Standard Journaled File System

Volume group name	datavg
*SIZE of file system (in 512-byte blocks)	[50000]
*MOUNT POINT	[/tmp/frag4096]
Mount AUTOMATICALLY at system restart?	yes
Fragment Size (bytes)	4096
Number of bytes per inode	512
OK or Enter	

-F3 to return to the menu

•Press **F10** to exit SMIT

•# **mount /tmp/frag512**

•# **mount /tmp/frag4096**

___ 4. Check both file systems with **df -v** and note any used space.

•# **df -v /tmp/frag512 /tmp/frag4096**

___ 5. To test their efficiency for storing a large number of very small files use the **/home/workshop/mkfile** script. This script creates a file that is 512 bytes in size. This script requires the file size parameter to be passed to it with the suffix of "bytefile". For example: **/home/workshop/mkfile 512** will create a file in your current directory called **512bytefile**. Run this command from the **/tmp** directory creating a 512-byte file.

•# **cd /tmp**

•# **/home/workshop/mkfile 512**

___ 6. To test the number of 512-byte files that can be stored in each file system, run the shell script **/home/workshop/fragcopy**. The shell script has the usage: **fragcopy numfiles dir/sourcefilename dir/targetfilename** The **fragcopy** script will create

copies of the **sourcefilename** until either the file system is full or the **numfiles** value is reached. The files will be put in the directory specified in **dir/targetfilename** with the **targetfilename** as the prefix followed by a "." and a number which represents the count of the file currently being created. While **fragcopy** processes, a count will be displayed showing the number of files that have been successfully copied. Have **fragcopy** copy **/tmp/512bytefile** **500** times and have as the **dir/targetfilename** **/tmp/frag512/frag50**.

```
•# /home/workshop/fragcopy 500 /tmp/512bytefile /tmp/frag512/frag50
```

___ 7. Look at the contents of the **/tmp/frag512** directory.

```
•# ls -l /tmp/frag512
```

___ 8. Do the same as above only this time create copies of the **512bytefile** in **/tmp/frag4096**

```
•# /home/workshop/fragcopy 50 /tmp/512bytefile /tmp/frag4096/frag50
```

___ 9. Look at the contents for **/tmp/frag4096**

```
•# ls -l /tmp/frag4096
```

___ 10. Now that there are two file systems with the same number of files, see how much disk space each has utilized.

How many 512-byte blocks have the files used in **/tmp/frag512**? _____

How many inodes have the files used in **/tmp/frag512**? _____

How many 512-byte blocks have the files used in **/tmp/frag4096**? _____

How many inodes have the files used in **/tmp/frag4096**? _____

What can you conclude from this? _____

```
•# df -v /tmp/frag512 /tmp/frag4096
```

___ 11. When you are finished reviewing the results, unmount and remove both file systems.

```
•# umount /tmp/frag512
```

```
•# umount /tmp/frag4096
```

```
•# rmfs -r /tmp/frag512
```

```
•# rmfs -r /tmp/frag4096
```

Using JFS Compression

___ 12. This exercise shows how to use some simple commands to investigate the effects of JFS compression on both performance and disk space usage.

Create and mount two compressed journaled file systems, one with a fragment size of 512 and a mount point of **/tmp/compress512**, the other with a fragment size of 2048, and NBPI of 2048 and a mount point of **/tmp/compress**. Make them both 32768 512-byte blocks in size and have them mount automatically at system restart. Put them in the **datavg** volume group.

•# smit crfs

Add a Journaled File System**-Add a Compressed Journaled File System**

```

Volume group name                datavg
SIZE of file system (in 512-byte blocks) [32768]
MOUNT POINT                       [/tmp/compress512]
Mount AUTOMATICALLY at system restart? yes
OK or Enter

```

•F3 to go back to the **Add a File System** menu**Add a Journaled File System****-Add a Compressed File System**

```

Volume group name                datavg
SIZE of file system (in 512-byte blocks) [32768]
MOUNT POINT                       [/tmp/compress]
Mount AUTOMATICALLY at system restart? yes
Fragment Size (bytes)            2048
Number of bytes per inode         2048
OK or Enter

```

•F3 to return to the menu

- ___ 13. Create a third file system that also has a fragment size of 2048, an NBPI of 2048 with a mount point of **/tmp/uncompress** and does not use compression. This will be used for purposes of comparison.

•F3 to go back to the **Add a File System** menu**•Add a standard Journaled File System**

```

Volume group name                datavg
SIZE of file system (in 512-byte blocks) [32768]
MOUNT POINT                       [/tmp/uncompress]
Mount AUTOMATICALLY at system restart? yes
Fragment Size (bytes)            2048
Number of bytes per inode         2048
OK or Enter

```

•F3 to return to the menu

- ___ 14. Check that the journaled file systems have been correctly created.

•Exit SMIT

•# lsfs -q | pg

- ___ 15. Mount the journaled file systems.

•# mount /tmp/compress512

•# mount /tmp/compress

•# mount /tmp/uncompress

___ 16. Next, check the performance of the compressed file system by copying a 1MB file named **bigfile** located in **/home/workshop**, to each file system, and measure the performance. First, check that the logical volume configuration is similar. Then, record copy times.

•# lspv -p hdisk0 (wherever **datavg** is located)

•# cd /tmp

•# /usr/bin/time cp /home/workshop/bigfile /tmp/compress512

•# /usr/bin/time cp /home/workshop/bigfile /tmp/compress

•# /usr/bin/time cp /home/workshop/bigfile /tmp/uncompress

___ 17. Use **du** to check how much space is really used and how efficient the compression is.

•# du /tmp/compress512

•# du /tmp/compress

•# du /tmp/uncompress

___ 18. Use **ls -l** to verify the normal size of each file.

•# ls -l /tmp/compress512

•# ls -l /tmp/compress

•# ls -l /tmp/uncompress

Fixing File System Problems

___ 19. Using the **defragfs** command, find out the current state of the file system **/home/teamxx/dir1**.

•# smit

System Storage Management (Physical & Logical Storage)

File Systems

Add / Change / Show / Delete File Systems

Enhanced Journaled File Systems

Defragment an Enhanced Journaled File System

-File System Name **/home/teamxx/dir1**

-Perform, Query, or Report ? **query**

-OK or Enter

-F3 to return to the menu

-OR-

•# defragfs -q /home/teamxx/dir1

___ 20. Defragment the **/home/teamxx/dir1** filesystem.

•# **smit**

System Storage Management (Physical & Logical Storage)

File Systems

Add / Change / Show / Delete File Systems

Journalled File Systems

Defragment a Journalled File System

-File System Name **/home/teamxx/dir1** Perform, Query, or
Report ? **perform** OK or Enter

-OR-

•# **defragfs /home/teamxx/dir1**

___ 21. Perform a check on the **/home/teamxx/dir1** file system so that if it finds something wrong you will be prompted as to whether or not to take any action. What kind of message did you get? _____ Unmount the file system and check it again.

•# **fsck /home/teamxx/dir1**

•# **umount /home/teamxx/dir1**

•# **fsck /home/teamxx/dir1**

END OF EXERCISE

Optional Exercises

- ___ 1. Create a shell script to tell you when any filesystem is 80% or more utilized. This should alert you that some file system expansion is needed before users get the message "file system is full". Send a message to yourself (**teamxx**) about any file systems that reach 80% or more utilization. (This could be run periodically using **cron**. You may want to refer back to this exercise after completing the unit on scheduling.) Here is an example script.

•\$ vi fscheck

```
-Type i to begin inserting text
-Type in the following
df | cut -c1-12,37-39,57-80 | grep -v proc\
while read device percentused directory
do
if [ "$device" = Filesystem ]
then :
else
if [ "$percentused" -gt 79 ]
then
echo $directory mounted on $device is \
$percentused percent full. >> /tmp/teamxx_tmpdf fi
fi
done
mail teamxx < /tmp/teamxx_tmpdf
-<esc> to change to command mode
-< : > will bring up a command entry prompt
-wq will save and exit
```

- ___ 2. There is a shell script provided by the system called **skulker** that periodically cleans out files on the system. Find this file and add to it to get rid of **teamxx's smit.log** and **smit.script** files if they haven't been used in over two days. (This could be run periodically using **cron**. You may want to refer back to this exercise after completing the unit on scheduling.)

•# vi /usr/sbin/skulker Notice that this script removes files that are in **/tmp**, **/var/tmp**, **/var/news**, etc. Towards the bottom of the script add the following line:

```
find /home/teamxx -name "smit.*" -mtime +2 -exec rm -f {};
```

END OF EXERCISE

Solutions

Following are the solutions for those instructions that include questions:

10. Now that there are two file systems with the same number of files, see how much disk space each has utilized.

How many 512-byte blocks have the files used in **/tmp/frag512**? _____

How many inodes have the files used in **/tmp/frag512**? _____

How many 512-byte blocks have the files used in **/tmp/frag4096**? _____

How many inodes have the files used in **/tmp/frag4096**? _____

What can you conclude from this? _____

Answer: 16576 512-blocks were used in /tmp/frag512.

67 inodes were used in /tmp/frag512.

16912 512-blocks were used in /tmp/frag4096.

67 inodes were used in /tmp/frag4096.

That for small files, a disk fragment size of 512 provides a more efficient use of blocks for disk space and to store inode information.

21. Perform a check on the **/home/teamxx/dir1** file system so that if it finds something wrong you will be prompted as to whether or not to take any action. What kind of message did you get? _____ Unmount the file system and check it again.

Answer: Checking /dev/lvxx (/home/) MOUNTED FILE SYSTEM; WRITING SUPPRESSED: Checking a mounted filesystem does not produce dependable results.

END OF LAB

Exercise 8. Paging Space

What This Exercise Is About

This exercise is designed to give students the opportunity to work with paging space changes on an active system.

What You Should Be Able to Do

After completing this exercise, students should be able to:

- List paging space
- Add another paging space
- Change the characteristics of a paging space
- Remove paging space

Introduction

In this exercise you will be working with page logical volumes, adding, deleting, and changing them. To do this exercise, you will need to work in teams one team per system. Only one team member will be able to do the exercise, the other team members will provide support and assistance where needed.

Exercise Instructions

- ___ 1. If you are not already logged into your system, log in as **teamxx** and **su** to **root**. Check the current memory size on the system and then check the paging space.
- ___ 2. If you have two disks on your system and successfully created another volume group named **datavg** during the Logical Volume Manager exercise, create two page spaces, one in the **datavg** volume group and the other in the **rootvg** volume group. Otherwise, create both page spaces in the **rootvg** volume group. If you are short on space in **rootvg**, put both paging spaces in **datavg**. Make them 16 MB each. Have them become active now and at system restart.
How many logical partitions was needed to satisfy the request of 16 MB? _____
The number of logical partitions depends on the logical partition size set in the volume group.
What is the name the system assigned to each? _____
- ___ 3. Check to be sure the new page spaces are active. Create some system activity and monitor the % used.

```
# ls -laR / > /dev/null &  
# find / -name a.* -print >/dev/null &  
# cat /etc/rc.net > /dev/null &
```

Check the % used on the page spaces. What conclusion can you come to based on these observations? needed, run these commands again and notice how the page space usage becomes balanced over time.
- ___ 4. Change the size of **paging00** to 32 MB. Check to be sure that **paging00** has been increased.
- ___ 5. Remove **paging01**. First, deactivate it.

END OF EXERCISE

Exercise Instructions with Hints

- ___ 1. If you are not already logged into your system, log in as **teamxx** and **su** to **root**. Check the current memory size on the system and then check the paging space.

•\$ su

•# lsattr -E -l mem0

•# lsps -a

- ___ 2. If you have two disks on your system and successfully created another volume group named **datavg** during exercise 8, create two page spaces one in the **datavg** volume group and the other in the **rootvg** volume group. Otherwise, create both page spaces in the **rootvg** volume group. If you are short of space in **rootvg**, put both paging spaces in **datavg**. Make them 16 MB each.

Have them become active now and at system restart.

How many logical partitions were needed to satisfy the request of 16 MB?

The number of logical partitions depends on the logical partition size set in the volume group.

What is the name the system assigned to each? _____

•# smit

System Storage Management (Physical and Logical Storage)

Logical Volume Manager

Paging Space

Add Another Paging Space

-A selector screen will pop-up for volume group. Select **datavg**.

(If you don't have the **datavg** on your system, select **rootvg**)

Volume group name

datavg

SIZE of paging space (in logical partitions)

[2]

Start using this paging space NOW?

yes

Use this paging space each time the system is RESTARTED?

yes

OK or Enter

-F3 to return to the menu

•Go back to the **Paging Space** menu

Add Another Paging Space

-A selector screen will pop-up for volume group. Select **rootvg** (or **datavg**).

Volume group name

rootvg

SIZE of paging space (in logical partitions)

[2]

Start using this paging space NOW?

yes

Use this paging space each time the system is RESTARTED?

yes

OK or Enter

-F3 to return to the menu

-OR-

•# **mkps -s 2 -n -a datavg** (or **rootvg** if you don't have **datavg**)

•# **mkps -s 2 -n -a rootvg**

___ 3. Check to be sure the new page spaces are active. Create some system activity and monitor the % used.

•**Exit SMIT.**

•# **lsps -a**

•# **ls -laR / > /dev/null &**

 # **find / -name "a.*" -print >/dev/null &**

 # **cat /etc/rc.net > /dev/null &**

•# **lsps -a**

•Check the % used on the page spaces. What conclusion can you come to based on these observations? _____

If needed, run these commands again and notice how the page space usage becomes balanced over time.

___ 4. Change the size of **paging00** to 16 MB. Check to be sure that **paging00** has been increased.

•# **smit**

System Storage Management (Physical and Logical Storage)
Logical Volume Manager
Paging Space
Change / Show Characteristics of a Paging Space

-At the selector screen pop-up select	paging00
Paging space name	paging00
NUMBER of additional logical partitions	[2]
OK or Enter	

•**F3** back to the **Paging Space** menu.

List All Paging Spaces

-**F3** to return to the menu

-OR-

•# **chps -s 2 paging00**

•# **lsps -a**

___ 5. Remove **paging01**. First, deactivate it.

•**F3** back to the **Paging Space** menu.

Deactivate a Paging Space

-At the selector screen pop-up select	paging01
---------------------------------------	-----------------

Solutions

Following are the solutions for those instructions that include questions:

2. If you have two disks on your system and successfully created another volume group named **datavg** during exercise 8, create two page spaces one in the **datavg** volume group and the other in the **rootvg** volume group. Otherwise, create both page spaces in the **rootvg** volume group. If you are short on space in **rootvg**, put both paging spaces in **datavg**. Make them 8 MB each. Have them become active now and at system restart.
How many logical partitions was needed to satisfy the request of 8 MB?

What is the name the system assigned to each? _____

Answer: Two logical partitions.
paging00 and paging01

3. Check to be sure the new page spaces are active and look at the % used. Next, create some system activity by doing some commands like:

```
# ls -laR / > /dev/null &  
# find /-name "a.*" -print > /dev/null &  
# cat /etc/rc.net >/dev/null &
```

Check the % used on the page spaces. What conclusion can you come to based on these observations? _____

Answer: The system begins to use active page spaces immediately and tries to spread its usage across them as much as possible. Items in memory at the time new page spaces are created and activated are not relocated but as new system activity occurs, the new space begins to be used.

Exercise 9. AIX Software Installation

What This Exercise Is About

In this exercise, you will list the software currently installed on the AIX system. You will then install two software packages.

What You Should Be Able to Do

- List the software installed on an AIX system
- Install software
- View the history of installed software

This exercise is designed to give you experience in working with the installation facilities supplied with AIX Version 5.1. If you have more than one student sharing a system (all systems have a minimum of two terminals attached to them), then only one person can actually perform these steps. All other students on that system should observe while the steps are being done.

In this exercise, you will install two software packages:

bos.dosutil

bos.games

The instructions are written assuming you are using SMIT in ASCII mode. However, it is easy to interpret the instructions so that they can be used with SMIT in the AIXWindows environment. Feel free to use SMIT in either mode.

When you select an item while using the ASCII user interface, use the cursor keys on the keyboard to highlight a menu item, then press enter. On a graphics display, choose (that is, click) the selected item with the left mouse button.

The last step of the machine exercise involves verification that the software successfully installed. You will test that the **bos.games** files set installed. The games available are common on many UNIX platforms.

Exercise Instructions

List and Install AIX software

- ___ 1. Log in to AIX as **teamxx** and **su** to **root**.
- ___ 2. Use SMIT to list the software on your system. What command is SMIT executing to provide this information? _____

Examine the output and verify that **bos.games** and **bos.dosutil** are not installed on your system.

- ___ 3. Now it is time to install the two software packages:

These packages have been pre-loaded (but not installed) in a directory called **/usr/sys/inst.images**. The procedure to install these packages from this directory are the same as those to install software from CD or tape.

Use SMIT to install the **bos.games** and **bos.dosutil** packages. When this task has successfully completed, return to the AIX command line.

Show software installation history

- ___ 4. View the history of the **bos.games** and **bos.dosutil** filesets that you just installed.
- ___ 5. Verify that the **bos.games** fileset installed correctly.

END OF EXERCISE

Exercise Instructions With Hints

List and Install AIX software

___ 1. Log in to AIX as **teamxx** and **su** to **root**.

- From the login window click **Options** and then click **Command Line Login**.
- When the unformatted message appears, press **Enter** to get the login prompt.
- Log in as **teamxx**
- \$ **su root**

___ 2. Use SMIT to list the software on your system. What command is SMIT executing to provide this information? _____

Examine the output and verify that **bos.games** and **bos.dosutil** are not installed on your system.

- smit**
- Software Installation and Maintenance**
- List Software and Related Information**
- List Installed Software and Related Information**
- List Installed Software**

```
SOFTWARE name          all
SHOW superseded levels? no
```

- OK** or **Enter**
- While viewing the output, use Find (/) to verify that the **bos.games** and **bos.dosutil** packages are not installed on your system.
- Use **F3** to return to the **Software Installation and Maintenance** menu.

___ 3. Now it is time to install the two software packages:

- bos.dosutil**
- bos.games**

These packages have been pre-loaded (but not installed) in a directory called **/usr/sys/inst.images**. The procedure to install these packages from this directory are the same as those to install software from CD or tape.

Use SMIT to install the **bos.games** and **bos.dosutil** packages. When this task has successfully completed, return to the AIX command line.

- From the **Software Installation and Maintenance** menu choose **Install and Update Software**.
- Install Software**

```
INPUT device          /usr/sys/inst.images  (Use F4)
```

SOFTWARE to install Use F4 to choose the packages listed above

When selecting the packages, be sure to install the entire package. Use **F7** to indicate which packages to install.

Press **Enter** to perform the installation.

- Verify that the output is correct and then press **F10** to return to the command line.

Show software installation history

___ 4. View the history of the **bos.games** and **bos.dosutil** filesets that you just installed.

- smit**

- Software Installation and Maintenance**

- List Software and Related Information**

- List Installed Software and Related Information**

- Show Software Installation History**

- On the SMIT **Show Software Installation History** menu type: **bos.games** to view the installation history of the **bos.games** package. Press **Enter**.

- Review the output and press **F3** to return to the previous screen.

- On the SMIT **Show Software Installation History** menu type: **bos.dosutil** to view the installation history for that fileset. Press **Enter**.

- Review the output and press **F10** to return to the command line.

___ 5. Verify that the **bos.games** fileset installed correctly.

- # cd /usr/games**

- # ls** to view which games are available

- If time permits, try out one of the games

END OF EXERCISE

Solutions

2. Use SMIT to list the software on your system. What command is SMIT executing to provide this information? _____

answer: **lspp -L all**

Exercise 10. Using backup and restore

What This Exercise Is About

The purpose of this exercise is to familiarize the students with backup and restore techniques.

What You Should Be Able to Do

After completing this unit, students should be able to:

- Perform an incremental backup by inode
- Perform a backup by file name
- Restore a file system and an individual file

In this exercise, you will backup and restore a file system as well as individual files. Some exercises may cover some options and techniques that may be in the student notes but not necessarily covered in the instructor's presentation. Either refer to the unit notes or check the hints in the **Exercise Instructions with Hints** section.

Backup media: You will **not** be using tapes or diskettes for this exercise. You will create a new file system and use it as a tape. Everything in the exercise will work the same whether you backup to tape or some other media.

Scenario: Existing and new file systems/files to be used for this exercise are:

/home/teamxx/dir1 - File system to be backed up. Created in Exercise 9

/home/bkupxx - New file system you create to use as the backup media

/home/bkupxx/weekly - File used for level 0 full inode backup

/home/bkupxx/daily - File used for level 1 incremental backup

/home/bkupxx/tardata - File used for **tar** backups

/home/teamxx/mybkup - Directory used to demonstrate relative vs. full path name backups and importance of mounting vs. unmounting before restoring a backup

Warning: There may be times in the exercise when you will be using the recursive remove command **rm -r**. Please ensure that you are in your **/home/teamxx** directory and not the **/(root)** directory. Being in **/(root)** can cause some **Irrecoverable problems** that might only be fixed by reloading your system.

The **Exercise Instructions with Hints** section provides both the command line and SMIT methods. Select the one that is most appropriate for you.

Exercise Instructions

*****Important***** You will be backing up the file system that you created in the Physical and Logical Storage exercise; therefore, that exercise must have been completed successfully before continuing with this exercise. When referencing the file system you can use either the logical volume name, **/dev/yylv** or the file system name, **/home/teamxx/dir1**.

Prepare File System for Backup/Restore

- ___ 1. Log in as **teamxx** and **su** to **root**. Use **su** without the dash so that you will retain the **teamxx** home directory.
- ___ 2. Create a new file system named **/home/bkupxx**, where **xx** is your login team number. Make the file system (one partitions) in size.
- ___ 3. Mount the new file system. Verify that it is mounted.
- ___ 4. Make sure the file system you created in the Physical and Logical Storage exercise, **/home/teamxx/dir1** in logical volume **/dev/yylv**, is mounted. If it isn't, mount it.
- ___ 5. Ensure that all files from the **/usr/samples** directory were copied into the **/home/teamxx/dir1** file system. You will be backing up these files to the new file system, **/home/bkupxx**, which you created in instruction 2.

Backup and Restore by inode (File System)

- ___ 6. The **sysbr** fileset contains the backup and restore utilities. Check that the **sysbr** fileset has been installed.
- ___ 7. You should be ready to back it up. First, change directory to **/home/teamxx**. Then unmount the **/home/teamxx/dir1** file system. Verify that the file system is unmounted. If you got an error unmounting the file system, it may be that you were sitting in that directory. You must be out of the file system before you can unmount it. Remember, it is a good idea to unmount the file system before you back it up to ensure that there is no activity happening in the file system at the time of backup.
- ___ 8. One more item before we start the backup procedure. You have unmounted the file system. Now, ensure that the mount point is empty. Do a listing on the directory. If it is empty, proceed to the next instruction. If not, ensure you are in your home directory, **/home/teamxx**, and delete the files in the directory **/home/teamxx/dir1**.
- ___ 9. Backup the entire file system in inode format. Make sure to update **/etc/dumpdates**. Your output media will be a file named **weekly** in the **/home/bkupxx** file system.
- ___ 10. Display the table of contents of the **/home/bkupxx/weekly** backup to ensure that all files in the **/home/teamxx/dir1** file system were backed up properly. How are the files listed? _____

- ___ 11. View **/etc/dumpdates** and analyze the contents. Note: If there is more than one team on your system, you will be writing to **/etc/dumpdates** simultaneously. Analyze the information that relates to your logical volume name. You will see the other team's logical volumes listed as well.
- ___ 12. Mount the **/home/teamxx/dir1** file system and simulate a daily change to the file named **/home/teamxx/dir1/samples/tcpip/resolv.conf**. Add your name in uppercase to the first line of the file.
- ___ 13. Now unmount the file system. Verify it is unmounted. Perform an incremental inode backup of **/home/teamxx/dir1** to the file **/home/bkupxx/daily**. It should backup just the changed file, **resolv.conf**. You are simulating the fact that you have a base backup in **/home/bkupxx/weekly** (analogous to the monthly backup explained in class) and an incremental backup in **/home/bkupxx/daily** (analogous to the daily backup explained in class).
- ___ 14. Display the table of contents of the **/home/bkupxx/daily** backup to ensure that just the changed file was backed up. Record the EXACT name of the file.

- ___ 15. View the contents of **/etc/dumpdates**. Analyze the contents.

Note: The next few instructions will show command line hints rather than SMIT screens because of the extra steps of removing files and destroying file systems, which is necessary to perform simulated recovery functions. You may continue to use SMIT utilizing the **F9** shellout feature to execute the crash procedures.

- ___ 16. Perform a file crash and recover the file using the above backup. Mount the file system. Change directory to **/home/teamxx/dir1**. Remove the **samples/tcpip/resolv.conf** file. Check that it no longer exists.
- ___ 17. Before you start the restore, be sure you are in the directory **/home/teamxx/dir1**. Why is this important? You will see messages displayed before the restore takes place. When prompted to specify next volume #, key in **1**. When prompted to set owner/mode, key in **no**.
- ___ 18. Now you will perform a crash of the entire **/home/teamxx/dir1** file system and then restore it using your backups. Ensure you are in the **/home/teamxx/dir1** directory. Remove all files and directories in this file system. Check to see that they were all removed. Restore the file system and check to ensure all the files were restored. Which backup should you use first? _____ Why? _____
- ___ 19. The **restoresymtable** file is created or updated upon each restore when working with incremental inode backups. Do a long listing on this file to see that it exists. Remove the **restoresymtable**. Note: It keeps track of links and deleted files that were created between the backups. Note that this file is only created when working with the **-r** restore option. The system does not know when you are finished restoring all your incremental inode backups, so it leaves you with the chore of cleaning up this control file. This file did not appear during the single file restore for

instruction 17. This is because the **-r** option is not appropriate for a single file restore. The **-x** option is the option of choice when restoring a single file and the unusual problems of restoring links and deleted files correctly is not an issue.

The next eight instructions are included to show what happens if you don't remember to mount a file system before performing a restore. This is a very common error that can cause a lot of headaches. Hopefully, by intentionally making this mistake in class, you can avoid it back at work or be able to identify the problem immediately and resolve it.

- ___ 20. The **/home/teamxx/dir1** file system should still be mounted from the previous restore. Once again, delete all the files and directories in the file system. (If you clean out the file system now, later it will be much easier to see if your restore is working properly.) Double check to make sure the files were removed.
- ___ 21. Unmount the file system and verify that it is unmounted.
- ___ 22. Change to the directory mount point and perform the restore.
- ___ 23. Mount the file system and look at the contents to make sure that the restore was good. Does the file system contain any files? _____
- ___ 24. Unmount the file system and list the files in the mount point directory. You will see that this is where your files went when you performed the restore.
- ___ 25. Clean up the mount point by deleting all the files in the **/home/teamxx/dir1** directory.
- ___ 26. Mount the file system. Verify it was mounted.
- ___ 27. Now that you have the file system mounted, try the restore again. List the files after you are through with the restore.

The next three instructions will demonstrate the advantage of backing up by relative path name.

- ___ 28. Create a new directory named **/home/teamxx/mybkup**. Change and verify that you are in the new directory.
- ___ 29. Restore the contents of **/home/bkupxx/weekly** into your new directory **/home/teamxx/mybkup**. Don't forget to use the verbose option so you can see what the **restore** command is doing.
- ___ 30. Check the directory **/home/teamxx/mybkup**. It should contain the contents of the **weekly** backup. You can see that backing up files by relative path name allows you to restore them back to ANY directory.

Backup and Restore by Name

- ___ 31. Make sure the **/home/teamxx/dir1** file system is mounted. Why would you want to have the file system mounted in order to back it up by name?

- ___ 32. Backup the file system by name using the **backup** command. Also, use the full path name to reference the file system. Once again, you will use **/home/bkupxx/weekly** as your output media instead of a tape.
- ___ 33. List the table of contents to verify the backup was successful. How were the files listed?
- ___ 34. Let's take a look at the difference between relative and full path backups by restoring by relative path name. First, **cd** to **/home/teamxx/mybkup** directory and delete all the files. Ensure the directory is empty.
- ___ 35. The goal is to restore the files from **/home/bkupxx/weekly** into the **/home/teamxx/mybkup** directory. Restore the files and take a look at the contents of the **/home/teamxx/mybkup** directory. Does it contain any files?

- ___ 36. Backup the file system by name, but use a relative path name. Make sure you are in **/home/teamxx/dir1**. List the contents of **weekly**. The file names should be in a **./filename** (relative path name) format.
- ___ 37. Now you should be able to restore these files into the **/home/teamxx/mybkup** directory. Change to the **/home/teamxx/mybkup** directory. Perform the restore.
- ___ 38. List the contents of the **/home/teamxx/mybkup** directory. All of the files should be listed.

END OF EXERCISE

Exercise Instructions with Hints

*****Important***** You will be backing up the file system that you created in the Physical and Logical Storage exercise; therefore, that exercise must have been completed successfully before continuing with this exercise. When referencing the file system you can use either the logical volume name, **/dev/yylv** or the file system name, **/home/teamxx/dir1**.

Prepare File System for Backup/Restore

- ___ 1. Log in as **teamxx** and **su** to **root**. Use **su** with out the dash so that you will retain the **teamxx** home directory.

•\$ su

- ___ 2. Create a new file system named **/home/bkupxx**, where **xx** is your login team number. Make the file system (one partition) in size.

•# smit

System Storage Management (Physical & Logical Storage)

File Systems

Add / Change / Show / Deleted File Systems

Journalled File System

Add a Journalled File System

Add a Standard Journalled File System

•From the **Volume Group Name** pop-up box, select **rootvg**.

-*SIZE of file system [**16384**]

MOUNT POINT [**/home/bkupxx**]

Mount AUTOMATICALLY at system restart [**yes**]

OK or Enter

-F3 to return to the menu

-OR-

•# crfs -v jfs -a bf=true -g rootvg -a size=16384 -m /home/bkupxx -A yes -p rw

-t no -a nbpi=4096 -a ag=64

- ___ 3. Mount the new file system. Verify that it is mounted.

•Go back to the **File System** menu

Mount a File System

-FILE SYSTEM name **[/dev/lv0x]**

(where **x** is the number of your logical volume)

DIRECTORY over which to mount **/home/bkupxx]**

OK or Enter

-F3 to return to the menu

- Go back to the **File System** menu

List all Mounted File Systems

- F3** to return to the menu

-OR-

- # mount /home/bkupxx**

- # mount**

- ___ 4. Make sure the file system you created in the Physical and Logical Storage exercise, **/home/teamxx/dir1** in logical volume **/dev/yy1v**, is mounted. If it isn't, mount it.

- # mount** (check mounted file systems)

- # mount /home/teamxx/dir1** (if not mounted)

- ___ 5. Ensure that all files from the **/usr/samples** directory were copied into the **/home/teamxx/dir1** file system. You will be backing up these files to the new file system, **/home/bkupxx**, which you created in instruction 2.

- # ls /home/teamxx/dir1** (check if data is in the file system)

- # cp -r /usr/samples /home/teamxx/dir1** (if necessary)

Backup and Restore by inode (File System)

- ___ 6. The **sysbr** fileset contains the backup and restore utilities. Check that the **sysbr** fileset has been installed.

- # ls1pp -l bos.sysmgt.sysbr**

- ___ 7. You should be ready to back it up. First, change directory to **/home/teamxx**. Then unmount the **/home/teamxx/dir1** file system. Verify that the file system is unmounted. If you got an error unmounting the file system, it may be that you were sitting in that directory. You must be out of the file system before you can unmount it. Remember, it is a good idea to unmount the file system before you back it up to ensure that there is no activity happening in the file system at the time of backup.

- # cd /home/teamxx**

- # umount /home/teamxx/dir1**

- # mount**

- ___ 8. One more item before we start the backup procedure. You have unmounted the file system. Now, ensure that the mount point is empty. Do a listing on the directory. If it is empty, proceed to the next instruction. If not, ensure you are in your home directory, **/home/teamxx**, and delete the files in the directory **/home/teamxx/dir1**.

- # ls -l /home/teamxx/dir1** (should be **total 0**)

- # cd /home/teamxx**

•# **rm -r /home/teamxx/dir1/*** (if not empty)

- ___ 9. Backup the entire file system in inode format. Make sure to update **/etc/dumpdates**. Your output media will be a file named **weekly** in the **/home/bkupxx** file system.

•# **backup -0 -u -f/home/bkupxx/weekly /home/teamxx/dir1**

-OR-

•# **smit**

**System Storage Management
File Systems
Backup a File System**

-*FILESYSTEM to Backup **[/home/teamxx/dir1]**
*Backup DEVICE **[/home/bkupxx/weekly]**
Backup LEVEL **[0]**
Record backup in /etc/dumpdates? **[yes]**
OK or Enter

-F3 to return to the menu

- ___ 10. Display the table of contents of the **/home/bkupxx/weekly** backup to ensure that all files in the **/home/teamxx/dir1** file system were backed up properly. How are the files listed? _____

•# **restore -T -f/home/bkupxx/weekly**

-OR-

•Go back to the **File Systems** menu

List Contents of a Backup

-*Backup DEVICE **[/home/bkupxx/weekly]**
OK or Enter

-F3 to return to the menu

- ___ 11. View **/etc/dumpdates** and analyze the contents. Note: If there is more than one team on your system, you will be writing to **/etc/dumpdates** simultaneously. Analyze the information that relates to your logical volume name. You will see the other team's logical volumes listed as well.

•# **pg /etc/dumpdates**

•Return to **SMIT**

- ___ 12. Mount the **/home/teamxx/dir1** file system and simulate a daily change to the file named **/home/teamxx/dir1/samples/tcpip/resolv.conf**. Add your name in uppercase to the first line of the file.

•Go back to the **File System** menu

Mount a File System

-FILE SYSTEM name **[/dev/yylv]**
 DIRECTORY over which to mount **[/home/teamxx/dir1]**
 OK or ENTER

-F3 to return to the menu

•F9 to access the command line

•# **cd /home/teamxx/dir1**

•# **vi samples/tcpip/resolv.conf** (add your name in uppercase)

•Return to **SMIT**

-OR-

•# **mount /home/teamxx/dir1**

•# **cd /home/teamxx/dir1**

•# **vi samples/tcpip/resolv.conf**

___ 13. Now unmount the file system. Verify it is unmounted. Perform an incremental inode backup of **/home/teamxx/dir1** to the file **/home/bkupxx/daily**. It should backup just the changed file, **resolv.conf**. You are simulating the fact that you have a base backup in **/home/bkupxx/weekly** (analogous to the monthly backup explained in class) and an incremental backup in **/home/bkupxx/daily** (analogous to the daily backup explained in class).

•Go back to the **File System** menu

Unmount a File System

 NAME of file system to unmount **[/home/teamxx/dir1]**

•Go back to the **File System** menu

List all Mounted File Systems

•Go back to the **File System** menu

Backup a File System

-FILESYSTEM to backup **[/home/teamxx/dir1]**
 Backup DEVICE **[/home/bkupxx/daily]**
 Backup LEVEL **[1]**
 RECORD backup in /etc/dumpdates **[yes]**
 OK or Enter

-F3 to return to the menu

-OR-

•# **cd /home/teamxx**

•# **umount /home/teamxx/dir1**

•# **mount**

•# **backup -u -1 -f /home/bkupxx/daily /home/teamxx/dir1**

___ 14. Display the table of contents of the **/home/bkupxx/daily** backup to ensure that just the changed file was backed up. Record the EXACT name of the file.

-Go back to the **File System** menu

•**List Contents of a Backup**

-Backup DEVICE **[/home/bkupxx/daily]**

-OR-

•# **restore -T -f /home/bkupxx/daily**

___ 15. View the contents of **/etc/dumpdates**. Analyze the contents.

•# **pg /etc/dumpdates**

Note: The next few instructions will show command line hints rather than SMIT screens because of the extra steps of removing files and destroying file systems, which is necessary to perform simulated recovery functions. You may continue to use SMIT shelling between windows to execute the crash procedures.

___ 16. Perform a file crash and recover the file using the above backup. Mount the file system. Change directory to **/home/teamxx/dir1**. Remove the **samples/tcpip/resolv.conf** file. Check that it no longer exists.

•# **mount /home/teamxx/dir1**

•# **cd /home/teamxx/dir1**

•# **rm samples/tcpip/resolv.conf**

•# **ls samples/tcpip/resolv.conf**

___ 17. Before you start the restore, be sure you are in the directory **/home /teamxx/dir1**. Why is this important? You will see messages displayed before the restore takes place. When prompted to specify next volume #, key in **1**. When prompted to set owner/mode, key in **no**.

•# **pwd** (if not in correct directory, **cd** to it)

-# **restore -xvf /home/bkupxx/daily**

-Extract requested files

-You have not read any media yet

-Unless you know which volume your file or files are on, you should start with the last volume and work towards the first

-Specify next volume number **1**

-Extract file **./samples/tcpip/resolv.conf**

- Add links
- Set directory mode, owner, and times
- set owner/mode for '.' ? [yes or no] **no**

•# **pg samples/tcpip/resolv.conf** (look for your name in the file)

- ___ 18. Now you will perform a crash of the entire **/home/teamxx/dir1** file system and then restore it using your backups. Ensure you are in the **/home/teamxx/dir1** directory. Remove all files and directories in this file system. Check to see that they were all removed. Restore the file system and check to ensure all the files were restored. Which backup should you use first?

•# **cd /home/teamxx/dir1**

•# **pwd** (Ensure you are in **/home/teamxx/dir1**. Being in any other directory and continuing with the next instruction could destroy your entire system rather than just the **dir1** file system.)

•# **rm -r /home/teamxx/dir1/***

•# **ls -lR** (total 0)

•# **restore -rvf /home/bkupxx/weekly** (notice the messages on a level 0 backup)

•# **restore -rvf /home/bkupxx/daily** (notice the messages on a level 1 backup)

•# **ls -lR** (should see all your files)

- ___ 19. The **restoresymtable** file is created or updated upon each restore when working with incremental inode backups. Do a long listing on this file to see that it exists. Remove the **restoresymtable**. Note: It keeps track of links and deleted files that were created between the backups. Note that this file only created when working with the **-r** restore option. The system does not know when you are finished restoring all your incremental inode backups, so it leaves you with the chore of cleaning up this control file. This file did not appear during the single file restore for instruction 17. This is because the **-r** option is not appropriate for a single file restore. The **-x** option is the option of choice when restoring a single file and the unusual problems of restoring links and deleted files correctly is not an issue.

•# **ls -l restoresymtable**

•# **rm restoresymtable**

The next 8 instructions are included to show what happens if you don't remember to mount a file system before performing a restore. This is a very common error that can cause a lot of headaches. Hopefully, by intentionally making this mistake in class, you can avoid it back at work or be able to identify the problem immediately and resolve it.

- ___ 20. The **/home/teamxx/dir1** file system should still be mounted from the previous restore. Once again, delete all the files and directories in the file system. (If you

clean out the file system now, later it will be much easier to see if your restore is working properly.) Double check to make sure the files were removed.

•**mount**

•**# rm -r /home/teamxx/dir1/***

•**# ls -lR /home/teamxx/dir1** (should see total 0)

__ 21. Unmount the file system and verify that it is unmounted.

•**# cd /home/teamxx**

•**# umount /home/teamxx/dir1**

•**# mount**

__ 22. Change to the directory mount point and perform the restore.

•**# cd /home/teamxx/dir1**

•**# smit**

System Storage Management

File Systems

Restore a File system

-*Restore DEVICE **[/home/bkupxx/weekly]**

*Target DIRECTORY **[.]**

VERBOSE output? **[yes]**

Number of BLOCKS to read in a single input operation **[]**

OK or Enter

-**F3** to return to the menu

- **OR** -

•**# cd /home/teamxx/dir1**

•**pwd**

•**# restore -rvf /home/bkupxx/weekly**

__ 23. Mount the file system and look at the contents to make sure that the restore was good. Does the file system contain any files?_____

Why?_____

•**# mount /home/teamxx/dir1**

•**mount**

•**# ls -lR**

__ 24. Unmount the file system and list the files in the mount point directory. You will see that this is where your files went when you performed the restore.

•**# cd /home/teamxx**

- # pwd
- # umount /home/teamxx/dir1
- # ls -lR /home/teamxx/dir1

___ 25. Clean up the mount point by deleting all the files in the /home/teamxx/dir1 directory.

- # rm -r /home/teamxx/dir1/*
- # ls -lR /home/teamxx/dir1 (total 0)

___ 26. Mount the file system. Verify it was mounted.

- # mount /home/teamxx/dir1
- # mount

___ 27. Now that you have the file system mounted, try the restore again. List the files after you are through with the restore.

- # smit

System Storage Management

File Systems

Restore a File system

```
-*Restore DEVICE      [/home/bkupxx/weekly]
*Target DIRECTORY    [.]
VERBOSE output       yes
Number of BLOCKS to read in a single input operation [ ]
OK or Enter
```

•Exit SMIT

- # ls -lR
- OR-
- # cd /home/teamxx/dir1
- # restore -rvf/home/bkupxx/weekly
- # ls -lR

The next 3 instructions will demonstrate the advantage of backing up by relative path name.

___ 28. Create a new directory named /home/teamxx/mybkup. Change and verify that you are in the new directory.

- # mkdir /home/teamxx/mybkup
- # cd /home/teamxx/mybkup
- # pwd

- ___ 29. Restore the contents of **/home/bkupxx/weekly** into your new directory **/home/teamxx/mybkup**. Don't forget to use the verbose option so you can see what the **restore** command is doing.

•# smit

**System Storage Management
File Systems
Restore a File System**

-*Restore DEVICE [**/home/bkupxx/weekly**]
*TARGET Directory [.]
VERBOSE output? **yes**
Number of BLOCKS to read in a single output operation []
OK or Enter

-F3 to return to the menu

-OR-

•# restore -rvf **/home/bkupxx/weekly**

- ___ 30. Check the directory **/home/teamxx/mybkup**. It should contain the contents of the **weekly** backup. You can see that backing up files by relative path name allows you to restore them back to ANY directory.

•# ls -lR

Backup and Restore by Name

- ___ 31. Make sure the **/home/teamxx/dir1** file system is mounted. Why would you want to have the file system mounted in order to back it up by name?

•# mount (to see if already mounted)

•# mount **/home/teamxx/dir1** (to mount if necessary)

- ___ 32. Back up the file system by name using the **backup** command. Also, use the full path name to reference the file system. Once again, you will use **/home/bkupxx/weekly** as your output media instead of a tape.

•# smit

**System Storage Management
Files & Directories
Backup a File or Directory**

-*Backup DEVICE [**/home/bkupxx/weekly**]
*FILE or DIRECTORY to backup [**/home/teamxx/dir1**]

VERBOSE output? **yes**

OK or Enter

-F3 to return to the menu

-OR-

•# **find /home/teamxx/dir1 -print | backup -i -v -f /home/bkupxx/weekly**

___ 33. List the table of contents to verify the backup was successful. How were the files listed?

•# **restore -T -f /home/bkupxx/weekly**

-OR-

•# **smit**

System Storage Management

File Systems

List Contents of a Backup

-*Backup DEVICE **[/home/bkupxx/weekly]**

OK or Enter

-F3 to return to the menu

___ 34. Let's take a look at the difference between relative and full path backups by restoring by relative path name. First, **cd** to **/home/teamxx/mybkup** directory and delete all the files. Ensure the directory is empty.

•# **cd /home/teamxx/mybkup**

•# **rm -r /home/teamxx/mybkup/*** (if necessary)

•# **ls -lR** (total 0)

___ 35. The goal is to restore the files from **/home/bkupxx/weekly** into the **/home/teamxx/mybkup** directory. Restore the files and take a look at the contents of the **/home /teamxx/mybkup** directory. Does it contain any files?

•# **smit**

System Storage Management

Files and Directories

Restore a File or Directory

-*Restore DEVICE **[/home/bkupxx/weekly]**

*Target Directory **[/home/teamxx/mybkup]**

VERBOSE output **yes**

OK or Enter

-F3 to return to the menu

•# **List Contents of a Backup**

-*Backup DEVICE /home/bkupxx/weekly

OK or Enter

-F3 to return to the menu

•Exit SMIT

•# ls -lR

-OR-

•# restore -xvf /home/bkupxx/weekly

•# ls -lR

- ___ 36. Backup the file system by name, but use a relative path name. Make sure you are in /home/teamxx/dir1. List the contents of **weekly**. The file names should be in a ./filename (relative path name) format.

•# cd /home/teamxx/dir1

•# smit

System Storage Management

Files & Directories

Backup a File or Directory

-*Backup DEVICE [/home/bkupxx/weekly]

*File or Directory to Backup [.]

VERBOSE output? yes

OK or Enter

-F3 back to the **Files & Directories** menu

-List Contents of a Backup

—*Backup DEVICE /home/bkupxx/weekly

—F3 to return to the menu

-OR-

•# cd /home/teamxx/dir1

•# find . -print | backup -ivf /home/bkupxx/weekly

•# restore -Tf /home/bkupxx/weekly

- ___ 37. Now you should be able to restore these files into the /home/teamxx/mybkup directory. Change to the /home/teamxx/mybkup directory. Perform the restore.

•# cd /home/teamxx/mybkup

•# smit

System Storage Management

Files & Directories

Restore a File or Directory

-*Restore DEVICE [/home/bkupxx/weekly]
 *Target Directory [.]
 VERBOSE output? yes
 OK or Enter

-F3 to return to the menu

-OR-

•# cd /home/teamxx/mybkup
•# restore -xvf /home/bkupxx/weekly

___ 38. List the contents of the /home/teamxx/mybkup directory. All of the files should be listed.

•# ls -lR /home/teamxx/mybkup

END OF EXERCISE

Solutions

- ___ 10. Display the table of contents of the **/home/bkupxx/weekly** backup to ensure that all files in the **/home/teamxx/dir1** file system were backed up properly. How are the files listed? _____

Answer:

The inode and relative path name of the files are displayed.

- ___ 17. Before you start the restore, be sure you are in the directory **/home /teamxx/dir1**. Why is this important? You will see messages displayed before the restore takes place. When prompted to specify next volume #, key in **1**. When prompted to set owner/mode, key in **no**.

Answer:

The files were backup up with relative path names. To restore them to their original locations, you must be in the original directory.

- ___ 18. Now you will perform a crash of the entire **/home/teamxx/dir1** file system and then restore it using your backups. Ensure you are in the **/home/teamxx/dir1** directory. Remove all files and directories in this file system. Check to see that they were all removed. Restore the file system and check to ensure all the files were restored. Which backup should you use first?

Answer:

Use the weekly backup first, then the daily backup.

- ___ 23. Mount the file system and look at the contents to make sure that the restore was good. Does the file system contain any files? _____
Why? _____

Answer:

No. The files were restored to the **/home/team01/dir DIRECTORY**. When you mounted the file system to the MOUNT POINT **/home/team01/dir**, you overlaid the directory with the file system contents.

- ___ 31. Make sure the **/home/teamxx/dir1** file system is mounted. Why would you want to have the file system mounted in order to back it up by name?

Answer:

To have the full path names backed up and ultimately restored by full path name.

- ___ 33. List the table of contents to verify the backup was successful. How were the files listed?

Answer:

The files are listed with full path names.

- ___ 35. The goal is to restore the files from **/home/bkupxx/weekly** into the **/home/teamxx/mybkup** directory. Restore the files and take a look at the contents of the **/home /teamxx/mybkup** directory.
Does it contain any files?

Answer:

No. The files were restored by their full path name, which put them into the **/home/team01/dir1** file system.

Exercise 11. Using tar and cpio (Optional)

What This Exercise Is About

The purpose of this exercise is to familiarize the students with the UNIX commands **tar** and **cpio**.

What You Should Be Able to Do

At the end of the lab, you should be able to:

- Use **tar** to perform a backup and a restore
- Use **cpio** to perform a backup and a restore

In this exercise you will backup files and directories using **tar** and then **cpio**. The backup media will be the hard drive.

The **Exercise Instructions with Hints** section provides the command line commands for this activity. SMIT does not support backups using **tar** or **cpio**. You must perform these steps from the command line.

Exercise Instructions

Using tar

- ___ 1. Before getting started, perform some housekeeping. Delete all of the files in the **/home/teamxx/mybkup** directory.
- ___ 2. Make sure that the **/home/teamxx/dir1** file system is mounted. **tar** will not backup file systems unless they are mounted. If it is not mounted, mount it.
- ___ 3. Change directory to the file system and create a directory called **myjunk**. In that directory, create four zero-length files named **file1 file2 file3 file4**.
- ___ 4. Back up the file system using the **tar** command to the file **/home/bkupxx/tardata** using relative path name. List the contents of **tardata** to ensure all files were backed up.
- ___ 5. Since the backup was done using relative path names, restore them to a different directory. Use **tar** to restore the contents of the **tardata** directory to the **/home/teamxx/mybkup** directory. Verify that all files were restored.
- ___ 6. Change directory to **/home/teamxx/mybkup**. Remove all files in **/home/teamxx/mybkup**. Verify that it is empty. Use **tar** to extract only the files contained in the **myjunk** directory in **tardata** and load these files to the **/home/teamxx/mybkup** directory. List the files in the **/home/teamxx/mybkup** directory.
- ___ 7. You have been using relative path names up to this point with **tar**. Specify a full path name and **tar** will back it up in full path name format. Backup the contents of the file system to **tardata** directory using full path names.
- ___ 8. Check the contents of **tardata**. All file names should be referenced by full path name. If you restored the files, they would restore back to the same directory that you copied them from.

Using cpio

In this section, you will back up and restore the same files again but this time using **cpio**.

- ___ 9. Change directory into **/home/teamxx/dir1/myjunk** and make sure your files are there.
- ___ 10. Back up the file system using the **cpio** command to the file **/home/bkupxx/cpiodata** using a relative path name. List the contents of **cpiodata** to ensure all files were backed up.
- ___ 11. Since this backup is done using a relative path names, restore them, using **cpio**, to the directory **/home/teamxx/mybkup**. FIRST remove all the files from the **/home/teamxx/mkbkup** directory.
- ___ 12. Change directory to **/home/teamxx/mybkup**. Remove all files in **/home/teamxx/mybkup**. Verify that it is empty. Use **cpio** to extract only the files

contained in the **myjunk** directory in **cpiodata** and load these files to the **/home/teamxx/mkbkup** directory. List the files in the **/home/teamxx/mkbkup** directory.

- ___ 13. You have been using relative path names up to this point with **cpio**. Specify a full path name with the **find** command and **cpio** will back it up with a full path name format. Backup the contents of the file system to **cpiodata** using full path names.
- ___ 14. Check the contents of **cpiodata**. All the file names should be referenced by full path names. If you restored the files, they would restore back to the same directory that you copied them from.

END OF LAB

Exercise Instructions with Hints

Using tar

- ___ 1. Before getting started, perform some housekeeping. Delete all of the files in the **/home/teamxx/mybkup** directory.
 - # **rm -r /home/teamxx/mybkup/***
- ___ 2. Make sure that the **/home/teamxx/dir1** file system is mounted. **tar** will not backup file systems unless they are mounted. If it is not mounted, mount it.
 - # **mount**
 - # **mount /home/teamxx/dir1** (if not mounted)
- ___ 3. Change directory to the file system and create a directory called **myjunk**. In that directory, create four zero-length files named **file1 file2 file3 file4**.
 - # **cd /home/teamxx/dir1**
 - # **mkdir myjunk**
 - # **cd myjunk**
 - # **touch file1 file2 file3 file4**
- ___ 4. Back up the file system using the **tar** command to the file **/home/bkupxx/tardata** using relative path name. List the contents of **tardata** to ensure all files were backed up.
 - # **cd /home/teamxx/dir1**
 - # **tar -cvf /home/bkupxx/tardata .**
 - # **tar -tvf /home/bkupxx/tardata .**
- ___ 5. Since the backup was done using relative path names, restore them to a different directory. Use **tar** to restore the contents of the **tardata** directory to the **/home/teamxx/mybkup** directory. Verify that all files were restored.
 - # **cd /home/teamxx/mybkup**
 - # **tar -xpvf /home/bkupxx/tardata**
 - # **ls -lR /home/teamxx/mybkup**
- ___ 6. Change directory to **/home/teamxx/mybkup**. Remove all files in **/home/teamxx/mybkup**. Verify that it is empty. Use **tar** to extract only the files contained in the **myjunk** directory in **tardata** and load these files to the **/home/teamxx/mybkup** directory. List the files in the **/home/teamxx/mybkup** directory.
 - # **cd /home/teamxx/mybkup**
 - # **rm -r /home/teamxx/mybkup/***
 - # **ls -lR**

```
•# tar -xpvf /home/bkupxx/tardata ./myjunk
```

```
•# ls -lR
```

- ___ 7. You have been using relative path names up to this point with **tar**. Specify a full path name and **tar** will back it up in full path name format. Backup the contents of the file system to **tardata** directory using full path names.

```
•# tar -cvf/home/bkupxx/tardata /home/teamxx/dir1
```

- ___ 8. Check the contents of **tardata**. All file names should be referenced by full path name. If you restored the files, they would restore back to the same directory that you copied them from.

```
•# tar -tvf /home/bkupxx/tardata
```

Using cpio

In this section, you will back up and restore the same files again but this time using **cpio**.

- ___ 9. Change directory into **/home/teamxx/dir1/myjunk** and make sure your files are there.

```
•# cd /home/teamxx/dir1/myjunk
```

```
•# ls
```

- ___ 10. Back up the file system using the **cpio** command to the file **/home/bkupxx/cpiodata** using a relative path name. List the contents of **cpiodata** to ensure all files were backed up.

```
•# cd /home/teamxx/dir1
```

```
•# find ./myjunk | cpio -ov > /home/bkupxx/cpiodata
```

```
•# cpio -itv < /home/bkupxx/cpiodata
```

- ___ 11. Since this backup is done using a relative path names, restore them, using **cpio**, to the directory **/home/teamxx/mybkup**. FIRST remove all the files from the **/home/teamxx/mkbbkup** directory.

```
•# cd /home/teamxx/mkbbkup
```

```
•# rm -r /home/teamxx/mkbbkup/*
```

```
•# cpio -idv < /home/bkupxx/cpiodata
```

```
•# ls -lR /home/teamxx/mybkup
```

- ___ 12. Change directory to **/home/teamxx/mybkup**. Remove all files in **/home/teamxx/mybkup**. Verify that it is empty. Use **cpio** to extract only the files contained in the **myjunk** directory in **cpiodata** and load these files to the **/home/teamxx/mkbbkup** directory. List the files in the **/home/teamxx/mkbbkup** directory.

```
•# cd /home/teamxx/mybkup
```

```
•# rm -r /home/teamxx/mybkup/*
```

```
•# ls -lR
```

```
•# cpio -idv < /home/bkupxx/cpiodata myjunk/*
```

•# ls -lR

- ___ 13. You have been using relative path names up to this point with **cpio**. Specify a full path name with the **find** command and **cpio** will back it up with a full path name format. Backup the contents of the file system to **cpiodata** using full path names.

•# find /home/teamxx/dir1/ | cpio -ov > /home/bkup01/cpiodata

- ___ 14. Check the contents of **cpiodata**. All the file names should be referenced by full path names. If you restored the files, they would restore back to the same directory that you copied them from.

•# cpio -itv < /home/bkupxx/cpiodata

END OF LAB

Exercise 12. Security Files

What This Exercise Is About

The purpose of this exercise is to gain familiarity with security-related files.

What You Should Be Able to Do

After completing this exercise, students should be able to:

- Execute commands that identify group membership
- Identify default system groups
- Display contents of security logs
- Work with the SUID and stickbit

Introduction

During this exercise, you will be given an opportunity to look at some of the files discussed in the unit. You will also have a chance to work with the SUID and stickbit.

Exercise Instructions

Security Control Files

- ___ 1. Log in as **teamxx** and **su** to **root**. Display a listing of the system-defined groups. Take a moment to review the members of each group.
- ___ 2. Exit SMIT if you are in SMIT, and display the groups of which **root** is a member. Next, without logging out, display the groups of which your **teamxx** login is a member.
- ___ 3. Display the contents of the file that keeps track of the successful and failed **su** attempts. How can you determine the failed attempts? _____
- ___ 4. When a user logs in successfully, the **login** program writes the associated information in the two files **/var/adm/wtmp** and **/etc/utmp**. Using the **who** command, examine the contents of these two files.
- ___ 5. Display in reverse chronological order, all previous logins and logouts recorded in **/var/adm/wtmp** for your login user name, **teamxx**, and **root**.
- ___ 6. Check to see if there were any invalid login attempts on your system due to an incorrect login name or password. How can you tell? _____

SUID and Sticky Bit

- ___ 7. Create a listing of all SUID programs on the system to a file called **allsuids**. Page through **allsuids** to see all the programs that are SUID programs. Look for some of the commands that you have already learned and executed.
- ___ 8. As an ordinary user, you have been executing the **su** command to switch user to **root** to perform privileged tasks. The **su** program has the SUID bit turned on. Do a long listing on **/usr/bin/su** to see the SUID bit.
- ___ 9. Turn the SUID bit off. Verify that the bit is turned off.
- ___ 10. Exit back to your **teamxx** login shell and try to **su** to **root**. Can you?

- ___ 11. Since you cannot **su** to **root** to turn the SUID bit back on, log off and back on as **root** and set SUID on the program **/usr/bin/su**. Verify that the SUID bit is turned on.
- ___ 12. Log off and back on as **teamxx** and **su** to **root**.
- ___ 13. Do a long listing on the **/tmp** directory. Locate the sticky bit that is set on the directory.
- ___ 14. Exit back to your **teamxx** login shell. Ensure you are in your **teamxx** home directory. Create a subdirectory in your home directory named **stickydir**.

Change the bits on the **stickydir** directory for full access by all three groups with the sticky bit turned on. Verify that the change was made.

- ___ 15. Create a zero-length file in the **stickydir** directory named **sticky1**.
- ___ 16. Now, **su** to a **teamy** user name that is not being used on your system. Check with any other teams that may be sharing your system. The existing user names should be **team01 - team05** with passwords the same as the user name. As this other **teamy** user, try and remove your **teamxx** file **sticky1**. Can you do it?
- ___ 17. Exit back to your **teamxx** login user name.

END OF EXERCISE

Exercise Instructions with Hints

Security Control Files

- ___ 1. Log in as **teamxx** and **su** to **root**. Display a listing of the system-defined groups. Take a moment to review the members of each group.

•# **cat /etc/group**

-OR-

•# **smit**

**Security & Users
Groups
List All Groups**

-F3 to return to the menu

- ___ 2. Exit SMIT if you are in SMIT, and display the groups that **root** is a member. Next, without logging out, display the groups of which your **teamxx** login is a member.

•F10 to exit SMIT (if you are in SMIT)

•# **groups**

-OR-

•# **setgroups**

•# **groups teamxx**

- ___ 3. Display the contents of the file that keeps track of the successful and failed **su** attempts. How can you determine the failed attempts?_____

•# **pg /var/adm/sulog**

- ___ 4. When a user logs in successfully, the **login** program writes the associated information in the two files **/var/adm/wtmp** and **/etc/utmp**. Using the **who** command, examine the contents of these two files.

•# **who /var/adm/wtmp**

•# **who /etc/utmp**

- ___ 5. Display in reverse chronological order, all previous logins and logouts recorded in **/var/adm/wtmp** for your login user name, **teamxx**, and **root**.

•# **last teamxx**

•# **last root**

- ___ 6. Check to see if there were any invalid login attempts on your system due to an incorrect login name or password. How can you tell?_____

•# **who /etc/security/failedlogin**

SUID and Sticky Bit

- ___ 7. Create a listing of all SUID programs on the system to a file called **allsuids**.
Page through **allsuids** to see all the programs that are SUID programs. Look for some of the commands that you have already learned and executed.
- # **find / -perm -4000 > allsuids**
 - # **pg allsuids**
- ___ 8. As an ordinary user, you have been executing the **su** command to switch user to **root** to perform privileged tasks. The **su** program has the SUID bit turned on. Do a long listing on **/usr/bin/su** to see the SUID bit.
- # **ls -l /usr/bin/su**
- ___ 9. Turn the SUID bit off. Verify that the bit is turned off.
- # **chmod 555 /usr/bin/su**
 - # **ls -l /usr/bin/su** (an x bit should replace the s bit)
- ___ 10. Exit back to your **teamxx** login shell and try to **su** to **root**. Can you?
- \$ **su**
Cannot su to "root" : Authentication is denied
- ___ 11. Since you cannot **su** to **root** to turn the SUID bit back on, logoff and back on as **root** and set SUID on the program **/usr/bin/su**. Verify that the SUID bit is turned on.
- \$ **exit**
 - # **chmod 4555 /usr/bin/su**
 - # **ls -l /usr/bin/su**
- ___ 12. Log off and back on as **teamxx** and **su** to **root**.
- # **exit**
 - \$ **su**
- ___ 13. Do a long listing on the **/tmp** directory. Locate the sticky bit that is set on the directory.
- # **ls -ld /tmp**
- ___ 14. Exit back to your **teamxx** login shell. Ensure you are in your **teamxx** home directory. Create a subdirectory in your home directory named **stickydir**. Change the bits on the **stickydir** directory for full access by all three groups with the sticky bit turned on. Verify that the change was made.
- # **exit**

•\$ pwd (should be in /home/teamxx)

•\$ mkdir stickydir

•\$ chmod 1777 stickydir

•\$ ls -ld stickydir

___ 15. Create a zero-length file in the **stickydir** directory named **sticky1**.

•\$ touch stickydir/sticky1

___ 16. Now, **su** to a **teamy** user name that is not being used on your system.

Check with any other teams that may be sharing your system. The existing user names should be **team01 - team05** with passwords the same as the user name. As this other **teamy** user, try and remove your **teamxx** file **sticky1**. Can you do it?

•\$ su teamyy (where **yy** is a different user name than your login name)

•\$ rm /home/teamxx/stickydir/sticky1

Because you are not the owner the system should properly respond with "Not owner".

___ 17. Exit back to your **teamxx** login user name.

•\$ exit

END OF EXERCISE

Solutions

Following are the solutions for those instructions that include questions:

3. Display the contents of the file that keeps track of the successful and failed **su** attempts. How can you determine the failed attempts? _____

Answer: A failed attempt is noted by a- (minus). A successfully attempt is noted by a + (plus).

6. Check to see if there were any invalid login attempts on your system due to an incorrect log in name or password. How can you tell? _____

Answer: Log in names that are not recognized will be logged as UNKNOWN.

10. Exit back to your **teamxx** login shell and try to **su** to **root**. Can you?

Answer: No because the SUID has been taken off the **su** program. Sometimes it is necessary for unprivileged users to be able to accomplish tasks that require privileges. When a SUID program is run, its effective UID becomes that of the owner of the program rather than the user that is running it. When you did a long listing on **/usr/bin/su** you saw that the owner was **security**.

16. Now, **su** to a **teamyy** user name that is not being used on your system. Check with any other teams that may be sharing your system. The existing user names should be **team01 - team05** with passwords the same as the user name. As this other **teamyy** user, try and remove your **teamxx** file **sticky1**. Can you do it?

Answer: No. As the creator, **teamxx**, of the directory, **stickydir**, you set the mode of **/home/teamxx/stickydir** so any user can create or delete their own file in this directory, but cannot delete each other's files. The **/tmp** directory is the most widely used directory for this feature.

Exercise 13. User Administration

What This Exercise Is About

This exercise introduces you to the management and administration of users and groups.

What You Should Be Able to Do

After completing this exercise, students should be able to:

- Create a user with password restrictions
- Implement and test user login controls
- Remove a user from the system
- Create a group
- Execute **pwdadm** to change another user's password
- Invoke user communication commands

Introduction

This exercise concentrates on the SMIT interface for creating and maintaining users and groups. The **Exercise Instructions with Hints** section will show full SMIT menus to get to a dialog screen, using F3 to go back to previous menus, and some SMIT fastpath commands. Adjust these hints according to your preference in working with SMIT. Only the options you are to fill in will be listed. All other options will use the system defaults.

The exercise instructions direct you to create users **usera**, **userb** and **userc**. If two students are sharing an RS/6000 system, and performing this exercise separately, create users **useraxx**, **userbxx**, **usercxx** where **xx** represents the student's initials. This will ensure unique user IDs.

You will be logging in and out of the system many times during this exercise; therefore, you will login as **root** rather than switching to the **root** user. Although this is not the recommended method for performing system administrative tasks, it will make it more efficient when doing this exercise.

Exercise Instructions

User Administration

- ___ 1. Log in to the system as **root**. Using SMIT, list the current users defined on your system.
- ___ 2. Create a new user named **usera** with the following restrictions:
 - a. 3 day password expiration warning
 - b. 2 passwords before reuse
 - c. 1 week before expiration and lockout
 - d. Prevent other users from switching to **usera**.
- ___ 3. List the user attributes. Exit SMIT and look at the **/etc/security/user** file. Compare the defaults in this file with the attributes listed for **usera**.
- ___ 4. To test the new user, log off and log in as **usera**. Could you login? _____ Why? _____
- ___ 5. Log in as **root** and page through the **/etc/passwd** file. What is in the password field for **usera**? _____ What does this mean? _____
- ___ 6. Assign a password to **usera**. Display the **/etc/passwd** file. What is in the password field for **usera**? _____ What does this mean? _____
- ___ 7. Do a long listing of all files including hidden files in **usera's** home directory. What files were created? _____
- ___ 8. Test the new user id. Log off and log in as **usera**. When prompted to change the password, type in the **same** password assigned in instruction 6 to test the reuse restriction set on the user id from instruction 2. After you get the reuse error message, proceed to change **usera's** password to something different. After successfully logging in as **usera**, logout.
- ___ 9. Suppose **usera** is going on an extended vacation. Login as **root** and using SMIT, lock **usera's** login account.
- ___ 10. Exit SMIT and test the account lock by attempting to login as **usera**. You should not be able to. If you could, redo instruction 9 and test it again.
- ___ 11. Log in as **root** and try to **su** to **usera**. Could you? _____ Why? _____ Kill the subshell and return to **root**. Unlock **usera's** account.
- ___ 12. Some users may try to guess other user's passwords. To help prevent illegal log ins, set the number of failed log in attempts to two for **usera**. Exit SMIT and log out.
- ___ 13. Test the change by trying to login as **usera** and entering an incorrect password three times. On the fourth attempt enter the correct password. If you are in a windows session, exit and execute this instruction from an ASCII command line.

- ___ 14. Log in as **root** and change the failed login attempts to **0** for **usera** to disable the failed login check.

Group Administration

- ___ 15. As your company grows you may need to add additional system administrators to perform certain administrative tasks. As **root**, create a user named **helper** that will assist you in user and group administration only by being a member of the **security** group. Add **security** to **helper's** group set, not the primary group. Make the password the same as the user name. What other group would have given this user permission to administer users and groups? _____ Why not use this other group? _____
- ___ 16. Exit SMIT. Page through the **/etc/group** file. Locate **security** and ensure that **helper** is listed there.
- ___ 17. Log out and back in as **helper**. Execute the **groups** command to ensure that you belong to two groups, **staff** and **security**. As a new system administrator, add a new group called **budget**. List all groups to verify the addition of the new group.
- ___ 18. Now add two new users, **userb** and **userc** making both members of **budget** as their group set.
- ___ 19. Exit SMIT. Assign the passwords for **userb** and **userc**. Make the password for each user the same as the user name.
- ___ 20. Log off and back in as **userb**. (As this will be **userb's** first login, you will be prompted to change the password. Simply keep it the same. You should be familiar with what to do; therefore, the prompts will not be shown.). Change to the **budget** group and create a file named **report**. Add "group" write permission to **report**. Do a long listing on the file to verify that the "group" access is the **budget** group. Return to the default group. Other than the command you used to change groups, what other command could be used? _____
- ___ 21. Let's test to see if a member of the **budget** group can edit the file **report**. Log out and back in as **userc**. As in the instruction above, this will be **userc's** first time to log in. Change the password accordingly. Edit **report** and add your name. Log out. Did **userc** have to issue any special command before editing the file? _____ Why? _____

Customizing the Default .profile File

- ___ 22. When a user is created, the default **.profile** file is copied into the user's home directory. As a system administrator, login, **su** to root, and edit the default **.profile** file so that all newly created users have by default the **EDITOR** variable automatically set up to **/usr/bin/vi** and their primary prompt string reflects the user's current directory. (Hint: remember that the **PS1** variable is for the primary prompt string and the **PWD** variable contains the value of the current directory.) Note: You

may want to go back and remove the **PS1** variable assignment from the **/etc/security/.profile** file so the **\$** becomes the primary prompt string.

- ___ 23. Create a user named **userd**. Assign a password to **userd**. Logout and back in as **userd**. You should see the current directory listed as your prompt. Next display the value of the **EDITOR** variable. If the results are not what you expected, repeat the previous instruction and try again.

Removing Users

- ___ 24. Log in as **root**. Before you remove **userb** from the system, locate the stanza for **userb** in **/etc/security/passwd**.
- ___ 25. Remove **userb** from the system. Take the default to the option **Remove AUTHENTICATION** which is **yes**. What is this doing? _____
- ___ 26. Page through the **/etc/security/passwd** file to ensure that the stanza for **userb** was removed.
- ___ 27. When a user is removed from the system, the user's home directory and files owned by the user are NOT removed. Verify that **userb's** home directory and files still exist. Remove all files and directories associated with **userb**.

Communicating with Users

- ___ 28. As **root**, edit **/etc/motd** and add to the file in all uppercase "**TODAY IS USERA'S BIRTHDAY. SURPRISE CAKE AT 11:00**". Display the message by logging out and back in. First check that the user access permissions on the file have write permission. If not, set write for "user".
- ___ 29. Now create a zero-length hidden file in **usera's** home directory named **.hushlogin**. You want everyone that logs in to see the output of **/etc/motd** except **usera**. Log out and back in as **usera**. The **/etc/motd** file should not have been displayed.
- ___ 30. As **root** create a file named **newsitem** in the **/var/news** directory. Type in a few lines. Log out and back in as **teamxx** and read the news.
- To do the following instruction you should have more than one user on your local system. If you are the only person on your system and you have two terminals, login on both terminals using two different **teamxx** ids. Perform the exercise from one terminal and look for the message on the other terminal.
- ___ 31. As **root**, send a note to all users on the system that the system will shutdown in 30 minutes.

END OF EXERCISE

Exercise Instructions with Hints

User Administration

- ___ 1. Log in to the system as **root**. Using SMIT, list the current users defined on your system.

•# **smit**

Security & Users

Users

List All Users

-F3 to return to the menu

- ___ 2. Create a new user named **usera** with the following restrictions:

Three-day password expiration warning

Two passwords before reuse

One week between expiration and lockout

Prevent other users from switching to **usera**

•Go back to the **Users** menu

Add a User

-User NAME

[usera]

Another user can SU to USER?

false

Days to WARN USER before password expires

[3]

NUMBER OF PASSWORDS before a reuse

[2]

Weeks between password EXPIRATION & LOCKOUT

[1]

OK or Enter

-F3 to return to the menu

- ___ 3. List the user attributes. Exit SMIT and look at the **/etc/security/user** file. Compare the defaults in this file with the attributes listed for **usera**.

•Go back to the **Users** menu

Change/Show Characteristics of a User

-User Name **[usera]**

OK or Enter

-F3 to return to the menu

•Exit Smit

•# **pg /etc/security/user**

- ___ 4. To test the new user, log off and log in as **usera**.

Could you login? _____ Why? _____

•# **exit**

•login: **usera**
usera's Password: **(Enter)**
You entered an invalid name or password
login:

- ___ 5. Log in as **root** and page through the **/etc/passwd** file. What is in the password field for **usera**? _____ What does this mean?

•# pg /etc/passwd

- ___ 6. Assign a password to **usera**. Display the **/etc/passwd** file. What is in the password field for **usera**? _____
What does this mean? _____

•# pwdadm usera

-Changing password for "usera" usera's New password: **(enter password)**
Enter the new password again: **(enter password again)**

•# pg /etc/passwd

- ___ 7. Do a long listing of all files including hidden files in **usera's** home directory. What files were created? _____

•# ls -al /home/usera

- ___ 8. Test the new user id. Log off and log in as **usera**. When prompted to change the password, type in the **same** password assigned in instruction 6 to test the reuse restriction set on the user id from instruction 2. After you get the reuse error message, proceed to change **usera's** password to something different. After successfully logging in as **usera**, logout.

•# exit

•login: **usera**

-usera's Password: **(enter original password)**
You are required to change your password.
Please choose a new one.
usera's New password: **(enter the original password again)**
Password was recently used and is not valid for reuse.
usera's New password: **(enter new password)**
Enter the new password again: **(enter password)**

•\$ exit

- ___ 9. Suppose **usera** is going on an extended vacation. Login as **root** and using SMIT, lock **usera's** login account.

•# smit

Security & Users Login Controls

Change/Show Login Attributes for a User

-User NAME [usera]
 Is this user ACCOUNT LOCKED [true]
OK or Enter
 -F3 to return to the menu

- ___ 10. Exit SMIT and test the account lock by attempting to login as **usera**. You should not be able to. If you could, redo instruction 9 and test it again.

•Exit SMIT

•login: **usera**
 usera's Password: **(enter password)**

-Your account has been locked, please see the system administrator.
 login:

- ___ 11. Log in as **root** and try to **su** to **usera**. Could you? _____ Why?

Kill the subshell and return to **root**. Unlock **usera's** account.

•# **su usera**

•\$ <ctrl-d>

•# **smit login_user**

-User NAME [usera]
 Is this user ACCOUNT LOCKED [false]
OK or Enter
 -F3 to return to the menu

- ___ 12. Some users may try to guess other user's passwords. To help prevent illegal logins, set the number of failed login attempts to two for **usera**. Exit SMIT and logout.

•Go back to **Change/Show Login Attributes for a User**

-User NAME [usera]
 Number of FAILED LOGINS before [2]
 user account is locked
OK or Enter
 -F3 to return to the menu

•Exit Smit

•# **exit**

- ___ 13. Test the change by trying to login as **usera** and entering an incorrect password three times. On the fourth attempt enter the correct password. If you are in a windows session, exit and execute this instruction from an ASCII command line.

•login: **usera**
 usera's Password: **(enter incorrect password)**
 You entered an invalid login name or password

•login: **usera**

usera's Password: **(enter incorrect password)**

You entered an invalid login name or password

•login: **usera**

usera's Password: **(enter incorrect password)**

You entered an invalid login name or password

The screen should scroll to refresh login prompt

•login: **usera**

usera's Password: **(enter correct password)**

There have been too many unsuccessful login attempts; please see the system administrator

login:

___ 14. Log in as **root** and change the failed login attempts to **0** for **usera** to disable the failed login check.

•# **smit login_user**

-User Name **[usera]**

Number of FAILED LOGINS **[0]**

OK or Enter

-**F3** to return to the menu

-**F10** to exit SMIT

Group Administration

___ 15. As your company grows you may need to add additional system administrators to perform certain administrative tasks. As **root**, create a user named **helper** that will assist you in user and group administration only, by being a member of the **security** group. Add **security** to **helper's** group set, not the primary group. Make the password the same as the user name. What other group would have given this user permission to administer users and groups? _____ Why not use this other group? _____

•# **smit**

Security & Users

Users

Add a User

-User NAME **[helper]**

Group Set **[security]**

OK or Enter

-**F3** to return to the menu

•Go back to **Security & Users** menu

Passwords

Change a Users Password

-User NAME [helper]
 Changing password for "helper"
 helper's New password: helper
 Re-enter helper's New password: helper
OK or Enter
-F3 to return to the menu

___ 16. Exit SMIT. Page through the **/etc/group** file. Locate **security** and ensure that **helper** is listed there.

•**F10** to return to the command line
 •**pg /etc/group**

___ 17. Log out and back in as **helper**. Execute the **groups** command to ensure that you belong to two groups, **staff** and **security**. As a new system administrator, add a new group called **budget**. List all groups to verify the addition of the new group.

•**# exit**
 •login: **helper**
 helper's Password: (enter password)
 •**\$ groups**
 •**\$ smit**

Security & Users**Groups****Add a Group**

-Group NAME [budget]
OK or Enter
-F3 to return to the menu

•Go back to the **Groups** menu

List All Groups

___ 18. Now add two new users, **userb** and **userc** making both members of **budget** as their group set.

•Go back to **Security & Users** menu

Users**Add a User**

-User NAME [userb] Group Set [budget]OK or Enter
-F3 to return to the menu

•Go back to **Add a User** menu

-User NAME [userc] Group Set [budget]OK or Enter
-F3 to return to the menu

___ 19. Exit SMIT. Assign the passwords for **userb** and **userc**. Make the password for each user the same as the user name.

•**Exit Smit**

•**\$ pwdadm userb**

-Changing password for "userb"

helper's Password: **<type helper>**

userb's New password: **<type userb>**

Re-enter userb's new password: **<type userb>**

•**\$ pwdadm userc**

-Changing password for "userc"

helper's Password: **<type helper>**

userc's New password: **<type userc>**

Re-enter userc's new password: **<type userc>**

___ 20. Log off and back in as **userb**. (As this will be **userb's** first login, you will be prompted to change the password. Simply keep it the same. You should be familiar with what to do; therefore, the prompts will not be shown). Change to the **budget** group and create a file named **report**. Add "group"write permission to **report**. Do a long listing on the file to verify that the "group" access is the **budget** group. Return to the default group. Other than the command you used to change groups, what other command could be used? _____

•**\$ exit**

•login: **userb**

userb's Password: **(enter password)**

•**\$ newgrp budget**

•**\$ vi report**

(type a few lines)

•**\$ chmod g+w report**

•**\$ ls -l report**

•**\$ newgrp**

___ 21. Let's test to see if a member of the **budget** group can edit the file **report**. Log out and back in as **userc**. As in the instruction above, this will be **userc's** first time to log in. Change the password accordingly. Edit **report** and add your name. Log out. Did **userc** have to issue any special command before editing the file? _____ Why?

•**\$ exit**

•login: **userc**

userc's Password: **(enter password)**

- \$ vi /home/userb/report
(type your name)
- \$ exit

Customizing the Default .profile File

___ 22. When a user is created, the default **.profile** file is copied into the user's home directory. As a system administrator, login, **su** to root, and edit the default **.profile** file so that all newly created users have by default the **EDITOR** variable automatically set up to **/usr/bin/vi** and their primary prompt string reflects the user's current directory. (Hint: remember that the **PS1** variable is for the primary prompt string and the **PWD** variable contains the value of the current directory.) Note: You may want to go back and remove the **PS1** variable assignment from the **/etc/security/.profile** file so the **\$** becomes the primary prompt string.

- \$ su - root
- # vi /etc/security/.profile
 - EDITOR=/usr/bin/vi
 - PS1='\$PWD=> '
 - export PATH EDITOR PS1

___ 23. Create a user named **userd**. Assign a password to **userd**. Log out and back in as **userd**. You should see the current directory listed as your prompt. Next display the value of the **EDITOR** variable. If the results are not what you expected, repeat the previous instruction and try again.

- # smit mkuser
 - User NAME [**userd**]
 - OK or Enter**
 - F3 to return to the menu
- Exit SMIT
- # pwdadm userd
- # exit
- login: **userd**
 - userd's Password: (**enter password**)
- /home/userd=> **echo \$EDITOR**
 - /usr/bin/vi

Removing Users

___ 24. Log in as **root**. Before you remove **userb** from the system, locate the stanza for **userb** in **/etc/security/passwd**.

•# pg /etc/security/passwd

___ 25. Remove **userb** from the system. Take the default to the option **Remove AUTHENTICATION** which is **yes**. What is this doing?_____

•# smit rmuser

-User NAME [userb]

OK or Enter

-F3 to return to the menu

___ 26. Page through the **/etc/security/passwd** file to ensure that the stanza for **userb** was removed.

•# pg /etc/security/passwd

___ 27. When a user is removed from the system, the user's home directory and files owned by the user are NOT removed. Verify that **userb's** home directory and files still exist. Remove all files and directories associated with **userb**.

•# ls -ld /home/userb

•# ls -al /home/userb

•# rm -r /home/userb

-OR

•# rm /home/userb/*

•# rmdir /home/userb

Communicating with Users

___ 28. As **root**, edit **/etc/motd** and add to the file in all uppercase "**TODAY IS USERA'S BIRTHDAY. SURPRISE CAKE AT 11:00.**" Display the message by logging out and back in. First check that the user access permissions on the file have write permission. If not, set write for "user."

•# ls -l /etc/motd

•# chmod u+w /etc/motd (if necessary)

•# vi /etc/motd

TODAY IS USERA'S BIRTHDAY. SURPRISE CAKE AT 11:00

•# exit

•login: root

root's Password: (enter password)

___ 29. Now create a zero-length hidden file in **usera's** home directory named **.hushlogin**. You want everyone that logs in to see the output of **/etc/motd** except **usera**. Log out and back in as **usera**. The **/etc/motd** file should not have been displayed.

- # touch /home/usera/.hushlogin

- # exit

- login: **usera**

- usera's Password: **(enter password)**

___ 30. As **root** create a file named **newsitem** in the **/var/news** directory. Type in a few lines. Log out and back in as **teamxx** and read the news.

- \$ su

- # cd /var/news

- # vi newsitem1

- (Type a few lines)

- # exit

- # exit

- login: **teamxx**

- teamxx's Password: **(enter password)**

- \$ news

To do the following instruction you must have more than one user on your local system. If you are the only person on your system and you have two terminals, login on both terminals using two different **teamxx** ids. Perform the exercise from one terminal and look for the message on the other terminal.

___ 31. As **root**, send a note to all users on the system that the system will shutdown in 30 minutes.

- # wall **The system will be shutdown in 30 minutes**

END OF EXERCISE

Solutions

Following are the solutions for those instructions that include questions:

4. To test the new user, log off and log in as **usera**. Could you login?

Answer: No, because **usera** does not have a password and therefore, is considered an invalid user.

5. Log in as **root** and page through the **/etc/passwd** file. What is in the password field for **usera**? _____ What does this mean? _____

Answer: An *. This means that **usera** is not a valid user as no password was set; therefore, there is no entry in **/etc/security/passwd** for **usera**.

6. Assign a password to **usera**. Display the **/etc/password** file. What is in the password field for **usera**? What does this mean? _____

Answer: This means that **usera** is a valid user with a password; therefore, there is an entry in **/etc/security/passwd** for **usera**.

7. Do a long listing of all files including hidden files in **usera's** home directory. What files were created? _____

Answer: .profile

11. Log in as **root** and try to **su** to **usera**. Could you? _____ Why? _____ Kill the subshell and return to **root**. Unlock **usera's** account.

Answer: Yes, because **root** is not locked out of any restrictions placed on a user. Along with the account locked feature, when you added **usera** you also put the restriction that no other user could **su** to this account. As with the account locked feature, root is exempt from this restriction as well.

15. As your company grows you may need to add additional system administrators to perform certain administrative tasks. As **root**, create a user named **helper** that will assist you in user and group administration only, by being a member of the **security** group. Add **security** to **helper's** group set, not the primary group. Make the password the same as the user name. What other group would have given this user permission to administer users and groups?

Answer: Being a member of the **system** group also allows a user to administer users and groups. But the **system** group also gives a user many other privileges to run other commands that are in the **/etc** directory. This may be too much power for a user that only needs to administer users and groups.

20. Log off and back in as **userb**. (As this will be **userb's** first login, you will be prompted to change the password. Simply keep it the same. You should be familiar with what to do; therefore, the prompts will not be shown.) Change to the **budget** group and

create a file named **report**. Add "group" write permission to **report**. Do a long listing on the file to verify that the "group" access is the **budget** group. Return to the default group. Other than the command you used to change groups, what other command could be used? _____

Answer: The command **setgroups budget** is the same as **newgrp budget**. The command **setgroup -r** is the same as **newgrp**.

21. Let's test to see if a member of the **budget** group can edit the file **report**. Log out and back in as **userc**. As in the instruction above, this will be **userc's** first time to login. Change the password accordingly. Edit **report** and add your name. Log out. Did **userc** have to issue any special command before editing the file?

Answer: No. When **userc** tries to edit the file in **userb's** directory, the group **budget** is checked in **/etc/group**. Since **userc's** name appears in the **budget** group, access is permitted.

24. Remove **userb** from the system. Take the default to the option **Remove AUTHENTICATION** which is **yes**. What is this doing? _____

Answer: When removing authentication, the stanza for **userb** is removed from the **/etc/security/passwd** file. If you were to select no, **userb's** stanza would remain in the file. The reason the option is given is to provide continued support to an additional authentication method, should one be customized for your system. Authentication methods are not covered in this course.

END OF EXERCISE

Exercise 14. Scheduling

What This Exercise Is About

The purpose of this exercise is to give you the opportunity to use the scheduling facilities of **at**, **batch**, and **crontab**. These tools are very important for balancing a system for off-peak usage as well as scheduling periodic tasks.

What You Should Be Able to Do

After completing this exercise, students should be able to:

- Use **at** to schedule one-time-run jobs at specific times
- Use **batch** to submit jobs into a queueing facility
- Use **crontab** files to schedule repetitive jobs at specific times

Introduction

You can issue a command by entering it on the command line. It can run in the foreground or the background. A command can also be issued with **nohup** allowing you to logoff and go home while the command is still running. The scheduling utilities covered in this exercise allow you to schedule commands to run after you have left for the day.

Exercise Instructions

Using at

- ___ 1. Log in as **teamxx**. Submit a single **at** job that will immediately echo the message **Running an "at" command** and then echo another message **This is it!** Check your mail. Notice the shell script name assigned to your job.
- ___ 2. Repeat the above instruction, but this time force your output to your screen. (Hint: Use the **tty** command to get your device name.)
- ___ 3. Experiment with the time specifications of **next week** and **next month**.
- ___ 4. Let's take a look at the environment when an **at** job executes. Change directory to **/etc**. Submit an **at** job that will return the current directory to your screen and have it execute in one minute. Now change directory to **/var/adm** and repeat the **at** request. Change directory to the **/(root)** directory list the queued jobs then wait for the execution of your two jobs. What can you deduce? _____
- ___ 5. You should now have several **at** jobs scheduled. **su** to **root** to give yourself proper permission for viewing these jobs. Change to the directory **/var/spool/cron/atjobs**. Examine some of the files in this directory and notice the additional statements that are created for the **at** job besides the ones that the user entered. Note: **pg** won't work very well because lines get truncated. For one thing, you should see that the directory for the **at** job does indeed get set specifically within the **at** job itself. If the contents of the file looks disjointed, it is because nulls are used as field delimiters within the file. When you have finished, return to your **teamxx** id.
- ___ 6. As **teamxx**, list your **at** jobs. Use the appropriate option to cancel several of them. Note: You need to specify the whole name.
- ___ 7. Switch to **root** to gain proper permission to view the security files. Page the **/var/adm/cron/at.deny** file. Notice there are no entries. What security implications does this have? For this exercise we won't modify this file, but if we were to, we would put one userid on each line for whom we wanted to deny access. Notice, also, that there is no **at.allow** file. Kill the subshell and return to **teamxx**.

Using batch

- ___ 8. As **teamxx**, submit "two" jobs to **batch** that will output the result of the **date** command to your screen after waiting 60 seconds (Hint: `sleep 60`). If you are a slow typist, you may want to wait 90 seconds. Remember, it is submitted exactly like an **at** job but without a date and time because the submittal time is determined by the queue definitions in the **/var/adm/cron/queuedefs** file. Since this file, by default, says to take a job every 60 seconds, you should still see one job in the batch queue. List the jobs in the queue.

Using crontab Files

-
- ___ 9. Switch to **root**. Make sure you are still in the **/var/adm/cron** directory. Display the contents of the **cron.deny** file. Also, look in the directory to see if a **cron.allow** file exists. Return to **teamxx**.
 - ___ 10. As **teamxx**, **cd** back to your home directory and create a shell script called **sizechk** to:
 - a. echo the message **Active files over 2 blocks in /home**
 - b. display the date and time
 - c. display the names of all files that are larger than 2 blocks in **/home** and have been modified within the last 2 days (Hint: Use the **find** command redirecting error messages to **/dev/null**).
 - d. echo **Done**
 - e. make sure all output goes to the screen
 - f. make the script executable
 - ___ 11. Test your script. If you don't get any out put, change the blocksize to **1**.
 - ___ 12. Run **sizechk** as an **at** job without redirecting output here (let the script do it). Make sure that your **at** job runs and that your output goes to your screen.
 - ___ 13. Verify the system date and time. Create a file called **cron01** that will cause **sizechk** to be invoked every minute for the next 5 minutes for today only. Remember to use full path names for commands used in **cron**. Remember, there can be NO blank lines in the file including pressing **Enter** after the last entry.
 - ___ 14. Place your **crontab** file in the **crontabs** directory via the **crontab** command. Wait for the next 1 minute interval and check that your **sizechk** script did indeed get invoked by **cron** and that it executed successfully. While you are waiting, use the appropriate option with **crontab** to look at the **crontab** entry that you created.
 - ___ 15. Switch user to **root**. Change directory to **/var/spool/cron/crontabs** and look at the files that are in this directory. Your **cron01** should be there with the name **teamxx**. Examine the contents of several of the files. They may contain statements that are commented and could be uncommented or modified based on specific installation requirements. They provide a starting point for the execution of some administrative commands in different areas.
 - ___ 16. Return to **teamxx**. Edit the current crontab file by adding to the existing crontab data a line that executes the **sizechk** script on the hour, every hour of every day except Sunday. Once you are done, remove this particular entry so it does not drive you crazy the rest of the week. Verify that it was removed.
 - ___ 17. Switch to **root**. Examine the file **/etc/inittab** and notice how the **cron** daemon actually gets started. **cron** will respawn if it is not running. Why is this important?
_____ Log off.

END OF EXERCISE

Exercise Instructions with Hints

Using at

- ___ 1. Log in as **teamxx**. Submit a single **at** job that will immediately echo the message **Running an "at" command** and then echo another message **This is it!** Check your mail. Notice the shell script name assigned to your job.

```
•$ at now
  echo Running an "at" command
  echo This is it!
  <ctrl-d>
```

```
•$ mail
```

•*Hint !*-Wait for a minute or so for the **mail daemon** to respond and keep checking for new mail.

- ___ 2. Repeat the above instruction, but this time force your output to your screen. (Hint: Use the **tty** command to get your device name.)

```
•$ at now
  echo Running an "at" command > /dev/xxxx (xxxx is replaced by your device
  name)
  echo This is it! >/dev/xxxx
  <ctrl-d>
```

•*Hint !*-Enter **tty** at the command line to find out what your **/dev/xxxx** device name is.

- ___ 3. Experiment with the time specifications of **next week** and **next month**.

```
•$ at now next week
  echo $PWD
  <ctrl-d>
```

```
•$ at now next year
  echo $PWD
  <ctrl-d>
```

```
•$ at -l
```

- ___ 4. Let's take a look at the environment when an **at** job executes. Change directory to **/etc**. Submit an **at** job that will return the current directory to your screen and have it execute in one minute. Now change directory to **/var/adm** and repeat the **at** request. Change directory to the **/(root)** directory list the queued jobs then wait for the execution of your two jobs. What can you deduce?_____

```
•$ cd /etc
```

```
•$ at now +1 min
  echo $PWD >/dev/xxxx (xxxx is device you are using)
  <ctrl-d>
```

•\$ cd /var/adm

•\$ at now +1 min

echo \$PWD >/dev/xxxx (xxxx is device you are using)
<ctrl-d>

•\$ cd /

•\$ at -l

(Wait for your jobs to run)

- ___ 5. You should now have several **at** jobs scheduled. **su** to **root** to give yourself proper permission for viewing these jobs. Change to the directory **/var/spool/cron/atjobs**. Examine some of the files in this directory and notice the additional statements that are created for the **at** job besides the ones that the user entered. Note: **pg** won't work very well because lines get truncated. For one thing, you should see that the directory for the **at** job does indeed get set specifically within the **at** job itself. If the contents of the file looks disjointed, it is because nulls are used as field delimiters within the file. When you have finished, return to your **teamxx** id.

•\$ su root

•# cd /var/spool/cron/atjobs

•# ls -l

•# cat <filename>

•# <ctrl-d>

- ___ 6. As **teamxx**, list your **at** jobs. Use the appropriate option to cancel several of them. Note: You need to specify the whole name.

•\$ at -l

•\$ at -r <jobname>

- ___ 7. Switch to **root** to gain proper permission to view the security files. Page the **/var/adm/cron/at.deny** file. Notice there are no entries. What security implications does this have? For this exercise we won't modify this file, but if we were to, we would put one userid on each line for whom we wanted to deny access. Notice, also, that there is no **at.allow** file. Kill the subshell and return to **teamxx**.

•\$ su

root's Password: (enter password)

•# cd /var/adm/cron

•# pg at.deny

•# ls -l /var/adm/cron

(Notice there is no at.allow file.)

•# exit

Using batch

- ___ 8. As **teamxx**, submit "two" jobs to **batch** that will output the result of the **date** command to your screen after waiting 60 seconds (Hint: `sleep 60`). If you are a slow typist, you may want to wait 90 seconds. Remember, it is submitted exactly like an **at** job but without a date and time because the submittal time is determined by the queue definitions in the `/var/adm/cron/queuedefs` file. Since this file, by default, says to take a job every 60 seconds, you should still see one job in the batch queue. List the jobs in the queue.

- \$ **batch**
 sleep 60
 date > /dev/xxxx
 <ctrl-d>
- Repeat the **batch** again
- \$ **at -l**

Using crontab Files

- ___ 9. Switch to **root**. Make sure you are still in the `/var/adm/cron` directory. Display the contents of the **cron.deny** file. Also, look in the directory to see if a **cron.allow** file exists. Return to **teamxx**.

- \$ **su**
 root's Password: (enter password)
- # **cd /var/adm/cron** (if necessary)
- # **pg cron.deny**
- # **ls -l**
- # <ctrl-d>

- ___ 10. As **teamxx**, **cd** back to your home directory and create a shell script called **sizechk** to:

- a. echo the message **Active files over 2 blocks in /home**
- b. display the **date and time**
- c. display the names of all files that are larger than 2 blocks in **/home** and have been modified within the last 2 days (Hint: Use the **find** command redirecting error messages to `/dev/null`).
- d. echo **Done**
- e. make sure all output goes to the **screen**
- f. make the script **executable**

- \$ **cd /home/teamxx**

```

•$ vi sizechk
  echo Active files over 2 blocks in /home > /dev/xxxx
  date > /dev/xxxx
  find /home -size +2 -mtime -2 -print > /dev/xxxx 2>/dev/null
  echo Done > /dev/xxxx

```

```
•$ chmod +x sizechk
```

- ___ 11. Test your script. If you don't get any output, change the blocksize to 1.

```
•$ sizechk
```

- ___ 12. Run **sizechk** as an **at** job without redirecting output here (let the script do it). Make sure that your **at** job runs and that your output goes to your screen.

```
•$ at now < sizechk
```

- ___ 13. Verify the system date and time. Create a file called **cron01** that will cause **sizechk** to be invoked every minute for the next 5 minutes for today only. Remember to use full path names for commands used in **cron**. Remember, there can be NO blank lines in the file including pressing **Enter** after the last entry.

```
•$ date
```

```
•$ vi cron01
```

```
25-29 3 12 5 * /home/teamxx/sizechk
```

(This is just an example to be tailored for the current date and time. 25-29 represents each of the next 5 minutes, 3 represents the current hour using military time, 12 represents the current day of the month, 5 represents the current month of the year, * is in the position of the current day of the week, and the last field contains the actual command. Make this execute for the current date and time.)

- ___ 14. Place your **crontab** file in the **crontabs** directory via the **crontab** command. Wait for the next 1 minute interval and check that your **sizechk** script did indeed get invoked by **cron** and that it executed successfully. While you are waiting, use the appropriate option with **crontab** to look at the **crontab** entry that you created.

```
•$ crontab cron01
```

```
•$ crontab -l
```

- ___ 15. Switch user to **root**. Change directory to **/var/spool/cron/crontabs** and look at the files that are in this directory. Your **cron01** should be there with the name **teamxx**. Examine the contents of several of the files. They may contain statements that are commented and could be uncommented and/or modified based on specific installation requirements. They provide a starting point for the execution of some administrative commands in different areas.

```
•$ su
```

```
root's Password: (enter password)
```

```
•# cd /var/spool/cron/crontabs
```

•# ls -l

•# pg teamxx

- ___ 16. Return to **teamxx**. Edit the current crontab file by adding to the existing crontab data a line that executes the **sizechk** script on the hour, every hour of every day except Sunday. Once you are done, remove this particular entry so it does not drive you crazy the rest of the week. Verify that it was removed.

•# <ctrl-d>

•\$ crontab -e (add the following line and close the file)

0 * * * 1-6 /home/teamxx/sizechk

•\$ crontab -l

•\$ crontab -e (delete the lines you just added)

•\$ crontab -l

- ___ 17. Switch to **root**. Examine the file **/etc/inittab** and notice how the **cron** daemon actually gets started. **cron** will respawn if it is not running. Why is this important?
_____ Log off.

•\$ su

root's Password: (enter password)

•# pg /etc/inittab

•# exit

END OF EXERCISE

Solutions

Following are the solutions for those instructions that include questions:

- Let's take a look at the environment when an **at** job executes. Change directory to **/etc**. Submit an **at** job that will return the current directory to your screen and have it execute in one minute. Now change directory to **/var/adm** and repeat the **at** request. Change directory to the **/(root)** directory and wait for the execution of your two jobs. What can you deduce? _____

Answer: The commands all execute relative to the directory you were in when you executed the command. The first execution of **echo \$PWD** was associated with the **/etc** directory, where you were when you issued the command. The second execution of **echo \$PWD** was associated with the **/var/adm** directory, where you were when you issued the command. When you switched to the **/root** directory and waited for the commands to execute, it did not matter. The script was set up when you did a **<ctrl-d>** to submit the job.

- Switch to **root** to gain proper permission to view the security files. Page the **/var/adm/cron/at.deny** file. Notice there are no entries. What security implications does this have? For this exercise we won't modify this file, but if we were to, we would put one userid on each line for whom we wanted to deny access. Notice, also, that there is no **at.allow** file. Kill the subshell and return to **teamxx**.

Answer: If this file exists, anybody can use **at**.

- Switch to **root**. Examine the file **/etc/inittab** and notice how the **cron** daemon actually gets started. **cron** will respawn if it is not running. Why is this important?

Answer: You never have to worry about the **cron** daemon not running on your system as it is respawned anytime it dies. If you are depending on **cron** to run jobs after hours, it must remain up without operator intervention.

Exercise 15. Printers and Queues

What This Exercise Is About

This exercise is designed to provide the student with the opportunity to configure and manage printers and queues.

What You Should Be Able to Do

After completing this exercise, students should be able to :

- Add a printer using SMIT
- Add a queue using SMIT
- Make changes to existing queues using SMIT
- Install printer support software if needed

Introduction

This exercise is designed for you to become familiar with adding a printer and a queue. In the area of printing there are many commands that can be used to do the same thing. In many of these cases we have provided only one command method and the other method takes you through SMIT. If you are already comfortable with certain UNIX commands for handling print activities, like submitting a print job, please feel free to use that command. Some of the functions provided by AIX can only be accessed through the command shown or through SMIT.

Printer configurations vary widely in the classrooms. Check with your instructor for specific instruction for your site.

If more than one student is sharing an RS/6000 but performing this exercise separately, be sure that the queue names are unique. For example, name one of the queues **xxdraft** where **xx** is the student's initials. Wherever you see **draft** in the exercise instructions, use your unique name. Wherever you see the queue name **quality**, use a queue name such as **xxquality** where the **xx** is the student's initials.

Exercise Instructions

Adding a Printer and a Queue

- ___ 1. Log in and **su** to **root**. Using SMIT configure your printer with a local queue called **quality**.

Note: If you don't have the correct software support you will be prompted to install the software first before adding the printer and the queue. If this is the case go the section titled **Installing Printer Support Software**.

Installing Printer Support Software

Perform the following instructions only if the software that supports your printer has not been installed.

- ___ 2. You would have received notification that the software that supports your printer has not been installed after you selected the printer model as shown in instruction 1.

The notification window will take you through the smit software install screens. Use these to install the printer support from the Installation Media.

Check the Queue

- ___ 3. Exit out of SMIT and examine the **/etc/qconfig** file to confirm the addition of the new queue and device stanzas.
- ___ 4. Using SMIT, add a second queue to the printer and name it **draft**.
- ___ 5. Exit out of SMIT and examine the **/etc/qconfig** file to confirm the addition of the new queue and device stanzas. Notice the location of the **quality** queue relative to the **draft** queue. Which queue is listed first? _____
- ___ 6. Using the **qchk** command, check the status of your newly created queues. They should be marked READY. Which queue is listed first? _____ Which queue do you think is the default queue? _____
- ___ 7. Using SMIT, make the **draft** queue the system default queue.
- ___ 8. Exit out of SMIT and check the status and order of your queues.
- ___ 9. Create a file that can be used as a print test file. Put the file in the **/tmp** directory and name the file **printxx**, where **xx** represents your initials. Put about 10 lines of data in it.
- ___ 10. Test your queues and printer by sending the **printxx** file you created in the step above to both the **draft** queue and to the **quality** queue.

Changing the Characteristics of a Queue

-
- ___ 11. Using SMIT, change the attributes of the **quality** queue by adjusting some printer characteristics. These may be different depending on the printer used, for example, try turning on emphasized print, double-strike and double-high print, and set the top margin to 25. Basically, change the look of the printed output.
 - ___ 12. Send the **printxx** file to the quality queue to ensure that the changes were successfully made to the queue.
 - ___ 13. Take the **draft** queue down.
 - ___ 14. Change the attributes of the **draft** queue so that its discipline is set to **sjn**, shortest job next. Check the status of the queues to verify that the change was made successfully.
 - ___ 15. Send the file **/etc/security/user** to the **draft** queue. Check to see that it is in the queue then send the **/tmp/printxx** file you created in the previous exercise to the **draft** queue. Which job is scheduled to run first after the queue is brought back up?

Why?

Managing Jobs in Queues

- ___ 16. Bring down the **quality** queue. Check the status of your queues to be sure that both queues are down.
- ___ 17. Send the files **/etc/qconfig** and **/etc/filesystems** to the **quality** queue and send the file **/etc/motd** to the **draft** queue.
- ___ 18. Check the order of the print jobs waiting in the two queues. In the **quality** queue the second job waiting to be printed should be the **/etc/filesystems** file. Change the print priority of this job to 25 so that it becomes the first print job scheduled for the **quality** queue.
- ___ 19. Lets assume that you really wanted the **/etc/filesystems** printed with the characteristics associated with the **draft** queue. Move the **/etc/filesystems** print job to the **draft** queue.
- ___ 20. You realize that you already printed **/etc/security/user** and you don't need to do it again. Cancel the job.
- ___ 21. You want to print all the jobs currently in your queues except for the **/etc/filesystems** job which you want to print at a later time. Put a hold on the **/etc/filesystems** job and bring up your two queues.
- ___ 22. Check to see all jobs have printed successfully. Then, release the **/etc/filesystems** job so it too can print.

END OF EXERCISE

Exercise Instructions with Hints

Adding a Printer and a Queue

- ___ 1. Login and **su** to **root**. Using SMIT configure your printer with a local queue called **quality**. NOTE: If you don't have the correct software support you will be prompted to install the software first before adding the printer and the queue. If this is the case go the section titled **Installing Printer Support Software**.

- login: **teamxx** teamxx's Password: **teamxx**

- \$ su**

- root's Password: **ibmaix**

- # smit**

- Print Spooling**

- Add a Print Queue**

You will then get a series of pop-up menus that prompt you for selections of where the printer will be attached, who the manufacturer is, the model of the printer, the type of printer interface and the parent adapter. The following shows the selections that should be made for each pop-up menu:

- Select the Attachment type **local**
- Select the manufacturer of your printer, like **IBM**
- Select the printer model you have, like **4201-2**

At this point you may get a menu titled **Printer Support Not Installed** if the software support for the printer you selected was not installed. If you get this menu, continue with the section titled **Installing Printer Support Software**. If you did not get this menu, proceed with the following steps.

- parallel**
- ppa0 Standard I/O Parallel Port Adapter**

This brings you to the dialog screen.

- *Name of new PRINT QUEUE to add **[quality]**
- Enter or OK**

After creating the quality queue, go to step 3.

Installing Printer Support Software

Perform the following instructions only if the software that supports your printer has not been installed.

- ___ 2. You would have received notification that the software that supports your printer has not been installed after you selected the printer model as shown in instruction 1.

The notification window will take you through the smit software install screens. Use these to install the printer support from the Installation Media.

- OK or Enter**

- At the next screen you will be prompted for the input device. Press the **F4** for a listing of valid devices. Select the installation device then press **Enter**.
- You will be prompted for the software to install.
 - Press **F4** to get a listing of software that is on the installation media.
 - Cursor through the selections until you find the listing for your printer. Once the printer drivers you need are selected press **Enter**.
 - Ensure that **Preview Only** is set to **NO**. Press **Enter** to install the software. This will take a couple of minutes.
- Once this process is complete, you are ready to **continue with step 1** at the point where you would indicate the printer interface/adaptor information.

Check the Queue

- ___ 3. Exit out of SMIT and examine the **/etc/qconfig** file to confirm the addition of the new queue and device stanzas.

- Press **F10** to exit SMIT
- # **pg /etc/qconfig**

- ___ 4. Using SMIT, add a second queue to the printer and name it **draft**.

- # **smit**

Print Spooling

Add a Print Queue

Once again you will be presented with a series of pop-up menus similar to the ones with which you were presented in instruction 1.

- local**

- IBM**

- ibm4201-2** (select the printer you previously selected in instruction 1)

The next pop-up prompts you to either **Add a new printer or select the existing printer below**. Select the existing printer.

- lp0 IBM 4201 Model 2 Proprinter II** (or whatever printer is configured on your system)

- This brings you to the dialog screen.

- *Name of new PRINT QUEUE to add **[draft]**

- ___ 5. Exit out of SMIT and examine the **/etc/qconfig** file to confirm the addition of the new queue and device stanzas. Notice the location of the **quality** queue relative to the **draft** queue. Which queue is listed first? _____

- Press **F10** to exit SMIT
- # **pg /etc/qconfig**

___ 6. Using the **qchk** command, check the status of your newly created queues. They should be marked READY. Which queue is listed first? _____ Which queue do you think is the default queue? _____

•# qchk -A

___ 7. Using SMIT, make the **draft** queue the system default queue.

•# smit

Print Spooling

Manage Print Queues

Set the System's Default Print Queue

-*System DEFAULT QUEUE name [draft]

___ 8. Exit out of SMIT and check the status and order of your queues.

•Press F10 to exit SMIT

•# qchk -A

___ 9. Create a file that can be used as a print test file. Put the file in the **/tmp** directory and name the file **printxx**, where **xx** represents your initials. Put about 10 lines of data in it.

•# vi /tmp/printxx

-Press **i** to begin inserting text Put 10 lines of anything you want in it **<esc>** to change to command mode **< : >** will bring up a command entry prompt **wq** will save and exit

___ 10. Test your queues and printer by sending the **printxx** file you created in the step above to both the **draft** queue and to the **quality** queue.

•# qprt /tmp/printxx

qprt -Pquality /tmp/printxx

-OR-

•# lp /tmp/printxx

lp -dquality /tmp/printxx

-OR-

•# lpr /tmp/printxx

lpr -Pquality /tmp/printxx

-AND-

•# qchk -A

Changing the Characteristics of a Queue

- ___ 11. Using SMIT, change the attributes of the **quality** queue by adjusting some printer characteristics. These may be different depending on the printer used, for example, try turning on emphasized print, double-strike and double-high print, and set the top margin to 25. Basically, change the look of the printed output.

•# smit

Print Spooling

Change/Show Print Queue Characteristics

-*PRINT QUEUE name [quality]

- At the pop up menu you will be provided with 4 choices. Select choice 2, **Default Print Job Attributes.**

EMPHASIZED print? [yes]

DOUBLE-STRIKE print? [yes]

DOUBLE-HIGH print? [yes]

TOP MARGIN (lines) [25]

- ___ 12. Send the **printxx** file to the **quality** queue to ensure that the changes were successfully made to the queue.

•# qprt -Pquality /tmp/printxx

-OR-

•# lp -dquality /tmp/printxx

__-AND-

•# qchk -A

- ___ 13. Take the **draft** queue down.

•# disable draft

•# lpstat

-OR-

•# smit

Print Spooling

Manage Print Queues

Stop a Print Queue

-*PRINT QUEUE name [draft]

-Press **Enter** to stop the Queue

- Press **F3** to go back to **Manage Print Queues** menu

Show Status of Print Queues

-Include status of print queues on remote servers? [no]

-Press **Enter**

Press **F10** to exit SMIT

- ___ 14. Change the attributes of the **draft** queue so that its discipline is set to **sjn**, shortest job next. Check the status of the queues to verify that the change was made successfully.

•# chque -q draft -a 'discipline = sjn'

-OR-

•# smit

Print Spooling

Change/Show Print Queue Characteristics

-*PRINT QUEUE name [draft]

•At the pop-up menu select: **4 Queuing Discipline**

-*Queuing DISCIPLINE [shortest job next] Press Enter

-F10 to exit SMIT

- ___ 15. Send the file **/etc/security/user** to the **draft** queue. Check to see that it is in the queue then send the **/tmp/printxx** file you created in the previous exercise to the **draft** queue. Which job is scheduled to run first after the queue is brought back up?

Why?

•# qprt /etc/security/user

•# lpstat

•# qprt /tmp/printxx

•# lpstat

Managing Jobs in Queues

- ___ 16. Bring down the **quality** queue. Check the status of your queues to be sure that both queues are down.

•# disable quality

•# lpstat

- ___ 17. Send the files **/etc/qconfig** and **/etc/filesystems** to the **quality** queue and send the file **/etc/motd** to the **draft** queue.

•# qprt -Pquality /etc/qconfig

•# qprt -Pquality /etc/filesystems

•# qprt /etc/motd

- ___ 18. Check the order of the print jobs waiting in the two queues. In the **quality** queue the second job waiting to be printed should be the **/etc/filesystems** file. Change the print priority of this job to 25 so that it becomes the first print job scheduled for the **quality** queue.

•# lpstat

•# qpri -#<job number> -a 25

•# lpstat

-OR-

•# lpstat

•# smit

Print Spooling

Manage Print Jobs

Prioritize a Print Job

-*Print JOB NUMBER [] Use F4 to list

***Priority LEVEL [25]**

Press Enter

-F10 to exit SMIT

•# lpstat

- ___ 19. Lets assume that you really wanted the **/etc/filesystems** printed with the characteristics associated with the **draft** queue. Move the **/etc/filesystems** print job to the **draft** queue.

•# qmov -mdraft -#<job number>

•# lpstat

-OR-

•# smit

Print Spooling

Manage Print Jobs

Move a Job Between Print Queues

-*DESTINATION PRINT QUEUE name [draft]

SOURCE (Select ONE of the following)

Print JOB NUMBER [job number]

Press Enter

•Press F10 to exit SMIT

•# lpstat

- ___ 20. You realize that you already printed **/etc/security/user** and you don't need to do it again. Cancel the job.

•# cancel <job number>

•# lpstat

-OR-

•# qcan -x<job number>

•# lpstat

-OR-

•# smit

Print Spooling

Manage Print Jobs

Cancel a Print Job

- PRINT QUEUE containing job [**draft**]
- *Print JOB NUMBER [**job number**]
- Press **Enter**
- Press **F10** exit SMIT
- Select **Exit** to exit SMIT
- # **lpstat**

___ 21. You want to print all the jobs currently in your queues except for the /etc/filesystems job, which you want to print at a later time. Put a hold on the /etc/filesystems job, verify the job is being held, and bring up your two queues.

- # **qhld -#<job number>**
- # **lpstat**
- # **enable quality draft**
- OR-
- # **smit**
- Print Spooling**
- Manage Print Jobs**
- Hold / Release a Print Job**
- Hold or Release jobs [**hold**]
- Print JOB NUMBER [**job number**]
- Press **Enter**
- F3** back to the **Print Spooling** menu.
- Manage Print Queues**
- Show Status of Print Queues**
- Include status of print queues on remote servers? [no]
- Press **Enter**
- F3** back to the **Manage Print Queues** menu.
- Manage Print Queues**
- Start a Print Queue**
- *PRINT QUEUE name [quality]
- Press **Enter**
- F3** back to the **Manage Print Queues** menu.
- Start a Print Queue**
- *PRINT QUEUE name [**draft**]

___ 22. Check to see all jobs have printed successfully. Then, release the /etc/filesystems job so it too can print.

- # **qhld -r -#<job number>**
- OR-
- # **smit**
- Print Spooling**
- Manage Print Jobs**
- Hold / Release a Print Job**

-Hold or Release jobs [**release**]
 Print JOB NUMBER [**job number**]
-Press **Enter F10** to exit SMIT

END OF EXERCISE

Solutions

Following are the solutions for those instructions that include questions:

5. Exit out of SMIT and examine the **/etc/qconfig** file to confirm the addition of the new queue and device stanzas. Notice the location of the **quality** queue relative to the **draft** queue. Which queue is listed first? _____

Answer: The **quality** queue is listed first.

6. Using the **qchk** command, check the status of your newly created queues. They should be marked READY. Which queue is listed first? _____ Which queue do you think is the default queue? _____

Answer: The **quality** queue is listed first. The system default queue is the one that is listed first in the **/etc/qconfig** file.

15. Send the file **/etc/security/user** to the **draft** queue. Check to see that it is in the queue then send the **/tmp/printxx** file you created in the previous exercise to the **draft** queue. Which job is scheduled to run first after the queue is brought back up? _____ Why? _____

Answer: **/tmp/printxx**. It is the smaller of the two files and the queuing discipline has been set up as shortest job next.

Optional Exercises

- ___ 1. As the **root** user, run the script **/home/workshop/lab6**. This script will create problems with the printing subsystem. Try printing a file. Look at the error message and check the file that is being referenced. Try to fix the problem and try printing a file again. If the problem originally presented was fixed, a new error message will be generated. Make sure the resource mentioned in the error message is working and then try printing a file again.

•# **/home/workshop/lab6**

•# **qprt /etc/motd**

The error message you will get looks something like this:

digest: error in config file /etc/qconfig, line 94.

digest: (FATAL ERROR): No device line in queue stanza.

enq: (FATAL ERROR): Error from digester /usr/lib/lpd/digest, status=1024, rv = 11924.

(The error numbers may be different depending on what is in **/etc/qconfig**.)

•# **pg /etc/qconfig**

vi /etc/qconfig

<ESC>: **set nu <shift G>** to get to the end of the file

Look around line 94 (or whatever line number your message indicated) **dd**

(delete the line with the stray character) **<shift zz>** (to save and quit the file)

•# **qprt /etc/motd**

The error message you will get looks something like this:

enq: (WARNING): Qdaemon appears to be dead.

enq: errno = 2 No such file or directory

enq: (WARNING): Cannot awaken qdaemon. (request accepted anyway)

(The last 2 messages you will get several times)

•# **lpstat** (check to see if your job is in the queue)

•# **lssrc -s qdaemon**

•# **startsrc -s qdaemon**

END OF EXERCISE

Exercise 16. Networking

What This Exercise Is About

This exercise provides an opportunity to configure and use TCP/IP.

What You Should Be Able to Do

After completing this exercise, students should be able to:

- Configure TCP/IP
- Test TCP/IP connectivity
- Use **telnet** and **ftp** to communicate on the network

Introduction

TCP/IP has been configured on your systems prior to class in order to support the AIX online documentation. So, in this exercise, the first thing you need to do is deconfigure TCP/IP. Then, you will have the opportunity to reconfigure TCP/IP using the hostname and IP address assigned to you by your instructor.

Your instructor will also indicate whether your classroom environment is using a Ethernet and a token-ring network.

Use the following IP addresses and system naming convention for this exercise:

IP Address	Hostname
9.19.98.1	sys1
9.19.98.2	sys2
9.19.98.3	sys3

Continue on with the same IP address and naming convention for all systems.

Your instructor will assign to you the TCP/IP name and address that you should use.

Exercise Instructions

Deconfigure TCP/IP

- ___ 1. Log in as **teamxx** and **su** to **root**. Determine if you are using an Ethernet or a Token Ring network by checking with your instructor.
- ___ 2. Deconfigure your network interface and adapter. Set your hostname to blank. Remove all entries except the loopback entry from the **/etc/hosts** file.
- ___ 3. Run the configuration manager so that it will recognize the adapter and interface you just deconfigured. Once this is complete, you are ready to proceed with the TCP/IP configuration.

Configure TCP/IP

- ___ 4. Configure the network interface for your network using SMIT, TCP/IP, Minimum Configuration and Startup.
- ___ 5. Review the **/etc/hosts** file and see that your host name was automatically added by SMIT from the instruction above. Add an entry in this file for every system on your network. You may use SMIT or vi.

Testing the Configuration

The following instructions will use the naming convention of **sysy** and **9.19.98.y** where y refers to your partner's system

- ___ 6. Use the network command, **ping**, to test connectivity to the some of the systems on the network. **ping** by IP address and then by host name. If you get a response back from some systems but not others, display the contents of your **/etc/hosts** file to ensure you have an entry for the system and it is correct. Ensure that the system you are trying to reach has completed the configuration steps.
- ___ 7. Execute the **host** command for various host names and IP addresses on the network.
- ___ 8. Execute the **netstat -i** command to display the status of the communication adapters on your system.

Using telnet

- ___ 9. Select a system on the network to be your partner. **telnet** to your partner's system and login as root. Execute the **hostname** command to show that you are logged in to another system.
- ___ 10. While remotely logged in to your partner's system, create a file named **sysxfile**, where x is the name of your system. You will use this file later in this exercise. List the contents of **root's** directory to verify that your file exists.
- ___ 11. Close the connection and verify that you are back on your local system by executing **hostname**. You should see your host name.

Using ftp

- ___ 12. Transfer the file, **sysxfile**, from your partner's system to your system renaming it to **ftpdoc**. When prompted to login, log in as root.
- ___ 13. Change to your **teamxx's** home directory ON YOUR system and list its contents. Pick out a small file that you can transfer to your partner system's **/home/teamxx** directory. Since you are root, you should not have any problems with permissions. You may want to ask your partner which **teamxx** home directory to use.
- ___ 14. End the file transfer session and verify that you are back on your local system.

END OF EXERCISE.

END OF LAB

Exercise Instructions with Hints

Deconfigure TCP/IP

- ___ 1. Log in as **teamxx** and **su** to **root**. Determine if you are using an Ethernet or a token-ring network by checking with your instructor.
- \$ **su**
 - #
- ___ 2. Deconfigure your network interface and adapter. Set your hostname to blank. Remove all entries except the loopback entry from the **/etc/hosts** file.
- rmdev -l tr0 -d** (Use en0 or et0 for ethernet - check with your instructor before executing this command)
 - rmdev -l tok0 -d** (Use ent0 for ethernet)
 - hostname ""**
 - vi /etc/hosts**
 - At the end of the file, remove all entries except the entry for loopback. The loopback entry will begin with 127.0.0.1.
- ___ 3. Run the configuration manager so that it will recognize the adapter and interface you just deconfigured. Once this is complete, you are ready to proceed with the TCP/IP configuration.
- cfgmgr**

Configure TCP/IP

- ___ 4. Configure the network interface for your network using SMIT, TCP/IP, Minimum Configuration and Startup.
- # **smit**
 - Communications Applications and Services**
 - TCP/IP**
 - Minimum Configuration & Startup**
 - Select appropriate available network interface from pop-up menu
 - *HOSTNAME [**sysx**]
 - *Internet Address [**9.19.98.x**]
 - Ring Speed **16**
 - (If using Token Ring)
 - OK or Enter** **F10** to exit SMIT

- ___ 5. Review the **/etc/hosts** file and see that your host name was automatically added by SMIT from the instruction above. Add an entry in this file for every system on your network. You may use SMIT or vi.

•# vi /etc/hosts

-OR-

•# smit

Communications Applications and Services

TCP/IP

Further Configuration

Name Resolution

Hosts Table (/etc/hosts)

Add a Host

-*Internet Address (dotted decimal) **[9.19.98.x]**

-*HOST NAME **[sysx]**

-OK or Enter

-F3 to return to the menu

Go back to the **Add a Host** menu. Add an entry for every host on your network. Repeat the following for each system where y is a remote system on your network:

•*Internet Address (dotted decimal) **[9.19.98.y]** .

•*HOST NAME **[sysy]**

•OK or Enter

•F3 to return to the menu

Testing the Configuration

The following instructions will use the naming convention of **sysy** and **9.19.98.y** where y refers to your partner's system.

- ___ 6. Use the network command, **ping**, to test connectivity to the some of the systems on the network. **ping** by IP address and then by host name. If you get a response back from some systems but not others, display the contents of your **/etc/hosts** file to ensure you have an entry for the system and it is correct. Ensure that the system you are trying to reach has completed the configuration steps.

•# ping sysy

•# ping 9.19.98.y

-<ctrl-c> (to stop the output)

- ___ 7. Execute the **host** command for various host names and IP addresses on the network.

•# host sysy

•# host 9.19.98.y

- ___ 8. Execute the **netstat -i** command to display the status of the communication adapter(s) on your system.

- # netstat -i

Using telnet

- ___ 9. Select a system on the network to be your partner. **telnet** to your partner's system and log in as root. Execute the **hostname** command to show that you are logged in to another system.

- # tn sysy
- login: **root**

root's Password(**enter password**)

- # **hostname**

- ___ 10. While remotely logged in to your partner's system, create a file named **sysxfile** where **x** is the name of your system. You will use this file later in this exercise. List the contents of **root's** directory to verify that your file exists.

- # **vi sysxfile**

(type a few lines that will identify this file as yours)

- # **ls**

- ___ 11. Close the connection and verify that you are back on your local system by executing **hostname**. You should see your host name.

- # <ctrl-t>

tn> close

-OR-

- # <ctrl-d>
- # **hostname**

Using ftp

- ___ 12. Transfer the file, **sysxfile**, from your partner's system to your system renaming it to **ftpdoc**. When prompted to login, login as root.

- # **ftp sysy** (where y is your partner's system number)

Connected to sysy

220 sysx FTP server

- Name (sysy:teamxx): **root**
- 331 Password required for root
- Password:<**enter root's password**>
- 230 User root logged in.
- ftp> **get sysxfile ftpdoc**

- ___ 13. Change to your **teamxx's** home directory ON YOUR system and list its contents. Pick out a small file that you can transfer to your partner system's **/home/teamxx**

directory. Since you are **root**, you should not have any problems with permissions. You may want to ask your partner which **teamxx** home directory to use.

- ftp> **lcd /home/teamxx**
- ftp> **!ls -l**
- ftp> **put <filename>**

___ 14. End the file transfer session and verify that you are back on your local system.

- ftp> **quit**
- # **hostname**

END OF EXERCISE

Appendix A. Optional Exercise: Installation and Configuration Basics

What This Exercise Is About

This exercise provides an opportunity to do an installation of the base operating system of AIX Version 5.1. The type of installation will be a complete overwrite install with all the default settings.

What You Should Be Able to Do

At the end of the lab, you should be able to:

- Install the AIX V5.1 operating system
- Configure TCP/IP
- Install the AIX V5.1 online documentation

Introduction

This exercise is designed to give you experience in installing a RS/6000 as if you had just received a new machine without anything on it including the installation and configuration of the AIX V5.1 online documentation packages and filesets. You will be using the same type of distribution media you would get from IBM. In this exercise you will install AIX V5.1, configure TCP/IP and then install the software necessary to use the AIX V5.1 online documentation.

If you feel you will never have to do an installation of this type but may be adding software at a later date, it would still be a good idea to complete this exercise as preparation for Exercise 7, AIX Software Installation, where you will be given an opportunity to install software.

If you have more than one student sharing a system (all systems have a minimum of two terminals attached to them), then only one person can actually perform these steps. All other students on that system should observe while the steps are being done.

In order to configure the AIX V5.1 online documentation, it will be necessary to first configure TCP/IP. Your instructor will supply you with the unique TCP/IP hostname and IP address that you should use. Your instructor will also indicate whether you are using token ring or ethernet for your TCP/IP network.

Required Materials

A RS/6000 with a tape drive or CD-ROM drive attached to it (depending on the installation media provided) and at least 1 GB of usable disk space.

Installation media (either tape or CD).

An ASCII terminal connected to one of the built-in serial ports on the RS/6000 or a graphics display station directly attached to the RS/6000 that has a tape drive or CD-ROM drive attached to it.

Exercise Instructions

___ 1. If your system is already on, login as **root**. Then shut down the system.

•Console login: root's Password: **ibmaix**

•# **shutdown -F**

When you see the **Halt Completed** message on the console, shutdown is complete. The system will then shut itself off.

___ 2. Turn on all attached external devices, such as terminals, CD-ROM drives, tape drives, monitors, and external disk drives. **DO NOT TURN THE SYSTEM UNIT ON YET.**

___ 3. Insert the installation media into the tape or CD-ROM drive.

If you are installing from a CD some CD-ROM drives have a removable disc caddy, while others have a sliding drawer. If the CD-ROM drive on your system has a sliding drawer, place the CD-ROM in the drawer and push the drawer in. If the CD-ROM drive on your system does not have a sliding drawer, insert the CD-ROM into the disc caddy and then insert the caddy into the CD-ROM drive.

If you are installing from tape you may find that on specific hardware, the tape drive door will not open while the system unit is turned off. If you have trouble opening the tape drive door during installation, use the following procedure:

- a. Turn the system unit on.
- b. Insert the AIX Version 5.1 installation tape.
- c. Turn the system unit off and wait for 30 seconds.

On some models that have a door to the tape drive, there may be a waiting period of up to three minutes before the tape drive door opens after you have pressed the button to open the tape drive. Some models also require that the button for the tape drive door be held in the depressed position for a few seconds before the tape drive door will open.

On some models, the eject button must be pressed for at least two seconds in order to eject a CD-ROM that is already in the disc caddy.

___ 4. If you are using a graphics display, skip to the next step. If you are using an ASCII terminal, be sure the communications options on the terminal are set as follows:

Line Speed (baud rate) = 9600
Word Length (bits per character) = 8
Parity = no (none)
Number of Stop Bits = 1
Interface = RS-232C (or RS-422A)
Line Control = IPRTS

Be sure the keyboard and display options are set as follows:

Screen = normal
Row and Column = 24x80
Scroll = jump
Auto LF (line feed) = off
Line Warp = on
Forcing Insert = line (or both)
Tab = field
Operating Mode = echo
Turnaround Character = CR
Enter = return
Return = new line
New Line = CR
Send = page
Insert Character = space

•On your IBM 3151 terminal, press the Ctrl+Setup keys to display the Setup Menu and follow the on-screen instructions to check the settings. If you need to make changes, follow the on-screen instructions for making changes.

- ___ 5. Turn the system unit power on. The system will begin booting from the installation media.
- ___ 6. After about five minutes, a screen will appear on all directly attached terminal or display devices asking you to define the system console. Notice that you are given these instructions in eight different languages. Follow the instructions as they appear on the device you wish to use as the system console.
- ___ 7. Next, a screen is displayed that prompts you to select an installation language. Follow the directions on this screen to select the language in which the installation instructions will be displayed.
- ___ 8. Select item 2, **Change/Show Installation Settings and Install from the Welcome to the Base Operating System Installation and Maintenance** screen.

Welcome to Base Operating System

Installation and Maintenance

Type the number of your choice and press Enter. Choice is indicated by >>>.

```
>>> 1 Start installation Now with Default Settings
    2 Change/Show installation Settings and install
    3 Start Maintenance Mode for System Recovery
```

88 Help ?

99 Previous Menu

```
>>> Choice [1]: 2
```

- ___ 9. Select item 1, **System Settings**, from the **Installation and Settings** menu that comes up next.

Installation and Settings

Either type 0 and press Enter to install with current settings or type the number of the setting you want to change and press Enter.

```

1 System Settings
Method of Installation.           Preservation
Disk Where You Want to Install   hdisk0

2 Primary Language Environment Settings (AFTER Install)
Cultural Convention              C(POSIX)
Language                        C(POSIX)
Keyboard                        C(POSIX)

3 Advanced Options

>>>0   Install AIX with the current settings listed above.

88 Help ?
99 Previous Menu

```

```
>>>Choice [0]: 1
```

- ___ 10. You will now be given the opportunity to change the method of installation. Select item 1, **New and Complete Overwrite** install, from the **Change Method of Installation** menu.

Change Method of Installation

Type the number of the installation method and press Enter

```

1 New and Complete Overwrite
Overwrites EVERYTHING on the disk selected for installation.
Warning: Only use this method if the disk is totally empty
or if there is nothing on the disk you want to preserve.

```

```

>>> 2 Preservation Install
Preserves SOME of the existing data on the disk selected for
installation.
Warning: This method overwrites the usr (/usr), variable (/var),
temporary (/tmp), and root (/) file systems.
Other product (application) files and configuration
data will be destroyed.

```

3 Migration Install

Upgrades the Base Operating System to current release.

Other product

(application) files and configuration data are saved.

88 Help ?

99 Previous Menu

>>> Choice [2]: 1

Note: Option 3, Migration Install, will only be presented if the existing system system is an AIX V3.2 or AIX 4.x system.

- ___ 11. You will now be given the opportunity to select the disk drives where you want the system to be loaded. Select the disk drive with the greatest amount of space on it, minimum of 1 GB, as long as it is marked bootable. If not, select both drives or if there isn't a single drive with greater than 1 GB on it, select both drives.

Change Disk(s) Where You Want to Install

Type one or more numbers for the disk(s) to be used for installation and press Enter. To cancel a choice, type the corresponding number and press Enter. At least one bootable disk must be selected. The current choice is indicated by >>>.

Name	Location Code	Size (MB)	VG Status	Bootable
1 hdisk0	04-C0-00-4,0	339	rootvg	yes
>>> 2 hdisk1	04-C0-00-5,0	639	rootvg	yes

>>> 0 Continue with choices indicated above

66 Disks not known to Base Operating System Installation

77 Display More Disk Information

88 Help ?

99 Previous Menu

>>> Choice [0]:

You will be taken back to the **Installation and Settings** menu. Select item 2 from the **Installation and Settings** menu, **Primary Language Environment Settings (AFTER install)**.

Installation and Settings

You should now be back at the **Installation and Settings** menu. If you are happy with your selections, select 0 to continue with the new and complete overwrite installation.

Installation and Settings

Either type 0 and press Enter to install with current settings or type the number of the setting you want to change and press Enter.

1 System Settings

Method of Installation.

New and Complete Overwrite

Disk Where You Want to Install hdisk1

2 Primary Language Environment Settings (AFTER Install)

Cultural Convention English (United States)

Language English (United States)

Keyboard English (United States)

3 Advanced Options

>>> 0 Install AIX with the current settings listed above.

88 Help ?

99 Previous Menu

>>> Choice [0]:

Once the installation begins, the following screen will appear. If using a classical RS/6000 system, turn the key to the NORMAL position anytime before the installation ends. Do so now. Note the progress indicator at the bottom of the screen. The installation process will take approximately one hour.

END OF LAB

Configuration of TCP/IP

TCP/IP will need to be configured in order to use the AIX V5.1 online documentation.

- ___ 1. When the system boots after AIX is loaded, you will get a screen titled Configuration Assistant TaskGuide. Click **Next** to begin customizing TCP/IP.
 - a. Using the Configuration Assistant, click **Configure network communications (TCP/IP)** and then click **Next**. Then, choose the option to **Manually configure TCP/IP** and click **Next**. Your instructor will assign you a unique TCP/IP address and hostname.

This will be a simple network with no name server or router unless required by your specific installation. If either of these are required, your instructor will provide the necessary information.

On a PCI RS/6000 with PCI-attached network adapters:

To configure the simple network described above, from the Configuration Assistant menu:

- a. Type in the host name, such as **sys1**
- b. Type in the IP address, such as **9.19.98.1**
- c. Type in the Network Mask, such as **255.255.255.0**. Use the same subnet mask for all systems on the network.
- d. Click **Next**.
- e. On the next menu, choose the communication interface that you are using. For most of our classrooms, it will be **tr0** for token ring or **en0** (or **et0**) for ethernet. Click **Next**.
- f. If using token ring, choose your ring speed. All systems in the network must use the same token ring speed. Click **Next**.
- g. On the next menu, just click **Next** unless it is necessary to configure a default router or domain name server for your environment.
- h. On the next screen, review your entries to verify they are correct. If not, click **Back** to make corrections. Otherwise, click **Next**.
- i. A new window will appear titled **Working....** When the gears within the window stop running and the word 'success' appears, you can **close** the window. On the TCP/IP window, click **Next** to return to the Configuration Assistant menu.
- j. On the Configuration Assistant menu, click **Exit the Configuration Manager** and then click **Next**.
- k. On the next menu, click **Finish now, and restart Configuration Assistant when restarting AIX** and then click **Finish** to exit the Configuration Manager.

On a PCI RISC System/6000 with ISA-attached network adapters ONLY:

Determine if you are using an ISA-attached Ethernet or token-ring network adapter. Most of the newer PCI RS/6000 systems (such as the 43P model 140) use PCI-attached network adapters and this section can be skipped for those systems. Most of the 40P and 43P model 7248 systems use ISA-attached network adapters and it will be necessary to complete this section for those systems.

If you are using Token Ring, use the speed of 16 mb/s, unless told otherwise by your network administrator.

- a. On the Configuration Assistant menu, click **Exit the Configuration Manager** and then click **Next**.
- b. On the next menu, click **Finish now, and restart Configuration Assistant when restarting AIX** and then click **Finish** to exit the Configuration Manager.
- c. Shut down the system using the command **shutdown -F**.
- d. Locate and insert the System Management Services diskette. Boot the system to the ASCII version of standalone mode.

For Ethernet, from the System Management Utilities menu select **Remote Initial Program Load Setup**. Record the parameters for the Ethernet adapter.

I/O Port Assignment _____
Connection Type _____
Interrupt Assignment _____
Shared Memory Address __0E400 (default value)

To find this information, do the following:

- Insert the System Management Services diskette
- Reboot the system
- After the PowerPC screen appears, press **F4** after the keyboard icon and before the last icon appears
- Select **Utilities** from the System Management Services menu
- Select **Remote Initial Program Load Setup**
- Select **Adapter Parameters**
- Select **IBM LAN Adapter for Ethernet**
- Select **View or Set Parameters**
- Record the values

For Token Ring, from the System Management Services menu, select **Test the Computer**. Run a test on the token-ring Adapter. Record the parameters for the token-ring adapter.

I/O Base Address _____
Interrupt Level _____
BIOS Base Address _____
Ring Speed _____
Shared RAM Base _____

To find this information, do the following:

- Insert the System Management Services diskette
- Reboot the system
- After the PowerPC screen appears, press **F4** after the keyboard icon and before the last icon appears
- Select **Test the Computer** from System Management Services menu
- Wait while diagnostics are loading
- Press **F2** to Deselect any currently selected test items
- Tab to **Test Token-Ring Adapter 1** and press the space bar to mark it as selected
- Press **F6** to execute the test
- Record the values (Hint, place a **0x** in front of the values and this is required as part of the values when configuring the adapter)

Reboot the system by pressing **F3** to reboot, or pressing the key sequence **<ctrl-alt-del>**

Log in as **root**.

Configure the communication adapter card using the **mkdev** command. Use the values recorded in the previous instruction, EXCEPT for the following values for the appropriate adapter card:

Ethernet - bus_mem_addr=0xc8000

Token Ring - shared_mem_leng=0x2000

Following is the **mkdev** command for an Ethernet card and a Token Ring card. Select the appropriate command for the card you are configuring. These values shown below may be different than the ones set on your system. Adjust the values accordingly:

```
# mkdev -c adapter -s isa -t ethernet -a bus_intr_lvl=11 \
> -a bus_io_addr=0x300 -a bus_mem_addr=0xc8000 \
> -a media_type=bnc -p bus1
```

-OR-

```
mkdev -c adapter -s isa -t tokenring -a intr_level=9 \
> -a bus_io_addr=0xa20 -a shared_mem_addr=0xd0000 \
> -a shared_mem_leng=0x2000 -a bios_addr=0xdc000 \
> -a ring_speed=16 -p bus1
```

Using SMIT, configure the network interface. Use the IP address and network mask listed earlier, one for each system.

```
# smit mkinet
```

If your network is Ethernet do the following:

- Select **Add a Standard Ethernet Network Interface**
- Select **en0**

If your network is Token Ring do the following:

- Select **Add a Token Ring Network Interface**
- Select **tr0**

Use the appropriate values for the IP address and network mask. Take all other defaults.

*INTERNET ADDRESS (dotted decimal) **[9.19.98.x]**

Network MASK (hexadecimal or dotted decimal) **[255.255.255.0]**

Set your host name through SMIT.

smit Communications Applications and Services

TCP/IP

Further Configuration

Hostname

Set the Hostname

*HOSTNAME (symbolic name of your machine) **[sys1]**

Next, edit the **/etc/hosts** file to add your IP address and host name along with the IP addresses and host names of the other systems in the network.

F3 back to the **Further Configuration** menu.

Name Resolution

Hosts Table (/etc/hosts)

Add a Host

*Internet Address (dotted decimal) **[9.19.98.x]**

*HOSTNAME **[sysx]**

F3 back to the **Add a Host menu**. Add an entry for every host on your network.

Repeat the following for each system where **y** is a remote system on your network:

*Internet Address (dotted decimal) **[9.19.98.y]**

*HOSTNAME **[sysy]**

e. If you have not done so already, update the **/etc/hosts** file so that you can use the hostname to communicate with other hosts in the network.

i. **# smit hostent**

ii. **Add a Host**

iii. Add the hostname and IP address of each system in the network. Your instructor will supply this information. It is not necessary to fill in the alias and comment fields. Press **enter** after each entry.

- iv. When all the hosts have been entered, view the file at the command line to verify that it is correct. This can be done with the **more /etc/hosts** command.

Installation of the AIX V5.1 online documentation

- ___ 1. The following additional filesets and products will be needed in order to use the AIX V5.1 online documentation:
 - IBM HTTP Server Web server, which is on the Expansion Pack CD.
 - The Netscape Navigator Web browser, which is on the Expansion Pack CD.
 - The AIX V5.1 Documentation CD
- ___ 2. To install this additional software needed for this course, do the following:
 - i. To install the Netscape Navigator:
 - a) Mount the Expansion Pack CD
 - b) # **smit install_latest**
 - c) Press **F4** to choose your installation media
 - d) Press **F4** at Software to Install
 - e) Choose: One of the Version levels of the Netscape Navigator
 - f) Press **Enter** to install the Netscape Navigator. This task should take less than five minutes.
 - g) Verify the results and press **F10** to exit SMIT
 - ii. To install the IBM HTTP Server Web server:
 - a) Mount the Expansion Pack CD
 - b) # **smit install_latest**
 - c) Press **F4** to choose your installation media
 - d) Press **F4** at Software to Install
 - e) Choose:
 - f) IBM HTTP Server Web server
 - g) Press **Enter** to install the IBM HTTP Server Web server. This task should take less than five minutes.
 - h) Verify the results and press **F10** to exit SMIT
 - iii. To install the AIX V5.1 Base Documentation:
 - a) Mount the AIX V5.1 Documentation CD
 - b) # **smit install_latest**
 - c) Press **F4** to choose your installation media
- f. You may wish to choose specific AIX documentation that you wish to install or you can just install the entire CD.

- g. Press **Enter** to install the AIX Documentation. This task should take about 30-60 minutes.
- h. Verify the results and press **F10** to exit SMIT

Appendix B. Optional Exercise: Serial Devices

What This Exercise Is About

This exercise gives you an opportunity to add and delete a serial device and make changes to a serial device that is attached to a RS/6000. It will also give you the opportunity to see what effect certain terminal settings have on the behavior of your terminal.

What You Should Be Able to Do

After completing this exercise, students should be able to:

- Add a terminal
- Change terminal characteristics
- Change the settings on an ibm3151 ASCII terminal
- Delete a terminal

In this exercise you will be adding a serial device, changing its characteristics both on the RS/6000 and on the device itself, and then delete the device. The serial device you will be using is an ibm3151 ASCII terminal. Setup screen information may differ depending on whether or not you are using a cartridge to define your language environment. The example information provided relative to setup screens is based on the ibm3151 terminal without a cartridge.

If you have another type of ASCII terminal, your instructor will provide directions on how it should be setup.

You would use many of the same steps for configuring a modem attached to a serial port. Your terminal should already be physically cabled to the first built-in serial port on your system. For this exercise you will need to work as a team with the other student who is working on your system.

Exercise Instructions

Verifying a Terminal

- ___ 1. At the console, log in as your user and **su** to **root**. Check to see if your ibm3151 ASCII terminal is currently configured. If it is, continue to the section titled **Removing A Terminal**. Otherwise, if your terminal has not been configured, skip to the section titled **Adding a Terminal**.

Removing a Terminal

- ___ 2. Using SMIT, remove the terminal you just finished setting up. Be sure to take the definition out of the database. Make sure you are logged off. Will the system let you? _____ What is the error message it gave you? _____
- ___ 3. Disable the terminal.
- ___ 4. Return to SMIT and complete the process of removing the ASCII terminal.
- ___ 5. You will need this terminal for later exercises so go to the next section titled **Adding A Terminal**. Add the terminal back in being sure to set the port #, **Enable login** to **enable**, the terminal type to **ibm3151** and **baud rate to 19200**.

Adding A Terminal

- ___ 6. Using SMIT, add a terminal on the first built-in adapter. Take all the defaults except for the baud rate which you should set to 19200. Be sure your ibm3151 terminal is configured to match the communications settings on the RS/6000.

Check Terminal Communications Settings

- ___ 7. On the ASCII terminal keyboard, press and hold the **ctrl** key and press the **setup** key. This puts you in setup mode. The cursor keys move you from one field to another. The space bar shows you the options for whatever field is highlighted. The Send key takes you to the next screen.
- ___ 8. On the Server console run the penable command that will send a login prompt to your ASCII terminal.
- ___ 9. Log in to the ASCII terminal as **root**. Try to go into SMIT. What kind of message do you get? Message: _____

- ___ 10. If SMIT did not run change the terminal type so you can use SMIT and then try starting SMIT again.

Changing Terminal Characteristics

- ___ 11. From another terminal and using SMIT, change the baud rate of your terminal to 9600. You will need to do this from your console. Be sure to disable the ibm3151 before making the changes and enable again once the changes are complete.
- ___ 12. Once this change is complete on the system, can you work with the terminal?
_____ Why not? _____ Change the settings on your terminal so it can communicate with your system.

END OF EXERCISE

Optional Exercises

Fixing a Hung Terminal

- ___ 1. DO NOT DO THIS FROM AN LPT. As **root**, from the ASCII terminal, run the shell script **/home/workshop/lab5**. This shell script will cause problems with the ibm3151 terminal. Determine what the problem symptoms are, such as a hung terminal (doesn't show any character when you try to type), or strange characters displayed when you try to type something. As part of troubleshooting, check the port attributes, like the baud rate, and whether or not there are any processes running associated with the terminal. Try to fix the problem using the suggestions in the student notebook before taking the last resort of turning the terminal off then on.

- ___ 2. DO NOT DO THIS FROM AN LPT. As **root**, from the ASCII terminal, run the shell script **/home/workshop/lab5.1**. This shell script will cause display problems with the ibm3151 terminal. Determine what the problem symptoms are, such as a hung terminal (doesn't show any character when you try to type), or strange characters displayed when you try to type something. As part of troubleshooting, check the port attributes, like the baud rate, and whether or not there are any processes running associated with the terminal. Try to fix the problem using the suggestions in the student notebook before taking the last resort of turning the terminal off then on.

END OF LAB

Exercise Instructions with Hints

Verifying a Terminal

- ___ 1. At the console, log in as your user and **su** to **root**. Check to see if your ibm3151 ASCII terminal is currently configured. If it is, continue to the section titled **Removing A Terminal**. Otherwise, if your terminal has not been configured, skip to the section titled **Adding a Terminal**.

- login: **teamxx**
 - Enter your password
- su root**
 - root's Password: **ibmaix**
- # penable**

If the output from the above command looks something like this:

```
console
tty0
```

then your ASCII terminal is currently configured. Go to the section titled **Removing A Terminal**. If your tty does not appear to be configured, skip to the section titled **Adding a Terminal**.

Removing a Terminal

- ___ 2. Using SMIT, remove the terminal you just finished setting up. Be sure to take the definition out of the database. Make sure you are logged off. Will the system let you? _____ What is the error message it gave you? _____

- # smit**
 - Devices**
 - TTY**
 - Remove a TTY**
 - You will get a pop-up screen which lists the available tty devices. **Select** the terminal from the list which corresponds to your terminal. Keep definition in database **[no] OK or Enter**
 - The system should not have allowed you to remove an active terminal. You must disable the terminal before you attempt to remove it.
 - F10** to return to the command line

- ___ 3. Disable the terminal.

- # pdisable tty0**

- ___ 4. Return to SMIT and complete the process of removing the ASCII terminal.

- # smit**
 - Devices**
 - TTY**

Remove a TTY

- You will get a pop-up screen which lists the available tty devices. **Select** the terminal from the list which corresponds to your terminal. Keep definition in database **[no] OK or Enter** to perform the action **F3** to return to the menu

This should take you back to the status screen. Press **F3** to get back to the **Remove a TTY** screen which should still have all the correct selections you made before. **OK or Enter**.

- ___ 5. You will need this terminal for later exercises so go to the next section titled **Adding A Terminal**. Add the terminal back in being sure to set the port #, **Enable login** to **enable**, the terminal type to **ibm3151** and **baud rate to 19200**.

Adding A Terminal

- ___ 6. Using SMIT, add a terminal on the first built-in adapter. Take all the defaults except the baud rate which you should set to 19200. Be sure your ibm3151 terminal is configured to match the communications settings on the RS/6000.

•# smit

Devices

TTY

Add a TTY

- Select the type of terminal connection **tty rs232 AsynchronousTerminal**
Select the port to which your terminal is attached&colon **sa0**
- The next screen is the dialog screen. The only value you need to insert is the port number. Press **F4** to view your choices.
- PORT number&colon **s1** Enable LOGIN&colon **enable** BAUD rate&colon **19200** TERMINAL type&colon **ibm3151** **OK or Enter** Press **F3** to return to the menu Press **F10** to return to the command line

Check Terminal Communications Settings

- ___ 7. On the ASCII terminal keyboard, press and hold the **ctrl** key and press the **setup** key. This puts you in setup mode. The cursor keys move you from one field to another. The space bar shows you the options for whatever field is highlighted. The Send key takes you to the next screen.

- The Setup Key is at the top right hand side of the numeric keypad of the ASCII terminal.
- This is what the settings may look like on the **General** menu

Machine Mode = IBM 3151
Screen = NORMAL
Row and Column = 24x80
Scroll = JUMP
Auto LF (line feed) = OFF

CRT Saver = ON
 Line Wrap = ON
 Forcing Insert = OFF
 Tab = FIELD
 -Press the **Send** key.

- You should now be at the **Communication** menu. Check to be sure the line speed (baud rate), word length, parity and stop bit match the system default selections of **19200, 8, NO, and 1**. The operating mode should be **ECHO**.

This is what the settings may look like on the **Communications** menu:

Operating Mode = ECHO
 Line Speed (bps) = 19200
 Word Length (bits) = 8
 Parity = NO
 Stop Bit = 1
 Turnaround Character = CR
 Line Control = IPRTS or PRTS
 Break Signal (ms) = 500
 Send Null Suppress = ON

If you have to make any changes, use the cursor key to take you to the appropriate field, then use the space bar to cycle through the selections. Once you have made all the changes, press the **Send** key.

- Check the values for the **Keyboard** menu. Entries should be **RETURN, NEW LINE, CR, PAGE, SPACE**.

This is what the settings may look like on the **Keyboard** menu:

Enter = RETURN
 Return = NEW LINE
 New Line = CR
 Send = PAGE
 Insert Character = SPACE

- Press the **Send** key again.
 - You should now be on the **Function** menu that will allow you to save your changes.
 - Press the right arrow key once to **Save**.
 - Press the space bar to save the changes. The word **Completed** should be flashing.
- Press and hold the **ctrl** key and press the **setup** key to exit setup mode.
- Check your terminal. Did you get a login prompt?

___ 8. On the Server console run the 'penable' command that will send a login prompt to your ASCII terminal.

•# penable tty0

___ 9. Log in to the ASCII terminal as **root**. Try to go into SMIT. What kind of message do you get? Message: _____

- login&colon **root** root's Password&colon **ibmaix**
- # smit

___ 10. If SMIT did not run change the terminal type so you can use SMIT and then try starting SMIT again.

- # export TERM=ibm3151
- # smit

Changing Terminal Characteristics

___ 11. From another terminal and using SMIT, change the baud rate of your terminal to 9600. You will need to do this from your console. Be sure to disable the ibm3151 before making the changes and enable again once the changes are complete.

- # pdisable tty0
- # smit

Devices

TTY

Change/Show Characteristics of a TTY

You will be presented with a pop-up screen listing the available tty devices. There should be only one and it will be highlighted.

- Select** your terminal from the list. You will now be presented with the dialog screen. Set the following characteristics:

Enable LOGIN	[enable]
BAUD rate	[9600]
TERMINAL type	[ibm3151]

-OK or Enter

-F3 to return to the menu

- Exit SMIT
- # penable tty0

___ 12. Once this change is complete on the system, can you work with the terminal? _____ Why not? _____ Change the settings on your terminal so it can communicate with your system.

- To change the settings on your terminal, follow the steps shown in instruction 7 under the heading **Check Terminal Communications Settings**. Look for the portion of these instructions that deal with the **Communication** menu.

END OF EXERCISE

Optional Exercises with Hints

Fixing a Hung Terminal

- ___ 1. DO NOT DO THIS FROM AN LPT. As **root**, from the ASCII terminal, run the shell script **/home/workshop/lab5**. This shell script will cause problems with the ibm3151 terminal. Determine what the problem symptoms are, such as a hung terminal (doesn't show any character when you try to type), or strange characters displayed when you try to type something. As part of troubleshooting, check the port attributes, like the baud rate, and whether or not there are any processes running associated with the terminal. Try to fix the problem using the suggestions in the student notebook before taking the last resort of turning the terminal off then on.

•# **/home/workshop/lab5**

From another terminal attached to the same system:

•# **stty -a < /dev/ttyx** (where x is the number of the tty device. In our case most likely 0)

•# **ps -ef | pg**

From the problem terminal:

•Try the key sequence **<ctrl-q>**

•Try the key sequence **<ctrl-j> stty sane <ctrl-j>**

From another terminal attached to the same system:

•# **pdisable ttyx # penable ttyx** (Wait a couple of minutes. If this doesn't work try the next item.)

•Turn off the terminal and turn it back on again.

The 'lab5' shell script caused a problem because it attempted to 'cat' several binary files to your ASCII terminal.

- ___ 2. DO NOT DO THIS FROM AN LPT. As **root**, from the ASCII terminal, run the shell script **/home/workshop/lab5.1**. This shell script will cause display problems with the ibm3151 terminal. Determine what the problem symptoms are, such as a hung terminal (doesn't show any character when you try to type), or strange characters displayed when you try to type something. As part of troubleshooting, check the port attributes, like the baud rate, and whether or not there are any processes running associated with the terminal. Try to fix the problem using the suggestions in the student notebook before taking the last resort of turning the terminal off then on.

•# **/home/workshop/lab5.1**

From another terminal attached to the same system:

•# **stty -a < /dev/ttyx** (Notice that the baud rate is different than the terminal setting.)

- # **stty 9600 < /dev/ttyx** (if this doesn't work then try ...)

- # **pdisable ttyx # penable ttyx**

- Turn off the terminal and turn it back on again.

The 'lab5.1' shell script caused a problem by using the 'stty' command to reset the baud rate on the ASCII terminal to something that did not match the terminal setup.

END OF EXERCISE

Solutions

Following are the solutions for those instructions that include questions:

2. Using SMIT, remove the terminal you just finished setting up. Make sure you are logged off. Will the system let you remove it? _____ Why or why not? _____ What is the error message it gave you? _____

Answer: No because the port is in use, even if there is only a login message displayed, the **getty** program is using the port. The message it gives is:

Cannot perform the requested function because the specified device is busy.

9. Login to the ASCII terminal as **root**. Try to go into SMIT. What kind of message do you get? Message: _____

Answer: The environment variable TERM is currently set to a terminal type that does not support the full screen display capabilities required for SMIT. Set TERM to an appropriate terminal type or use another terminal.

12. Once this change is complete on the system, can you work with the terminal? _____ Why not? _____

Answer: No because the terminal settings don't match the port settings on the system.

Appendix C. Optional Exercise: Itanium System Startup and Shutdown

What This Exercise is About

This lab demonstrates new AIX 5.1 features in the area of system startup and shutdown.

What You Should Be Able to Do

At the end of the lab, you should be able to:

- Use the Setup menu on an Itanium-based system
- Use the EFI shell on an Itanium-based system
- Use the EFI Boot Manager to set the boot list on an Itanium-based system

Introduction

This exercise reinforces the material covered in the System Startup and Shutdown unit. It consists of questions and hands-on activities. There are two levels of information:

- Exercise instructions
- Exercise instructions with hints

Use any level that facilitates your learning process. Use all available resources: team members, documentation, your instructor.

Required Materials

- Itanium-based system running AIX 5.1.

Exercise Instructions

Use the Setup menu

- ___ 1. Insert the Software Installation CD-ROM into the drive.
(This is in preparation for the next exercise. If there is no CD-ROM in the drive during power up, the EFI Boot Manager will not list the CD-ROM drive as a potential boot device.)
- ___ 2. Reboot the system.
- ___ 3. Observe the console screen as the PCI SCSI controller BIOS runs. Make a note of the device number for each disk found on the SCSI bus:
- ___ 4. When the Splash screen is displayed, use the <Arrow> keys to choose **Enter Setup** and press the <Enter> key.
- ___ 5. The **Setup** menu presents a series of menus organized as tabs across the top of the screen. The **Help** tab describes how to navigate.

Note: On some early versions of firmware, the mouse does not work in **Setup** and you must use the <Arrow> and <Tab> keys to navigate.
- ___ 6. Navigate to the **Integrated IDE** tab. Note the status of the IDE buses and what devices are connected. You should see a **Ultra High Density (UHD)** floppy drive and a second drive (which is the CD-ROM, although it may not be labeled as such) attached to the Primary IDE bus. Some class room machines also have one or two disks connected to the secondary IDE bus.

Primary IDE: _____	Secondary IDE: _____
Master: _____	Master: _____
Slave: _____	Slave: _____
- ___ 7. Navigate to the **Time/Date** tab. Set the system time of day clock if it is not correct.
- ___ 8. Navigate to the **General** tab. You can set the Splash screen delay from this tab.
- ___ 9. Navigate to the **Save/Exit** tab and exit **Setup**.
- ___ 10. You will next see a screen providing information about firmware version numbers, number of processors, cache size, and so forth.

- ___ 11. This screen is followed by the EFI Boot Manager screen. Use the <UpArrow> or <DownArrow> key to stop the time-out.

Notes:

- 1) On some early versions of firmware, the system goes directly to the EFI shell. Type `exit` to go to the EFI Boot Manager.
- 2) When you perform a **New and Complete Overwrite** software installation, the installation programs create a new entry in the EFI Boot Manager boot list and place it first in the list. On the next reboot, the system will not allow you to stop in the EFI Boot Manager. You are forced to boot automatically to the newly created boot disk. On subsequent reboots, you can stop in the EFI Boot Manager using the <UpArrow> or <DownArrow> key.

Use the EFI shell

- ___ 1. Use the <DownArrow> or <UpArrow> keys to select **EFI Shell [Built-in]**. Press <Enter> to go to the shell.
- ___ 2. Review the `Device mapping table`. EFI displays the `Device mapping table` when it enters the shell. Use the `map` command to re-display the table if necessary. You should see at least one hard disk with two partitions and a CD-ROM drive. Partition 1 of the hard disk and the CD-ROM drive should each have a file system short name associated with them.
- ___ 3. What is the device number for the CD-ROM drive? _____
- ___ 4. What short names are associated with the CD-ROM drive? _____
- ___ 5. If your system has IDE drives, what device numbers are used for them?

- ___ 6. Connect to partition 1 of the hard disk.
What command did you use?
- ___ 7. Partition 1 on the boot disk is an **EFI system partition** and contains the AIX boot loader. List the files in the root directory of partition 1 of the hard disk.
What command did you use?
Note the file names here:
- ___ 8. Change directories to `\EFI\AIX`. List the files in this directory.
- ___ 9. Connect to partition 2 of the hard disk.
- ___ 10. Attempt to list the files in partition 2 of the hard disk.
Were any files listed?

- ___ 11. Navigate to the CD-ROM volume. List the files in the root directory of the CD-ROM.
Note them here:

- ___ 12. Use `set` to display the `path` variable. Note the value of `path` here:

- ___ 13. Given the default value of `path` and the current device mapping, if the user types `boot` immediately upon entering the EFI Shell, which device would the system boot from?

- ___ 14. Exit the EFI shell.

- ___ 15. When the EFI Boot Manager screen is displayed, use the <DownArrow> key to stop the time-out.

Use the EFI Boot Manager

- ___ 1. You should be in the EFI Boot Manager screen, from the last exercise. If you are not, reboot the system and use the <DownArrow> key to stop at this screen.

- ___ 2. Use the <UpArrow> and <DownArrow> keys to move between the menu choices. Following initial system installation, there will be one boot device listed, which is given the name `AIX 5L hdisk0`. This is the EFI system partition on the AIX boot disk.

- ___ 3. Select the **Boot option maintenance menu** and press the <Enter> key.

- ___ 4. Select **Add a Boot Option** to add a boot device to the boot list.

- ___ 5. The **Select a volume** screen lists the potential boot devices that EFI discovered. Select the CD-ROM (Device: FF) and press <Enter>.

Note: If no CD-ROM was in the drive when the system was powered on, the CD-ROM drive will not be listed as a boot option. If you are in this situation, insert the CD-ROM and reboot.

- ___ 6. The next screen prompts you for a name for this boot option. Enter `AIX 5.1 CD` and press <Enter>.

- ___ 7. Enter `n` for no arguments to the boot command when prompted.

- ___ 8. Answer `y` (yes) when prompted to save changes to NVRAM.

- ___ 9. Exit the **Select a volume** screen to return to the main menu.

- ___ 10. Select **Change Boot Order**.

-
- ___ 11. This screen shows the items in the boot list and menu selections in the top of the screen. The bottom half of the screen shows the device path for the boot device which is highlighted.

You should have two boot devices displayed: the hard disk and the CD-ROM. Highlight one and then the other and observe how the details in the bottom half of the screen change.

The boot order is indicated by the order that the boot devices are shown on the screen. EFI attempts to boot from the top device first. If that fails, you get an error message and EFI attempts to boot from the next boot option.

- ___ 12. Select **Help** to learn how to change the boot order.
- ___ 13. Change the boot order so the system attempts to boot from the CD-ROM first, followed by the boot disk, followed by the EFI shell.
- ___ 14. Select **Save Setting to NVRAM**.
- ___ 15. Select **Exit** to return to the main menu.
- ___ 16. Select **Exit** to return to the EFI Boot Manager screen.
- ___ 17. Select `AIX 5L hdisk0` to boot from the hard drive. Allow the system to boot to multiuser mode. (You will boot from the CD in the “Installation” Unit.)
- ___ 18. Remove the CD from the drive.
- ___ 19. When the system gets back to multiuser mode, display the partitioning of the boot disk.

Note: AIX numbers partitions starting at 0; the EFI shell starts numbering at 1.
How large is the system partition on your machine?

END OF LAB

Exercise Instructions with Hints

Use the Setup menu with hints

- ___ 1. Insert the Software Installation CD-ROM into the drive.
(This is in preparation for the next exercise. If there is no CD-ROM in the drive during power up, the EFI Boot Manager will not list the CD-ROM drive as a potential boot device.)
- ___ 2. Reboot the system.

Hint:

`shutdown -r` (or `shutdown -Fr`, if you're sure no one else is using the system)

- ___ 3. Observe the console screen as the PCI SCSI controller BIOS runs. Make a note of the device number for each disk found on the SCSI bus:
- ___ 4. When the Splash screen is displayed, use the <Arrow> keys to choose **Enter Setup** and press the <Enter> key.
- ___ 5. The **Setup** menu presents a series of menus organized as tabs across the top of the screen. The **Help** tab describes how to navigate.

Note: On some early versions of firmware, the mouse does not work in **Setup** and you must use the <arrow> and <Tab> keys to navigate.

- ___ 6. Navigate to the **Integrated IDE** tab. Note the status of the IDE buses and what devices are connected. You should see a **Ultra High Density (UHD)** floppy drive and a second drive (which is the CD-ROM, although it may not be labeled as such) attached to the Primary IDE bus. Some classroom machines also have one or two disks connected to the secondary IDE bus.

Primary IDE: _____	Secondary IDE: _____
Master: _____	Master: _____
Slave: _____	Slave: _____

- ___ 7. Navigate to the **Time/Date** tab. Set the system time of day clock if it is not correct.
- ___ 8. Navigate to the **General** tab. You can set the Splash screen delay from this tab.
- ___ 9. Navigate to the **Save/Exit** tab and exit **Setup**.
- ___ 10. You will next see a screen providing information about firmware version numbers, number of processors, cache size, and so forth.

- ___ 11. This screen is followed by the EFI Boot Manager screen. Use the <UpArrow> or <DownArrow> key to stop the time-out.

Notes:

- 1) On some early versions of firmware, the system goes directly to the EFI shell. Type `exit` to go to the EFI Boot Manager.
- 2) When you perform a **New and Complete Overwrite** software installation, the installation programs create a new entry in the EFI Boot Manager boot list and place it first in the list. On the next reboot, the system will not allow you to stop in the EFI Boot Manager. You are forced to boot automatically to the newly created boot disk. On subsequent reboots, you can stop in the EFI Boot Manager using the <UpArrow> or <DownArrow> key.

Use the EFI shell with hints

- ___ 1. Use the <DownArrow> or <UpArrow> keys to select **EFI Shell [Built-in]**. Press <Enter> to go to the shell.
- ___ 2. Review the `Device mapping table`. EFI displays the `Device mapping table` when it enters the shell. Use the `map` command to re-display the table if necessary. You should see at least one hard disk with two partitions and a CD-ROM drive. Partition 1 of the hard disk and the CD-ROM drive should each have a file system short name associated with them.
- ___ 3. What is the device number for the CD-ROM drive? _____

Hint:
FF

- ___ 4. What short names are associated with the CD-ROM drive? _____

Hint:
If a CD-ROM was in the drive when you booted, there should be three short names:
`blkX` (block name for entire drive)
`blkY` (block name for partition 1)
`fsZ` (file system name for partition 1)

- ___ 5. If your system has IDE drives, what device numbers are used for them?

Hint:
See your notes in Exercise , “Use the Setup menu with hints” on page 6.
EFI numbers disks starting at 80 and it numbers any IDE drives before any SCSI drives.

___ 6. Navigate to partition 1 of the hard disk.

What command did you use?

Hint:

```
shell> fsX:
```

___ 7. Partition 1 on the boot disk is an **EFI system partition** and contains the AIX boot loader. List the files in the root directory of partition 1 of the hard disk.

What command did you use?

Note the file names here:

Hint:

```
fs0:\> ls
```

```
Directory of fs0:\
```

```
02/21/01 11:41p<DIR>          512  EFI
                                0  File          0  bytes
                                1  Dir           512  bytes
```

___ 8. Change directories to \EFI\AIX. List the files in this directory.

Hint:

```
fs0:\> cd \efi\xaix
```

```
fs0:\> ls
```

```
Directory of fs0:\EFI\AIX\
```

```
10/18/00 11:25p          2,636,000  BOOT.EFI
                                1  Files     2,636,000  bytes
                                0  Dir           0  bytes
```

___ 9. Connect to partition 2 of the hard disk.

Hint:

```
shell> fsX:
```

___ 10. Attempt to list the files in partition 2 of the hard disk.

Were any files listed?

Hint:

No. Partition 2 of the boot disk contains the AIX Basic Operating System file systems. Partition 2 is not a FAT file system, so EFI is unable to access any of the files.

- ___ 11. Connect to the CD-ROM volume. List the files in the root directory of the CD-ROM.
 Note them here:
 Hint:
`fsX:`
`ls`
- ___ 12. Use `set` to display the `path` variable. Note the value of `path` here:
- ___ 13. Given the default value of `path` and the current device mapping, if the user types `boot` immediately upon entering the EFI Shell, which device would the system boot from?
 Hint:
 The AIX boot disk.
- ___ 14. Exit the EFI shell.
 Hint:
`exit`
- ___ 15. When the EFI Boot Manager screen is displayed, use the <DownArrow> key to stop the time-out.

Use the EFI Boot Manager with hints

- ___ 1. You should be in the EFI Boot Manager screen from the last exercise. If you are not, reboot the system and use the <DownArrow> key to stop at this screen.
- ___ 2. Use the <UpArrow> and <DownArrow> keys to move between the menu choices. Following initial system installation, there will be one boot device listed, which is given the name `AIX 5L hdisk0`. This is the EFI system partition on the AIX boot disk.
- ___ 3. Select the **Boot option maintenance menu** and press the <Enter> key.
- ___ 4. Select **Add a Boot Option** to add a boot device to the boot list.
- ___ 5. The **Select a volume** screen lists the potential boot devices that EFI discovered. Select the CD-ROM (Device: FF) and press <Enter>.
Note: If no CD-ROM was in the drive when the system was powered on, the CD-ROM drive will not be listed as a boot option. If you are in this situation, insert the CD-ROM and reboot.
- ___ 6. The next screen prompts you for a name for this boot option. Enter `AIX 5.1 CD` and press <Enter>.
- ___ 7. Enter `N` for no arguments to the boot command when prompted.
- ___ 8. Answer `Y` (yes) when prompted to save changes to NVRAM.
- ___ 9. Exit the **Select a volume** screen to return to the main menu.

- ___ 10. Select **Change Boot Order**.
- ___ 11. This screen shows the items in the boot list and menu selections in the top of the screen. The bottom half of the screen shows the device path for the boot device which is highlighted.

You should have two boot devices displayed: the hard disk and the CD-ROM. Highlight one and then the other and observe how the details in the bottom half of the screen change.

The boot order is indicated by the order that the boot devices are shown on the screen. EFI attempts to boot from the top device first. If that fails, you get an error message and EFI attempts to boot from the next boot option.
- ___ 12. Select **Help** to learn how to change the boot order.
- ___ 13. Change the boot order so the system attempts to boot from the CD-ROM first, followed by the boot disk, followed by the EFI shell.
- ___ 14. Select **Save Setting to NVRAM**.
- ___ 15. Select **Exit** to return to the main menu.
- ___ 16. Select **Exit** to return to the EFI Boot Manager screen.
- ___ 17. Select `AIX 5L hdisk0` to boot from the hard drive. Allow the system to boot to multiuser mode. (You will boot from the CD in the "Installation" Unit.)
- ___ 18. Remove the CD from the drive.
- ___ 19. When the system gets back to multiuser mode, display the partitioning of the boot disk.

Note: AIX numbers partitions starting at 0; the EFI shell starts numbering at 1.

Hint:

`efdisk -p hdisk0`

How large is the system partition on your machine?

Hint:

Usually 32 MB

END OF LAB

Appendix D. Optional Exercise: The System V Print Subsystem

What This Exercise is About

This lab demonstrates configuring a printer and printing using the System V print subsystem.

What You Should Be Able to Do

At the end of the lab, you should be able to:

- Add a System V printer.
- Submit jobs to the printer.
- Display status of the printer and print jobs.

Introduction

This exercise reinforces the material covered in the System V Print Subsystem unit. It consists of questions and hands-on activities. There are two levels of information:

- Exercise instructions
- Exercise instructions with hints

Use any level that facilitates your learning process. Use all available resources: team members, documentation, your instructor.

Required Materials

- System running AIX 5.1 with connected local printer.

Exercise Instructions

If your classroom does not have printers, you can perform most of these exercises by printing to a file. Notes are provided in the instructions for this option.

Switch print subsystems

- ___ 1. Use `switch.prt -d` to determine which print subsystem is active.
- ___ 2. If the System V print subsystem is active, change to the AIX print subsystem.
What command did you use? _____
- ___ 3. What file is `/usr/bin/lpstat` linked to? _____
- ___ 4. Switch to the System V print subsystem.
What command did you use? _____
- ___ 5. What file is `/usr/bin/lpstat` linked to? _____

Add a System V printer

- ___ 1. Collect the following information from the instructor:
 - Printer device _____
(If you will be printing to a file, the device will be the name of the target file.)
 - How the printer is connected
(serial or parallel) _____,
which adapter _____ and
which port it is connected to _____.
(If you will be printing to a file, you do not need this information.)
 - If the printer is connected via a serial connection, details of the connection
(baud rate, parity, bits per character, stop bits, and flow control):

(If you will be printing to a file, you do not need this information.)
 - Printer type _____
(If you will be printing to a file, use printer type `unknown`.)
 - Printer content type _____
(If you will be printing to a file, use content type `simple`.)
 - Interface script _____
(If you will be printing to a file, use the `standard` interface script.)
- ___ 2. Choose a name for your printer: _____
- ___ 3. Login as root.

- ___ 4. Configure the printer device:
 (If you are printing to a file, skip the steps in the table and simply create the target file using the `touch` command, for example:
`# touch /tmp/dummy_printer)`

Step	Action
1.	Use SMIT fastpath <code>smit pdp</code> to open the Printer/Plotter Devices menu.
2.	Move the cursor to select Add a Printer/Plotter ; press <Enter>.
3.	Scroll through the device list and select the printer device.
4.	Select the type of interface (connection).
5.	Select the parent adapter.
6.	For parallel connected printers, enter <p> in the PORT number field and press <Enter>.
7.	For serial connected printers, enter the port number in the PORT number field, fill in the baud rate and so forth and press <Enter>.

- ___ 5. List the newly created printer device.
 What command did you use? _____
- ___ 6. Use `lpadmin` to define a new System V printer using the printer device you just created. Use the information you gathered in steps 1 and 2 to configure the printer.
 What command did you use?

- ___ 7. Use `lpstat` to verify queueing status.
 What command did you use? _____
- Is the printer accepting requests? _____
- What reason is given? _____
- ___ 8. Use `lpstat` to verify printing status.
 What command did you use? _____
- Is the printer enabled? _____
- ___ 9. Use `lpstat` to get a long listing of your printer's characteristics.
 What command did you use? _____
- ___ 10. Using the output from the previous step, answer these questions:
 What users are allowed to access this printer? _____
- What action will be taken "On fault"? (This is the default Alert action.)

- ___ 11. View the printer configuration file.
 What command did you use? _____

- ___ 12. Navigate to the spool directory.
What command did you use? _____
- ___ 13. List the files in this directory: _____

Submit print jobs

- ___ 1. Attempt to print /etc/motd (the message of the day file) on your new printer.
What command did you use? _____

What happened? _____
- ___ 2. Enable queueing using the **accept** command. (Don't enable printing yet.)
What command did you use? _____
- ___ 3. Resubmit your print job.
Note the request-ID here: _____
- ___ 4. Use **lpstat** to list outstanding job status.
What command did you use? _____
- ___ 5. List the files in the spool directory: _____
- ___ 6. Examine the request file (*x-0*) and answer these questions:
What file will be printed? _____

What were the file's permissions? _____
- ___ 7. Submit another request to print /etc/motd, but this time, request that the print service copy the file to the spool directory.
What command did you use? _____
- ___ 8. List the new files in the spool directory: _____
- ___ 9. Examine the two new files.
Which file is the request file? _____

Which file is the copy of the file to be printed? _____
- ___ 10. Enable printing on your printer.
What command did you use? _____
- ___ 11. Your print jobs should begin printing as soon as you enabled the printer.
Use **lpstat -p** while the printer is printing to show what job is being printed.

(If your jobs do not print, ask the instructor for help.)

___ 12. Examine the request log.
What command did you use? _____

Look for request IDs in the file.

What character at the beginning of the line indicates a new entry (new print request) in this file? _____

END OF LAB

Exercise Instructions with Hints

Switch print subsystems with hints

___ 1. Use `switch.prt -d` to determine which print subsystem is active.

Hint:

Unless someone has changed it, the AIX print subsystem should be active.

___ 2. If the System V print subsystem is active, change to the AIX print subsystem.
What command did you use? _____

Hint:

```
# switch.prt -s AIX
```

___ 3. What file is `/usr/bin/lpstat` linked to? _____

Hint:

```
# ls -l /usr/bin/lpstat  
/usr/aix/bin/lpstat
```

___ 4. Switch to the System V print subsystem.
What command did you use? _____

Hint:

```
switch.prt -s SystemV
```

___ 5. What file is `/usr/bin/lpstat` linked to? _____

Hint:

```
# ls -l /usr/bin/lpstat  
/usr/sysv/bin/lpstat
```

Add a System V printer with hints

___ 1. Collect the following information from the instructor:

- Printer device _____
(If you will be printing to a file, the device will be the name of the target file.)
- How the printer is connected
(serial or parallel) _____,
which adapter _____ and
which port it is connected to _____.
(If you will be printing to a file, you do not need this information.)
- If the printer is connect via a serial connection, details of the connection
(baud rate, parity, bits per character, stop bits, and flow control):

(If you will be printing to a file, you do not need this information.)

- Printer type _____
(If you will be printing to a file, use printer type `unknown`.)
- Printer content type _____
(If you will be printing to a file, use content type `simple`.)
- Interface script _____
(If you will be printing to a file, use the `standard` interface script.)

___ 2. Choose a name for your printer: _____

___ 3. Login as root.

- ___ 4. Configure the printer device:
 (If you are printing to a file, skip the steps in the table and simply create the target file using the `touch` command, for example:
`# touch /tmp/dummy_printer)`

Step	Action
1.	Use SMIT fastpath <code>smit pdp</code> to open the Printer/Plotter Devices menu.
2.	Move the cursor to select Add a Printer/Plotter ; press <Enter>.
3.	Scroll through the device list and select the printer device.
4.	Select the type of interface (connection).
5.	Select the parent adapter.
6.	For parallel connected printers, enter <p> in the PORT number field and press <Enter>.
7.	For serial connected printers, enter the port number in the PORT number field, fill in the baud rate and so forth and press <Enter>.

- ___ 5. List the newly created printer device.
 What command did you use?

Hint:

If using a printer:

```
# lsdev -Cc printer
```

If printing to a file:

```
# ls -l directory (where directory is the directory containing your target file)
```

- ___ 6. Use `lpadmin` to define a new System V printer using the printer device you just created. Use the information you gathered in steps 1 and 2 to configure the printer. What command did you use? _____
-

Hint:

```
# lpadmin -p printer_name -v device_name -T printer_type \
-I content_type -m interface_script
```

___ 7. Use `lpstat` to verify queueing status.
What command did you use? _____

Is the printer accepting requests? _____

What reason is given? _____

Hint:

`lpstat -a` (lists status for all printers) OR
`lpstat -a printer_name` (lists status for *printer_name* only)
No
New printer.

___ 8. Use `lpstat` to verify printing status.
What command did you use? _____

Is the printer enabled? _____

Hint:

`lpstat -p`
No

___ 9. Use `lpstat` to get a long listing of your printer's characteristics.
What command did you use? _____

Hint:

`lpstat -p -l printer_name`

___ 10. Using the output from the previous step, answer these questions:
What users are allowed to access this printer? _____

What action will be taken "On fault"? (This is the default Alert action.)

Hint:

all
mail to root once

___ 11. View the printer configuration file.
What command did you use? _____

Hint:

`cat /etc/lp/printers/printer_name/configuration`

___ 12. Navigate to the spool directory.
What command did you use? _____

Hint:

```
# cd /var/spool/lp/tmp/host_name
```

___ 13. List the files in this directory: _____

Hint:

Unless there are other printers defined on this host, the only file should be .SEQF.

Submit print jobs with hints

___ 1. Attempt to print /etc/motd (the message of the day file) on your new printer.
What command did you use? _____

What happened? _____

Hint:

```
# lp -d printer_name [-L C] /etc/motd
```

Print request was refused with this error message:

```
UX:lp: ERROR: 0920-067 Requests for destination "canon" aren't  
being accepted.
```

```
TO FIX: Use the "lpstat -a" command to see why this  
destination is not accepting requests.
```

___ 2. Enable queueing using the `accept` command. (Don't enable printing yet.)
What command did you use? _____

Hint:

```
# accept printer_name
```

___ 3. Resubmit your print job.
Note the request-ID here: _____

Hint:

```
printer_name-X (where X is the job number)
```

___ 4. Use `lpstat` to list outstanding job status.
What command did you use? _____

Hint:

```
# lpstat -o
```

___ 5. List the files in the spool directory: _____

Hint:

```
# ls /var/spool/lp/tmp/host_name
```

___ 6. Examine the request file (*x-0*) and answer these questions:

What file will be printed? _____

What were the file's permissions? _____

Hint:

File to be printed is the *F* line.

permissions are in the *o* line, the *flist* attribute.

___ 7. Submit another request to print */etc/motd*, but this time, request that the print service copy the file to the spool directory.

What command did you use? _____

Hint:

```
# lp -d printer_name -c /etc/motd
```

___ 8. List the new files in the spool directory: _____

Hint:

***y-0* and *y-1* (where *y* is the request number)**

___ 9. Examine the two new files.

Which file is the request file? _____

Which file is the copy of the file to be printed? _____

Hint:

request file: *Y-0*

file to print: *Y-1*

___ 10. Enable printing on your printer.

What command did you use? _____

Hint:

```
# enable printer_name
```

___ 11. Your print jobs should begin printing as soon as you enabled the printer.

Use `lpstat -p` while the printer is printing to show what job is being printed.

(If your jobs do not print, ask the instructor for help.)

___ 12. Examine the request log.
What command did you use? _____

Look for request IDs in the file.

What character at the beginning of the line indicates a new entry (new print request) in this file? _____

Hint:

```
# pg /var/lp/logs/requests
```

Each new entry starts with a line starting with “=”.

END OF LAB

Optional Exercise

Configure a remote print server and client

- ___ 1. Use *Printing for Fun and Profit under AIX 5L* (Redbook), *Chapter 3. System V network printing* as a reference for this exercise.
- ___ 2. You will need to work with another team.
- ___ 3. One team will configure their system as a print server machine (see section 3.3 in the Redbook). The other team will configure their system to use the other machine's remote printer (see section 3.1 in the Redbook).
- ___ 4. Test your configuration by attempting to print from the client machine to the printer on the server machine.
- ___ 5. Make notes below of the steps you took and your results.

