



*AIX 6 System  
Administration I:  
Implementation*

(Course code AU14)

**Instructor Exercises Guide**  
**with hints**

ERC 12.0

IBM certified course material

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# Instructor exercises overview

The objective of the AIX V6.1 System Administration exercises is to have students understand and successfully perform the types of activities a new AIX system administrator may encounter on a day-to-day basis.

There are several connected exercises of which one or more must be completed in order to complete a following exercise. The following is a list of these exercise dependencies:

*Exercise 11 - Managing File Systems*, as well as *Exercise 13 - Backup and Restore*, depend on the completion of Exercises 9 and 10, *Working with LVM* and *Working with File Systems* respectively.

Before teaching this course, read the **Overview Exercise Description**, included in this guide, as well as the *Student Exercises* book. This section explains the format of the different exercise sections. This must be covered with the students as an overall exercise introduction before the first exercise is started.

It is also imperative that you read and understand the **Common Student Problems** and **Known Hardware/Software Problems** sections provided with each exercise. These sections alert you to known problems or common mistakes that are inherent to the exercise.

Be sure you understand the equipment configuration for your teach site before introducing the exercises. The password for root should be set to **ibmaix**. During the first exercise students will create five users taking the default information for their creation. IT IS MANDATORY THAT STUDENTS HAVE ACCESS TO THE **root** PASSWORD as all exercises require at some point for students to be the **root** user. Supplemental exercise scripts have been created and placed in the **/home/workshop** directory. Check for the existence of this directory and its files. If **/home/workshop** does not exist or is empty, restore the scripts from the instructor exercise diskette that is provided with the instructor materials. Without these scripts, the following exercises cannot be done:

Exercise 11 sections: *Optional exercises*, *Using Fragments For Disk Usage Efficiency*, *Using JFS Compression*

The following is a synopsis of what these scripts do:

Exercise 18, **lab6** - Creates problems with the printing subsystem.

Exercise 11, **mkfile** - Creates a file called 512-byte file whose size is 512 bytes so it occupies only one 512-byte fragment.

**fragcopy** - Makes copies of the 512-byte file to test the number of 512-byte files that can be stored in each file system. As it processes, a count will be displayed showing the number of files that have been successfully copied.

**bigfile** - It is a 1 MB file that is copied to each file system used to assist in measuring performance.

Due to the variety of classrooms where this class may be offered, the equipment available in any one classroom may be different from another. It may be that the equipment is remote, and only terminals that can remotely access the systems are available. There should be two students per system. To alleviate the potential problems that can be caused by terminal differences at various sites, directions are provided for both ASCII interfaces and graphics interfaces. If you have loaded the systems using **mksysb** images, the same printer support that is found on a distribution tape or CD has been loaded onto the **mksysb** image. Thus, you should have no problems providing the necessary printer driver support for whatever printers are attached to the AIX systems (assuming you are not working in a remote environment).

There should be an extra unconfigured Ethernet adapter (either virtual or physical) that will be used during *Exercise 7, Devices*, to give students an opportunity to remove and discover a device. It is not intended that the interface for this adapter be configured with an IP address and so there is no need for it to be cabled to a hub or switch. Local environments with physical non-partitioned lab systems can use a CD-ROM as a substitute, but the lab instructions are written to use an Ethernet adapter.

The **Exercise Review/Wrap-up** section at the end of each exercise in this guide is meant to be conducted by you as an exercise review at the end of each exercise session and before the beginning of the next unit. The students do **not** have this section in their exercise notebook. These are suggested review questions. To add to the exercise review, keep track of questions and common problems students had during the exercise. Use the board to cover these common problems. Simply state that these are a few of the common problems seen in all classes. Do not single out any one team or student. Keep it a group discussion.

## Exercises configuration

The following are the required software and hardware necessary to teach AU14 (note that the official document on the lab setup is the *Lab Setup Guide* for the course; what follows is a guide to what you should already find on the platform after the instructions in that document are complete):

1. Software: Each AIX system must be installed with AIX 5L V5.3 with the following filesets and AIX 5L V5.3 TL6 for POWER6 servers:
  - Java 1.4.1 applet filesets (java141.ext on Volume 3 of AIX Installation CDs)

The AIX 5L V5.3 Web-based services, such as remote, wsm are installed during the lab setup. The students do not install it, but configure it. See the *Lab Setup Guide* for this course for more information.

Also, check to be sure that Mozilla Firefox is installed and functional on the system (in an Xwindow environment execute: `mozilla &`).

TCP/IP needs to be configured in support of remote access and the AIX 6.1 Migration installation from a NIM server, unless using non-partitioned local lab systems.

Use the provided AU140 lab files CD to create the **/home/workshop** directory. This directory contains numerous files used throughout the machine exercises.

The following software packages should have been placed in the **/usr/sys/inst.images** directory during setup. The filesets in this package are used in Exercise 17, **Printers and Queues**.

- **printers**

The following filesets should also be stored in the **/usr/sys/inst.images** directory. These filesets are used in Exercise 4, **AIX Software Installation**.

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

2. Hardware:

A. Minimum:

**43P-Model 140 and MCA machines are not supported by AIX V6.1. You need at a POWER5 or POWER6 server (a POWER4 server would work, except that the lab HMC instructions assume using HMCv7 which do not support POWER4).**

For a class size of 24, there should be at least 12 AIX systems. These system could be physical, but it is more likely that they will be logically partitioned. Each system (whether physical or logical) should have the following:

- 256 MB memory

- Two hard drives; one with a minimum of 2.2 GB

- CD-ROM (for physical systems)

- Graphics terminal (for physical systems)

- Have all systems connected via Ethernet

**Note:** If you have systems with disks less than 2.2 GB, the AIX 5L V5.3 and AIX 6.1 systems have to be loaded using both drives. Thus, students are not able to do exercises which require two disks. The preferred configuration is two disks at least 2.2 GB in size.

More than two students per system is not recommended. Check to be sure the **/home/workshop** directory has been set up on the student systems and that the following files are in that directory:

- mkfile**

- fragcopy**

- lab5** (only used for the serial devices exercise in the appendix)

- lab5.1** (only used for the serial devices exercise in the appendix)

If the files are not there, you need to load them from the diskette that was provided with your instructor materials.

For detailed lab set up instructions, refer to the *Lab Setup Guide* for this course. These instructions also include how to set up X Terminals and enable the AIX V6.1 online documentation.

## 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.

## Text highlighting

The following text highlighting conventions are used throughout this book:

<b>Bold</b>	Identifies file names, file paths, directories, user names and principals.
<i>Italics</i>	Identifies links to Web sites, publication titles, and is used where the word or phrase is meant to stand out from the surrounding text.
Monospace	Identifies attributes, variables, file listings, SMIT menus, code examples of text similar to what you might see displayed, examples of portions of program code similar to what you might write as a programmer, and messages from the system.
<b>Monospace bold</b>	Identifies commands, daemons, menu paths and what the user would enter in examples of commands and SMIT menus.
<text>	The text between the < and > symbols identifies information the user must supply. The text may be normal highlighting, <b>bold</b> or monospace, <b>Or monospace bold</b> depending on the context.



# Exercise 1. root login methods

*(with hints)*

## Estimated time

00:10

## What this exercise is about

In this exercise, you look at several ways to invoke the privileges of the **root** user.

## What you should be able to do

After completing this exercise, students should be able to:

- Directly log in as **root**
- Use the **su** command to log in as **root**

## Introduction

Typically the system administrator should not use **root** as their normal login account. Instead, they should use the **su** command to *become* **root** for a short period of time to do administrative tasks.

## Common Student Problems

None.

## Known Hardware/Software Problems

None.

## Exercise Instructions with Hints

### Preface

Two versions of these instructions are available; one with hints and one without. You can use either version to complete this exercise. Also, please don't hesitate to ask the instructor if you have questions.

All exercises of this chapter depend on the availability of specific equipment in your classroom.

If your lab environment uses remote System p platforms, the instructor provide you with instructions for accessing the remote environment. For example, this may involve using a Web browser to access a Web server which provides access to a virtual private network (VPN) or it may involve using a toll that extends a remote VPN to your desktop machine.

Once you have access to the remote environment you can choose a tool to connect to your assigned machine. Once again, your instructor provides you with the addressing (IP address or hostname) and instructions for accessing the remote machine. Your network utility may be a telnet client, an X-Windows server, or a VNC client. Whatever tool you are using, at various points in the labs, you may need to re-launch your remote access tool to obtain a new login prompt.

If you are using an ascii based network client, such as PuTTY, be sure to specify the telnet protocol in addition to providing the IP address of your assigned lab system. You may also want to customize the terminal emulation, such as configuring the keyboard mapping to generate <ctrl-H> when the backspace key is pressed. You might also wish to adjust the window appearance characteristics such as the font size. If you did not customize before launching the terminal emulation, you can make the changes later by right clicking on the title bar and selecting "change settings".

If you are using a VNC viewer (to access CDE environment), you need to enter (when prompted) the IP address of your assigned lab system, immediately followed by ":", where # is the port number for the vncserver. For example: 192.168.22.5:1.

The output shown in the answers is an example. Your output and answers based on the output may be different.

All hints are marked with a >> sign.

### Part 1 - Direct logins to root

- \_\_\_ 1. Establish connectivity to the remote lab environment. (If you are using local non-partitioned machines, you only need to turn on the local attached terminal and skip to step 3).  
    » Your instructor should provide details on how to do this.
- \_\_\_ 2. Select and launch a network utility to access your assigned lab system.

- » See the discussion in the above preface. Your instructor provides you with more specific instructions such as the IP address of your assigned system.
- \_\_\_ 3. Log in as the user **root**. The password is **ibmaix**.
- » At the username prompt, enter: **root**  
At the password prompt, enter **root**'s password: **ibmaix** (You do not see the password appear on the screen)  
(you may only be prompted for a password - assume it is root's password)
- \_\_\_ 4. Open a terminal. (if necessary)
- » If you are using a CDE graphic interface:
- 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. You may wish to resize the terminal window or adjust the font size being used.
- \_\_\_ 5. Determine your current directory and your home directory.
- Current directory: \_\_\_\_\_/\_\_\_\_  
Home directory: \_\_\_\_\_/\_\_\_\_
- » # **pwd**  
» /  
» # **echo \$HOME**  
» /
- \_\_\_ 6. To verify that you do, in fact, have **root** privileges, **cat** out the file **/etc/security/passwd**. This file holds the encrypted passwords for the users on your system. Only **root** can look at this file. More details on this file are mentioned later in the course. Did you see the contents of the file? \_\_\_\_\_ **Yes.**
- » # **cat /etc/security/passwd**
- \_\_\_ 7. Log out of the system.
- » If you are using a CDE graphical interface:
- 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 (if using a local terminal).
- » Otherwise, type **exit** to logout of the **telnet** window.

## Part 2 - Using the `su` command

\_\_\_ 8. Log into the system using the login name **team01** and the password **team01**.

» At the username prompt, enter: **team01**

At the password prompt, enter password: **team01** (You do not see the password appear on the screen)

\_\_\_ 9. Open a terminal. (if necessary)

» If you are using a CDE graphic interface:

- On the tool bar at the bottom, click the small triangle above the *pencil and paper* icon (fourth icon from the left). This opens 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.

\_\_\_ 10. Determine your current directory and your home directory.

Current directory: \_\_\_\_\_ /home/team01

Home directory: \_\_\_\_\_ /home/team01

» **\$ pwd**

**/home/team01**

**\$ echo \$HOME**

**/home/team01**

\_\_\_ 11. Check to see if you have the authority to view **/etc/security/passwd**.

» **\$ cat /etc/security/passwd**

**cat: cannot open /etc/security/passwd**

Did you see the contents of the file? \_\_\_\_\_ **No**

\_\_\_ 12. Change to the **/tmp** directory.

» **\$ cd /tmp**

**\$ pwd (to confirm)**

**/tmp**

\_\_\_ 13. Now, switch user to **root** without using the “-” (dash) option.

» **\$ su** or **\$ su root**

**root's Password: ibmaix**

\_\_\_ 14. Determine your current directory and your home directory.

Current directory: \_\_\_\_\_ /tmp  
Home directory: \_\_\_\_\_ home/team01

```
» # pwd
/tmp
# echo $HOME
/home/team01
```

Has anything changed? \_\_\_\_\_

The current directory has not changed, it is still /tmp.

\_\_\_ 15. Do you have **root** privileges? Check **/etc/security/passwd**. \_\_\_\_\_ Yes.

```
» # cat /etc/security/passwd
<Output is the contents of the /etc/security/passwd file>
```

\_\_\_ 16. Change to the **/etc** directory.

```
» # cd /etc
# pwd
/etc
```

\_\_\_ 17. Exit back to **team01**.

```
» # exit
$
```

\_\_\_ 18. Did the **su** and the **cd** to **/etc** (in the resulting subshell) affect the current directory after exiting the subshell? \_\_\_\_\_ No

```
» $ pwd
/tmp
```

\_\_\_ 19. Now, try using the **su** command with the **-** (dash) option. What is your home directory? If you're not sure, check before performing the **su**. \_\_\_\_\_  
/home/team01.

```
» $ echo $HOME
/home/team01
$ su - or su - root
#
```

**Note**

Make sure you include a space before and after the “-” (dash) **root**'s Password:  
**ibmaix**

\_\_ 20. Determine your current directory and your home directory.

```
>> # pwd
/
# echo $HOME
/
```

Current directory: \_\_\_\_/\_\_\_\_

Home directory: \_\_\_\_/\_\_\_\_

Is there any thing different this time? Yes, the current directory is now **root**'s directory.

\_\_ 21. Check **/etc/security/passwd** to make sure you have **root** privileges.

```
>> # cat /etc/security/passwd
```

<Output is the contents of the **/etc/security/passwd** file>.

\_\_ 22. Exit back to **team01** and log out.

```
>> # exit
```

If you are using a CDE graphical environment:

- In 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 (if using a local terminal).

## End of exercise

## Exercise Review/Wrap-up

Consider the following questions:

- What is the difference between the **su** command used with and without the dash?
- What situations would it be helpful to use the dash and not use the dash?
- Are there disadvantages of logging in directly as **root**?



## Exercise 2. Using SMIT

*(with hints)*

### Estimated time

00:20

### What this exercise is about

AIX provides several different interfaces; ASCII (command-line), Common Desktop Environment (CDE) and X-Window (Motif). This exercise provides an opportunity to use the ASCII interface to the System Management Interface Tool (SMIT). Optionally, you can also use CDE and Motif interface to SMIT.

### What you should be able to do

After completing this exercise, students should be able to:

- Log in from the ASCII interface
- Start SMIT (ASCII and optionally the 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
- Start and use graphical SMIT

### Introduction

This exercise is designed to give you experience working with the system management tools supplied with AIX. In most classrooms, there are two students per AIX system. In many cases, only one person is able to perform the task at a time. You need to work together with your teammate. Be sure to take turns at the keyboard.

### Common Student Problems

For classes where the students are sitting at a locally attached graphic AIX system console, if a student cannot start an X-Windows session with `xinit`, make sure they haven't shelled out (**F9**) in SMIT to get to

the command line. Also, `<ctrl-c>` may not work if students are running a command when shelled out in SMIT.

When the students get to the place when they are presented with the login screen for CDE, they may at first have difficulty logging in with the command line. If they delay too long in logging in, the CDE login is again displayed.

Students get confused over the different interfaces. You may need to help them determine the benefits of each. Try to hold the discussion until after the exercise. The exercise contains detailed instruction for each interface.

There is a difference in function key activity between the ASCII interface and the Motif interface. For example, in Motif, there is NO function key to *shell out* to a command line (`F9` in ASCII). It is assumed that you can simply open another window and run the command.

If the class is being held with the System p platforms in a remote location and you are using a tool (such as VNC) which is only configured to support a specific graphic interface (such as CDE), warn the students in Step 11 to leave CDE as the default interface. Changing to a command line interface may prevent that tools from working. If that happens, they will need to use `telnet` to get back into the machine and change the user interface back.

## Known Hardware/Software Problems

Please tell the students that AIX 5L V5.3 is being used in this lab, but that AIX 6.1 behaves the same. SMIT is being introduced, before you migrate to AIX 6, because SMIT is needed for the Software Installation unit.

While using SMIT in Graphic Mode, the system hangs when changing a user password. You need to open a console session and restart the system.

## Exercise Instructions with Hints

### Preface

Two versions of these instructions are available; one with hints and one without. You can use either version to complete this exercise. Also, please don't hesitate to ask the instructor if you have questions.

Note that on some terminal emulations, the function keys are not operative and you may need to substitute escape sequences. For example, instead of pressing F3, you might need to press <ESC><3> for the same function.

All exercises of this chapter depend on the availability of specific equipment in your classroom.

The output shown in the answers is an example. Your output and answers based on the output may be different.

All hints are marked with a >> sign.

### Part 1 - Using SMIT (ASCII interface)

\_\_\_ 1. Log in as the user **root**. The password is **ibmaix**.

- » At the username prompt, enter: **root**  
At the password prompt, enter **root's** password: **ibmaix**

\_\_\_ 2. Open a terminal. (if necessary)

- » If you are using a CDE graphical interface:
  - On the tool bar at the bottom, click the small triangle above the *pencil and paper* icon (fourth icon from the left). This opens 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. Start SMIT in ASCII mode.

- » # **smitty**

\_\_\_ 4. Add five users to the system. They should be named **team100** through **team104**. Take all of the defaults. Customizing the attributes is 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.

- » In SMIT, select:

**Security & Users ->****Users ->****Add a User**

\* User NAME [teamxxx] A

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 **Security & Users** menu.
- » Select **Change a User's Password**
  - User Name [team###]
  - Changing password for team###
  - teamxx's New password: team### (The password will not appear on the screen)
  - Enter the new password again: team###
- » Repeat that process until all new accounts have passwords. Then, press **F10** and exit from SMIT.

\_\_\_ 5. 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? \_\_\_\_\_.

ps -ef

- How can you find out? \_\_\_\_\_

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

- Return to the main menu.

» # smitty -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. Select **no**.
- » **F6** (to view the command).
- » **F3 - Cancel** until you are back at the **System Management** screen.

\_\_\_ 6. 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.
- » Press **F3**.
- » Repeat as appropriate.

\_\_\_ 7. 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 step. 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 IDs).
- » Select **syslogd**.
- » **Enter** (to stop the subsystem).
- » **F6** (to view the command).
- » **F3 (repeatedly)** to return to the **Subsystems** menu.
- » Select **List All Subsystems** (**syslogd** should be inoperative).
- » **F3** back to **Subsystems** menu.
- » Select **Start a Subsystem**.
- » **F4** (to see the list of Subsystem Name).
- » Select **syslogd**.
- » **Enter** (to start the subsystem).

\_\_\_ 8. You should have the **COMMAND STATUS** screen displayed. Capture an image of this screen. Exit SMIT.

» Press **F8**=(Image) and **Enter**.

» **F10**

\_\_\_ 9. Look at the SMIT history files using **pg** or **more**. Look for the image you captured in the previous step.

- What information is in each of these files? \_\_\_\_\_

\_\_\_\_\_

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.

- Why should these files be monitored?

\_\_\_\_\_

Both files should be monitored regularly and purged periodically so disk space is not wasted.

» # **pg /home/team100/smit.log**

» # **pg /home/team100/smit.script**

\_\_\_ 10. Look at the ownership of the SMIT history files of user **team100** with **ls -al**.

- Was it a good idea to create these files as **root**? \_\_\_\_ **No**
- What will happen if user **team100** will use SMIT?

\_\_\_\_\_

User **team100** is not the owner of the SMIT history files and has no write access these files. If user **team100** starts using SMIT, user **team100** gets an error message saying "Could not open SMIT log file: ./smit.log".

» # **ls -al /home/team100/smit.log**

» # **ls -al /home/team100/smit.script**

\_\_\_ 11. As the system administrator, you can select the default interface that the users can use. Depending on your classroom environment, you may be able to set a different interface. Ask your instructor if you would like to change the interface. For the new interface to take effect, you need to reboot your system. Log out when you are done.

**Note**

If you are using VNC for remote graphics, do not change the system user interface in this step; your VNC server is configured to only work with a CDE user interface.

» # **smitty**

» Select:

**System Environments ->  
Change System User Interface**

» At **Select System Login User Interface**, generate a list (**F4**) to see your choices.

» Typically, your interface is set to **AIX CDE 1.0**. If you prefer the **Command Line** interface, select it and press **Enter**. If you don't want to change the interface, press **F3** until you are out of SMIT and then logout (this is not an option if you are using a remote LPAR system).

» Press **F3** twice to get back to the **System Management** screen.

» If you did **not** make a change to the interface, select **F3 - Cancel** until you have exited SMIT and log out. You are finished with Part 1 of the exercise. If you changed the interface, you 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**.

**-OR-**

» This step could be achieved from the command line with:

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

» Upon reboot, your new interface should appear.

- \_\_\_ 12. If you did not change your System User Interface (and thus did not need to reboot), terminate smit and log off of your system.

» press **F10**

»# **exit**

## Part 2 - (Optional) Using SMIT (Motif interface)

\_\_\_ 13. If using CDE, log into CDE desktop as **root** and the password **ibmaix**.

If using an X-Windows environment, log in to the AIX system from the ASCII interface as **root** and the password **ibmaix**.

» CDE environment (you may need to use a VNC client to remotely acquire a CDE interface):

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

» X-Windows environment:

- Start an X-Window from the ASCII interface command prompt using

# **xinit**

**-OR-**

# **startx**



### Note

If you are not sure how to login in an X-Windows environment, ask your instructor.

\_\_\_ 14. If necessary, open a terminal window. If one already exists, skip to the next step.

» CDE environment:

- 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.

» X-Windows environment:

- 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.

\_\_\_ 15. Add five users to the system. They should be named **team200** through **team204**. Take all the defaults. **Do not assign passwords for these users.** When the five users 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 **team200** and click **OK**.
- » When you see the running man (at the top) stop and stand with his arms up in victory, click **Done** to return to the **Add a User** menu.
- » Add users **team201** through **team204** in the same way.
- » When the five users are added, click **Cancel** to return to the **Users** window.
- » Once all users are added, click **Cancel** and then **Exit** to exit SMIT and return to the command line.

\_\_\_ 16. In a similar manner, select each of the main SMIT menu entries, examine the submenu, and 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.

\_\_\_ 17. Exit from SMIT. Look at the SMIT history files with **pg** or **more**.

- What information is in each of these files?

---

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.

- Why should these files be monitored?

---

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.

- » Point and click **Exit**.
- » Select **Exit SMIT**.

- » # pg /smit.log
- » # pg /smit.script

\_\_\_ 18. Log out of CDE or X-Windows.

» If using 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.

» If using X-Windows:

- 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 appears. 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.

\_\_\_ 19. Log out of the system.

- » # logout

## End of exercise

## Exercise Review/Wrap-up

In an X-Window session, if I want to use the ASCII interface with SMIT, what command do I type to invoke SMIT?

Answer: `smitty`



## Exercise 3. System startup and shutdown

*(with hints)*

### Estimated time

00:30

### What this exercise is about

This exercise familiarizes 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 a System p in multi-user
- 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.

### Common Student Problems

Cover the user name and passwords the students are to use when they log in. For the purpose of this exercise, it is assumed that the login user names are **team01** - **team05**. The passwords should be the same as the user name. Ensure that if there is more than one student on a system, that no two users use the same user name.

When using a local System p lab machine with attached console, if the lab machines provide the CDE environment, and students did not disable the CDE default, they will be prompted by the CDE interface upon each reboot during this exercise. Have them select command-line login.

## Known Hardware/Software Problems

For classroom configurations where students are sharing one AIX system, they must act as a single team during this exercise. This is indicated in the “Introduction” section. Be sure to cover this as part of an exercise introduction. Encourage them to take turns at the keyboard. Suggest that everyone work as a team and go through the exercise in its entirety. Any students wanting additional practice should repeat this exercise before or after class or during free time when the other students are not working on the system.

If the AIX systems being used to complete the exercise are remote partitioned systems, the local workstations need access to the HMC particularly to complete *Part 2 - Boot Using System Management Services*.

## Exercise Instructions with Hints

### Preface

Two versions of these instructions are available; one with hints and one without. You can use either version to complete this exercise. Also, please don't hesitate to ask the instructor if you have questions.

All exercises of this chapter depend on the availability of specific equipment in your classroom.

The output shown in the answers is an example. Your output and answers based on the output may be different.

All hints are marked with a >> sign.

### Part 1 - 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 log in using the user name, you are 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 **shdaemon**? \_\_\_\_\_ **2**
- What does it mean? The run level for rc is 2. It represents AIX multi-user mode.

» **# pg /etc/inittab**

- \_\_\_ 3. Log out of this session.

» **# exit**

## Part 2 - Boot using System Management Services

- \_\_\_ 4. If your remote AIX system is an LPAR on a remote managed system, then you can do this SMS exercise by remotely accessing the HMC using your Web browser and starting a virtual console session with your AIX system (the Web browser must have connectivity to the HMC which may be inside a virtual private network (VPN).
- \_\_\_ 5. In order to boot to an SMS mode, you must first shutdown the AIX system. From the command line, request a shutdown with no delay and no reboot.

» # shutdown -F

- \_\_\_ 6. Access your system's HMC by starting a Web browser and using the HMC's IP address as the URL. If you do not have this IP address, ask your instructor. (If you are on a stand-alone system, skip to Step 4 below for booting in SMS mode.)

» Start a Web browser.

» For example, the standard method for IBM provided lab environments is to find the Mozilla Firefox application icon in the Applications box of the e-lab Web interface. Use of Internet Explorer, if available, should also work correctly.

» Double-click the **Firefox** icon.

(click No, to make this your default browser )

# https://##.##.##.##

(click OK, to Accept the certificate temporarily for the session)

- \_\_\_ 7. Start the Hardware Management Console application by clicking the Launch link. Log into your system HMC as **hscroot**. and password **abc1234**. Locate your machine and the logical partition which your are assigned.

» Click the link to launch the HMC application:

Log on and launch the Hardware Management Console Web application

userid: hscroot

Password: abc1234

Click logon or press < Enter >

Click **Not Now** in response to the prompt: "Do you want Firefox to remember this password"

You may also get an error about pop-ups being disabled. Click OK on the error box. In Mozilla, pull down the **Tools** menu, select the **Options** item, click on the **Content** icon, and uncheck the **Block Popup Windows** option. Click **OK**. Then repeat the above sequence.

If prompted to accept security certificates, respond by clicking Yes.



You may also get a screen entitled "**Choose a Disconnected Session**". Do not use someone else's disconnected hscroot session. Click on the "**New Session**" button and obtain a brand new hscroot session.

- » Expand the **Systems Management** selection in the Navigation window.
- » Expand the **Servers** selection in the Navigation window.
- » Click the server for your assigned LPAR. You may need to ask your instructor. All the configured lpars appear in the *Contents* window.
- » Expand the **Systems Management** selection in the Navigation window.
- » Expand the **Servers** selection in the Navigation window.
- » Click the server for your assigned LPAR. You may need to ask your instructor. All the configured lpars appear in the *Contents* window.

- \_\_\_ 8. Locate the icon for your partition. The state of the partition should be **not active**. Activate the partition, specifying that you want to open a terminal window and that you want a boot mode of SMS.
- » To activate a logical partition from the HMC:
    - a) If not selected, click the **Select** box to the left of your lpar
    - b) Click the **arrows** which appeared to the right of the lpar
    - c) Drag the mouse to **Operations, Activate** and then click **Activate**
    - d) Check **Open a terminal window or console session**, and then click the **Advanced** button
    - e) Click the drop-down menu for the **Boot mode**, select **SMS**, and then click OK  
(Do not change anything with the Keylock position)
    - f) This should return you to the **Activate** screen again. Click OK to start the activation.
    - g) A virtual terminal window should start up on your workstation. Since it is acting as the system console you should be able to watch the boot messages and see when the SMS menu appears.
- \_\_\_ 9. If you are using a local non-partitioned system (otherwise skip to the next step): As the **root** user, shut down and reboot the system to the System Management Services mode. As soon as you see the keyboard and hear a beep, you should press the numeric **1** key or <F1> key to access SMS.
- » **# shutdown -Fr**

When the first screen appears (PowerPC screen), after the **keyboard** icon but before the last icon appears, press **F1** (or **1**, depending upon your environment). The *System Management Services* screen then displays.

- \_\_\_ 10. System Management Services (SMS) menus and contents vary from one System p machine/model to another. Take a few moments to explore the menu options which display on your system. Do not make any changes or run any tests. *Also, don't click **Exit** on the main SMS screen until you are finished exploring the other options.*
- » The following menu items may be different than what you see on your system. Navigating the menu also may vary from system to system. On some systems, you have a graphic interface and click the **EXIT** icon to return to a previous menu or eventually exit from SMS. On other systems with an ASCII interface, you press the <ESC> key to return to a previous menu or use the "x" response to exit from SMS.
  - » **Select Language** - Type **1** and press <Enter>.
    - This shows a list of various languages to use while in the SMS menus.
    - Return to the previous menu <Esc>.
  - » **Set up Remote IPL** - Type **2** and press <Enter>.
    - This prompts you for which interface you want to use for remote IPL and then would prompt for networking information needed for a network boot.
    - Return to the previous menu <Esc>.
  - » **Change SCSI Settings** - Type **3** and press <Enter>.
    - This lists two options to modify: **Hard Drive Spin Up Delay** and **Change SCSI ID**.
    - Return to the previous menu < Esc>.
  - » **Select Console** - Type **4** and press <Enter>.
    - This will display a message on all eligible terminals to select as console. Press 0 (zero).
    - Return to the previous menu <Esc>.
  - » **Select Boot Options** - Type **5** and press <Enter>.
    - This provides boot options to select an install/boot device, configure the boot device order, or enable/disable Multi-boot Startup Mode.
    - Return to the previous menu <Esc>.
- \_\_\_ 11. When you are done exploring, exit the SMS program and allow the system to reboot in multi-user mode.
- » Enter "**X**" and press <Enter> at the SMS screen. This will cause the system to reboot in multi-user mode.

## Part 3 - System Resource Controller (SRC)

- \_\_\_ 12. 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**

- \_\_\_ 13. 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**

## Part 4 - Resetting the run level (INIT)

- \_\_\_ 14. Shutting a system down to Single User mode removes any TCP/IP network access to the system. Due to this, you need to use the system console while doing this lab exercise.

If you are using a non-partitioned local system, then login at the attached console and skip to step 18.

If you are using a partitioned system, you need to start a virtual terminal to your partition, as you did earlier when booting to SMS mode. Do the following steps:

- \_\_\_ 15. Access your system's HMC by starting a Web browser and using the HMC's IP address as the URL. If you do not have this IP address, ask your instructor. (If you are on a stand-alone system, skip to Step 4 below for booting in SMS mode.)

» Start a Web browser.

» For example, the standard method for IBM provided lab environments is to find the Mozilla Firefox application icon in the Applications box of the e-lab Web interface. Use of Internet Explorer, if available, should also work correctly.

» Double-click the **Firefox** icon.

(click No, to make this your default browser )

# **https://##.##.##.##**

(click OK, to Accept the certificate temporarily for the session)

- \_\_\_ 16. Start the Hardware Management Console application by clicking the Launch link. Log into your system HMC as **hscroot**. and password **abc1234**. Locate your machine and the logical partition which your are assigned.

» Click the link to launch the HMC application:

**Log on and launch the Hardware Management Console Web application**

**Userid: hscroot**

**Password: abc1234**

Click logon or press < Enter >

Click **Not Now in response to the prompt: "Do you want Firefox to remember this password"**

You may also get an error about pop-ups being disabled. Click OK on the error box. In Mozilla, pull down the **Tools** menu, select the **Options** item, click on the **Content** icon, and uncheck the **Block Popup Windows** option. Click **OK**. Then repeat the above sequence.

If prompted to accept security certificates, respond by clicking Yes.

You may also get a screen entitled "**Choose a Disconnected Session**". Do not use someone else's disconnected hscroot session. Click on the "**New Session**" button and obtain a brand new hscroot session.

- » Expand the **Systems Management** selection in the Navigation window.
- » Expand the **Servers** selection in the Navigation window.
- » Click the server for your assigned LPAR. You may need to ask your instructor. All the configured lpars appear in the *Contents* window.

- » Expand the **Systems Management** selection in the Navigation window.
- » Expand the **Servers** selection in the Navigation window.
- » Click the server for your assigned LPAR. You may need to ask your instructor. All the configured lpars appear in the *Contents* window.

\_\_\_ 17. Start a virtual console window for your assigned partition. This acts as your system console during the exercise.

- » In the contents window locate your partition and then:
  - a) Select your lpar by clicking the Select box to the left of the lpar name.
  - b) Click on the arrows which appeared to the right of the lpar
  - c) Drag the mouse to **Console Window**, and then click **Open Terminal Connection**
  - d) After a short delay a window should appear with an AIX login prompt
  - e) Login as root

\_\_\_ 18. Reset the run level to Single User Mode without rebooting the system.

» # **shutdown -m**

You will see several messages appear. Enter the **root** password when you see the following:

```
INIT: Single-User Mode
PASSWORD:
```

\_\_\_ 19. Verify that several subsystems have been stopped.

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

\_\_\_ 20. Verify that there are few processes running on the system.

» # **ps -ef | more**

\_\_\_ 21. Run `/etc/rc.net` to start the network interfaces and then reset the Run Level to Multi-User Mode.

```
» #/etc/rc.net
» # telinit 2
```

\_\_\_ 22. Ensure that all normal subsystems have been started and are working properly. If you have been using CDE, and CDE fails/hangs now, you forgot to run `/etc/rc.net` in the previous step.

```
» login: root
root's Password: <Enter root's password.>
# lssrc -a | pg
```

\_\_\_ 23. Shut down and reboot the system one more time.

```
» # shutdown -Fr
```

## End of exercise

## Exercise Review/Wrap-up

1. What do you need on a PCI RS/6000 to invoke Maintenance mode?

**Answer:** Access to the System Management Services firmware.





## Exercise 4. AIX software installation

*(with hints)*

### Estimated time

00:25

### What this exercise is about

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

### What you should be able to do

- List the software installed on an AIX system
- Install software
- Install software fixes (optional)
- View the history of installed software (optional)

### Introduction

This exercise is designed to give you experience working with the installation facilities supplied with AIX. If there is more than one student sharing a system, 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 install two software packages:

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

In this exercise, you may also install a fix to already installed software packages.

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 fix installation and display of the fix history is optional. It requires that the lab setup for the exercises used an AIX 5L V5.3 TL6 base installation. If the image used in your lab environment has additional maintenance already installed and committed, you may not be able to successfully complete the optional steps.

## Instructor exercise overview

The fix installation and display of the fix history is optional. It requires that the lab setup for the exercises used a base level AIX 5L V5.3 installation and that there is a fix that needs to be done. If the image used in the lab environment already has the fix installed and committed, the students are not able to successfully complete the optional steps.

## Common Student Problems

Be sure to explain the information in the **Introduction** of this Exercise.

In the classroom, students install software that has been preloaded to the **/usr/sys/inst.images** directory. Explain that the installation from this directory is the same as an installation from CD or tape.

However, if you are in an environment where you plan to provide the students with the actual installation media, be sure to tell the students which input media is being used.

**Important:** Since students install certain UNIX games onto their systems, it may be important to set some ground rules. They might enjoy playing with the games during break, but stress that they are not to play with them during lecture or when they should be working on machine exercises. Most students will oblige. However, if a student becomes disruptive with the games, the instructor always has the option of using SMIT to remove the fileset.

## Exercise Instructions With Hints

### Preface

Two versions of these instructions are available; one with hints and one without. You can use either version to complete this exercise. Also, please don't hesitate to ask the instructor if you have questions.

All exercises of this chapter depend on the availability of specific equipment in your classroom.

The output shown in the answers is an example. Your output and answers based on the output may be different.

All hints are marked with a >> sign.

### Part 1 - List and install AIX software

\_\_\_ 1. Access your system. If remote, we recommend an interactive ascii prompt via telnet, but CDE graphical session can also work.

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

>> Log in as **teamxx**

>> If using CDE, after logging in start up a dtterm window to obtain an interactive command prompt.

>> **\$ su root**

\_\_\_ 2. Use SMIT to list the software on your system.

- What command is SMIT executing to provide this information?\_\_\_\_\_

**lslpp -l all**

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

>> **# smitty**

**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**.

- Press **F6** to see the generated command and then **F3** to return to the displayed output.

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

\_\_\_ 3. Now it is time to install the two software packages, **bos.dosutil** and **bos.games**:

These packages have been preloaded (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.

» In the SMIT **Software Installation and Maintenance** screen, select:

**Install and Update Software ->**

**Install Software ->**

\* INPUT device / directory for software      [/usr/sys/inst.images]  
(Use **F4** to select this standard repository location off the list)

SOFTWARE to install                              [bos.dosutil,bos.games]  
(Use **F4** to list the available packages from which to choose)

- 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.

\_\_\_ 4. Verify that the **bos.games** fileset installed correctly and list the games which are available.

»# **lslpp -L bos.games**

» # **cd /usr/games**

# **ls**

\_\_\_ 5. Use SMIT to remove the **bos.dosutil** fileset.

» # **smitty install**

**Software Maintenance Utilities ->**

\* SOFTWARE name                              [bos.dosutil]    +  
  PREVIEW only?                              [no]                +

- Press **Enter** to perform the fileset removal.
- Verify that the output is correct and then press **F10** to return to the command line.

- \_\_\_ 6. If not doing the optional *Part 2 - Working with AIX Fixes*, log off the system at this point.

## Part 2 - Working with AIX Fixes (Optional)

- \_\_\_ 7. We have already downloaded AIX 5.3 TL6 Service Pack 1 and stored the fix files in the **/usr/sys/inst.images/fixes** directory. Use SMIT to run a **Comparison Report** between this fix repository and what is currently installed on your system. Only report on installed software that is at a lower level than what is in the fix repository.

Briefly examine the generated report. Can you tell what problems or new capabilities are included in which fileset update? \_\_\_\_\_

» # smit install

**Software Service Management ->**

**Comparison Reports ->**

**Compare Installed Software to Fix Repository**

FIX REPOSITORY location        [/usr/sys/inst.images/fixes]

FILE location of lspp -Lc output        []

(Leave blank to compare against this system.)

Select which reports to run.

Installed Software that is at a LOWER level    yes    +  
(lowerlevel.rpt)

Installed Software that is at a HIGHER level   no    +  
(higherlevel.rpt)

Updates for filesets that are NOT INSTALLED   no    +  
(notinstalled.rpt)

Installed Software with NO UPDATES found      no    +  
(no\_update\_found.rpt)

DIRECTORY location for reports.                [/tmp]

(Leave blank to omit.)

»The report is only a listing of filesets and their version, release, mod, and fix level.

- \_\_\_ 8. Return to the **Software Installation and Maintenance** menu and choose the menu sequence which allows you to list software that is on installation media (which could be a directory). List the APARs that are addressed by the filesets in the **/usr/sys/inst.images/fixes** directory. Briefly examine the output.

» Press F3 repeatedly to return to the **Software Installation and Maintenance** menu

**List Software and Related Information ->**

**List Software on Media and Related Information**

**List Software Fixes (APAR) on the Installation Media**

INPUT device / directory for software   [/usr/sys/inst.images/fixes]    +

- \_\_\_ 9. Return to the **Software Installation and Maintenance** menu and follow a menu sequence that presents a dialogue panel which allows you to install a fix by specifying the related APAR number. Request to use our /usr/sys/inst.images/fixes directory as the source of the fixes.
- » Press F3 repeatedly to return to the **Software Installation and Maintenance** menu
  - Install and Update Software ->**
  - Update Software by Fix (APAR)**
  - INPUT device / directory for software [/usr/sys/inst.images/fixes] +**
- \_\_\_ 10. There is a bug in AIX 5L V5.3 TL6 where the **usrck** command can (incorrectly) lock all user accounts. You do not want that to happen. In the dialogue panel, get a listing of APARs which are available to be installed. Find the APAR which was just described. Select and install that fix. Examine the output to verify that the fix was installed. What filesets have been installed?
- 
- 
- » Use F4 on the “FIXES to install” line to get a list.
  - » Use F7 to select the desired fix
- ```

FIXES to install                                [IY59384]  +
  PREVIEW only? (update operation will NOT occur)  no      +

```
- » Press <Enter> to install the fix.
  - » The installed filesets were bos.rte.install and bos.rte.security
  - » Press **F10** to exit smit
- \_\_\_ 11. View the history of the installed filesets using the **ls1pp** command.
- » **# ls1pp -h bos.rte.install**
  - » **# ls1pp -h bos.rte.security**
- \_\_\_ 12. Log off from the system.

## End of exercise





# Exercise 5. AIX 6.1 installation and configuration

*(with hints)*

## Estimated time

01:00

## What this exercise is about

In this exercise, you have the opportunity to migrate your AIX OS image from AIX V5.3 to AIX 6.1, and work with the Configuration Assistant. The Configuration Assistant is an application that can be used to configure the initial system settings.

## What you should be able to do

After completing this exercise, students should be able to:

- Install an Operation System by migrating to AIX 6.1
- Use the Configuration Assistant

## Introduction

The Hardware Management Console (HMC) and Configuration Assistant are graphics-based applications that assist the system administrator with various tasks. These applications are used to perform the installation of the operating system and system configuration respectively.

## Common Student Problems

If the students are working in a remote lab environment, the `DISPLAY` environment variable has to be exported for the `configassist` and `install_assist` commands to work.

## Known Hardware/Software Problems

None.

## Exercise Instructions with Hints

### Preface

Two versions of these instructions are available; one with hints and one without. You can use either version to complete this exercise. Also, please don't hesitate to ask the instructor if you have questions.

All exercises of this chapter depend on the availability of specific equipment in your classroom.

The objective for the first part of this lab is to install an IBM AIX 6.1 mksysb image. The instructions to accomplish this using an eLab environment and a stand-alone system is listed. **Ask your instructor to confirm that the /spot and lppsource (bos) have been allocated for your system before starting.**

The output shown in the answers is an example. Your output and answers based on the output may be different.

All hints are marked with a >> sign.

- \_\_\_ 1. Log in to your assigned system.
- \_\_\_ 2. Before you start the migration/install, you need to identify the boot disk and the adapter which has a configured interface. Use the `bootlist -o` command to identify the boot disk. Use the `netstat -in` and the `lsfg` commands to obtain the location of the configured interface's adapter. If the configured interface is **en4**, then the related adapter is **ent4** (the number in both names will always match). You only need the last two positions of the location code (either C#-T# or P#-T#). You cover location codes in more detail in the Device unit later in the course.

boot disk: \_\_\_\_\_

configured interface and IP address \_\_\_\_\_

location code of the network adapter \_\_\_\_\_

» To collect the information:

```
# bootlist -o -m normal
# netstat -in | grep en
# lscfg | grep -i ent
```

- \_\_\_ 3. If you do not already have a working HMC window, access your system's HMC by starting a Web browser and using the HMC's IP address as the URL. If you do not have this IP address, ask your instructor.

If you are not using a HMC, log on to your stand-alone system and skip to Step 3.

» Start a Web browser.

» For example, standard for IBM provided lab environments is to find the Mozilla Firefox application icon in the Applications box of the e-lab Web interface. Use of Internet Explorer, if available, should also work correctly.

- » Double-click the **Firefox** icon.

(click No, to make this your default browser )

# **https://##.##.##.##**

(click OK, to Accept the certificate temporarily for the session)

- \_\_\_ 4. If you are not already logged into the HMC, start the Hardware Management Console application by clicking the Launch link. Log into your system HMC as **hscroot**. and password **abc1234**.

- » Click the link to launch the HMC application:

**Log on and launch the Hardware Management Console Web application**

**Userid: hscroot**

**Password: abc1234**

Click logon or press < Enter >

Click **Not Now** in response to the prompt: "Do you want Firefox to remember this password"

You may also get an error about pop-ups being disabled. Click OK on the error box. In Mozilla, pull down the **Tools** menu, select the **Options** item, click on the **Content** icon, and uncheck the **Block Popup Windows** option. Click **OK**. Then repeat the above sequence.

If prompted to accept security certificates, respond by clicking Yes.

You may also get a screen entitled "**Choose a Disconnected Session**". Do not use someone else's disconnected hscroot session. Click on the "**New Session**" button and obtain a brand new hscroot session.

- \_\_\_ 5. Locate your machine and the logical partition which you are assigned.
  - » Expand the **Systems Management** selection in the Navigation window.
  - » Expand the **Servers** selection in the Navigation window.
  - » Click the server for your assigned LPAR. You may need to ask your instructor. All the configured lpar's will appear in the *Contents* window.
- \_\_\_ 6. Shutdown your assigned lpar, This can be performed using the HMC (Operating System options only) or by using the **shutdown** command at an interactive root user prompt.

- » If you are performing this task at a root user interactive prompt, type:

# **shutdown -F**

**-OR-**

- » If you are performing this task using the HMC, follow the steps below:
  - a) Select your lpar by clicking the Select box to the left
  - b) Click on the arrows which appeared to the right of the lpar
  - c) Drag the mouse to **Operations, Shutdown**, and then click **Shutdown**  
**[DO NOT EXECUTE AN “IMMEDIATE” SHUTDOWN OF THE PARTITION FROM THE HMC. THIS CAN CAUSE DISK CORRUPTION ON A RUNNING AIX SYSTEM]**
  - d) Click **Operating System Immedediate**, and then **OK**  
( After awhile, the Reference Code will show all zero's)
- \_\_\_ 7. If you currently have a virtual terminal open, close that window.
  - » Click on the upper right corner of the window to close it.
  - » (there were older versions of the HMC where this would not be sufficient and you would also need to close the virtual session from the HMC menus)
- \_\_\_ 8. Boot your system in SMS mode. Open a console session if you are using a lpar system and HMC configuration.
  - » If you are performing this task using the HMC, follow the steps below:
    - a) If your lpar is not already selected, click the Select box to the left of the lpar name.
    - b) Click the arrows which appeared to the right of the lpar
    - c) Drag the mouse to **Operations, Activate** and then click **Activate**
    - d) Check **Open a terminal window or console session**, and then click the **Advanced...** button
    - e) Click the drop-down menu for the **Boot mode**, select **SMS**, and then click **OK**  
(Do not change anything with the Keylock position)
    - f) This should return you to the **Activate screen** again. Click **OK** to start the activation.
  - » If you have a local System p machine and locally attached console in front of you:
    - a) Power on your machine.
    - b) Soon after the LED reads E1F1, the keyboard is discovered and the distinctive beeping will sound. Between that time and before the system begins to search for the boot image, press either the F1 key or numeric 1 key (depending on the type of machine) to invoke the Service Mode boot list.
  - » The console should eventually display the **SMS** menu.
- \_\_\_ 9. Configure your system Remote IPL parameters. You need the correct subnet mask, plus the IP addresses of the NIM server and the gateway. These must be configured to boot off the network adapter. The instructor provides you with the NIM and gateway addresses.

NIM server IP address: \_\_\_\_\_

Gateway IP address: \_\_\_\_\_

- a) Select **Setup Remote IPL (Initial Program Load)** from the Main Menu, by typing **2** at the prompt on the bottom of the screen and pressing <Enter>.
  - b) Select the **NIC Adapter Device** one which matches the location that you recorded earlier in step 2 by entering the number to the left of that network adapter and pressing <Enter>.
  - c) select **IP Parameters** , by entering **1** and pressing <Enter>. Make sure that all IP addresses are correct. These IP Addresses can be changed by entering the number to the left, pressing <Enter>, typing in the IP Address, and pressing <Enter> again.
  - d) When you finished entering all the IP Addresses, Press the <ESC> until you return to the Main Menu.
- DO NOT EXIT SMS AT THIS POINT

\_\_\_ 10. Assign your network adapter as the first and only boot device. Be sure the location of the adapter matches what you recorded earlier.

- a) From the **SMS Main menu**, select "**Select Boot Options**" by entering the number to the left <5>, and pressing <Enter>.
- b) From the Multiboot menu, select **Configure Boot Device Order**, by entering the number to the left <2>, pressing <Enter>.
- c) From this menu, select "**Select 1st Boot Device**" by entering the number to the left <1>, pressing <Enter>.
- d) From this menu, select **Network** by entering the number to the left <6>, pressing <Enter>.
- e) From this menu, select the network adapter by entering the number to the left <1>, pressing <Enter>.
- f) From this menu, select **Set Boot Sequence**, by entering the number to the left <2>, pressing <Enter>.  
(You should see the Current Boot Sequence displayed, with the network adapter as the first and only device.)
- g) **Exit the SMS menu** by press "**X**". You will be prompted "**Are you sure**". Type the number for YES <1> and press <Enter>.
- h) Your system should start booting and connecting to your NIM server.

\_\_\_ 11. Your system should be downloading an AIX network boot image at this time. The download and execution of the network boot image takes 2 to 3 minutes. When done, you see a prompt; select the terminal console and the English during installation.

- » Type **1** and press <Enter> for console, then type **1** and press <Enter> again to have English during install.
- \_\_\_ 12. On the Main Installation and Maintenance menu, select Change/Show Setting and Install.
  - » Type **2** and press <Enter>.
- \_\_\_ 13. Verify that the Method of Installation is set to `Migration` and the Disk to Install is the one you previously identified as the boot disk (probably `hdisk0`). When verified, enter 0 to start the installation.
- \_\_\_ 14. You may get prompted once or twice for other verifications. For example, it may give you the option of listing filesets and configuration files that are replaced. You may choose to examine these; the lists are not very large. Eventually respond with a 0 to continue with the migration.

When you see the “Installing Base Operation System”, you can take a break (though the instructor may wish to use this time to discuss another topic).

This takes 30 to 40 minutes.

  - » Type **#** and press <Enter> (the value of **#** depends on what you want to examine or if you just want to continue).
- \_\_\_ 15. Once the install is complete, the system automatically reboots. Once the reboot is completed, there will be a login prompt on the system console. At that point, continue to the next step.
- \_\_\_ 16. Log in as root user and start the Configuration Assistant.
  - » If you are using a graphical interface, type:  
**# install\_assist**  
**-OR-**  
**# configassist**
  - » If you are using an ASCII interface, type:  
**# install\_assist**
- \_\_\_ 17. Ensure the date and time are set correctly.
  - » Click **Next** on the opening screen.
  - » Date and time are already selected. Click **Next**.
  - » Make any changes if necessary to the date and time.
  - » Click **Next** when finished.

- \_\_\_ 18. Familiarize yourself with some of the other options. When you've finished, exit from Configuration Assistant and select the option to **Finish now, and do not restart Configuration Assistant when restarting AIX**.
- » Click **Exit the Configuration Assistant**, then click **Next**.
  - » Click **Finish now, and do not restart Configuration Assistant when restarting AIX**, then click **Finish**.

**End of exercise**

## Exercise Review/Wrap-up

Have the students discuss the various things that can be configured with the Configuration Assistant.



## Exercise 6. Web-based System Manager

*(with hints)*

### Estimated time

00:20

### What this exercise is about

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

### What you should be able to do

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

- Use the Web-based System Manager
- Configure the Web-based System Manager for client machine access
- Use the Web-based System Manager from the client machine using the WebSM client application

### Introduction

This exercise is designed to give you experience working with the Web-based System Manager in AIX. 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 the Web-based System Manager for client machine access. The client machine can be another AIX system or a PC. In both cases, the client platform must have a browser that is Java-enabled.

## Exercise Instructions with Hints

### Preface

Two versions of these instructions are available; one with hints and one without. You can use either version to complete this exercise. Also, please don't hesitate to ask the instructor if you have questions.

All exercises of this chapter depend on the availability of specific equipment in your classroom.

If there are multiple interfaces on your system, your instructor should identify which interface to use for this exercise. If you are in an environment where the AIX system is accessed remotely, be sure to not deconfigure the interface used for that purpose.

The output shown in the answers is an example. Your output and answers based on the output may be different.

All hints are marked with a >> sign.

## Part 1: Use the Web-based System Manager

- \_\_\_ 1. For this exercise you need a graphic interface to your system.

If you are using a partitioned system, then you need to use a remote graphics utility such as VNC or an Xwindows Server utility to access your system. You should be presented with a CDE login prompt.

If you are using a local non-partitioned system you need to use the attached graphic console.

- \_\_\_ 1. Log in as **root**.

- \_\_\_ 2. If you logged using a locally attached graphic console on a non-partitioned system, then make sure you are in the AIX windows or CDE environment.

» \$ **xinit** (if using a local graphic console and not already in an AIXwindow or CDE environment)

- \_\_\_ 3. If you are in a CDE environment and there is no terminal emulation window, open the **Personal Application** subpanel (arrow over the pencil and paper icon) and click on the **Terminal** icon.

Access the Web-based System Manager.

» \$ **wsm &**

- \_\_\_ 4. 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.

Return to the view of the task icons for **Processes** when you have completed this task.

- » From the Web-based System Manager Contents area (on the right), double-click **Processes**, then double-click **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**.
  - On the tool bar, click the **Details** icon, which is just to the left of the rightmost one. **Note:** If you rest the mouse pointer over the icon, the icon name is displayed.
- » Once you have reviewed the output, go back to the **Processes** plug-in by clicking the back arrow on the title bar.

\_\_\_ 5. View the Web-based System Manager window that displays the current system date and time.

- » Single-click **System Environment** in the Navigation area.
- » In the **System Environment** window, double-click **Settings**.
- » Double-click **Date/Time**.
- » View the Date and Time and then click a **Time Zone** option. Since you are not the **root** user, you will not be able to make any changes.
- » When you are done, click Cancel to close this task. window.

\_\_\_ 6. Close the Web-based System Manager Launch Pad window and log out of the system.

- » Close the Web-based System Manager by clicking the upper left of the title bar (**Console**) and then clicking **Exit** on the pull-down menu.
- » Click the **Exit Now** button in the pop-up.
- » Click and hold the right mouse button in the **root window** area.
- » If in CDE environment, log-off by clicking the **Log out** menu item.
- » When prompted, click on "Continue logout"
- » If in a native Xwindows/Motif environment, click on the **End Session** menu item. This brings up a sub-menu; click the **Quit** menu item.
- » If exiting the graphics environment results in a ASCII command prompt, type **exit** to complete the log out of AIX.

## Part 2 (Optional): Configure the Web-based System Manager for AIX client access

### Preface

For the optional sections, you need to have a functioning network environment in lab room. The lab teams need to pair up and work together. Each team pair select which machine is remotely managed (Web-based System Manager server) and which machines are the remote system administrator platform (Web-based System Manager client).

There is no need for additional configuration to use the Web-based System Manager to manage an AIX platform from an AIX client with the Web-based System Manager installed. Client-server mode does not require that the server run a Web server; the connection is made directly between the two Web-based System Manager applications.

- \_\_\_ 7. Log into the WebSM Client system as **root** and using the correct **root** password.
  
- \_\_\_ 8. On the WebSM Client system, make sure you are in the AIX windows or CDE environment. If you are in a CDE environment and there is no terminal emulation window, open the **Personal Application** subpanel (arrow over the pencil and paper icon) and click the **Terminal** icon.  
  
Access the Web-Based System Manager on the client platform, but specify the IP address or hostname of the Web-based System Manager server machine.  
  
» # **xinit** (if using a local non-partitioned system and not in a windows environment)  
  
»# **wsm -host <server IP address>**  
  
»-OR-  
  
»# **wsm -host <server hostname>**
  
- \_\_\_ 9. Do a couple things to validate that the interface is working correctly and then close down the application.
  
- \_\_\_ 10. At the Web-based System Manager server system, disable client-server (and remote client) access. This way you can use the Web-based System Manager locally on a platform but not allow remote client-server access.  
  
» # **/usr/websm/bin/wmsmserver -disable**

- \_\_\_ 11. At the client platform, again start the Web-based System Manager specifying the IP address or hostname of the Web-based System Manager server machine. Did it work? \_\_\_\_\_

**No**

»# *wsm -host <server IP address>*

»-OR-

»# *wsm -host <server hostname>*

- \_\_\_ 12. At the Web-based System Manager server platform, re-enable client-server (and remote client) access.

» # */usr/websm/bin/wsmserver -enable*

## Part 3 (Optional): Configure the Web-based System Manager for remote client access

### Preface

In order to do this optional exercise, you must have a qualified PC running a supported version of Windows or Linux, a supported desktop environment, and a Java-capable Web browser. The PC must have network connectivity to the AIX server platform.

When using a PC platform as the Web-based System Manager Remote Client, you must first install the Web-based System Manager remote client application on that platform. This is done using the Web server on the Web-based System Manager Server platform.

Once a PC has the WebSM Client, it can access any AIX system which has wsmserver enabled (as in the previous exercise part). The AIX WebSM servers do not need the following configuration completed, only the server that provides for Web browser-based download of the WebSM client package.

The alternative to using a Web browser interface is to ftp download the install shield executable file to the PC. The path to that file is:

**/usr/websm/pc\_client/setup.exe**

- \_\_\_ 13. While a Web page server is not needed to use the Web-based System Manager function, it is used to download the Web-based System Manager client to a remote Linux or Windows platform you might wish to work from. The HTTP Server Web Server software (**IHS2**), which is delivered on the AIX 5L V5.3 Expansion Pack CD, should already be pre-installed on your system.

Verify that it has been installed.

» # **smit list\_software**

**List Installed Software and Related Information ->**  
**List Installed Software**

|                         |                 |   |
|-------------------------|-----------------|---|
| * SOFTWARE name         | [ <b>IHS2</b> ] | + |
| SHOW superseded levels? | no              | + |

» **Press Enter**

» **-OR-**

» # **lslpp -L "IHS2"**

- \_\_\_ 14. You need a graphic interface to configure the Web server support for providing the WebSM PC client. In your graphic environment start a terminal emulation window and execute **configassist** in the background.

Configure the Web server support for Web-based System Manager using the following values.

- The root document directory is: **/usr/HTTPServer/htdocs**
- The root CGI directory is: **/usr/HTTPServer/cgi-bin**
- The HTTPServer start command is: **/usr/HTTPServer/bin/apachectl restart**

»# configassist

»At the Configuration Assist task list, select:

Configure the Web Server for Web-based System Manger remote management

- Click on next
- Confirm or change the displayed values
- Click on Next until you return to the task list
- Then exit out of the Configuration Assistant.

- \_\_\_ 15. On the client PC, start the Web browser and enter a URL of:  
*http://<wsmservname>/remote\_client.html*
- \_\_\_ 16. Click the **InstallShield** hyperlink on the new Web page. (The **Java Web Start** method requires additional security software to be installed on both client and server platforms).
- \_\_\_ 17. Identify the client as either a **Linux** or **Windows** platform on the resulting Web page.
- \_\_\_ 18. On the **File Download** pop-up, click the **Save to Disk** button. In the **Save In:** field, navigate to store it on the **desktop** and again click the **Save** button. In the **Download complete** pop-up, click the **Open** button. This runs the **Install Shield** wizard. (*There will be a command prompt window launch to execute **java.exe** just before the Installer window appears; do not do anything with the command prompt window.*)
- On the Installer window, click the **Next** button.
  - Use the default install Directory name and click the **Next** button.
  - Note the location and size of the install and click the **Next** button.
  - After the install is complete, click the **Finish** button.
- \_\_\_ 19. You should now see an icon on your desktop labeled: **Web Based System Manager Application**.
- Open this new icon.

- In the **Log On** window, enter the Web-based System Manager server hostname or IP address and click the **Log On** button.
- After the handshake procedure is completed, enter **root** and the **root** password and again click the **Log On** button.

\_\_\_ 20. Once the Web System Manager window appears and has all the icons filled in, try a few operations to prove it is operational and then exit the application.

## **End of exercise**



# Exercise 7. Devices

*(with hints)*

## Estimated time

00:30

## What this exercise is about

This exercise familiarizes 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 optional exercises will deal with terminals and printers.

*Part 5 - Configuring a defined device*, can only be done if you have an externally attached tape drive or CD-ROM. Most lab facilities do not have this.

## Common Student Problems

Be sure to warn your students not to change any other system parameters other than the one mentioned in the exercise, as other changes could disable the system for other users.

In situations where you have many students to a single AIX system, you need to coordinate the changing of system parameters section as well as the section that deals with configuring a defined device.

In part 5, if a student fails to power the tape drive back on prior to completing the last instruction, he/she will get the following message:

```
Method error (/etc/method/cfgsctape) : 0514-047 Cannot  
access a device.
```

Simply have the student power on the device and try the instruction again.

## Known Hardware/Software Problems

None.

## Exercise Instructions with Hints

### Preface

Two versions of these instructions are available; one with hints and one without. You can use either version to complete this exercise. Also, please don't hesitate to ask the instructor if you have questions.

All exercises of this chapter depend on the availability of specific equipment in your classroom. If your lab environment uses remote System p/AIX platforms, the instructor will provide you with the addressing (IP address or hostname) and instructions for accessing the remote machine. For example, you might be using telnet, an X-windows server, or a VNC client. Whatever tool you are using, at various points in the labs you may need to re-launch your remote access tool to obtain a new login prompt.

The output shown in the answers is an example. Your output and answers based on the output may be different.

All hints are marked with a >> sign.

### Part 1 - List device configuration

- \_\_\_ 1. Log in as a regular user and obtain a command prompt. If using a graphical interface (ex. CDE), then start a terminal emulation window.
- \_\_\_ 2. **su** to the **root** user. If more than one person is using the same system you need to work as a team.

>> \$ **su root**

- \_\_\_ 3. List all the supported devices on the system.

>> # **lsdev -P -H | pg**

>> - OR -

>> # **smit**

**Devices ->**

**List Devices ->**

**List All Supported Devices**

- \_\_\_ 4. 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.

- \_\_\_ 5. 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.

- \_\_\_ 6. 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.

## Part 2 - List and change system parameters

- \_\_\_ 7. 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? \_\_\_\_\_

---

```
>># lsattr -E -l sys0 | more
```

```
>> -OR-
```

```
>> # smit
```

**System Environments ->**

**Change/Show Characteristics of Operating System**

>> On our development system some of the values were:

```
keylock, realmem, conslogin.
```

Some PCI systems may also include:

```
fwversion, modelname, boottype, frequency, systemid.
```

LPAR systems may also have many additional unchangeable attributes which are outside the scope of this class to discuss.

- \_\_\_ 8. Which attribute in the previous listing describes the number of processes a user can run? \_\_\_\_\_

```
>> maxuproc
```

- \_\_\_ 9. 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 takes effect immediately.

```
>> # chdev -l sys0 -a maxuproc=150
```

```
>> -OR-
```

```
>> # smit
```

**System Environments ->**

**Change/Show Characteristics of Operating System**

```
Maximum number of PROCESSES allowed per user [150]
```

**F10** to return to the command line.

## Part 3 - Removing and redefining a network adapter device

Your machine must have an extra network adapter for which the corresponding interface is not configured. Otherwise, skip to *Part 5 - Changing the status of a disk drive device*.

- \_\_\_ 10. Identify the network interfaces that are configured (for example, available) on your system by listing the if class of devices. Look for the names of the Standard Ethernet Network Interfaces. Which of these interfaces are available and which ones are defined?

---

```
»# lsdev -Cc if
```

```
» - OR -
```

```
»# smit inet
```

### List All Network Interfaces

```
» On our development system, en0 was Available and en1 was Defined. An interface is not made available until it is configured with an IP address.
```

- \_\_\_ 11. For the interfaces which are only defined, select one and list the adapter which the interface is using. For example, if the interface is en4, then the corresponding network adapter device name is ent4 (the numbers always match). What is the status of the adapter?

---

```
» In our hints throughout this part you refer to the Ethernet adapter that you have identified as entx.
```

```
»# lsdev -l entx
```

```
» -OR-
```

```
»# lsdev -Cc adapter | grep -i ethernet
```

```
» - OR -
```

```
»# smit ethernet
```

### Adapter =>

### List All Ethernet Adapters

```
» On our development system ent1 was Available.
```

- \_\_\_ 12. Put the Ethernet adapter device into a `Defined` state. Be careful to specify the correct adapter and **not** the one with a configured interface. Display the adapter and verify its status.

```
>># rmdev -l entx
>># lsdev -l entx
>> -OR -
>># lsdev -Cc adapter | grep ent
>> (entx should be Defined)
>> there is no smit panel for removing an Ethernet adapter.
```

- \_\_\_ 13. Remove the Ethernet adapter from the customized database.

```
>> # rmdev -dl entx
>> # lsdev -l entx
>> -OR-
>># lsdev -Cc adapter | grep ent
>> You should not see entx listed.
```

- \_\_\_ 14. Rediscover and configure the Ethernet adapter. Check its status.

```
>> # cfgmgr
>> # lsdev -l entx
(entx should be Available)
>> -OR-
>> # smit devices

Install/Configure Devices Added After IPL

Input device / directory for software          [none]
>> OK or Enter.
>> F3 to go back to the Devices Menu.

List Devices ->
List All Defined Devices
entx should be Available.
```

## Part 4 - Changing the status of a disk drive device

Your machine must have a an extra disk drive to continue with this section. Otherwise, you are done with this exercise.

- \_\_\_ 15. Determine the logical names of your disk drives and the volume group they (if any) that they are assigned to by using the `lspv` command. (We will be covering PVs and VGs later in the course).

Which disks have a volume group of rootvg? \_\_\_\_\_

Which disks have a volume group of none? \_\_\_\_\_

» # `lspv`

» On our development system `hdisk0` was in the `rootvg` and all other disks were listed as “none” for the volume group column.

- \_\_\_ 16. Generate a device listing for the disk devices. Select one disk which was not in a volume group and record the location of that disk. If it is SCSI attached, what is the SCSI ID of the disk.

\_\_\_\_\_  
\_\_\_\_\_

»# `lsdev -Cc disk`

»# `lscfg | grep hdisk`

» -OR-

» # `smit`

**Devices ->**

**Fixed Disk ->**

**List All Defined Disks**

» On our development system the disk `hdisk1` was SCSI attached with an AIX location code of 03-08-00-4,0. The physical location code ended in P1-T10-L4-L0.

- \_\_\_ 17. Using the disk selected above, put that disk device into a `Defined` state.

» # `rmdev -l hdisk1`

» # `lsdev -Cc hdisk`

» (**hdisk1** should be **Defined**)

- \_\_\_ 18. Remove the disk device from the customized database.

» # `rmdev -dl hdisk1`



» # **lsdev -Cc hdisk1**  
You should not see **hdisk1** listed.

\_\_\_ 19. Rediscover and configure that same disk for use. Does the device that appears have the same location? \_\_\_\_\_

» # **cfgmgr**  
»# **lsdev -Cc hdisk**  
»# **lscfg | grep hdisk**  
(**hdisk1** should be **Available**)  
-OR-

» # **smit devices**

**Install/Configure Devices Added After IPL**

Input device / directory for software [none]

» **OK** or **Enter**.

» **F3** to go back to the **Devices** Menu.

**Devices ->**

**Fixed Disk ->**

**List All Defined Disks**

**hdisk1** should be **Available**.

» On our development system, the disk that reappeared with the same logical device name also had the same location code. This is not always the case; never assume that it is the same device just because a device name is the same.

## Part 5 - Configure a tape device (optional)

If you have an externally attached tape drive, continue with this section. Otherwise, skip to *Part 4 - Configure a CD-ROM device*.

- \_\_\_ 20. 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
```

- \_\_\_ 21. 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.
```

- \_\_\_ 22. Log in and **su** to **root**. Check the status of the tape drive.

- Is it in a state where it can be used? \_\_\_\_ No
- Why? \_\_\_\_\_ Because the system was not able to communicate with it during the reboot.
- 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.
```

- \_\_\_ 23. 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 and press **OK** or **Enter**.

**End of exercise**

## Exercise Review/Wrap-up

1. Review the commands that list information on configured devices.

**Answer:** `lsdev`, `lscfg`, `lsattr`

2. Review the differences between an available device and a defined device.
3. Ask students what different ways could be used to make a defined device available.

**Answer:** You could turn on the device then do a **shutdown** and a reboot or you could turn on the device and go into SMIT under devices and select **Install/Configure Devices Added After IPL**.

4. Ask the students what could make a device become defined.

**Answer:** Either the device was removed from the system, it was turned off during the last system reboot, it is broken, or another device was added with the same physical address.

## Exercise 8. LVM commands

*(with hints)*

### Estimated time

00:15

### What this exercise is about

This exercise gives you a chance to look at the file system configuration on your machine and introduce you to some LVM commands.

### What you should be able to do

After completing this exercise, students should be able to:

- Display information about your file systems
- List the LVM information on your system

## Exercise Instructions with Hints

### Preface

Two versions of these instructions are available; one with hints and one without. You can use either version to complete this exercise. Also, please don't hesitate to ask the instructor if you have questions.

All exercises of this chapter depend on the availability of specific equipment in your classroom.

The output shown in the answers is an example. Your output and answers based on the output may be different.

All hints are marked with a >> sign.

\_\_\_ 1. Log in as **team01** and **su** to **root**.

>> \$ su  
password: **ibmaix**

\_\_\_ 2. View the contents of **/etc/filesystems** and list the file systems on your machine.

>> # more /etc/filesystems

\_\_\_ 3. Execute the command: **lsfs**.

- What does it show? \_\_\_\_\_

**The list of all defined file systems on the machine.**

>> # lsfs

\_\_\_ 4. Execute the command: **lsvg**.

- What does it show? \_\_\_\_\_

**The list of all volume groups defined on the machines.**

>> # lsvg

\_\_\_ 5. Execute the command: **lspv**.

- What does it show? \_\_\_\_\_

**The list of all defined physical volumes on the machine.**

>> # lspv

\_\_\_ 6. Execute the command: `lsvg -l rootvg`.

- What does it show?

**A list of all the logical volumes contained in** `rootvg`.

» `# lsvg -l rootvg`

**End of exercise**





## Exercise 9. Working with LVM

*(with hints)*

### Estimated time

Parts 1 and 2 - 00:20

Parts 3, 4, and 5 - 00:40

### 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) is used extensively throughout this exercise.

### What you should be able to do

After completing this exercise, students should be able to:

- Add and remove a disk from a volume group
- Create and remove a volume group
- List the characteristics of the system's volume groups, physical volumes, and logical volumes
- Add a logical volume
- Extend a logical volume

### Introduction

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

## Common Student Problems

At this point, students are still trying to understand the differences between the various parts of the logical volume structure. They often get physical volumes and volume groups mixed up. A large part of this exercise is designed to give students an opportunity to view on a real system the various pieces of the LVM. This is meant to give them a greater understanding of the concepts and prepare them for working with logical volumes. File systems are covered in the next exercise.

Some students prefer to use the commands. For those students, if they use commands that don't have the appropriate option for the resource, they will get error messages that imply the LVM is locked or corrupted.

An error message like: Unable to find \_\_\_\_\_ in the Device Configuration database is usually the result of entering a name for a logical volume when the command was expecting a physical volume or vice versa.

An error message like: Unable to find attribute hdisk0 in the Device Configuration Database. Execute `syncldvdm` to attempt to correct the database. is usually the result of typing in something like: `lsvg -l hdisk0` when the correct form of the command is: `lsvg -l rootvg`

It is common for the lab System p platforms to have disks that were part of a non-**rootvg** volume group prior to the mksysb installation and still have a VGDA on them. When trying to either add these disks to an existing or new volume group, the operation will fail unless the `-f` (force) option is used.

## Known Hardware/Software Problems

If you have lab systems with only one disk drive, your students won't be able to do the section on creating their own volume group. In that case, they won't be able to complete the **Optional Exercise** of the backup of a volume group in the backup/recovery exercise. Warn them about this section when introducing this exercise.

If you have more than one student per machine and they try to use the LVM simultaneously, then students will get locking error messages.

## Exercise Instructions with Hints

### Preface

Two versions of these instructions are available; one with hints and one without. You can use either version to complete this exercise. Also, please don't hesitate to ask the instructor if you have questions.

All exercises of this chapter depend on the availability of specific equipment in your classroom.

The output shown in the answers is an example. Your output and answers based on the output may be different.

All hints are marked with a >> sign.

## Part 1 - Adding and removing a disk from a volume group

- \_\_\_ 1. Log in as **teamxx** and switch to the **root** user account.

>> \$ **su**

- \_\_\_ 2. Ensure you have a hard disk available to create a new volume group.

- What is the name of the disk that is currently available? \_\_\_\_\_

>> # **lspv**

- \_\_\_ 3. From the disk information that you determined in the step above, add a free disk into **rootvg**.



#### Note

You need to substitute your free disk name when **hdiskn** is referenced.

>> # **smit vg**

**Set Characteristics of a Volume Group ->**  
**Add a Physical Volume to a Volume Group ->**

|                                     |                 |
|-------------------------------------|-----------------|
| FORCE the creation of volume group? | <b>yes</b>      |
| VOLUME GROUP name                   | <b>[rootvg]</b> |
| PHYSICAL VOLUME names               | <b>[hdiskn]</b> |

Then, use **F10** to exit from SMIT.

» **-OR-**

» # **extendvg -f rootvg hdiskn**

\_\_\_ 4. Check to see if the disk is now associated with **rootvg**.

» # **lspv**

\_\_\_ 5. Take the same disk that you added to **rootvg**, out of **rootvg**. Make sure you remove the correct disk.

» # **smit vg**

**Set Characteristics of a Volume Group ->**

**Remove a Physical Volume from a Volume Group ->**

```
VOLUME GROUP name           [rootvg]
PHYSICAL VOLUME names       [hdiskn]
FORCE deallocation of all partitions on this physical volume? no
```

Then, use **F10** to exit from SMIT.

» **-OR-**

» # **reducevg rootvg hdiskn**

\_\_\_ 6. Verify that the disk is no longer associated with **rootvg**.

» # **lspv**

## Part 2 - Creating and removing a volume group

\_\_\_ 7. Using the free disk, create a new volume group called **newvg**.

» # **smit vg**

**Add a Volume Group ->  
Add an Original Volume Group**

|                                      |                   |
|--------------------------------------|-------------------|
| VOLUME GROUP name                    | [ <b>newvg</b> ]  |
| Physical partition SIZE in megabytes | <b>16</b>         |
| PHYSICAL VOLUME names                | [ <b>hdiskn</b> ] |
| Force the creation of a volume group | <b>Yes</b>        |

Then, use **F3** to return to the **Volume Groups** menu.

» **-OR-**

» # **mkvg -f -y "newvg" -s 16 hdiskn**

\_\_\_ 8. Verify that the new volume group was created.

- What are the maximum number of physical volumes that can be added to this volume group? \_\_\_\_\_

» **Select List All Volume Groups**

|                                     |           |
|-------------------------------------|-----------|
| List only the ACTIVE volume groups? | <b>no</b> |
|-------------------------------------|-----------|

- Use **F3** to return to the **Volume Groups** menu.

• **Select List Contents of a Volume Group**

|                   |                  |
|-------------------|------------------|
| VOLUME GROUP name | [ <b>newvg</b> ] |
| List OPTIONS      | <b>status</b>    |

- Use **F3** to return to the **Volume Groups** menu.

» **-OR-**

» # **lsvg**

» # **lsvg newvg**

Look at the **Max PVs** field in the output to get the maximum number of physical volumes.

When creating a volume group, if a particular physical partition size is specified and it is not large enough to address the all the storage in the largest disk in the volume group using the default 1016 PPs/PV, then the **mkvg** command will automatically make the **-t** factor large enough to allow a sufficient number of PPs/PV. In this exercise, you have specified a PPSize of 16 MB. Let's say you

have a (nominally) 34 GB hard drive. 1016 x 16 MB only allows you to address about 16.25 GB. If you increase the -t factor to 2, then you can address only 32.5 GB which is still not enough. In fact, the **mkvg** command would set the -t factor equal to 3 which allows up to 3048 PPs/PV and can then address up to 48.75 GB. Remember, there is a trade off in the number of PVs/VG when increasing the -t factor. if you had a -t factor of 1, you would be able to include 32 PPs in the normal VG. By using a -t factor of 3, it has to divide that by the factor. This results in a maximum of only 10 PPs. The numbers change depending on the size of your disks, but the principle is the same.

\_\_\_ 9. Convert **newvg** into a big volume group.

» In SMIT, select:

**Set Characteristics of a Volume Group ->  
Change a Volume Group**

|                         |         |
|-------------------------|---------|
| VOLUME GROUP name       | [newvg] |
| Change to big VG format | yes     |

Then, use **F3** to return to the **Volume Groups** menu.

» **-OR-**

» # **chvg -B newvg**

» Answer **y** to the prompt, if asked.

\_\_\_ 10. What is the maximum number of physical volumes that can be added to the converted **newvg**? \_\_\_\_\_

» Select **List Contents of a Volume Group**

|                   |         |
|-------------------|---------|
| VOLUME GROUP name | [newvg] |
| List OPTIONS      | status  |

Then, use **F3** to return to the **Volume Groups** menu.

» **-OR-**

» # **lsvg newvg**

Look at the **Max PVs** field in the output to get the maximum number of physical volumes.

The trade-off between PPs/PV and PVs/VG which you saw in step 8 is the same here, except that in a big VG the default number of PVs/VG with a -t factor of 1 is 128. So a -t factor of 3 would result in 128/3 which would allow 42 PPs in our big volume group, given the example 34 GB hard drive.

- \_\_\_ 11. Convert **newvg** into a scalable volume group. In order to make this change the volume group must first be varied offline. Vary it back online when the conversion is completed.

» varyoffvg newvg

» In SMIT, select:

**Set Characteristics of a Volume Group ->  
Change a Volume Group**

|                               |         |
|-------------------------------|---------|
| VOLUME GROUP name             | [newvg] |
| Change to big scalable format | yes     |

Then, use **F3** to return to the **Volume Groups** menu.

» **-OR-**

» # chvg -G newvg

» Answer **y** to the prompt, if asked.

»# varyonvg newvg

- \_\_\_ 12. What is the maximum number of physical volumes that can be added to the scalable format **newvg**? \_\_\_\_\_

» Select **List Contents of a Volume Group**

|                   |         |
|-------------------|---------|
| VOLUME GROUP name | [newvg] |
| List OPTIONS      | status  |

Then, use **F3** to return to the **Volume Groups** menu.

» **-OR-**

» # lsvg newvg

Look at the **Max PVs** field in the output to get the maximum number of physical volumes.

The scalable VG has even more space in the VGDA to manage its constituent PVs. And the management of the PPs is no longer on a PV by PV basis. Instead the PPs are managed globally within the VG. You notice that there is no maximum number of PPs per PV characteristic in a scalable VG.

- \_\_\_ 13. Remove the **newvg** volume group.

» There are two **Volume Groups** menu items in SMIT that let you remove a volume group. You can select **Set Characteristics of a Volume Group** and remove the disk from the volume group. The volume group is automatically deleted when the last disk is removed. Since there is only one disk in the newvg volume group, removing that disk removes the volume group. The other menu choice of removing the VG is obvious; yet, under the covers it is only doing a series of reducevg requests until the last disk has been removed. Use this second choice.

## Select **Remove a Volume Group**

VOLUME GROUP name

[**newvg**]

Then, use **F10** to exit SMIT.

» **-OR-**

» # **reducevg newvg hdiskn**



### Note

There is no such command as **rmvg**.

- \_\_\_ 14. Verify that **hdiskn** is not associated with any volume group. If it is not, repeat the steps above. You need to have this disk free for a later exercise.

» # **lspv**



## Part 3 - Exploring your storage environment

\_\_\_ 15. Log in as **teamxx** and **su** to **root**, if not already.

» \$ **su**

\_\_\_ 16. 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]

Pressing the **F6** key shows: /usr/sbin/lsvg

Click **OK** or press **Enter**

» **-OR-**

» # **lsvg**

\_\_\_ 17. List the contents of the **rootvg** volume group. If you are using SMIT, for **List OPTION** use **status**.

Find the information that is necessary to answer the following questions about your environment:

» **F3** to go back to the **Volume Groups** menu.

-> **List Contents of a Volume Group**

|                   |          |
|-------------------|----------|
| VOLUME GROUP name | [rootvg] |
| List OPTION       | status   |

» **-OR-**

»# **lsvg rootvg**

a) How many physical volumes are there? \_\_\_\_\_

Check the field: TOTAL PVs.

b) How many logical volumes are there? \_\_\_\_\_

Check the field: LVs.

c) How many total physical partitions are there for this volume group? \_\_\_\_\_

Check the field: TOTAL PPs.

d) How many of those physical partitions are free? \_\_\_\_\_

Check the field: FREE PPs.

e) How large are the physical partitions? \_\_\_\_\_

Check the field: PP SIZE.

f) What is the Logical Track Group size? \_\_\_\_\_

Check the field: LTG size.

g) What is the maximum number of PPs per physical volume? \_\_\_\_\_

Check the field: Max PPs per PV.

\_\_\_ 18. List the contents of the **rootvg** volume group 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 middle, center, inner middle, inner edge. Make a note of the free partitions and their position on disk. \_\_\_\_\_

» **F3** to go back to the **List Contents of a Volume Groups** menu.

VOLUME GROUP name  
List OPTION

[rootvg]  
physical volumes

» **-OR-**

» **# lsvg -p rootvg**

\_\_\_ 19. List all of the physical volumes on the system.

» **F3** (three times) to go back to the **Logical Volume Manager** menu.

**Physical Volumes ->**  
**List all Physical Volumes in System**

» **-OR-**

» **# lspv**

\_\_\_ 20. List the contents of any physical volume on your system. If you are using SMIT, for **List OPTION** use **status**.

Find the information that is necessary to answer the following questions about your environment:

a) To which volume group does the physical volume belong? \_\_\_\_\_

Check the field: VOLUME GROUP.

b) What is the physical partition size? \_\_\_\_\_

Check the field: PP SIZE.

c) How many total physical partitions are there? \_\_\_\_\_

Check the field: TOTAL PPs.

d) How many of those physical partitions are used? \_\_\_\_\_

Check the field: USED PPs.

e) What is the maximum transfer size? \_\_\_\_\_

Check the field: MAX REQUEST.

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

» **F3** to go back to the **Physical Volumes** menu.

### List Contents of a Physical Volume

PHYSICAL VOLUME name  
List OPTION

[hdisk#]  
status

» **-OR-**

»# **lspv hdisk#**

(where # is the number for some disk on your system)

» You find that we can only examine the contents of a physical volume if that PV is assigned to a volume group. Thus, for our current lab situation, the disk which is assigned to the rootvg is the only available choice.

\_\_\_ 21. List all of the logical volumes in the **rootvg** volume group.

» **F3** (three times) to go back to the **Logical Volume Manager** menu.

**Logical Volumes ->**

**List all Logical Volumes by Volume Group**



#### Note

This will list all volume groups. You will have to look through the list for **rootvg**, then note the logical volumes for **rootvg**.

**-OR-**

# lsvg -l rootvg

- \_\_\_ 22. Show the characteristics for the logical volume **hd4**. If you are using SMIT, for **List OPTION** use **status**.

Find the information that is necessary to answer the following questions about your environment:

- a) To which volume group does it belong? \_\_\_\_\_

Check the field: VOLUME GROUP.

- b) How many copies? \_\_\_\_\_

Check the field: COPIES.

- c) How many physical partitions is it? \_\_\_\_\_

Check the field: PPs.

- d) How large is the logical volume in megabytes? \_\_\_\_\_

This is calculated: PP SIZE \* PPs.

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

-> **Show Characteristics of a Logical Volume**

LOGICAL VOLUME name  
List OPTION

[hd4]  
status

» **-OR-**

» # **lslv hd4**

## Part 4 - Adding a volume group

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 (you can use the **lspv** command).

If all disk drives are assigned, continue with the next section *Adding a logical volume*.



### Important

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

- \_\_\_ 23. Only one physical volume has been defined to be a member of the **rootvg** volume group. Using an available physical volume located on your system, create a new volume group called **datavg**. Verify that the new volume group was successfully created.

» **F3** (three times) to go back to the **Logical Volume Manager** menu.

**Volume Groups ->**

**Add a Volume Group ->**

**Add an Original Volume Group**

|                                                        |                   |
|--------------------------------------------------------|-------------------|
| VOLUME GROUP name                                      | [ <b>datavg</b> ] |
| Physical partition SIZE in megabytes                   | <b>16</b>         |
| PHYSICAL VOLUME names                                  | [ <b>hdisk1</b> ] |
| FORCE the creation of volume group?                    | <b>yes</b>        |
| Activate volume group AUTOMATICALLY at system restart? | <b>yes</b>        |

» **-OR-**

» **# mkvg -f -y datavg -s 16 hdiskx** (where x is number of the physical volume that has not been assigned to a volume group)

» To verify that your volume group has been created:

**F3** (three times) to go back to the **Volume Groups** menu.

**List All Volume Groups ->**

|                                     |    |
|-------------------------------------|----|
| List only the ACTIVE volume groups? | no |
|-------------------------------------|----|

» **-OR-**

» **# lspvg**

## Part 5 - Adding a logical volume

- \_\_\_ 24. Add a logical volume, which is one partition in size, to the **datavg**. (Note: If you only have one disk on your system, create the logical volume in **rootvg**.) Allocate the partitions on the outer edge of the disk. Allow the system to default the logical volume name and note the system generated name.

» **F3** (three times) to go back to the **Logical Volume Manager** menu.

### Logical Volumes -> Add a Logical Volume

```
Logical volume NAME                []  
VOLUME GROUP name                  datavg  
    (or rootvg if you didn't add a new volume group)  
Number of LOGICAL PARTITIONS       [1]  
PHYSICAL VOLUME names              []  
Logical volume TYPE                []  
POSITION on physical volume        outer_edge
```



#### Note

Depending on your AIX version, this may show as “edge”.

...

» **-OR-**

» **# mklv -a e datavg 1**

- \_\_\_ 25. 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 verify that it has been renamed.

» **F3** (two times) to go back to the **Logical Volumes** menu.

### Set Characteristic of a Logical Volume -> Rename a Logical Volume

```
CURRENT logical volume name        [lv00]  
NEW logical volume name             [yylv]
```

» **-OR-**

» **# chlv -n yy lv 1v00**

» To verify that your volume group has been created:

- **F3** (three times) to go back to the **Logical Volumes** menu.
- Select **List All Logical Volumes by Volume Group**

\_\_\_ 26. Extend the **yylv** logical volume by one partition and specify that the added partition be allocated on the outer edge of the disk. This logical volume is used in the next exercise.

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

-> **Set Characteristic of a Logical Volume**

-> **Increase the Size a Logical Volume**

|                                         |                   |
|-----------------------------------------|-------------------|
| LOGICAL VOLUME name                     | [ <b>yylv</b> ]   |
| Number of ADDITIONAL logical partitions | [ <b>1</b> ]      |
| POSITION on physical volume             | <b>outer_edge</b> |



### Note

Depending on your AIX version, this may show as “**edge**”.

Notice that this is already selected because it is the current location of the existing PPs in the LV.

» **-OR-**

» # **extendlv yy1v 1**

**End of exercise**

## Exercise Review/Wrap-up

1. Review each of the LVM terms with the students being sure they understand the relationships between them.
2. Ask the students how they can tell whether a logical volume is being mirrored.

**Answer:** By the number of copies there are from the status listing of a logical volume.

3. Ask the students if they know the number of PPs in a logical volume and if the PP size can you tell what the size (in MB) the logical volume is. Then ask how.

**Answer:** Yes, by multiplying the number of PPs times the PP size.



# Exercise 10. Working with file systems

*(with hints)*

## Estimated time

00:20 Part 1

00:40 Parts 2 - 6

## What this exercise is about

In this exercise the students are 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 specifying the number of bytes per inode
- Create an enhanced JFS (JFS2) file system and illustrate the AIX 6.1 file system shrink capability
- Mount and unmount a file system
- Extend a file system
- Add and remove mirrors

## Introduction

In this exercise, you are using SMIT extensively to work with file systems. You add a file system to the logical volume you created in the previous exercise and then mount it so users can access the storage space. You copy files into this file system and then experiment with unmounting and mounting the file system once again but in different locations. You 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.

## Common Student Problems

Often students try to unmount file systems and they have a process running that is using that file system. This is particularly true when a student uses the **su** command extensively to go from **teamxx** to **root** back to **teamxx** again instead of using **exit** or **<ctrl-d>**.

With the **df** command, the default output is in 512 byte blocks which some students have trouble translating into KB, MB, or GB. The **df** command has flags to display the output in KB (with **df -k**), MB (with **df -m**), and GB (with **df -g**). Because the SMIT panels display only in blocks of 512 bytes, you may want to recommend the command line hints for the displaying of information about the file systems.

If you are in a situation where you have several students working on terminals attached to a single system, you can run into locking error messages with the LVM. This usually is not a problem, the student simply needs to wait his/her turn. However, it could be a problem if someone does a **<ctrl-c>** when in the middle of an LVM operation. Locked files may not get released and the LVM could be locked indefinitely. If this happens, try using the following command:

```
chvg -u VGname
```

This command is used to unlock a volume group. A volume group can become locked when an LVM command terminates abnormally. This is likely when the system crashes while an LVM operation is in process or if an LVM command causes a core dump.

Some students prefer to use the commands. For those students, if they use commands that don't have the appropriate option for the resource, they will get error messages that imply the LVM is locked or corrupted. An error message like:

```
"Unable to find..."
```

is usually the result of entering a name for an LV when the command was expecting a physical volume or vice versa. An error message like:

```
"Unable to find attribute hdisk0 in the Device  
Configuration Database. Execute synclvodm to attempt to  
correct the database."
```

is usually the result of typing in something like:

```
lsvg -l hdisk0
```

when the correct form of the command is:

```
lsvg -l rootvg
```

Since, in the previous exercise, you used the second disk drive to create a volume group, if students don't change the specification to spread across multiple drives when they go to turn mirroring on, they get a message that indicates there are not enough resources to satisfy their request. They simply need to modify the appropriate field in SMIT and try again.

In the first step in Part 6, if the student does not properly complete **reducevg** for **hdisk1** on the **datavg**, then the VGDA is still on the disk. Attempting to specify that disk in the following **extendvg** would then fail. First be sure the **reducevg** is properly completed. If necessary you may use the **-f** (force) option on the **extendvg** command.

## Exercise Instructions with Hints

### Preface

Two versions of these instructions are available; one with hints and one without. You can use either version to complete this exercise. Also, please don't hesitate to ask the instructor if you have questions.

All exercises of this chapter depend on the availability of specific equipment in your classroom.

The output shown in the answers is an example. Your output and answers based on the output may be different.

All hints are marked with a >> sign.

## Part 1 - Inodes and NBPI

- \_\_\_ 1. If you are creating a JFS file system intended to store files that are smaller than 512 bytes in size, what would you choose for the following values?

Fragment Size: \_\_\_\_\_ 512 NBPI: \_\_\_\_\_ 512

Regular or Large-file enabled: \_\_\_\_\_ Regular

- \_\_\_ 2. If you are creating a JFS file system intended to store files about 8 KB in size, what would you choose for the following values?

Fragment Size: 4096 \_\_\_\_\_ NBPI: 4096 \_\_\_\_\_

Regular or Large-file enabled: \_\_\_\_\_ Regular

- \_\_\_ 3. If you are creating a JFS file system intended to store files about 2 MB in size, what would you choose for the following values?

Fragment Size: 4096 \_\_\_\_\_ NBPI: 4096 \_\_\_\_\_

Regular or Large-file enabled: \_\_\_\_\_ Regular

- \_\_\_ 4. When should you use large file-enable file systems? \_\_\_\_\_

Large-file enabled file systems are intended for files larger than 4 MB. If a large-file enable file system is used for files less than 4 MB in size, the file will be stored the same way as in a regular file system.

\_\_\_ 5. When should you use compressed file systems? \_\_\_\_\_

---

Compressed file systems are good for JFS online archives and files that are not accessed very often. Performance is significantly lower on compressed file systems versus non-compressed file systems.

## Part 2 - Creating a journaled file system

- \_\_\_ 6. 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 journaled file system on the logical volume you created in the previous exercise. Make the default mount point **/home/teamxx/dir1** where the **xx** represents your team number. (Wherever you see **yylv** substitute your initials for **yy**.) Request that the filesystem be mounts at system restart.

» **\$ su**

» **# smit**

**System Storage Management (Physical & Logical Storage)->**

**File Systems ->**

**Add / Change / Show / Delete File Systems ->**

**Journaled File Systems ->**

**Add a Journaled File System on a Previously Defined Logical Volume ->**

**Add a Standard Journaled 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**

- \_\_\_ 7. At this moment, can the space be used to create an AIX file?

---

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

Mount the file system. 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 launch a sub-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 /home/teamxx/dir1`
- » `# mount`
- » `# ls -ld /home/teamxx/dir1`
- » `# chown teamxx.staff /home/teamxx/dir1`
- » `# cp -r /usr/samples /home/teamxx/dir1`

- \_\_\_ 8. Create an enhanced journaled file system in the **rootvg** and let the system create the logical volume for you. Have it mount automatically at system restart. Set its default mount point to **/home/teamxx/dir2**. First try to create it with a size of 1 MB. If that fails, create the file system with a size of 16 MB.

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

**Add/Change/Show/Delete File Systems ->**

**Enhanced Journaled File Systems ->**

**Add a Enhanced Journaled File System**

|                                        |                     |
|----------------------------------------|---------------------|
| Volume group name                      | [rootvg]            |
| SIZE of file system                    |                     |
| Unit Size                              | [Megabytes]         |
| Number of Units                        | [1]                 |
| *MOUNT POINT                           | [/home/teamxx/dir2] |
| Mount AUTOMATICALLY at system restart? | yes                 |

**OK or Enter.**

**-OR-**

- » `#crfs -v jfs2 -g rootvg -a size=1M -m /home/teamxx/dir2 -A yes`

- \_\_\_ 9. 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 /home/teamxx/dir2**

» **# mount**

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

\_\_\_ 10. 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**

\_\_\_ 11. 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 ..**

» **# umount /home/teamxx/dir1**

» **# ls -a dir1**

\_\_\_ 12. 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**.

» **# ls -a dir2**

» **# mount /dev/yylv /home/teamxx/dir2**



» # `ls -a dir2`

» # `mount`

- What files are there now? \_\_\_\_\_

They are the files which were in the **yylv** logical volume which can be mounted at any directory on the system.

- Where did they come from? \_\_\_\_\_

These are the files that were copied from the **/usr/samples** directory.

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

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.

\_\_\_ 13. 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`

## Part 3 - Changing the file system size

- \_\_\_ 14. 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 logical volumes the file systems are on and the physical partitions in each file system and write it down.

• File system: \_\_\_\_\_ /home/teamxx/dir1  
Logical volume: \_\_\_\_\_ yylv (where yy represents your initials)  
Size: \_\_\_\_\_ Two physical partitions

• File system: \_\_\_\_\_ /home/teamxx/dir2  
Logical volume: \_\_\_\_\_ fslv00  
Size: \_\_\_\_\_ One physical partition

Note that the two file systems are in two different volume groups which might have different PPsizes.

» # `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 -m`

- \_\_\_ 15. Record the current size of the filesystem.

» If you are using **SMIT**, this will be displayed on the panel you will use to extend the size in the next step.

**-OR-**

» # `lsfs /home/teamxx/dir1`

- \_\_\_ 16. Extend the size of **/home/teamxx/dir1** file system by ten 512-byte blocks.

• What is the new size of the file system? \_\_\_\_\_

- How much did the file system actually get extended? \_\_\_\_\_  
The file system actually got extended by the PPsize of your volume group.
  - Why didn't the size increase by 5,120 bytes? \_\_\_\_\_  
Because the system allocates disk space in increments of physical partitions.
  - Did this change the size of the logical volume with which it is associated? \_\_\_\_\_  
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.
- » **F3** to go back to the **System Storage Management** menu.

**File Systems ->****Add / Change / Show / Delete File Systems ->****Journaled File Systems ->****Change / Show Characteristics of a Journaled File System**

Select the correct mount point from the selector screen.

```

SIZE of file system
      Unit Size                      [512 bytes]
      Number of Units                [+10]

```

**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=+10 /home/teamxx/dir1
» # lsvg -o | lsvg -i -l
» # df -m

```

\_\_\_ 17. Extend the size of the **yylv** logical volume by one physical partition.

- What is the size of the logical volume? \_\_\_\_\_
- What is the size of the file system? \_\_\_\_\_
- Did this change the size of the file system? \_\_\_\_\_ No.
- Why not? \_\_\_\_\_  
\_\_\_\_\_

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.

- 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-**

» **# extendlv yy1v 1**

» **# lsvg -l datavg**

» **# df -m**

At this point, your logical volume should be one physical partition larger in size than the size of the file system. Increase the size of the file system by one 512-byte block. The system rounds up to the next physical partition boundary.

» **Change/Show Characteristics of a Journaled File System**

```
SIZE of file system
Unit Size                [512 bytes]
Number of Units          [+1]
```

(This will expand the file system by 1 logical partition and thus to the size of the logical volume.)

**-OR-**

» **# chfs -a size=+1 /home/teamxx/dir1**

» **# df**

## Part 4 - Reducing the size of a file system

- \_\_\_ 18. Change the characteristics of the **/home/teamxx/dir1** standard file system to reduce the size down to a final size of 1 megabyte.

- Was this successful? \_\_\_\_\_

This attempt failed because traditional journal file systems can only be shrunk through a backup and restore procedure.

- » **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 Journalled File System**

Select the correct mount point from the selector screen.

SIZE of file system	
Unit Size	[Megabytes]
Number of Units	[1]

**OK or Enter.**

**-OR-**

- » **# chfs -a size=1M /home/teamxx/dir1**

- \_\_\_ 19. Change the characteristics of the **/home/teamxx/dir2** enhanced journal file system to increase the size by one 512 byte block.

- What is the final size resulting from this? \_\_\_\_\_

You will note that the file system increased by a full Physical Partition, since this is the unit of allocation used for obtaining disk space from the volume group.

- » **F3** to go back to the **System Storage Management** menu.

**File Systems ->**

**Add / Change / Show / Delete File Systems ->**

**Enhanced Journalled File System ->**

**Change / Show Characteristics of an Enhanced Journalled File System**

Select the correct mount point from the selector screen.

SIZE of file system	
Unit Size	[512 bytes]
Number of Units	[+1]

**OK or Enter.**

**-OR-**

```
» # chfs -a size=+1 /home/teamxx/dir2
» # df -m
```

- \_\_\_ 20. Change the characteristics of the **/home/teamxx/dir2** enhanced journal file system to reduce the size down to a final size of 16 megabytes. Was this successful?

---

The dynamic reduction in size is supported by the enhanced journal file system, but it will only reduce the size down to the nearest PPsize boundary and no less than the 16 MB minimum allocation for JFS2.

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

### **File Systems**

#### **Add / Change / Show / Delete File Systems**

#### **Enhanced Journaled File System**

#### **Change / Show Characteristics of an Enhanced Journaled File System**

Select the correct mount point from the selector screen.

SIZE of file system	
Unit Size	[Megabytes]
Number of Units	[16]

**OK** or **Enter**.

**-OR-**

```
» # chfs -a size=16M /home/teamxx/dir2
» # df -m
```

## Part 5 - Removing a file system

- \_\_\_ 21. Remove the **yylv** logical volume, the one with **/home/teamxx/dir1** as the mount point. (where **xx** is the number of the logical volume assigned by the system when you created the file system in Step 3.

- Can it be done? \_\_\_\_\_

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

- » **F3** to go back to the **System Storage Management** menu.

**Logical Volume Manager ->**  
**Logical Volumes ->**  
**Remove a Logical Volume**

LOGICAL VOLUME name [yylv]

**OK** or **Enter**.

**-OR-**

- » **# rmlv -f yylv**

- \_\_\_ 22. Unmount **/home/teamxx/dir1** and remove the **yylv** logical volume.

- Does this remove all references to the logical volume and its mount point? \_\_\_

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

- » **F3** to go 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**.

- » **F3** to go back to the **System Storage Management** menu.

**Logical Volume Manager ->**  
**Logical Volumes ->**  
**Remove a Logical Volume**

LOGICAL VOLUME name [yylv]

- » **F3** to go back to the **System Storage Management** menu

**File Systems ->**  
**Add / Change / Show / Delete File Systems ->**

## Journal File System ->

### Change/Show Characteristics of a Journal File System

File System Name

[/home/teamxx/dir1]

OK or Enter.

-OR-

```
» # umount /home/teamxx/dir1
» # rmlv -f yy1v
» # cat /etc/filesystems
```

\_\_\_ 23. Ensure that all references to the **yy1v** 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? \_\_\_\_\_

Yes, because if you remove the logical volume and forget to either remove the entry in the **/etc/filesystems** file or remove the file system through SMIT, you could create another file system 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.

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

## File Systems ->

### Add / Change / Show / Delete File Systems ->

#### Journal File Systems ->

#### Remove a Journal File System

FILE SYSTEM name

/home/teamxx/dir1

Remove Mount Point

yes

OK or Enter.

-OR-

```
» # rmfs -r /home/teamxx/dir1
» # cat /etc/filesystems
```



## Part 6 - Working with mirrors

- \_\_\_ 24. Normally you would mirror across multiple disks. If your system does not have two disks in a volume group, this will not be possible, and, for this lab, you should place both copies on the same disk. If your system has two disks but one of the disks is in a second volume group then you may wish to remove that volume group and extend the **rootvg** to include the available disk.

» # **reducevg datavg hdisk1**

The physical volume being reduced from the volume group must not have any logical volumes allocated on it. It is recommended that you identify the logical volumes (**lsvg -l datavg**), and either delete any remaining logical volumes (**rmlv**) or move them (**migratepv**) to a physical volume that remains in the volume group. You may use the **-d** flag for **reducevg** to automatically delete any remaining logical volumes.

» # **extendvg rootvg hdisk1**

- \_\_\_ 25. Change the characteristics of the **fslvxx** logical volume so that mirroring is turned on to have a single mirror (two copies). Be sure to allow creating a mirror on the same disk **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 [**fslvxx**]

\*NEW TOTAL number of logical partition copies [**2**]

PHYSICAL VOLUME names [**hdisk1**]

(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 y fslvxx 2 hdisk1**

(if there is only 1 PV in the VG, code **"-s n"** instead)

- \_\_\_ 26. Show the characteristics of the **fslvxx** logical volume.

- Can you tell that it is mirrored? \_\_\_\_\_ Yes
- What information indicates it is mirrored? \_\_\_\_\_  
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.
- What is the LV STATE? \_\_\_\_\_ Stale
- Why do you think it is marked stale? \_\_\_\_\_  
The exercise did not have you synchronize your copies when you turned mirroring on.
- What is the scheduling policy for writes? \_\_\_\_\_ Parallel

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

### Show Characteristics of a Logical Volume

```
LOGICAL VOLUME name          [fslvxx]
List OPTION                  [status]
```

**OK** or **Enter**.

**-OR-**

» **#** **lslv fslvxx**

\_\_\_ 27. 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          [fslvxx]
SCHEDULING POLICY for writing logical partition copies [sequential]
```

**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/dir2]
```

**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                [fslvxx]
SCHEDULING POLICY for writing logical [sequential]
partition copies
```

**OK** or **Enter**.

- » To synchronize the copies:

Press **F9** to obtain a sub-shell

```
# syncvg -l fslvxx
# mount /home/teamxx/dir2
# exit (to return to SMIT)
```

**-OR-**

- » Try changing the write policy:

```
# chlv -d s fslvxx
```

- » To fix the problem:

```
# umount /home/teamxx/dir2
```

- » Try changing the write policy again:

```
# chlv -d s fslvxx
```

- » To synchronize the copies:

```
# syncvg -l fslvxx
```

- » # mount /home/teamxx/dir2

\_\_\_ 28. Show the characteristics of the **fslvxx** logical volume.

- What values have changed? \_\_\_\_\_

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

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

**Show Characteristics of a Logical Volume**

```
* LOGICAL VOLUME name                [fslvxx]
List OPTION                          [status]
```

**OK** or **Enter**.

**-OR-**

» # **lslv fslvxx**

\_\_\_ 29. Turn off mirroring on the **fslvxx** 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                [fslvxx]
*NEW maximum number of logical partition
copies                               [1]
```

**OK or Enter.**

**-OR-**

» # **rmlvcopy fslvxx 1**

\_\_\_ 30. Remove the, now unused, second disk from the **rootvg**.

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

**Logical Volume Manager ->**  
**Logical Volumes ->**  
**Set Characteristic of a Logical Volume ->**  
**Remove a Physical Volume from a Volume Group->**

```
*VOLUME GROUP name                  [rootvg]
*PHYSICAL VOLUME name               [hdisk1]
```

» **-OR-**

» # **reducevg rootvg hdisk1**

\_\_\_ 31. Define the available disk as the volume group **datavg**.

» **Volume Groups ->**  
**Add A Volume Group->**  
**Add an Original 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)
Force the creation of a volume group? yes
```

ACTIVATE volume group AUTOMATICALLY  
at system restart?

**yes**

**OK or Enter.**

**-OR-**

» # **mkvg -f -y datavg -s 16 hdisk~~x~~** (where **x** is number of the physical volume  
that has not been assigned to a volume group)

**End of exercise**

## Exercise Review/Wrap-up

JFS2 requires a minimum allocation of 16 MB. If the volume group has a PPsize which is equal to or greater than this minimum, then a 1 MB request would result in a large enough allocation to satisfy the requirement. If the PPsize is less than 16 MB, then a request for 1 MB would result in an allocation that is less than the requirement and thus the allocation would fail.

1. Ask students what the difference is between adding a file system to a previously created logical volume and simply adding a file system letting the system create the logical volume. Why would you want to do it one way versus the other?

**Answer:** When you create a logical volume you have the ability to specify exactly where on the disk and which disk within a volume group you wish to use. Thus, you have some control on positioning for performance or availability. If you let the system create both the file system and logical volume at the same time, you lose any control over where the file system gets placed on disk.

2. Ask students what happens to files in a directory if you mount another logical volume over it.

**Answer:** The files are still there, you just can't get to them because the file system pointers now take you to the contents of a different location on disk.

3. Ask students how they think mirroring affects file system performance.

**Answer:** On writes it would degrade file system performance because two write operations have to be scheduled. If the scheduling policy is sequential, that would slow things down as well. On reads, it could improve performance because the quickest copy to get to is read first.

4. Ask students what they discovered in the **Removing A File System** section.

**Answer:** They should have discovered that just because the logical volume has been removed it doesn't mean that all references to the logical volume and the file system have been removed as well.

5. Ask students what happens to a file system and all its data when you remove the logical volume.

**Answer:** The file system and all its data gets deleted too.

6. Ask then if all data gets deleted, when might you want to remove a logical volume.

**Answer:** If a file system gets broken, you might wish to remove it, recreate it and then restore from backup. You would remove it when the contents of it are no longer needed or you might remove it when you are trying to relocate it to another volume group after you have already created a new one and copied the necessary data into it.

# Exercise 11. Managing file systems

*(with hints)*

## Estimated time

00:25

## 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 perform 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 the last two exercises; *Working with LVM* and *Working with File Systems*.

Throughout this exercise you are 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 the current user instead of continually executing the `su` command.

In order to do *Part 2 - Using Fragments For Disk Usage Efficiency* and *Part 3 - Using JFS Compression*, it is assumed that you have two disk drives in your system and that you have completed *Exercise 10 - Working with LVM*, *Part 4 - Adding A Volume Group*.

## Common Student Problems

The students are asked to **su** several times from their regular user name to **root** and back again. The **Exercise Instructions With Hints** version of the exercise encourages the use of the **exit** command to return back to a previous user. However, students invariably get several shells deep and then when they get to the step where a file system unmount occurs, they can't unmount the file system because somewhere along the line a process has the mount point directory in its environment. Encourage students to use **exit** in tandem with **su** functions.

## Known Hardware/Software Problems

There are three shell scripts used in this exercise, **mkfile**, **fragcopy**, and **bigfile**. They should be located in the **/home/workshop** directory. This directory and the files in it should have been loaded prior to the start of class. If they were not, load them from the instructor exercise diskette if such a diskette was included in your instructor kit.



## Exercise Instructions with Hints

### Preface

Two versions of these instructions are available; one with hints and one without. You can use either version to complete this exercise. Also, please don't hesitate to ask the instructor if you have questions.

All exercises of this chapter depend on the availability of specific equipment in your classroom.

The output shown in the answers is an example. Your output and answers based on the output may be different.

All hints are marked with a >> sign.

### Part 1 - Determining file system usage

- \_\_\_ 1. Check that the **/home/team01/dir2** file system is mounted. If it is not, then mount it.

>> # **mount**

>> # **mount /home/team01/dir2** (if not already mounted)

- \_\_\_ 2. If you aren't already logged in, log in to your system and then **su** to **root**. Recursively, copy the files under **/usr/samples** under your **/home/teamxx/dir2** **directory**. Assume you have already determined that the **/home/teamxx/dir2** 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.

>> # **cp -r /usr/samples /home/teamxx/dir2**

>> # **du /home/teamxx/dir2/samples | sort -nr | pg**

>> # **du -a /home/teamxx/dir2/samples/snmpd | sort -nr | pg**

>># **ls -l /home/teamxx/dir2/samples/snmpd/dpi2/dpi20ref.txt**

>>(Note: your system may have a different directory and file as the big users of disk space then what we have listed above.)

- \_\_\_ 3. Let's assume that you have concluded that more space is needed (as opposed to removing files to free up space); therefore, the file system needs to be expanded. Expand the file system by the size of 1 physical partition. Verify the usage of this file system.

>> # **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 are prompted to provide the file system name.

Select **/home/teamxx/dir2**.

File system name	<b>/home/teamxx/dir2</b>
SIZE of file system	
Unit Size	<b>[Megabytes]</b>
Number of Units	<b>[+1]</b>

» Press **F10** to exit SMIT.

» **# df -m**

**-OR-**

» **# chfs -a size=+1 /home/teamxx/dir2**

» **# df -m**

## Part 2 - Using fragments for disk usage efficiency

- \_\_\_ 4. For this exercise, you 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 file systems, 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 System p system, it is necessary to modify the file system names in order to make them unique. Once the file systems are created, mount them.

» # **smit crjfs**

### Add A Standard Journaled File System

Select **datavg** for the Volume group name.

Volume group name	<b>datavg</b>
SIZE of file system	
Unit Size	<b>[512 bytes]</b>
Number of Units	<b>[50000]</b>
MOUNT POINT	<b>[/tmp/frag512]</b>
Mount AUTOMATICALLY at system restart?	<b>yes</b>
Fragment Size (bytes)	<b>512</b>
Number of bytes per inode	<b>512</b>

**OK or Enter.**

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

### Add A Standard Journaled File System.

Volume group name	<b>datavg</b>
*SIZE of file system	
Unit Size	<b>[512 bytes]</b>
Number of Units	<b>[50000]</b>
*MOUNT POINT	<b>[/tmp/frag4096]</b>
Mount AUTOMATICALLY at system restart?	<b>yes</b>
Fragment Size (bytes)	<b>4096</b>
Number of bytes per inode	<b>512</b>

**OK or Enter.**

» **F3** to return to the menu.

» Press **F10** to exit SMIT.

» # **mount /tmp/frag512**

» # **mount /tmp/frag4096**

- \_\_\_ 5. Check both file systems with `df -v` and note any used space.

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

You test the efficiency of the two file systems you just created for storing a large number of very small files.

- \_\_\_ 6. First, you need a source file to use as input in the next step. Use the `/home/workshop/mkfile` script to create a file that is 512 bytes in size. This script requires the file size parameter to be passed to it and uses the suffix of **bytefile**. For example: `/home/workshop/mkfile 512` creates 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
```

- \_\_\_ 7. 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 creates copies of the `sourcefilename` until either the file system is full or the `numfiles` value is reached. The files are 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 is displayed showing the number of files that have been successfully copied. Have `fragcopy` copy `/tmp/512bytefile` 500 times and have as the `dir/targetfilename` value: `/tmp/frag512/frag500`.

```
» # /home/workshop/fragcopy 500 512bytefile frag512/frag500
```

- \_\_\_ 8. Look at the contents of the `/tmp/frag512` directory. Note how many files are in this directory.

```
» # ls -l /tmp/frag512 | wc -l
```

The `ls -l` command output results in an extra line in the report, thus giving the wrong number of files. Replace `ls -l` with `ls`.

- \_\_\_ 9. Do the same as step 7 only this time create copies of the **512bytefile** in `/tmp/frag4096`

```
» # /home/workshop/fragcopy 500 512bytefile frag4096/frag500
```

- \_\_\_ 10. Look at the contents for **/tmp/frag4096**. Note how many files are in this directory.
- » # **ls -l /tmp/frag4096 | wc -l**  
The **ls -l** command output results in an extra line in the report, thus giving the wrong number of files. Replace **ls -l** with **ls**.
- \_\_\_ 11. 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**? \_\_\_\_\_ **17048**
  - How many inodes have the files used in **/tmp/frag512**? \_\_\_\_\_ **517**
  - How many 512-byte blocks have the files used in **/tmp/frag4096**? \_\_\_\_\_ **20528**
  - How many inodes have the files used in **/tmp/frag4096**? \_\_\_\_\_ **517**
  - What can you conclude from this? \_\_\_\_\_
- For small files, a disk fragment size of 512 provides a more efficient use of blocks for disk space and to store inode information.**
- » # **df -v /tmp/frag512 /tmp/frag4096**
- \_\_\_ 12. 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**

## Part 3 - Using JFS compression

- \_\_\_ 13. 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 65536 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 Journaled File System ->**

**Add a Compressed Journaled File System**

Volume group name	<b>datavg</b>
SIZE of file system	
Unit Size	<b>[512 bytes]</b>
Number of Units	<b>[65536]</b>
MOUNT POINT	<b>[/tmp/compress512]</b>
Mount AUTOMATICALLY at system restart?	<b>yes</b>

**OK or Enter.**

» **F3** to go back to the **Add a Journaled File System** menu.

**Add a Compressed File System.**

Volume group name	<b>datavg</b>
SIZE of file system	
Unit Size	<b>[512 bytes]</b>
Number of Units	<b>[65536]</b>
MOUNT POINT	<b>[/tmp/compress]</b>
Mount AUTOMATICALLY at system restart?	<b>yes</b>
Fragment Size (bytes)	<b>2048</b>
Number of bytes per inode	<b>2048</b>

**OK or Enter.**

» **F3** to return to the menu.

- \_\_\_ 14. Create a third file system (the same size as the two file systems you just created and also in the **datavg** volume group) that does not use compression, that also has a fragment size of 2048 and an NBPI of 2048, that has a mount point of **/tmp/uncompress**, and that is automatically mounted at system restart. This will be used for purposes of comparison.

» **F3** to go back to the **Add a Journaled File System** menu.

**Add a Standard Journaled File System**

Volume group name	<b>datavg</b>
SIZE of file system	
Unit Size	<b>[512 bytes]</b>
Number of Units	<b>[65536]</b>
MOUNT POINT	<b>[/tmp/uncompress]</b>
Mount AUTOMATICALLY at system restart?	<b>yes</b>
Fragment Size (bytes)	<b>2048</b>
Number of bytes per inode	<b>2048</b>

**OK or Enter.**

» **F3** to return to the menu.

\_\_\_ 15. Check that the journaled file systems have been correctly created.

» Exit SMIT.

» **# lsfs -q | pg**

\_\_\_ 16. Mount the journaled file systems.

» **# mount /tmp/compress512**

» **# mount /tmp/compress**

» **# mount /tmp/uncompress**

\_\_\_ 17. Next, check the performance of the compressed file system by creating a 4 MB file named **bigfile** by using the script **/home/workshop/mkfile** and then move it to **/home/workshop**. Then copy it to each file system, and measure the performance using **timex**. First, check that the logical volume configuration is similar. Then, record copy times.

Real time for compress512: \_\_\_\_\_

Real time for compress: \_\_\_\_\_

Real time for uncompress: \_\_\_\_\_

» **# /home/workshop/mkfile 4194304**

»**# mv 4194304bytefile /home/workshop/bigfile**

» **#timex cp /home/workshop/bigfile /tmp/compress512**

» **#timex cp /home/workshop/bigfile /tmp/compress**

» **#timex cp /home/workshop/bigfile /tmp/uncompress**

\_\_\_ 18. Use `du` to check how much space is really used and how efficient the compression is.

Disk usage for `compress512`: \_\_\_\_\_

Disk usage for `compress`: \_\_\_\_\_

Disk usage for `uncompress`: \_\_\_\_\_

» # `du /tmp/compress512`

# `du /tmp/compress`

# `du /tmp/uncompress`

\_\_\_ 19. Use `ls -l` to verify the normal size of each file. What is the amount of data in the `bigsize` file in each filesystem?

File size of `bigfile` in `compress512`: \_\_\_\_\_

File size of `bigfile` in `compress`: \_\_\_\_\_

File size of `bigfile` in `uncompress`: \_\_\_\_\_

» # `ls -l /tmp/compress512`

# `ls -l /tmp/compress`

# `ls -l /tmp/uncompress`



## Part 4 - Fixing file system problems

\_\_\_ 20. Using the **defragfs** command, find out the current state of the file system **/tmp/compress512**.

» # **smit**

**System Storage Management (Physical & Logical Storage) ->**

**File Systems ->**

**Add / Change / Show / Delete File Systems ->**

**Journalled File Systems ->**

**Defragment a File System**

File System Name

**/tmp/compress512**

Perform, Query, or Report?

**query**

**Click OK or press Enter.**

» **F3** to return to the menu.

**-OR-**

» # **defragfs -q /tmp/compress512**

\_\_\_ 21. Defragment the **/tmp/compress512** file system.

» # **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

**/tmp/compress512**

Perform, Query, or Report?

**perform**

**OK or Enter.**

**-OR-**

» # **defragfs /tmp/compress512**

\_\_\_ 22. Perform a check on the **/home/teamxx/dir2** file system so that if it finds something wrong you are prompted as to whether or not to take any action.

» # **fsck /home/teamxx/dir2**

- What kind of message did you get?

The current volume is /dev/fslv00

File System is currently mounted.

Primary superblock is valid

fsck: Performing read-only processing does not produce dependable results \_\_\_\_\_

- Unmount the file system and check it again. Mount the file system again after the check is complete.

» # `umount /home/teamxx/dir2`

» # `fsck /home/teamxx/dir2`

» # `mount /home/teamxx/dir2`

## Part 5 - Optional exercise

- \_\_\_ 23. 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 a line that gets 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**, and so forth. Towards the bottom of the script add the following line:

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

## End of exercise

## Exercise Review/Wrap-up

1. In Part 1 - step 2, Why does the `du -a` size and the `ls -l` size for **dpi20ref.txt** differ?

**Answer:** `du -a` gives the amount of disk space allocated to the file while `ls -l` gives the size of the file from the application perspective. If you are using a fragment size of 4 KB and the application writes a 100 byte file, then what size would each of these commands return?

2. Ask students when they think they would want to defragment a file system.

**Answer:** When there is a strong indication that file system performance is being impacted by file system fragmentation. Some file systems are set up to be fragmented across disks (that is, striped) to improve performance through multiple actuator and possibly multiple scsi adapter access. The performance of these file systems would be reduced, not improved, if defragmented.

# Exercise 12. Paging space

*(with hints)*

## Estimated time

00:20

## 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 work with paging logical volumes, adding, deleting, and changing them. To do this exercise, you need to work in teams - one team per AIX system. Only one team member is able to do the exercise, the other team members provide support and assistance where needed.

## Exercise Instructions with Hints

### Preface

Two versions of these instructions are available; one with hints and one without. You can use either version to complete this exercise. Also, please don't hesitate to ask the instructor if you have questions.

All exercises of this chapter depend on the availability of specific equipment in your classroom.

The output shown in the answers is an example. Your output and answers based on the output may be different.

All hints are marked with a >> sign.

- \_\_\_ 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
>> # lspcs -a
```

- \_\_\_ 2. If you have two disks on your system and successfully created another volume group named **datavg** during the Working with LVM exercise, create two page spaces: first one in the **rootvg** volume group with a size of one partition and then the other in the **datavg** volume group with an equivalent amount of space. (Be careful, the volume groups may have different ppsize values.) 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 one partition each. Have them become active now and at system restart.

```
>> # smit
```

**System Storage Management (Physical and Logical Storage) ->**

**Logical Volume Manager ->**

**Paging Space ->**

**Add Another Paging Space ->**

Select **rootvg** for the volume group.

Volume group name	<b>rootvg</b>
SIZE of paging space (in logical partitions	<b>[1]</b>
Start using this paging space NOW?	<b>yes</b>
Use this paging space each time the system is RESTARTED?	<b>yes</b>

**OK or Enter.**

- » **F3** to return to the menu.
- » Go back to the **Paging Space** menu.

### Select **Add Another Paging Space**

A selector screen will pop up for volume group. Select **datavg** (or **rootvg** if you don't have a second VG) .

Volume group name	<b>datavg</b>
SIZE of paging space (in logical partitions)	<b>[8]</b>
Start using this paging space NOW?	<b>yes</b>
Use this paging space each time the system is RESTARTED?	<b>yes</b>

**OK** or **Enter**.

- » **F3** to return to the menu.

**-OR-**

- » **# mkps -s 1 -n -a rootvg**
- » **# mkps -s 8 -n -a datavg** (or **rootvg** if you don't have **datavg**)

What names did the system assign to the two new paging spaces?\_\_\_\_\_

**paging00 and paging01 to the new paging spaces.**

- \_\_\_ 3. Check to be sure the new paging spaces are active. Create some system activity and monitor the % of paging space used.

- » Exit SMIT.
- » **# lsps -a**
- » The following example commands use up memory on your system. Depending on the amount of memory, you still may not be able to force paging.
  - **# wsm &** (if you are in a CDE graphical environment)
  - **# find / -type f | xargs grep treasure >/dev/null &**
  - **# ls -laR / > /dev/null &**
- » **# lsps -a**

Check the % used on the paging spaces.

- What conclusion can you come to based on these observations?

---

**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.**

If necessary, run these commands again and notice how the page space usage becomes balanced over time. Note that your system may have so much memory that this step may not use enough to trigger an noticeable increase in paging space utilization.

- \_\_\_ 4. Change the size of **paging00** to four partitions. 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	<b>paging00</b>
Paging space name	<b>paging00</b>
NUMBER of additional logical partitions	<b>[3]</b>

**OK or Enter.**

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

**List All Paging Spaces**

» **F3** to return to the menu.

**-OR-**

» # **chps -s 3 paging00**

» # **lspcs -a**

- \_\_\_ 5. Reduce the size of **paging00** by one partition. Check to be sure that **paging00** has been decreased.

» # **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	<b>paging00</b>
Paging space name	<b>paging00</b>
NUMBER of logical partitions to remove	<b>[1]</b>

**OK or Enter.**

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

**List All Paging Spaces**

» **F3** to return to the menu.



**-OR-**

» # **chps -d 1 paging00**

» # **lsps -a**

\_\_\_ 6. Remove **paging01**. First, deactivate it.

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

**Deactivate a Paging Space**

At the selector screen pop-up select  
Paging space name

**paging01**  
**paging01**

**OK** or **Enter**.

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

**Remove a Paging Space**

At the selector screen pop-up select  
Paging space name

**paging01**  
**paging01**

**OK** or **Enter**.

» **F10** to return to the command line.

**-OR-**

» # **swapoff /dev/paging01**

» # **rmpps paging01**

**End of exercise**

## Exercise Review/Wrap-up

1. Review the steps students need to take to remove a paging space.

**Answer:** To remove a paging space, first you need to deactivate it and then remove it. In AIX 5L V5.2 and later versions, this can be done without rebooting the system.

2. Review the reasons why additional page space may be needed and where it is best to locate additional page space.

**Answer:** The amount of paging space required depends on the type of activities on the system. If paging space runs too low, processes may be lost and if it gets full, the system may halt completely. Since the performance of processes depend on access to items in memory, the best place to put paging space is where you can get the best performance. Thus, it is recommended to allocate paging space in the middle (center) of the disk to reduce disk arm travel and to use multiple paging spaces, each allocated on a separate physical volume. If there are multiple SCSI adapters on the system, putting the paging spaces on disks on separate SCSI adapters may also help performance.

# Exercise 13. Using backup and restore

*(with hints)*

## Estimated time

Part 1 - 00:20

Parts 2, 3 and 4 - 00:40

## 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:

- Backup a **non-rootvg** volume group
- Perform an incremental backup by inode
- Perform a backup by file name
- Restore a file system and an individual file

In this exercise, you back up 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 do *not* use tapes or diskettes for this exercise. You create a new file system and use a file in it as your backup media. Everything in the exercise works the same whether you backup to tape or some other media.

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

- **/home/teamxx/dir2** - File system to be backed up. Created in the *Working with File Systems* exercise.
- **/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 versus full path name backups and importance of mounting versus 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.

## Common Student Problems

There are some exercise hints that use the **.** (dot) for current directory. The dot may not be noticed by some students doing the Hints section. Watch for any problems relating to the instructions that make reference to the **.** (dot).

When students perform the full inode backup, ensure they have used a zero 0 and not an uppercase O.

## Known Hardware/Software Problems

When listing a directory, the students are directed in the **Exercise Instructions with Hints** section to do an **ls -lR**. If the students do not use the recursive **-R**, they do not see a listing of files. They only see a listing of directories. The files they are asked to list are from **/usr/samples**. This directory consists of sublevel directories with all the files contained within these directories. Students doing the **Exercise Instructions** section may not use the appropriate options. Direct them to use **ls -lR**.

If your classroom is equipped with a tape drive per student and you can supply two tapes per student, you can adjust this exercise so the students back up to tape rather than the new file system they are asked to create. To ensure that this exercise could be done under any circumstance, it was designed to use a user-defined file system as the backup media.

## Exercise Instructions with Hints



### Important

You are backing up the file system that you created in the *Working with File Systems* 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/fslvxx** or the file system name, **/home/teamxx/dir2**.

### Preface

Two versions of these instructions are available; one with hints and one without. You can use either version to complete this exercise. Also, please don't hesitate to ask the instructor if you have questions.

All exercises of this chapter depend on the availability of specific equipment in your classroom.

The output shown in the answers is an example. Your output and answers based on the output may be different.

All hints are marked with a >> sign.

## Part 1 - Use SMIT to backup a non-rootvg volume group

1. Create a file system called **/home/savevg** in **rootvg** that holds the backup image and then mount it. Make sure the file system is in **rootvg**.

>> # **smit fs**

**Add/Change/Show/Delete File Systems ->**

**Journalled File Systems ->**

**Add a Journalled File System ->**

**Add a Standard Journalled File System**

Select **rootvg** for the volume group name

Volume group name:

**rootvg**

SIZE of file system

Unit Size

**Megabytes**

\* Number of units

**[16]**

\*MOUNT POINT

**[/home/savevg]**

>> **Use F3 until you get back to the File Systems menu.**

>> **Select Mount a File System.**

FILE SYSTEM name

**[/home/savevg]**

- » Use **F10** to exit SMIT
- » OR
- » `# crfs -v jfs -g rootvg -a size=16M -m /home/savevg`
- » `# mount /home/savevg`

\_\_\_ 2. Back up the **datavg** volume group to **/home/savevg/bkup**.

- » `# smit savevg`
  - \* Backup Device or FILE [ /home/savevg/bkup ]
  - \* VOLUME GROUP to back up [ datavg ]
- » Use **F10** to exit SMIT
- » OR
- » `# savevg -f /home/savevg/bkup -i datavg`

\_\_\_ 3. Make sure the backup completes successfully before doing this step. Remove the **datavg** volume group. The volume group must not have any physical partitions allocated to logical volumes. In order to remove these logical volumes in the **datavg**, you must first make sure that they are all closed. In others words, the file systems must be unmounted and the paging spaces must be inactive. You need to unmount all mounted file systems in **datavg** first.

- » `# smit vg`
  - Select **Remove a Volume Group**
  - \*VOLUME GROUP name [ datavg ]
- » OR
- » `# reducevg -df datavg hdiskn`

\_\_\_ 4. Recover the volume group from your backup.

- » `# smit restvg`
  - \* Restore DEVICE or FILE [ /home/savevg/bkup ]
  - SHRINK the filesystems? no
  - PHYSICAL VOLUME names [ hdiskn ]
- » Use **F10** to exit SMIT
- » OR
- » `# restvg -q -f /home/savevg/bkup hdisk1`

\_\_\_ 5. Verify that the volume group is back.

» # **smit lsvg**

Select **List Content of a Volume Group**

VOLUME GROUP name

[**datavg**] +

List OPTION

**status** +

**F10** to exit SMIT.

\_\_\_ 6. Examine the contents of the file **/tmp/vgdata/datavg/datavg.data**. What is the file used for?

» # **pg /tmp/vgdata/datavg/datavg.data**

## Part 2 - Prepare file system for backup/restore

- \_\_\_ 7. Log in as **teamxx** and **su** to **root**. Use **su** with out the dash so that you retain the **teamxx** home directory.

» **\$ su**

- \_\_\_ 8. Create a new file system in **datavg** 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 **datavg**.

Volume group name	<b>datavg</b>	
SIZE of file system		
Unit Size	<b>Megabytes</b>	+
* Number of units	<b>[1]</b>	#
* MOUNT POINT	<b>[/home/bkupxx]</b>	
Mount AUTOMATICALLY at system restart?	<b>yes</b>	+

» **OK or Enter.**

» **OR**

» **# crfs -v jfs -g datavg -a size=1M -m /home/bkupxx -A yes -p rw**

- \_\_\_ 9. Mount the new file system. Verify that it is mounted.

» In SMIT, **F3** back until you are In the SMIT **File System** menu.

» Select **Mount a File System**

FILE SYSTEM name	<b>[/dev/lv0x]</b>
(where x is the number of your logical volume)	
DIRECTORY over which to mount	<b>[/home/bkupxx]</b>

» **OK or Enter.**

» **F3** to go back to the File System menu.

» Select **List all Mounted File Systems**



- » **F10** to exit SMIT.
- » **OR**
- » **# mount /home/bkupxx**
- » **# mount**

- \_\_\_ 10. Make sure the file system you created in the *Working with File Systems* exercise, **/home/teamxx/dir2** in logical volume **/dev/fslvxx**, is mounted. If it isn't, mount it.
- » **# mount** (check mounted file systems)
  - » **# mount /home/teamxx/dir2** (if not mounted)
- \_\_\_ 11. Ensure that all files from the **/usr/samples** directory were copied into the **/home/teamxx/dir2** file system. You are backing up these files to the new file system, **/home/bkupxx**, which you created in Step 8.
- » **# ls /home/teamxx/dir2** (check if data is in the file system)
  - » **# cp -r /usr/samples /home/teamxx/dir2** (if necessary)

## Part 3 - Backup and restore by inode (file system)

\_\_\_ 12. The **bos.rte.archive** fileset contains the backup and restore utilities. Check that the **bos.rte.archive** fileset has been installed.

```
» # lslpp -l bos.rte.archive
```

\_\_\_ 13. You should be ready to back it up:

- Change directory to **/home/teamxx**.

```
» # cd /home/teamxx
```

- Unmount the **/home/teamxx/dir2** file system.

```
» # umount /home/teamxx/dir2
```

- Verify that the file system is unmounted. If you got an error unmounting the file system, it may be that you were residing 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.

```
» # mount
```

- Ensure that the mount point is empty. Do a listing on the directory. If it is empty, proceed to the next step. If not, ensure you are in your home directory, **/home/teamxx**, and delete the files in the directory **/home/teamxx/dir2**.

```
» # ls -l /home/teamxx/dir2 (should be total 0)
```

```
» # cd /home/teamxx
```

```
» # rm -r /home/teamxx/dir2/* (if not empty)
```

\_\_\_ 14. Back up 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/dir2
```

```
» OR
```

```
» # smit
```

**System Storage Management ->**

**File Systems ->**

**Backup a File System**

\*FILESYSTEM to Backup

[/home/teamxx/dir2]

\*Backup DEVICE

[/home/bkupxx/weekly]

```
Backup LEVEL [0]
Record backup in /etc/dumpdates? [yes]
```

» **OK or Enter.**

- \_\_\_ 15. Display the table of contents of the **/home/bkupxx/weekly** backup to ensure that all files in the **/home/teamxx/dir2** file system were backed up properly. How are the files listed? \_\_\_\_\_

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

» In SMIT, **F3** back to the **File Systems** menu.

» **Select List Contents of a Backup**

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

» **OK or Enter.**

» **F10** to exit SMIT.

» **OR**

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

- \_\_\_ 16. 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 see the other team's logical volumes listed as well.

» **# pg /etc/dumpdates**

- \_\_\_ 17. Mount the **/home/teamxx/dir2** file system and simulate a daily change to the file named **/home/teamxx/dir2/samples/tcpip/resolv.conf**. Add your name in uppercase to the first line of the file.

» **# smit**

**System Storage Management ->**

**File Systems ->**

**Mount a File System**

```
FILE SYSTEM name [ /dev/fslvxxx ]
DIRECTORY over which to mount [ /home/teamxx/dir2 ]
```

» **OK or Enter.**

- » In SMIT, go back to the **File System** menu.

» **F3** back to the **File System** menu.

```
[ /home/teamxx/dir2]
```

» **F3** back to the **File System** menu.

```
[ /home/teamxx/dir2]
```

```
[ /home/bkupxx/daily]
```

[1]

[yes]

» **OR**

```
>> # umount /home/teamxx/dir2
```

```
>> # mount
```

```
» # backup -u -l -f /home/bkupxx/daily /home/teamxx/dir2
```

- \_\_\_ 19. 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.

» In SMIT, **F3** back to the **File System** menu.

» **Select List Contents of a Backup**

Backup DEVICE [/home/bkupxx/daily]

» **OR**

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

- \_\_\_ 20. View the contents of **/etc/dumpdates**. Analyze the contents.

» **# pg /etc/dumpdates**



### Note

The next few steps 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 the SMIT **F9** shellout feature to execute the crash procedures.

- \_\_\_ 21. Simulate a user accident and recover the lost file using the above backup:

Mount the file system. Change directory to **/home/teamxx/dir2**. Remove the **samples/tcpip/resolv.conf** file. Check that it no longer exists.

» **# mount /home/teamxx/dir2**

» **# cd /home/teamxx/dir2**

» **# rm samples/tcpip/resolv.conf**

» **# ls samples/tcpip/resolv.conf**

- \_\_\_ 22. Before you start the restore, be sure you are in the directory **/home /teamxx/dir2**. Why is this important? \_\_\_\_\_

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

You will see messages displayed before the restore takes place. When prompted to specify next volume #, type in **1**. When prompted to set owner/mode, type 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).

\_\_\_ 23. Now, you perform a crash of the entire **/home/teamxx/dir2** file system and then restore it using your backups. Ensure you are in the **/home/teamxx/dir2** 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? \_\_\_\_\_

Use the weekly backup first, then the daily backup.

- » `# cd /home/teamxx/dir2`
- » `# rm -r /home/teamxx/dir2/*`
- » `# 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` (You should see all your files)

\_\_\_ 24. 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

The **restoresymtable** file keeps track of links and deleted files that were created between the backups. 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. 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 three steps demonstrate the advantage of backing up by relative path name, by restoring into a directory that is different from where the files originally resided.

- \_\_\_ 25. 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
```

- \_\_\_ 26. 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
```

\_\_\_ 27. 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**



## Part 4 - Backup and restore by name

\_\_\_ 28. Make sure the **/home/teamxx/dir2** file system is mounted.

- Why would you want to have the file system mounted in order to back it up by name? \_\_\_\_\_

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

- » **# mount** (to see if already mounted)
- » **# mount /home/teamxx/dir2** (to mount if necessary)

\_\_\_ 29. 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 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	<b>[ /home/bkupxx/weekly ]</b>
*FILE or DIRECTORY to backup	<b>[ /home/teamxx/dir2 ]</b>
VERBOSE output?	<b>yes</b>

- » **OK or Enter.**
- » **F3** to return to the menu.
- » **OR**
- » **# find /home/teamxx/dir2 | backup -i -v -f /home/bkupxx/weekly**

\_\_\_ 30. List the table of contents to verify the backup was successful.

- How were the files listed? \_\_\_\_\_

The files are listed with full path names.

- » **# smit**

**System Storage Management ->**  
**File Systems ->**  
**List Contents of a Backup**

*Backup DEVICE	<b>[ /home/bkupxx/weekly ]</b>
----------------	--------------------------------

- » **OK or Enter.**

» F3 to return to the menu.

» **OR**

» # `restore -T -f /home/bkupxx/weekly`

\_\_\_ 31. 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)

\_\_\_ 32. The goal is to restore the files from **/home/bkupxx/weekly** into the **/home/teamxx/mybkup** directory. Restore the files and note the way the files are listed in the output of the `restore` command. Take a look at the contents of the **/home /teamxx/mybkup** directory.

- During restore where the filenames full or relative path? \_\_\_\_\_

The file names are listed by their full path names.

- Does it contain any files? \_\_\_\_\_

No. The files were restored by their full path name, which put them into the **/home/teamxx/dir2** file system.

» # `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.**

» **F10 to exit SMIT.**

» # `ls -lR` (total 0)

» **OR**

» # `restore -xvf /home/bkupxx/weekly`

» # `ls -lR` (total 0)

- \_\_\_ 33. Back up the file system by name, but use a relative path name. Make sure you are in **/home/teamxx/dir2**. List the contents of **weekly**. The file names should be in a **./filename** (relative path name) format.

» # **cd /home/teamxx/dir2**

» # **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.

» Select **List Contents of a Backup**

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

» **F10** to exit SMIT.

» **OR**

» # **cd /home/teamxx/dir2**

» # **find . | backup -ivf /home/bkupxx/weekly**

» # **restore -Tf /home/bkupxx/weekly**

- \_\_\_ 34. 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.**

» **F10** to exit SMIT.

» **OR**

```
» # cd /home/teamxx/mybkup  
» # restore -xvf /home/bkupxx/weekly
```

\_\_\_ 35. List the contents of the **/home/teamxx/mybkup** directory. All of the files should be listed.

```
» # ls -lR /home/teamxx/mybkup
```

## Part 5 - (Optional)

The next eight steps 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.

- \_\_\_ 36. The **/home/teamxx/dir2** 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, it is much easier to see if your restore is working properly later.) Double check to make sure the files are removed.

```
» # mount
» # rm -r /home/teamxx/dir2/*
» # ls -lR /home/teamxx/dir2 (should see total 0)
```

- \_\_\_ 37. Unmount the file system and verify that it is unmounted.

```
» # cd /home/teamxx
» # umount /home/teamxx/dir2
» # mount
```

- \_\_\_ 38. Change to the directory mount point and perform the restore.

```
» # cd /home/teamxx/dir2
» # 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/dir2
```

```
» # pwd
» # restore -rvf /home/bkupxx/weekly
```

\_\_\_ 39. Mount the file system and look at the contents to make sure that the restore worked.

- Does the file system contain any files?\_\_\_\_\_ No
- Why? \_\_\_\_\_

The files were restored to the /home/teamxx/dir DIRECTORY. When you mounted the file system to the MOUNT POINT /home/teamxx/dir, you overlaid the directory with the file system contents.

```
» # mount /home/teamxx/dir2
» # mount
» # ls -lR
```

\_\_\_ 40. Unmount the file system and list the files in the mount point directory. You see that this is where your files went when you performed the restore.

```
» # cd /home/teamxx
» # pwd
» # umount /home/teamxx/dir2
» # ls -lR /home/teamxx/dir2
```

\_\_\_ 41. Clean up the mount point by deleting all the files in the /home/teamxx/dir2 directory.

```
» # rm -r /home/teamxx/dir2/*
» # ls -lR /home/teamxx/dir2 (total 0)
```

\_\_\_ 42. Mount the file system. Verify it was mounted.

```
» # mount /home/teamxx/dir2
» # mount
```

\_\_\_ 43. Now that you have the file system mounted, try the restore again. List the files after you are through with the restore.

```
» # cd /home/teamxx/dir2
» # 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.**

» **F10** to exit SMIT.

» **# ls -lR**

» **OR**

» **# cd /home/teamxx/dir2**

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

» **# ls -lR**

**End of exercise**





## Exercise 14. (Optional) Using `tar` and `cpio`

*(with hints)*

### Estimated time

00:30

### 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 back up files and directories using `tar` and then `cpio`. The backup media is 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 with Hints

### Preface

Two versions of these instructions are available; one with hints and one without. You can use either version to complete this exercise. Also, please don't hesitate to ask the instructor if you have questions.

All exercises of this chapter depend on the availability of specific equipment in your classroom.

The output shown in the answers is an example. Your output and answers based on the output may be different.

All hints are marked with a >> sign.

### Part 1 - 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/dir2** file system is mounted. **tar** does not back up file systems unless they are mounted. If it is not mounted, mount it.

```
>> # mount
```

```
>> # mount /home/teamxx/dir2 (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**, and **file4**.

```
>># cd /home/teamxx/dir2
```

```
>> # 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 names. List the contents of **tardata** to ensure all files are backed up.

```
>> # cd /home/teamxx/dir2
```

```
>> # tar -cvf /home/bkupxx/tardata . (note the dot as an argument)
```

```
» # 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 your directory to **/home/teamxx/mybkup**. Remove all the 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** backs 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/dir2
```

- \_\_\_ 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
```

## Part 2 - Using `cpio` (Optional)

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

- \_\_\_ 9. Change directory into **/home/teamxx/dir2/myjunk** and make sure your files are there.

```
>> # cd /home/teamxx/dir2/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/dir2
>> # find . | cpio -ov > /home/bkupxx/cpiodata
>> # cpio -itv < /home/bkupxx/cpiodata
```

- \_\_\_ 11. Since this backup was 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/mybkup
>> # rm -r /home/teamxx/mybkup/*
>> # cpio -idv < /home/bkupxx/cpiodata
>> # ls -lR /home/teamxx/mybkup
```

- \_\_\_ 12. Change your directory to **/home/teamxx/mybkup**. Remove all the 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/mybkup** directory. List the files in the **/home/teamxx/mybkup** 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** backs it up with a full path name format. Back up the contents of the file system to **cpiodata** using full path names.

```
» # find /home/teamxx/dir2/ | cpio -ov > /home/bkupxx/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 exercise



# Exercise 15. Security files

*(with hints)*

## Estimated time

00:30

## 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 sticky bits

## Introduction

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

## Common Student Problems

None.

## Known Hardware/Software Problems

None.

## Exercise Instructions with Hints

### Preface

Two versions of these instructions are available; one with hints and one without. You can use either version to complete this exercise. Also, please don't hesitate to ask the instructor if you have questions.

All exercises of this chapter depend on the availability of specific equipment in your classroom.

The output shown in the answers is an example. Your output and answers based on the output may be different.

All hints are marked with a >> sign.

## Part 1 - 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 of which **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? \_\_\_\_\_



A failed attempt is noted by a - (minus). A successful attempt is noted by a + (plus).

» # **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? \_\_\_\_\_

Login names that are not recognized will be logged as UNKNOWN.

» # **who /etc/security/failedlogin**

## Part 2 - SUID and sticky bit

- \_\_\_ 7. Create a listing of all SUID programs on the system in 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 > /tmp/allsuids
» # pg /tmp/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 u-s /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? \_\_\_\_\_

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**.

```
» $ su
Cannot su to root: Authentication is denied
```

- \_\_\_ 11. Since you cannot **su** to **root** to turn the SUID bit back on, login over yourself as **root** and set SUID on the program **/usr/bin/su**. Verify that the SUID bit is turned on.

```
» $ login root
» # chmod u+s /usr/bin/su
» # ls -l /usr/bin/su
```

- \_\_\_ 12. Log in over yourself as **teamxx** and **su** to **root**.

```
» # login teamxx
```

```
» $ 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 user, group, and others with the sticky bit turned on. Verify that the change was made.

```
» # exit
```

```
» $ pwd (You 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 **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 to first add and then remove a file named **sticky2**.

- Can you do it? \_\_\_\_\_

Yes. As a member of the staff group, teamyy has write authority to the stickydir directory.

- 

As this other **teamyy** user, try and remove the **teamxx** file named **sticky1**.

- Can you do it? \_\_\_\_\_

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 files in this directory, but cannot delete another user's files. The /tmp directory is the most widely used directory with this feature.

```
» $ su teamyy (where teamyy is a different user name from your login name).
```

```
»$ touch sticky2
```

```
»$ rm stickey2
```

```
» $ 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

## Exercise Review/Wrap-up

1. Who else can view the files in the **/etc/security** directory?

**Answer:** Members of the **security** group. If you do an **ls -ld** on the **/etc/security** directory, you see that **root** has read/write permissions and those in the **security** group have read-only permissions. Others has no permissions. You must determine who is a member of the **security** group because of the read-only permissions available to that group.

2. As a system administrator, how should you monitor the security control files like **/var/adm/sulog**?

**Answer:** How big the file grows. If space is a premium on your system, files like these should be analyzed, printed, and then reduced in size. You also want to monitor the contents to see who is **su**-ing to **root** in case someone gets **root's** password who shouldn't be using it.



# Exercise 16. User administration

*(with hints)*

## Estimated time

00:40 Parts 1-5

00:10 Parts 6-7

## 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 has two parts. Be sure to do only the currently assigned part of the exercise.

This exercise concentrates on the SMIT interface for creating and maintaining users and groups.

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

## Common Student Problems

In the **Introduction**, it is pointed out that only the options the students are to fill in are listed. All other options use the system default value as presented on the dialog screens. Cover this with students before the start of the exercise.

Also, in the **Introduction**, the students are asked to log in as **root** rather than switching to **root**. Cover this with the students before the start of the exercise; otherwise, the students might automatically log in as **teamxx** and switch to **root** as they have done throughout the week. This causes problems with some of the instructions.

The exercise instructions direct the students to create users **usera**, **userb** and **userc**. If two students are sharing an AIX system, and performing this exercise separately, they should create users **useraxx**, **userbxx**, **usercxx** where **xx** represents the student's initials. This ensures unique user IDs.

If any students are using the CDE interface they have to edit the **.dtprofile** in their login directory and uncomment the last line:

```
DTSOURCEPROFILE=true
```

The files **/etc/profile** and **\$HOME/.profile** are not read by default by CDE. By editing the **.dtprofile**, CDE will use **\$HOME/.profile**.

Step 30 has the students work with the **news** command. Although this command was not covered in lecture, it is self explanatory. Information on this facility is included in the **Exercise Review/Wrap-up** and the instructor may wish to cover this with the students.

The following are common mistakes that can be made while editing **/etc/security/login.cfg** in **Part 2** of this exercise:

- The new line and return codes must be preceded by a \ backward slash and not a / forward slash.
- There can be no return at the end of the customized login line under **default**. The instructions tell the student to let **vi** do the line wrap. To many students who are proficient typists, it is natural for them to want to press the return key.
- There must be double quotes around the login prompt information.
- There must be spaces around the equal sign after the word **herald**.

Should the student make any one of the above errors, they are all recoverable and the students are able to login and edit the file.



## Exercise Instructions with Hints

### Preface

Two versions of these instructions are available; one with hints and one without. You can use either version to complete this exercise. Also, please don't hesitate to ask the instructor if you have questions.

All exercises of this chapter depend on the availability of specific equipment in your classroom.

The output shown in the answers is an example. Your output and answers based on the output may be different.

All hints are marked with a >> sign.

## Part 1: 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**

>> **F3** back to the SMIT Users menu

>> Select **Add a User**

User NAME	[ <b>usera</b> ]
Another user can SU to USER?	<b>false</b>
Days to WARN USER before password expires	[ <b>3</b> ]
NUMBER OF PASSWORDS before a reuse	[ <b>2</b> ]
Weeks between password EXPIRATION & LOCKOUT	[ <b>1</b> ]

>> **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**.

» **F10** to exit SMIT.

» **# pg /etc/security/user**

\_\_\_ 4. To test the new user, log off and log in as **usera**.

• Could you log in? \_\_\_\_\_ **No**

• Why? \_\_\_\_\_

**usera does not have a password and therefore, is considered an invalid user.**

» **# exit**

» login: **usera**

usera's Password: <**Enter password**>)

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**? \_\_\_\_\_

**The \* character.**

• What does this mean? \_\_\_\_\_

**That usera is not a valid user as no password was set; therefore, there is no entry in /etc/security/passwd for usera.**

» **# 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? \_\_\_\_\_

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

» **# pwdadm usera**

- » Changing password for "usera"
- » usera's New password: <enter-new-password>
- » Enter the new password again: <enter-new-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? \_\_\_\_\_ .profile

» # 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 step 6 to test the reuse restriction set on the user ID from step 2. After you get the reuse error message, proceed to change **usera's** password to something different. After successfully logging in as **usera**, log out.

» # 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. Log in 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 log in as **usera**. You should not be able to. If you could, redo step 9 and test it again.

» **F10** to 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**. Change to **usera**'s environment at the same time.

• Could you? \_\_\_\_\_ Yes

• Why? \_\_\_\_\_

**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.

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 log out.

» Use **F3** to go back to the **Change/Show Login Attributes for a User** dialogue panel

User NAME [usera]

Number of FAILED LOGINS before [2]

user account is locked

» **OK or Enter.**

» **F10** to exit SMIT.

» # **exit**

\_\_\_ 13. Test the change by trying to log in 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 reset the failed login count for usera.

```
»login root
```

```
»# smit user
```

### Reset User's Failed Login Count

```
* User NAME [usera] +
```

```
» Press <Enter>
```

```
» F10 to exit SMIT.
```

\_\_\_ 15. Attempt to login at usera with the correct password. Was it successful?

```
»# exit
```

```
» login usera
```

\_\_\_ 16. Log in as **root** and change the failed login attempts limit 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.
```

## Part 2 - Group administration

- \_\_\_ 17. 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 assists 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.

» # **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.

- \_\_\_ 18. 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**

- \_\_\_ 19. 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** or **setgroups** or **id**

» \$ **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.

Select **List All Groups**

\_\_\_ 20. 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.

\_\_\_ 21. 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>

- \_\_\_ 22. Log off and back in as **userb**. (Because this is **userb**'s first login, you are prompted to change the password. Simply keep it the same. You should be familiar with what to do; therefore, the prompts are not 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? \_\_\_\_\_

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

» \$ **exit**

» login: **userb**

userb's Password: <enter password>

» \$ **id**

» \$**newgrp budget**

» \$ **id**

» \$**vi report**

(type a few lines)

» \$ **chmod g+w report**

» \$ **ls -l report**

» \$ **newgrp**

» \$ **id**

- \_\_\_ 23. 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 step above, this is **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? \_\_\_\_\_ No
- Why? \_\_\_\_\_

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.

» \$ **exit**

» login: **userc**

userc's Password: <enter password>



```
» $ vi /home/userb/report  
   (type your name)  
» $ exit
```

## Part 3 - Customizing the default .profile file

- \_\_\_ 24. 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
```

- \_\_\_ 25. 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 step 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
```

## Part 4 - Removing users

\_\_\_ 26. Log in as **root**. Before you remove **userb** from the system, locate the stanza for **userb** in **/etc/security/passwd**.

» # **pg /etc/security/passwd**

\_\_\_ 27. Remove **userb** from the system. Take the default to the option **Remove AUTHENTICATION** which is **yes**.

- What is this doing? \_\_\_\_\_

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.

» # **smit rmuser**  
User NAME [userb]

» **OK or Enter.**

» **F10** to exit SMIT

\_\_\_ 28. Page through the **/etc/security/passwd** file to ensure that the stanza for **userb** was removed.

» # **pg /etc/security/passwd**

\_\_\_ 29. 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**

## Part 5 - Communicating with users

- \_\_\_ 30. As **root**, edit **/etc/motd** and add to the file in all uppercase "**TODAY IS USERA'S BIRTHDAY. SURPRISE CAKE AT 11:00.**"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
```

- \_\_\_ 31. Display the message by logging out and back in as **usera**.

```
» # exit
» login: usera
    root's Password: <enter password>
```

- \_\_\_ 32. 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>
```

- \_\_\_ 33. 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
```

- \_\_\_ 34. To do this step 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, log in on both terminals using two different **teamxx** IDs. Perform the exercise from one terminal and look for the message on the other terminal. As **root**, send a note to all users on the system that the system shuts down in 30 minutes.

» # wall The system will be shutdown in 30 minutes

## Part 6 - Examine the security set up

\_\_\_ 35. As **root**, examine any of the security files you have not yet seen.

```
»$ su root
» # more /etc/passwd
» # more /etc/security/passwd
» # more /etc/security/user
» # more /etc/group
» # more /etc/security/group
» # more /etc/profile
» # more /etc/environment
» # more /etc/security/envIRON
» # who /etc/security/failedlogin
» # more /etc/security/login.cfg
```

## Part 7 - Customizing the login herald

- \_\_\_ 36. If you are sharing your machine with other students, you need to work together to configure the new login prompt. **ONLY ONE PERSON PER MACHINE CAN PERFORM THIS STEP.**

You can customize the login prompt that appears on an individual terminal or customize it so that all terminals use the same login herald depending on what stanza you change in **/etc/security/login.cfg**. In this step, you set up a global default herald.

The herald should read:

```
. Your Company Name
Unauthorized users will be prosecuted.
login:
```

First, make a backup of the **/etc/security/login.cfg** file. If you corrupt this file, you are not able to log in again.

```
» # cp /etc/security/login.cfg /etc/security/login.cfg.bk
```

- \_\_\_ 37. Edit the **default** stanza in **/etc/security/login.cfg** and add the herald line.

*Tip!* - Do not use <Enter> at what looks like the end of the line. Let **vi** wrap the line. The **\r** and **\n** are escape sequences that will signal to the <RETURN> and <NEW LINE> for you. Note that for some terminal emulations, the **\r** <carriage return> is displayed as a literal. On those emulations, the **\n** <new line> handles both the carriage return and new line feed.

When finished, save the file and log out.

```
» # vi /etc/security/login.cfg

default:
    sak_enabled = false
    logintimes =
    logindisable = 0
    logininterval = 0
    loginreenable = 0
    logindelay = 0
    herald = "\n\n YOUR COMPANY NAME\r\nUnauthorized users will be
    prosecuted..\r\nlogin: "

» # exit

» $ exit
```

- \_\_\_ 38. Check to see if the login prompt is what you expect. You must be using an ascii interface to see the effect of the change.

For students using a local console: If you are using an ASCII screen, your new herald should be displayed. If you are using CDE, you cannot see your changes unless you select the **Option** button and selection **Command Line**. If you don't see your new herald, then check your entry in **/etc/security/login.cfg**.

For student using remote access, attempt a new remote connection. For example you might use a telnet protocol either via a telnet command or via PuTTY.

## **End of exercise**



## Exercise Review/Wrap-up

1. There are many ways to prevent other users from accessing a particular user account on the system. Two ways demonstrated in this exercise are not allowing others to **su** to the user account and setting the number of failed logins. Did you notice any other attributes that would enforce the same kind of action?

**Answer:** The following are similar or more restrictive:

- a. User can log in remotely - If marked false, the user account cannot be remotely accessed with the **telnet** or **rlogin** commands.
  - b. Allowed login times - Specifies time of day and days of week the user is allowed to log in. Enter a comma separated list of day,time.
  - c. Valid ttys - Key in a list of terminals that can access this user account.
  - d. User can log in - This is more like the account locked feature. This option indicates whether the user can log in using the login command.
2. When adding a user to a group, does the group have to already exist?

**Answer:** Yes. As you add users to a group, the user name is automatically placed in the **/etc/group** file after the associated group name. If that group name is not in this file, the task fails.

3. In Step 11, **root** could **su** to **usera** even though **usera** has the option `Another user can SU TO USER?` set to **no**. Take a moment and log in as **teamxx**. Now try to **su** to **usera**. You should receive the messages:

```
You are not allowed to su to this account. Cannot su to usera : account is not accessible.
```

4. In Step 33, students work with the **news** command. The **news** command writes system news items to standard output. This keeps you informed of news concerning the system. Each news item is contained in a separate file in the **/var/news** directory. Users should include the **news -n** command in their **/etc/profile** to display news each time they log in. Any user having write permission to the **/var/news** directory can create a news item.



# Exercise 17. Scheduling

*(with hints)*

## Estimated time

00:30

## 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 log off 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.

## Common Student Problems

The most common problem is the slow typist or the students that issue commands to run five or ten minutes from the time they issued them and then get impatient waiting. Help both types of students cope with these issues during this exercise.

If students execute the steps in instruction 23 too quickly in succession, they could lock the screen because the **cron** update may not have completed the first edit before trying to do the second edit.

AIX V4.2 and later uses a version of the BSD mail daemon which may cause problems when performing some of the steps in this exercise. The BSD mail daemon assumes the use of DNS rather than **/etc/hosts**. Thus, if **/etc/hosts** is used instead, it takes quite a while for mail to appear. To fix this situation, it is necessary for the **/etc/hosts** file to contain entries which look like the following:

```
10.0.0.1      sys1.    sys1
```

To improve performance further, do the following:

- **vi /etc/netsvc.conf**
- Add the line: `hosts=local` and then save the file
- **chmod 400 /etc/netsvc.conf**

In the June 2005 update of these materials, a series of steps that depended on the student's ability to view the LEDs of the lab system being used were rewritten to facilitate offering of this course using a wider range of hardware platforms and in a wider range of environments, particularly with remote lab systems.

## Exercise Instructions with Hints

### Preface

Two versions of these instructions are available; one with hints and one without. You can use either version to complete this exercise. Also, please don't hesitate to ask the instructor if you have questions.

All exercises of this chapter depend on the availability of specific equipment in your classroom.

The output shown in the answers is an example. Your output and answers based on the output may be different.

All hints are marked with a >> sign.

### Part 1 - Using at

1. Log in as **teamxx**. Submit a single **at** job that immediately echoes the message "Running an **at** command." and then echoes 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 process and forward the mail. Keep checking for new mail.

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



#### Hint

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

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

- \_\_\_ 3. Experiment with the time specifications of **next week** and **next month**. After entering jobs to be executed “next week” and “next month,” list the **at** jobs waiting to run and check to see whether the jobs you just submitted appear in the list.

```
» $ at now next week
```

```
echo $PWD
```

```
<ctrl-d>
```

```
» $ at now next month
```

```
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 returns 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 **at** queued jobs, then wait for the execution of your two jobs.

```
» $ 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.
```

- What can you deduce from the results you obtained in this exercise step?

---

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.

- \_\_\_ 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 content of a 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 job 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 that there are no entries.

- What security implications does this have? \_\_\_\_\_

Since this file exists, and it has no entries, anybody can use **at**.

For this exercise we won't modify this file, but if we were to, we would put one userid on each line to specify each user for whom we wanted to deny access. Notice, also, that there is no **at.allow** file. Exit the **root** 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
```



## Part 2 - Using batch

- \_\_\_ 8. As **teamxx**, submit a job to **batch** that outputs the result of the **date** command to your screen after waiting 60 seconds (**Hint**: Use the command **sleep 60**). Remember, it is submitted exactly like an **at** job but without a date and time because the time at which the job will be run is determined by system load. Unless your system is very busy, you should see the output from your **batch** job quite soon. Wait for your job to run.

```
» $ batch
sleep 60
date > /dev/xxxx
<ctrl-d>
```

## Part 3 - Using crontab Files

- \_\_\_ 9. Switch to **root**. Switch to 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. The expected result is that **cron.deny** exists, but contains no user names, and that **cron.allow** does not exist.

```
» $ su
root's Password: (enter password)

» # cd /var/adm/cron

» # pg cron.deny

» # ls -l
```

- \_\_\_ 10. Return to **teamxx** and change to your home directory.

```
» # exit

» $ cd
```

- \_\_\_ 11. Create a zero length file called **datefile** in the **/tmp** directory.

```
» $ touch /tmp/datefile
```

- \_\_\_ 12. In your home directory, create a file called **cron00** (which will be used as a **crontab** file) which specifies that the output of the **date** command will be appended (using the **>>** operator) to the file **/tmp/datefile** every minute from now on. Remember to use full path names for commands used in **crontab** files. Remember, there can be

NO blank lines in the file including lines created by pressing **Enter** after the last entry.

```
» $ vi cron00
* * * * * /usr/bin/date >> /tmp/datefile
```

- \_\_\_ 13. Place your **crontab** file in the **crontabs** directory via the **crontab** command. Then, use the appropriate option with **crontab** to look at the **crontab** entry that you created.

```
» $ crontab cron00
» $ crontab -l
```

- \_\_\_ 14. Use the **-f** option of the **tail** command to check for additions to the file **/tmp/datefile**. If you have done the last few steps correctly, you should see an addition to the file in 1 minute, another in 2 minutes, and so on. Wait to see 3 or 4 additions to the file, then terminate the **tail -f** session.

```
» $ tail -f /tmp/datefile
» ^c
» $
```

- \_\_\_ 15. As **teamxx**, use the appropriate option of the **crontab** command to remove your current **crontab** file. Verify that it has been removed.

```
» $ crontab -r
» $ crontab -l
```

## Part 4 - Optional

The remaining exercise steps are *optional*. Complete them if there is time available in this lab session and if you would like more practice working with AIX scheduling facilities.

- \_\_\_ 16. Continuing 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 that 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
```
- \_\_\_ 17. Test your script. If you don't get any output, change the blocksize to 1.
- ```
» $ sizechk
```
- \_\_\_ 18. 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
```

- \_\_\_ 19. Verify the system date and time. Create a file called **cron01** that causes **sizechk** to be invoked every minute for the next 5 minutes for today only. Remember to use full path names for commands used in **crontab** files. Remember, there can be NO blank lines in the file including lines created by 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.)

- \_\_\_ 20. 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

- \_\_\_ 21. 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

- \_\_\_ 22. 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. Wait a moment, and then verify that this line has been added to your **crontab**. 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
```

\_\_\_ 23. Switch to **root**. Examine the file **/etc/inittab** and notice how the **cron** daemon actually gets started.

```
» $ su
root's Password: (enter password)
# pg /etc/inittab
```

- **cron** will respawn if it is not running. Why is this important?

---

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.

Return to your **teamxx** ID.

```
» # exit
```

## End of exercise

## Exercise Review/Wrap-up

1. How many **crontab** files can a user have?

**Answer:** Each user can only have one **crontab** file

2. Why are **crontab** files given the name of the user id rather than letting a user name their own file?

**Answer:** To ensure that no one overwrites someone else's **crontab** file accidentally by giving it the same name that another user has used.

3. What is the major difference between **at** and **cron**?

**Answer:** **at** should be used for one-time jobs. **cron** is used for jobs that must be run multiple times.

4. What happens if you submitted an **at** job to run at midnight and the system goes down at 23:00 and doesn't come back up until 8:00 the next morning?

**Answer:** Luckily, because the **at** job is stored in the **/var/spool/cron/atjobs** directory, it should run as soon as the system comes up.

5. What happens if you submitted a **cron** job to run at midnight and the system goes down at 23:00 and doesn't come back up until 8:00 the next morning?

**Answer:** Unlike **at** and **batch**, **cron** jobs do NOT execute when the system comes back up. You need to know if your system crashed and check to see if there were any **crontab** files that should have run that did not.

6. Using **at**, where does standard out go by default?

**Answer:** The screen. You have to redirect standard out with the commands you specify to **at**.

# Exercise 18. Printers and queues

*(with hints)*

## Estimated time

00:40

## What this exercise is about

This exercise is designed to provide the student with the opportunity to configure and manage printers and queues using AIX Print Spooling.

## 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 AIX system, 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.

## Known Hardware/Software Problems

This lab is designed to run without any physical printers, either local or remote. To support working with print queues, the students need to define a remote printer with the client also being the print server. There are steps in the exercise which cannot be done in that situation. In others, specifically the print status displays, they get error messages about the print server not having the local printer to serve to the client. The students are still able to complete most of the lab but they are not able to see the job print out. The queues can still be created, jobs can still be sent to the queues and the queues can still be managed.

Some classrooms with local systems have physical printers, either local or remote. For those environments, if you wish to see printouts, you need to customize Part 1 of the lab to use the local environment information. For example you need to know the type of printer, or the address of the network attached printer or the address of the server to which the printer is attached. If the printer is server attached, you need to configure that server to support the student systems acting as print clients. If using physical printers, before starting this exercise it would be a good idea to check all printers for a reasonable supply of paper. Occasionally, the paper jams and causes delays. If this occurs and the jam can't be quickly resolved, suggest that the people on the system with the jammed printer team up with another group who are not having paper problems.

There is a shell script that is used in the **Optional Exercises**. It should be located in the **/home/workshop** directory. The shell script is named **lab6**. This directory and the files in it should have been loaded prior to the start of class. If they are not, you can easily create this script. Below are the contents of the script. Be sure to make it executable. Since it contains a subsystem command, only **root** can execute it.

```
#!/usr/bin/ksh
echo "Working, please wait .\c"
stopsrc -s qdaemon 2>/dev/null 1>/dev/null
echo ".\c"
echo "\n\n:\n" >>/etc/qconfig 2>/dev/null
echo ".\c"
```

If students request this script, refer them to Appendix D in the *Student Guide*.



## Exercise Instructions with Hints

### Preface

Two versions of these instructions are available; one with hints and one without. You can use either version to complete this exercise. Also, please don't hesitate to ask the instructor if you have questions.

All exercises of this chapter depend on the availability of specific equipment in your classroom.

The output shown in the answers is an example. Your output and answers based on the output may be different.

All hints are marked with a >> sign.

### Part 1 - Add a local printer and a queue

- \_\_\_ 1. If your AIX system has printer port(s) available, then define a local printer (**this Part 1**) and then proceed to Part 3.

If your AIX system does not have printer port(s) available (possibly in a remote LPAR environment), then create a file device queue instead (**Part 2**) and then proceed to Part 3.

- \_\_\_ 2. Log in and **su** to **root**. Check that the AIX Print Spooling system is activated. 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 to the *Part 2 - Installing Printer Support Software*.

```
>> login: teamxx
      Password: <password-for-teamxx>
      $ su
      root's Password: ibmaix

      # smit
      Print Spooling ->
      AIX Print Spooling ->
      Add a Print Queue
```

You then get a series of pop-up menus that prompt you for selections of where the printer is 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 **local** for the **ATTACHMENT TYPE**
- 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. This notification window takes you through the SMIT software installation screens. Use these to install the printer support from the installation media or in the course environment from **/usr/sys/inst.images**. When prompted for the input device, press **F4** for a listing of valid devices. Select the installation device, then press **Enter**.

You are 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. When the printer drivers you need are selected, press **Enter**.
- Ensure that **Preview Only** is set to **NO**. Press **Enter** to install the software. This takes a couple of minutes.

Now, continue with the following steps:

- Select **parallel** for the **Printer Interface**
- Select **ppa0 Standard I/O Parallel Port Adapter** for the **Parent Adapter**

This brings you to the dialog screen:

\*Name of new PRINT QUEUE to add                      [quality]

\_\_\_ 3. Using SMIT, add a second queue to the printer and name it **draft**.

» # **smit**

**Print Spooling ->**  
**AIX Print Spooling ->**  
**Add a Print Queue**

Once again, you are presented with a series of pop-up menus (similar to the ones in the previous step) that prompt you for selections of where the printer is 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 **local** for the **ATTACHMENT TYPE**
- Select the manufacturer of your printer, like **IBM**
- Select the printer model you have, like **4201-2**  
(Select the same printer that you selected in the previous step).

The next pop-up prompts you to either **Add a new printer or select the existing printer below**. Select the existing printer.

This brings you to the dialog screen:

\*Name of new PRINT QUEUE to add [draft]

\_\_\_ 4. Exit SMIT and display the status of your print queues.

» Use F10 to exit SMIT

»# **lpstat**

## Part 2 - Add a file device queue

This part provides an alternative to working with a printer device in partitioned machine environments where there are no serial or parallel port that can be used for a printer definition.

- \_\_\_ 5. Log in and **su** to root.
- \_\_\_ 6. Using SMIT, configure an ASCII queue (called **quality**) with an attachment type of file and a printer type of other (generic printer). The make the requested /dev device name a value of **null**.

Any “print” jobs sent to this queue (if in a READY status) is sent to /dev/null. You disable the queues, thus simulating a printer problem. In that state you are able to practice the same print queue management procedures as would be used with any print queue.

»

» **smit**

**Print Spooling ->**  
**AIX Print Spooling ->**  
**Add a Print Queue ->**

- Select **file** for the **ATTACHMENT TYPE**
- Select **other** for the **Type of Remote Printing**
- Confirm that you want a printer type of **generic**
  - \* Name of existing FILE in /dev directory [**null**]
- Press **Enter**
  - Names of NEW print queues to add [**quality**]  
ASCII
- Press **Enter**.

- \_\_\_ 7. Using SMIT, add a second queue name it **draft**.  
Use the exact same procedure as described in the previous step.
- \_\_\_ 8. Exit SMIT and display the status of your print queues.

» Use F10 to exit SMIT

- \_\_\_ 9. Bring down both the **quality** and **draft** queues. Check the status of your queues to be sure that both queues are down.
  - » **# disable quality**
  - # disable draft**
  - # lpstat**

## Part 3 - Check the queue

\_\_\_ 10. 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? \_\_\_\_\_ **quality**

» # **pg /etc/qconfig**

\_\_\_ 11. Using the **qchk** command, check the status of your newly created queues. They should be marked READY.

- Which queue is listed first? \_\_\_\_\_ **quality**
- Which queue do you think is the default queue? \_\_\_\_\_

The one that is listed first in the **/etc/qconfig** file.

» # **qchk -A**

\_\_\_ 12. Using SMIT, make the **draft** queue the system default queue.

» # **smit**

**Print Spooling ->**

**AIX Print Spooling ->**

**Manage Print Queues ->**

**Set the System's Default Print Queue**

\*System DEFAULT QUEUE name [draft]

\_\_\_ 13. Exit out of SMIT and check the status and order of your queues.

» **Press F10** to exit SMIT

# **qchk -A**

\_\_\_ 14. 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 **< : >**.
- At the command entry prompt, type **wq** which will save and exit.

- \_\_\_ 15. 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
```

## Part 4 - Change the characteristics of a queue

If you are working with a remote queue, you are not able to set default print jobs characteristics or the print queue discipline which are for local print queue management. If that is your situation, then skip the next two steps.

- \_\_\_ 16. If you do not have a physical printer in the lab, you are not able to see the effects of your changed job attributes, but it is still useful to know where to set these defaults.

Using SMIT, change the attributes of the **quality** queue by adjusting some printer characteristics. These may be different depending on the printer used. Try making some changes. Basically, change the look of the printed output. Here is a list of some changes you might try (depending on your printer):

- Use double spacing
- Set a top margin of 20 lines
- Specify 50 lines per page
- Use double high printing
- Provide a separator page at the head of the job

» # **smit**

**Print Spooling ->**

**AIX Print Spooling ->**

**Change/Show Print Queue Characteristics**

\*PRINT QUEUE name [quality]

At the pop-up menu you are provided with 4 choices. Select choice **2, Default Print Job Attributes**. That gives you a panel of attributes to change. Some possibilities are:

|                    |                              |
|--------------------|------------------------------|
| DOUBLE SPACING?    | [yes]                        |
| TOP MARGIN (lines) | [20]                         |
| LINES PER PAGE     | [50]                         |
| SEPARATOT PAGES    | [header for job; no trailer] |
| DOUBLE-HIGH print? | [yes]                        |

- \_\_\_ 17. If you have physical printers, 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
```

\_\_\_ 18. Take the **draft** queue down, if not already down.

```
» # disable draft
# lpstat
```

**-OR-**

```
# smit
```

**Print Spooling ->**

**AIX 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.

\_\_\_ 19. Change the queue characteristics 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 ->**

**AIX 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**.

Press **F10** to exit SMIT.



\_\_\_ 20. Send the file **/etc/security/user** to the **draft** queue and check to see that it is in the queue.

Next, send the **/tmp/printxx** file you created in the previous exercise to the **draft** queue and again display the job queues.

- Which job is scheduled to run first after the queue is brought back up?

\_\_\_\_\_ **/tmp/printxx**

- Why? \_\_\_\_\_

It is the smaller of the two files and the queuing discipline has been set up as shortest job next.

```
» # qprt /etc/security/user
# lpstat
# qprt /tmp/printxx
# lpstat
```

## Part 5 - Manage jobs in queues

- \_\_\_ 21. Bring down the **quality** queue, if not already down. Check the status of your queues to be sure that both queues are down.

```
» # disable quality
# lpstat
```

- \_\_\_ 22. 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
```

- \_\_\_ 23. Check the order of the print jobs waiting in the two queues. They should all have the same priority value (Pri). In the **quality** queue, the **/etc/filesystems** file should be behind the **/etc/qconfig** file, because it was submitted later.

Change the print priority of the **/etc/filesystems** job to 25 so that it becomes the first print job scheduled for the **quality** queue.

```
» # lpstat -t
# qpri -#<job number> -a 25
# qchk -L -P quality

-OR-

# lpstat -t
# smit
Print Spooling ->
AIX Print Spooling ->
Manage Print Jobs ->
Prioritize a Print Job
    *Print JOB NUMBER          [] (Use F4 to list)
    *Priority LEVEL             [25]

Press Enter.

Press F10 to exit SMIT.

# qchk -L -P quality
```

- \_\_\_ 24. Let us 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 ->**

**AIX 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
```

- \_\_\_ 25. 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 ->**

**AIX 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.
```

```
# lpstat
```

- \_\_\_ 26. 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 then bring up your two queues.

```
» # qhld -#<job number>
# lpstat
# enable quality draft
# lpstat
```

**-OR-**

```
# smit
```

- **Print Spooling ->**  
**AIX 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]
```

- **F10** to exit SMIT.

```
# lpstat
```

- \_\_\_ 27. 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 ->**

**AIX Print Spooling ->**

**Manage Print Jobs ->**

**Hold / Release a Print Job**

Hold or Release jobs

[**release**]

Print JOB NUMBER

[**job number**]

Press **Enter**.

Press **F10** to exit SMIT.

## Part 6 - Add a remote print queue (optional)

- \_\_\_ 28. Work with another team to do remote printing. One team acts as the print server and the other will act as the print client. Record, below, the IP address of the other team's AIX system (not your own).
- 

```
>># host $(hostname)
```

- \_\_\_ 29. Each team log in and **su** to root
- \_\_\_ 30. On both platforms, add a name resolution entry to you local hosts file for the other team's machine if not already resolvable.

```
>># host <hostname of other team's system>
```

>> if there is no resolution, then continue with the following steps:

```
>># smit hosts
```

### Add a Host

```
* INTERNET ADDRESS (dotted decimal)    [other team IP address]
* HOST NAME                             [other team hostname]
```

>> press Enter

>> **F10** to exit SMIT

- \_\_\_ 31. On the server platform, using SMIT, add print access for the client system and start the print server subsystem (**lpd** daemon).

```
>> smit
```

**Print Spooling ->**

**AIX Print Spooling ->**

**Manage Print Server ->**

**Add Print Access for a Remote Client**

```
Name of the REMOTE CLIENT                [client-hostname]
```

- Press **Enter**.
- **F3** back to the **Manage Print Server** menu.
- Select **Start the Print Server Subsystem**.
- Take the defaults.
- Press **Enter**.
- **F10** to exit SMIT.

- \_\_\_ 32. On the client system, using SMIT, configure a remote print queue (called **remote**) with your server systems hostname as the server with and a server print queue name of **quality**. Define it with a timeout value of 1 minute.

» **smit**

**Print Spooling ->**

**AIX Print Spooling ->**

**Add a Print Queue ->**

- Select **remote** for the **ATTACHMENT TYPE**
- Select **standard processing** for the **Type of Remote Printing**

|                                    |                            |
|------------------------------------|----------------------------|
| Name of the QUEUE to add           | [ <b>remote</b> ]          |
| HOSTNAME of the remote server      | [ <b>server-hostname</b> ] |
| Name of QUEUE on the remote server | [ <b>quality</b> ]         |
| Backend TIMEOUT period             | [ <b>1</b> ]               |

- Press **Enter**.

- \_\_\_ 33. On the client system, send the files **/etc/motd** and **/etc/filesystems** to the **remote** queue.

```
» # qprt -Premote /etc/motd
# qprt -Premote /etc/filesystems
```

- \_\_\_ 34. On the client system, check to see the status of the print jobs.

```
» # qchk -A
```

- \_\_\_ 35. On the server, see if the remote print jobs are in the **quality** queue.

```
» # qchk -A
```

- \_\_\_ 36. Bring up your two local queues.

```
» # enable quality draft
```

## End of exercise

## Optional Exercise

\_\_\_ 37. As the **root** user, run the script **/home/workshop/lab6**. This script creates 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 is generated. Make sure the resource mentioned in the error message is working and then try printing a file again.

```
» # ksh /home/workshop/lab6
# qprt /etc/motd
```

The error message you 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 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 Review/Wrap-up

1. Ask if everyone has the AIX Print Spooling active and not the System V Print Spooling.
2. Ask if anyone had to install the printer software.
3. Ask the students what they thought would happen if they tried to change the print characteristics of a queue to something that is not physically supported by the printer.

**Answer:** It basically ignores the change.

4. Ask how can you tell what is the default queue is.

**Answer:** You could look in the `/etc/qconfig` file. The first queue listed is the system default queue.

5. Ask how do you send something to the default queue.

**Answer:** Simply use one of the print commands followed by the name of the file.

6. Ask what happened to the order of the jobs in the **draft** queue when the queuing discipline was changed to shortest job next.

**Answer:** They moved around so that the shortest job was next in line to print.

7. Ask the students what they observed relative to the order for the jobs in the **draft** queue when the longest job, `/etc/security/user`, was given a higher priority.

**Answer:** It became the first in line to print even though it was the longest job in the shortest job next queue. Thus, priorities take precedence over type of queue.



# Exercise 19. Networking

*(with hints)*

## Estimated time

00:40

## 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 NIM-based installation/migration exercise and to provide remote access to the lab systems. In this exercise, you record the existing network configuration and then you remove that configuration. At that point you only have access to the system from the system console (either a local terminal or via an HMC virtual console). From the console, you configure TCP/IP using the same values as it had before.

## Common Student Problems

During the initial machine setup, TCP/IP was configured. In this exercise, students first de-configure TCP/IP and then reconfigure it.

## Known Hardware/Software Problems

If no one can `telnet` or `ftp` to any other system in the room or if the two commands are extremely slow in execution, check for the existence of the `/etc/resolv.conf` file on the system.

For Ethernet, be sure to tell the students which cable type to use in the lab system. In most cases they can select n/a (the adapter connection type can be auto-detected) or tp. Some local system environments might be using BNC, though that would be rare these days.

## Exercise Instructions with Hints

### Preface

Two versions of these instructions are available; one with hints and one without. You can use either version to complete this exercise. Also, please don't hesitate to ask the instructor if you have questions.

All exercises of this chapter depend on the availability of specific equipment in your classroom.

If there are multiple interfaces on your system, your instructor identifies which interface to use for this exercise. If you are in an environment where the AIX system is accessed remotely, be sure to not deconfigure the interface used for that purpose.

The output shown in the answers is an example. Your output and answers based on the output may be different.

All hints are marked with a >> sign.

## Part 1 - Deconfigure TCP/IP

- \_\_\_ 1. If you are using a local non-partitioned system, login to the locally attached system console as **teamxx** and **su** to **root**. Then go to step 6.

>> \$ su  
#

- \_\_\_ 2. If you are using a remote partitioned system, access your system's HMC by starting a Web browser and using the HMC's IP address as the URL. If you do not have this IP address, ask your instructor.

>> Start a Web browser, the Firefox Web browser should be available on the eLab Web Interface. The Firefox application icon should appear in the Applications box.

>> Double-click the **Firefox** icon.

(click No, to make this your default browser )  
# https://##.##.##.##

(click OK, to Accept the certificate temporarily for the session)

- \_\_\_ 3. Start the Hardware Management Console application by clicking the Launch link. Log into your system HMC as **hscroot**. and password **abc1234**. Locate your machine and the logical partition which you are assigned.

>> Click the link to launch the HMC application:

Log on and launch the Hardware Management Console Web application

Userid: hscroot

Password: abc1234

Click logon or press < Enter >

Click **Not Now** in response to the prompt: "Do you want Firefox to remember this password"

You may also get an error about pop-ups being disabled. Click OK on the error box. In Mozilla, pull down the **Tools** menu, select the **Options** item, click on the **Content** icon, and uncheck the **Block Popup Windows** option. Click **OK**. Then repeat the above sequence.

If prompted to accept security certificates, respond by clicking Yes.

You may also get a screen entitled "**Choose a Disconnected Session**". Do not use someone else's disconnected hscroot session. Click on the "**New Session**" button and obtain a brand new hscroot session.

- » Expand the **Systems Management** selection in the Navigation window.
- » Expand the **Servers** selection in the Navigation window.
- » Click the server for your assigned LPAR. You may need to ask your instructor. All the configured lpar's will appear in the *Contents* window.

- \_\_\_ 4. Start a virtual console window for your assigned partition. This acts as your system console during the exercise.

» In the contents window locate your partition and then:

- a) Select your lpar by clicking the Select box to the left of the lpar name.
- b) Click on the arrows which appeared to the right of the lpar
- c) Drag the mouse to **Console Window**, and then click **Open Terminal Connection**
- d) After a short delay a window should appear with an AIX login prompt

- \_\_\_ 5. Log in to your assigned partition as **teamxx** and **su** to **root**. This acts as your system console during the exercise.

```
»$ su root
#
```

- \_\_\_ 6. Collect the current network configuration information.

IP address: \_\_\_\_\_

IP address name resolution: \_\_\_\_\_

network mask: \_\_\_\_\_

default gateway: \_\_\_\_\_

» To collect the information run the following commands:

```
# netstat -in | grep en0
# hostname
# host $(hostname)
# lsattr -El en0
# netstat -r | grep default
```

- \_\_\_ 7. Identify a partner team with whom you validate network connectivity (this may have been assigned by your instructor or this could be left to you to work out with other students). Exchange IP address and hostname information with that partner team. Record their configuration information below:

IP address: \_\_\_\_\_

IP address name resolution: \_\_\_\_\_

- \_\_\_ 8. **ping** your partner team's system to verify this currently works.

» # **ping <IP address or hostname of other system>**

- \_\_\_ 9. Detach both the en0 and et0 interfaces.

» # **ifconfig en0 detach**

# **ifconfig et0 detach**

- \_\_\_ 10. Remove your network interface (en0) and network adapter (ent0) from the ODM.

»# **rmdev -dl en0 -d**

# **rmdev -dl ent0**

- \_\_\_ 11. Set your hostname to a null string and rename **/etc/hosts** to **/etc/hosts.bak**

» # **hostname ""**

# **mv /etc/hosts /etc/hosts.bak**

- \_\_\_ 12. Run the configuration manager so that it rebuilds the adapter and interface you just deleted. Once this is complete, you are ready to proceed with the TCP/IP configuration.

»# **cfgmgr**

- \_\_\_ 13. **ping** your partner team's system to verify that you cannot communicate.

»# **ping <IP address or hostname of other system>**

- \_\_\_ 14. Display the network interfaces to show that the interface is not configured.

»# **netstat -in (you should only see the loopback interface)**

## Part 2 - Configure TCP/IP

- \_\_\_ 15. 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 interface (ex.en0) from the **Available Network Interface** pop-up menu.

|                                |                          |
|--------------------------------|--------------------------|
| *HOSTNAME                      | [ <b>your hostname</b> ] |
| *Internet Address              | [your IP address]        |
| *Network MASK (dotted decimal) | [your netmask]           |

**F10** to exit SMIT.

- \_\_\_ 16. Verify that the above action automatically set the hostname and the name resolution for your own system.

»# **host \$(hostname)**

- \_\_\_ 17. Add an entry for your partner system in the **/etc/hosts** file. 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) | [partner IP address]        |
| *HOST NAME                         | [ <b>partner hostname</b> ] |

**F3** to return to the **Hosts Table (/etc/hosts)** menu.



## Part 3 - Testing the configuration

- \_\_\_ 18. Use the network command, **ping**, to test connectivity to your default gateway by IP address. If you can not get a response, check your en0 address and mask for correctness.

```
> # ping <gateway IP address>  
<ctrl-c> (to stop the output)
```

- \_\_\_ 19. Use the network command, **ping**, to test connectivity to your partner system. **ping** by IP address and then by host name. If you can not get a response back 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 <partner hostname>  
<ctrl-c> (to stop the output)  
# ping <partner IP address>  
<ctrl-c> (to stop the output)
```

- \_\_\_ 20. Execute the **host** command for the hostname of your partner system and, again, for the IP addresses of your partner system.

```
> # host <hostname of partner system>  
# host <ip address of partner system>
```

- \_\_\_ 21. Execute the **netstat -i** command to display the status of the communication adapter(s) on your system.

```
> # netstat -i
```

## Part 4 - Using telnet

- \_\_\_ 22. 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.

```
» # telnet <hostname of partner system>
login: root
root's Password: (enter password)
# hostname
```

- \_\_\_ 23. While remotely logged in to your partner's system, create a file named **sysxfile** where **x** is the number of your system. You 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
```

- \_\_\_ 24. Close the connection and verify that you are back on your local system by executing **hostname**. You should see your host name.

```
» # <ctrl-t>
telnet> close
# hostname

-OR-

# <ctrl-d>
# hostname
```

## Part 5 - Using ftp

- \_\_\_ 25. Transfer the file, **sysxfile**, from your partner's system to your system renaming it to **ftpdoc**. When prompted to log in, log in as **root**.

```
» # ftp sysy (where sysy is where your partner's system hostname would be)
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
```

- \_\_\_ 26. 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>
```

- \_\_\_ 27. 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: AIX 5L V5.3 installation

*(with hints)*

## Estimated time

Unknown

## What this exercise is about

This exercise provides an opportunity to do an installation of the base operating system of AIX 5L V5.3. The type of installation is a complete overwrite installation 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 5L V5.3 operating system

## Introduction

This exercise is designed to give you experience in installing a system as if you had just received a new machine without anything on it. You should be using the same type of distribution media you would get from IBM.

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.

## Requirements

- A local system capable of running AIX 5L V5.3 with a CD-ROM drive attached to it and at least 128 MB of memory and 2.2 GB of physical disk space
- Installation media (CD)

- An ASCII terminal connected to one of the built-in serial ports on the system or a graphics display station directly attached to the system that has a CD-ROM drive attached to it.

## Common Student Problems

If the exercise equipment includes graphics displays directly attached to the pSeries/AIX platform, then encourage the students to select that as the console during installation. This makes the optional appendix exercise relating to serial devices go a little bit smoother. If they don't select the graphics display as the console, you need to help them get it configured after the installation is complete.

Sometimes students have problems with the menus and figuring out what to type where. The entry will be shown next to the Choice: line. If a default is shown, it looks like this:

**Choice** [0] :

The student's choice should still be placed after the colon. If the enter key is pressed with no choice made, what is in the brackets will be the selection. That which is shown in the brackets is the default.

## Known Hardware/Software Problems

The target disk should not be smaller than 2.2 GB. The classroom systems are likely have disk drives larger than this. So, the students should be able to load AIX on a single disk.

## Exercise instructions

### Preface

There is only one version of these instructions available; there is not a separate section “with Hints” as the other exercises have. All instructions are included.

All exercises of this chapter depend on the availability of specific equipment in your classroom.

- \_\_\_ 1. If your system is already on, log in 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 then shuts 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 CD-ROM drive.

Place the first Installation CD in the CD-ROM drawer and push the drawer in.
- \_\_\_ 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. Press **F5** after you see the keyboard icon on the screen. The system will begin booting from the installation media.
  
- \_\_\_ 6. After about five minutes, a screen appears on all directly attached terminal or display devices asking you to define the system console. Notice that you are given these instructions in many 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. The **Welcome to Base Operating System - Installation and Maintenance** menu will be displayed. Select item 2, **Change/Show Installation Settings and Install**.

```
Welcome to Base Operating System
Installation and Maintenance
```

Type the number of your choice and press Enter. Choice is indicated by >>>.

```
1 Start Install now with Default Setting
>>> 2 Change/Show Installation Settings and Install
3 Start Maintenance Mode for System Recovery

88 Help ?
99 Previous Menu

>>> Choice [1]: 2
```



- \_\_\_ 9. The **Installation and Settings** menu is displayed. Select item 1, **System Settings**.

### 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)  
Keyboard Type ..... Default

#### 3 More Options (Desktop, Security, Kernel, Software, ...)

0 Install AIX with the current settings listed above.

88 Help ?

99 Previous Menu

>>> Choice [0]: 1

- \_\_\_ 10. The **Change Method of Installation** menu is displayed. You are now given the opportunity to change the method of installation. Select item 1, **New and Complete Overwrite**.

### 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**

- \_\_\_ 11. The **Change Disks Where You Want To Install** menu is displayed. You are now 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 2.2 GB, as long as it is marked bootable. If not, select both drives or if there isn't a single drive with greater than 2.2 GB on it, select both drives.

#### Change Disks 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  | 2063      | rootvg    | yes      |
| 2     | hdisk1 | 04-C0-00-5,0  | 2063      | rootvg    | yes      |

>>> 0 Continue with choices indicated above

55 More Disk Options

66 Disks not known to Base Operating System Installation

77 Display More Disk Information

88 Help ?

99 Previous Menu

>>> Choice [0]: <Enter>

- \_\_\_ 12. You are taken back to the **Installation and Settings** menu. Select item 2, **Primary Language Environment Settings (AFTER install)**.

## 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)  
Keyboard Type ..... Default

### 3 More Options (Desktop, Security, Kernel, Software, ...)

0 Install AIX with the current settings listed above.

88 Help ?

99 Previous Menu

>>> Choice [0]: **2**

- \_\_\_ 13. Change the language environment and code set for the language you wish to have after installation. The menu that is displayed looks like this:

Type the number for the Cultural Convention (such as date, time, and money), Language and Keyboard for this system and press Enter, or type 106 and press Enter to create your own combination.

|    | Cultural Convention                                                              | Language                | Keyboard         |
|----|----------------------------------------------------------------------------------|-------------------------|------------------|
| >> | 1. C (POSIX)                                                                     | C (POSIX)               | C (POSIX)        |
|    | 2. Albanian                                                                      | English (United States) | Albanian         |
|    | 3. Arabic                                                                        | Arabic (Bahrain)        | Arabic (Bahrain) |
|    | ... several screens later ...                                                    |                         |                  |
|    | 106. Create your own combination of Cultural Convention, Language and Keyboards. |                         |                  |
|    | 88 Help ?                                                                        |                         |                  |
|    | 99 Previous menu                                                                 |                         |                  |
|    | Choice [1]:                                                                      |                         |                  |

- \_\_\_ 14. 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.....hdisk0

#### 2 Primary Language Environment Settings (AFTER Install)

Cultural Convention..... English (United States)  
Language..... English (United States)  
Keyboard..... English (United States)  
Keyboard Type ..... Default

#### 3 More Options (Desktop, Security, Kernel, Software, ...)

0 Install AIX with the current settings listed above.

88 Help ?

99 Previous Menu

>>> Choice [0]: **0**

- \_\_\_ 15. Once the installation begins, a status screen appears. Note the progress indicator at the bottom of the screen. The installation process will take approximately one hour.

## Exercise Review/Wrap-up

1. Ask students if they noticed the different message displayed on the graphics display versus the one displayed on the ASCII terminal when prompted to select a console.

**Answer:** The graphics display prompts to press the **F1** key and the ASCII display prompts to press 2.

2. Ask students what would happen if the ASCII display was being used as the console but was set up differently than the settings the system was expecting.

**Answer:** Garbage is displayed on the screen.

3. Ask students how they would recover from the above described situation.

**Answer:** If you fix the terminal setup, and press the correct key, you will be able to continue with the installation.

4. Ask the students at what point in the process do they think the disk will be corrupted by the install. This is important if there already is a system loaded out there and they decide to abort the installation.

**Answer:** The disk does not get overwritten by the install process until after the last warning. Up until the last warning is issued, you can still abort the installation without affecting what is on the hard disk.



# Appendix B. Serial devices

*(with hints)*

## Estimated time

Unknown

## 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 also gives 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 are 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 use is an ibm3151 ASCII terminal. The 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 should 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.

## Common Student Problems

Sometimes students with some experience go ahead and configure the ASCII terminal prior to this exercise. To handle this potential problem we have provided a way for these students to delete the terminal first, then go back and add it in. For students who have some knowledge of adding terminals, encourage them to do the delete section anyway because they might not be aware of the fact that the terminal has to be disabled before removing it.

Some students have difficulty understanding the built-in serial adapter and port labeling scheme. The systems should be set up with the ASCII terminal attached to the **s1** port.

An optional exercise (**Part 6 - Fixing a hung terminal**) is included which includes use of the **stty** command which is not covered in class. Explain this to the students. The optional exercise involves using the **stty** command to work with hung terminals.

For students who chose to do the **Optional Exercises** if, after executing the **stty -a < /dev/ttyx** command, they get the error message `/bin/ksh: /dev/ttyx: cannot open` they did not substitute their tty device number for the x in **/dev/ttyx**. Have them try the operation again with the appropriate substitution.

In the **Optional Exercises**, if the **1ab5** script is run from an Low Function Terminal instead of the ASCII terminal, the **tty** command does not work and the terminal may quit functioning completely. Recovery is to reboot the machine.

## Known Hardware/Software Problems

Before start of class on Monday, be sure to check that all cables and interposers are in place and that all terminals work. Occasionally, a cable, or other connector, may have been borrowed for some other purpose at a site and not yet returned. When this occurs there is no guarantee that what is left behind will work, particularly if the interposer was borrowed, but the cable was left behind and plugged in. The only true test is to get a login prompt.

The exercise was written for an ibm3151 ASCII terminal without a cartridge. In some countries language cartridges are used thus the example setup screens may not map exactly to the information a student may see when in setup mode. Other ASCII terminals can be used, however, some modifications will have to be made in the hints section where the terminal type is provided. For example, some classrooms use ibm3101 ASCII terminals. The setup menu on these terminals is accessed via **<Ctrl>+ <break>**. These terminals must be configured as a Wyse 60. In addition, not all ASCII terminals function exactly the same. Thus, some of the results may be slightly different, especially from the optional exercise (**Part 6 - Fixing a hung terminal**).

There are two shell scripts that are used in the optional exercise (**Part 6 - Fixing a hung terminal**). They should be located in the **/home/workshop** directory. The shell scripts are named **1ab5** and **1ab5.1**. This directory and the files in it should have been loaded prior to the start of class. If they are not, you can easily create these scripts. Be sure the students



only execute these scripts against an ASCII terminal. Below are the contents of each script. Be sure to make them executable for all users.

**lab5**

```
this_tty=`tty`  
cat /bin > $this_tty
```

**lab5.1**

```
this_tty=`tty`  
stty 38400
```

If students request these scripts, refer them to Appendix B of the **Student Guide**.

## Exercise Instructions with Hints

### Preface

Two versions of these instructions are available; one with hints and one without. You can use either version to complete this exercise. Also, please don't hesitate to ask the instructor if you have questions.

All exercises of this chapter depend on the availability of specific equipment in your classroom.

The output shown in the answers is an example. Your output and answers based on the output may be different.

All hints are marked with a >> sign.

### Part 1 - Verify 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 **Part 2 - Remove A Terminal**. Otherwise, if your terminal has not been configured, skip to the section titled **Part 3 - Add a Terminal**.

```
>> login: teamxx
>> Enter your password
>> # su root
>> root's Password: ibmaix
>> # penable
```

If the output from the **penable** command looks something like this:

```
console
tty0
```

then your ASCII terminal is currently configured. Go to the section titled **Part 2 - Remove A Terminal**. If your tty does not appear to be configured, skip to the section titled **Part 3 - Add a Terminal**.

## Part 2 - Remove 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. Does the system let you?

No, because the port is in use, even if there is only a login message displayed, the `getty` program is using the port.

What is the error message it gave you? \_\_\_\_\_

Cannot perform the requested function because the specified device is busy.

»

- # `smit`

**Devices ->**

**TTY ->**

**Remove a TTY**

- You 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.
- Cannot perform the requested function because the specified device is busy.
- **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.  
After you complete this step, be sure to do the next section, **Part 2 - Add a terminal** because you will need this terminal for later exercises.

»

- # `smit`

**Devices ->**

**TTY ->**

**Remove a TTY**

- You 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.
- **F10** to return to the command line.

## Part 3 - Add a terminal

- \_\_\_ 5. 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:  
**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. Select:

PORT number: **s1**  
Enable LOGIN: **enable**  
BAUD rate: **19200**  
TERMINAL type: **ibm3151**

- **OK or Enter.**
- Press **F10** to return to the command line.

## Part 4 - Check terminal communications settings

- \_\_\_ 6. 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.

»

- Press the **setup** key that 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 allows 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?

\_\_\_ 7. On the Server console run the **penable** command that sends a login prompt to your ASCII terminal.

```
» # penable tty0
```

\_\_\_ 8. Log in to the ASCII terminal as **root**. Try to go into SMIT.

- What kind of message do you get? Message:

```
_____
_____
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. login: root
```

```
» root's Password: ibmaix
```

```
» # smit
```

\_\_\_ 9. If SMIT did not run change the terminal type so you can use SMIT and then try starting SMIT again.

```
» # export TERM=ibm3151
```

```
» # smit
```

## Part 5 - Change terminal characteristics

- \_\_\_ 10. 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 are presented with a pop-up screen listing the available tty devices. There should be only one and it is highlighted.

- Select your terminal from the list. You are now presented with the dialog screen. Set the following characteristics:

|               |           |
|---------------|-----------|
| Enable LOGIN  | [enable]  |
| BAUD rate     | [9600]    |
| TERMINAL type | [ibm3151] |

- **OK or Enter.**
- **F10** to exit SMIT.
- # penable tty0

- \_\_\_ 11. Once this change is complete on the system, can you work with the terminal? \_\_\_ No

Why not? \_\_\_\_\_

Because the terminal settings don't match the port settings on the system.

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 Step 6 in **Part 4 -Check Terminal Communications Settings**. Look for the portion of these instructions that deal with the **Communication** menu.



## Part 6 - Fixing a hung terminal (optional)

- \_\_\_ 12. DO NOT DO THIS FROM AN LFT. As **root**, from the ASCII terminal, run the shell script `/home/workshop/lab5`. This shell script causes 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 to turn off the terminal and turn it back on again.



### Note

The `lab5` shell script caused a problem because it attempted to `cat` several binary files to your ASCII terminal.

- \_\_\_ 13. DO NOT DO THIS FROM AN LFT. As **root**, from the ASCII terminal, run the shell script `/home/workshop/lab5.1`. This shell script causes 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.



#### Note

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

## Exercise Review/Wrap-up

1. Ask the students what they had to do to get SMIT to work the first time they tried to get into SMIT.

**Answer:** They had to set the TERM variable for their terminal type.

2. Ask the students what they had to do to get the terminal to communicate with the system after they had changed the terminal characteristics.

**Answer:** They had to change the terminal setup to match the port characteristics.

3. Ask the students what they had to do to be able to remove a terminal.

**Answer:** First they had to disable the port through the use of the `pdisable` command.



# Appendix C. Optional exercise: The System V print subsystem

*(with hints)*

## Estimated time

Unknown

## 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
- Remove a System V printer

## Introduction

This exercise reinforces the material covered in the System V Print Subsystem appendix. 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.

## Requirements

- System running AIX 5L with connected local printer.

## Instructor exercise overview

These exercises require a local printer for each team of students.

You need to provide students with the following information about their printer:

- Printer device (which device driver to use)
- How the printer is connected (serial or parallel and which adapter and port)
- If the printer is serially connected: baud rate, parity, bits per character, stop bits, and flow control.
- Printer type (**terminfo** entry)
- Content type for the printer (usually this will be **simple**)
- Interface script to use (use **standard** for non-PostScript printers)  
(This lab was written for non-PostScript printers.)

You should TEST these exercises BEFORE you teach this class to verify that your values will work!!!

The exercises are currently configured to use the command line.

If printers are not available, most of the exercise can be done by printing to a file (specify a regular file name for the **-v** flag to **lpadmin**).

## Exercise Instructions with Hints

### Preface

Two versions of these instructions are available; one with hints and one without. You can use either version to complete this exercise. Also, please don't hesitate to ask the instructor if you have questions.

All exercises of this chapter depend on the availability of specific equipment in your classroom. If your lab environment uses remote pSeries/AIX platforms, the instructor will provide you with the addressing (IP address or hostname) and instructions for accessing the remote machine. For example, you might be using telnet, an X-windows server, or a VNC client. Whatever tool you are using, at various points in the labs you may need to re-launch your remote access tool to obtain a new login prompt.

The output shown in the answers is an example. Your output and answers based on the output may be different.

All hints are marked with a >> sign.

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.

## Part 1 - Switch print subsystems

- \_\_\_ 1. Use `switch.prt -d` to determine which print subsystem is active.  
» 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? \_\_\_\_\_ `switch.prt -s AIX`
- \_\_\_ 3. What file is `/usr/bin/lpstat` linked to? \_\_\_\_\_ `/usr/aix/bin/lpstat`
- \_\_\_ 4. Switch to the System V print subsystem.  
What command did you use? \_\_\_\_\_ `switch.prt -s SystemV`
- \_\_\_ 5. What file is `/usr/bin/lpstat` linked to? \_\_\_\_\_ `/usr/sysv/bin/lpstat`

## Part 2 - Add a System V printer

\_\_\_ 6. 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.)

\_\_\_ 7. Choose a name for your printer: \_\_\_\_\_

\_\_\_ 8. Log in as **root**.

\_\_\_ 9. 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 <b>Printer/Plotter Devices</b> menu.                                                    |
| 2    | Move the cursor to select <b>Add a Printer/Plotter</b> ; 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 <b>PORT number</b> field and press <Enter>.                                               |
| 7    | For serial connected printers, enter the port number in the <b>PORT number</b> field, fill in the baud rate and so forth and press <Enter>. |

\_\_\_ 10. List the newly created printer device.

What command did you use? \_\_\_\_\_

» If using a printer:

```
# lsdev -Cc printer
```

» If printing to a file:

```
# ls -l directory
```

(where *directory* is the directory containing your target file)

\_\_\_ 11. 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? \_\_\_\_\_

```
> # lpadmin -p printer_name -v device_name -T printer_type \
-I content_type -m interface_script
```

```
# lpadmin -p myprinter -v /dev/lp0 -T ibmproprinter \
-I simple -m standard
```

```
# lpadmin -p myprinter -v /dev/lp0 -T bj-300
```

\_\_\_ 12. Use `lpstat` to verify queueing status.

What command did you use? \_\_\_\_\_

Is the printer accepting requests? \_\_\_\_\_ No

What reason is given? \_\_\_\_\_ New printer

» # lpstat -a (lists status for all printers)

-OR-

» # lpstat -a printer\_name (lists status for printer\_name only)

\_\_\_ 13. Use **lpstat** to verify printing status.

What command did you use? \_\_\_\_\_ lpstat -p

Is the printer enabled? \_\_\_\_\_ No

\_\_\_ 14. Use **lpstat** to get a long listing of your printer's characteristics.

What command did you use? \_\_\_\_\_ lpstat -p -l printer\_name

\_\_\_ 15. Using the output from the previous step, answer these questions:

What users are allowed to access this printer? \_\_\_\_\_ all

What action will be taken "On fault"? (This is the default Alert action.) \_\_\_\_\_  
mail to root once

\_\_\_ 16. View the printer configuration file.

What command did you use? \_\_\_\_\_  
cat /etc/lp/printers/printer\_name/configuration

\_\_\_ 17. Navigate to the spool directory.

What command did you use? \_\_\_\_\_ cd /var/spool/lp/tmp/host\_name

\_\_\_ 18. List the files in this directory: \_\_\_\_\_

» Unless there are other printers defined on this host, the only file should be **.SEQF**.

## Part 3 - Submit print jobs

\_\_\_ 19. Attempt to print **/etc/motd** (the message of the day file) on your new printer.

What command did you use? \_\_\_\_\_

lp -d printer\_name [-L C] /etc/motd

What happened? \_\_\_\_\_

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.

\_\_\_ 20. Enable queueing using the **accept** command. (Don't enable printing yet.)

What command did you use? \_\_\_\_\_ accept printer\_name

\_\_\_ 21. Resubmit your print job.

Note the request-ID here: \_\_\_\_\_ printer\_name-X (where X is the job number)

\_\_\_ 22. Use **lpstat** to list outstanding job status.

What command did you use? \_\_\_\_\_ lpstat -o

\_\_\_ 23. List the files in the spool directory: \_\_\_\_\_ ls /var/spool/lp/tmp/host\_name

\_\_\_ 24. Examine the request file (**X-0**) and answer these questions:

What file will be printed? \_\_\_\_\_ File to be printed is the F line

What is the file's size? \_\_\_\_\_ size is in the O line, the flist attribute

\_\_\_ 25. 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? \_\_\_\_\_ lp -d printer\_name -c /etc/motd

\_\_\_ 26. List the new files in the spool directory: \_\_\_\_\_

Y-0 and Y-1 (where Y is the request number)

\_\_\_ 27. Examine the two new files.

- Which file is the request file? \_\_\_\_\_ request file: Y-0
- Which file is the copy of the file to be printed? \_\_\_\_\_ file to print: Y-1

\_\_\_ 28. Enable printing on your printer.

- What command did you use? \_\_\_\_\_ enable printer name

\_\_\_ 29. 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.)

\_\_\_ 30. Examine the request log.

- What command did you use? \_\_\_\_\_ pg /var/lp/logs/requests

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? \_\_\_\_\_

Each new entry starts with a line starting with “=”

\_\_\_ 31. Disable printing on your printer using the **disable** command.

- What command did you use? \_\_\_\_\_ disable printer name

\_\_\_ 32. Disable queueing using the **reject** command.

- What command did you use? \_\_\_\_\_ reject printer name

\_\_\_ 33. Use **lpadmin** to remove a System V printer.

- What command did you use? \_\_\_\_\_ lpadmin -x printer name

## Part 4 - (Optional) Configure a remote print server and client

- \_\_\_ 34. Use *Printing for Fun and Profit under AIX 5L* (Redbook), Chapter 3. *System V network printing* as a reference for this exercise.
  
- \_\_\_ 35. You need to work with another team.
  
- \_\_\_ 36. One team configures their system as a print server machine (see Section 3.3 in the Redbook). The other team configures their system to use the other machine's remote printer (see Section 3.1 in the Redbook).
  
- \_\_\_ 37. Test your configuration by attempting to print from the client machine to the printer on the server machine.
  
- \_\_\_ 38. Make notes below of the steps you took and your results.

### End of exercise

## Exercise Review

In the exercise the following material was covered:

- `switch.prt` was used to display the active print subsystem and to switch print subsystems
- SMIT was used to configure a printer device
- `lpadmin` was used to define a System V printer
- `lpadmin -x` was used to remove a System V printer
- `lpstat -a` and `lpstat -p` were used to display queueing status and printing status (respectively)
- The printer configuration file (`/etc/lp/printers/printer_name/configuration`) was examined
- `lp` was used to submit print jobs
- `accept` was used to enable queueing
- `reject` was used to disable queueing
- `lpstat -o` was used to display job status
- `enable` was used to enable printing
- `disable` was used to disable printing
- Spool files (`/var/spool/lp/tmp/host_name/*`) were examined
- The request log (`/var/lp/logs/requests`) was examined



