CISCO SYSTEMS

Cisco Networking Academy Program
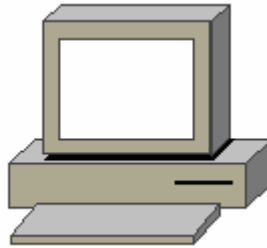
IT Essentials II: Network Operating Systems v 3.0

Student Manual

Configuring Linux as an NIS Client

Estimated Time: 30 minutes

Objective

To configure a Linux Red Hat system as an NIS server and client.

Equipment

- A computer with Linux Red Hat 7.X installed.

Scenario

The system administrator of a large company has been asked to enable some computer systems to share information, including a common set of user accounts, user groups, and TCP/IP hostnames. In order to centralize the administrative efforts involved, the administrator decides to configure a Linux Red Hat system as an NIS server to manage the database. The administrator also configures the employees' computer systems as NIS clients.

Procedures

Setting up a Linux system as an NIS client

To configure a Linux system as an NIS master server, first configure the system as an NIS client. Use the following steps to configure a Linux system as an NIS client.

Step 1

Log in as the root user.

Step 2

When setting up an NIS client, first get the NIS domain name, NIS master server name, and the NIS slave server names. In a true running network, these might already be configured. However, for the purposes of this lab, the names will be invented.

Step 3

Since there is no NIS domain name, one must be defined. To do so, type `domainname Ciscotest` at the shell prompt. After pressing enter, the screen should look similar to the following.

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[root@chi anpowei]# domainname Ciscotest

[root@chi anpowei]#

Step 4

This command will set the NIS domain name to `Ciscotest`. To verify the NIS domain name, type **domainname** at the shell prompt. The screen should look similar to the following.

```
[root@chi anpowei]# domainname

Ciscotest

[root@chi anpowei]#
```

Step 5

This command will only set the NIS domain name temporarily. When the system is rebooted, this information will be erased unless the system is configured to run this command every time the system boots up. There are many methods that can be used to force a Linux system to run commands upon startup. Many of these commands have already been learned or will be learned in this course. One easy method is to edit the `/etc/init.d/network` file by using the following steps:

1. First, type **vi /etc/init.d/network** at the shell prompt to view the `/etc/init.d/network` file so the system is configured properly.

2. After opening the file, press the **i** key to enter insert mode. Use the arrow keys to navigate to the ninth line and enter the following text:

    ```
    # Set the NIS domain name.
    domainname Ciscotest
    ```

    Next, press the **Esc** key to close this file and return to the shell prompt. Then type **:wq**, and press the **Enter** key.

Step 6

Set up the `/etc/yp.conf` file. To work properly, the **ypbind** daemon needs to know the NIS domain name and the names of the NIS servers. The **ypbind** daemon is the process that runs the NIS service on the system. This information is contained in the `/etc/yp.conf` file. Therefore, the file needs to be edited with the proper information. To edit this file, first open it by entering **vi /etc/yp.conf** at the shell prompt.

Step 7

The vi editor should now be open with the contents of the `/etc/yp.conf` file in view. As in the previous step, enter insert mode to make the proper configuration change. Do this by pressing the **i**key. Once insert mode has been entered, navigate to the bottom of the text and enter the following:

```
domain Ciscotest server Phoenix1
```

This will define the name of the NIS master server. If the network consisted of NIS slave servers, they would be entered directly below this text . Enter the following text in this file:

```
domain Ciscotest server Phoenix1
domain Ciscotest server Tempe1
domain Ciscotest server Scottsdale1
```

Now close this file and return to the shell prompt. Do this by pressing the **Esc** key. Then type `:wq` and press the **Enter** key.

Step 8

To run NIS as a client, start the `ypbind` and `ypwhich` daemons. The `ypbind` daemon performs two functions, the master and the slave functions. The master process handles requests for information from the NIS server and the slave process checks the bindings. The `ypwhich` daemon finds the NIS server. Starting these daemons and configure them to run automatically every time the system is booted. To do this, type `/sbin/chkconfig ypbind on` at the shell prompt. The screen should look similar to the following.

```
[root@chi anpowei]# /sbin/chkconfig ypbind on
```

`[root@chi anpowei]#`There are other ways to accomplish this, but this may be the easiest way.

Step 9

At this point, the Linux system should be setup to run as an NIS client. If this system was connecting to an actual NIS server, the `ypwhich` and `ypcat hosts` commands could be used to test connectivity. However, since this system is not connecting to an NIS server, these commands will return error messages.

Reflection

Configuring a Linux system can be very useful. What are some circumstances in which using NIS might be beneficial? When would using NIS not be beneficial?

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Using Device Manager in Windows 2000 Server

Estimated Time: 20 minutes

Objective

Upon completion of this lab, the student will be able to navigate the Windows 2000 Device Manager, locate hardware, and manually reinstall a device.

Equipment

- Windows 2000 Professional or Windows 2000 Server installed.

Scenario

Windows 2000 Server, has just been installed on a PC. While testing devices, it is determined that the CD-ROM is not working properly. Uninstalling and reinstalling the CD-ROM device can resolve the problem.

Procedures

First, navigate through the device manager. Then reinstall the CD-ROM driver.

Step 1

Right-click on **My Computer** and select **Properties**. List the different tabs available in the System Properties window.

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_____

Step 2

Click on the **Hardware** tab. Now click on **Device Manager**. Use the space below to record what is on the screen.

_____

_____

Step 3

Click on the plus sign next to **Keyboards** to see the type of keyboard on the system. Next, double-click on the keyboard.

What is the Device Status?

_____

_____

Step 4

Click on the **Resources** tab. List the IRQ that the keyboard is using and then click **OK.**

_____

Step 5

Locate the CD-ROM device. Click on the box to the left of the **DVD/CD-ROM** drives. The CD-ROM installed on the system will be displayed. Double-click the system CD-ROM**.** What tabs are listed? What do the tabs contain?

_____

_____

Step 6

Click on the **Drivers** tab. Click the **Uninstall** button. Click **OK**. The computer is uninstalling the CD-ROM. When it is finished, look at the CD-ROM device. Is the CD-ROM device there? Why or why not?

_____

_____

Step 7

Reinstall the CD-ROM driver. Click the **Action** button in the Device Manager. Click **Scan for Hardware Changes**. What happened?

_____

_____

Is the CD-ROM drive in the Device Manager?

_____

Reflection

How can using the Device Manager be beneficial to an administrator who is troubleshooting the devices connected to the server?

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Using the HCL

Estimated Time: 20 minutes

Objective

Upon completion of this lab, you will be able to identify and analyze the compatibility of system hardware to the corresponding operating system.

Equipment

You will need the following items to complete this lab:

- Internet access

Scenario

You have been assigned the responsibility of loading a Network Operating System onto a server that best supports the existing hardware. Your manager has asked that the Network Operating System be Windows 2000, Linux (Red Hat), or Linux (Caldera).

Procedures

In this lab, you will be exploring the websites of the Network Operating Systems listed above. There are four pieces of hardware that need to be compatible with the Network Operating System. Compatibility information can be ascertained using the Hardware Compatibility List (HCL) of each Network Operating Systems. Each NOS website contains a HCL.

Step 1

Open up three instances of an Internet Browser.

Step 2

The websites are as follows, Copy/Paste or type each URL into the browser:

- Windows 2000 Server:

  http://www.microsoft.com/windows2000/server/howtobuy/upgrading/compat/default.asp

  Once connected click on the **Hardware Devices** tab. Now you can start your search.

- Linux (Red Hat):

  http://hardware.redhat.com/

  Once connected, click on **Hardware Compatibility List** and you can now start your search.

- Linux (Caldera):

  http://www.caldera.com/support/hardware/

Once connected click on **OpenLinux eSERVER 2.3** and you can start your search.

Step 3

Using the HCL gather information concerning the hardware components below. Depending whether or not the product is supported by the NOS, write yes or no next to each device.
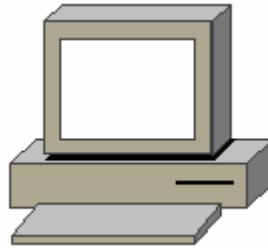
		Network Operating Systems		
Device	Product	Windows 2000	Linux(Red Hat)	Linux(Caldera)
Network Interface Card	3Com Etherlink XL (3c905)			
Video Card	RAGE 128 PRO			
CPU	Pentium III			
Hint:Type, compatable CPU in the "Search This Site" box	AMD K5			
	AMD K6-III			
SCSI	DELL PowerVault 110T LTO			

Reflection

Which website did you find to be the easiest to navigate and find the information you were looking for?

_____

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Which website was the most difficult to navigate?

_____

_____

Adding Swap File Space in a Linux System

Estimated Time: 20 minutes

Objective

To assess and add swap space in a Linux Red Hat operating system.

Equipment

- A computer with Linux Red Hat 7.X installed

Scenario

The system administrator of a large company notices that one of the Linux Apache Web servers for the internal company Web site has been running slowly, and most of its resources have been used up. Most of the IT budget for the year has been spent. Therefore, adding more RAM is not an option. The administrator decides to add more swap space to the server instead.

Procedures

Step 1: Assessing swap usage

In order to determine how much swap space to add, first look at the size of some files on the system. Determine how much memory is being used and how much is left on the system.

The `free` command in Linux can be used to check the system memory. Type `free -m -t` at the shell prompt.

How much physical memory is available? How much physical memory is being used?

_____

_____

_____

Step 2: Adding a swap file

To add swap space on a system, add a swap file by using the following steps:

1. Log on to the system as root.

2. Create a file that is equal in size to the swap file that is going to be created. Do this by using the `dd` command. Enter the following command at the shell prompt:

   dd if=/dev/zero of=/swapfile bs=1024 count=131072

   The screen should look similar to the following.

   [root@chi anpowei] # **dd if=/dev/zero of=/swapfile bs=1024 count=131072**131072+0 records in

   131072+0 records out

3. The `swap` file that was created will need to be setup. After it is setup, the Linux system can use it to swap memory to a disk use the `mkswap` command to enable Linux to use the new swap file. However, the new swap file will not be active. Enter the following command at the shell prompt:

   mkswap –f /swapfile

   or

   /sbin/mkswap –f /swapfile

   The screen should look similar to the following.

   [root@chi anpowei] # /sbin/mkswap –f /swapfile

   Setting up swapspace version 1, size 134213632

4. To activate this swap file, use the `swapon` command. To make this swap file inactive, use the `swapoff` command in place of the `swapon` command. Enter the following command at the shell prompt:

   swapon /swapfile

   or

   /sbin/swapon /swapfile

   The screen should look similar to the following.

   [root@chi anpowei] # /sbin/swapon /swapfile

   [root@chi anpowei] #

---

5. Now, check to see if the swap file is enabled. Use one of the following commands.

```
cat /proc/swaps
```

or

```
free
```

The swap file that was just created will not be used the next time the system is rebooted unless the entry in made in `/etc/fstab`.

Reflection

This method is the quickest and easiest way to add swap space. However, it does create some problems. By creating this swap file on a partition that is already being used, the file can become fragmented as the partition gets used more and more. What are some other methods that can be used to add a swap file?

_____

_____

_____

_____

Installation Demonstration of Windows 2000 Professional

Estimated Time: 50 minutes

Objective

In this exercise, the student will learn how to install Windows 2000 Professional step by step.

Equipment

The following equipment is required for this exercise:

- A computer with no operating system installed, or a computer with at least one blank partition with no operating system on it.

- A processor of Pentium class or better.

- A minimum of 2 GB hard drive with at least 1 GB of free space.

Scenario

A new computer has just been delivered and the technician is assigned the task of installing Windows 2000 Professional.

Procedures

In this lab, the student will learn how to install the Windows 2000 Professional operating system.

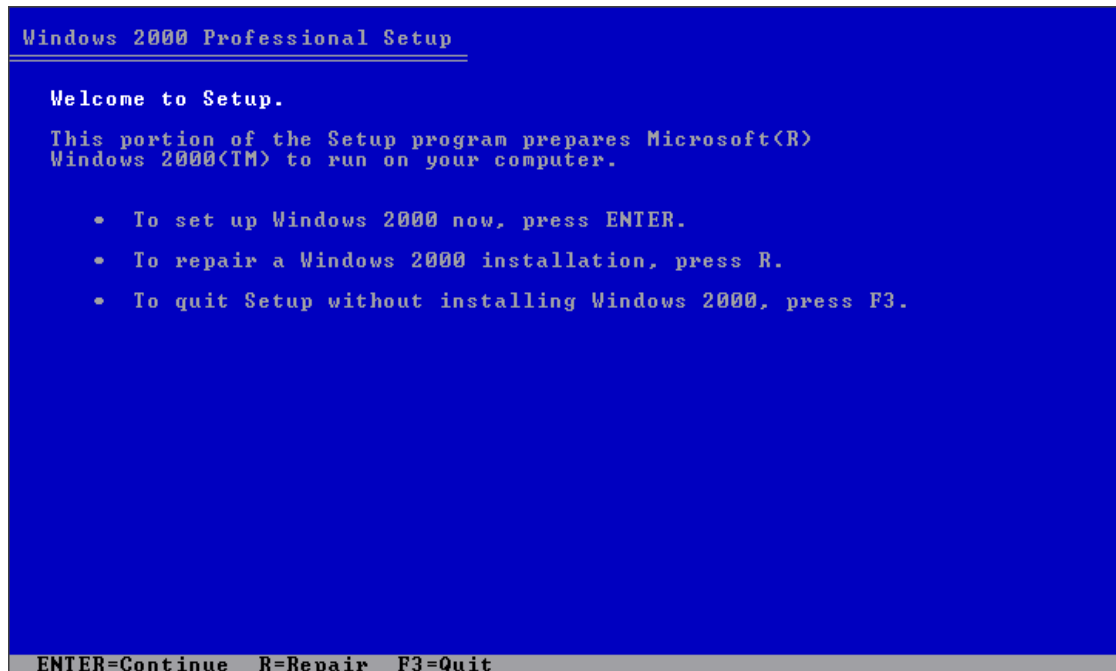**Installing Windows 2000 Professional**

Note: In this lab, Windows 2000 Professional will be installed from the CD.

1. Turn on the computer, and enter CMOS setup. After the beep, press the **DEL** key to enter CMOS setup.

2. Using the arrow keys, select the BIOS FEATURES SETUP and press the **Enter** key.

3. If the boot sequence is not set to boot from CDROM first, scroll down and change the boot sequence to boot from CD-ROM first, by using the **Page Up**, **Page Down**, (+) or (-) keys.

4. Insert the Windows 2000 CD into the CD-ROM drive.

5. Press the **Escape** key once.

6. Select Save and exit setup, and press the **Enter** key.

7. Type Y and press the **Enter** key.

8. If prompted to **press any key to boot from CD**, then press any key. The message "Setup is configuring your computer's hardware configuration …" should be displayed.

---

9. A blue screen will appear with the message **Windows 2000 Setup**. Wait while Windows 2000 loads files.


```
Windows 2000 Setup
```

```
Setup is starting Windows 2000
```
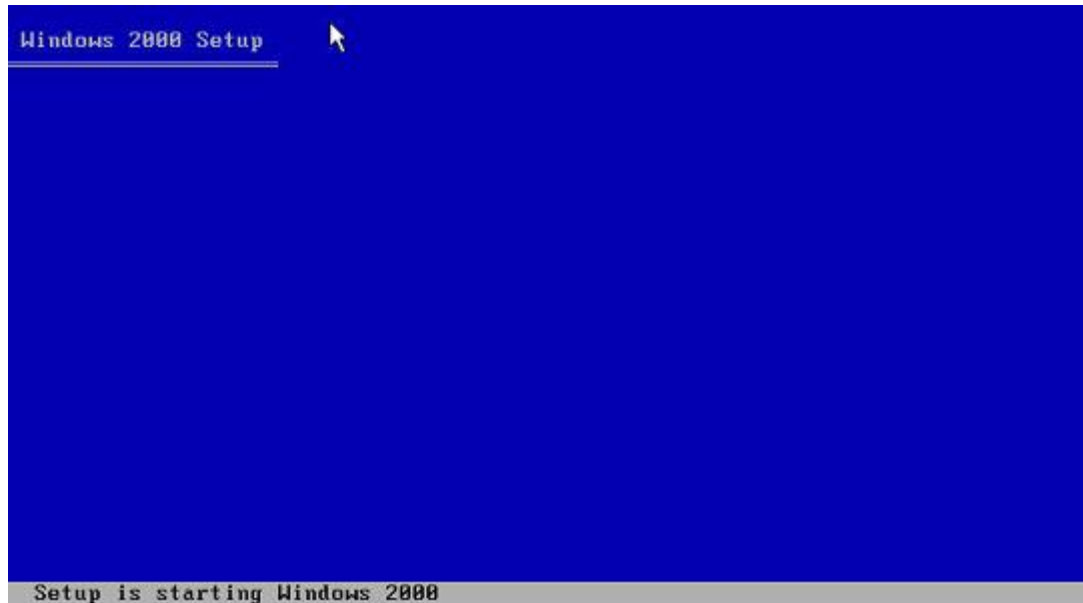
10. The next screen offers three options, as shown on the screen below. This lab uses option 1. Press **Enter** to begin installation of Windows 2000.


```
Windows 2000 Professional Setup

   Welcome to Setup.

   This portion of the Setup program prepares Microsoft(R)
   Windows 2000(TM) to run on your computer.

      •  To set up Windows 2000 now, press ENTER.

      •  To repair a Windows 2000 installation, press R.

      •  To quit Setup without installing Windows 2000, press F3.




 ENTER=Continue   R=Repair   F3=Quit
```

11. Press **F8** to accept the Licensing Agreement.

```
Windows 2000 Licensing Agreement

    ****************************************************************

    Microsoft Windows 2000 Professional Licensed Copies: 1

    *************************************************
    END-USER LICENSE AGREEMENT
    *************************************************

    IMPORTANT-READ CAREFULLY: This End-User License Agreement
    ("EULA") is a legal agreement between you (either an
    individual or a single entity) and Microsoft Corporation for
    the Microsoft software product identified above, which
    includes computer software and may include associated media,
    printed materials, and "online" or electronic documentation
    ("Product"). An amendment or addendum to this EULA may
    accompany the Product. YOU AGREE TO BE BOUND
    BY THE TERMS OF THIS EULA BY INSTALLING,
    COPYING, OR OTHERWISE USING THE PRODUCT. IF
    YOU DO NOT AGREE, DO NOT INSTALL OR USE THE
    PRODUCT; YOU MAY RETURN IT TO YOUR PLACE OF
    PURCHASE FOR A FULL REFUND.

    1.    GRANT OF LICENSE. Microsoft grants you the following
    rights provided that you comply with all terms and
    conditions of this EULA:

        * Installation and use. You may install, use, access,

  F8=I agree   ESC=I do not agree   PAGE DOWN=Next Page
```
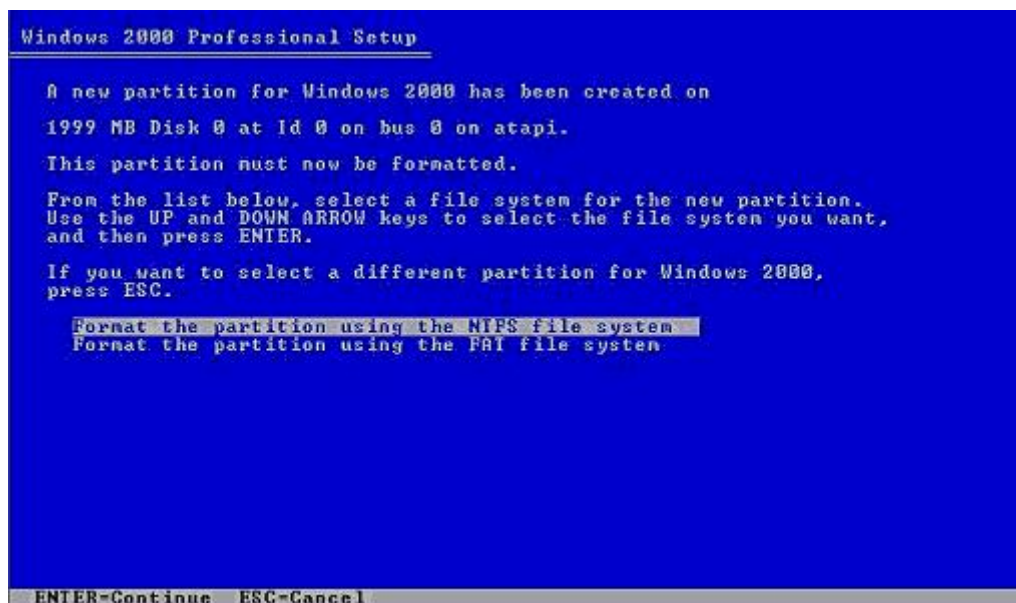
12. Windows will now show all partitions, and prompt to select which one to install to. If
    there are no partitions available, then select **To create a partition in the
    unpartitioned space**, **press C**. to create a partition and install Windows on this
    partition. If a partition already exists, then follow the options on the screen to delete it.
    Press the **Enter** key to begin the installation.

```
Windows 2000 Professional Setup

   The following list shows the existing partitions and
   unpartitioned space on this computer.

   Use the UP and DOWN ARROW keys to select an item in the list.

        •  To set up Windows 2000 on the selected item, press ENTER.

        •  To create a partition in the unpartitioned space, press C.

        •  To delete the selected partition, press D.

   ┌──────────────────────────────────────────────────────────────┐
   │ 1999 MB Disk 0 at Id 0 on bus 0 on atapi                       │
   │                                                                │
   │        Unpartitioned space                       1998 MB       │
   │                                                                │
   │                                                                │
   │                                                                │
   │                                                                │
   │                                                                │
   └──────────────────────────────────────────────────────────────┘

 ENTER=Install   C=Create Partition   F3=Quit
```

13. Select **Format the partition using the NTFS file system** and press **Enter**. NTFS offers more security than FAT32, and should be the file system of choice when installing Windows 2000.


```
Windows 2000 Professional Setup

   A new partition for Windows 2000 has been created on

   1999 MB Disk 0 at Id 0 on bus 0 on atapi.

   This partition must now be formatted.

   From the list below, select a file system for the new partition.
   Use the UP and DOWN ARROW keys to select the file system you want,
   and then press ENTER.

   If you want to select a different partition for Windows 2000,
   press ESC.

        Format the partition using the NTFS file system
        Format the partition using the FAT file system

 ENTER=Continue   ESC=Cancel
```

14. Windows formats the partition with the specified file system. This may take several minutes, depending on the size of the hard drive.

15. Setup will now check the disk and copy files needed to install Windows 2000.

16. The system will reboot and continue with setup. Do not press a key to boot from the CDROM.

17. Click **Next** when the setup wizard appears. Setup will start detecting and installing devices on the computer. If **Next** is not clicked, Windows will automatically go to the next step.

18. Click **Next** when the Regional Settings window appears.

19. Enter **Administrator** for the name and **CWA** for the organization.

20. Click **Next**.
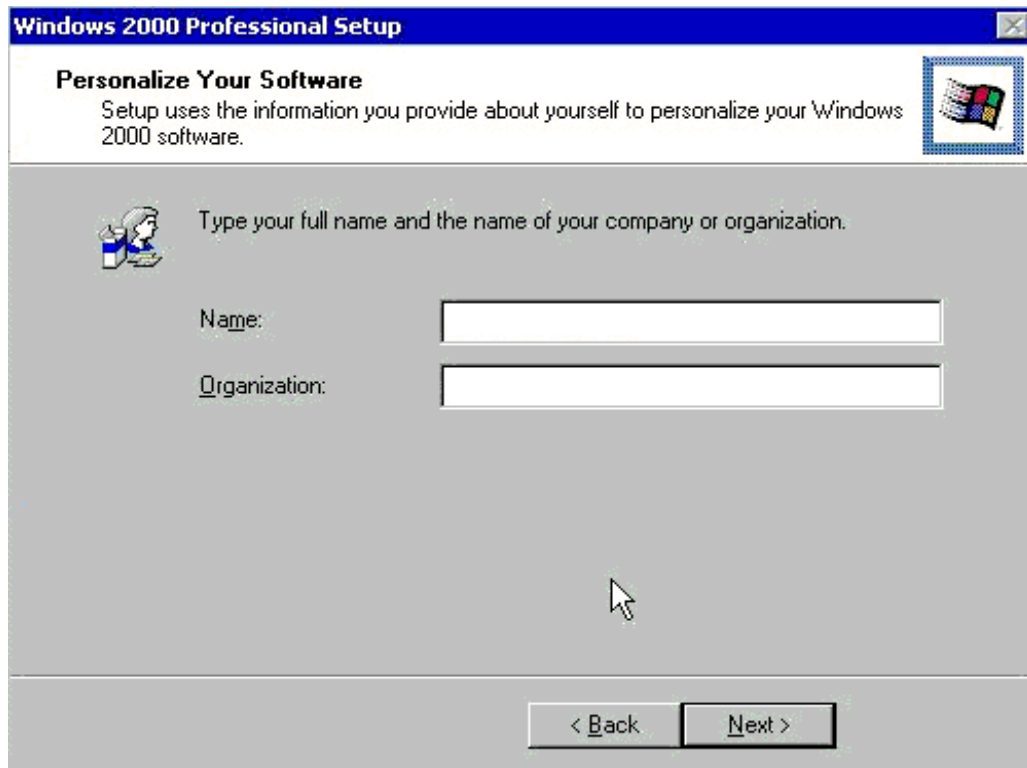
21. Enter the product key that came with the Windows 2000 CD.

22. Click **Next**.

23. Enter **KIT2** for the computer name text box, and **password** in the administrator password box and confirm password text boxes. Be sure to enter the password in lower case letters, because Windows 2000 is case sensitive for passwords.
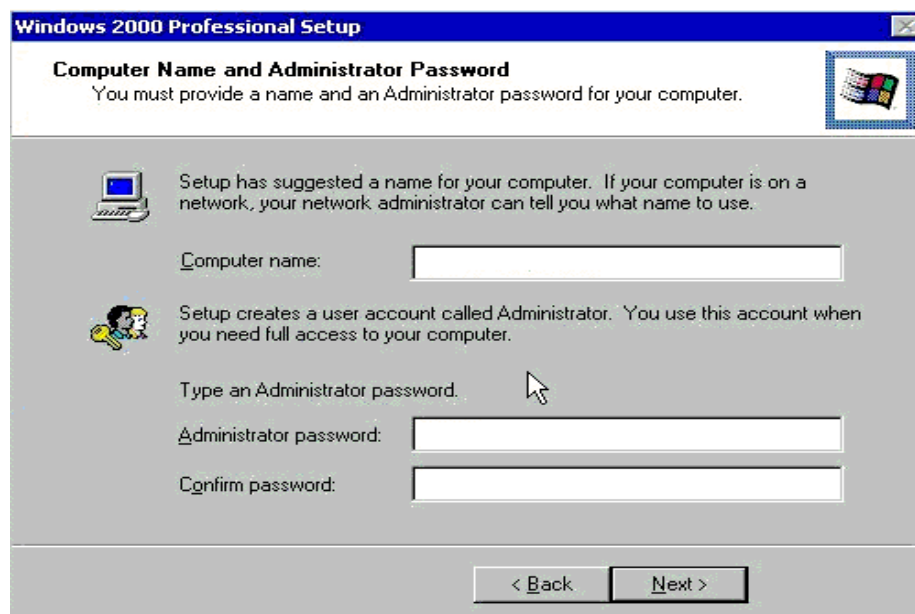
24. Click **Next**.

25. Enter the correct date, time, and regional area for the location.
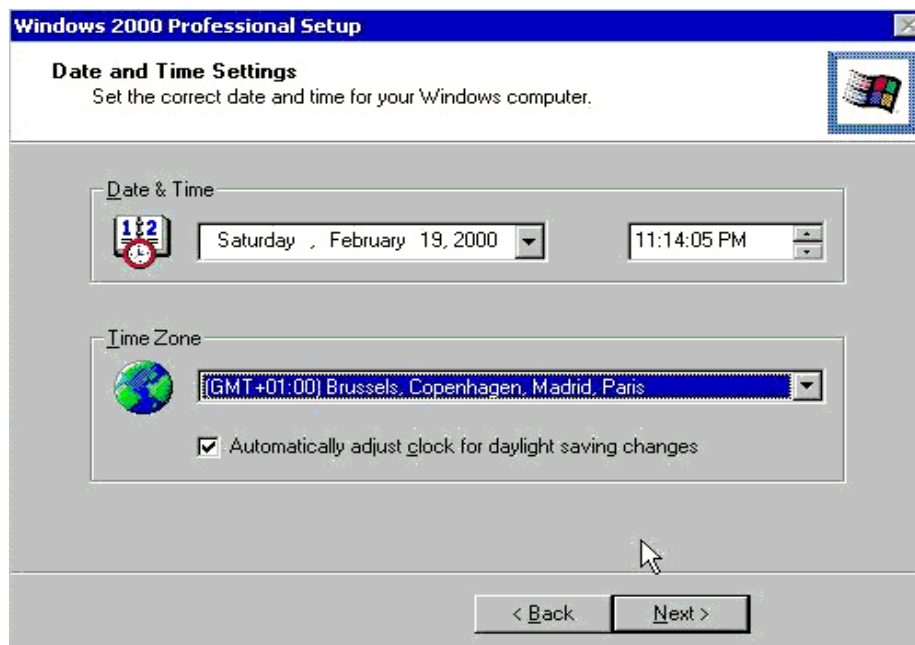
26. Click **Next**.

27. Click **Next** to do a typical installation.
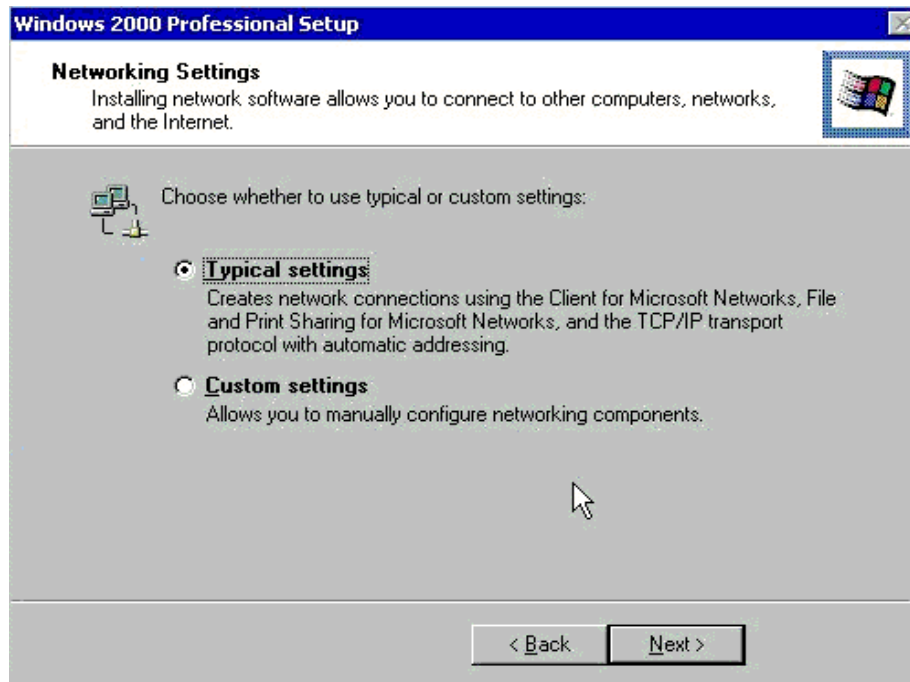
28. Click **Next** to install this computer as a member of the workgroup, **workgroup**. This will take up to ten minutes to complete.
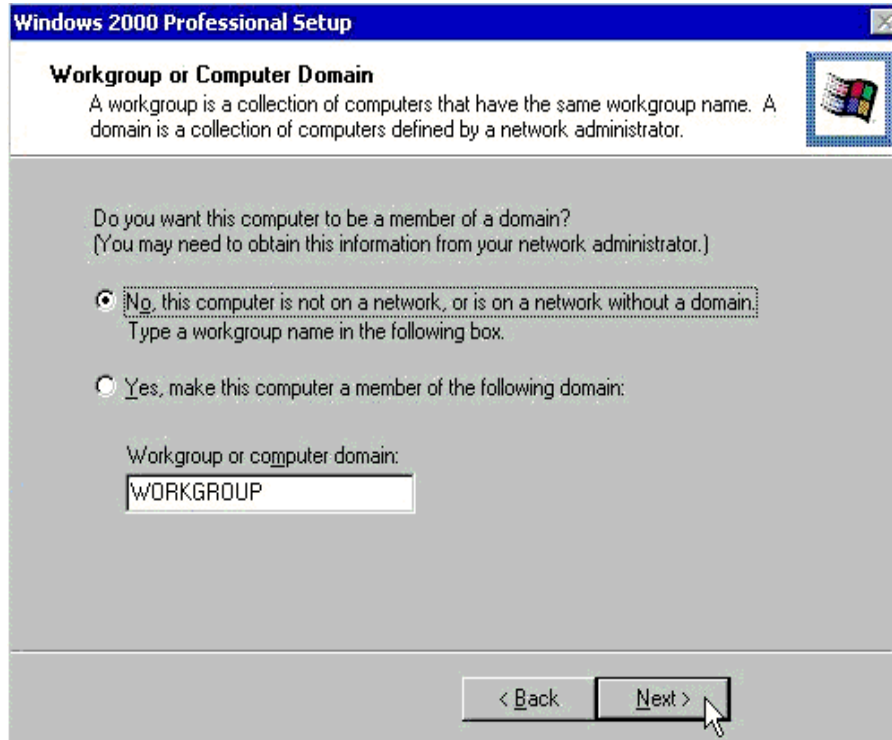
29. Remove the Windows 2000 CD, and click **Finish** to restart windows.

Windows 2000 Professional Setup

Completing the Windows 2000 Setup Wizard

You have successfully completed Windows 2000 Setup.

If there is a CD in your drive, remove it. Then, to restart your computer, click Finish.

Microsoft **Windows** 2000

< Back   Finish

30. Click **Next** when the Welcome to the Network Connection Wizard window appears.

Network Connection Wizard

Welcome to the Network Connection Wizard

Using this wizard you can create a connection to other computers and networks, enabling applications such as e-mail, Web browsing, file sharing, and printing.

To continue, click Next.

< Back   Next >   Cancel

31. Select the radio button **User must enter a user name and password to use this computer**.

32. Click **Next**.

33. Click **Finish** to complete the Network Identification Wizard.

34. This is the last step in the process.
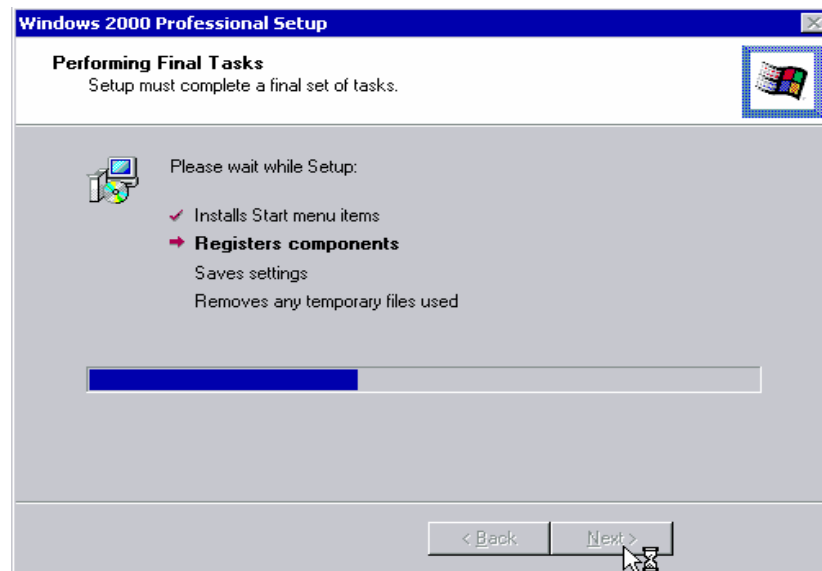
35. The log on box will be displayed. Log on with the **Administrator** account and **password** that were created during Setup.

36. Enter **password** in the password text box, and click **OK**.

37. The system will now log on and launch the Windows 2000 Desktop.

38. Remove the check from the **Show this screen at startup** screen.

39. Click **Exit**.

Windows 2000 has now been successfully installed.

Troubleshooting

Before proceeding with the installation, confirm that the system meets the proper hardware requirements. Also make sure that the Operating System is being installed on either a blank partition or a hard drive that has enough space to install the operating system.

When the installation is complete check hardware settings to see if the network card driver is installed. Upgrade the driver if necessary.

Ping the instructor's server to check network connectivity.

Configuring an IP Address and Default Gateway in Windows 2000
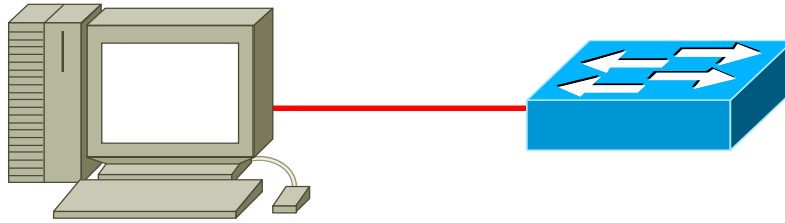
Estimated Time: 20 Minutes

Objective

Configure a Windows 2000 Professional IP address.

Equipment

The following equipment is required for this exercise:

- A computer system with Windows 2000 Professional installed.

- Network connection from the system to hub, switch, or some other host.

Scenario

The Air Guitar Company has just installed a server with Windows 2000 Professional. The company has asked the network administrator to configure the system with an IP address and subnet mask.

Procedures

Before beginning this lab, make sure the Windows 2000 Professional system is ready to log in. Power the server on, if necessary.

Ask the instructor or a lab technician for the appropriate IP address information for the system. Record that information in the table provided:

Host IP Address Configuration	
IP address:	
Subnet mask:	
Default gateway:	
DNS server	
DHCP server	Enabled/Disabled

Note: If the instructor provides a DHCP server, write down the IP range, subnet mask, and default gateway for the network.

Step 1: Log in

Log in as the **Administrator**.

Step 2: Configure TCP/IP to use a static IP address

Right-click **My Network Places**, and then click **Properties**. This will display the Network and Dial-Up Connections window.

1. Right-click **Local Area Connection** and then select **Properties**.

2. The Local Area Connection properties dialog box appears.

3. Click on **TCP/IP** Verify that the check box to the left of the entry is selected. Then click **Properties**.

4. The Internet Protocol (TCP/IP) Properties dialog box appears.

5. Click **Use The Following IP Address**.

6. In the IP Address box, the Subnet Mask box, and the Default Gateway box, type the values that were entered in the table in the Procedures step of this lab.

7. Click **OK**.

8. Click **OK** to close the Local Area Connection Properties dialog box.

9. Minimize the Network And Dial-Up Connections window.

Step 3: To test the static TCP/IP configuration

1. Open the Command Prompt. Select **Start** > **Run** and type `cmd` in the window to display a command prompt.

2. At the command prompt, type `ipconfig /all` and then press **Enter**.

   This will display the TCP/IP information configured on the physical and logical adapters in the computer.

3. Record the current TCP/IP configuration settings for your local area connection in the following table:
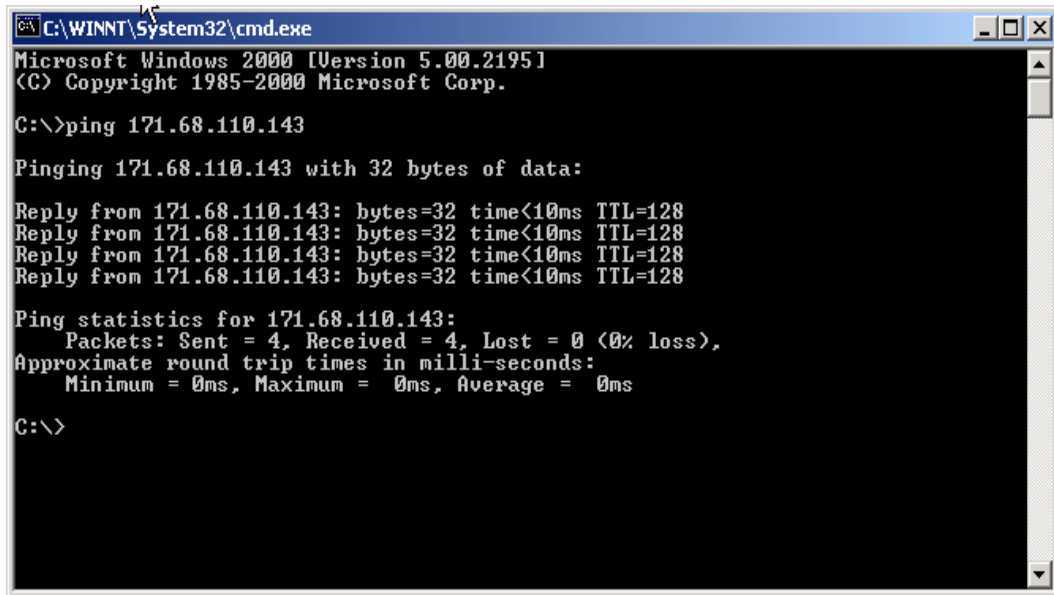
Current IP Address Configuration	
IP address:	
Subnet mask:	
Default gateway:	
DNS Server	
DHCP Server	Enabled/Disabled

Step 4: Using Ping

1. At the command prompt type `ping xxx.xxx.xxx.xxx` (replace the xxx.xxx.xxx.xxx with the IP address that was entered for the computer. Example ping 10.1.1.5)

This will send messages to the system to test if the IP address information was entered correctly.

A successful reply is displayed like the output shown below,

```
C:\WINNT\System32\cmd.exe

Microsoft Windows 2000 [Version 5.00.2195]
(C) Copyright 1985-2000 Microsoft Corp.

C:\>ping 171.68.110.143

Pinging 171.68.110.143 with 32 bytes of data:

Reply from 171.68.110.143: bytes=32 time<10ms TTL=128
Reply from 171.68.110.143: bytes=32 time<10ms TTL=128
Reply from 171.68.110.143: bytes=32 time<10ms TTL=128
Reply from 171.68.110.143: bytes=32 time<10ms TTL=128

Ping statistics for 171.68.110.143:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum =  0ms, Average =  0ms

C:\>
```
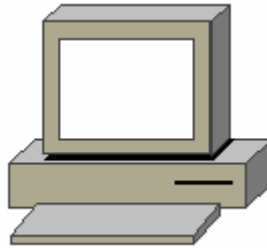
Troubleshooting

As an IT professional, configuring and troubleshooting TCP/IP can be a daily activity. Always double-check the static IP configuration. Most operating systems will issue a warning when another node on the network with the same IP address is detected. Be careful when manually entering IP configuration settings, especially numeric addresses. The most frequent cause of TCP/IP connection problems is incorrectly entered IP address information.

Logging on to Windows 2000 Professional

Estimated time: 10 minutes

Objective

In this exercise, the student will learn how to log on to Windows 2000 Professional.

Equipment:

The following equipment is required for this exercise:

- A computer with Windows 2000 Professional installed.

Background

The option to **Log on to Windows 2000 Professional** must be enabled in order to give users the ability to log on to either a network domain or a local computer.

The logon process is the main component of security for the Windows 2000 Professional operating system. It defines who is accessing the computer and its network resources. It also specifies the rights and permissions the user has for accessing these resources.

Procedures

In this lab, the student will log on to the local computer using the local administrator password. Logging on to the local computer as administrator will give the student full administrative control of this computer, but the student will not have access to any network resources. The student will have to log on to the domain using a domain user account in order to have access to network resources.

Step 1: Log on to the Local Computer

1. When the computer finishes booting, the Windows 2000 Professional logon screen displays.

---

2. Log on with the following information:

   Username: **Administrator**

   Password: **cisco This does not match with what was created in the installation lab? password**

   Passwords are case sensitive and only display asterisks when they are entered.

3. Press the **Enter** key, or click the **OK** button to log on to the local Windows 2000 machine.

Step 2: Log off of Windows 2000

1. The user must first log off of the system before logging on to Windows 2000 again as a new user. Click the **Start** button and select **Shut Down** to display the Shut Down Windows dialog box.

2. Select **Log off Administrator** from the drop-down box. The administrator will now be logged off and the system will return to the start-up screen.

Using the Windows 2000 Professional GUI
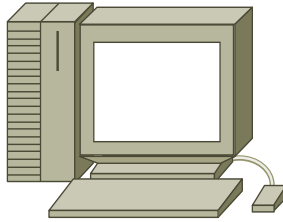
Estimated Time: 15 Minutes

Objective

In this exercise, the student will explore the basic features of the Windows 2000 Professional GUI.

Equipment

The following equipment is required for this exercise:

- A computer system with Windows 2000 Professional with administrative tools enabled.

Scenario

The Air Guitar Company has just installed a system with Windows 2000 Professional. The company has asked the administrator to explore the basic features of the Windows GUI.

Procedures

Before beginning this lab, make sure that the computer with Windows 2000 Professional is powered on and ready for log in.

Step 1: Log onto Windows 2000

Once the Windows server boots, the **Log On to Windows** dialog box appears. Log in with the following information:

Username: **Administrator**

Password: **cisco**

After entering the password, click the **Enter** button. If the username and password were typed in correctly, the system will authenticate the user and grant access to the server.

Step 2: Navigating the Desktop

Once user information is authenticated, the desktop environment will display.

The desktop environment includes several icons and the taskbar. By default, the taskbar resides at the bottom of the screen. Windows is designed for a two-button mouse. The function of left and right mouse buttons is described in the following table below.

Mouse Button	Function
Left	Use this button to select and drag items.
Right	This button is used to bring up a menu for the selected object (when applicable).

A user can run applications by opening windows on the desktop. Windows include borders that can be dragged to resize the window, and graphical buttons that can be clicked to minimize, maximize, restore and close the window. The table below shows the window buttons and their function.

Window Button	Function
	This button minimizes a window. Clicking its title on the taskbar can restore a minimized window (the taskbar is part of the panel).
	This button maximizes a window.
	This button restores a maximized window to its original size.
	This button closes a window. If the window contains an application running in the foreground, this option will terminate the application.

The Windows taskbar contains icons that start key applications or opens different menus. It also contains an area that displays the names of the open windows. A user can switch between these windows by clicking on the names in the taskbar.

The icons in the table below typically appear on the taskbar.

Taskbar Icon	Function
Start	This icon opens the Start menu.
	This icon launches the Internet Explorer Web Browser (iexplore.exe). This is a Quick Launch icon, and may not appear on all taskbars.
	This icon minimizes all open windows to reveal the desktop. This is a Quick Launch icon, and may not appear on all taskbars.

The Windows Start Menu is typically the first place an administrator goes to perform a task.

Right-click on the taskbar and select **Properties,** and then click the **Advanced** tab. Check the box for **Display Administrative Tools** and click **OK**.

Click on the **Start** button and select **Programs** from the menu. After the Programs submenu appears, select the **Administrative Tools** option, as shown below.
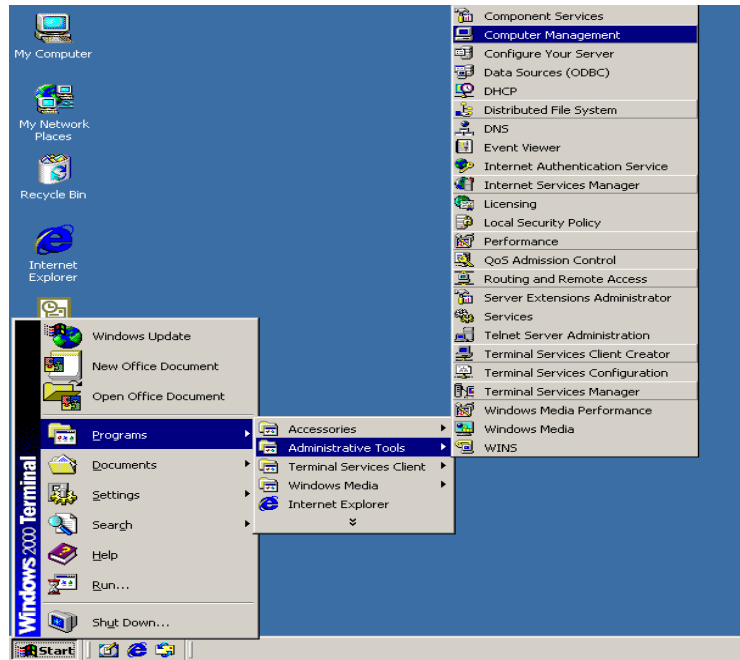
Once in the Administrative Tools submenu, left-click on **Computer Management**.

The Computer Management Window offers centralized management that allows a user to configure most of the system's key components:

- Network services such a mail, Web, DNS, SNMP

- Shared Folder

- Hardware devices (via Device Manager)

- Local Users and groups

- Storage
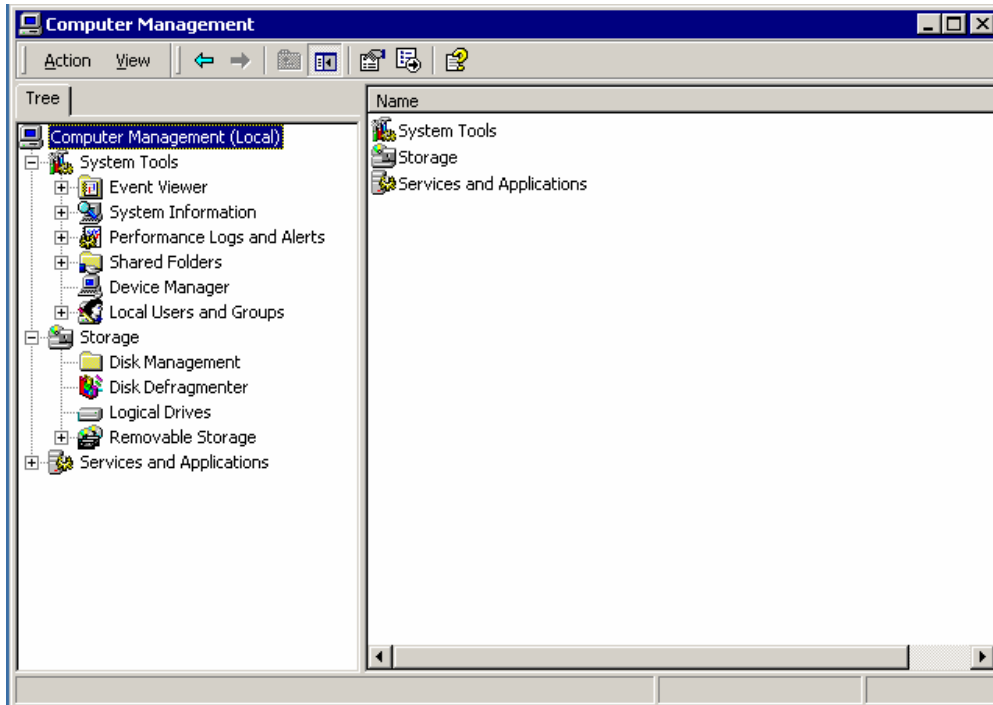
Windows 2000 Professional system administrators typically use the Computer Management Window to complete a majority of their administration tasks. The student will return to this window in future labs.

The student will explore some of the Computer Management features in the next step.

Step 3: Using Event Viewer

Event Viewer can be used to track down the root of a problem. Now, click on the plus sign (**+**) to the left of Event Viewer. The Management Tree will expand to display all of the logs kept by the Event Viewer.

The Event Viewer is used to track, or log, events on the system. If the system crashes or the administrator suspects a security problem, the Event Viewer can give some idea as to what happened.

1. What are the names of the logs shown in the expanded tree?

_____

Click on the minus sign (-) next to Event Viewer to collapse the tree.

Next, click on the plus sign (**+**) to the left of **System Information** and highlight **System Summary**, as shown below.
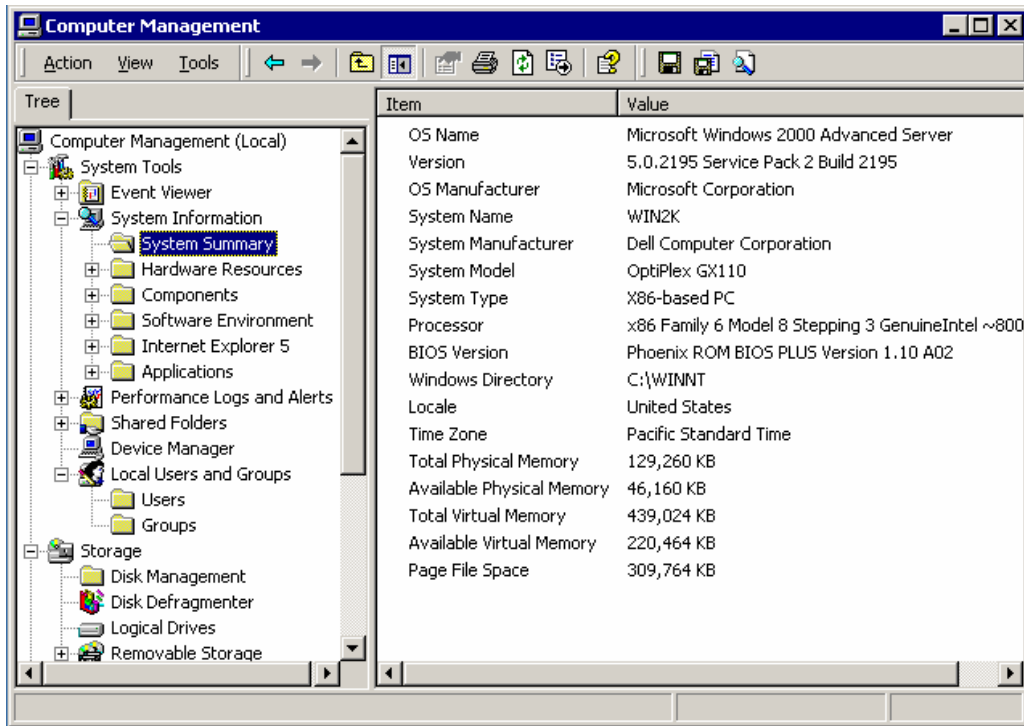
2. According to the output of the System Summary on the server, what is the version number of the NOS?

_____

3. Who is the system manufacturer?

_____

4. What type of processor does the server have?

_____

5. What is the BIOS version of the system?

_____

6. What is the total amount of physical memory on the system?

_____

Once the above questions have been answered, close the Computer Management window by clicking on the "**X**" at the top right corner of the window.

Step 4: Log off Windows 2000

From the Start menu, log off the system.

Reflection

Who should have access to the Computer Management window?

_____

What information is provided in the System Summary?

_____

_____

_____

What other information can be found under System Information?

_____

_____

_____

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Using the Windows 2000 CLI
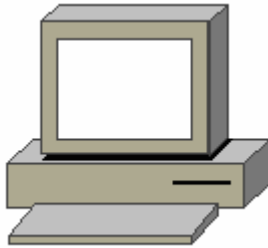
Estimated Time: 10 Minutes

Objective

In this lab, the student will learn how to use the Windows 2000 Professional command-line Interface (CLI) by executing several commands.

Equipment

The following equipment is required for this exercise:

- A computer with Windows 2000 Professional installed.

Scenario

The system administrator is going to be setting up a telnet administration, which is run from the command line.

Procedures

In this lab the student will access the CLI. The student will learn and execute various helpful commands to become familiar with using the CLI and how it works.

Step 1: Opening the CLI

There are two ways to access the CLI:

1. Logon as the **Administrator**.

2. On the taskbar, click **Start** > **Programs** > **Accessories** >**Command Prompt**.

3. When the command prompt opens type **exit** to close the CLI.

4. On the taskbar, click the **Start** > **Run**, and then type **cmd.**
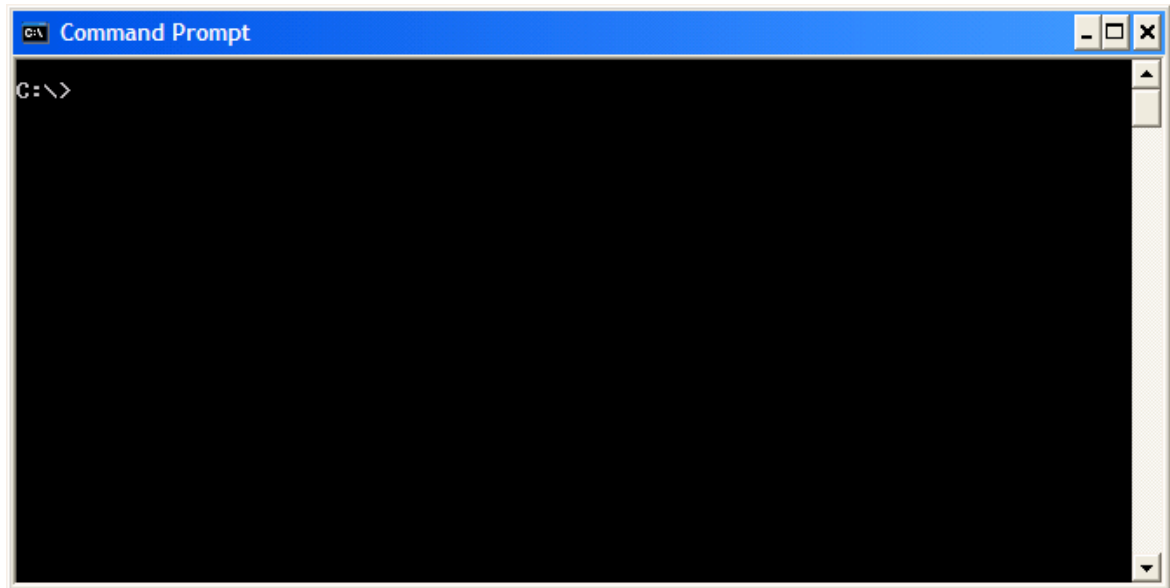
Step 2: Executing commands and Navigating with the CLI

1. Press **ALT + Enter** on the keyboard. The display will then switch to fill the entire screen with the Windows 2000 CLI.

2. Type **dir** at the C:\> prompt. This will show the contents of the **C: drive**.

3. Type **cd winnt** at the C:\> prompt and then **dir**. This will show the contents of the **C:\Winnt** folder.

4. Type **cd**, this will bring the user back to the C:\> prompt.

5. Type **edit autoexec.bat**. The autoexec.bat file can be edited with this command.

6. Press **Alt** + the letter **F**, to display the drop-down menu. Go to exit and press **Enter** to get back to the command prompt.

7. Type **ipconfig /all** to display the network configurations of the computer.

   • What is the IP address?

   _____

   • What is the DNS server address and the hostname of the computer?

   _____

Troubleshooting

Using the CLI can help with troubleshooting a variety of problems when the GUI is not available. Using the CLI will enable a user to effectively access the operating system and make repairs without crashing the system.

Navigating the Windows 2000 Professional file system with Windows Explorer and My Computer
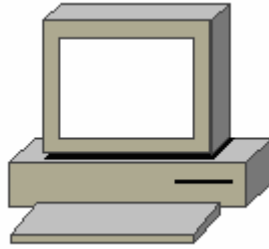
Estimated Time: 15 Minutes

Objective

In this lab, the student will learn how to navigate the Windows 2000 Professional file system with Windows Explorer. The student will also learn how to use the navigation tools to locate files and folders.

Equipment

The following equipment is required for this exercise:

- A computer with Windows 2000 Professional installed.

- A Marketing folder with an Excel file named **Spreadsheet.xls** saved in the Marketing folder
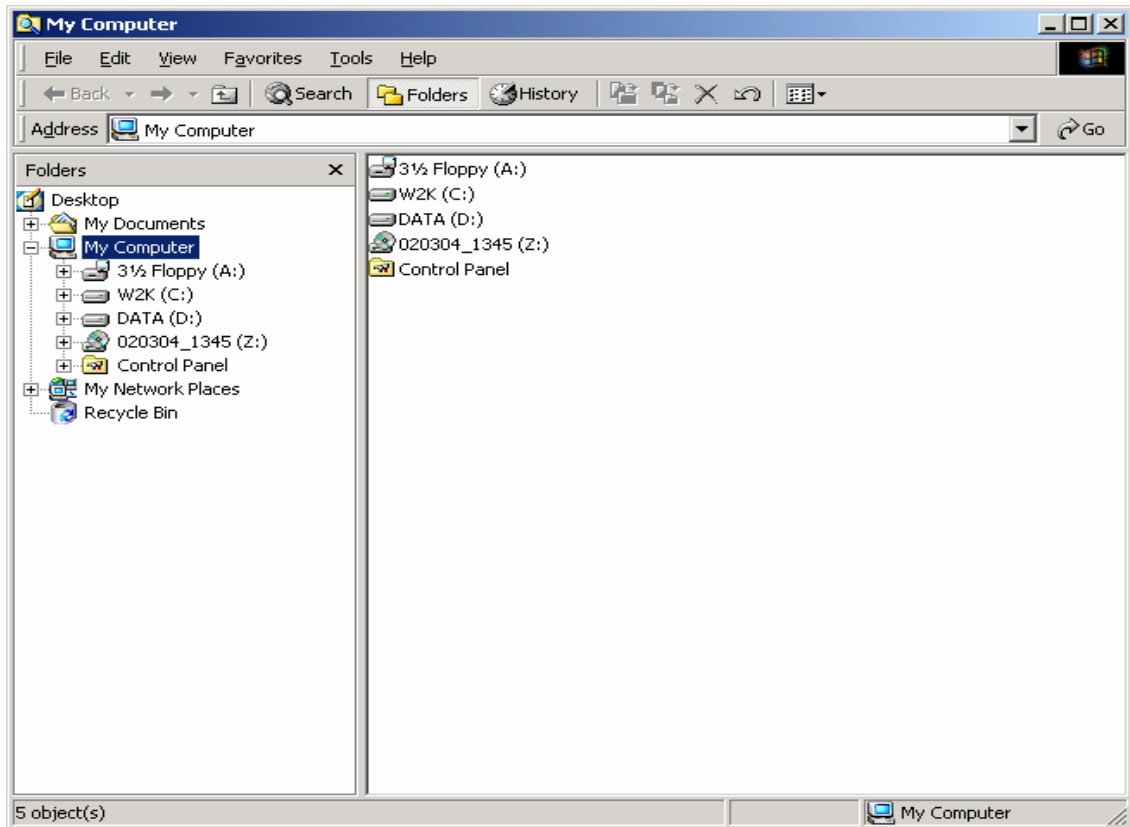
Scenario

A user needs help locating a lost file. The student will use various ways to navigate through the system and locate files.

Procedures

The student will use **Windows Explorer** and **My Computer** to navigate to files.

Step 1: Navigating the Windows 2000 file system using Windows Explorer

1. Right-click the **My Computer** icon on the desktop or right-click the **Start** button and select **Explore** from the menu.

2. Click on the (**+**) sign to the left of the **MyComputer** icon. Locate the **local Disk C:** icon and click on the (**+**) sign to expand the contents of the drive.

3. If the user clicks directly on the drive, the contents of the drive will be displayed on the right side of the screen.

4. On the left side menu of Windows Explorer, locate the **Documents and Settings** folder and click on the (**+**) sign next to it. This will display the contents of the folder.

5. Click directly on the folder itself and the contents of the Documents and Settings folder will display on the right side of the screen.

6. Click on the (**+**) sign next to the **Administrator** folder to expand it.

7. click on the (**+**) sign next to the **All Users** folder to expand it

8. Now the user has successfully navigated to the **Administrator** and **All Users** folder using Windows Explorer.

9. Close the Windows Explorer Window.

Step 2: Navigating the Windows 2000 Professional file system using My Computer

Double-click the **My Computer** icon located on the desktop.

1. This will display all of the drives located on the system.

2. Click on the folder view ▦▾ button located on the menu bar. A drop-down menu displays the folder and file options in My Computer. Select the **Details** option to change the view. The Details view provides important information including the date last modified, size, and type.

3. Double-click on the **Local Disk (C:)** icon to display the contents of the C:\ drive. Change the view to details again if it is necessary to see the file information.

4. Locate the **Documents and Settings** folder and double-click on it.

5. This will display the contents of the Documents and Settings folder. Within this folder, locate the **Administrator** and **All Users** folders.

Reflection

There are various ways to navigate and to locate files and folders.

1. What is another way to locate files or folders, or to navigate the Windows 2000 Professional file system?

_____

Adding Users in Windows 2000 Professional
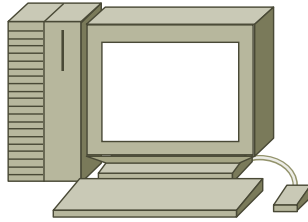
Estimated Time: 10 Minutes

Objective

- Describe the role and purpose of user accounts.

- Plan and create local and domain user accounts.

Equipment

The following equipment is required for this exercise:

- A system with Windows 2000 Professional installed with Administrative Tools enabled.

Scenario

The Air Guitar Company has just installed a new system with Windows 2000 Professional. The company has asked the student to log onto the server and create local accounts.

Procedures

Before proceeding with this lab, the student will need to obtain information from the instructor in order to create the new users. The student will need:

- User names
- Full names
- Descriptions
- Passwords

Additionally, the student will need the user name, password and domain to log on as the administrator.

In this lab, the student will create two user accounts in Windows 2000 Professional. Log on as the administrator and create the first user. While logged on as the first user, use the `Run As` command to gain administrator privileges to create the second user.

Step 1: Creating a User Account

1. Log on as the **Administrator**.

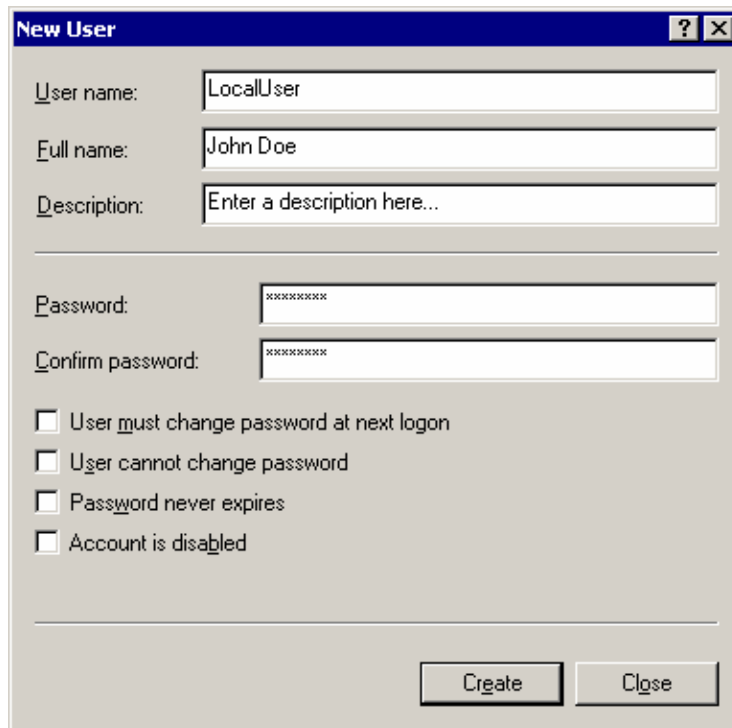2. Go to: **Start** > **Programs** > **Administrative Tools** > **Computer Management**.
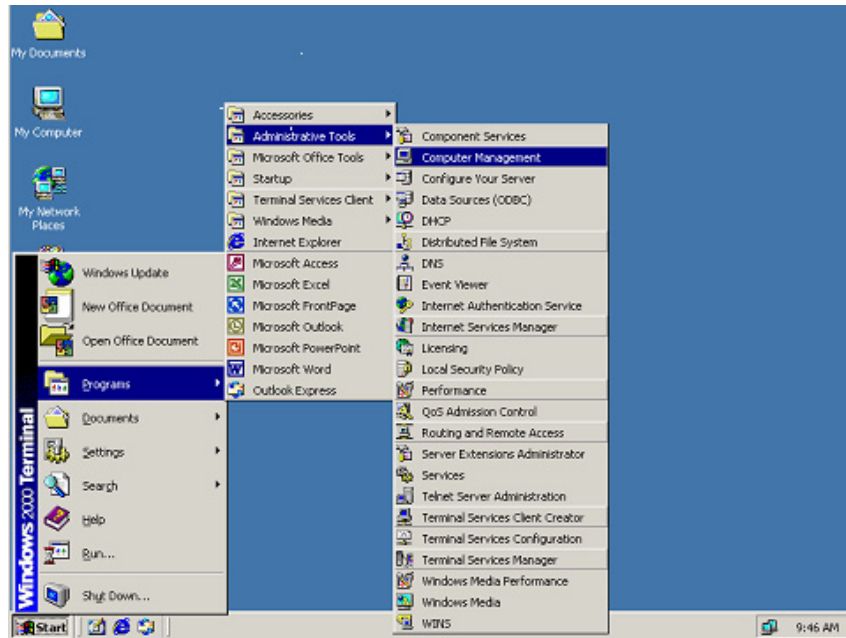
3. Under **System Tools,** expand **Local Users and Groups**.

4. Right-click on the **Users** folder and select **New User**.

Copyright © 2004, Cisco Systems, Inc.
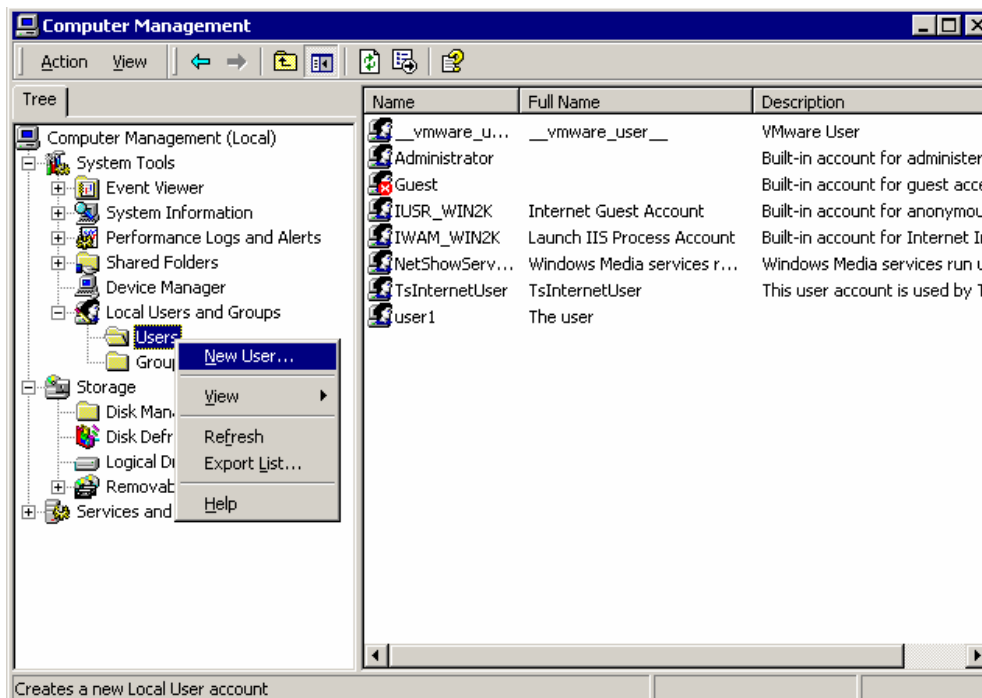
5. Create the first new user. Enter all information as provided by the instructor.

Note: Make sure that all options are unchecked.

6. When finished, click the **Create** button.

   The new user has now been created.

7. Log off of the system.

8. Using the account information that was just created, log back on to the system.

Note: Since the student is now a new user, Administrative tools will not be available. Follow these steps to add Administrative tools to the start menu:

   a. Right-click on task bar and click **Properties**

   b. Select the **Advanced** tab

   c. Under the Start Menu Settings, check the **Display Administrative Tools**

   d. Click **Apply** and click **OK** to exit back to the desktop

9. The second user will be added with the "Run As" command.

10. Go to **Start** > **Programs** > **Administrative Tools** > **Computer Management**.

11. Right-click on **Computer Management** and select **Run As**. Enter the Administrator Account Information and click **OK**.
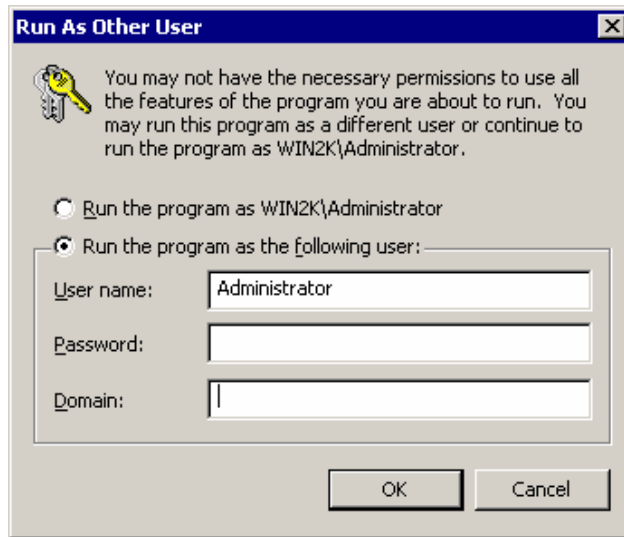
This grants administrator privileges to this instance of Computer Management only.

12. Repeat steps 2-7 to create the second user.

Troubleshooting

To create accounts in Windows 2000, the user must be either logged onto the server as Administrator or operating the tools as Administrator with the "Run As" option. If problems are encountered while creating these accounts, verify that the necessary administrative privileges are had by logging off of the server and logging on again using the Administrator account.

Reflection

2. What are some of the other applications found under the Administrative Tools of the Start menu?

_____

_____

3. Is the Run As option available for any other Administrative Tools in Windows 2000 Professional?

_____

_____

4. Why is it important that only an administrator is allowed to create user accounts?

_____

_____

Managing User Accounts in Windows 2000 Professional

Estimated Time: 15 Minutes

Objective

In this lab, the student will learn how to manage user accounts using the Windows 2000 Professional operating system. Also discussed are the features and tools that are used to manage user accounts.

Procedure

In this lab, the student will learn some of the Windows 2000 Professional techniques that are used to manage the user accounts after they are created. The student will use the studentA1 and the studentA2 accounts that were created in a previous lab.

Step 1: Changing User Account Properties

1. Log on to the system with the **Administrator** account.

2. Open the **Computer Management** screen by selecting **Start > Programs > Administrative Tools > Computer Management**.

3. Click on the plus sign (**+**) next to the **Local Users and Groups** icon to expand it.

4. Click on the **Users** folder to display the list of users in the right side of the screen.
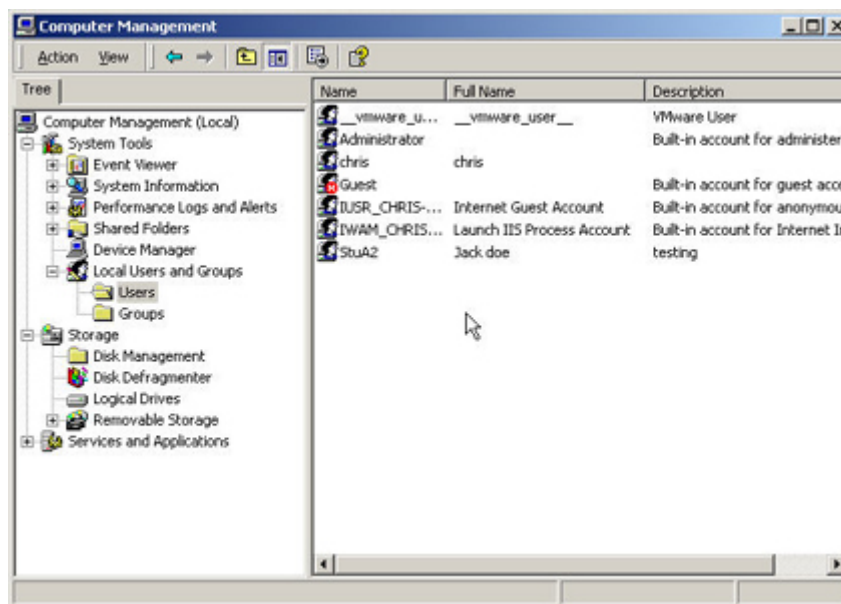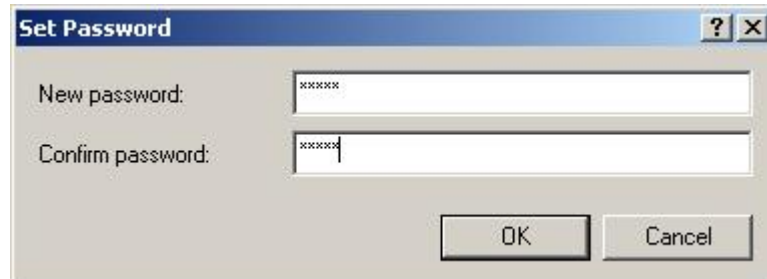

5. Right-click on the **StudentA1** account and select **Properties**.

6. Select the **User Cannot Change Password** and the **Password Never Expires** radio buttons. Next, click **Apply**, and then click **OK**.

Step 2: Changing a Password

1. Right-click on the **StudentA1** account and click **Set Password**. Type in a new password and then type it again to confirm the password. Click **OK**.

Step 3: Resetting a User's Password

1. Right-click on the **StudentA1** account and select **Properties**.

2. Uncheck the **User Cannot Change Password** and the **Password Never Expires** radio buttons. The **User must change password on next login** box will display. Click **Apply and then** click **Close** to exit.

3. Log off as the administrator and log on with the **StudentA1** account. When logging back on, a message prompting will be displayed the user to enter the new password. Type it in and then confirm it. Log in with the **StudentA1** account.

4. Log off as **StudentA1**.

Step 4: Deleting an Account

1. Open the **Computer Management** screen from administrative tools in the start menu.

2. Navigate to the **StudentA1** account.

3. Right-click on the account and select **Delete**. Read the message and select **Yes** to confirm the deleted message.
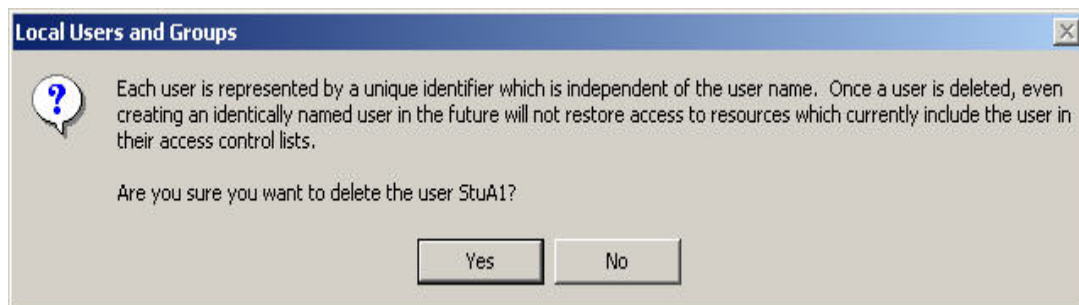
Troubleshooting

Sometimes a user will have problems with their account. Passwords can be forgotten or entered incorrectly and after a certain number of attempts, a user can be locked out. These tasks can be used to unlock the account. User account management should be kept simple in order to maintain the large number of user accounts in a large company.

Reflection

1. What other method can be used to change user account information?

   _____

   _____

Creating Files and Directories Using Windows 2000 Professional
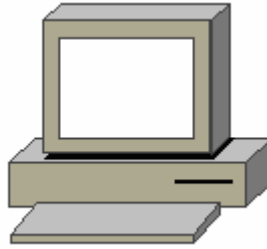
Estimated Time: 15 Minutes

Objective

In this lab, the student will learn how to create files and directories in Windows 2000 Professional.

Equipment

The following equipment is required for this exercise:

- A computer system with Windows 2000 Professional installed.

Scenario

The IT department has purchased some new computer systems. They want new directories and files created on the server for the people that are going to be receiving these new computers.

Procedures

In the first step of this lab, the student will create a directory or folder. Then, the student will create a file and save it inside the directory.

Step 1: Creating a Directory

1. Log in as the **Administrator**.

2. Right-click on the **My Computer** icon, or the **Start** button and select **Explore**.

3. Locate the **Local Disk (C:)** and click on the plus (**+**) sign to expand this drive.

4. Click on the **Local Disk (C:)** icon to display the contents of this drive on the right side of the Windows Explorer screen.

5. Move the cursor to the right side of this screen, right-click in an open area and select **New** > **Folder**, to create a new directory on this drive.

6. When the folder is created, name it **Lab 5.3.5**.

Step 2: Creating a File

1. Double-click on the **Lab 5.3.5** folder to open it.

2. Right-click on an open space in the directory and select **New** > **Text Document**, to create a new file on this drive.

3. When the file is created, name the file **Lab 5.3.5 document**.

4. The file can now be opened and edited or saved. Double-click on the file to open it and then type the sentence below.

   I have learned how to create a file and directories with Windows 2000 Professional.
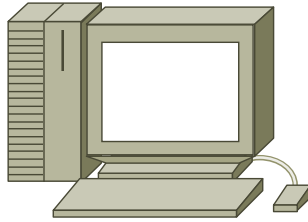
5. Close the document and select **Yes** when asked to save the file.

Troubleshooting

Make sure that file names contain valid characters. There are some characters that Windows will not allow in a file or folder name. Do not use the following characters listed below.

\ /: *? " < > |

Creating Groups in Windows 2000 Professional

Estimated Time: 20 Minutes

Objective

- Create groups in Windows 2000 Professional.

- Add members to these groups and organize user accounts.

Equipment

The following equipment is required for this exercise:

- A system with Windows 2000 Professional installed.

Scenario

The ABC Company stores sales reports on their Windows 2000 Professional computer. The company would like to allow specific users to access these reports over the network. The network administrator's task is to create and configure the necessary groups to accommodate this request.

Procedures

A group is a collection of user accounts. Groups are used to simplify the management of users and access to shared resources. Groups allow a user to define permissions for multiple users at one time. After group permissions are defined, members are then added to the group. Windows 2000 provides different types of groups for different tasks.

In this lab, the student will create two local groups called Marketing and Engineering. The student will than create LocalUser1, LocalUser2, LocalUser3, and LocalUser4. The student will add users to the Engineering group, and then remove a user from the Engineering group.

Note: LocalUser1 and LocalUser2 were deleted in lab 8.3.2.

Step 1: Creating Local Groups

1. Log in as the **Administrator.**

2. Open the **Computer Management** screen. Click on **Start > Programs > Administrative Tools > Computer Management**.

3. Click on the plus (**+**) sign to expand **Local Users and Groups**, and then click **Users**. This will display the list of current and built-in local users in the details pane.

4. Create the accounts **LocalUser1**, **LocalUser2**, **LocalUser3**, and **LocalUser4**. Give each account a full name and make the password for each account, **password**.

5. Now, click **Groups**. This will display the list of current and built-in local groups in the details pane.

6. To create a new group, right-click on the right panel and select **New Group**. The New Group dialog box will be displayed.

7. Type **Marketing** in the **Group name** box. Then type **Access to Client Files** in the **Description** box. Click on the **Create** button.

8. The **Select Users or Groups** dialog box displays.

9. Scroll down the list of users to find the **LocalUser1** and **LocalUser3**. Hold the **Ctrl** key down and select LocalUser1 and LocalUser3 and click **Add**. Click **OK**.

10. In the New **Marketing Group** dialog box, notice that **LocalUser1** and **LocalUser3** are listed in the **Members** box. Click **Create**.

11. Windows 2000 Professional creates the group and adds it to the list of users and groups. Note the New Group dialog box is still open and might block the view of the list of users and groups.

12. Repeat **steps 5-10** to create a group named **Engineering**. Type **Access to design files** in the description box, and make **LocalUser2** and **LocalUser4** members of the Engineering group.

13. When both groups have been created, click **Close** to close the **New Group** dialog box.

14. Notice that the **Engineering** and **Marketing** groups are listed in the details pane.

Step 2: Adding and Removing Members

1. In the details pane of Computer Management, double-click on the **Engineering Group**.

   The **Engineering Properties** dialog box displays the properties of the group. Notice that **LocalUser2** and **LocalUser4** are listed in the **Members** box.

2. To add a member to the group, click **Add**. The **Select Users or Groups** dialog box will display.

3. In the **Name** box, select **LocalUser3**, click **Add**, and then click **OK**.

4. The **Engineering Properties** dialog box will list **LocalUser2**, **LocalUser3**, and **LocalUser4** in the **Members** box.

5. Select **LocalUser4** and then click **Remove**.

6. Notice that **LocalUser4** is no longer listed in the **Members** box. **LocalUser4** still exists as a local user account, but it is no longer a member of the Engineering group.

7. Click **OK**.

Step3: Deleting a Local Group

1. Right-click the **Engineering** group in the **Computer Management** details pane, and select **Delete**.

   A **Local Users And Groups** dialog box appears, asking whether or not to delete the group.

   Click **Yes**.

   Notice that the Engineering group is no longer listed in the Computer Management details. The members of the group were not deleted. **LocalUser2** and **LocalUser3** are still local user accounts on the computer.

   Click the **x** in the upper right hand corner of the window to close Computer Management.

## Troubleshooting

The user must be logged onto the system using an account with administrative privileges to perform system administrator tasks in Windows 2000 Professional. If there are any problems finding the necessary tools or making changes to the system, make sure to be logged on as the Administrator.

Reflection

What are some benefits of using groups to control access?

_____

_____

_____

Assigning Permissions in Windows 2000 Professional
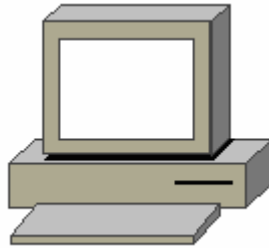
Estimated Time: 30 Minutes

Objective

In this exercise, the student will learn how to assign NTFS permissions to the folders based on the scenario that is described in the following section.

Equipment

The following equipment is required for this exercise:

- A computer with Windows 2000 Professional formatted with NTFS.

Scenario

There is some sensitive data that needs to be contained Create the folders and assign the proper permissions to the folders. The goal is to give LocalUser2 permissions to be able to create and delete files in these folders and prevent LocalUser1 from doing so.

Procedures

In the first part of the lab, create the folders and assign permissions using the chart as a guide to help create the folders and assign the proper permissions. Then, assign permissions to folders based on the following chart. In the second part of the lab, log in to the system as the administrator to test the permissions.

Step 1 Initial Lab Setup

First, create the folder structure exactly as it is shown in the following chart on the C:\ drive of the computer. 1. Create a folder on the **C:\ drive**. Name it **Chemistry**.

2. Next, create two more folders within the **Chemistry** folder. Name one **Experiments** and the other **Laboratory.**

3. Now, open the **Experiments** folder and create a new folder. Name it **Week 3**.

Assign users and permissions to the following folders. Use the **LocalUser1** and **LocalUser2** accounts that were already created. Log on to the system as one of the users and test these NTFS permissions in the second part of the lab.

| Folders	Users & Groups	Permissions
C:**Chemistry**	Users Group → Administrators Group→	→ Read & Execute → Full Control
C:\Chemistry**Experiments**	Users Group → Administrators Group →	→ Read & Execute → Full Control
C:\Chemistry\Experiments**Week_3**	Users Group → Administrators Group → LocalUser2	→ Read & Execute → Full Control → Modify
C:\Chemistry**Laboratory**	Users Group → Administrators Group →	→ Read & Execute → Full Control

Step 2 Verifying NTFS

1. Log in as the **Administrator**.

2. Open **My Computer** and right click on the **C:\ drive**.

3. Click **Properties**.

4. Under the general tab, verify that the file system is NTFS, click **OK**.

   If the file system is not NTFS then this lab will not work.

Step 3 Assign NTFS permissions for the folders

Only the Administrator account can complete the following steps.

1. Open **Windows Explorer** and navigate to the Chemistry folder.

2. Right-click the **Chemistry** folder and select **Properties**. The properties box should be displayed for the folder in the **General** tab view.
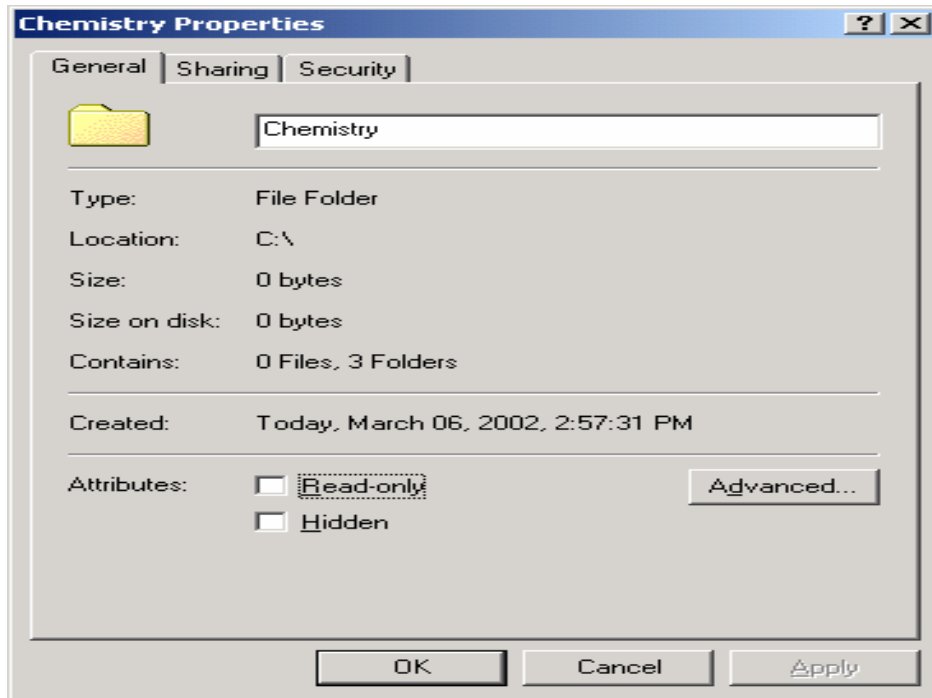
3. Click on the **Security** tab.

4. Next click the **Add** button to add permissions for the user or group accounts according to the chart in Step 1.

   Note: (This needs to be done for each folder in the chart but this can only be done one folder at a time.) When you click the **Add** button, Windows will display the **Select Users or Groups** box.
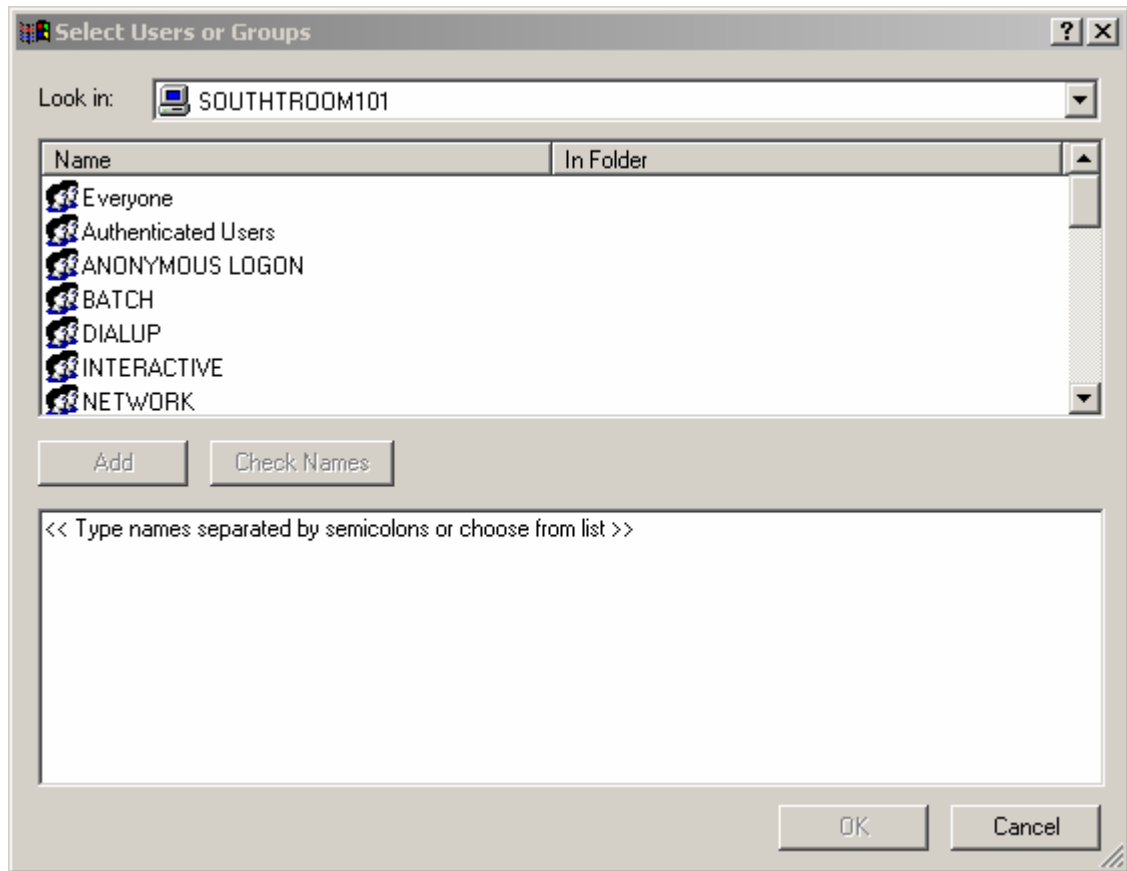
5. Make sure that the name of the computer in the computer box is your computer, if it is not scroll through the drop-down menu and select your computer.

6. According to the chart in **Step 1**, begin adding user accounts and group accounts by selecting them in the name box and clicking the **Add** button. Again, do so according to the chart in Step 1, then click **OK**.

   Note: Do not proceed to Step 7 until all Users & Groups have been added to the specified folder according to the Chart in Step 1.

7. To assign permissions, click on the users group and set the permissions according to the chart in step 1 by checking the appropriate box. Do this by right clicking on the folder and selecting the **Security** tab just like in steps 2, 3, & 4. Then click on the **Admin group** and set the permissions by checking the appropriate box. Next click **Apply** and then **OK** to close the window.

   Repeat steps 6 & 7 for each folder that is highlighted in the chart in Step 1.

8. When finished, click **OK** to return to the properties dialog box for the folder.

9. Now go back to the **Chemistry** folder and open the properties box by right clicking on the folder and selecting **Properties**. Then, select the **Security** tab again. If the properties box contains user accounts and groups that are not listed in the chart remove them by selecting them and then click **Remove**. The **Everyone** group must be removed, otherwise it will inherit the permissions. To remove the **Everyone** group, deselect the box next to, **Allow Inheritable permissions from parent to propagate**

to this object. A warning message will appear. Read it first and then select **Remove** to confirm that the Everyone group will be removed. The Everyone" group should automatically be removed at this point.

Note: If it does not, then manually remove the Everyone group by selecting it and clicking **Remove**.

10. Click **OK** to save the changes and close the properties box.

11. Close all the boxes and log off Windows.

Step 4: Test the NTFS permissions you assigned in Step 1

1. Test the permissions for the Week 3 folder while logged on as LocalUser1 by doing the following:

   - Log on as **LocalUser1**, and navigate to the **Chemistry\Experiments\Week 3** folder.

   - Try to create a file in the Week 3 folder.

Was the attempt to create this file successful?

Test the permissions for the Week 3 folder while logged in as LocalUser2

   - Log off Windows and Log back on as **LocalUser2**, and then navigate to the **Chemistry\Experiments\Week 3** folder.

   - Try to create a file in the Week 3 folder.

Was the attempt to create this file successful?

2. Test permissions for the Laboratory folder while logged in as Administrator by doing the following:

   - Log off Windows and Log back on as **Administrator**, and then navigate to the **Chemistry\Laboratory** folder.

   - Try to create a file in the Laboratory folder.

Was the attempt to create this file successful?

3. Test permissions for the Experiments folder while logged in as LocalUser1 by doing the following:

   - Log off Windows and log back on as **LocalUser1**, then navigate to the **Chemistry\ Experiments** folder.

   - Try to create a file in the Experiments folder.

Was the attempt to create this file successful?

4. Test Permissions for the Laboratory folder while logged in as LocalUser2 by doing the following:

- Log off Windows and log back in a **Local User2**, then navigate back to the **Chemistry\ Laboratory** folder.

- Try to create a file in the Laboratory folder.

Was the attempt to create this file successful?

_____

Reflection

From how permissions are assigned in this lab it is possible to control who has access to specific folders on a computer and protect sensitive files that are located on computers on a network.

Troubleshooting

Assigning NTFS permissions can be a confusing task when you are dealing with large amounts of data. It is a good idea to keep the process as simple as possible. Also, when formatting a drive or volume with NTFS, the Full Control permission is assigned to the Everyone group. Change this default permission and assign other appropriate NTFS permissions to control access to the folders and files on the network.

Configuring HTTP Services on Windows 2000 Professional
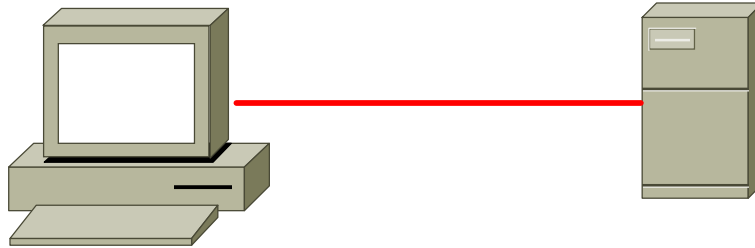
Estimated Time: 30 Minutes

Objective

In this lab, the student will configure a Windows 2000 Professional system with HTTP services and create an HTTP server.

Equipment

The following equipment is required for this exercise:

- A computer system with Windows 2000 Professional installed.

Scenario

The Marketing Director of the XYZ Company needs help creating a web site that the employees in the Marketing and Sales department will be able to access and provide content and information for their clients. It is your job to create an HTTP site on the server for them to access.

Procedures

In the first step of this lab, start the HTTP services and configure the HTTP site on the server. In the second step, configure the HTTP site properties and build the content that will be on the HTTP server.

Step 1: Starting the HTTP Services

1. Log on with the **Administrator** account.

2. Open the Control Panel. Go to **Start** > **Settings** > **Control Panel**.

3. From the Control Panel, double-click on the **Add & Remove Programs** icon.

4. Next, click on the **Add/Remove Windows Components** button.

5. When the **Windows Components Wizard** appears, click in the box next to **Internet Information Services (IIS)**.

---
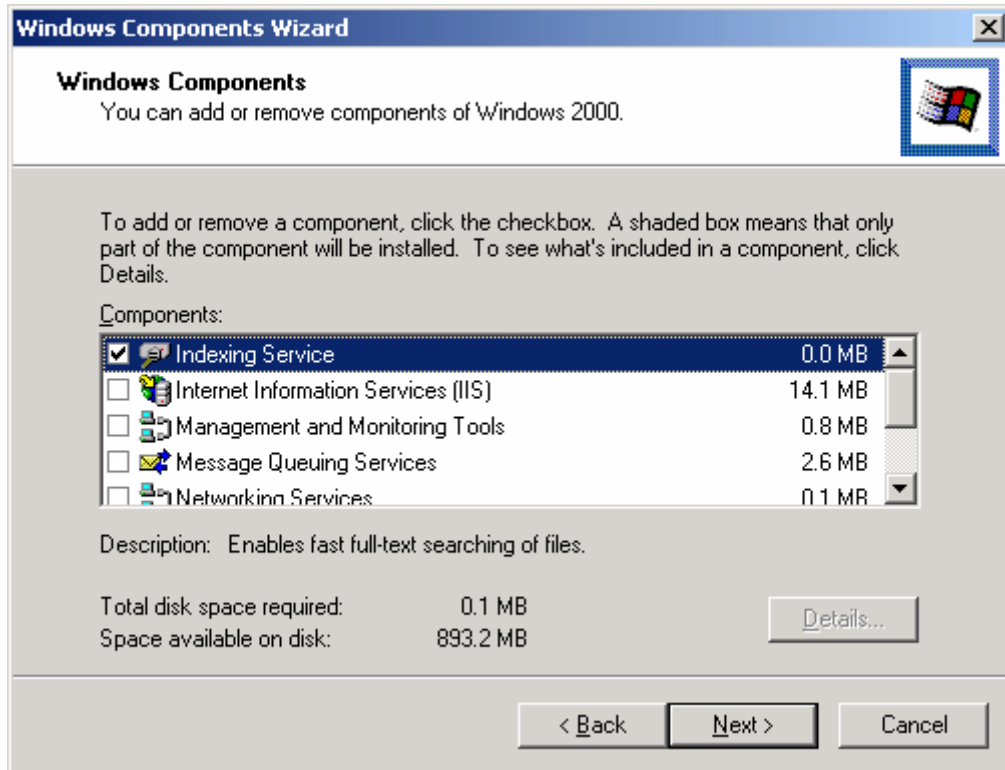
6. Click the **Next** button to install the Internet Information Services. The Windows 2000 Professional CD will be needed to complete the installation. When prompted, insert the installation CD to copy the necessary files. The installation process will complete in a few minutes.

7. Click **Finish** to close the installation box. Then click **Close** to close the **Add/Remove Programs** box. Finally, close the **Control Panel.**

Step 2: Configuring the HTTP sites properties and building the content

1. Open the **Start Menu** and go to **Programs** > **Administrative Tools** > **Internet Services Manager**. This will open the IIS configuration page where the user can begin to configure and create an HTTP site.
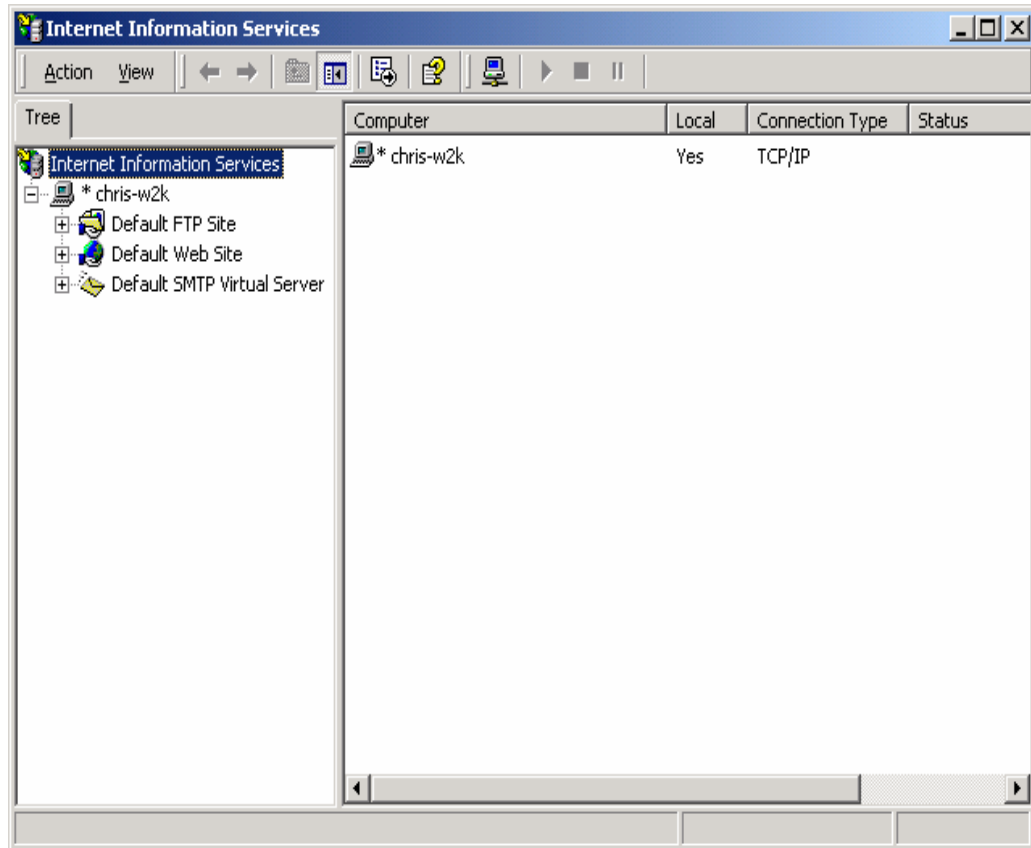
2. Once the IIS page opens, find the name of the computer and click the plus (**+**) sign next to it. This will display the **FTP**, **HTTP**, and **SMTP Virtual Server** icons.

3. Click on the **Default Web Site** icon to display the default web site contents and the directories where the content files are stored.

4. Right-click the **Default Web Site** icon and choose **Properties**. From this page, the user can configure all the properties and control what will be displayed on the HTTP site.

5. While on the **Web Site** tab, select the **IP Address** box. Click on the arrow from the drop-down menu and select the IP address of the computer.

6. Next, go to **Connections** section of the same tab and change **Connection Timeout** value to **120**. After making these changes select **Apply**.

7. Click on the **Home Directory** tab and click **Browse** to select the folder that will contain the website documents to view on the site. This is typically, **C:\inetpub\wwwroot**. Click **Apply** to save the changes. Close the Internet Services Manager.

   Note: If using a third party HTML editor like FrontPage, make the home directory folder the **My Webs** folder. As web pages are created and edited, all the files will be saved in this folder, not the default folder.

Step 3 Checking the connection

1. To check if the HTTP site is working properly, go to any computer on the network and type the IP address of your HTTP server into the address bar of the Internet browser. All the contents of the FTP directory should be visible in the browser.

2. Open the command line interface. At the prompt type `ftp` and then the address of the server. Type in the user name and password.

3. To check the contents of the directory type `dir`.

4. To exit the site, type `bye`.

Troubleshooting

If there is trouble connecting to the HTTP site, check the IP address that is typed in the browser as well as the IP address that is specified in the HTTP site properties page. If the network IP addresses are assigned dynamically with a DHCP server, then the IP address might change from time to time. Assign the HTTP server a static IP address so that the IP address does not change. This will save administrative costs and troubleshooting access to the HTTP site.

Reflection

If setting up a HTTP server in a business or corporate network, routers and firewalls will have to be configured to allow HTTP access to the HTTP server. Remember that the IP address of the HTTP server might not be a public IP address and therefore will not be directly connected to the network. In this case, you will have to configure the router to forward incoming HTTP requests to the proper computer on which the HTTP server resides.

Configuring FTP Services on Windows 2000 Professional
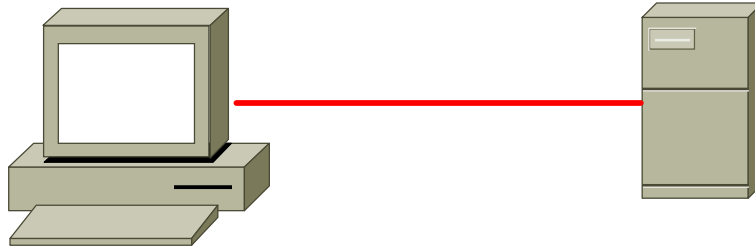
Estimated Time: 20 Minutes

Objective

In this lab, the student will configure a Windows 2000 Professional system with FTP services and create a FTP server.

Equipment

The following equipment is required for this exercise:

- A computer system with Windows 2000 Professional installed.

Scenario

The Marketing Director of the XYZ Company wants an FTP site that the employees in the Marketing and Sales department will be able to access, so they can download files when they are away from the office. Create a FTP site on the server for them to access.

Procedures

In the first Step of this lab, the student will start the Internet Information Services (IIS) services and configure the FTP site on the server. In the second step, the student will configure the FTP site properties and build the content that will be on the FTP server.

Step 1: Starting the FTP Services

Note: The IIS services were installed when the HTTP server lab was complete. If not, complete steps 1-6. If IIS services are installed, skip steps 1-6.

1. Open the Control Panel. Click on **Start** > **Settings** > **Control Panel**.

2. Double-click on the **Add & Remove Programs** icon.

3. Next, click on the **Add/Remove Windows Components** button.

4. When the **Windows Components Wizard** appears, click in the box next to Internet Information Services (IIS).

5. Click the **Next** button to install the Internet Information Services (IIS). The Windows 2000 Professional CD will be necessary to complete the installation. When prompted, insert the installation CD to copy the necessary files. The installation process will complete in a few minutes.

---

6. Once the installation completes, click **Finish** to close the Installation box. Click **Close** to close the **Add/Remove Programs** box. Close the **Control Panel**.

Step 2: Configuring the FTP sites properties and building the content

1. Open the **Start Menu** and go to **Programs** > **Administrative Tools** > **Internet Services Manger**. This will open the IIS configuration page where the user can begin to configure and create the FTP site.

2. Once the IIS page is open, find the name of the computer and click the plus (**+**) sign next to it. This will display the FTP, HTTP, and SMTP Virtual Server icons.
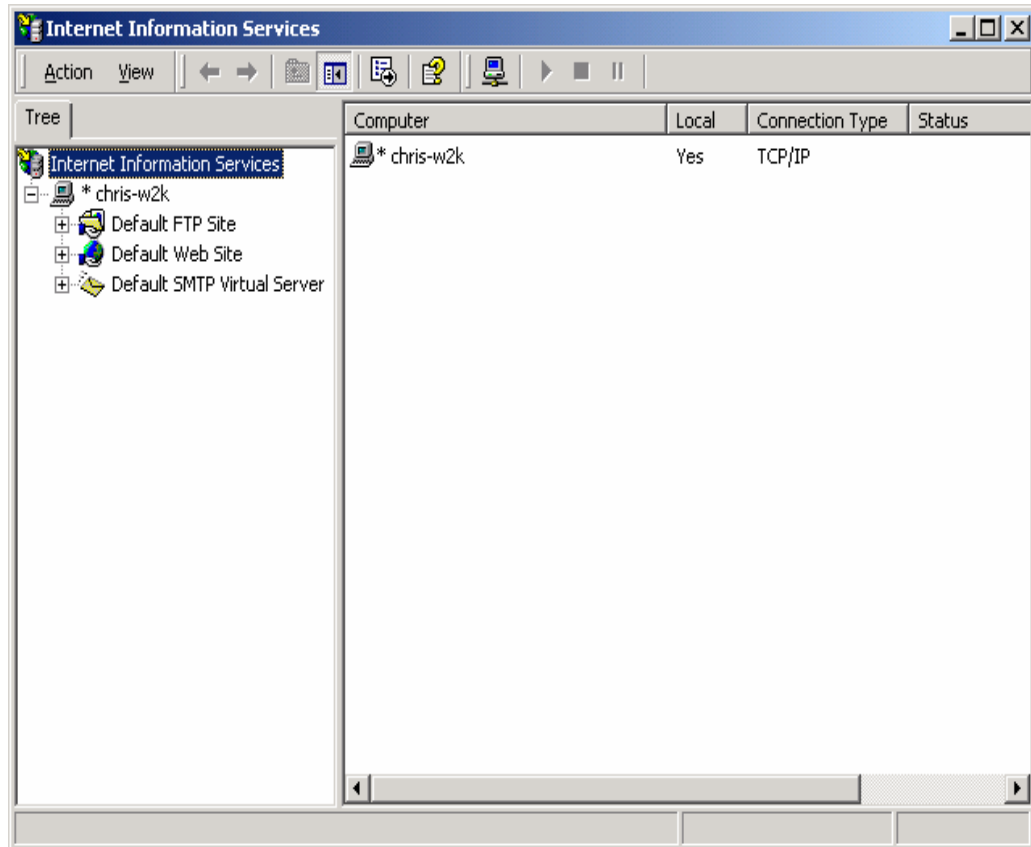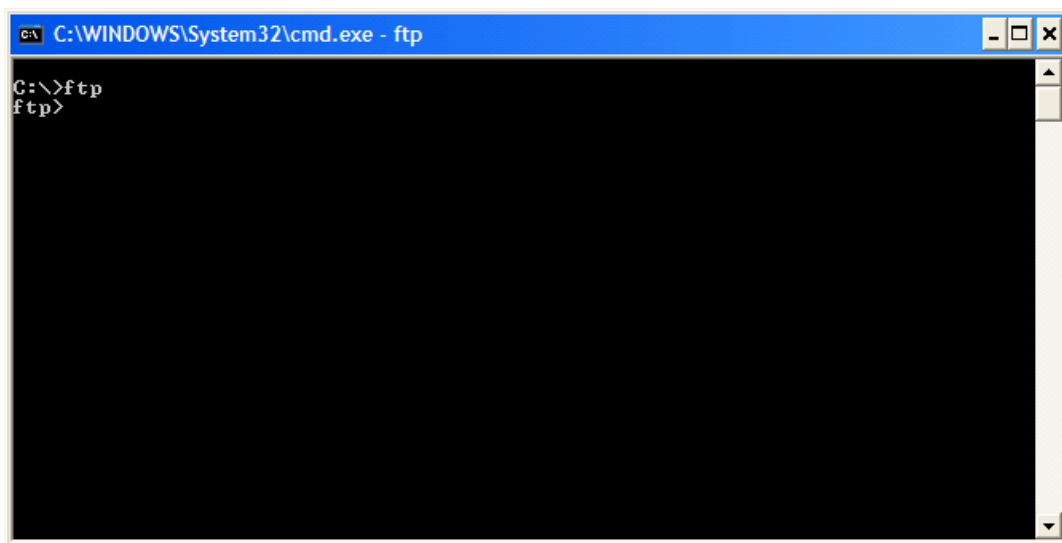
3. Right-click on the **Default FTP Site** icon and select **Properties**.

4. From this page the user can configure all the properties and control what will be displayed on the FTP site.

5. While on the FTP site tab, go to the **IP address** box and select the IP address of the computer from the drop-down menu.

6. Go to **Connection** section of the same tab and change the value from **ten** to **two** to limit the number of connections allowed at a time. Then change the **Connection Timeout** value to **120**. After making these changes, select **Apply**.

7. Next, select the **Messages** tab and create messages that will be displayed to people when they connect to the FTP server.

8. Click on the **Home Directory tab** and click **Browse** to select the folder that will be used when the FTP site is accessed. Click **Apply** to save the changes and close the Internet Services Manager.

9. Go to the **C:\Inetpub\ftproot** directory. Once in this directory, right-click and create a small text file. Save this file as **MyFTP**.

   Note: Make sure that the content of this folder contains only the information and files wanted on the FTP server.

10. Verify that your FTP site is working at the command prompt. Go to **Start** > **Run** and type in **cmd**. At the command prompt type in the IP address (ftp 10.1.1.5 for example).

   - Login as anonymous and press **Enter** for the password.

   - Now type the word **dir** to see if the file **MyFTP** file is there.

   - Type the word **bye** to exit the FTP session.

Troubleshooting

If there is trouble connecting to the FTP site, check the IP address that is typed in the browser and the IP address that is specified in the FTP site properties page. If the network IP addresses are assigned dynamically with a DHCP server, the IP address might change from time to time. Assign the FTP server a static IP address so that the IP address does not change. This will save administrative costs and troubleshooting access to the HTTP site.

Reflection

If setting up a FTP server in a business or corporate network, routers and firewalls will have to be configured to allow FTP access to the FTP server. Remember that the IP address of the FTP server might not be a public IP address and therefore will not be directly connected to the network. In this case, configure the router to forward incoming FTP requests to the proper computer on which the FTP server resides.

1. What are the advantages and disadvantages of anonymous log in to FTP sites?

_____

_____

Configuring Telnet on Windows 2000

Linux Server

Workstation (or another server)
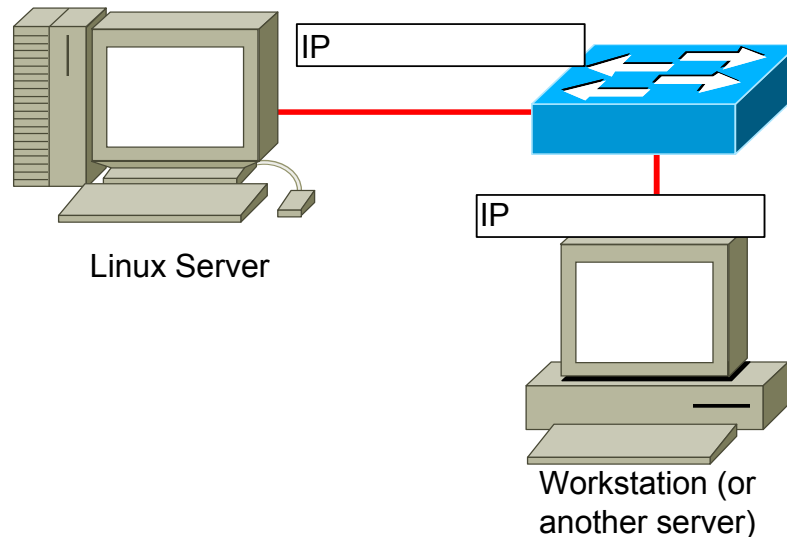
Estimated Time: 40 Minutes

Objective

In this lab, the student will learn how to configure Telnet services on Windows 2000 Professional.

Equipment

The following equipment is required for this exercise:

- A system with Windows 2000 Professional installed.

- A network connection from the workstation to a hub or switch.

- A PC with a Telnet client program connected to the same hub or switch.

Scenario

The ABC Company has just installed a server running Windows 2000. The company has asked that Telnet services be configured so that the workstation can be remotely administered using Telnet.

Procedures

Before beginning this lab, make sure that both the Windows 2000 Professional workstation and the other PC are ready for log in. Power these hosts on, if necessary.

This activity requires that the PC be connected to at least one other host on the same IP network. Verify that the Ethernet connections are in place. If using a hub or switch, check the LED lights to verify a connection.

Finally, ask the instructor or a lab technician for the appropriate IP address information for both hosts. Record that information in the tables provided:

Connected Host IP Address Configuration	
IP address:	
Subnet mask:	
Default gateway:	

Local Host IP Address Configuration	
IP address:	
Subnet mask:	
Default gateway:	

Record the IP address of the server and workstation in the boxes provided in the network diagram.

Step 1: Log in to Windows 2000

Log in as the **Administrator**.

Step 2: Setting the IP address

Configure the Windows 2000 Professional workstation IP address, subnet mask, and default gateway to match the information entered in the table. If this information has already been configured in a previous lab, get the other workstation's information. Configure the workstation IP stack accordingly. Use `ping` to verify that the server can communicate.

Step 3: Open Administrative Tools

On the workstation, start the **Computer Management** console. Go to **Start** > **Programs** > **Administrative Tools**.

Step 4: Services and Applications

Once the Computer Management window displays on screen, click the plus (**+**) symbol to the left of **Services and Applications** and select **Services** from the expanded tree.
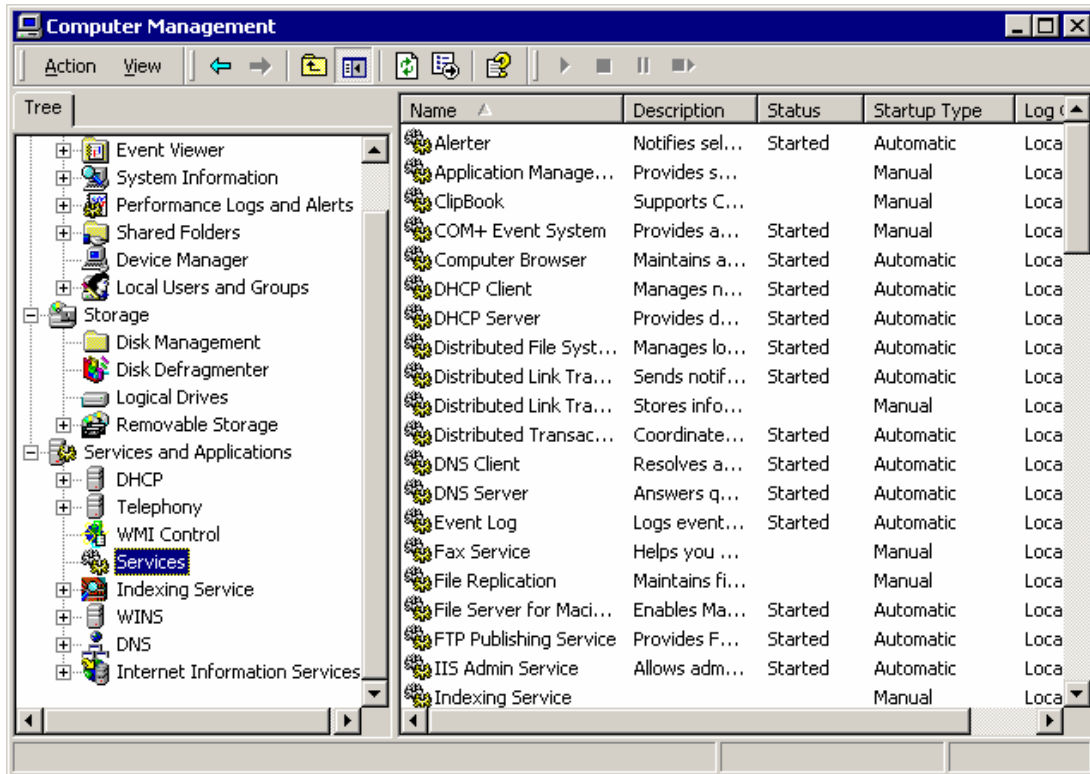
The Services section contains controls for starting and stopping the various services that are run in Windows 2000.

Step 5: Configuring the Telnet Service

In order to allow Telnet clients to connect to the workstation, the Telnet service must be started. Scroll the right-hand pane until the **Telnet** service is visible.

Notice that the **Status** column is blank for the Telnet service indicating that the service is not currently running. To start the Telnet service, right-click on the service and select **Start** from the menu.
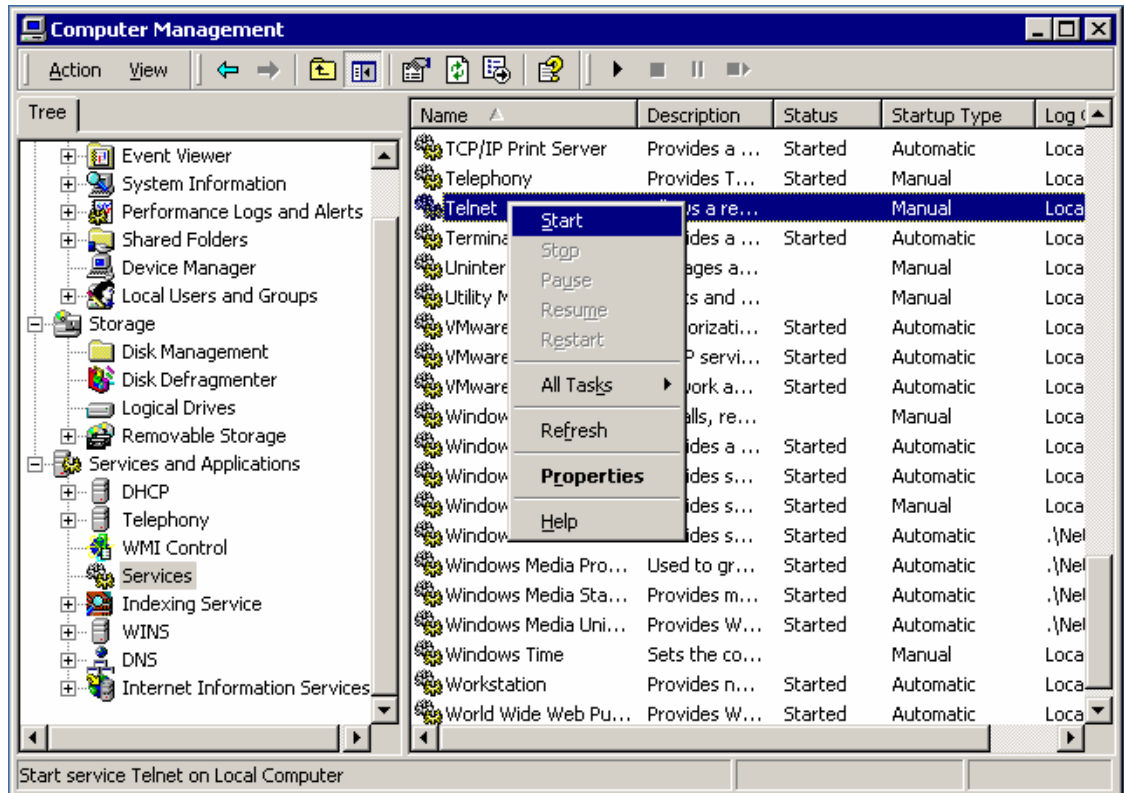
A Status indicator displays as Windows attempts to start the service. Check the Status column and verify that the service has started.

Step 6: Locating the Telnet Service

The Telnet service for Windows 2000 Professional defaults to using NT LAN Manager NTLM authentication, which is not supported on all systems. In order to make sure that the Telnet service will work with any Telnet client, the service needs to be configured to accept clear text usernames and passwords, if NTLM authentication fails. To do this, start Telnet Server Administration, which is located in the Administrative tools menu next to Computer Management.

```
Telnet Server Administration

Microsoft (R) Windows 2000 (TM) (Build 2195)
Telnet Server Admin (Build 5.00.99201.1)

Select one of the following options:


0) Quit this application
1) List the current users
2) Terminate a user session ...
3) Display / change registry settings ...
4) Start the service
5) Stop the service

Type an option number [0 - 5] to select that option: _
```
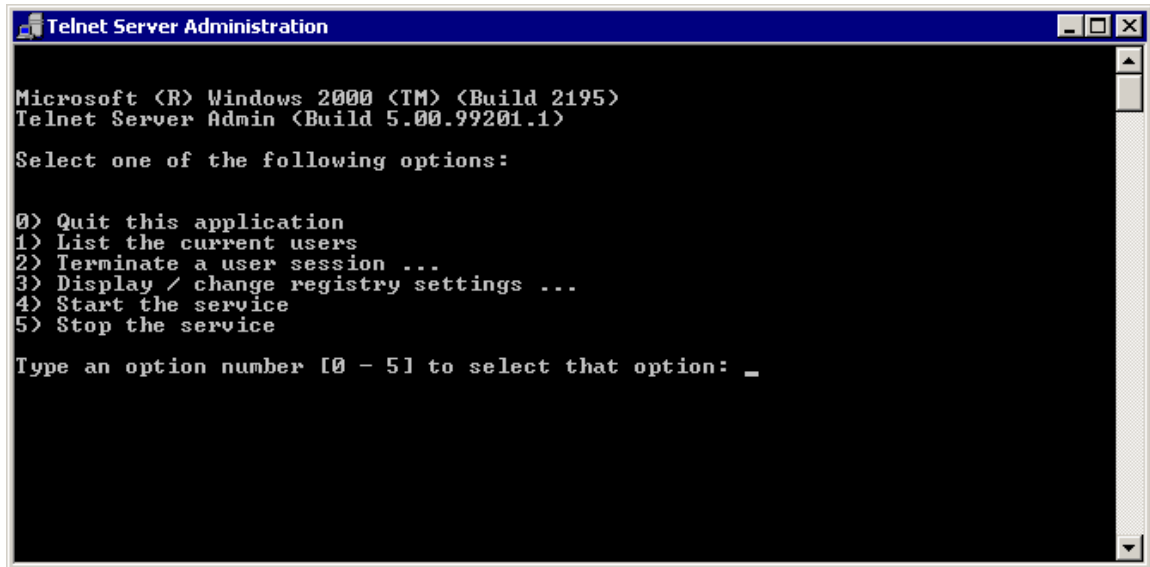
Step 7: Telnet Administration

The Telnet Server Administration program is a menu driven program, to allow plain text as well as NTLM. Press **3** to enter the **Display / Change the registry settings** section of the program.

At the next menu, choose **7** for NTLM. The default value for NTLM is 2, which does not allow clear text authentication in any circumstances. Changing the NTLM value to 1 will allow clear text authentication if NTLM fails. The following dialog with the menu will change NTLM to 1:

```
        Current value of NTLM = 2

        Do you want to change this value? [Y/n] y

        NTLM [current value = 2; acceptable values 0, 1 or 2]: 1

        Are you sure you want to set NTLM to: 1? [Y/n] y
```

Activate the changes that were just made by **Stopping** and **Restarting** the Telnet service.

Note: Although it is convenient to allow clear text authentication so that clients can have unrestricted access to the Telnet service (provided a valid user name and password are present during the Telnet login), it is not recommended that clear text authentication be enabled on a production server.

Step 8: Starting the Telnet Session

To restart the Telnet service, enter a **0** to return to the main menu, and press the corresponding number **5** to stop the service. Verify that the Telnet service has stopped by going to Computer Management. Once the service has been stopped, it can be started again by choosing the correct number **4** from the menu. The following text will appear on the screen when the service is started:

```
Starting Microsoft Telnet Service...

Microsoft Telnet Service started successfully
```

The Telnet service could be initially started from here as well as the Computer
Management console. Now that the Telnet service has been started and configured on
the Windows 2000 Professional workstation it will be used to Telnet into the other
workstation. Add `netstat -a` command to verify connections.

Step 9: Run Command Window

Go to another workstation and test this connection. On the workstation, the easiest way
to start a Telnet session to the Windows 2000 server is to go to **Start** > **Run** and enter
telnet *ip_address_or_hostname*.
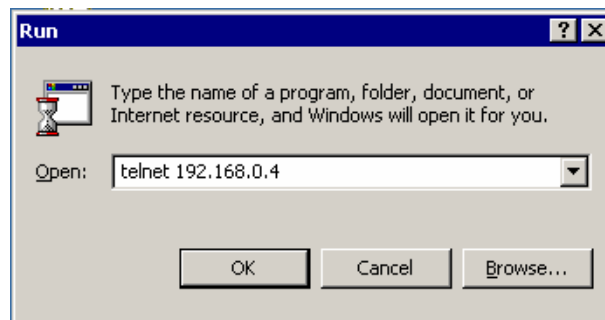
Once the Telnet client window comes up, it may warn that the user is about to send
password information through the Internet zone and it will prompt for permission. Click
Yes and the window will display as shown below.
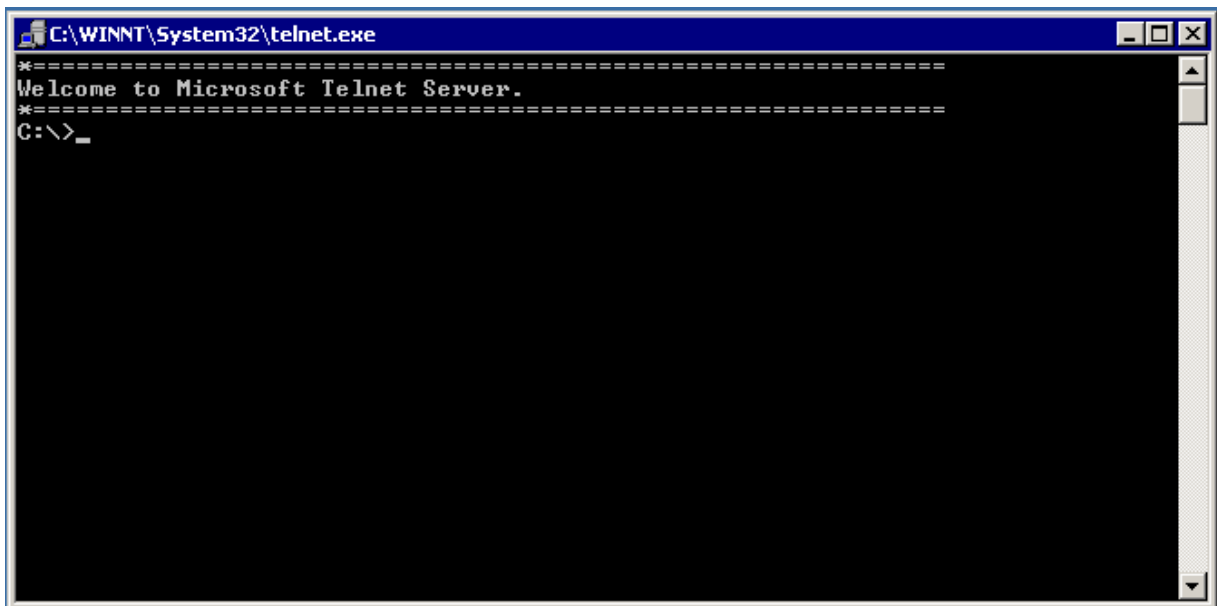
A Telnet session is comparable to having a command prompt open on the Windows 2000
server. From here, the system can be manipulated remotely.

Step 10: Remote System Statistics

In some environments, the statistics of the computer being logged into may not always be known. There are some commands and programs that can give useful information about the server being logged in to. Among these is the `ver` command, which displays the version of windows that the system is running. Type `ver` into the Telnet window and press **Enter**. Output should appear similar to the output displayed below.
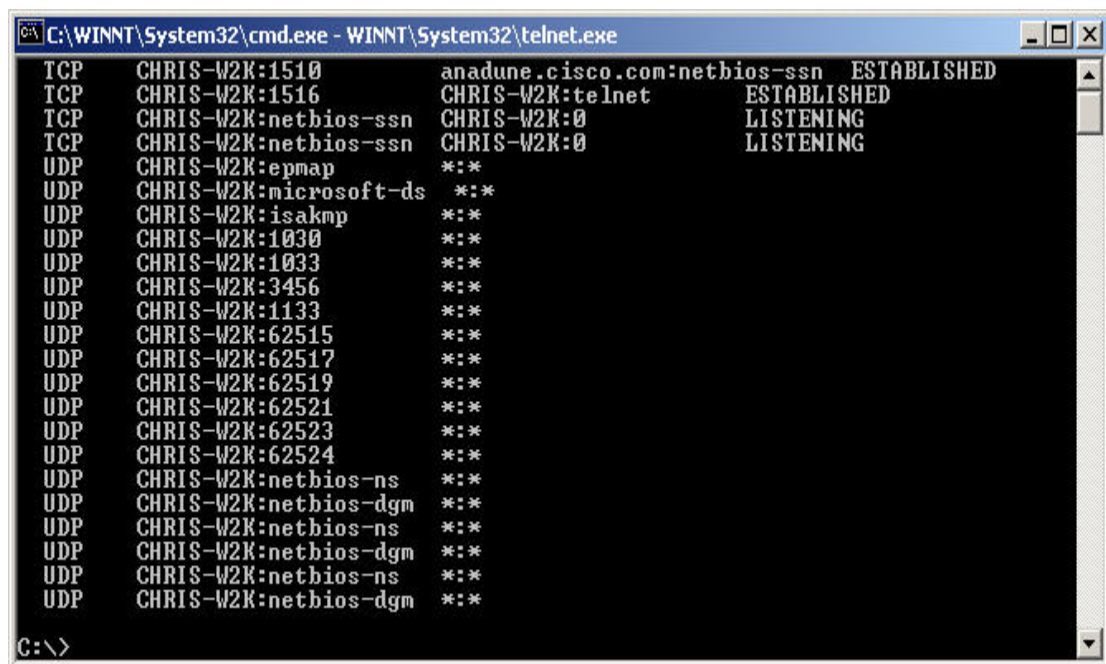
```
C:\>ver

Microsoft Windows 2000 [Version 5.00.2195]

C:\>
```

The `netstat -a` command is also very useful in tracking connections to the server.

```
C:\WINNT\System32\cmd.exe - WINNT\System32\telnet.exe              _ □ ×
  TCP      CHRIS-W2K:1510         anadune.cisco.com:netbios-ssn  ESTABLISHED
  TCP      CHRIS-W2K:1516         CHRIS-W2K:telnet          ESTABLISHED
  TCP      CHRIS-W2K:netbios-ssn  CHRIS-W2K:0               LISTENING
  TCP      CHRIS-W2K:netbios-ssn  CHRIS-W2K:0               LISTENING
  UDP      CHRIS-W2K:epmap        *:*
  UDP      CHRIS-W2K:microsoft-ds *:*
  UDP      CHRIS-W2K:isakmp       *:*
  UDP      CHRIS-W2K:1030         *:*
  UDP      CHRIS-W2K:1033         *:*
  UDP      CHRIS-W2K:3456         *:*
  UDP      CHRIS-W2K:1133         *:*
  UDP      CHRIS-W2K:62515        *:*
  UDP      CHRIS-W2K:62517        *:*
  UDP      CHRIS-W2K:62519        *:*
  UDP      CHRIS-W2K:62521        *:*
  UDP      CHRIS-W2K:62523        *:*
  UDP      CHRIS-W2K:62524        *:*
  UDP      CHRIS-W2K:netbios-ns   *:*
  UDP      CHRIS-W2K:netbios-dgm  *:*
  UDP      CHRIS-W2K:netbios-ns   *:*
  UDP      CHRIS-W2K:netbios-dgm  *:*
  UDP      CHRIS-W2K:netbios-ns   *:*
  UDP      CHRIS-W2K:netbios-dgm  *:*

C:\>
```

While logged in to the server, a user can run programs and issue commands, provided those commands do not require the GUI.

When finished with the Telnet session, type `exit` at the command prompt. **Note:** The current logged in user (name and password) on the local computer will be used automatically when establishing a Telnet session. If the user is not defined on the Telnet destination computer, a valid login name and password will have to be provided.

Create these accounts prior to doing this lab.

Troubleshooting

This lab requires that the two workstations have TCP/IP connectivity with each other. If the user cannot telnet to the server from the workstation, verify each system's IP configuration and physical connections to the network.

If the Telnet session is opened, but the user cannot log in, verify that the username and password being used have been configured on the server.

Also, verify that NTLM authentication has been disabled, as described in Step 6 of this lab.

Reflection

1. Telnet allows an administrator to remotely access the server. What kind of administrative tasks can be performed using the Windows CLI through Telnet?

   _____

   _____

   _____

   _____

2. Telnet service is not enabled by default on a Windows 2000 server. What are the dangers of enabling Telnet services?

   _____

   _____

   _____

   _____

Starting and Stopping Services in Windows 2000

Estimated Time: 25 Minutes

Objective

In this lab, the student will learn how to manually stop and start services on Windows 2000 Professional.

Equipment

The following equipment is required for this exercise:

- A system with Windows 2000 Professional installed.

Scenario

The ABC Company has just installed a server running Windows 2000. The company has asked that for security concerns, the Telnet services be manually stopped in all Windows 2000 systems

Procedures

In this lab, the student will open the services management screen, locate, and stop the telnet service from running. Depending on the setup and configuration of your PC, the telnet service may be stopped or started. This lab will provide the steps in order to both start and stop the telnet service. Depending on the configuration of your PC, you may first have to follow the procedures for starting the telnet service in order to stop it.

Step 1: Log in to Windows 2000

Log in as the **Administrator**.

Step 2: Staring the Service

1. Right-click the **My Computer** icon on the Desktop and choose **Manage**.

2. Click and expand the **Services and Applications** icon.

3. Click and expand the **Services** icon.
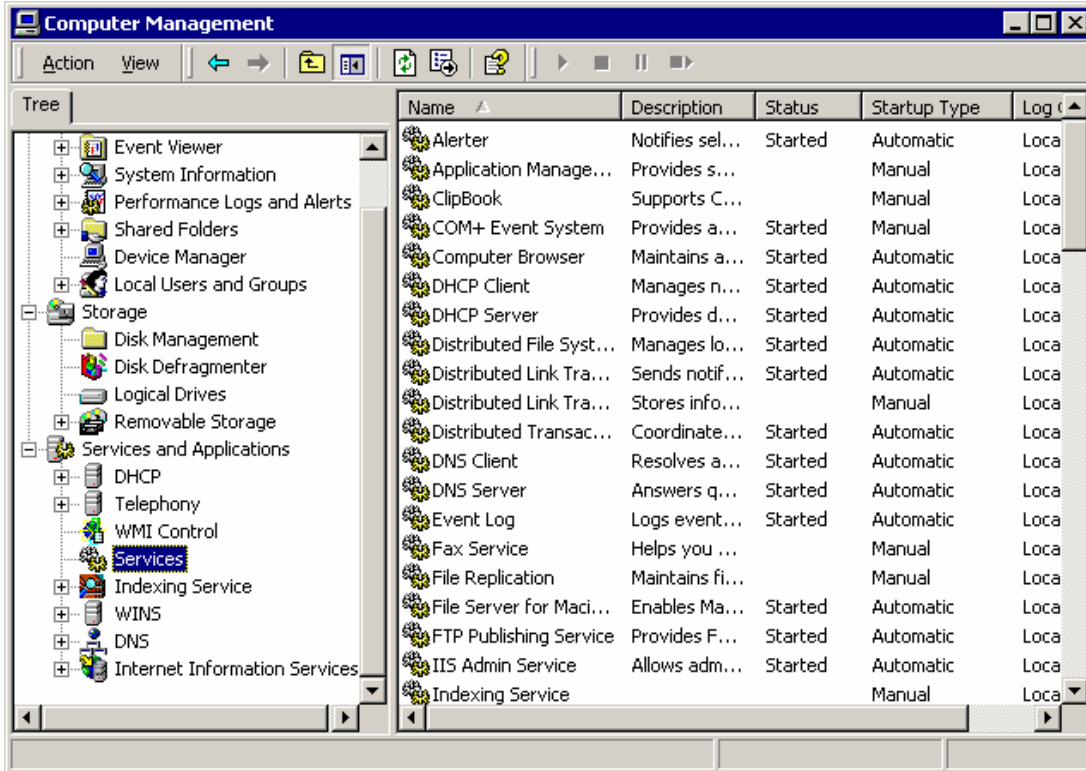
4. To stop the Telnet service, right-click **Telnet** and choose **Start**.
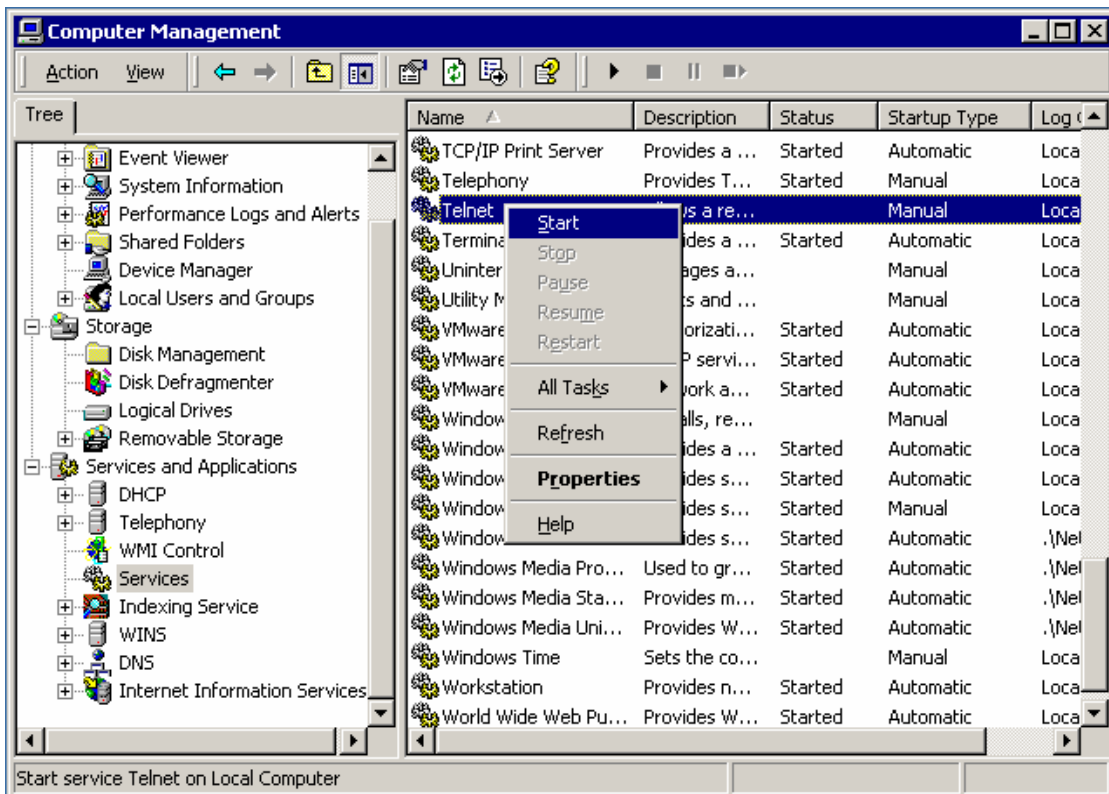
A Status indicator displays as Windows attempts to start the service. Check the Status column and verify that the service has started.

Name	Description	Status	St
Telnet	Enables a r...	Started	M

Step 3: Stopping the Service

1. Right-click the **My Computer** icon on the Desktop and choose **Manage**.

2. Double-click the **Services and Applications** icon.

3. Double-click the **Services** icon.

4. To stop the Telnet Service, right-click **Telnet** and choose **Stop**.

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Writing a Script in Windows 2000
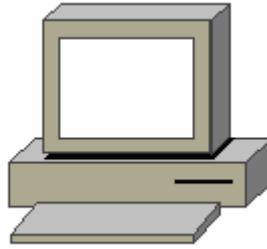
Estimated Time: 30 Minutes

Objective

The objective of this lab is to learn how to write a script in Windows 2000.

Equipment

The following equipment is required for this exercise:

- A computer with Windows 2000 Professional installed.

Scenario

The system administrator needs to create a script in the startup folder that will display on the users desktops when they log on to their systems. To experiment with writing scripts for that, practice with a sample script that will be created in this lab.

Procedures

In this lab, the student will create and execute a Visual Basic Script and place it the start menu.

Step 1: Writing the Script

1. Open up Notepad. Go to **Start** > **Programs** > **Accessories** > **Notepad**.

2. Type this text into Notepad:

   Dim Greeting

   Dim UserName

   UserName = InputBox ("Please enter your name:")

   UserName = Trim (UserName)

   If UserName = "" Then

   Greeting = "Why won't you tell me your name? That's not very nice."

ElseIf UserName = "go away" Then

Greeting = "That's not very nice."

ElseIf Username = "who's asking?" Then

Greeting = "I asked you first."

Else

Greeting = "Hello, " & UserName & ", it's a pleasure to meet you."

If UserName = "Steve" Then

Greeting = Greeting & " I like the name Steve."

End IF

End IF

MsgBox Greeting

3. Save the document as **Greeting.vbs**

Note: If the student needs to edit changes after saving, have them change the extension to .txt.

To change the file back to a .vbs scripts go to the following folder:

C:\WINNT\system32

In this folder associate the Greeting.vbs file with the wscript file.

Step 2: Executing the Script

1. Navigate to the folder where the file was saved and double-click on it.

2. Do not type anything in the box and click **OK**. Notice what message is displayed and how it corresponds to the entry in the text of the script.

3. Click **OK**.

4. Double-click the script again and this time type **go away** in the box. Notice what message is displayed and how it corresponds to the entry in the text of the script.

5. Click **OK**.

6. Double-click the script again and this time type **who's asking** in the box. Notice what message is displayed and how it corresponds to the entry in the text of the script.

7. Click **OK**.

8. Double-click the script again and this time type **Alice** in the box. Notice what message is displayed and how it corresponds to the entry in the text of the script.

9. Click **OK**.

10. Double-click the script again and this time type **Steve** in the box. Notice what message is displayed and how it corresponds to the entry in the text of the script.

Step 3: Executing the script when the system starts

1. Navigate to the Startup folder. Go to **C:/Document and Settings/All Users/Start Menu/Programs/Startup**. Drag the script file that was created in Step 1 and place it into the folder.

2. Restart the computer and the script should execute automatically when the system reboots.

Troubleshooting

Troubleshooting a Visual Basic Script or can be difficult since the text has to be 100 percent accurate for the script to execute properly. Review the script before it is saved and executed to make sure that is written correctly.
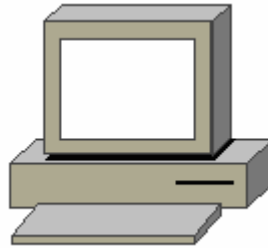
Reflection

Scripts can serve a variety of functions and can be very helpful to a system administrator. The script that was written in this lab was fairly simple script compared to how complex a Visual Basic script can be.

1. What are some other uses for scripts?

   _____

   _____

   _____

2. Where might they be useful and where might they cause harm?

   _____

   _____

   _____

Installation of Linux

Estimated Time: 50 minutes

Objective

- Install the Red Hat 7.2 distribution of Linux.

- Configure the Linux settings as needed.

- Create a boot disk.

Equipment

The following equipment and documentation is required for this exercise:

- Red Hat Linux installation CDs.

- An extra floppy disk.

- PC Hardware inventory documentation.

- Linux documentation.

Procedures

In this lab, the Linux operating system will be installed on a computer where the hard drive has been formatted and no operating systems exists. Also, the BIOS has been set to allow the CD-ROM to boot the computer.

Many companies have created different distributions of Linux. The Linux kernel remains the same among these distributions but the different versions appeal to different markets. This lab will use the Red Hat distribution of Linux version 7.2.

Step 1: Setting the BIOS Settings

The Linux CD is capable of booting the computer. Before starting the installation process, be sure that the BIOS settings are set to boot the computer from the CD-ROM.

Note: The BIOS setting seen may look different than the BIOS setting of this particular PC.

Step 2: Installation Options, Graphical or Text Mode

Place the Red Hat installation CD in the computer and turn on the computer. On boot up, the screen will open first. To install Linux in the graphical mode, press the **Enter** key and Linux will go to the next screen. If the enter key is not pressed in approximately thirty seconds, Linux will start the installation process in the graphical mode.

Step 3: Language Selection

English is the default language for the Linux installation. Select another if necessary. The language selected will help Red Hat find a time zone later in the installation process.

Select the appropriate language and click the **Next** button.

Copyright © 2004, Cisco Systems, Inc.
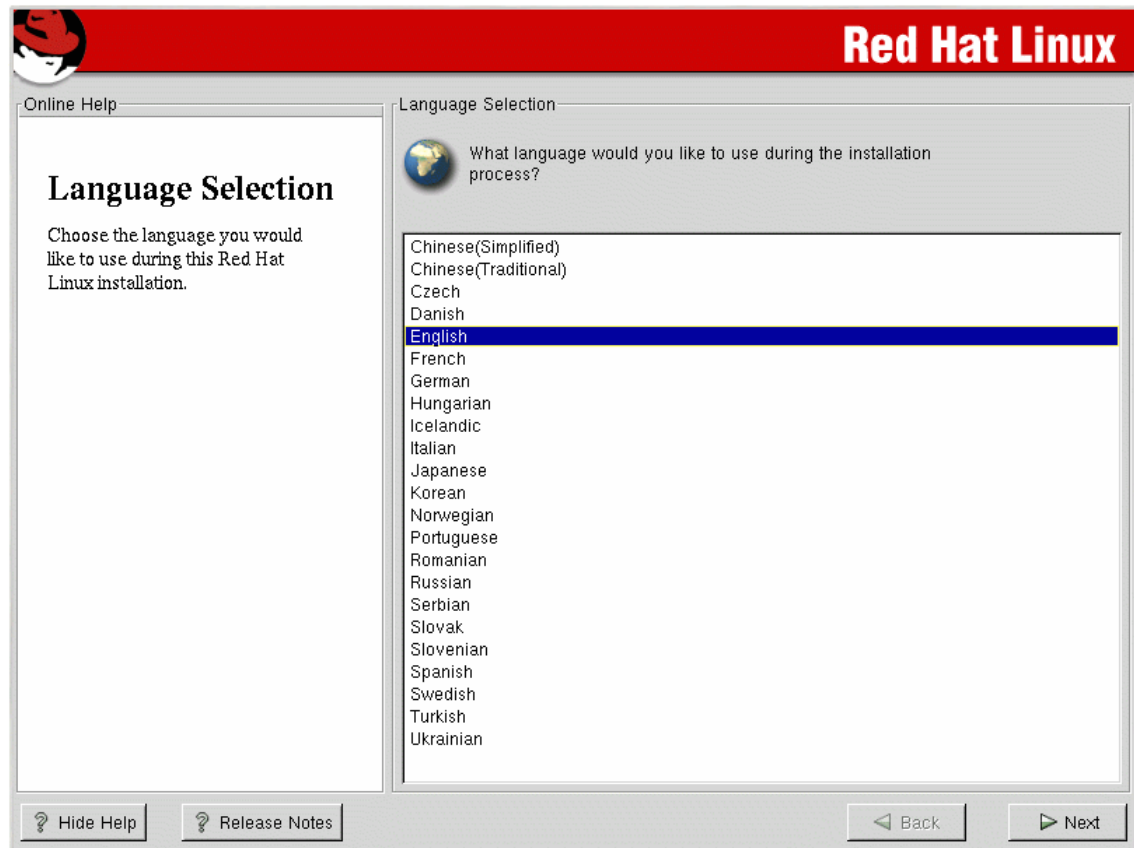
Step 4: Keyboard Configuration

Red Hat will auto-detect the keyboard. If another keyboard is wanted, select the correct model here. If an exact match cannot be found, choose a **Generic** one.

The default Red Hat keyboard layout is English. Choose another layout if needed.

Dead keys allow the creation of special characters with multiple keystrokes (such as Ñ, Ô, and Ç). Dead keys are enabled by default but if not needed, select **Disable dead keys**.

To test your keyboard, use the blank text field at the bottom of the screen.

When finished, click the **Next** button to continue.
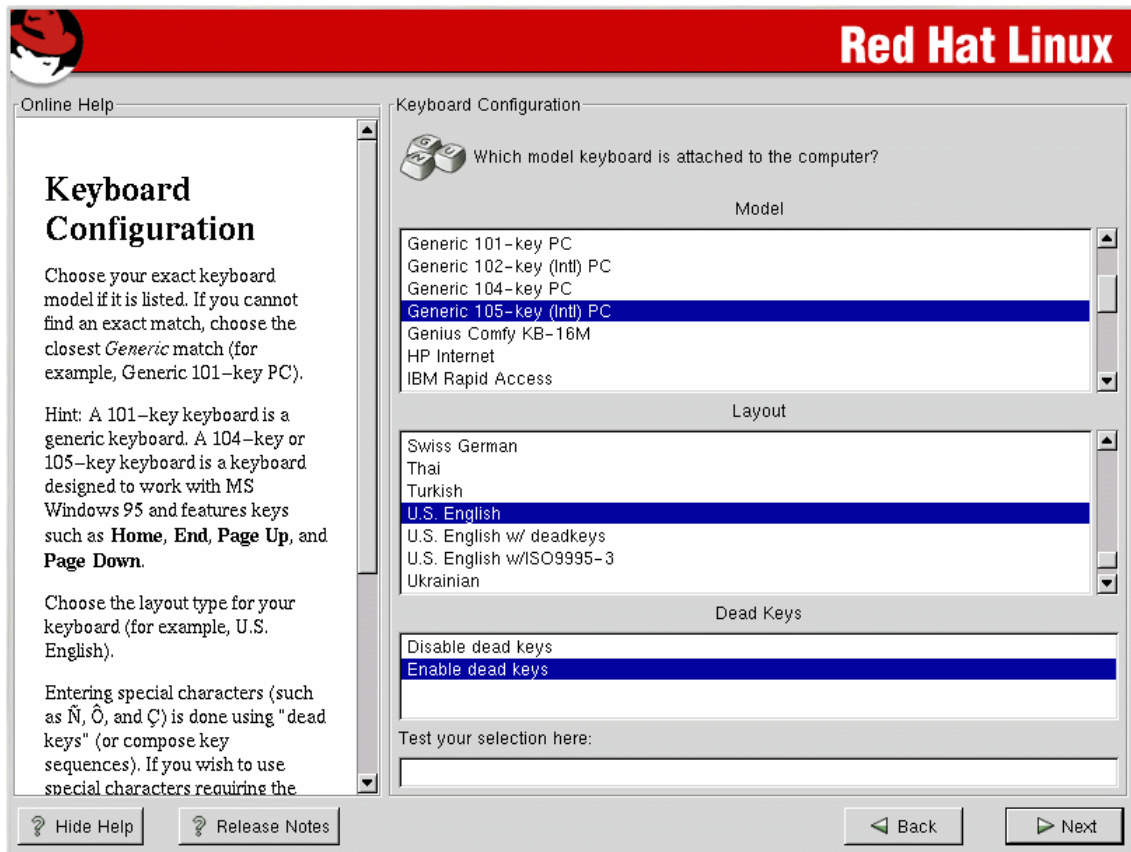
Step 5: Mouse Configuration

Red Hat will auto-detect the mouse, and most of the time the user will simply need to read this screen and click the **Next** button. Be sure to check the **Emulate 3 Buttons**.

If another type of mouse is desired, select it here. Select a mouse type that is compatible with the system if an exact match cannot be found.

If a mouse cannot be found that is compatible with the system, select one of the **Generic** options. The graphic does not have the emulate 3 buttons checked.
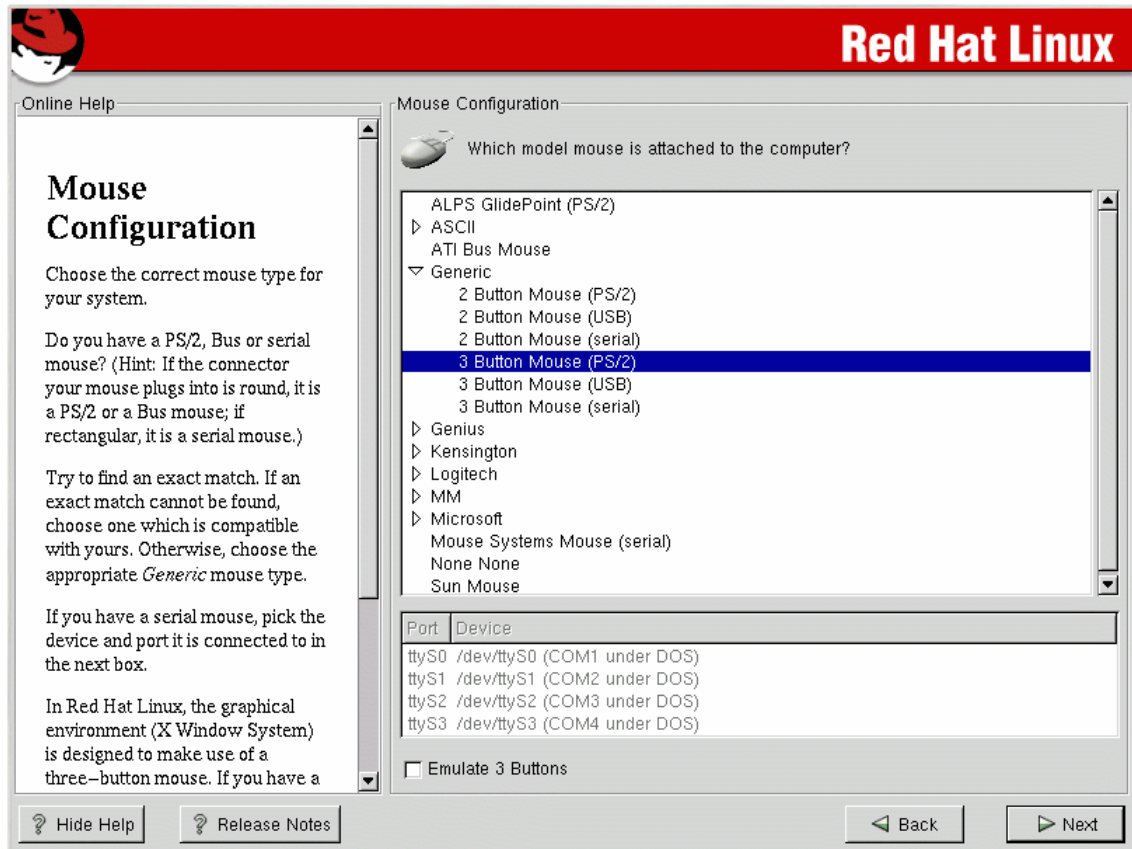
Step 6: Welcome to Red Hat Linux

The Welcome screen is for informational purposes only. Read the help text in the left panel for instructions and information to register Red Hat.

After reading this screen, click the **Next** button.

Step 7: Install Options

Read the installation options text and then select the **Custom** installation.

Click the **Next** button.
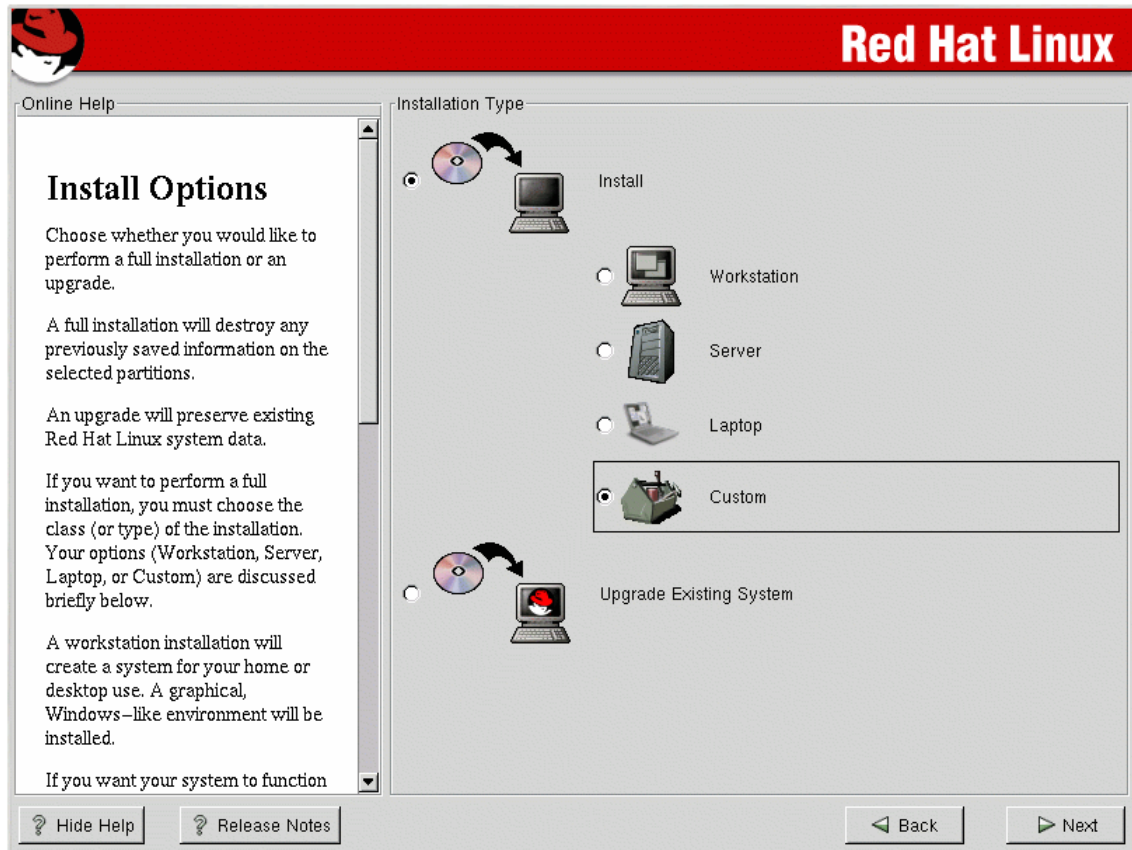
Step 8: Disk Partitioning

Partitioning divides the hard drive into sections that work as individual hard drives.

On this screen, a user can choose to perform automatic partitioning, partition manually using **Disk Druid**, or to partition manually using the DOS utility `fdisk`.

For this installation, select the **Automatic** partitioning option and Red Hat will automatically partition the hard drive.

After the automatic partition option has been selected, click the **Next** button.
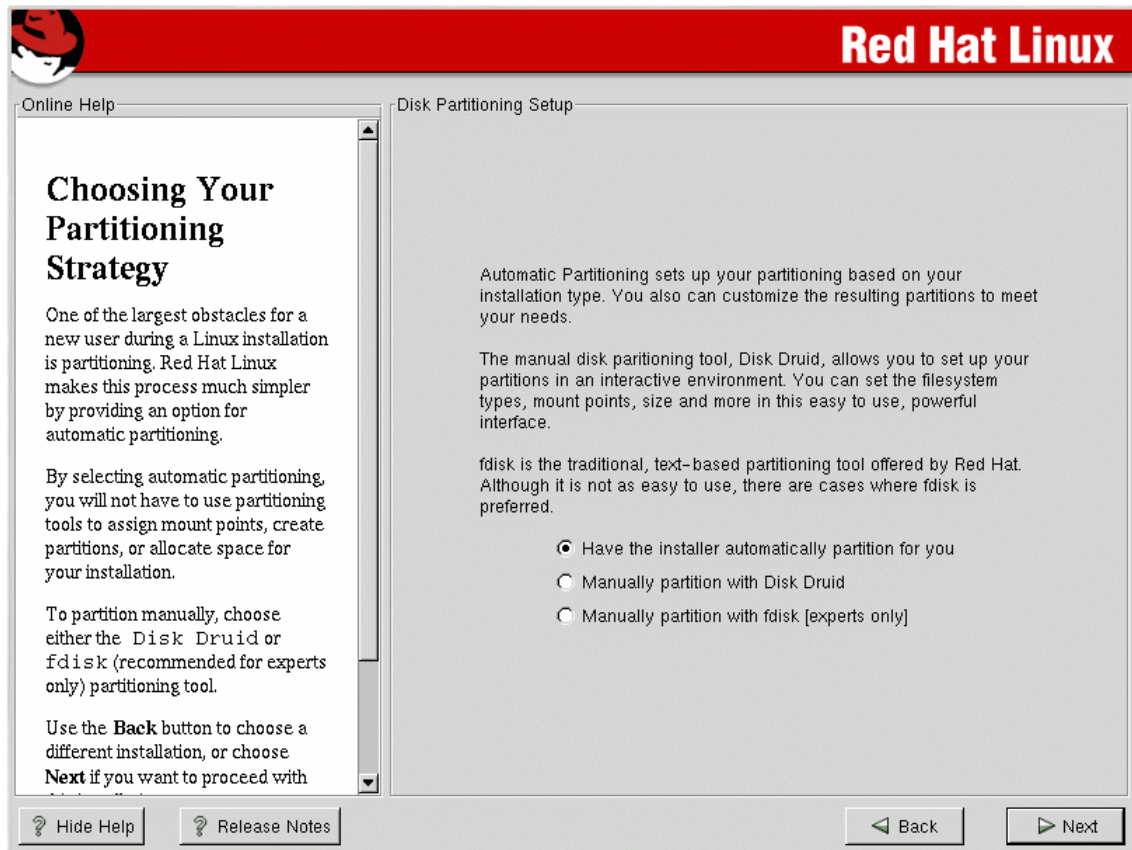
Step 9: Automatic Partitioning

The following are the automatic partitioning options:

- **Remove all Linux partitions on this system** — This option will remove existing Linux partitions and will leave other partitions intact. **Select this option for this lab**.

- **Remove all partitions on this system** — This option will remove all partitions on the hard drive which may include partitions used by other operating systems such as Windows.

- **Keep all partitions and use existing free space** — This option will keep the partitions and use the free space (if any) to create a Linux partition.

The **Review** option is selected by default. Leave this box checked.

Click **Next** to continue.
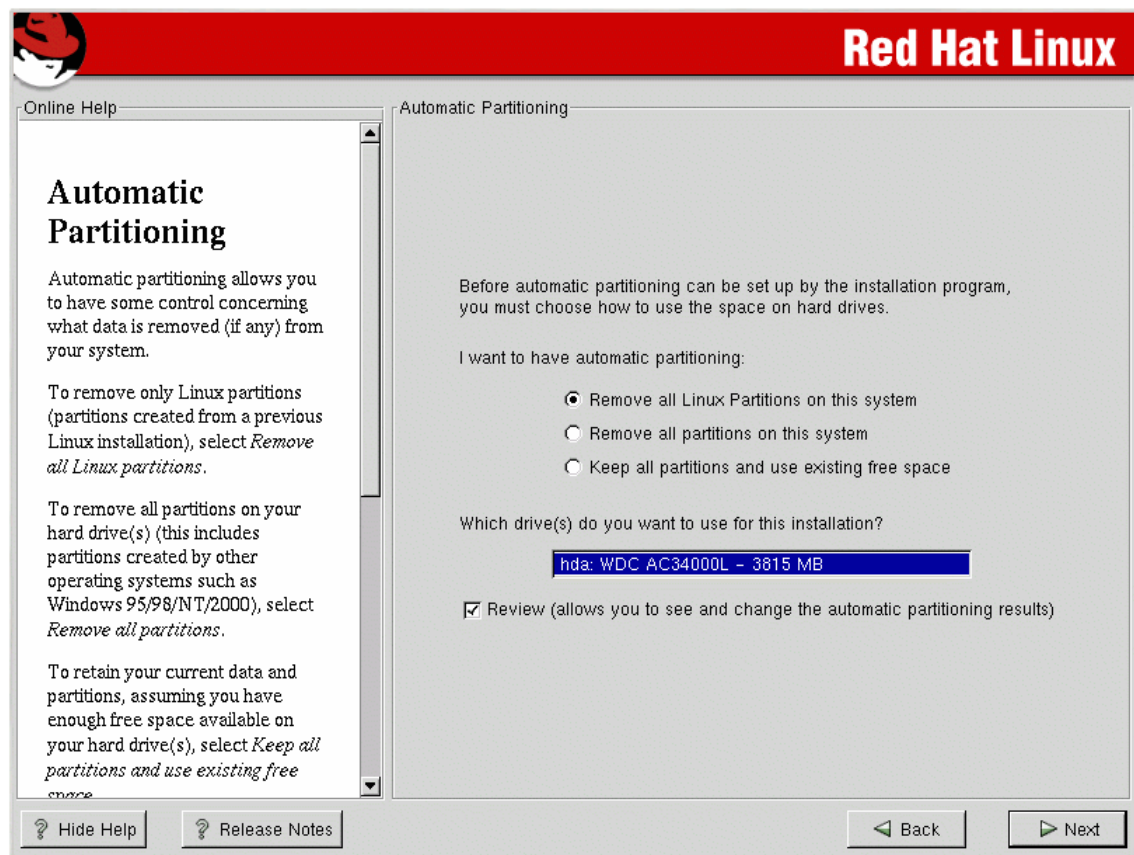
Step 10: Partitioning the System

This screen displays how Red Hat has automatically determined the hard drive setup.

Note: Red Hat will create one partition for the **Linux Kernel** (**/boot**), one for the **files and applications (/)**, and a **swap file** to store data that does not fit into RAM.

A user has the option to edit the settings. For the purpose of this lab, accept the default settings and click the **Next** button.

Step 11: Boot Loader Installation

Linux needs a boot loader to help the computer find the operating system. Boot loaders are usually installed in the Master Boot Record (MBR). GRUB is a relatively new boot loader, but for the purpose of this lab, the LILO (Linux Loader) boot loader should be selected. Be sure to select the settings as shown in the screen below:

- Use LILO as the boot loader

- Install Boot Loader record on /dev/hda

- Boot label: Linux

After reviewing the settings, click the **Next** button.

Step 12: Network Configuration

The default setting for the NIC is to use the DHCP settings. Change this by clicking on the **Active on boot** check box.

Ask your instructor for the correct settings. At a minimum enter in the following information:

IP Address	
Netmask	
Hostname	
Gateway	

If given more settings such as Network, DNS, or Broadcast, they can be entered as well.

The screen below is only an example. Ask the instructor for the correct data.

Review the settings and click the **Next** button.

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Step 13: Firewall Configuration

At this point, select the **No firewall** option and be sure to select all the boxes next to **Allow incoming** such as DHCP, SSH, Telnet, WWW (HTTP), Mail (SMTP), and FTP.

Security level settings:

The **High** selection only allows the following connections:

- DNS replies

- DHCP

The **Medium** selection does not allow the following:

Ports lower than 1023, such as **FTP**, **SSH**, **telnet**, and **HTTP** are blocked.

The **No firewall** disables any security checking.

Choose **Customize** to add trusted devices or to allow additional incoming services.

The **Trusted devices** selection allows access to the system for all traffic from that device. It excludes that device from any firewall rules.

In later labs, the student will be connecting to other computers in the classroom and using network protocols such as FTP and HTTP to connect to those computers. Click on the **Customize** button below and check the **eth0** box under the Trusted devices.

Review the selections and click the **Next** button. Graphic does not have all boxes checked.
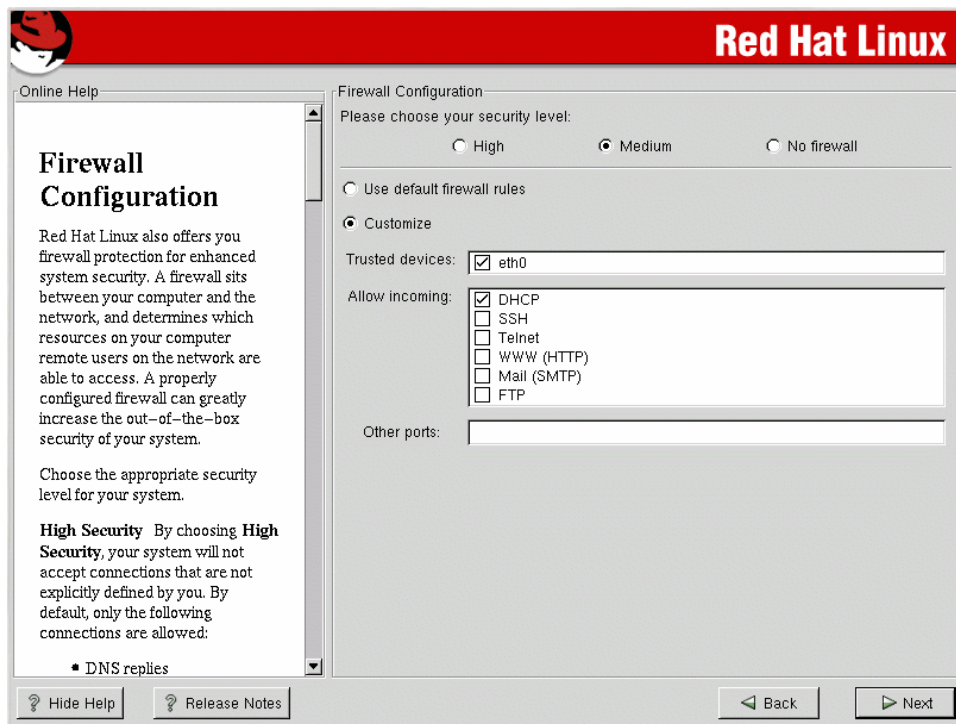
Step 14: Language Support

Choose a language that will be used as the default on the Linux system. If other languages are installed, the default language can be changed after the installation. However, installing many languages can take up too much hard drive space.

Once the language has been selected, click the **Next** button.
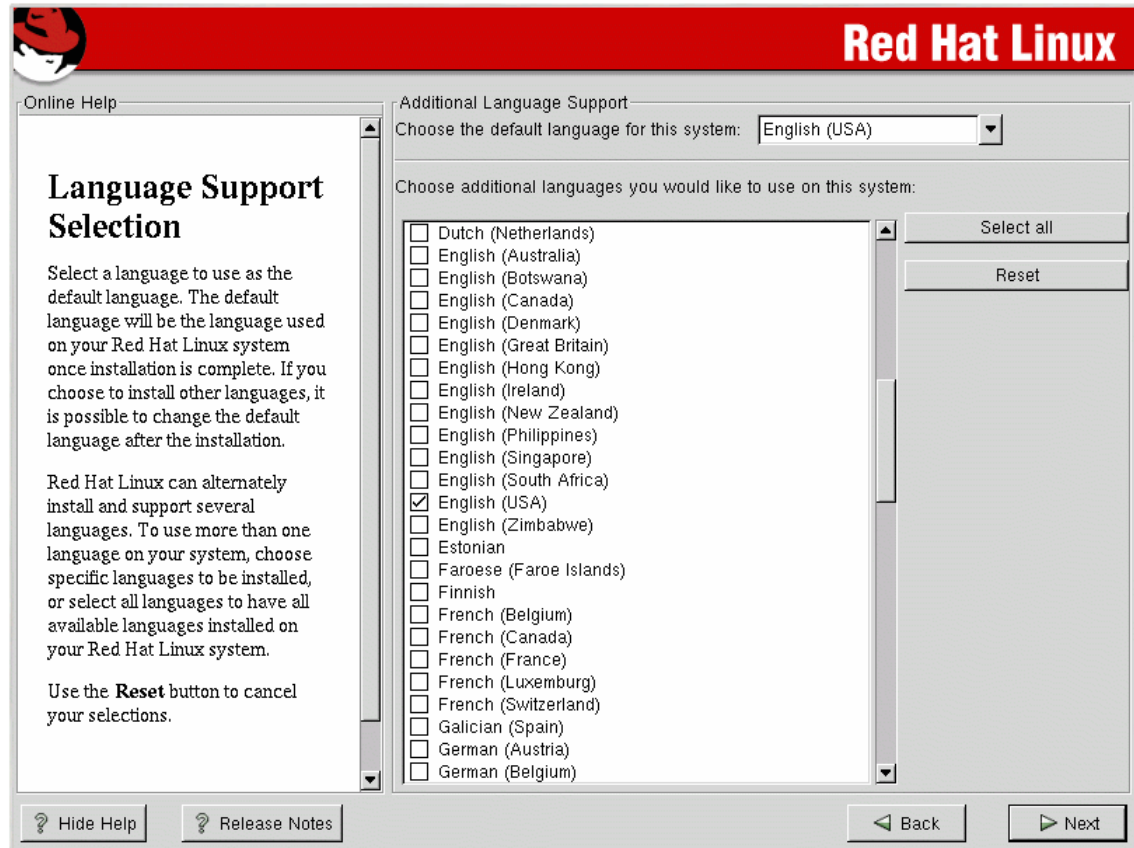
Step 15: Time Zone Selection

Select the correct time zone by scrolling to, and highlighting, the correct city. Click the **Next** button when finished.
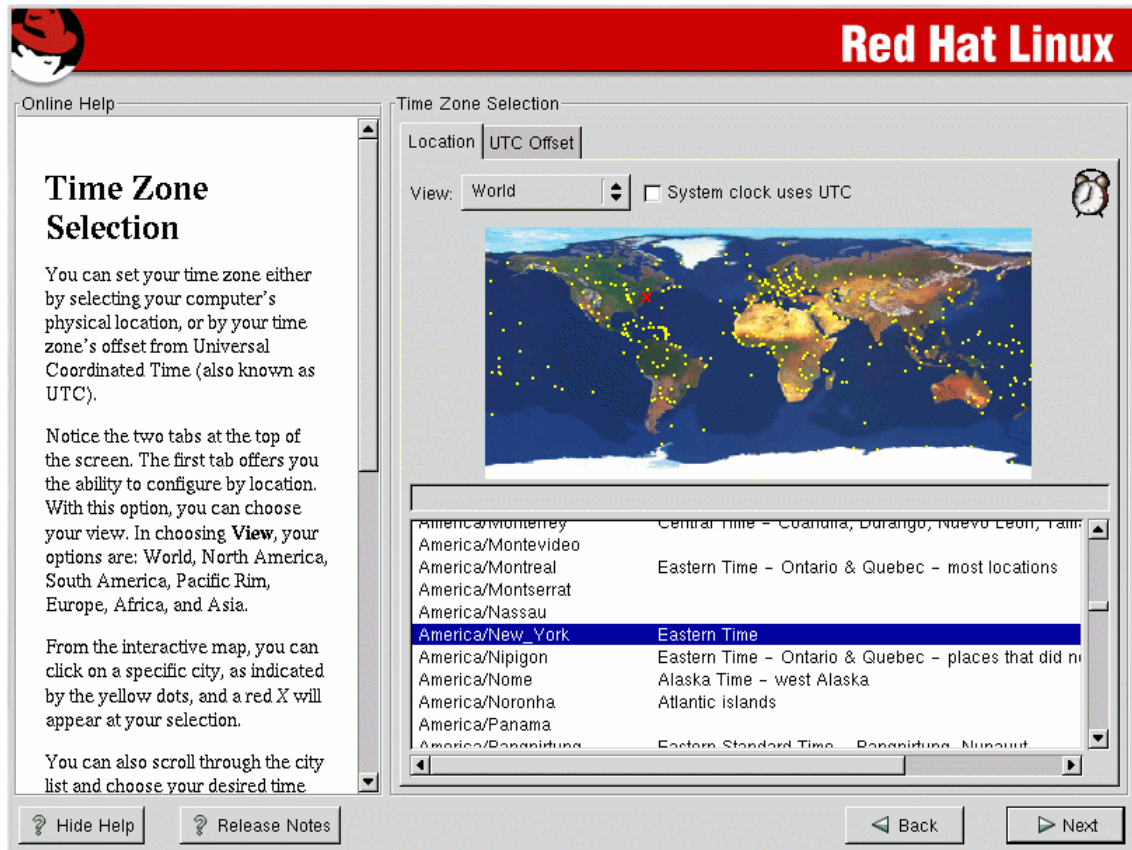
Step 16: Account Configuration

Enter the root password twice:

> Root Password: **cisco1**

> Confirm: **cisco1**

Create a new user with the **Add** button. Ask the instructor for the correct name and password.

In the **Add a New User** box enter the following information:

> **User Name:** This is the name the student will use to log into the system
> **Full Name:** This is the complete name of the student
> **Password:** Enter a password the student or user can log on initially
> **Confirm:** Re-enter the password for confirmation

Click **OK** and then **Next** to continue.

Step 17: Authentication Configuration

Read the help screen on the left and press the **Next** button to continue.

Step 18: Authentication Configuration

It is very important not to select the default settings:

Make sure the following boxes are checked.

- ✓ Printing Support

- ✓ Classic X Windows System

- ✓ X Window System

- ✓ GNOME

- ✓ KDE

- ✓ Sound and Multimedia Support

- ✓ Network Support

Do not choose the **Everything** option, as the hard drive has not been partitioned with enough space.

After selecting the correct boxes, click the **Next** button.

Step 19: Unresolved Dependencies

Software libraries must be installed before they can function properly. Red Hat will check the system for all of the libraries that are required. Red Hat Linux will check for these dependencies every time software packages are installed or removed. If Red Hat finds any errors it will locate the correct dependencies and install them.

Read and click the **Next** button.
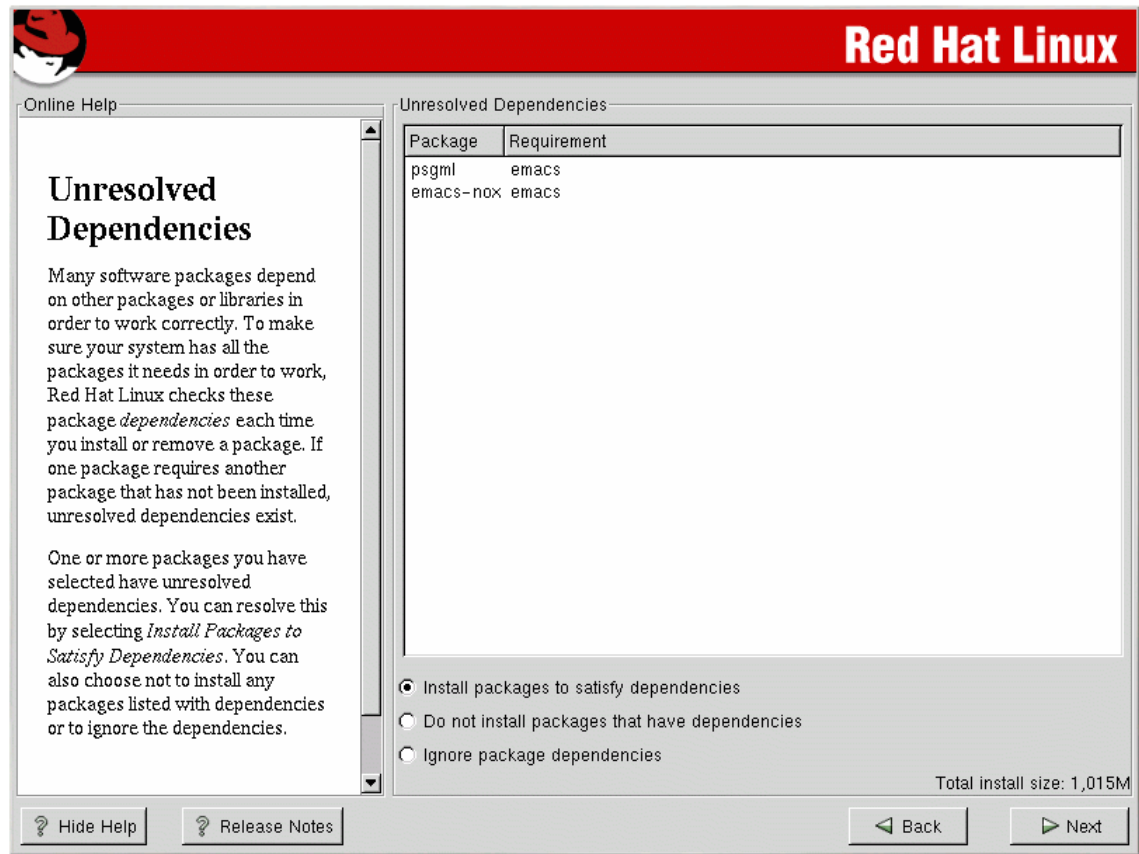
Step 20: Video Configuration

Red Hat will auto-detect the video card.

If the video card does not appear on the list below, X Windows may not support it. The user may choose the **Unlisted Card** option and attempt to configure it by matching the card's video chipset with one of the available X servers. Ask the instructor for information about the video card being used.

Click **Next** to continue.
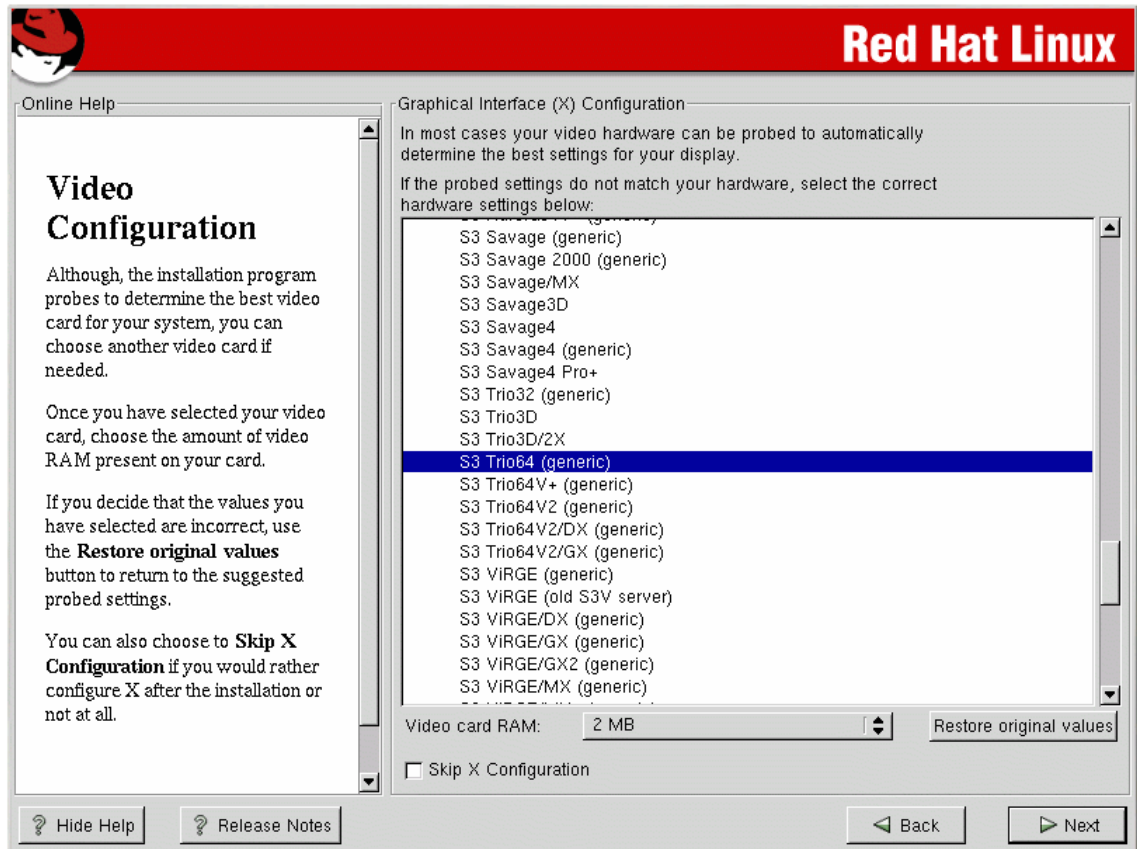
Step 21: Preparing to Install
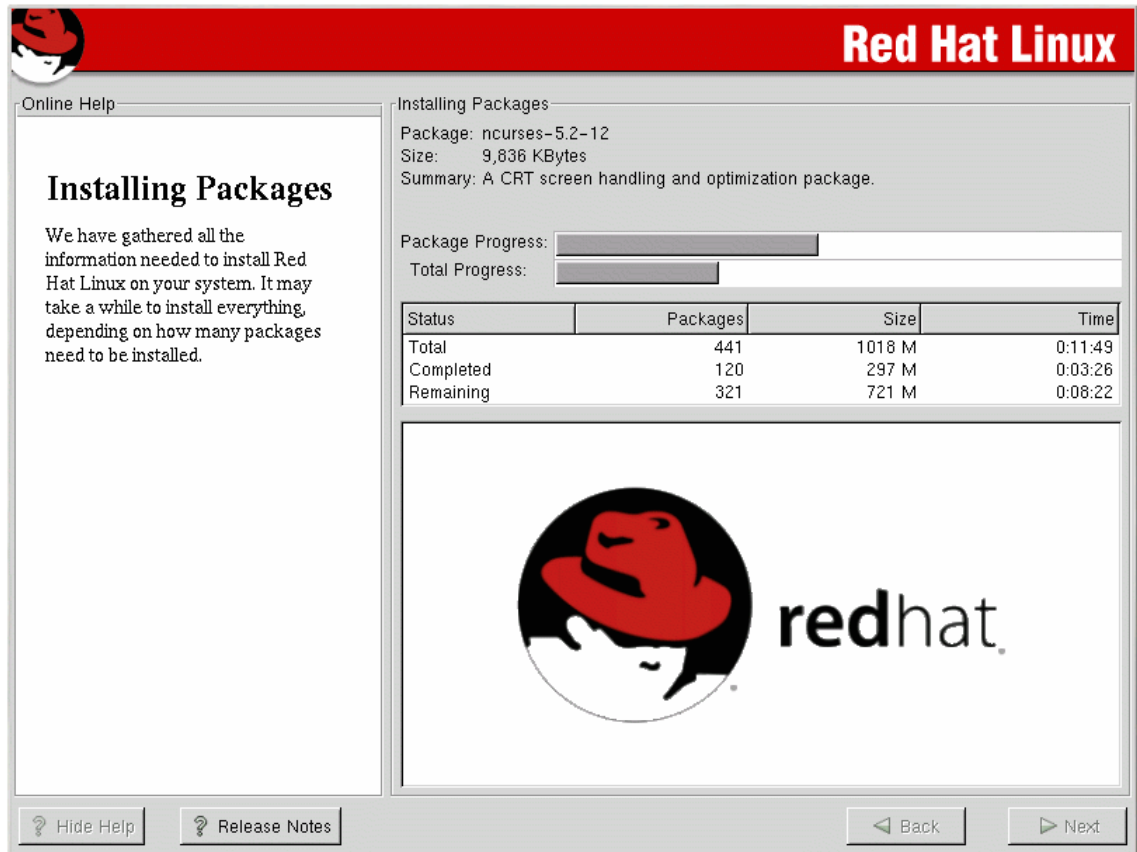
After the video card has been selected, the **About to Install** screen will display. There are no selections to be made on this screen. Read the information and click the **Next** button.

Step 22: Installing Packages

Red Hat will install all the necessary software to set up the computer. There are no selections to be made here. How long this process takes is dependant on the number of packages being installed and the speed of the computer.

Depending on the number of packages to be installed, the user may be asked for the second Red Hat CD-ROM. If this occurs, Red Hat will stop the installation process, eject the first CD, and ask for the second. Simply insert the second disk and press **Enter**.

It is very important that this process not be interrupted. Do not turn the power off or reset the computer. If this happens the installation will have to start over.

Step 23: Boot Disk Creation

After the software packages have been installed, the user will be asked to create a boot disk. If the system was not able to boot, a boot disk would bypass the LILO boot loader and the computer could start with the floppy.

Install a blank floppy disk and Linux will create the boot disk. After the disk has been created, remove it and be sure to label it.

Step 24: X Configuration

Most of the time, Red Hat will auto-detect the monitor. If the monitor was automatically found, it will be listed below. Click the **Next** button.

If the monitor was not auto-detected, select a Generic model from the list. If a Generic monitor is selected, Red Hat will suggest horizontal and vertical sync ranges. Once the settings have been selected, click the **Next** button.
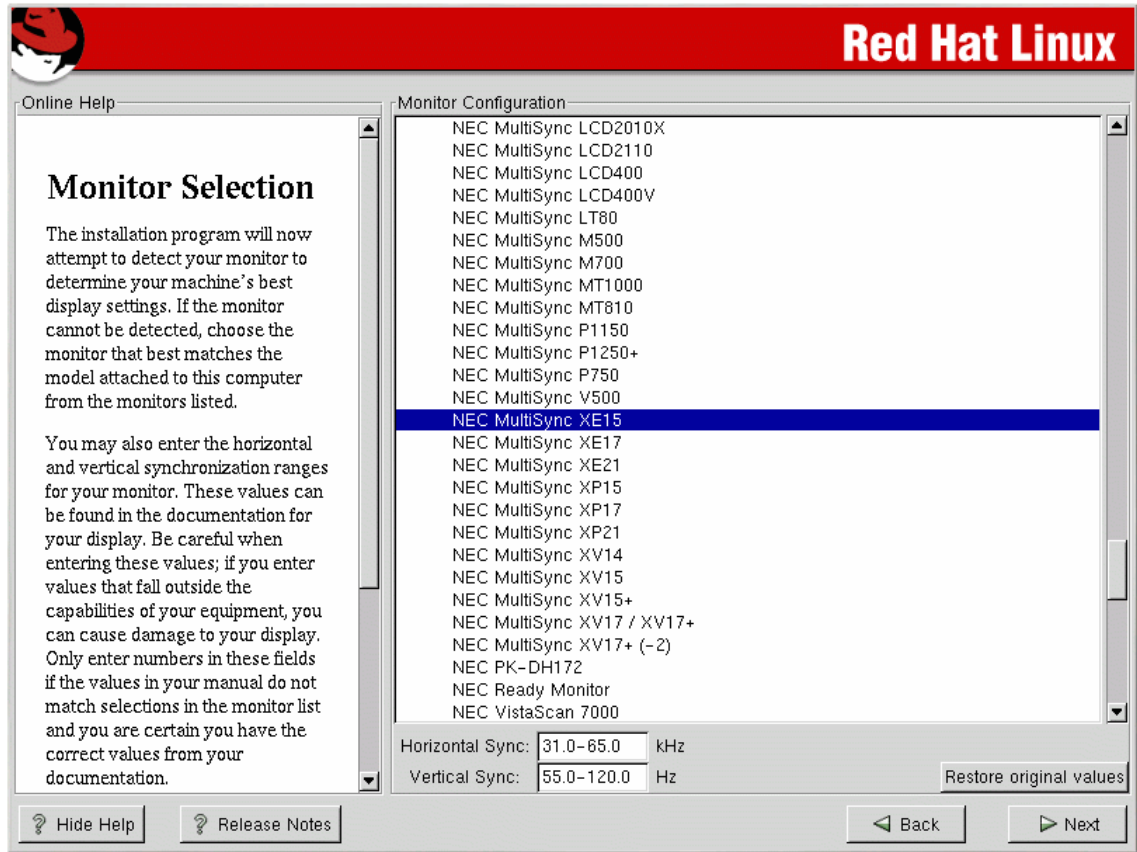
Step 25: Custom X Configuration

Choose the correct color depth and resolution for the X configuration. Click **Test Setting** to try out this configuration. If another configuration is desired, click **No** to choose another resolution.

It is recommended that the user test the configuration to make sure the resolution and color settings are usable.

Your desktop environment will depend on whether GNOME or KDE was installed. If both GNOME and KDE are installed, the user can choose which one to use as the default desktop environment.

For the purpose of this lab, select the **KDE** desktop environment. Additionally, select the **Text** option as the login type.
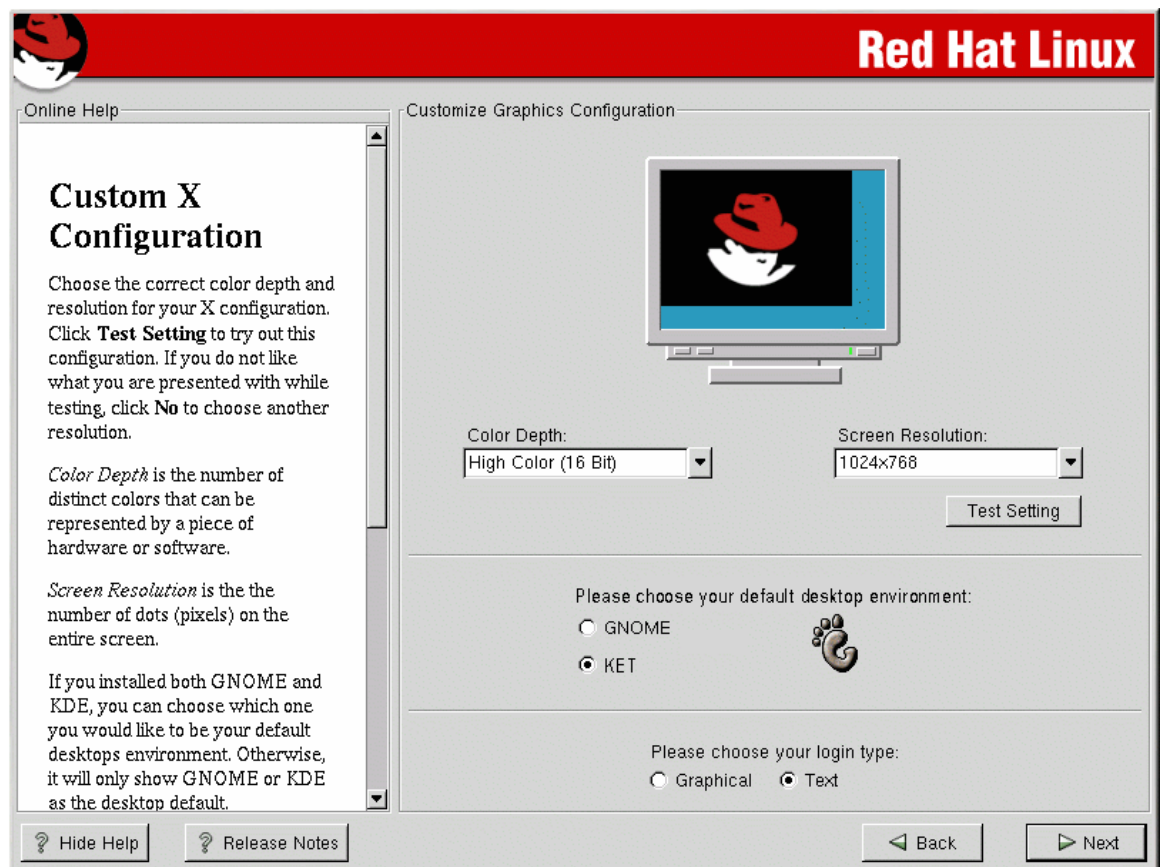
Step 26: Installation Complete and booting up for the first time.

Red Hat Linux 7.2 installation is now complete!

The user will be prompted to prepare the system for reboot. Remove any diskette or CD.

When the system is restarted, the following screen will appear as the system boots up.

```
scsi0: Tagged Queuing now active for Target 0
INIT: version 2.78 booting
                      Welcome to Red Hat Linux
                Press 'I' to enter interactive startup.
Mounting proc filesystem:                                    [   OK   ]
Configuring kernel parameters:                               [   OK   ]
Setting clock  (localtime): Thu Jan 10 12:44:11 MST 2002     [   OK   ]
Loading default keymap (us):                                 [   OK   ]
Setting default font (lat0-sun16):                           [   OK   ]
Activating swap partitions:                                  [   OK   ]
Setting hostname localhost.localdomain:                      [   OK   ]
Mounting USB filesystem:                                     [   OK   ]
Initializing USB controller (usb-uhci):                      [   OK   ]
Checking root filesystem
/: clean, 89512/462144 files, 317162/923729 blocks
                                                             [   OK   ]
Remounting root filesystem in read-write mode:               [   OK   ]
Finding module dependencies:                                 [   OK   ]
Checking filesystems
/boot: clean, 27/14056 files, 5616/56196 blocks
                                                             [   OK   ]
Mounting local filesystems:                                  [   OK   ]
Turning on user and group quotas for local filesystems:      [   OK   ]
Enabling swap space:                                         [   OK   ]
_
```

After the operating system has loaded the user will be asked to login. Stop at this point. Logging in and starting the KDE interface are discussed in the next lab.

```
Red Hat Linux release 7.1 (Seawolf)
Kernel 2.4.2-2 on an i686

localhost login: _
```

Troubleshooting

The following is a list of common installation problems. Below each installation problem, list possible solutions.

1. The computer will not boot from the Linux installation CD-ROM.

    _____

    _____

2. Linux did not find the video card and/or monitor.

    _____

    _____

3. LILO did not load and the computer did not boot up.

    _____

    _____

Reflection

1. What are the advantages to installing LILO on a floppy and booting the computer from the floppy?

    _____

    _____

2. When should firewalls be enabled and when should they be disabled?

    _____

    _____

3. When should Linux be configured to go directly into X Window on boot up?

    _____

    _____

Configuring Network Settings
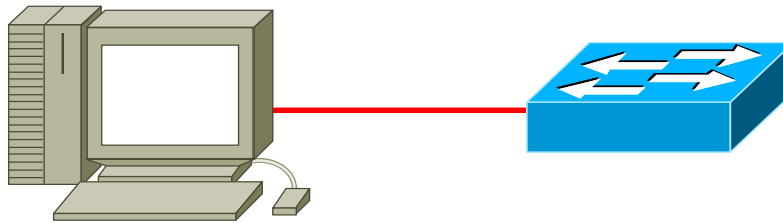
Objective

Configure a Red Hat 7.2 Linux computer's IP address.

Equipment

The following equipment is required for this exercise:

- A server with Linux Red Hat 7.2 installed.

- A network connection from the server to a hub, switch, or some other host.

Scenario

The Air Guitar Company has just purchased a server with Linux Red Hat 7.2 installed. The company has asked that the server be configured with an IP address and subnetmask.

Procedures

Before beginning this lab, make sure the Linux Red Hat system is ready to log in. Ask the instructor or a lab technician for the appropriate static IP address information for the server. Record the information in the table provided:

Server IP Address Configuration	
IP address:	
Subnet mask:	
Default gateway:	

Important Note: The IP address, Subnet Mask and Default Gateway that are used in this lab are only examples. Ask the instructor for the IP scheme used in the lab and record them in the table above. Refer to this table for the correct information.

Step 1: Login as root

In this lab, the network IP address will be changed. In the Linux system, only the root account can configure an IP address.

1. Log in as the **root** user.

If the GUI is open, open a terminal window. Do this by clicking on the **terminal emulator** icon on the bottom of the screen to open the terminal window.

Configure the IP address and subnet mask using the CLI.

Step 2: ifconfig

IP addresses are assigned to physical interfaces, such as Ethernet Network Interface Cards (NICs). IP addresses can also be assigned to logical interfaces, such as a local loopback. An interface typically has only one IP address assigned to it, although it is possible to assign more than one IP address to an interface.

Configure the interface IP address using the **ifconfig** program. The **if** in **ifconfig** stands for **interface**.

Use the **man** command to get information on the ifconfig program, type:

    man ifconfig

1. According to the man output, when are you likely to use ifconfig?

    _____

2. According to the man output, what does the **ifconfig –a** option do?

    _____

3. Type **q** to exit the **man** page.

From the shell prompt, run the **ifconfig** command with the **–a** option.

    ifconfig -a or /sbin/ifconfig -a

Note: All TCP/IP hosts associate the IP address **127.0.0.1** as a **loopback address**. In the output above, see the loopback interface, **lo** has the 127.0.0.1 address, with a mask of 255.0.0.0. Use the **ifconfig** command to change the loopback's IP address. It is recommended that this address not be changed.

Note how Linux refers to the Ethernet NIC. The output seen may be different from the sample shown above. In this exercise the NIC is referenced as **eth0**. If the interface has a different designation, be sure to substitute the interface name for **eth0** in these examples.

The Ethernet NIC (**eth0**) may already have an IP address bound to it. The **ifconfig** command displays IP addresses and their associated masks as follows:

```
[root@systemA1 root]# ifconfig -a
eth0      Link encap:Ethernet  HWaddr 00:10:4B:C9:19:6C
          inet addr:171.68.110.125  Bcast:255.255.255.255  Mask:255.255.255.0
          UP BROADCAST NOTRAILERS RUNNING  MTU:1500  Metric:1
          RX packets:1310376 errors:0 dropped:0 overruns:0 frame:0
          TX packets:3628 errors:0 dropped:0 overruns:0 carrier:3
          collisions:34 txqueuelen:100
          RX bytes:92808069 (88.5 Mb)  TX bytes:1597103 (1.5 Mb)
          Interrupt:10 Base address:0xe400

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:1219 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1219 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:1086635 (1.0 Mb)  TX bytes:1086635 (1.0 Mb)

[root@systemA1 root]# █
```

The **inet** stands for **Internet Address (IP)**. The word **Mask** refers to the **IP Subnet Mask**.

4. What is the **HWaddr** of your computer's NIC (s)?

_____

5. What does **HWaddr** stand for?

_____

Step 3: Configuring the IP address

Use the **`ifconfig`** command to setup the Ethernet interface's IP address. Use the information that was recorded earlier in the table (see the procedures section).

1. Enter the appropriate command at the shell prompt.

The following example is correct given a new IP address of 192.168.0.5 and a subnet mask of 255.255.255.0, type:

`ifconfig eth0 192.168.0.5 netmask 255.255.255.0`

or

`/sbin/ifconfig eth0 192.168.0.5 netmask 255.255.255.0`

The **`netmask`** argument is used to specify the subnet mask. Verify that the change has taken effect by issuing the **`ifconfig -a`** command. IP address changes take effect immediately in Linux; do not need to reboot the system.

The output of the `ifconfig -a` command should indicate that the new IP address is bound to the NIC, type:

```
ifconfig -a
```

```
[root@systemA1 root]# ifconfig -a
eth0      Link encap:Ethernet  HWaddr 00:10:4B:C9:19:6C
          inet addr:192.168.0.5  Bcast:192.168.0.255  Mask:255.255.255.0
          UP BROADCAST NOTRAILERS RUNNING  MTU:1500  Metric:1
          RX packets:1329045 errors:0 dropped:0 overruns:0 frame:0
          TX packets:4025 errors:0 dropped:0 overruns:0 carrier:3
          collisions:34 txqueuelen:100
          RX bytes:94122827 (89.7 Mb)  TX bytes:1698194 (1.6 Mb)
          Interrupt:10 Base address:0xe400

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:1219 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1219 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:1086635 (1.0 Mb)  TX bytes:1086635 (1.0 Mb)

[root@systemA1 root]#
```

At this point, `ifconfig` should report this interface as **UP** as shown by the highlighted output above. If this interface is shown as down, troubleshoot the Ethernet connection. Make sure the Ethernet cable is connected to the NIC and connect the other end to a networking device, such as a hub or switch.

A user can manually bring down an interface by using the `down` argument.

```
ifconfig eth0 down      or      /sbin/ifconfig eth0 up
```

To return a down interface to the up state, use the `up` argument.

```
ifconfig eth0 up   or      /sbin/ifconfig eth0 up
```

Step 4: The `ping` command

To test the configuration, use **Internet Control Messaging Protocol** (**ICMP**) better known as the `ping` command.

Use the `man` command to get information on the `ping` program, as shown:

```
man ping
```

Type `q` to exit the man pages.

Send a ping to the server interface. Use `CTRL-C` to stop the pinging. The following example assumes that the interface is configured as 192.168.0.5, type:

```
ping 192.168.0.5
```

```
PING 192.168.0.5 (192.168.0.5) from 192.168.0.5: 56(84) bytes of data.
64 bytes from 192.168.0.5: icmp_seq=0 ttl=255 time=240 usec
64 bytes from 192.168.0.5: icmp_seq=1 ttl=255 time=108 usec
64 bytes from 192.168.0.5: icmp_seq=2 ttl=255 time=136 usec
64 bytes from 192.168.0.5: icmp_seq=3 ttl=255 time=133 usec
64 bytes from 192.168.0.5: icmp_seq=4 ttl=255 time=135 usec
64 bytes from 192.168.0.5: icmp_seq=5 ttl=255 time=132 usec
64 bytes from 192.168.0.5: icmp_seq=6 ttl=255 time=136 usec
64 bytes from 192.168.0.5: icmp_seq=7 ttl=255 time=131 usec
64 bytes from 192.168.0.5: icmp_seq=8 ttl=255 time=136 usec

--- 192.168.0.5 ping statistics ---
9 packets transmitted, 9 packets received, 0% packet loss
round-trip min/avg/max/mdev = 0.108/0.143/0.240/0.035 ms
```

In the output example above **64 bytes from 192.168.0.5** means that a reply of 64 bytes was received from that host. If no reply is received, check to see if the wrong IP address was entered either with the **ping** command, or when **ifconfig** was used.

If other hosts are connected to the network, try pinging them. Find out what their addresses are. A successful ping reply from another host means that the IP configuration is working and that it is live on the network.

Step 5: The **router** command

In order for the server to communicate with TCP/IP hosts beyond the local subnet, the system must use the services of a local router. The term **gateway** was commonly used in the past to refer to a router because a router acts a gateway to other networks. When configuring a host for IP, configure the **default gateway**. This is the IP address of the local router's interface.

In the Linux CLI, configure the default gateway using the **route** command.

Use the **man** command to get information on the **route** command, type:

> **man route**

Type **q** to exit the man pages.

1. According to the **man** output, what is the primary use of the **route** command?

   _____

2. What does the **–n** switch do when it is added to the router command?

   _____

Check your system's route table, as shown, type:

> **route -n**   or   **/sbin/route -n**

```
[root@systemA1 root]# route -n
Kernel IP routing table
Destination     Gateway          Genmask          Flags Metric Ref    Use Iface
192.168.0.0     0.0.0.0          255.255.255.0    U     0      0        0 eth0
127.0.0.0       0.0.0.0          255.0.0.0        U     0      0        0 lo
[root@systemA1 root]#
```

The system may already have a default route to the gateway already installed. The output above shows that no default route is known by the kernel's routing table. That means this host cannot send messages beyond its local subnet, 192.168.0.0/24.

Use the **route** command to install a default route to the **gateway** (the router). The following example installs 192.168.0.1 as the default gateway:

Use the information recorded in the table (from Step 3) to install a default gateway on the system. Replace the highlighted address above with the address appropriate to the network. Type the following command at the prompt:

> **route add –net default gw 192.168.0.1 dev eth0**

> or

> **/sbin/route add –net default gw 192.168.0.1 dev eth0**

```
[root@systemA1 root]# route add -net default gw 192.168.0.1 dev eth0
```

If adding a default route and the route already exists, the following error message will display:

> **SIOCADDRT: File exists**

If directed by the instructor, use another IP address for the default gateway.

When finished, use **route** to check the modified routing table, type:

> **route -n**   or   **/sbin/route -n**

```
[root@systemA1 root]# route -n
Kernel IP routing table
Destination     Gateway          Genmask          Flags Metric Ref    Use Iface
192.168.0.0     0.0.0.0          255.255.255.0    U     0      0        0 eth0
127.0.0.0       0.0.0.0          255.0.0.0        U     0      0        0 lo
0.0.0.0         192.168.0.1      0.0.0.0          UG    0      0        0 eth0
[root@systemA1 root]#
```

Step 6: Reboot

Reboot you're the system using the **reboot** command.

Return to the CLI and use **ifconfig** and **route** to display the current IP addressing configuration. Notice that any changes that were made in previous steps using those commands have disappeared.

The system should be configured just as it was before you began the lab. This is because the **ifconfig** command that ran above does not change the startup config files that Linux uses to configure the NIC.

Manually using the **ifconfig** and **route** commands every time the system boots would not be an inefficient way to configure IP addressing information. Fortunately, Linux runs several scripts during boot time, some of which perform the task of IP address configuration. A user can modify the script files manually with a text editor, or use a command to modify these files. Once these scripts are correctly configured, your system will reboot with the desired IP configuration.

The easiest method is to modify the relevant script is to use the program called **netconfig**.

At the shell prompt, run the **netconfig** command, type:

      netconfig   or   **/usr/sbin/netconfig**
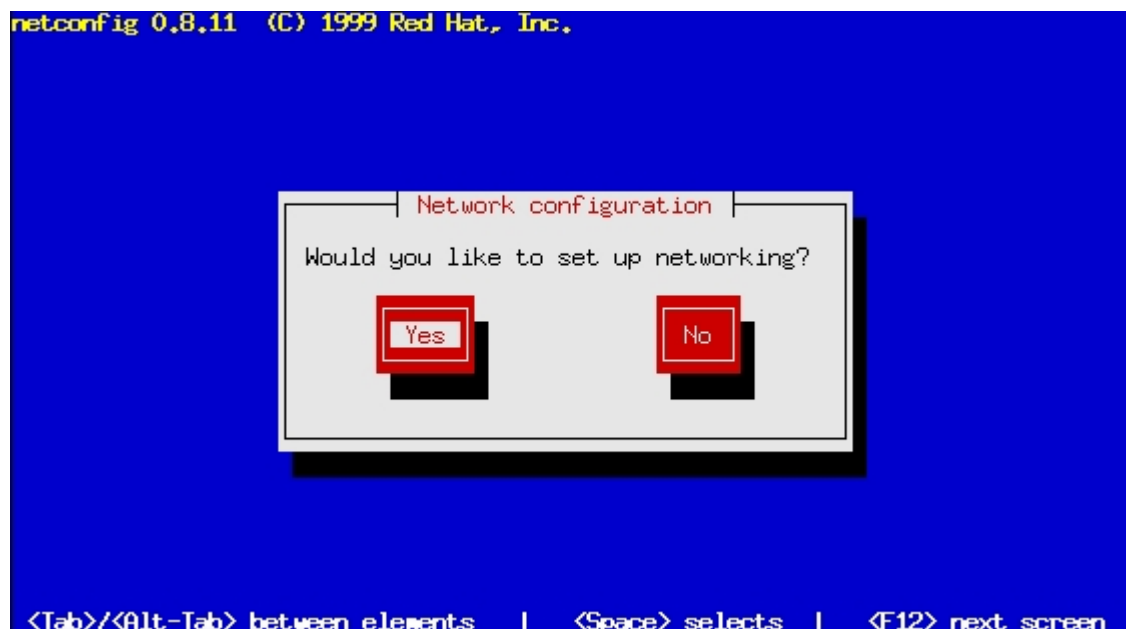
The **netconfig** command presents a configuration dialog box. Based on the answers, the command configures the appropriate scripts. Select **Yes** to set up networking and continue on to the next screen.

```
netconfig 0.8.11  (C) 1999 Red Hat, Inc.

┤ Configure TCP/IP ├

Please enter the IP configuration for this machine. Each
item should be entered as an IP address in dotted-decimal
notation (for example, 1.2.3.4).

[ ] Use dynamic IP configuration (BOOTP/DHCP)

IP address:
Netmask:
Default gateway (IP):
Primary nameserver:

OK                          Back

<Tab>/<Alt-Tab> between elements  |  <Space> selects  |  <F12> next screen
```
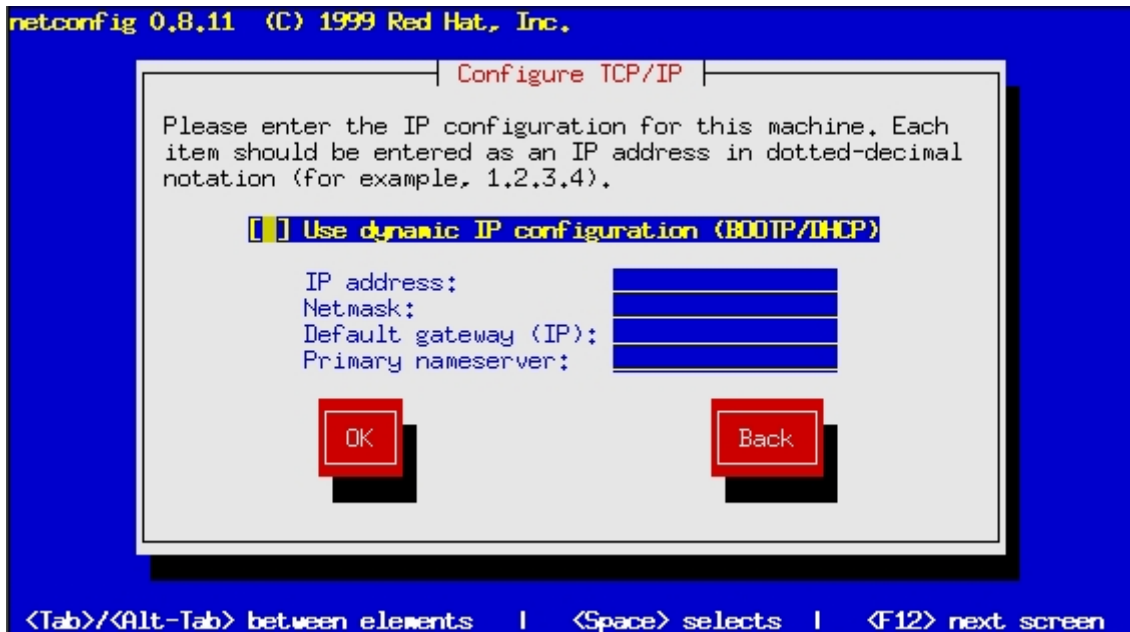
The final configuration screen gives the option to configure TCP/IP. Select **dynamic** configuration, which means that the system will query a DHCP or BOOTP server in an attempt to automatically configure its IP address. Dynamic IP addressing is used for workstations and desktop PCs.

Typically, servers are manually configured for a static IP address. If a server's address were to change from one day to the next, users and other systems may not be able to find them.

Enter the **IP address**, **subnet mask**, and **default gateway** information that you recorded in the table (Step 3). For now, leave the primary nameserver (DNS) field blank, or allow the default address to remain in the field.

Use **ifconfig** and **route** to verify that the changes have taken immediate effect. Reboot the system and check again to make sure these settings remain intact.

Step 7: Network Scripts

Modify the IP configuration script files manually using a text editor such as **vi**.

In Red Hat Linux, the relevant file is:

> **/etc/sysconfig/network-scripts/ifcfg-eth0**

To check the contents of this file use the **more** command:

Type:

> **more /etc/sysconfig/network-scripts/ifcfg-eth0**

Note: the highlighted portion below may be different on the system, depending on how the Ethernet NIC is designated by the kernel.

```
DEVICE=eth0
ONBOOT=yes
BOOTPROTO=static
IPADDR=192.168.0.5
NETMASK=255.255.255.0
GATEWAY=192.168.0.1
[root@systemA1 root]#
```

Manually editing this file and then rebooting is another way to change the IP configuration of the NIC. However, it is easy to mistype a configuration command or leave something important out of this file. For these reasons, use **netconfig** instead of a text editor whenever possible.

Troubleshooting
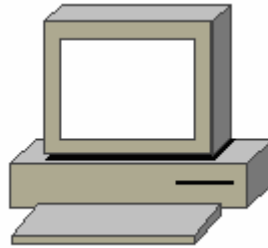
As an IT professional, configuring and troubleshooting TCP/IP is typically a daily activity. A common problem with manually configured IP addresses is, operator error. Always double-check a static IP configuration. Most operating systems will warn the user when it detects another node on the network with the same IP address.

Reflection

Administrators usually manually configure static addresses on servers. Why is static configuration uncommon among workstations?

_____

_____

_____

_____

_____

Should a large company allow the employees to manually assign IP addresses on their workstations? Why or why not?

_____

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_____

Configuring X Server

Estimated Time: 15 minutes

Objective

To properly configure the X server GUI environment with the available tools.

Equipment

- A computer with Linux Red Hat 7.X installed.

Scenario

The system administrator of a large company has recently installed Linux Red Hat 7.X on several systems. Some of the hardware installed in these systems require extra configuration for the X windows GUI.

Procedures

Step 1: Running the Xconfigurator tool

The Xconfigurator tool can be used in text mode or GUI mode, depending on which mode it is launched from. The Xconfigurator tool goes through a series of menus that allows the appropriate settings to be selected. The Xconfigurator tool is easy to use. The following steps of this lab will explain how to use the Xconfigurator tool:

Using the `Xconfigurator` command in Linux will enable manual configuration of the X windows GUI.

1. Log on as **root**.

2. Type `Xconfigurator` at the shell prompt.

The interface should be displayed as shown below.

```
■─▨ rtalbot@dhcp-158-63:/home/rtalbot - Shell - Konsole          ▪ ▫ ✕

Session  Edit  View  Settings  Help

Xconfigurator 4.10.7 - (C) 1997-2002 Red Hat, Inc. and others
                          ┤ Welcome ├
   This program will create a basic XF86Config file, based on    #
   menu selections you make.

   The XF86Config file usually resides in /usr/X11R6/lib/X11 or
   /etc/X11. A sample XF86Config file is supplied with XFree86;
   it is configured for a standard VGA card and monitor with
   640x480 resolution.

   You can either take the sample XF86Config as a base and edit
   it for your configuration, or let this program produce a base
   XF86Config file for your configuration and fine-tune it. Refer
   to /usr/X11R6/lib/X11/doc/README.Config for a detailed


           ▄▄▄▄▄▄▄                        ▄▄▄▄▄▄▄▄▄▄
           █ Ok  █                        █ Cancel █
           ▀▀▀▀▀▀▀                        ▀▀▀▀▀▀▀▀▀▀


  <Tab>/<Alt-Tab> between elements  |  <Space> selects  |  <F12> next screen

 ║ ▨ New ▾ ║ ▨ Shell
```

3. Use the **Tab** key on the keyboard to navigate through the menus Select **OK** and press **Enter**.

The interface should now be displayed as shown below.

---
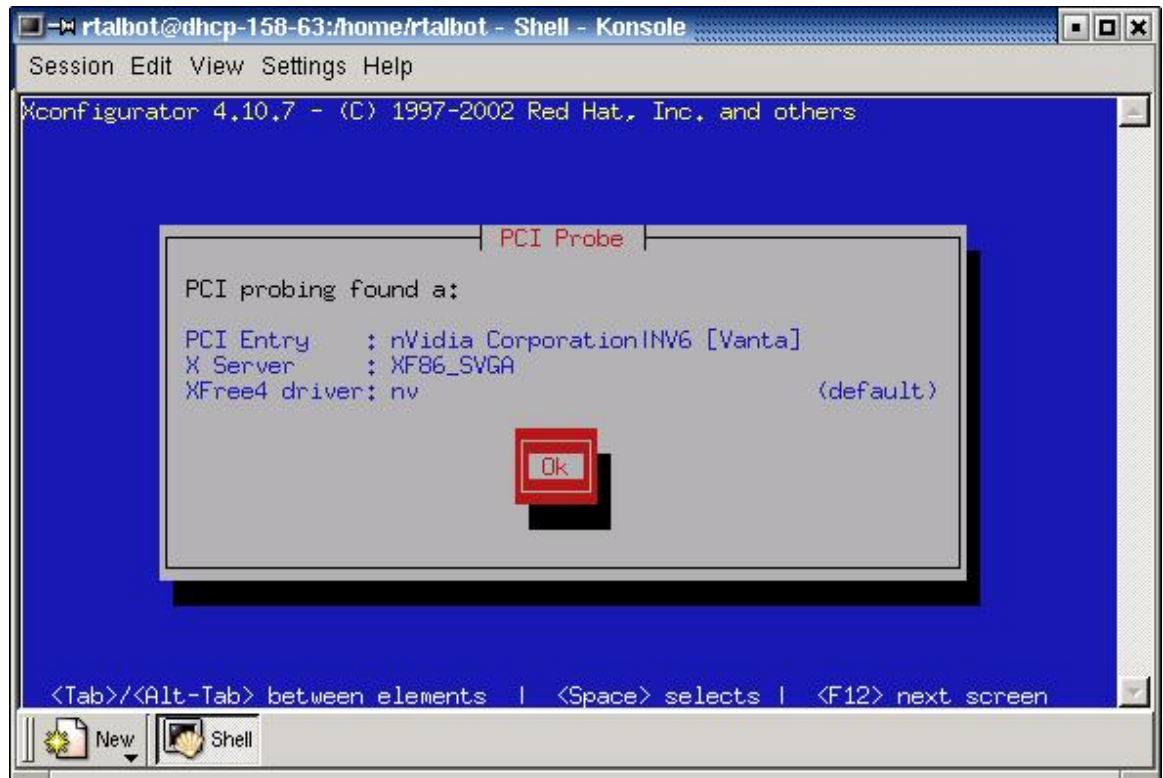
4. In this screen, the system is detecting which type of video card is installed in the system, which version of X server is installed, and what driver is installed. Read this information to verify that it is correct. Then hit the **Enter** key.

   The interface should now be displayed as shown below.

5. In this screen, the system is detecting what type of monitor is installed in the system. Read over the information to verify that it is correct. Then hit the **Enter** key to confirm that these settings are correct.

   The interface should now be displayed as shown below.

---
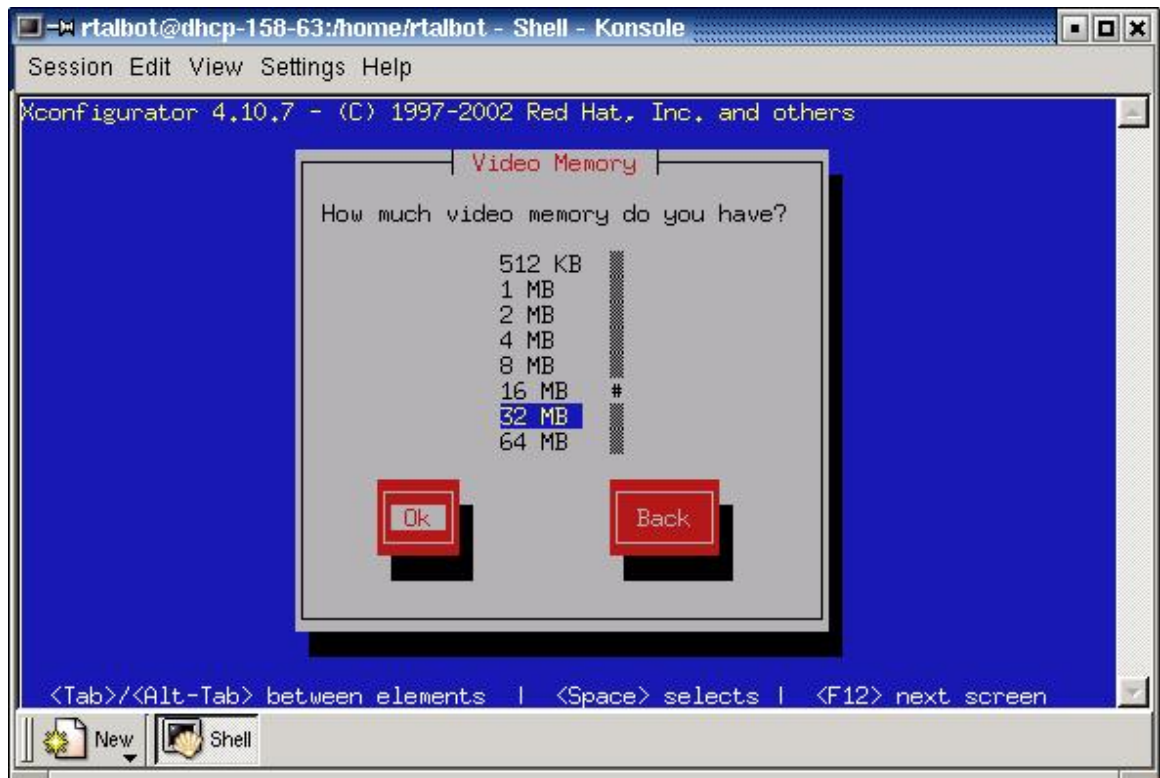
6. In this screen, the system is detecting how much RAM is installed on the video card. Most of the time, the system will auto detect the amount of RAM. If the system does not detect the amount of RAM automatically, use the up and down arrow keys to select the correct amount. Use the **Tab** key to select the **Ok** button and press **Enter**.

   The interface should now be displayed as shown below.
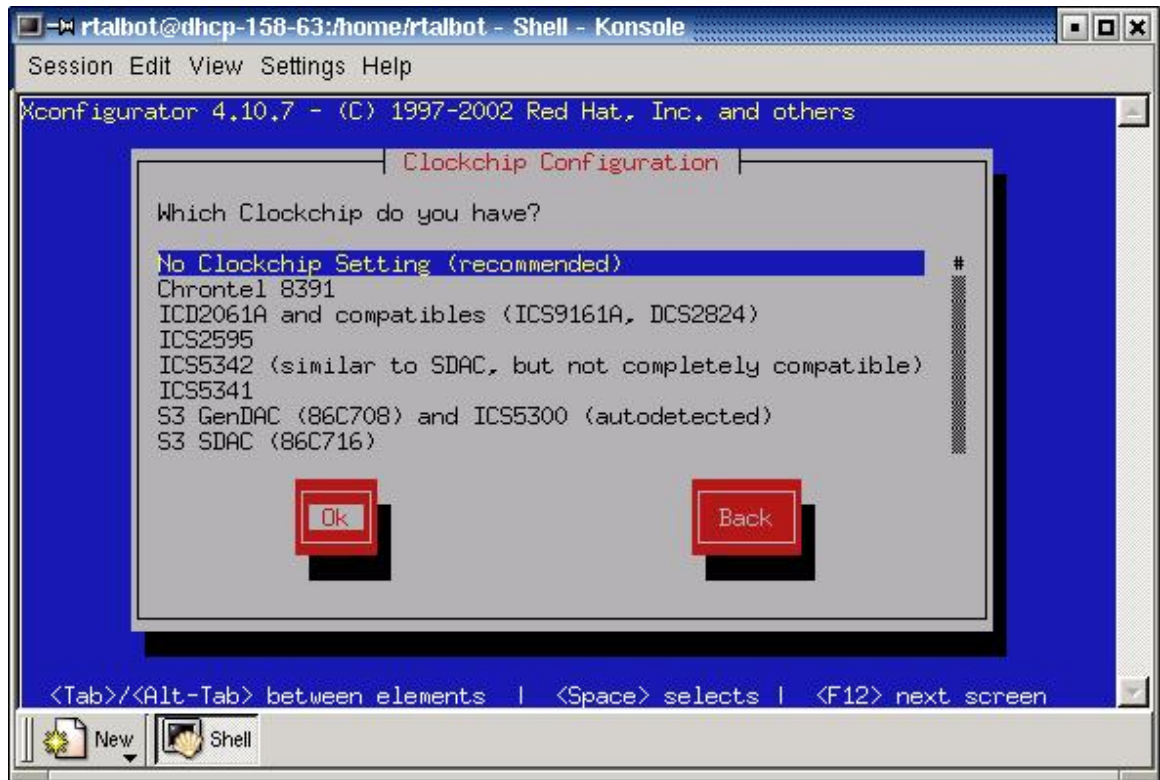
7. In this screen, the system is detecting the clockchip configuration. The default option, which is **No Clockchip Setting**, is recommended. Use the **up** and **down** arrow keys to select the correct setting. Then use the **Tab** key to select the **Ok** button and press **Enter**.

The interface should now be displayed as shown below.
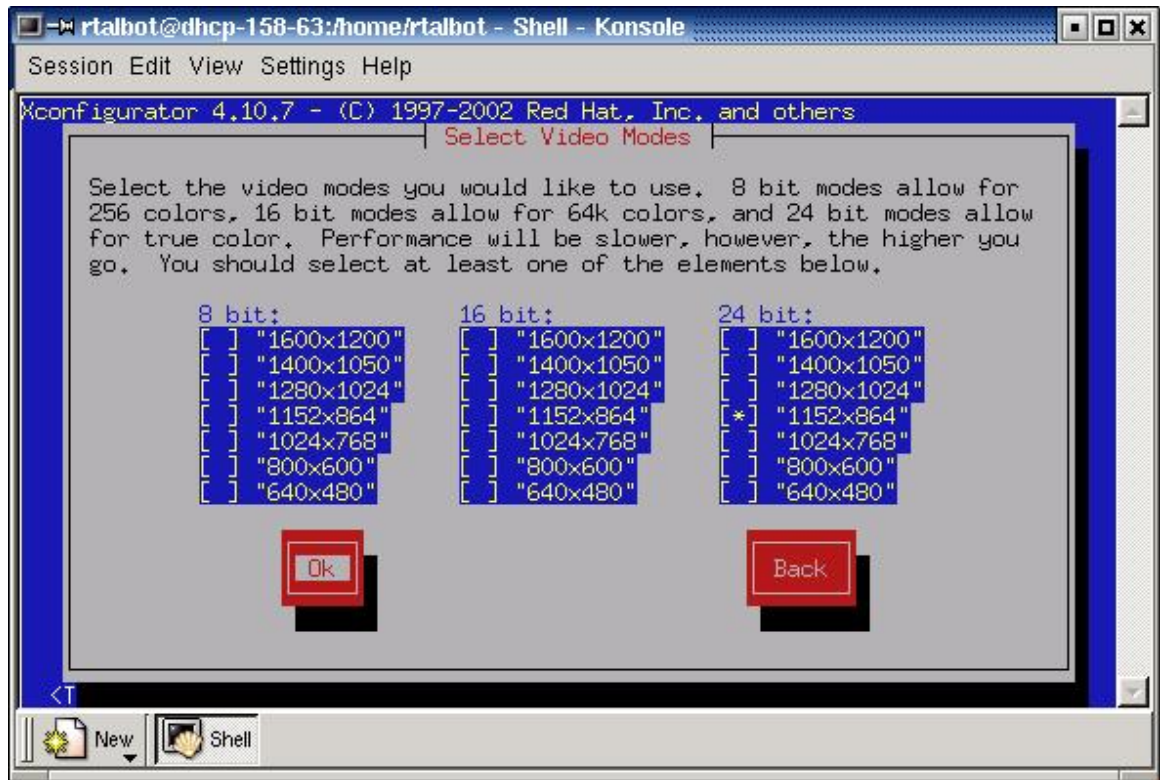
8. In this screen, select the desired screen resolution size. Use the Tab key to navigate around this screen. After reaching the desired setting, hit the **Spacebar** key on the keyboard to select it. Then use the **Tab** key to navigate to the **Ok** button and press **Enter**.

The interface should now be displayed as shown below.
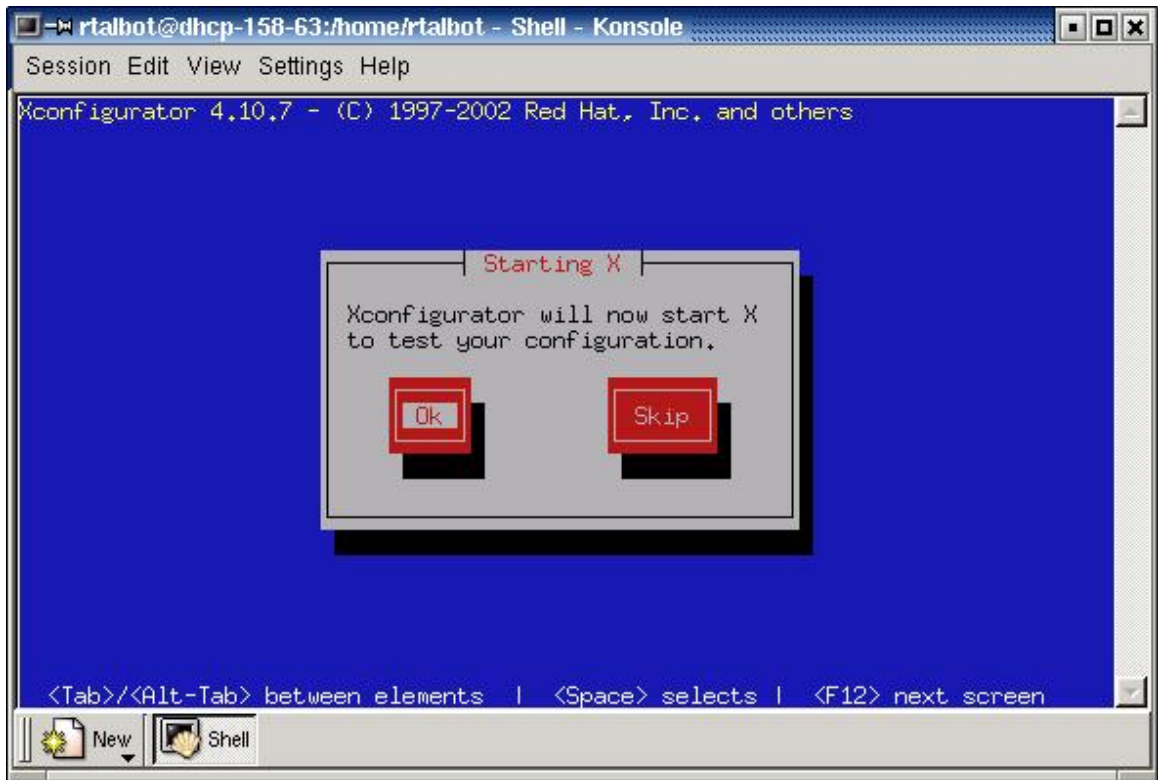
9. At this point, the configuration section has been completed. Proceed to the section that will test and restart the X server with the new settings. To do this, select the **Ok** key and press **Enter**.

   After **Ok** is selected, the screen with flicker a few times. Then a test configuration screen will appear and ask if the screen is visible and if the settings are accepted. If the screen looks ok, select **Yes** and the X server will restart and display the new settings.

Reflection

   The X server configuration tools can only be used when logged in as the root user. Why is it important that regular users are not able to run these tools?

   _____

   _____

   _____

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Post-Installation of Applications and Programs

Estimated Time: 20 minutes

Objective

To install applications and programs after the installation of Linux Red Hat is complete.

Equipment

- A computer with Linux Red Hat 7.X installed.

Scenario

The system administrator of a large company has recently deployed several Linux Red Hat systems. All of these systems should be installed with the latest version of the Netscape Navigator Internet browser. The version that comes with Linux is not the latest version available. Find and install the latest version.

Procedures

Step 1: Downloading the package from the Internet

Note: Log in as the **root** user.

There are several ways to get the latest version of Netscape. One way is to get the CD. For the purposes of this lab, download the package from the Netscape Web site by using the following steps:

1. Open the existing Netscape Communicator web browser. Go to the Netscape homepage. Do this by clicking on the **K-start menu** > **Internet** > **Netscape Communicator** link. This will open the browser. When the browser opens, click on the **Home** button. This will open the Netscape homepage at home.netscape.com.

2. Once the page loads, click on the **Downloads** link in the top right-hand corner.

3. At this screen, click on the **Free Download** button.

4. After a few seconds, the **Save as** box will appear. Make a note of the location where the file is being saved so it can be found after being installed. Click **OK** to save the file in the default location.

Step 2: Unpacking and installing the application

1. In the terminal Window, navigate to the folder where the application was saved. It should be the home folder. After reaching the correct directory, type **`ls -bl`** at the shell prompt.

    This will list the contents of the directory. The downloaded file should be listed in the directory. Look for the filename `netscape-i686-pc-linux-gnu-installer.tar.gz`. That is the name of the file that needs to be unpacked and installed.

2. To unpack and install the file, enter the following command at the shell prompt:

    `tar -xvzf netscape-i686-pc-linux-gnu-installer.tar.gz`

    Press **Enter.** This should create a new directory called **`netscape-installer`** in the same directory. To list the contents of the directory again, use the **`ls -l`** command.

3. Change to the **`netscape-installer`** directory by entering **`cd netscape-installer`** at the shell prompt.

    Now use the **`ls -l`** command to list the contents of the **`netscape-installer`** directory.

4. Install the software by entering the following command at the shell prompt:

    `./netscape-installer`

    This should automatically launch the Netscape installer window. Click **Next**. On the following screen, click **Accept** to accept the license agreement.

    Click **Next** again to accept the **Recommended** installation.

    Note: Keep the **default** settings.

    On the next screen, click on the **Install** button. It will take a few minutes for the files to download and install. Once the status bar shows that the download has been completed, the software should self-install.

    After the installation is complete, some boxes will prompt registration or entry of a Netscape username and password. Enter the requested information or select **Cancel**. Registration can be done at a later time..

    After the information is entered, or **Cancel** is selected, the new Netscape browser should open. When it does, close it.

Step 3: Using the new application

1. Open the Netscape browser by clicking on the **K start menu > Internet > Netscape Communicator** link. This should open the old version of Netscape. This occurs in Linux because the old version of Netscape is still installed and the link still points to the old Netscape version. Follow the next steps to create a desktop application that links to the new version of Netscape.

2. Right click on the desktop and select **Create new > Link to Application**.

3. The **Properties** box will open. Type `Netscape` in the box. Then click on the **Execute** tab.

4. In the **Command** box, type `/usr/local/netscape/netscape`. Click **Ok**

5. Click on the new desktop icon and launch the new Netscape browser.

6. When the **Netscape Network Registration** box appears, press the **Cancel** button.

Reflection

How does software installation in a Linux system compare to that in a Windows system? Are there any advantages to the way that it is done in a Linux system as opposed to a Windows system?

_____

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Linux Kernel Management

Estimated Time: 25 Minutes

Step 1

1. How many open files does your current kernel support?

    _____

2. When might you want to change this number?

    _____

3. To change the number of open files that the kernel can support enter the following command:

    ```
    # echo 8192 > /proc/sys/fs/file-max
    ```

4. This change in step 3 is in RAM and will only be valid until the computer reboots. The following steps will change the default settings?

    Open the `/etc/rc.d/rc.local` file using the vi editor:

    ```
    # vi /etc/rc.d/rc.local
    echo "8192" > /proc/sys/fs/file-max
    ```

    Exit the vi editor and save the changes. Reboot the system and check to see if the number of files the kernel can support has changed. Run the following command:

    ```
    # cat /proc/sys/fs/file-max
    ```

    How many files does the kernel now support?

    _____

5. Briefly describe the following kernel commands: (hint: use the **man** command)

    lsmod

    insmod

    rmmod

6. Login as the root user. Run the following commands:

   # **lsmod**

   How many modules are installed?

   _____

   # **rmmod -a**
   (If you are not sure what the -a switch does, read the man page)

   # **lsmod** (again) Did the number of modules change and what is the number?

   _____

Logging into Linux
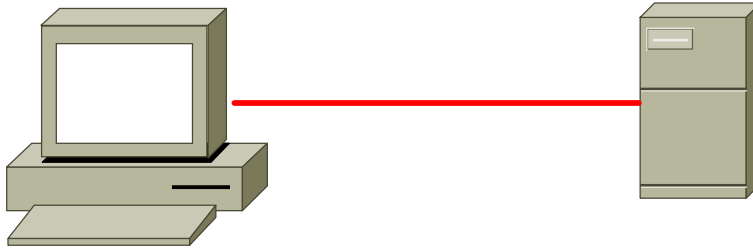
Estimated Time: 30 minutes

Objective

In this lab, the student will learn how to boot a Linux computer, log in as the root user, navigate using the Command-Line Interface (CLI), and then shut the computer down.

This lab will cover the following CLI commands:

- `su`

- `whoami`

- `man`

- `ls`

- `shutdown`

Equipment

The following equipment is required for this exercise:

- Computer with Linux Red Hat 7.2 installed

Scenario

Boot up the Linux computer and log in using the root user. Run Linux in the command line mode and shut down the system using the Unix-based shutdown command.

Step 1

Turn the computer on and observe the boot process. When Linux begins to load, the following screen will be displayed. This screen gives the user the option of booting into the text mode. Press the **Enter** key to bypass this screen, or wait and Linux will automatically begin to boot (in approximately five seconds).

The boot process may take a few minutes. The time will vary according to the speed of the computer. As Linux boots, the Linux processes will load. The screen should look similar to the following as the Linux system boots up.

Copyright © 2004, Cisco Systems, Inc.

```
Detected 200462794 Hz processor.
Console: colour dummy device 80x25
Calibrating delay loop... 399.77 BogoMIPS
Memory: 47080k/49152k available (860k kernel code, 408k reserved, 748k data, 56k init)
CPU: Intel Pentium MMX stepping 03
Checking 386/387 coupling... OK, FPU using exception 16 error reporting.
Checking 'hlt' instruction... OK.
Intel Pentium with F0 0F bug - workaround enabled.
POSIX conformance testing by UNIFIX
PCI: PCI BIOS revision 2.10 entry at 0xfdb31
PCI: Probing PCI hardware
Linux NET4.0 for Linux 2.2
Based upon Swansea University Computer Society NET3.039
NET4: Unix domain sockets 1.0 for Linux NET4.0.
NET4: Linux TCP/IP 1.0 for NET4.0
IP Protocols: ICMP, UDP, TCP, IGMP
Initializing RT netlink socket
Starting kswapd v 1.5
vesafb: framebuffer at 0x08000000, mapped to 0xc3802000, size 1024k
vesafb: mode is 800x600x8, linelength=800, pages=0
vesafb: protected mode interface info at c7df:0008
vesafb: scrolling: redraw
Console: switching to colour frame buffer device 100x37
fb0: VESA VGA frame buffer device
Serial driver version 4.27 with MANY_PORTS MULTIPORT SHARE_IRQ enabled
ttyS00 at 0x03f8 (irq = 4) is a 16550A
ttyS01 at 0x02f8 (irq = 3) is a 16550A
pty: 256 Unix98 ptys configured
apm: BIOS version 1.2 Flags 0x0b (Driver version 1.9)
Real Time Clock Driver v1.09
RAM disk driver initialized:  16 RAM disks of 4096K size
PCI_IDE: unknown IDE controller on PCI bus 00 device 2a, VID=3388, DID=8013
PCI_IDE: not 100% native mode: will probe irqs later
hda: QUANTUM FIREBALL EX3.2A, ATA DISK drive
ide0 at 0x1f0-0x1f7,0x3f6 on irq 14
hda: QUANTUM FIREBALL EX3.2A, 3079MB w/418kB Cache, CHS=782/128/63
Floppy drive(s): fd0 is 1.44M
FDC 0 is a post-1991 82077
md driver 0.90.0 MAX_MD_DEVS=256, MAX_REAL=12
md.c: sizeof(mdp_super_t) = 4096
Partition check:
 hda: hda1 hda2 < hda5 hda6 hda7 hda8 > hda4
```

Do these processes make sense?

_____

_____

_____

Step 2

After Linux is loaded, the user will be prompted to login. During the installation process, the **Command-Line Interface** (**CLI**) was set as the default boot. The screen below shows a CLI login prompt.


```
Red Hat Linux release 7.2 (Enigma)
Kernel 2.4.7-10 on an i686
login: root_
```

The Linux administrator account is called the **root** account. Type in `root` and press the **Enter** key. Be careful when typing because like all UNIX computers, Linux is case sensitive.

Next, type in the root password:

cisco1


```
Red Hat Linux release 7.2 (Enigma)
Kernel 2.4.7-10 on an i686
login: root
Password:
[root@systemA1 root]# _
```

Note: the root account is signified by the # at the prompt.

It is not a good practice to work as the root user. The root user has complete control of the Linux system and can inadvertently delete important files. It is better to work as a user that does not have total control and to switch to the root account only when maintaining or upgrade the system. In Linux, it is a simple process to switch users by using the **su** command.

During the installation process two accounts were created. One account was for the root account and another for general student use. Students will need to ask the instructor for the student account name.

At the command prompt, type:

su - studentA1

Note: When root users are switching users they will not be prompted for a password. All other accounts will be prompted for a password.

```
[root@systemA1 root]# su - studentA1
[studentA1@systemA1 studentA1]$ █
```

Did the command prompt change? How?

Troubleshooting

_____

_____

Note: The (**-**) after the **su** command is called a switch. When switching users, this switch will run all associated user scripts. To experiment, type **exit** after logging in as any user other than the root user. The user will become the root user.

Now type:

su studentA1

What happened without the –switch this time.? Did the user end up in studentA1's home directory?

_____

Make sure to be logged on as a student user. To verify this, use the `whoami` command. The `whoami` command will only display the login name of the current user.

At the command prompt type in:

    `whoami`

```
[root@systemA1 root]# su - studentA1
[studentA1@systemA1 studentA1]$
[studentA1@systemA1 studentA1]$ whoami
studentA1
[studentA1@systemA1 studentA1]$ ▮
```

What were the results?

_____

Step 5

Navigating the Command-Line Interface (CLI) is not difficult if the user knows where to find help. In Linux, the `man` command displays information about CLI commands.

For example, to learn about the `ls` command type in:

```
man ls
```



```
LS(1)                          FSF                          LS(1)

NAME
       ls - list directory contents

SYNOPSIS
       ls [OPTION]... [FILE]...

DESCRIPTION
       List information about the FILEs (the current directory by
       default).  Sort entries alphabetically if none of -cftuSUX
       nor --sort.

       -a, --all
              do not hide entries starting with .

       -A, --almost-all
              do not list implied . and ..

       -b, --escape
              print octal escapes for nongraphic characters

       --block-size=SIZE
              use SIZE-byte blocks

       -B, --ignore-backups
              do not list implied entries ending with ~

       -c     with -lt: sort  by, and show, ctime (time of last
              modification of file status information)  with  -l:
              show  ctime  and  sort  by  name otherwise: sort by
:
```

Results of the `man ls` command

To move around the `man` screen, press the **Enter** key to move down.

Like DOS, Linux commands may have switches associated with them. Note that the `ls` command uses many switches, `-a` and `-l` are the most common.

To exit the `man` command, type the letter:

```
q
```

The user will return to the CLI.

At the CLI, type in the following commands. Describe the results after each command is entered:

ls

ls -a

ls -al

```
[studentA1@systemA1 studentA1]$ ls
[studentA1@systemA1 studentA1]$ ls -a
.  ..  .bash_history  .bash_logout  .bash_profile  .bashrc  .kde  .xauth
[studentA1@systemA1 studentA1]$ ls -al
total 32
drwx------      4 studentA studentA      4096 Mar  1 00:49 .
drwxr-xr-x      4 root     root          4096 Mar  1 00:48 ..
-rw-------      1 studentA studentA         9 Mar  1 00:49 .bash_history
-rw-r--r--      1 studentA studentA        24 Mar  1 00:48 .bash_logout
-rw-r--r--      1 studentA studentA       191 Mar  1 00:48 .bash_profile
-rw-r--r--      1 studentA studentA       124 Mar  1 00:48 .bashrc
drwxr-xr-x      3 studentA studentA      4096 Mar  1 00:48 .kde
drwx------      2 studentA root          4096 Mar  1 00:49 .xauth
[studentA1@systemA1 studentA1]$ 
```

How are files hidden in Linux?

Hint: What character does Linux place in front of the file to hide it?

_____

_____

Step 7

In this step, using the shutdown command will turn off the computer. Linux, like all NOSs, must complete the shut down process. Linux needs time to shutdown so it can put files where they belong. Turning off a Linux system quickly can result in files being lost and the corruption of vital configuration settings.

To learn about the **shutdown** command, type in:

man shutdown

```
SHUTDOWN(8)     Linux System Administrator's Manual     SHUTDOWN(8)

NAME
        shutdown - bring the system down

SYNOPSIS
        /sbin/shutdown [-t sec] [-arkhncfF] time [warning-message]

DESCRIPTION
        shutdown brings the system down  in  a  secure  way.   All
        logged-in  users  are  notified  that  the system is going
        down, and login(1) is blocked.  It is possible to shut the
        system  down  immediately or after a specified delay.  All
        processes are first notified that the system is going down
        by the signal SIGTERM.  This gives programs like vi(1) the
        time to save the file being edited, mail and news process-
        ing programs a chance to exit cleanly, etc.  shutdown does
        its job by signalling  the  init  process,  asking  it  to
        change  the runlevel.  Runlevel 0 is used to halt the sys-
        tem, runlevel 6 is used to reboot the system, and runlevel
        1  is used to put to system into a state where administra-
        tive tasks can be performed; this is the default  if  nei-
        ther the -h or -r flag is given to shutdown.  To see which
        actions are taken on halt or reboot  see  the  appropriate
        entries for these runlevels in the file /etc/inittab.

OPTIONS
        -a      Use /etc/shutdown.allow.

        -t sec  Tell  init(8)  to  wait sec seconds between sending
                processes the warning and the kill  signal,  before
                changing to another runlevel.

        -k      Don't  really  shutdown; only send the warning mes-
                sages to everybody.

        -r      Reboot after shutdown.

        -h      Halt after shutdown.

        -n      [DEPRECATED] Don't call init(8) to do the  shutdown
:
```

From this **man** page, briefly describe the **shutdown** command.

_____

_____

_____

What does the **-r** switch do?

_____

What does the **-h** switch do?

_____

How is the time set with the **shutdown** command?

_____

What letter is typed to exit the man page help screen?

_____
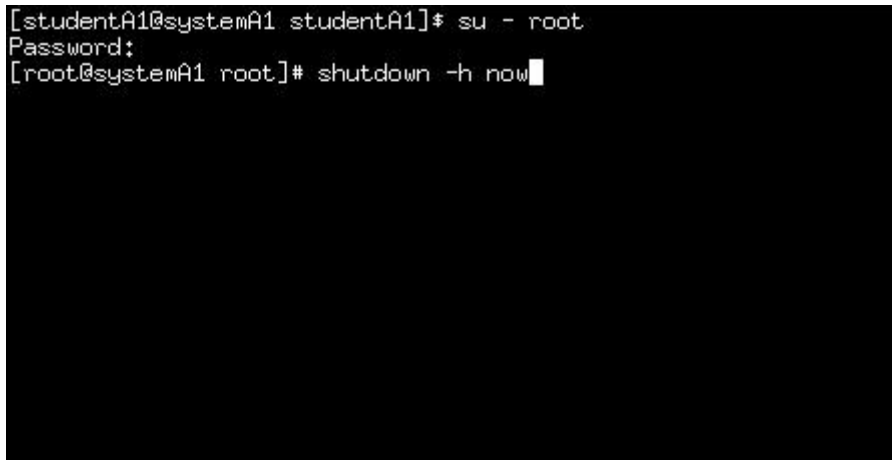
Only the root user is allowed to shutdown a Linux computer. To complete this step, verify that the user is logged in as the root user. If not, type:

```
su – root
```

If requested, enter the root password.

Next, type:

```
shutdown –h now
```

```
[studentA1@systemA1 studentA1]$ su - root
Password:
[root@systemA1 root]# shutdown -h now
```

Describe the shutdown process.

_____

_____

After the shutdown process was complete, did the computer turn off?

_____

Note: With an ATX power supply it will turn the computer off. Older AT boxes will not.

Troubleshooting

IT professionals are frequently called on to troubleshoot Linux log-in problems. The following list can be used as a checklist when troubleshooting:

Problem: Cannot log in to the system

Possible causes:

- Username or password is misspelled or mistyped. Check both the username and password and carefully re-enter this information. In both Linux and UNIX, usernames and passwords are case-sensitive, so verify that the password uses the correct case.

- Keyboard Caps Lock is on. Press the **Caps Lock** key once, verify that the keyboard

Caps Lock indicator light is off, and try entering the password again.

- User has confused username with password. Verify that the user is typing his or her username in the "User name" field, and password in the "Password" field.

- When logging in through CLI, some users do not realize that although they do not see anything being entered as they type, the system is taking the input. So it is sometimes common for beginning users to think their machine is frozen at this point.

Reflection

1. Why is it important to log out or lock the console when leaving it unattended?

   _____

   _____

2. What are some of the reasons a user may not be able to log in to the server?

   _____

   _____

3. What advantages does the ability to switch between multiple login terminals provide?

   _____

   _____

Using the Linux GUI (X Window)
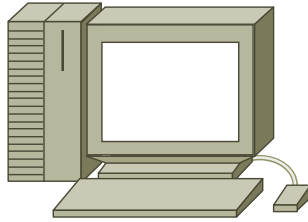
Estimated Time: 25 minutes

Objective

In this lab, the student will learn to explore the basic features of the X Window and the KDE desktop environment.

Equipment

The following equipment is required for this exercise:

- Computer with Linux Red Hat 7.2 (or greater) installed.

Scenario

The XYZ Company has just installed a server running Red Hat Linux 7.2. The company has asked the student to log in to the server with the administrative account. The server is configured with the KDE desktop environment. The task is to explore the basic features of the KDE GUI.

Procedures

Before beginning this lab, power on or reboot the Red Hat Linux server.

Step 1: Starting an X Window Session

This Linux system was setup to boot into the command line by default. Linux, however, can be configured to boot into the GUI by default. If the user is just booting up the system for the first time, then the user will need to login and supply the password as done in the previous lab. If already at the command prompt, type:

```
startx
```

The `startx` command will initialize an X Window session and start the KDE interface.

Once the X Window session initializes, the KDE Welcome dialog box appears. The user will not have to log in to the GUI because a username and password were already supplied in order to authenticate the user in the CLI.

Step 2: Navigating the KDE interface

Once the system grants access, the desktop environment will be visible on the server. The installation of Red Hat 7.2 allows installation of the KDE desktop environment. Use the KDE as the default **Graphical User Interface** (**GUI**) for all users. Other desktop environments, such as GNOME, can also be configured and used with Linux.

UNIX and Linux both rely on the X Window system to display the GUI. The **X Window** system is software that works with the system hardware and graphical applications including the window manager. The **window manager** is the software responsible for sizing, positioning, and rendering the graphical windows that programs run in.

Windows include borders that can be dragged to resize and graphical buttons that can be clicked to minimize, maximize, restore, and close the window. Since Linux supports several window managers and each window manager can be customized, there is no one way a window will look or act.

KDE, like most Unix/Linux GUIs, is designed to use a three-button mouse. The function of each button can be customized on a per-user basis. The following table describes the functions commonly associated with each mouse button:

Mouse Button	Function
Left	Use to select and drag items.
Middle	Used to paste text or to move things
Right	Used to bring up a menu for the selected object (when applicable).

KDE is not a window manager. In fact, KDE can work with several different kinds of window managers. KDE is a desktop environment. A desktop environment is a combination of programs, applications, and applets that make up part of the GUI.

KDE provides:

- Graphical panels that can be used to start applications or display status

- A graphical **desktop** that can be used to store applications, files, and menus

- A standard set of desktop tools and applications

- A set of conventions that enable applications to work together consistently

The KDE desktop panel contains icons that start key applications or open menus. The panel contains icons that start key applications or open menus. It also contains a task bar that allows switching between running applications.

The following icons typically appear on the panel:

KDE control

The KDE desktop environment can be configured to look and act in hundreds of different ways. Some of KDE's key features can be configured using the **KDE Control Center**.

To switch to another desktop environment go to the **K** at the lower left corner of the screen. Hold the mouse down until the menu pops up and find the **Run** command. Click on it and type:

```
switchdesk
```

Click **Enter** A display of all of the available desktops that are installed will be seen.

Read the popup box and click **Cancel**.
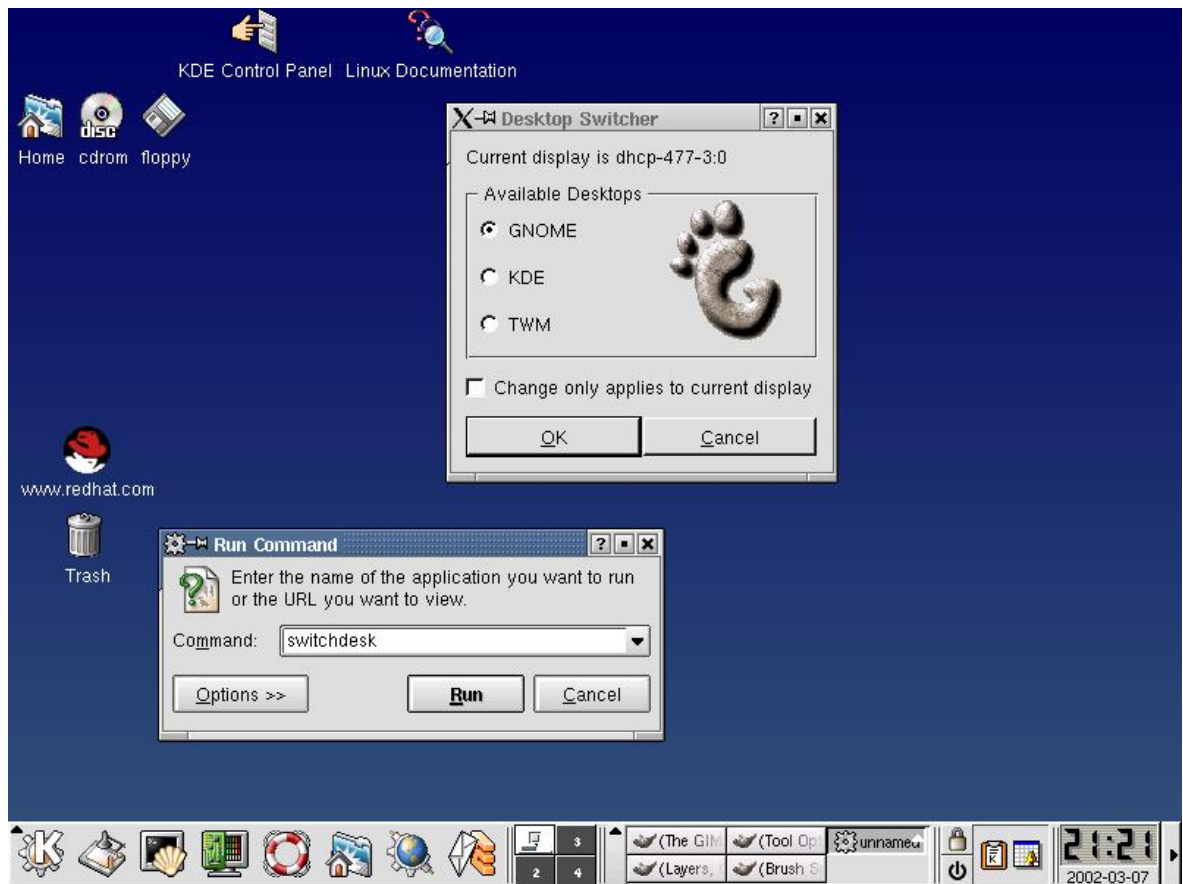
Open the **KDE Control Center** now by clicking once on the icon on the panel. The KDE Control Center window will appear as shown:
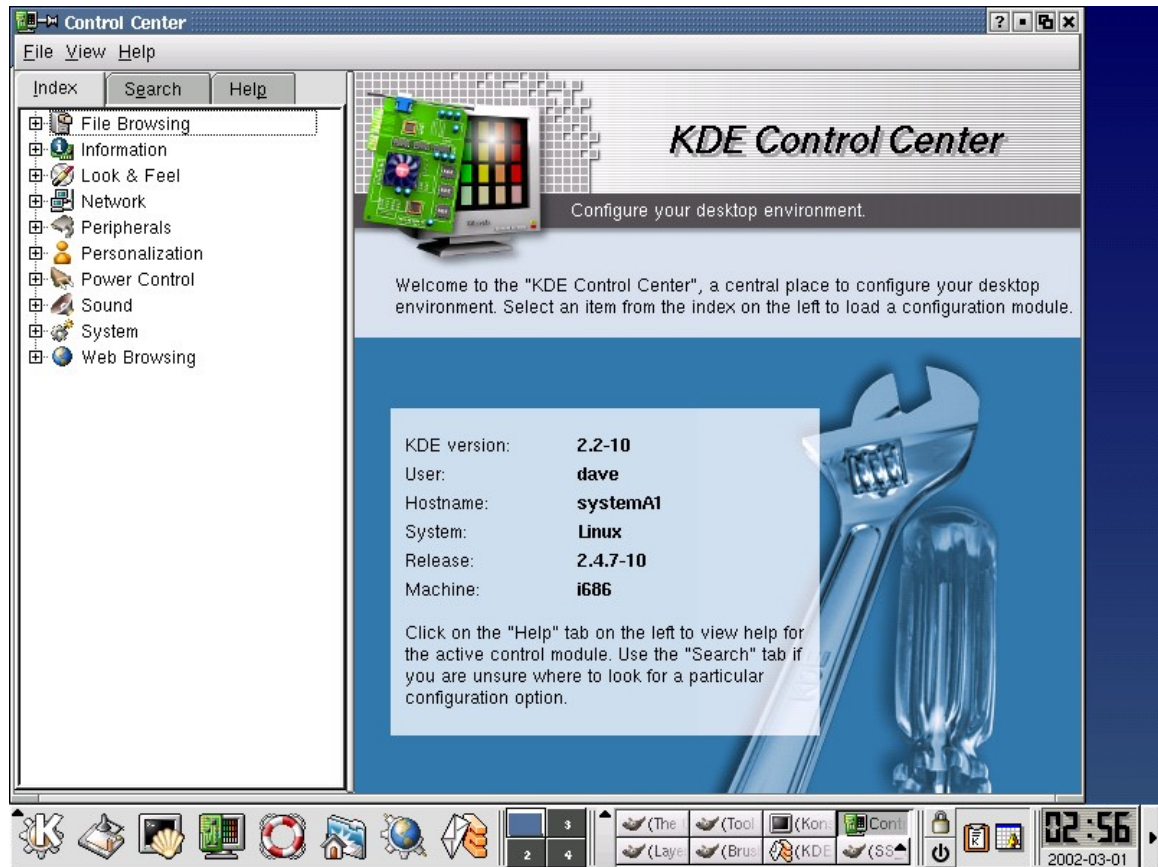
From the Control Center, the user can customize aspects of KDE's appearance, including the desktop background, the window manager, and the panel.

Before leaving the Control Center, click on the **Look and Feel** option under the **Index** tab. This will list many options for configuring the KDE desktop environment.

The Look and Feel tool is the name of the window manager that KDE is working with. Remember, KDE can be configured to work with other window managers. There are many aspects of the window manager that can be configured here. Click on the **Theme Manager** icon. Then, select the **Eclipse** option from the list as shown:
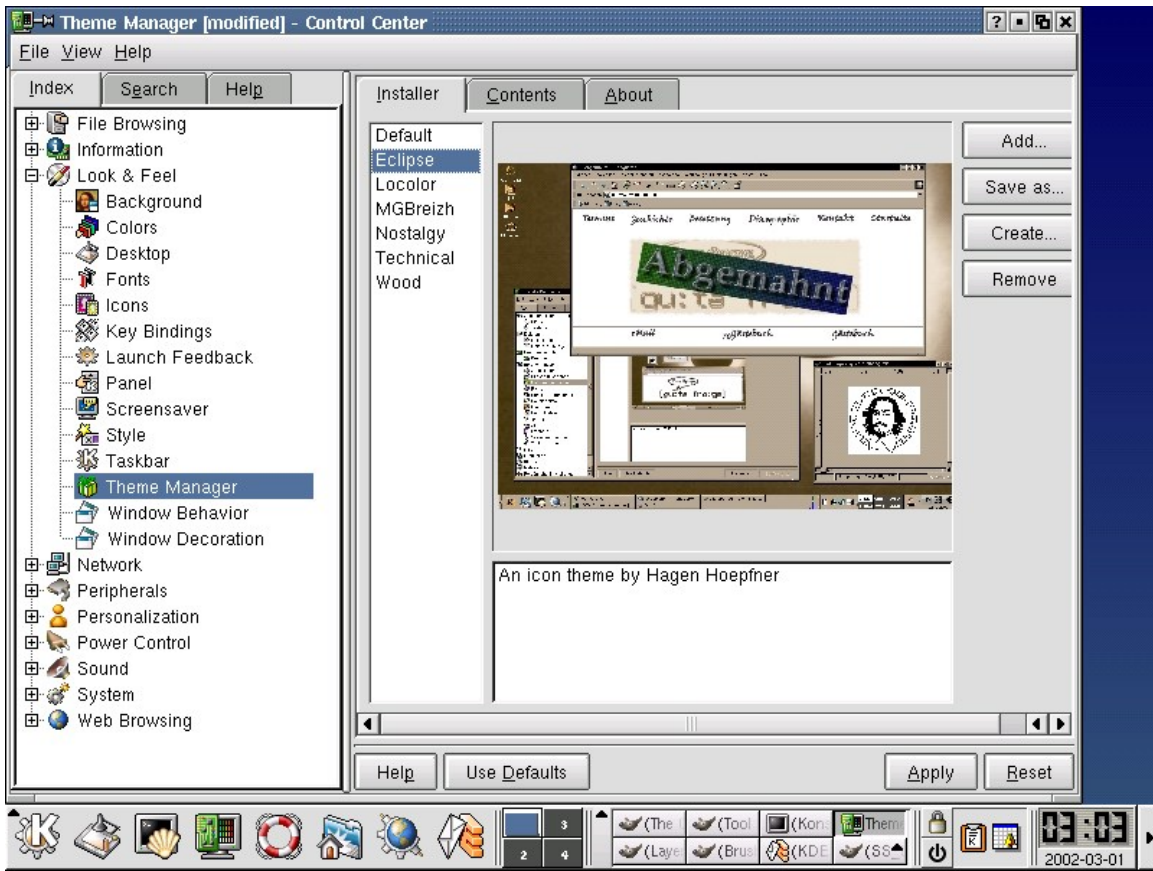
Click on the **Apply** button at the bottom of the Control Center window. The new frame style should appear on all open windows. This change is purely cosmetic and does not affect the way the operating system functions.

To get back to the default KDE settings, reopen the KDE Control Center, click on the **Look and Feel** button, and then select **Theme Manager**. Select the **Default** setting and click **Apply**, and KDE will revert to its original settings.

Click on the **X** at the top of window to close the Theme Manager.

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Step 3: Opening the Control Panel

Next, click on the **KDE** start application button in the lower left hand corner of the screen. A menu will open. Select the **System** menu. Then select the **KDE Control Panel**.
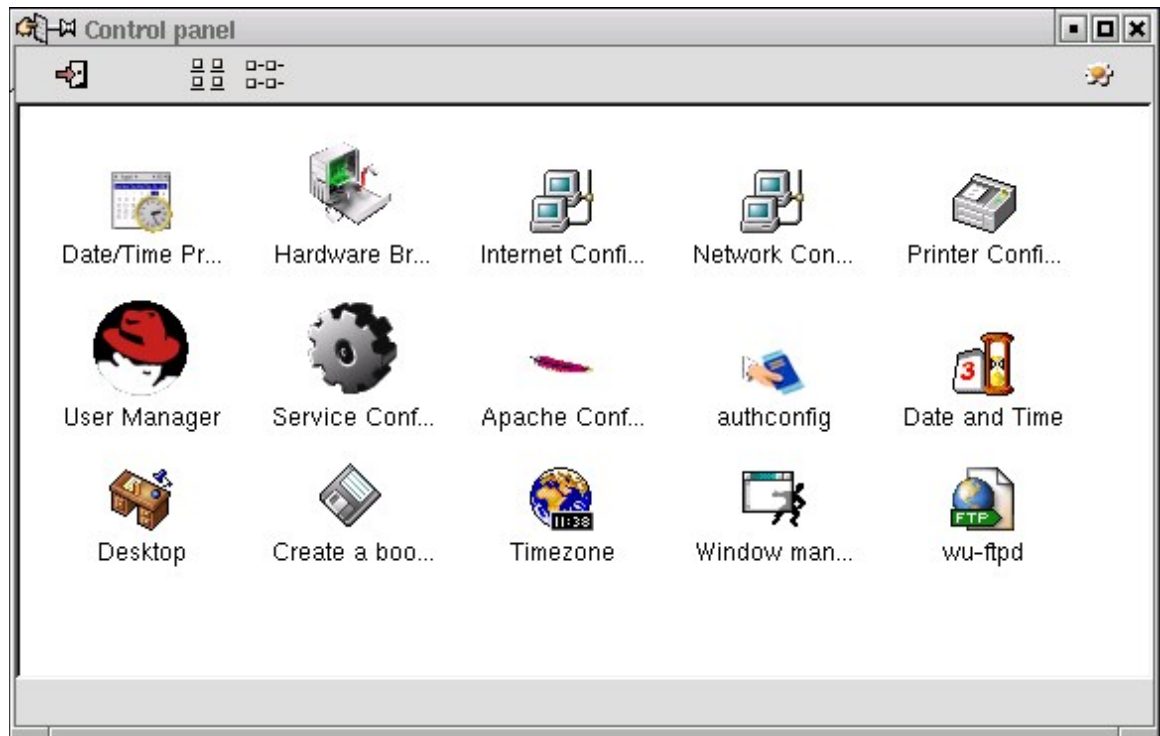
Once in the KDE Control Panel, click on the **Hardware Browser** icon. If asked for the root password, enter it in the KDE dialog box that will appear.
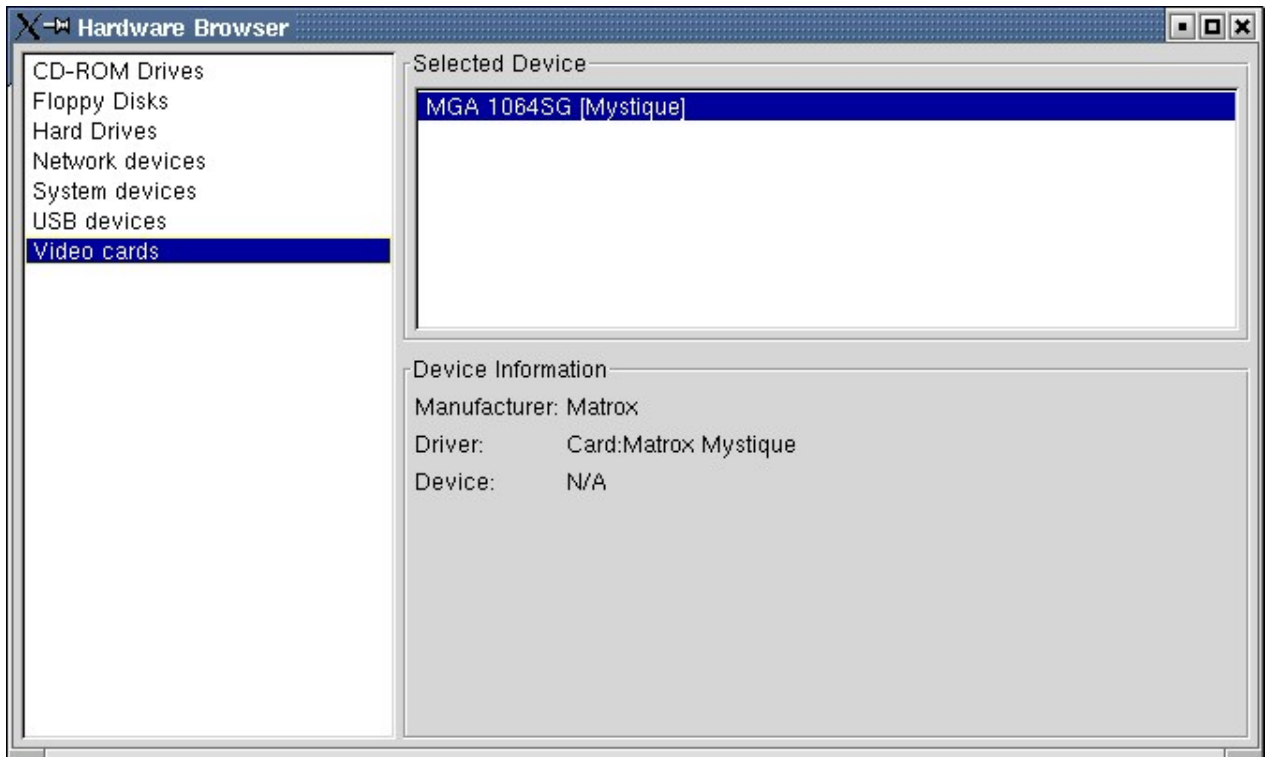
Click through each item listed. In the space below briefly describe the disk information that is described under the **Hard Drives** section.

To close the control panel, click the **X** in the upper right corner of each window that is open.

Step 4: Closing X Window and Shutting down the system

To close out of the X Window session entirely, close all the applications that are open. Next, click the following three keys simultaneously:

Ctrl + Alt + Backspace

This will close X Window and bring the user back in the CLI. From the CLI, shut the computer off by using the shutdown command:

shutdown –h now

Or, as an alternative, reboot the computer:

shutdown –r now

Troubleshooting

Configuring X for a particular system can be a challenging task. Many software components are required, including a window manager and several libraries.

Problem: Cannot run X Window.

Possible causes:

- Because X configuration can be complicated, the user will have to consult websites and other documentation relevant to the software and the system being used. If in the CLI, try using the **ALT-F7** key combination to switch to X. If X is not running, type `startx` at the shell prompt.

Reflection

1. What types of applications require a GUI?

   _____

   _____

2. Who is more likely to use a GUI, an end user or an administrator? Why?

   _____

   _____

3. The CLI program Xconfigurator is useful in fixing and reconfiguring X Window problems. At a terminal window type in man Xconfigurator and read the online documentation.

   _____

   _____

The CLI Interface

Estimated Time: 15 minutes

Objective

In this lab, the student will navigate the Linux file system. The student will learn how to use the navigation tools provided by Linux to locate files and folders. This lab covers he following commands:

cd

ls

pwd

cal

date

Equipment

The following equipment is required for this exercise:

- A computer with Linux Red Hat 7.2 operating system installed.

Scenario

The student is setting up a new computer for a user. Before the user can have the new computer, some directories and files need to be created that the user will need.

Procedure

Using this new computer that has the Linux operating system installed on it, the student will navigate through the file system and locate the user's home directory. The student will also use the file system to navigate through and check to make sure that the necessary directories are in place.

Step 1: The `ls, pwd` and `cd` Commands

1. Login as the root user.

2. At the command line type:

    `ls`

This will display the contents of the root's home directory. In the space below list the contents of this directory.

3. From within the root's home directory type:

    `cd ..`

Press the **Enter** key. Make sure to include a space between the (cd and the **..**). The `cd` **..** command moves the users up one directory. The parent directory of the root's home directory is the "root" (/) of the Linux directory structure. Although the " **/** "and the " /root " directory sound the same, they are two entirely different directories. The " / " is the highest level you can go in the Linux directory system. The " /root " is the home directory for the root user.

4. From the " / " type:

    `ls`

Press the **Enter** key. This will display the contents of the " / " directory. In the space below, list the directories just below the root " / ".

___

Example:

```
[root@systemA1 /]# ls
bin   dev  home   lib         misc  opt   root  tmp  var
boot  etc  initrd  lost+found  mnt   proc  sbin  usr
[root@systemA1 /]# █
```

The contents of the " / " directory should look similar to the example above.

5. From the root of the Linux directory structure type:

    `cd bin`

Press the **Enter** key. This will change the current active directory to the bin. Verify this with the `pwd` command. The `pwd` command will print the current working directory to the screen. Type:

    `pwd`

___

Press the **Enter** key. In the space below, write down the output of the `pwd` command:

_____

6. To list the contents of the /bin directory type:

    `ls`

Press the **Enter** key. Briefly describe the files and programs that are located in the /bin directory.

In the space below, list three commonly used commands that can be found in the/bin directory.

_____

```
arch            cpio            false       login           ps          su
ash             csh             fgrep       ls              pwd         sync
ash.static      cut             gawk        mail            red         tar
awk             date            gawk-3.1.0  mkdir           rm          tcsh
basename        dd              grep        mknod           rmdir       touch
bash            df              gtar        mktemp          rpm         true
bash2           dmesg           gunzip      more            rvi         umount
bsh             dnsdomainname   gzip        mount           rview       uname
cat             doexec          hostname    mv              sed         usleep
chgrp           domainname      igawk       netstat         setserial   vi
chmod           echo            ipcalc      nice            sh          view
chown           ed              kill        nisdomainname   sleep       ypdomainname
consolechars    egrep           ln          pgawk           sort        zcat
cp              ex              loadkeys    ping            stty
[root@systemA1 bin]# █
```

Example: typical /bin directory

7. From the /bin directory, type the following command and press the **Enter** key:

    `cd`

When typed without switches, the `cd` command will lead to the user's home directory. Verify that the user is in the /root home directory, type:

    `pwd`

Press the **Enter** key and write down the output of the `pwd` command.

_____

8. From the /root home directory type and press the **Enter** key:

    `cd /etc`

This command will take the user to the /etc directory. The " / " before the etc directory will tell Linux to "go up" to the root (/) first, then down to the etc directory. From within the /root directory the user cannot simply type "cd etc". Typing "cd etc" from within the /root directory will tell Linux to look "down" first and the etc directory will not be found.

_____

From within the /etc directory type:

        ls

Press the **Enter** key and briefly describe the contents of the /etc directory.

In the space below, write the files that start with "rc".

_____

9. Return home by typing:

        cd

Press the **Enter** key and verify that you are in the home directory by typing:

        pwd

In the space below, write out the path.

_____

Step 2: The **cal** and **date** Commands

1. To use the **man** command to learn about the cal command, type the following:

        man cal

Next, type the current month.

Example:

        cal 11 2002

Now try:

        cal 09 1752

Example:

```
[root@systemA1 etc]# cal 09 1752
    September 1752
Su Mo Tu We Th Fr Sa
       1  2 14 15 16
17 18 19 20 21 22 23
24 25 26 27 28 29 30


[root@systemA1 etc]#
```

Linux did not get the month wrong. What happened to the 3rd through the 13th in September of 1752?

_____

2. To use the `man` command to learn about the date command, type the following:

    man date

Type:

    date

Then type:

    date –u

In the space below, describe the difference between the two outputs.

_____

Reflection

Navigating the file system can be done with the X-Windows GUI similar to the way it is done in Windows. However, many experienced Linux users find it easier and faster to navigate using the CLI (Command Line Interface).

The Linux bash and C Shells

Estimated Time: 15 minutes

Objective

In this lab, the student will learn how to use the following shells:

- bash

- csh

Equipment

The following equipment is required for this exercise:

- Computer with Linux Red Hat 7.2 installed.

Scenario

Login and run the bash shell and the C shell. Initiate various commands to compare and contrast the two shells.

Procedures

Step 1: Shell Background Information

Answer the following questions:

1. What is a shell?

   _____

   _____

   _____

2. Who wrote the bash and the C shells?

   _____

   _____

   _____

This lab will be using the Linux `ps` command. The `ps` command gives a snapshot of the current processes (or jobs) that are running. Before starting this lab, learn more about the `ps` command by typing:

    man ps

What are some significant switches that can be used with the `ps` command?

_____

Note: All Linux shells have many common attributes. For example, the following keystrokes will do the following functions:

`Ctrl-C`   Sends an interrupt signal to terminate a process.

`Ctrl-D`   Sends an end of file to the running command.

`Ctrl-Z`   Suspends the currently running program.

Step 2: Shell Operations

If not already logged in, log in now with a student user account and password. To determine the current shell, try typing in the following commands:

    ps

and

    echo $SHELL

The `echo` command will reply back to the monitor (or echo) information about the current running shell.

```
[studentA1@systemA1 studentA1]$ ps
  PID TTY          TIME CMD
 3914 pts/1    00:00:00 bash
 3944 pts/1    00:00:00 ps
[studentA1@systemA1 studentA1]$ echo $SHELL
/bin/bash
[studentA1@systemA1 studentA1]$ 
```

Does the screen look like this? What is the shell that is currently running?

_____

Step 3: The C Shell

1. Switch to the C shell. At the prompt type:

    csh

    What does the prompt look like? How is it different from the bash shell?

    _____

    _____

2. Run the **ps** command again, type:

    ps

    Describe the output of this command:

    _____

```
[studentA1@systemA1 studentA1]$ ps
 PID TTY          TIME CMD
 3914 pts/1    00:00:00 bash
 3944 pts/1    00:00:00 ps
[studentA1@systemA1 studentA1]$ echo $SHELL
/bin/bash
[studentA1@systemA1 studentA1]$ csh
[studentA1@systemA1 ~]$ ps
 PID TTY          TIME CMD
 3914 pts/1    00:00:00 bash
 4162 pts/1    00:00:00 csh
 4167 pts/1    00:00:00 ps
[studentA1@systemA1 ~]$
```

Does the screen look similar to this screen?

_____

What is the Process Identification (PID) for the csh shell on the computer?

_____

Step 4: Exit the C shell

From the C shell type:

exit

What shell did the user end in?

_____

How can this be verified?

_____

Step 5: Exit the bash shell

From the bash shell type:

exit

Where did the user end up this time?

_____

Step 6: Shell Helpful Tips

If logged out in the previous step, log back in with a student account. There are many useful keyboard combinations that are part of the bash shell. For example, if it is known that a command starts with **ca**, but the rest of the command has been forgotten, try typing:

ca+TAB   *(without any spaces)*

What were the results?

_____

Now, go to the C shell (type **csh**) again and try the same command, type:

ca+TAB   *(without any spaces)*

Did the same command work in the C shell? Explain why.

_____

_____

Go back to the bash shell when done and type:

exit

Step 7: Navigating the File Structure

Type:

cd /

This will take you to the **/** of the directory structure.

Next, from the root (/) of the bash shell type:

cd /h (*then click the Tab key*)

Did it complete the command for you?

_____

_____

Click the **Enter** key. What directory did the user end up in?

_____

_____

Try this same command sequence in the C shell. Does tab-competition work in the C shell?

_____

_____

Reflection

Linux shells are generally not considered to be very user-friendly. Between the bash shell and the C shell, which one is easier and why?

_____

_____

Using the Linux vi Editor
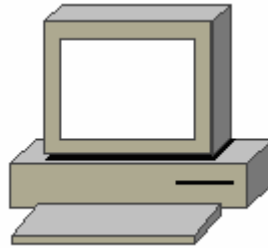
Estimated Time: 30-45 Minutes

Objectives

- Become familiar with the vi Editor

- Review the three vi Modes

- Review keystrokes to move between vi modes

- Create a new file with vi Editor

- Invoke vi with show mode

- Review the save and quit commands

- Open an existing file with vi Editor

- Use editing commands

- Customize a session

- Use search commands

Equipment

The following equipment is required for this exercise:

- A login user ID (for example, studentA1) and password assigned by the instructor.

- A computer with Linux Red Hat 7.2 operating system installed.

Scenario

In this lab, the student will use a UNIX text-editing tool called the vi (pronounced "vee eye") Editor. This text editor is primarily used for creating and modifying files that customize the work environment and for writing script files to automate tasks. System administrators use text editors to create and modify system files used for networking, security, application sharing, and so on. The vi Editor became a part of the UNIX operating systems shortly after UNIX's inception, and is universally available with UNIX systems (including Linux). The vi Editor is a very flexible and powerful editor with many options. These will be reviewed here with examples of their use.

For users learning to become system administrators, it is important to know how to use the vi Editor. It is sometimes the only full screen editor available to edit crucial system files. Examples of these include scripts and environment control files.

Skill in using vi Editor is also needed if the windowing system is not available. The vi Editor is a useful tool when working remotely on other Linux workstations or servers. Administrators routinely login remotely or telnet to another Linux computer to perform maintenance and troubleshooting tasks using the vi Editor. The availability and operation of vi Editor is consistent across all UNIX/Linux platforms.

Use the diagram of the sample Class File System directory tree to assist with this lab.

Step 1: Log in to Linux and go into X-Window (startx)

Log-in with the user name and password assigned by the instructor in the KDE entry box.

Step 2: Access the Command Line

Select **Terminal** from the task bar to open a terminal window.

Step 3: Review the Three vi Modes

There are three modes of operation in vi Editor. Understanding the function of these three modes is the key to working with vi Editor. All commands available with vi Editor can be classified in one of the three modes. The table below lists the modes and a brief description of each. Review the three modes and answer the following questions.

Mode	Function / Characteristics
Command mode	Initial default mode for creating and editing files, cursor positioning and modification of existing text. All commands are initiated from this mode.
Insert mode	Used for entry of new text. Entering an insert command such i (insert), a (append) and o (open new line) will take the user from command mode to entry mode. Entry commands are stand-alone and are entered without pressing the Enter key.
Last-line mode	Used for saving work and quitting vi Editor. Type a colon (**:**) to get to this mode. Pressing the **Enter** key or **Esc** key returns to command mode.

1. Which vi mode is primarily used to enter new text?

    _____

2. Which vi mode is used to save the work and quit vi Editor?

    _____

3. When starting start the vi Editor, which mode is the default?

    _____

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Step 4: Review Keystrokes to Move Between vi Modes

The table below shows how to switch modes and get from one mode to another. Review the keystrokes required to move between modes and answer the following questions.

From Mode	To Mode	Commands / Keystrokes
Command	Entry	i (input), o (open new line), a (append to existing line)
Entry	Command	Press **Esc** (Escape)
Command	Last-line	Colon (:)
Last-line	Command	Press **Esc** or **Enter**
Entry	Last-line	Press **Esc** to return to Command mode, then enter a colon
Last-line	Entry	Press **Enter** or **Esc** to return to Command mode, then enter an insert command

1. Which single-character alphabetic commands will put vi in Entry mode?

    _____

2. Which key will return vi to Command mode from either Last-line or Entry mode?

    _____

3. Which command will put vi into Last-line mode from Command mode?

    _____

Step 5: Create a New File with vi Editor

The vi Editor is started from the command line. Whenever invoking vi Editor, the user is opening a file. The name of the file to be created or edited can be specified when the user starts vi Editor, a new file can be opened to be named later. It is common to start vi Editor and specify a file name. If the file exists, it is opened for editing. If the file does not exist, it is created.

Command Format: `vi [option(s)] [filename]`

1. If logged in as the root user, switch users to another account (su -). If another account is not known, ask the instructor for an available account. Verify that the student is in the home directory. What command was used?

    _____

2. Open a new file called **myvifile** using the command: `vi myvifile`. What does the vi document screen look like?

    _____

---

3. Press the lower case letter **i** to begin inserting text at the first line. Is there any indication on the screen that the user is in Insert Entry mode?

_____

4. Type the student's name. If a mistake is made, do not try to correct it at this time. Was the student able to enter text in Insert mode?

_____

5. Press the **Esc** key to leave Insert Entry mode and return to Command mode. Is there any indication on the screen that the user is back in Command mode?

_____

6. Type a **colon** to go from Command mode to Last-line mode. Is the user now at the bottom left corner of the screen at a colon (:) prompt? If not, press **Esc** again, and enter another colon.

_____

7. Type a lower case **w** (write - to save the new file), followed by a lower case **q** (quit - to exit the vi Editor) and press **Enter**. What was the result of the **wq** commands? Is the user back to the command prompt now?

_____

8. The new file should be saved in the practice directory on the hard disk. Display a long listing of this directory to verify that the file is there (**ls –l**). How many bytes are in the file?

_____

Step 6: Review the Save and Quit Commands

In the previous steps, the student created a file and saved it with the **w** (write) command and exited vi Editor with the **q** (quit) command. There are several Save and Quit commands available with vi Editor. The following table lists some of the more common ones.

Note: Save and Quit commands (except for ZZ) are entered only when in Last-line mode.

Save and Quit Commands

Command	Meaning
`:w`	Write buffer (Save changes and continue working in vi Editor)
`:w new_filename`	Write buffer to `new_filename` (continue working in vi)
`:wq`	Write buffer (save changes) and quit `vi`
`ZZ (upper case)`	Save changes and quit `vi`. Alternative to `:wq`
`:q!`	Quit without saving changes
`:wq!`	Write buffer (save changes) and quit `vi` (The ! will override
	Read only permissions if the user is the owner of the file.)

1. Most save and quit commands are entered in which mode?

    _____

2. Which command will allow the user to exit vi Editor and not save any of the changes?

    _____

3. Which two commands listed in the table perform the same function?

    _____

4. Which command allows the user to save the current file being edited under another name, and remain in vi Editor to continue editing the current file?

    _____

Step 7: Open an Existing File

If the user starts vi Editor and specifies an existing file name, it is opened for editing. Here the student will add some new text in Entry mode and try a few cursor positioning commands.

1. Open **myvifile**, which was created earlier using the command: `vi myvifile`. What does the vi document screen look like?

    _____

2. Position the cursor at the end of the name and press the lower case letter **a** to Append to the line that was typed earlier. Type some text, and the press **Enter** for a hard return and then type some more text. Enter about three lines of text this way. What mode is the user currently in?

_____

3. Press the **Esc** key to leave Insert mode and return to Command mode. In Command mode, can the user position the cursor (with the arrow keys) for additional editing?

_____

4. The user can move the cursor with the arrow keys while in the various entry modes and will still remain in that mode. The table below contains some of the more common cursor positioning keys and commands. If using the alphabetic commands while in an entry mode, they will be entered as text. The user needs to press **Esc** to get to command mode to use them. Practice using these while editing this file. Which character moves the user back one word at a time?

_____

Step 8: Cursor Positioning Commands

Command	Meaning
j or **Down arrow**	Move down one line
k or **Up arrow**	Move up one line
Space bar	Move right (forward) one character
w	Move forward one word (including punctuation)
Back Space	Move left one character (check for accuracy)
B	Move back one word (including punctuation)
$	Move to end of line
0 (zero) or ^	Move to beginning of line
Return	Move down to beginning of next line

1. Press the up arrow to position the cursor until it is on line two. Use the **j** (**jump down**) command to move down and then use the **k** (**kick up**) command to move back to line two.

2. Type a lower case **o** to open a new line below the line the cursor is on and enter some new text. What mode is the user in now?

_____

3. Press the **Esc** key again to leave Open line Entry mode and return to Command mode.

4. Type a colon (`:`) to go to Last-line mode then save and quit this file when finished. If this were a real file, and some mistakes had been made, and the user did not want to save the changes, what Last-line mode command would be used?

_____

5. The new file should be saved in the practice directory on the hard disk. Display a long listing of this directory to verify that the file is there. How many bytes are in the file?

_____

Step 9: Use Editing Commands

There are a many editing commands that can be used to modify existing text in a file. These include commands for deleting, and changing text. The majority of these commands are entered while in command mode.

1. Open a new document with vi Editor. What is the file named?

_____

2. Insert some text. Add five or more lines of text and press **Enter** at the end of each line. Make some mistakes while typing.

3. Delete some text. While in command mode, position the cursor to the desired location and use the options shown in table below to delete some of the mistakes.

Note: These commands are ALL lower case and are entered without the **Enter** key.

Basic Text Deletion Commands

Command	Meaning
`x`	Delete character at the cursor
`dw`	Delete word (or part of word to right of cursor)
`3dw`	Delete three words
`dd`	Delete line containing the cursor
`3dd`	Delete three lines

1. Undo and change some text. To change text and undo changes, use the commands shown in the table below. Many of these commands change the user to Insert mode until Escape is pressed.

Note: These commands are ALL lower case.

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Undo and Change Commands

Command	Meaning
`cw`	Change word (or part of word) at the cursor location to the end of the word
`3cw`	Change three words
`r`	Replace character at cursor with one other character
`u`	Undo previous command

1. Copy and paste text. To copy and paste text, use the following options:

Copy and Paste Commands

Command	Meaning
`YY`	Yank a copy of line and place in the clipboard
`p`	Put (paste) yanked or deleted line below current line
`P (upper case)`	Put (paste) yanked or deleted line above current line

1. Save the file and quit vi Editor.

   What command was used?

   _____

Step 10: Customize the Session

The vi Editor includes options for customizing the edit sessions. These are summarized in the table below. The `set` command is used from last-line mode to control these options. The `set nu` option shows line numbers and is used frequently when writing programs and script files. The line numbers are not part of the file.

1. Open the document you just created with vi Editor. Use the commands in the table to customize the vi session.

Session Customizing Commands

Command	Meaning
`:set nu`	Show line numbers
`:set nonu`	Hide line numbers
`:set showmode`	Display current mode of operation
`:set noshowmode`	Turn off mode display
`:set`	Display all `vi` variables set
`:set all`	Display all possible `vi` variables and their current settings

Step 11: Use Search Commands

The commands in the table below allow the user to perform advanced editing such as finding lines or conducting searches for text. Note that the forward slash (/) and the question mark (?) search options are also last-line commands, but they do not require a colon first. The **next** (**n**) and **next previous** (**N**) commands can be used to find the next occurrence after the **/string** or **?string** commands found what the user was looking for.

Basic Search Commands

Command	Meaning
`G (upper case)`	Go to last line of file
`:21`	Go to line 21
`/string`	Search forward for string
`?string`	Search backward for string
`n`	Find next occurrence of string

Use the commands in the table to practice searching for a particular line or string of text.

Quit vi Editor without saving any changes. What command was used?

_____

Step 12: Remove Files and Directories Created in this Lab

At the prompt, type:

```
rm myvifile
```

Step 13: Close the Terminal Window and Logout

Double click on the dash button in the upper left corner of the screen, then click the **EXIT** icon on the front panel.

Using the `AWK` Command

Estimated Time: 45 Minutes

Objective

In this lab, the student will learn how to write a script and execute it with the `awk` command

Equipment

The following equipment is required for this exercise:

- A Linux system with access to the AWK command

- A text file (see below) that is copied into the users home directory

Background

The AWK command is a programming language that allows you to search through files and modify records.

AWK is named after its authors– Aho, Weinberger and Kernigham < 1978

When running AWK, remember to stop errors:

1. The entire **AWK** command are enclosed in a single quote

2. All quotes inside the command are paired off

3. Enclose action statements with curly brackets and conditional statements round brackets.

Step 1: Create the text file that simulates a small database

The first step would be to create a data file using the vi text editor.

Type the following text in the file and then save the file.

```
# vi counties.txt
```

To save the file in vi press the "**esc**" key, then type "**:wq**" (save & quit) at the prompt.

Country	Area(sq-km)	Population	Median_age(yr)	Life_expectancy	Capital
Afghanistan	647,500	28,513,677	17.5	42.46	Kabul
Cambodia	181,040	13,363,421	19.5	58.41	Phnom_Penh
Canada	9,984,670	32,507,874	38.2	79.96	Ottawa
Mexico	1,972,550	104,959,594	24.6	74.94	Mexico_City
United_States	9,631,418	293,027,571	36	77.43	Washington_DC

source: www.cia.gov

Step 2

Verify the contents of this file:

```
cat countries.txt
```

Run the following commands and then briefly describe the output. If you do not have access to the **awk** command, try logging using the root account.

```
awk '{print $0}' countries.txt

awk '{print $1}' countries.txt

awk '{print $2}' countries.txt

awk '{print $1 $5}' countries.txt

awk '{print $1,$5}' countries.txt

awk '{print $1 "\t" $5}' countries.txt

awk '{print $1 "\t" $2}' countries.txt

awk '{if ($1~/Cambodia/) print $0}' countries.txt

awk '{if ($1~/Mexico/) print $0}' countries.txt

awk '{if ($5~/7/) print $0}' countries.txt

awk '{if ($5!~/7/) print $0}' countries.txt

awk '/^C/' countries.txt

awk '{if ($4 > 20.0) print $0}' countries.txt

awk '{if ($5 >= 50.0) print $0}' countries.txt

awk '{if ($5 > 70.0) print $0}' countries.txt
```

Step 3

Total up the population numbers in the output:

```
#awk '(tot+=$3); END{print "Total population numbers:" tot}'
countries.txt
```

Describe the output.

Adding Users in Linux
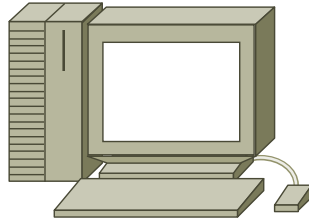
Estimated Time: 20 minutes

Objective

In this lab, the student will learn how to create user accounts using the Linux Red Hat 7.X operating system.

Equipment

The following equipment is required for this exercise:

- Computer with Linux Red Hat 7.X operating system installed.

- The computer will boot to the Command Line Interface (CLI) not the Graphical User Interface (GUI).

Scenario

The XYZ Company has just installed a server running Linux. The company needs an IT person to log onto the server and create users.

Procedures

Until now, each workstation has acted independently from other computers. Each student will create user accounts and these accounts will be used in later labs.

To complete the steps below, each student will need to be at the command line. If X Window was launched at boot up, then students will need to open a terminal window.

Step 1: Account Planning

From the drawing below, plan out how many accounts will need to be added.

SystemA1 is in the first computer in row A. The computer name (host name) will be systemA1 and the student account will be studentA1
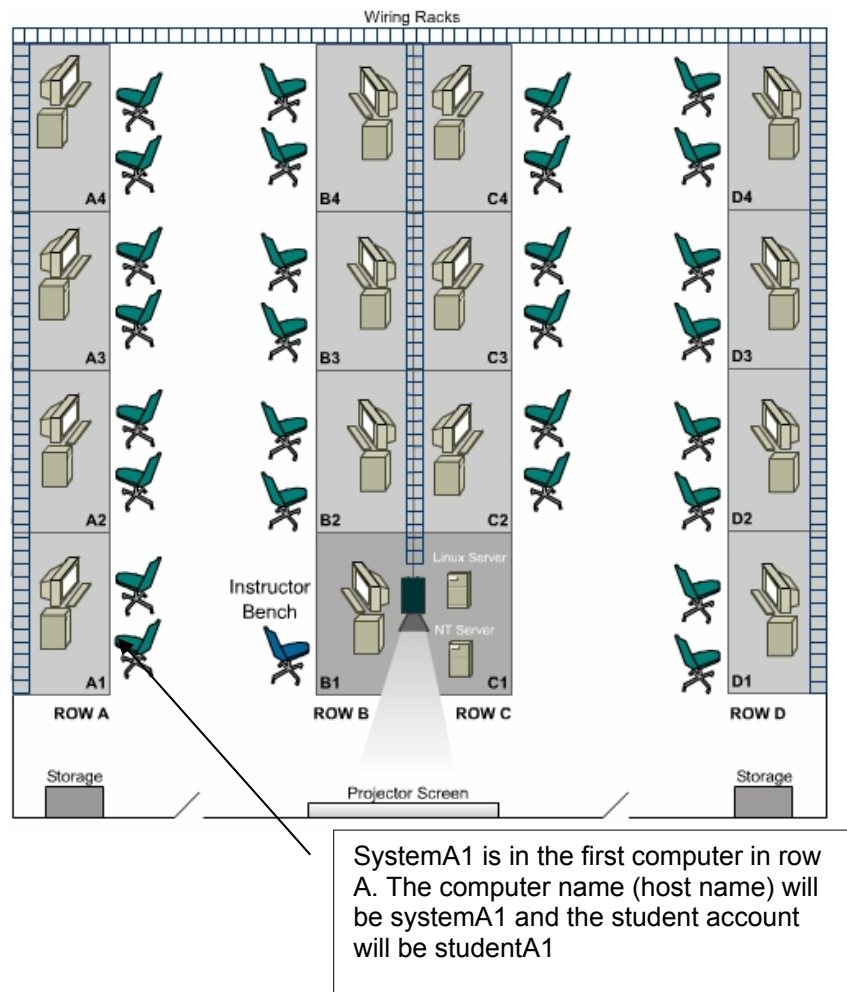
Assign each computer a name, which will also identify its location. User accounts may be added to the system name to identify not only the computer but also the user at that location.

For example, **systemA1** is used by students therefore a user account with the name: **studentA1** will be used.

Assign a password that is the same as the computer name in order to make the initial login easier.

In the space below, write out a user account list. Include the computer being worked on as well.

Computer Name/Location	User Account/Name	Password	Comments

Example of user accounts and host names.

Computer Name/Location	User Account/Name	Password	Comments
A1	studentA1	studentA1	
A2	studentA2	studentA2	
A3	studentA3	studentA3	
A4	studentA4	studentA4	
B1	instructorB1	instructorB1	Instructor, Windows Computer
B2	studentB2	studentB2	
B3	studentB3	studentB3	
B4	studentB4	studentB4	
C1	instructorC1	instructorC1	Instructor, Linux Computer
C2	studentC2	studentC2	
C3	studentC3	studentC3	
C4	studentC4	studentC4	
D1	studentD1	studentD1	
D2	studentD2	studentD2	
D3	studentD3	studentD3	
D4	studentD4	studentD4	

Step 2: The `useradd` Command

At the command prompt, type the command:

`man useradd`

What do the following switches do?

-c _____

-d _____

-e _____

Does the `useradd` command create a home directory for the user by default? If so where?

_____

Step 3: The `passwd` Command

The `useradd` command by itself does not automatically allow a user to login. A password must first be assigned to the user account. This is done with the `passwd` command.

At the command prompt, type the command:

`man passwd`

Briefly describe the following `passwd` switches:

-k: _____

-l: _____

-u: _____

-d: _____

What other means of password protection does the `man passwd` page discuss?

_____

Step 4: Adding Users

For this step, make sure to be logged in as the root user. If not already root, use the `su – root` command with the root's password.

With the list from Step 1, create accounts for all other users in the lab.

Example:

```
[root@systemA1 root]# useradd studentA2
[root@systemA1 root]# passwd studentA2
Changing password for user studentA2
New password:
BAD PASSWORD: it is based on a dictionary word
Retype new password:
passwd: all authentication tokens updated successfully
[root@systemA1 root]#
```

Note: Part of the password for these accounts can be found in a dictionary (the word student). Linux will warn against using these passwords for security reasons, but it will accept them. All passwords must be entered twice.

Notice that in the example above, this is a two-step process. First, create the account with the `useradd` command. Then give the new user account a password with the `passwd` command.

1. Type:

   `useradd studentXX`

   (where XX is the username from the table in step 1), and then press **Enter**.

2. Type:

   `passwd studentXX`

   Press **Enter**.

Use the student account for the password. Linux will ask the user to enter the password twice to check for accuracy.

3. Continue this procedure until all the users are added to the systems.

Step 5: Account Verification

In this step, verify that the accounts were created correctly in step 4 by using the `finger` command.

To learn about the finger command type:

>   `man finger`

Experiment with the finger command, type:

>   `finger root`

Briefly describe the output of this command?

_____

_____

_____

Verify that the accounts were created correctly in Step 4. Randomly pick six accounts and use the `finger` command to see if they were created correctly, List the results in the table below.

Account name	Verified Y/N

Step 6: Deleting Users

To delete an account, the Linux administrator uses the `userdel` command. Read the man page on the `userdel` command, type:

>   `man userdel`

Describe the `-r` switch when it is run with the `userdel` command.

_____

_____

To test the `userdel` command create a temporary account, type:

>   `useradd temp123`

Note: This account does not need a password since this is only a temporary account.

To see if the account was created, type:

finger temp123

Was a home directory created? Y/N

Next delete the temp account, type:

userdel –r temp123

Does the account still exist? Type:

finger temp123

What was the output of this command?

_____

Troubleshooting

To create accounts in Linux, the user must be logged onto the server as an Administrator. If problems are encountered while creating these accounts, verify that the user has the necessary administrative privileges by logging off of the server and logging on again using the Administrator account.

Reflection

Why is it important that only an administrator is allowed to create user accounts?

_____

_____

_____

_____

Managing User Account and Passwords

Estimated Time: 45 Minutes

Step 1

1. Log in with the root user account
    Type:

    # tail /etc/passwd

2. What is the last user that was added to your system?

    _____

    _____

3. There are seven fields in the passwd file, identify them below:

    1) _____ 2) _____ 3) _____ 4) _____
    5) _____ 6) _____ 7) _____

4. Create a short policy on login names for your organization. Briefly write out three rules
    that your login names should follow:

    _____

    _____

Step 2

1. Using the **useradd** command create a temporary user account; i.e. temp1. Do not
    assign this new account a password. Delete the "x" from the password field in the
    /etc/passwd file; logout and login again with the new account. Were you able to?

    _____

2. Use the vi editor to edit and create a temporary account i.e. temp2 in the `/etc/passwd`
    file. Add a line at the end of the `/etc/passwd` file with all the attributes necessary to
    create an account. Logout and login again using the new account; describe any problems
    that you may have encountered and what the cause of this problem is.

    _____

    _____

3. Use the vi editor to delete the "x" from the password field in the `/etc/passwd` file for the
    temp2 account; logout and login again with the new account. Were you able to? Describe
    any problems that you may have encountered and what the cause of this problem is.

    _____

    _____

4. Run the following command:

   # authconfig

   What are the options in this command? Hint: "man authconfig"

   _____

   _____

5. Run the following command:

   # cat /etc/passwd | grep root

   What is the UID of the root account?

   _____

   _____

   Could you create another account with a UID that is the same as the root account?

   _____

   _____

6. Edit the field for the account created above (temp1) in the **/etc/passwd** file. If there is an "x" in the password field, remove it. Change the UID to 0 (this is the first number). Log out completely and login back in as **temp1**.
   Were you asked to enter a password when you logged in? _____
   What privileges does this account have? _____

Step 3

1. Create a new account: temp3. After the account has been created run the following command:

   # chfn temp3

   Change the name to <temp4> and place random numbers when prompted to enter phone numbers. Run the following command sequence:

   # cat /etc/passwd | grep temp*

   Where did the temp4 name and information show up in the passwd file?

   _____

   _____

Next, type in the following command sequence:

```
# finger temp3
```

Describe the output of the finger command:

_____

Where is the **chfn** command located? **Hint:** type **which chfn**. Should administrators disable this command?

_____

_____

Step 4

1. Run the **man** command on the **passwd** command. Briefly describe the following options:

    -k
    -l
    -u
    -d
    -n
    -x
    -w
    -i
    -S

2. Try running the –S option on your new accounts;

    ```
    # passwd –S temp1
    ```

    Now try it on the root account:

    ```
    # passwd –S root
    ```

    Was there a difference?

    _____

3. Create passwords for your new users.

    ```
    # passwd temp3
    ```

    Set min/max dates for the account:

    ```
    # passwd –n 1 –x 30 –w 1 temp3
    ```

    Verify that the passwords have been updated:

    ```
    # tail -5 /etc/shadow
    ```

    Logout and log back in the with the temp3 account to verify that the account works.
    When you are done, become the root user and delete the users temp1, temp2, temp3.

Creating Groups in Linux
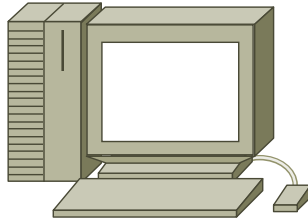
Estimated Time: 30 minutes

Objective

In this lab, the student will learn how to create, rename, and delete groups using the Linux operating system. The student will then add members to that group.

Equipment

The following equipment is required for this exercise:

- A computer system with Linux Red Hat 7.2 operating system installed.

Scenario

A few members in the Engineering Department, who are using Linux, are going to be working on classified documents. They need to have their own group created so they can keep these documents in certain folders that only their group will have permissions to. A group must be created and members added to this group.

Procedures

In this lab, the student will first create the engineering group and then add the localuser1 user account to this group. The student will then rename the group. For the last step, the student will delete the group.

Tips Before You Begin, Remember:

- User permissions apply to the owner of the file or directory.

- Group permissions apply to the members of the group that are assigned to a file or directory.

- Linux stores group information in the **/etc/group** file.

Step 1: Creating a Group and Adding Users to the Group

Note: The account studentA5 will be used throughout this lab as an example. Ask the instructor for the appropriate account for the particular lab situation.

1. Login with the root account.

2. At the command prompt, type:

   groupadd Engineering

   Press **Enter**. This will create the Engineering group.

3. Next, add a student account to the new Engineering group by typing:

   usermod –G Engineering studentA5

   Press **Enter**. This will add the studentA5 account to the Engineering Group.

4. Verify that the new group has been created by typing:

   grep studentA5 /etc/group

The **grep** command looks for strings of text. In this case, the user asked the **grep** command to look in the /etc/group file for anything named studentA5. What were the results?

_____

Does the output look similar to the example below?

_____

```
[root@systemA1 root]# grep studentA5 /etc/group
studentA5:x:504:
Engineering:x:505:studentA5
[root@systemA1 root]# 
```

Step 2: Create a Working Folder for the Engineering Group

1. As the root user, go to the /home directory:

   cd /home

2. Create a new directory:

   mkdir Eng

3. Verify that the new directory exists:

   ls –l

4. Change the ownership of the Eng directory with the following command:

   chgrp Engineering Eng

5. Verify that ownership has changed from the root to Engineering:

    ```
    ls -l
    ```

Who is now the owner of the Engineering directory?

_____

6. Change the permissions of the Engineering directory:

    ```
    chmod 771 Eng
    ```

7. Verify that permissions of the directory have changed:

    ```
    ls -l
    ```

Write down the following permissions. Do they look like the example?

_____

```
[root@systemA1 home]# ls -l
total 24
drwx------    9 dave      dave       4096 Mar  1 04:28 dave
drwxrwx--x    2 root      Engineer   4096 Mar  4 02:31 Eng
drwx------   10 studentA  studentA   4096 Mar  4 02:11 studentA1
drwx------    3 studentA  studentA   4096 Mar  3 05:20 studentA2
drwx------    4 studentA  studentA   4096 Mar  4 01:58 studentA5
drwx------    3 temp      temp       4096 Mar  3 05:45 temp
[root@systemA1 home]#
```

Note: The owner of the Eng directory is the root user. The group is called Engineer because Linux can only display eight characters, otherwise Engineering would appear. Both the root account and the Engineering group have the same Read, Write, and execute permissions. In the last group, everyone has execute privileges only.

Step 3: Creating Files in the Eng Directory

1. Switch users from root to the studentA5 account:

    ```
    su – studentA5
    ```

2. Go into the Eng directory:

    ```
    cd /home/Eng
    ```

3. Create a file, type:

    ```
    touch grp_file
    ```

4. Verify that the new file was created:

```
ls -l
```

Is the file grp_file there? Y/N _____

5. Now switch user to a studentA1 who is not a member of the Engineering group:

```
su - studentA1
```

6. Go to the /home/Eng directory:

```
cd /home/Eng
```

7. Create a file:

```
touch grp_file1
```

What happened?

_____

Try typing:

```
ls -al
```

What happened? Why?

_____

Step 4: Deleting the Eng directory

1. Log back in as the root user:

```
su - root
```

Enter the password and press **Enter**.

2. Verify that you are the root user:

```
whoami
```

3. Go to the /home directory:

```
cd /home
```

4. Delete the Eng dir and its contents:

```
rm -r Eng
```

When prompted to descend into directory Eng, type **Y** for yes.

When prompted to delete the files, type **Y** for yes.

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When prompted to delete the directory, type **Y** for yes.

5. Verify that the Eng directory has been removed:

   ```
   ls -l
   ```

Is the Eng directory gone? Y/N _____

Step 5: Renaming a Group

1. At the command prompt, type:

   ```
   groupmod -n Engineers Engineering
   ```

   Press **Enter**. This will rename the group.

2. Verify that the group name changed:

   ```
   grep Engineers /etc/group
   ```

Step 6: Deleting a Group

1. At the command prompt type:

   ```
   groupdel Engineers
   ```

   Press **Enter**. This will delete the group.

2. Verify with the `grep` command:

   ```
   grep Engineers /etc/group
   ```

Troubleshooting

To create accounts in Linux, the user must be logged onto the server as the root user. If problems are encountered while creating these accounts, verify that the user has the necessary administrative privileges by logging off of the server and logging on again using the root account.

Reflection

Why is it important that only an administrator be allowed to create groups?

_____

_____

_____

Creating Directories in Linux
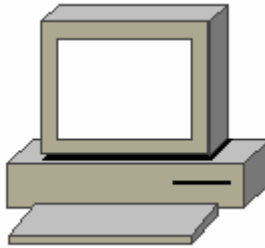
Estimated Time: 15 minutes

Objective

In this lab, the student will learn how to create files and directories with the Linux operating system.

Equipment

The following equipment is required for this exercise:

- A computer system with Linux Red Hat 7.2 operating system installed.

Scenario

The IT department in a small company has purchased some new computer systems. They want some new directories and files created on the server for the people that are going to be receiving these new computers.

Procedures

In the first step of this lab, the student will create a directory or folder. In the second step of the lab, the student will create a file and save it inside the directory.

Step 1: Login

Login using a student account for this lab.

For example, at the terminal window type:

>   **studentA1**

Then, type the password for student A1.

Step 2: The `mkdir` Command

The `mkdir` command is used to create directories and subdirectories. Run the following command:

>   **man mkdir**

What does the **–p** switch do when it is run in conjunction with the **mkdir** command?

_____

Step 3: Creating Directories

1. The following command sequence will not work unless the user is in the home directory. Type:

    cd

Verify that the user is in the home directory, type:

    pwd

Next, create the directory structure by typing in the following command:

    mkdir –p chemistry/experiments/week3

```
[studentA1@systemA1 studentA1]$ mkdir -p chemistry/experiments/week3
[studentA1@systemA1 studentA1]$ 
```

Example

Verify that the directories were created correctly by typing:

    ls –R

Be sure to use a capital **R** with the **ls** command. Describe the results.

_____

```
./chemistry:
experiments

./chemistry/experiments:
week3

./chemistry/experiments/week3:

./Desktop:
cdrom    Home                Linux Documentation   www.redhat.com
floppy   KDE Control Panel   Trash

./Desktop/Trash:

./Mail:
drafts   inbox   outbox   sent-mail   trash
[studentA1@systemA1 studentA1]$ 
```

Example: The results should look similar to this screen.

2. Next, create another directory in the **chemistry** directory, type:

    `cd chemistry`

This will change the current working directory to the chemistry directory. From the chemistry directory, type:

    `mkdir laboratory`

Verify that the laboratory directory was created, type:

    `ls`

Is the subdirectory called **laboratory** there? Y/N

_____

Are there now two directories in the chemistry directory? Y/N

_____

3. In the space below draw a picture of the home directory. Create a graphical representation of the home directory including all of the new directories that were created in the steps in this lab.

Reflection

If the user did not use the **–p** switch with the **mkdir** command, how would the directory structure have been created?

_____

_____

Managing Runlevels
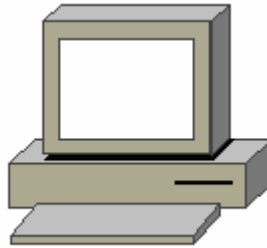
Estimated Time: 20 minutes

Objective

The student will understand the purposes that the Runlevels play in a Linux environment.

Equipment

- A computer with Linux Red Hat 7.X operating system installed.

Scenario

The system administrator of a large company is responsible for a group of Linux servers whose resources need to be given to the incoming user requests. The systems need to boot up automatically into text mode instead of the GUI mode. The systems resources need to be used for other things besides running the X Window GUI. This task can be accomplished by permanently changing the default runlevel.

Procedures

Note: Log in as the root user prior to starting this lab.

Step 1: Manually change the Runlevel

Manually change the runlevel using the following steps:

1. Make sure that the system is booted and that the X Window GUI is running.

2. Open a terminal window and type `init 3 or /sbin/init 3` at the command prompt.

   The system should exit the GUI mode and take a few seconds to terminate some running processes. Then, the system will enter text mode.

3. Once the login prompt appears, log back in as the **root** user.

4. After successfully logged on, type `init 5 or /sbin/init 5` at the shell prompt.

5. The GUI login interface will now load. Log in to the X Window session again with the **root** account.

The runlevel has been successfully changed.

Step 2: Permanently Changing the Runlevel

It is a simple process to permanently change the default runlevel on a Linux system:

1. Open a terminal window, then open the `/etc/inittab` file with the vi editor. To do this enter `vi /etc/inittab` at the shell prompt. Read over this file. It contains a lot of useful information regarding the system configuration.

2. Change the default runlevel manually so the system will automatically start in text mode instead of GUI mode. To permanently change the default runlevel, change the `id:5:initdefault:` line to `id:3:initdefault:`.

3. Save this edit. To save, press the **Esc** key on the keyboard, then type `:wq` and press **Enter**. This should return the system to a shell prompt.

4. Remember that there may be other labs to do after this one. Repeat steps 1 – 3 and change the runlevel back to 5 instead of 3.

Reflection

Are there any other situations where permanently changing the default runlevel could be an advantage? Is it possible to have certain programs start at different runlevels?

_____

_____

_____

_____

HTTP Apache Web Server
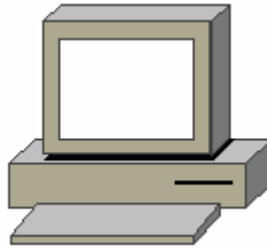
Estimated Time: 55 minutes

Objective

In this lab, the student will learn to install the Apache web server. The student will examine the configuration files, check the status of the HTTPD daemon and test the Apache server using Netscape.

Equipment

The following equipment is required for this exercise:

- A computer with Linux Red Hat 7.2 or greater installed.

- A CD-ROM with the Apache RPM.

Scenario

The student is the administrator of a Linux server. Install the Apache web application and test all of its configuration files.

Procedures

Login as the root user and install the Apache web server. Check the Apache configuration files and the HTTPD daemon. Launch a local web page and test it both locally and on other classroom computers.

Step 1: Mounting the Apache RPM CD-ROM

1. Boot the Linux computer and login as the root user. Launch X Windows (use the **startx** command) and make sure to be using the KDE desktop.
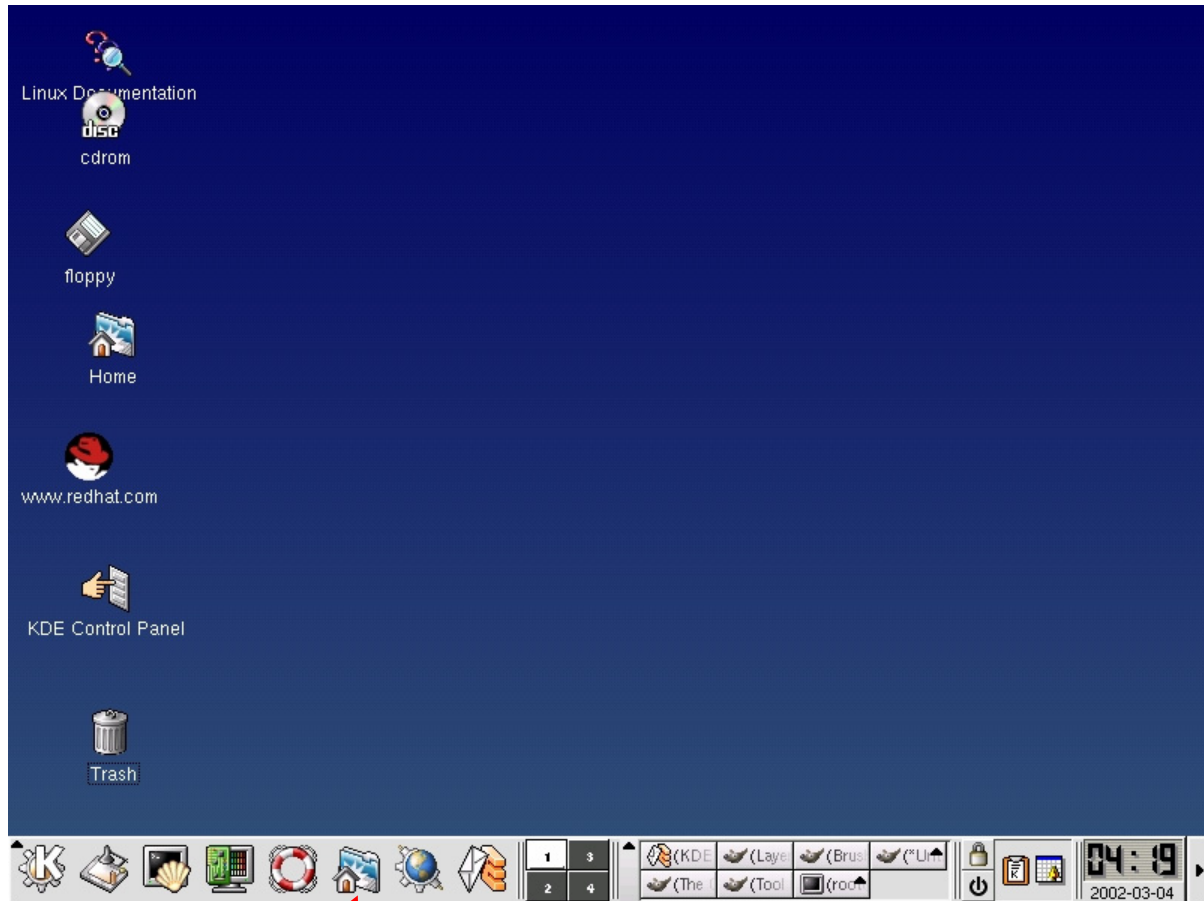
Open the Home Directory (the Linux equivalent of Windows Explorer) by clicking (once) on the folder in the taskbar.

2. Go to the desktop and look for the CD-ROM icon. In some Linux systems, the CD-ROM can be mounted automatically. Click on the CD-ROM to view the contents. If the contents of the CD-ROM are not visible, run the following command from a terminal window. Again, the user must be logged with the root account for this command to work:

   mount /mnt/cdrom

   Go to the KDE Home Directory window and click on the CD-ROM icon. The contents of the CD-ROM will now be visible in KDE.

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Step 2: Install the Apache RPM

1. When the CD-ROM is open, go to the following directory:

   `/RedHat/RPMS`
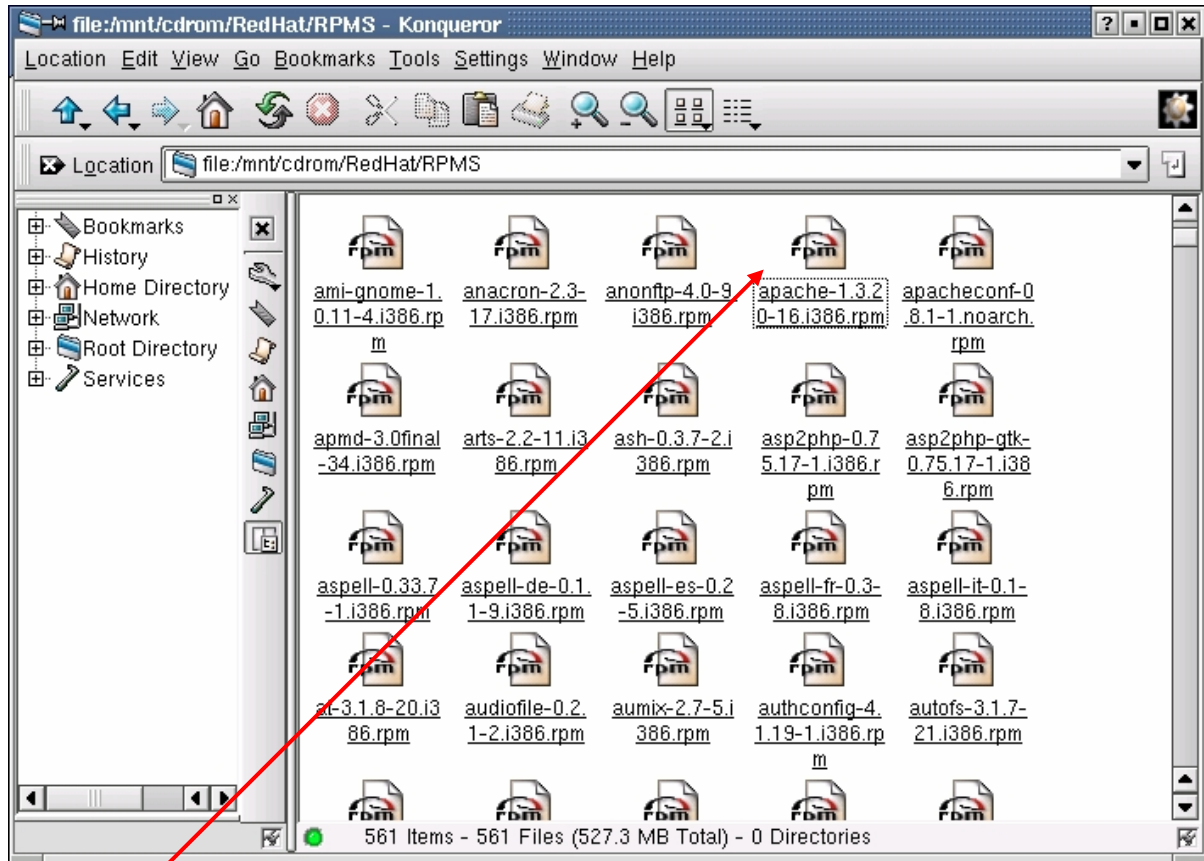
Once in the RPMS directory, locate the file called apache-1.3.20-16.i386.rpm. Click once on this file. The RedHat Package manager will open.

Note: If the apache RPM is not found, it might be located on the second disk that came with RedHat.
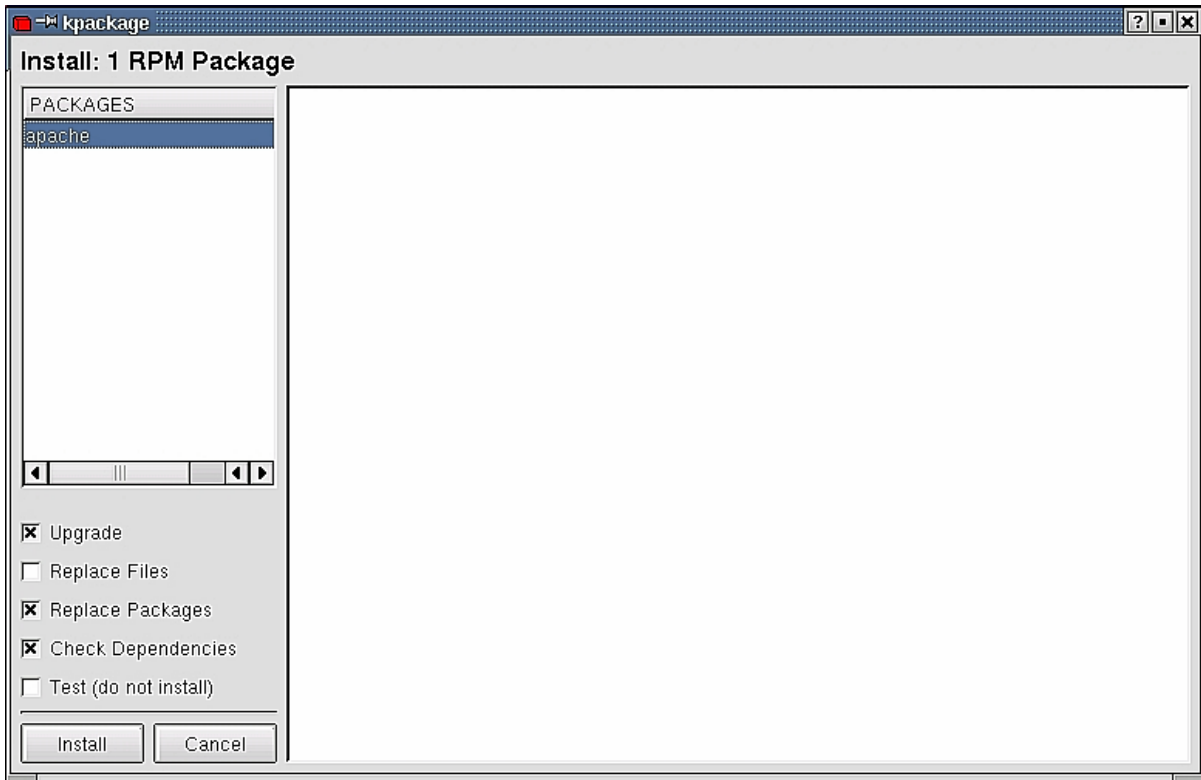
2. Click on the **Install** button. This will install Apache. To verify that the Apache server was installed correctly, run the following command from the terminal window:

   rpm –q apache

3. Write down the results.

_____

If Apache was installed correctly the screen will look like the following example:


```
[root@systemA1 root]# rpm -q apache
apache-1.3.20-16
[root@systemA1 root]# 
```

4. After Apache has been installed, remove the CD-ROM. To do this, go back to the KDE Home Directory and locate the CD-ROM. Again the icon is usually located under the desktop directory. Once located, right click on the CD-ROM and select the eject option.

The CD-ROM can also be ejected using a command from the CLI. First, unmount the CD-ROM, from a terminal window:

umount /mnt/cdrom

Press the eject button on the CD-ROM itself and the CD-ROM will come out.

Step 3: Checking the Apache installation files

1. It is important for the Linux administrator to know where the RPM has placed the Apache configuration files and directories. Below is a list of the important Apache files and directories with a brief description of each:

   Use the **cd** command (from a terminal window) and go to the following directory:

   cd /etc/httpd/conf

2. The /etc/httpd/conf directory is where the configuration file for Apache is located. Use the **ls** command to verify that the file exists:

   ls –a

   Is there a file called **httpd.conf** present in this directory? Yes/No _____

3. Go to the following directory:

   cd /var/www/html

   This directory is where Apache finds the html startup page. Use the **ls** command to verify that the file exists:

   ls –a

   Is there a file called index.html present in this directory? Yes/No _____

   Go to the following directory. Use the **cd** command:

   cd /etc/init.d

   This directory contains the httpd daemon. A daemon is a small application that runs as a background task. The httpd daemon must be running for the Apache web server to work.

   Using the **ls** command, is there a file in this directory called httpd? Yes/No _____

Step 4: The Apache config Files

1. To get familiar with the Apache config file, run the following command from the command line:

   more /etc/httpd/conf/httpd.conf

This is a long file, just skim it and do not make any changes. The **#** before most of the lines signifies a comment. Reading the comments is one of the best ways to understand how the Apache web server works. (Use the space bar to scroll through the file.)

2. Can the httpd configuration file be used to determine what TCP port number Apache uses?

_____

Note: To exit the more command type the letter **q** and return to the terminal window.

Step 5: The Apache home page

1. The Apache index.html (Apache's startup page) file runs the following command:

   vi /var/www/html/index.html

This file contains the startup page text. Change the name of the startup page by editing this file. Change the main heading of this page to the student login name or any name the instructor gives.

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 3.2 Final//EN">
<HTML>
 <HEAD>
  <TITLE>Test Page for the Apache Web Server on Red Hat Linux</TITLE>
 </HEAD>
<!-- Background white, links blue (unvisited), navy (visited), red
(active) -->
 <BODY BGCOLOR="#FFFFFF">

  <H1 ALIGN="CENTER">studentA1</H1>
  This page is used to test the proper operation of the Apache Web server
after
  it has been installed.  If you can read this page, it means that the
Apache
  Web server installed at this site is working properly.

  <HR WIDTH="50%">

  <H2 ALIGN="CENTER">If you are the administrator of this website:</H2>
  <P>
  You may now add content to this directory, and replace this page.  Note
that
  until you do so, people visiting your website will see this page, and
not your
  content.
  </P>
```

> Using the vi editor, delete the text **Test Page** and replace with the login ID.

Exit the vi editor and be sure to save, **ESC:wq**

Step 6: HTTPD Daemon Status

1. Next, verify the httpd daemon status by typing in the following command:

```
/etc/init.d/httpd status
```

What is the status of the httpd daemon? Write down the results:

_____

The following is an example of an httpd daemon that has been stopped.

```
[root@systemA1 root]# /etc/rc.d/init.d/httpd status
httpd is stopped
[root@systemA1 root]# █
```

If the httpd daemon is stopped, enter the following command:

```
/etc/init.d/httpd start
```

Write down the results:

_____

Note: To stop Apache type: **`/etc/init.d/httpd stop`**

Step 7: Looking at the Home Page in Netscape

1. Go back to the KDE desktop and launch the Netscape browser. Netscape will be under the **K** button. Go to the Internet subdirectory.

2. After Netscape has loaded, go to the following URL:

    http://localhost

    The user will see the local Apache server index.html file.

    See the student name at the top of the page? Yes/No _____
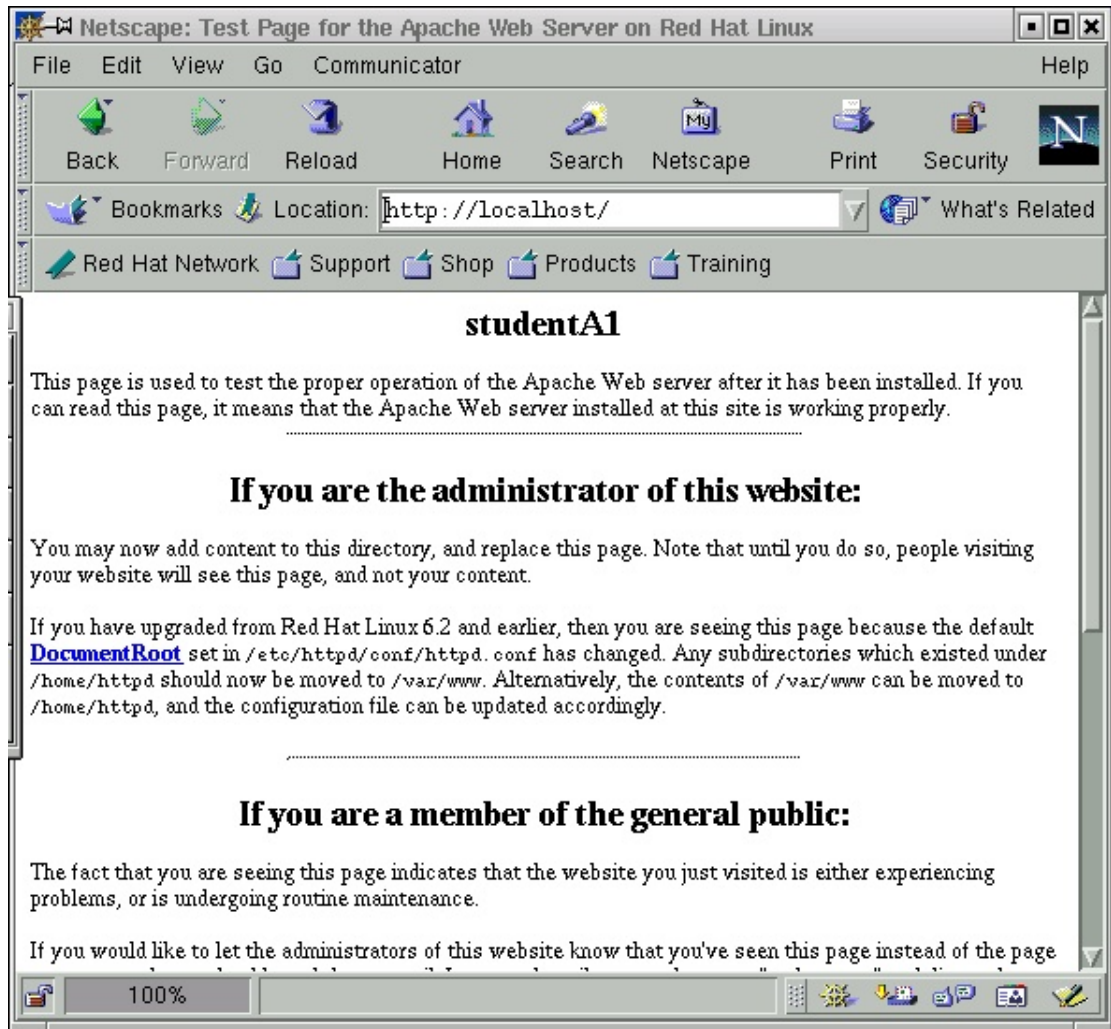
Example of Apache server

Step 8: Connecting to Neighbors

From a terminal window, run the following command:

```
ifconfig
```

Find the IP address of the eth0. Write down the IP address and give it to other students in the class. Have them type in the IP address being used in their Netscape browser.

Example: http://192.168.5.5

Can they see the web page? Can their web pages be seen? Yes/No _____

Troubleshooting

Did the web page work? If not, go through this checklist:

- Is Apache installed correctly? Use the `rpm -q apache` command.

- Were the configuration files in the correct directories?

- Is the HTTPD daemon running? Test it: `/etc/init.d/httpd status`

- Did the Web server work locally but the neighbors could not see it? Check the network connections. Make sure to not be behind a firewall.

Reflection

With a web server up and running, the Linux system now needs to be more reliable than ever. In the space below identify five hardware and software issues that affect a computer's reliability. After each item, list what can be done as the Linux administrator in order to make the computer more reliable.

Configuring FTP Services in Linux
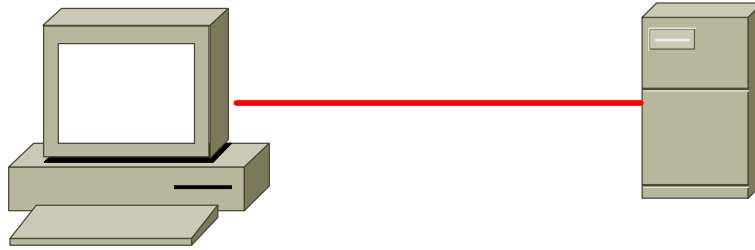
Estimated Time: 25 minutes

Objective

In this lab, the student will configure a Linux Red Hat 7.2 computer with FTP services. The student will also create a FTP server.

Equipment

The following equipment is required for this exercise:

- A computer system with Linux Red Hat 7.2 or greater installed.

Scenario

The Marketing Director of the XYZ Company has requested an FTP site so employees in the Marketing and Sales Department will be able to access and download files when away from the office. An FTP site must be created on the server for them to access.

Procedures

In Linux Red Hat 7.2, the FTP services are not started by default. In this lab, the student will first have to navigate to the configuration file to start the FTP services. In the first step of this lab, the student will configure the FTP configuration file. In the second part of this lab, the student will start the FTP services and build the content that will be on the FTP server. The procedures for starting the FTP services will be done in much the same way that the Telnet services are started.

Step 1: Configuring the FTP Server

1. Login with the **root** account. FTP services can only be started with the root account. Make sure to be at the CLI command prompt. If in the GUI interface, open a terminal emulator window.

2. Once at the command prompt interface type:

   ```
   cd /etc/xinetd.d
   ```

   This will change the user to the proper directory where the Telnet configuration file is located.

3. Next, type:

   ```
   ls
   ```

This will display a list of all the configuration files in the xinetd.d directory.

4. Locate the **wu-ftpd** configuration file. Is the wu-ftpd file in this directory?

   Y/N

   If the wu-ftpd file is not found, install it now. Ask the instructor or lab aid for help.

5. At the command prompt, type:

   vi wu-ftpd

   This will allow use of the vi Editor to change the Telnet configuration file.

6. Once the vi Editor window opens, press **i** on the keyboard to enter **insert** mode. Locate the **disable = yes** line in the configuration file as shown in the graphic:

```
# default: on
# description: The wu-ftpd FTP server serves FTP connections. It uses \
#       normal, unencrypted usernames and passwords for authentication.
service ftp
{
        socket_type             = stream
        wait                    = no
        user                    = root
        server                  = /usr/sbin/in.ftpd
        server_args             = -l -a
        log_on_success          += DURATION USERID
        log_on_failure          += USERID
        nice                    = 10
        disable                 = no
}
~
~
~
~
~
~
~
~
~
"wu-ftpd" [readonly] 15L, 363C
```

7. Use the arrow keys on the keyboard to move the cursor to delete the word **yes** and replace it with **no**. This will change the configuration file to allow FTP access to the server.

8. To exit the vi Editor, hit the **Esc** key, , and then type **:wq.** This will save the changes that have been made.

Step 2: The xinetd Daemon

Before testing the FTP services, make sure that the FTP daemon is running. The daemon that runs the FTP services is called xinetd.

1. From the command prompt type:

   /etc/rc.d/init.d/xinetd stop

2. Next, start the xinetd daemon:

   /etc/rc.d/init.d/xinetd start

3. Check the status of the xinetd daemon:

   /etc/rc.d/init.d/xinetd status

In the space below, write down the status of the xinetd daemon:

```
[root@systemA1 root]# /etc/rc.d/init.d/xinetd stop
Stopping xinetd:                                          [  OK  ]
[root@systemA1 root]# /etc/rc.d/init.d/xinetd start
Starting xinetd:                                          [  OK  ]
[root@systemA1 root]# /etc/rc.d/init.d/xinetd status
xinetd (pid 10706) is running...
[root@systemA1 root]#
```

Example of the xinetd daemon being stopped and started.

Step 3: Testing the FTP Properties

1. To test if the FTP services are working properly from a terminal window, type:

   ftp localhost

   This command will use the system to access the FTP services on the system.

2. The Linux system will attempt to make a FTP connection to the system through the local loopback address 127.0.0.1. It will run through the login procedure and prompt the user to enter a username and password.

3. Login using a student account (do not use the root account to log on). When prompted, type the student account name and password.

4. If connected to the system, then you have successfully configured your Linux Red Hat Server for FTP access.

```
[root@systemA1 root]# ftp localhost
Connected to localhost (127.0.0.1).
220 systemA1 FTP server (Version wu-2.6.1-18) ready.
Name (localhost:studentA1): studentA1
331 Password required for studentA1.
Password:
230 User studentA1 logged in.
Remote system type is UNIX.
Using binary mode to transfer files.
ftp> █
```

Example of a successful FTP login

5. To see the current working directory, type:

    pwd

6. To see the files in the current directory, type:

    ls –a

7. To exit the FTP session, type:

    bye

Step 4: Connecting to Other FTP Systems (optional)

To complete this exercise, the user will need to work with another student on a system that is networked to the computer being used.

1. From a terminal window, type:

    ifconfig

    Write down the IP address of eth0. Exchange IP addresses with a classmate.

    _____

2. Create a temporary user for the FTP purposes:

    adduser ftpclient

3. Give the new ftpclient a password:

    passwd ftpclient

    When prompted, make the password the same as the account name, for example, ftpclient.

4. Create a file that can be viewed and transferred. First, go into the newly created ftpclient home directory, and type:

```
cd /home/ftpclient
```

Next, type:

```
touch <hostname>
```

The name of the file that is created with the `touch` command will be the same as the computer's host name. As an example, if the hostname is systemA1 then the command to create the file would be `touch systemA1`. Verify that this file exists with the `ls` command.

5. FTP to the classmate's computer. With the IP address from step 1 above, type:

```
ftp IPaddress
```

Log-in using the **ftpclient** account and password.

6. After you have logged in to the classmate's computer, FTP their file by typing:

```
get <hostname>
```

This will bring their file to the computer being used. Verify that the file has been received with the `ls` command, or view the file in a KDE window.

Was the file received? Y/N

Troubleshooting

If having trouble connecting to the FTP site, check the IP address that is typed in the browser as well as the IP address that was specified in the FTP site properties page. If the network's IP addresses are assigned dynamically with a DHCP server, then the IP address might change from time to time. It is a good idea to assign the FTP server a static IP address so that the IP address does not change. Having the IP address changing all the time could create a lot of administrative costs and trouble from users and customers who will be calling and saying they cannot access the FTP site anymore.

If having difficulties with the Linux FTP client, try a windows computer. A Windows system can easily connect to a Linux FTP server by using a popular program called WS_FTP. If familiar with WS_FTP, try to connect to the Linux system and download the file directly to the PC.

Reflection

If setting up an FTP server in a business or corporate network, routers and firewalls will have to be configured to allow FTP access to the FTP server. Remember that the IP address of the FTP server might not be a public IP address and therefore will not be directly connected to the network. In this case, configure the router to forward incoming FTP requests to the proper computer on which the FTP server resides. Keep in mind that the IP address of the Web or FTP must be statically assigned.

Configuring Telnet in Linux

Estimated Time: 25 Minutes

Objective

In this lab, the student will learn how to configure Telnet services on a system so that the user can remotely administer a Linux server.

Equipment

The following equipment is required for this exercise:

- A system with Linux Red Hat 7.2 or greater installed.

- Another system, either Linux or Windows, to attempt to Telnet into the Linux server.

Scenario

The student is setting up a Linux server that will need to be administered and accessed remotely. To do this, Telnet services will be installed on the Linux Red Hat 7.2 computer.

Procedures

In Linux Red Hat 7.2, the Telnet services are not started by default. In this lab, the student will first have to navigate to the configuration file to start the Telnet services. Second, the student will need to make sure that the proper accounts are created to access the server through Telnet. In the last part of the lab, the student will test the Telnet services to confirm that the Telnet services are properly installed and started on the server.

Step 1: Configuring Telnet Services

1. Login with the **root** accountand open up a terminal emulator window.

2. From a terminal window, type the following command.

   ```
   cd /etc/xinetd.d
   ```

   This will change the user to the directory where the Telnet configuration file is located.

3. Next, type:

    ```
    ls
    ```

    This will display a list of all the configuration files in the xinetd.d directory.

```
[root@systemA1 xinetd.d]# ls
chargen       daytime-udp  finger  rlogin   talk     time-udp
chargen-udp   echo         ntalk   rsh      telnet   wu-ftpd
daytime       echo-udp     rexec   sgi_fam  time
[root@systemA1 xinetd.d]#
```

Example of the /etc/xinetd.d directory

4. Locate the Telnet file. Is it present? Y/N _____

5. Next, check the confirmation of the Telnet file:

    ```
    vi telnet
    ```

    This will allow the user to use the vi Editor to change the Telnet configuration file.

6. Once the vi Editor window opens, press **i** on the keyboard to enter **insert** mode. Locate the **disable = yes** line in the configuration file. Use the arrow keys on the keyboard to move the cursor to delete the word **yes** and replace it with **no**. This will change the configuration file to allow Telnet access to the server.

```
# default: on
# description: The telnet server serves telnet sessions; it uses \
#       unencrypted username/password pairs for authentication.
service telnet
{
        flags            = REUSE
        socket_type      = stream
        wait             = no
        user             = root
        server           = /usr/sbin/in.telnetd
        log_on_failure   += USERID
        disable          = no
}
~
~
~
~
~
~
~
~
~
~
"/etc/xinetd.d/telnet" [readonly] 14L, 304C
```

Example of the Telnet configuration file, change disable to no.

7. To exit the vi Editor press the **Esc** button first, and then type `:wq` This will save the changes that have been made.

Step 2: Starting the Telnet xinetd Daemon

1. Before testing the Telnet service, make sure that the Telnet daemon is running. The daemon that runs the Telnet services is called **xinetd** (the same daemon that worked with FTP). From the command prompt, type:

   /etc/rc.d/init.d/xinetd stop

2. Next, start the xinetd daemon:

   /etc/rc.d/init.d/xinetd start

3. Check the status of the xinetd daemon:

   /etc/rc.d/init.d/xinetd status

In the space below, write down the status of the xinetd daemon?

_____

_____

Step 3: Testing Telnet Access to the Localhost

1. To test Telnet services, type:

   telnet localhost

This will use the system to access the Telnet services on the system.

At this point the system will attempt to make a Telnet to the system through the local loopback address, 127.0.0.1. It will run through the login procedure and prompt the user to enter a username and password.

2. A user cannot login to a remote site with the root account. Use one of the other student accounts to log on and test the Telnet configuration.

If a connection to the system is established, then the Linux server has been successfully configured for Telnet access.

What directory are you in? To find out, type:

   pwd

In the space below, write down the current working directory:

_____

_____

```
[studentA1@systemA1 studentA1]$ telnet localhost
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^]'.
Red Hat Linux release 7.2 (Enigma)
Kernel 2.4.7-10 on an i686
login: studentA5
Password:
Last login: Tue Mar  5 01:55:59 from systemA1
[studentA5@systemA1 studentA5]$ pwd
/home/studentA5
[studentA5@systemA1 studentA5]$
```

An example of a Telnet session to the localhost and running the `pwd` command.

Step 4: Connecting to Other Systems via Telnet (optional)

1. As in the FTP lab, use the `ifconfig` command to get an IP address. Exchange IP addresses with a classmate.

2. Telnet to their computer and have them Telnet to the one being used. Telnet cannot be used with the root account, so use a student account created in previous labs.

3. The student can also use a MS Windows computer to Telnet to a Linux computer. The example below shows the output of the command line in a windows computer. To Telnet from a Windows computer, go to the `run` command and type Telnet and the IP address.
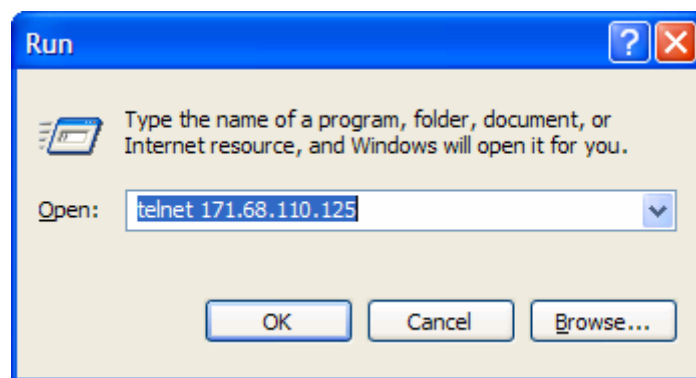
When prompted, type in the correct user account and password.

```
Telnet 171.68.110.125                                    _ □ ×
Red Hat Linux release 7.2 (Enigma)
Kernel 2.4.7-10 on an i686
login: studentA5
Password:
Last login: Tue Mar  5 01:56:42 from systemA1
[studentA5@systemA1 studentA5]$ pwd
/home/studentA5
[studentA5@systemA1 studentA5]$ _
```

Troubleshooting

Configuring services like Telnet for a Linux operating system can be somewhat confusing to the inexperienced user. Editing the configuration files can be a difficult task, so it is important to remember where these files are located and how to navigate to them. Telnet can be a useful troubleshooting tool, which will allow access to the system from virtually any operating system that has an Internet connection. As a system administrator, this can help with troubleshooting efforts.

Reflection

1. What security risks does enabling Telnet pose to a system?

   _____

2. What are some precautions that would allow a user to provide security while having Telnet access enabled on a system?

   _____

   _____

3. Which daemon is used for the Telnet service?

   _____

Creating a Samba Server

Estimated Time: 25 minutes

Objective

Configure a Linux server as a Samba file server to provide access to Windows clients.

Equipment

- A computer with Linux Red Hat 7.X installed.

- A computer on the same network as the Linux computer with Windows 2000 installed.

Scenario

The system administrator of a large company has a large number of Windows workstations that employees use. These Windows clients need access to the Linux file servers to backup their data and access shared files on the network.

Procedures

Step 1: Adding a Samba User

Note: Log in as the **root** user prior to starting this lab.

Adding a Samba user account is similar to adding a regular user account:

1. Add the user account for the user that needs access to the Linux file server. To do this, enter `useradd –m johnd` at the shell prompt.

2. Assign a password for the new user account. Enter `passwd johnd` at the shell prompt. After this command is entered, the operating system will return a message stating that it is changing the password for the **johnd** user account. It will ask for the new password once and then again for verification. To add additional Samba user accounts, repeat steps 1 and 2.

3. Create the Samba password file. Enter the following command at the command prompt:

   ```
   cat /etc/passwd | /usr/bin/mksmbpasswd.sh >
   /etc/samba/passwd
   ```

4. Add an SMB password for users that have Samba accounts. Enter `smbpasswd johnd` at the shell prompt. After this command has been entered, the operating system will return a message stating that it is changing the SMB password for the **johnd** user account. It will ask for the new password once and then again for verification.

Step 2: Starting the Samba Service

To start the Samba Service use the following steps:

1. To start the SMB daemon, enter `/etc/init.d/smb start` at the shell prompt. This command will run the Samba service during the current session but once the system is rebooted, the Samba service will be turned off.

2. To start the Samba service automatically every time, reboot the system and enter `/sbin/chkconfig smb on` at the shell prompt. This command will force the Samba service to start automatically in run levels 3, 4, and 5.

At this point the user can go to any Windows system and map a network drive to the home directory for the newly created user account. To map a network drive, use the following syntax from a Windows system.

`//Linux servername/username`

Reflection

1. What are some of the advantages of creating a share like this for Windows systems?

   _____

   _____

2. Are there any security concerns that need to be addressed?

   _____

   _____

3. What is a share for a Samba server?

   _____

Writing a Script File in Linux
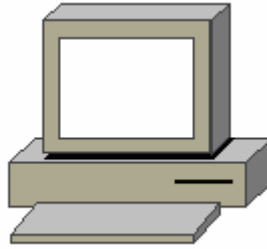
Estimated Time: 25 minutes

Objective

Upon completion of this lab, the student will be able to create a script file and run it in the Linux environment.

Equipment

The following equipment is needed in order to complete this lab:

- A lab computer with Linux 7.X installed.

Scenario

The members of the Engineering Department are working on some important documents that need to be backed up frequently. This involves a repetitive process that requires them to type a long list of commands every time they need to perform a backup. Instead of typing all these different commands individually each time, a script file can be written to execute all of them with one command.

Procedures

Basic knowledge of the command line and the vi editor will be utilized in this lab. In the first step of this lab the student will log on to the system with the root account and create the script. In the second step of the lab, the student will assign permissions on the script so that only the specified users can execute it. Then in the third step of this lab, the student will log in with the studentXX account and execute the script.

Background on the Linux .tar and .gz Extensions

When a **.tar** (tape archive) file extension is seen, someone has bundled two or more files together (usually for backup purposes). When a **.gz** extension is seen, the file has been compressed (similar to the .zip extension in DOS).

For example, to archive a folder of WordPerfect files in a **wp** directory, use the following command:

```
tar –cvf mywpdocs.tar wp/
```

To see all the files, use the following command:

tar –tvf mywpdocs.tar   (the **–t** will list all the files)

To extract all the files, use the following command:

tar –xvf mywpdocs.tar   (the **–x** extracts the contents)

The following is a list of flags that are used with the **.tar** command:

-c   Create a new archive

-t   List the contents of an archive

-x   Extract the contents

-f   Write the archive to file

-M   Span multiple floppies if the archive is too big for one floppy

-v   List the files as they are being processed

-u   Add files to the archive

-z   Compress or decompress automatically

gzip and gunzip

It is very common for files to be compressed when a tar archive is created.

- **gzip mywpdocs.tar** will create a compressed file called **mywpdocs.tar.gz** and the original file will be deleted.

- **gunzip mywpdocs.tar.gz** will decompress the file.

Step 1: Creating the Script

1. Login as **root** and make sure that to be in the home directory. **StudentA5** will be used as an example in this lab. Ask the instructor for the correct login for the computer. At the command prompt, type:

   mkdir mybkup

   cd mybkup

   touch file1 file2 file3

   This will create a small subdirectory in the **/home** directory called **mybkup** and it will contain three files. Verify the creation of the three files with the **ls** command:

   ls

   Were file1, file2, file3 created in the mybkup directory? Y/N _____

Return to the home directory:

```
cd /home
```

2. Create a vi script that will automate the backup process. From the command line, type:

```
vi/home/studentA5/backup
```

This will launch the vi text editor and a file called **backup** will be created and saved in the home directory.

3. After the vi Editor is open, type the letter **i** on the keyboard to enter the text insert mode.

4. Type the following text into the text editor:

```
#!/bin/sh
#
ls -R mybkup
tar -cvf mybkup > mybkup.tar
ls -l
#
```

To exit and save the file, press the **ESC** key andon the keyboard and type:

```
:wq
```

5. To verify that the backup script exists, at the command prompt type:

```
ls
```

Does the file backup exist in this directory? Y/N _____

6. To verify that the contents of the backup script, at the command prompt type:

```
cat /home/studentA5/backup
```

Do the contents of the backup file match step 4 above? Y/N _____

Step 2: Assigning Permissions

1. For a script to be executable, the file permissions need to be changed. At the command prompt, type:

```
chmod 700 /home/studentA5/backup
```

2. To check the permissions of the backup file, type:

```
ls -l /home/studentA5/backup
```

Write the results in the space below:

_____

Is the file now executable? How can this be verified?

_____

Step 3: Executing the Script

1. At the command prompt, execute the script by typing:

    `/home/studentA5/backup`

2. To verify that a new file was created after the script was executed, type:

    `ls`

Does a file called mybkup.tar now exist in the home directory? Y/N _____

Step 4: Delete and recover the mybkup directory

1. From the /home/studentA5 directory locate the original mybkup file, type:

    `ls –R mybkup`

    Is the directory mybkup there? Y/N _____

2. To delete the mybkup directory, type:

    `rm –fr mybkup`

3. To verify that the mybkup directory has been deleted, type:

    `ls mybkup`

    Is the directory gone? Y/N _____

4. To recover the mkbkup directory with the tar command, type:

    `tar –xvf mybkup.tar`

5. To verify that the original directory has been restored with the backup, type:

    `ls –R mybkup`

6. Is the directory there and are file1, file2 and file3 there? Y/N. In the space below list
    the directories and files in the home directory:

    _____

    _____

    Did the student get the directory and files back? Y/N _____

Backing up With Windows 2000
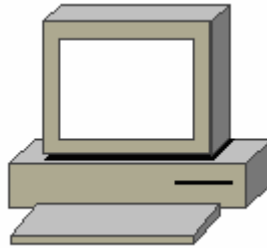
Estimated Time: 20 Minutes

Objective

In this exercise the student will use the backup wizard from Windows 2000 to perform a backup of files to the hard disk.

Equipment

The following equipment is required for this exercise:

- A computer system with Windows 2000 Professional installed.

Scenario

The System Administrator for the XYZ Company needs to back up some of the files on the server. These files are important to the company and losing these files would damage the company. It is the administrator's job to perform backups as preventative maintenance, and to back up important files as required.

Procedures

In this lab, the student will use the Windows Back up Wizard to select the files that to be backed up, and then perform the Back up.

Step 1: Creating, running, and verifying a backup job

1. Log on to the Server with the **Administrator** account.

2. When the systems boots up, go **to Start** > **Run**.

3. In the Run Dialog box, type **ntbackup** and then click **OK**. The Backup dialog box will display.
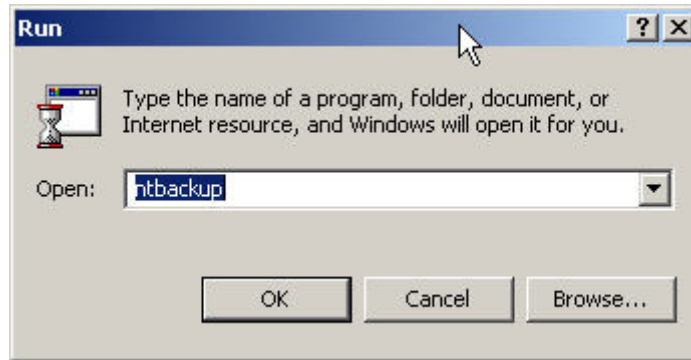
4. Read the three descriptions under the **Welcome** tab, and click **Backup Wizard**. The Backup Wizard will start.
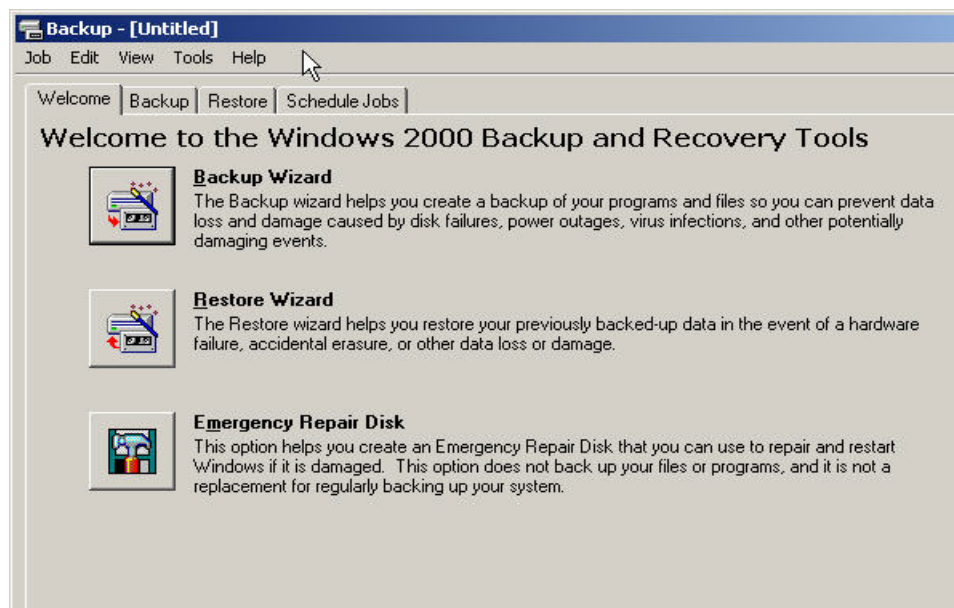
5. Click **Next**, to display the **What to Back Up** screen. Select the type of backup to perform.
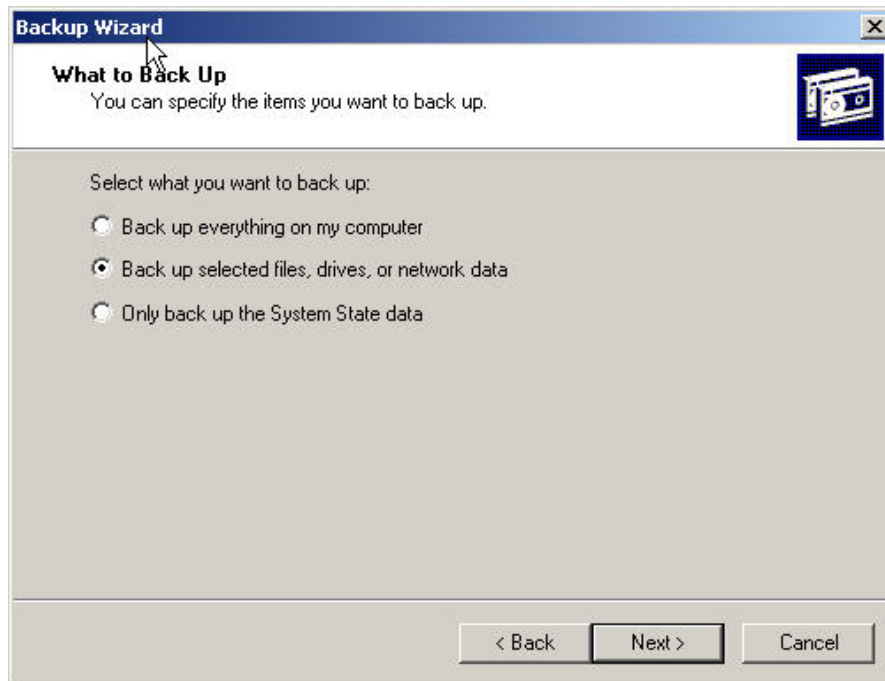
6. Click the **Back Up Selected Files, Drives, Or Network Data** button, and then click **Next**. The **Items to Back Up** screen will display, prompting to select the local and network drives, folders, and files to be backed up.
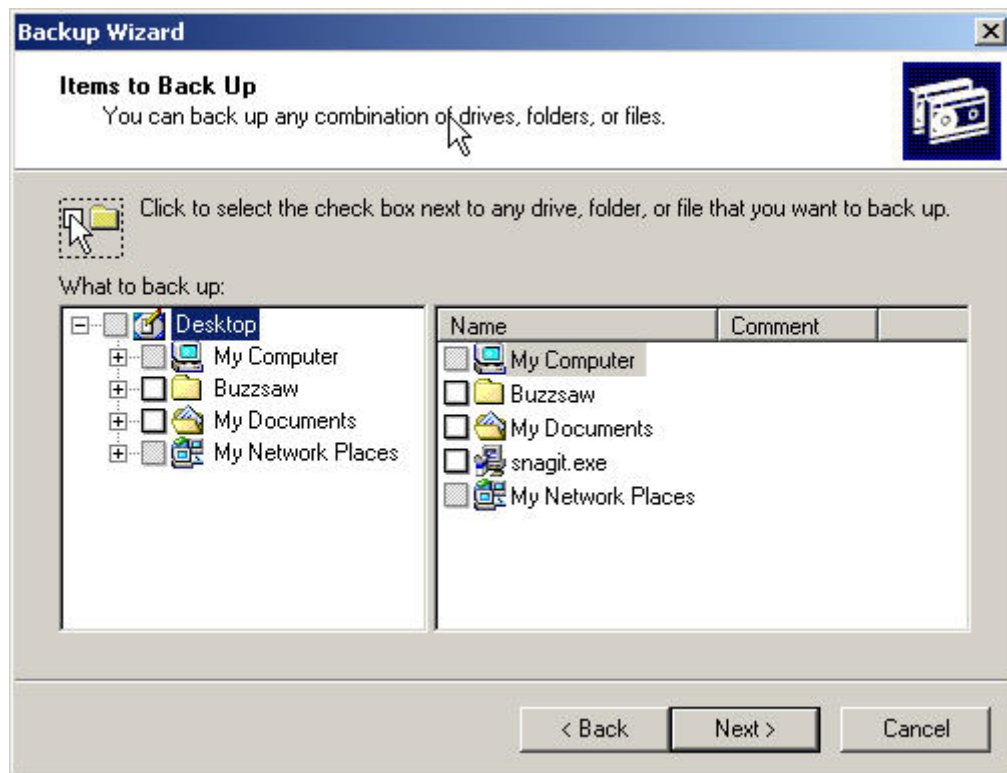
7. Expand **My Computer** and double click on **System State** (do not select the box to the left of System State) to display the System State files that can be backed up.
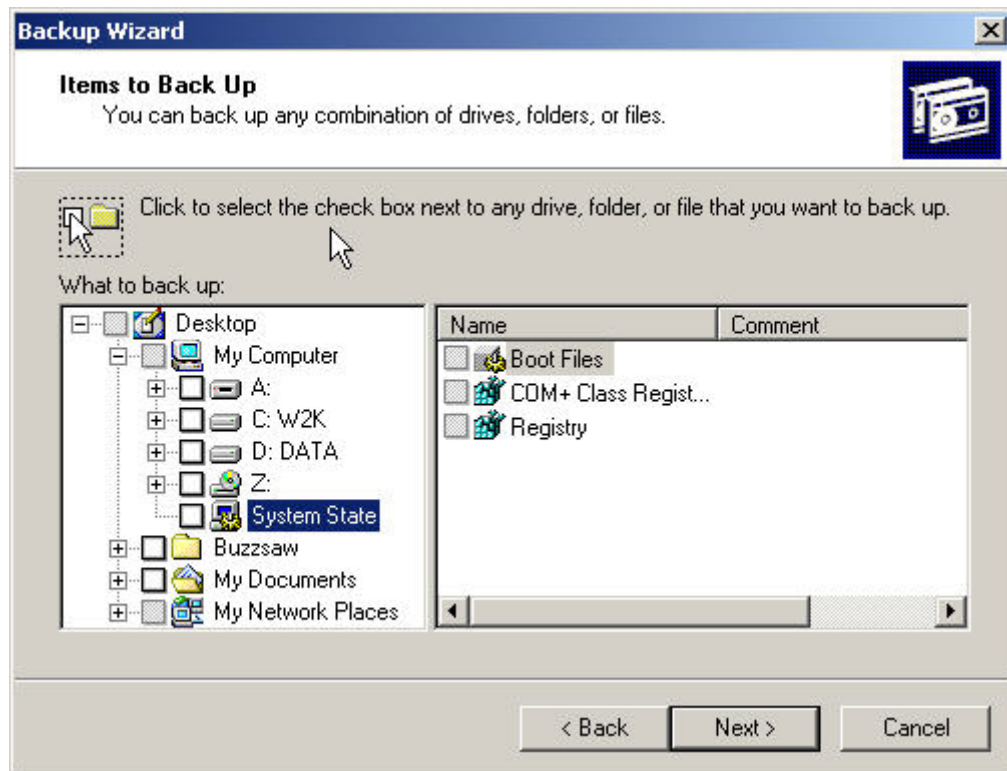
8. In the left window, expand the **C:** drive by double-clicking on the letter **C**. Do not select the check box to the left of C:.
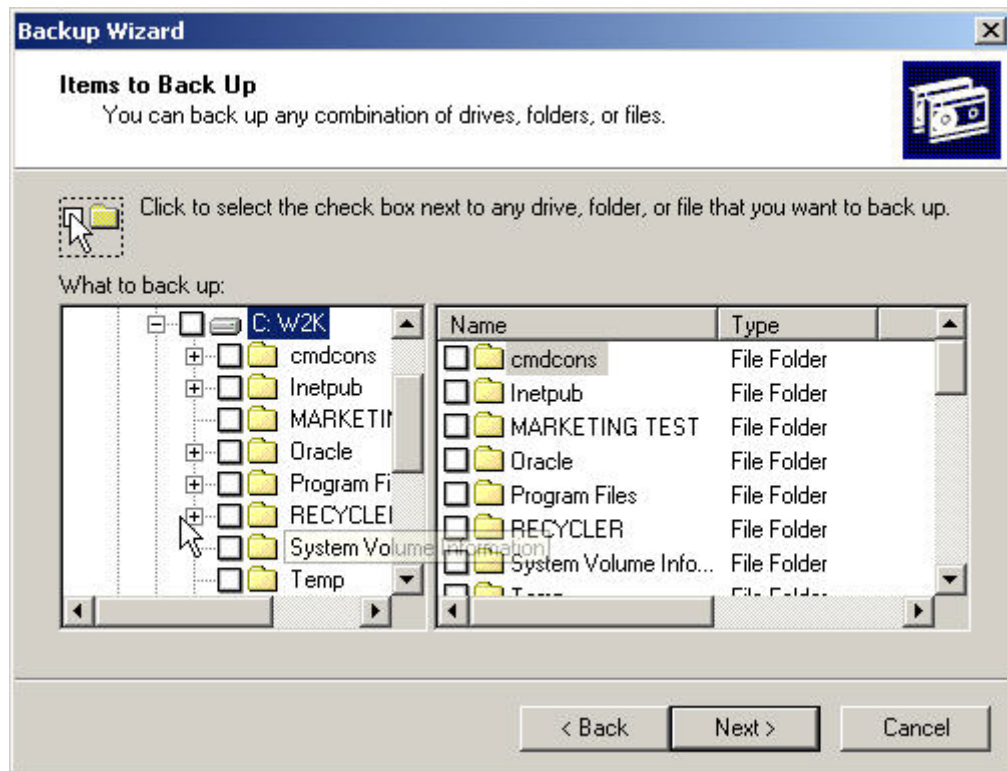
9. In the details window, scroll down and select the **boot.ini** check box and click **Next**.
    The **Where to Store The Backup** screen will display. In the **Backup Media or File
    Name** text box, type `c:\ backup1.bkf` and then click **Next**.
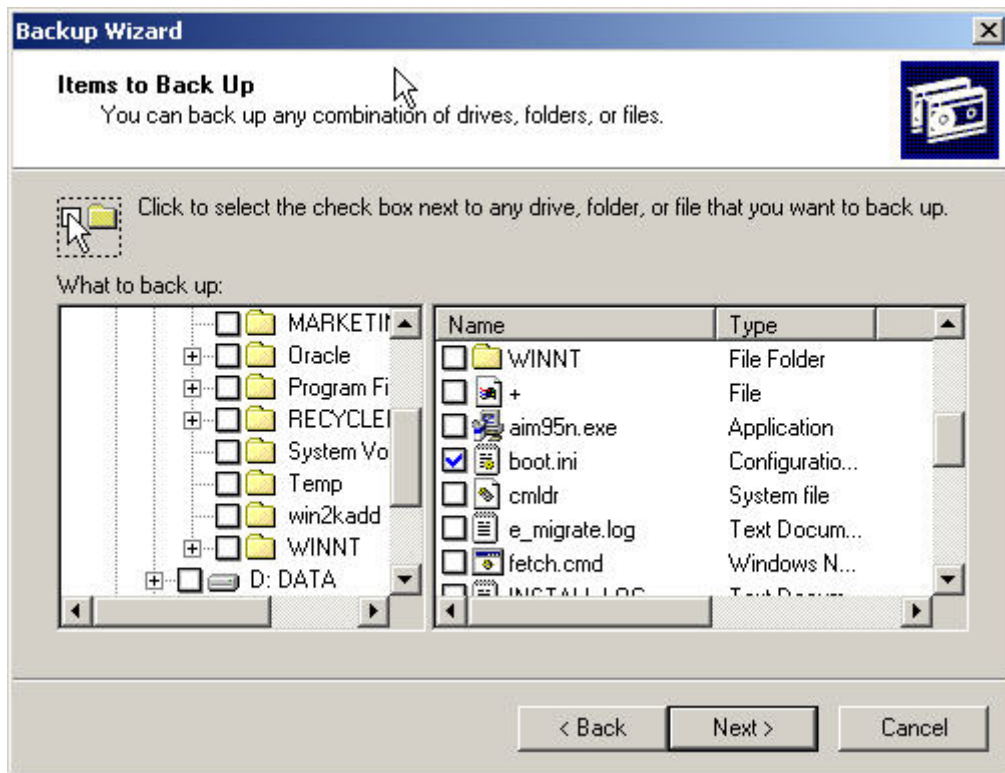
Note: The **Backup Media Type** drop-down list will be gray because there is no
removable media to backup to and **File** is the only backup media type available. In a
real scenario, the technician would want to do a back up to some type of removable
media, removable disk, or to another hard drive on another computer.

10. The **Completing the Backup Wizard** screen should display. This screen shows the details of the backup to be performed. Additional changes could be made from this point also. Click the **Advanced** button.

11. When the **Type of Backup** screen displays, make sure that **Normal** is selected and that the **Backup Migrated Remote Storage Data** check box is not checked.
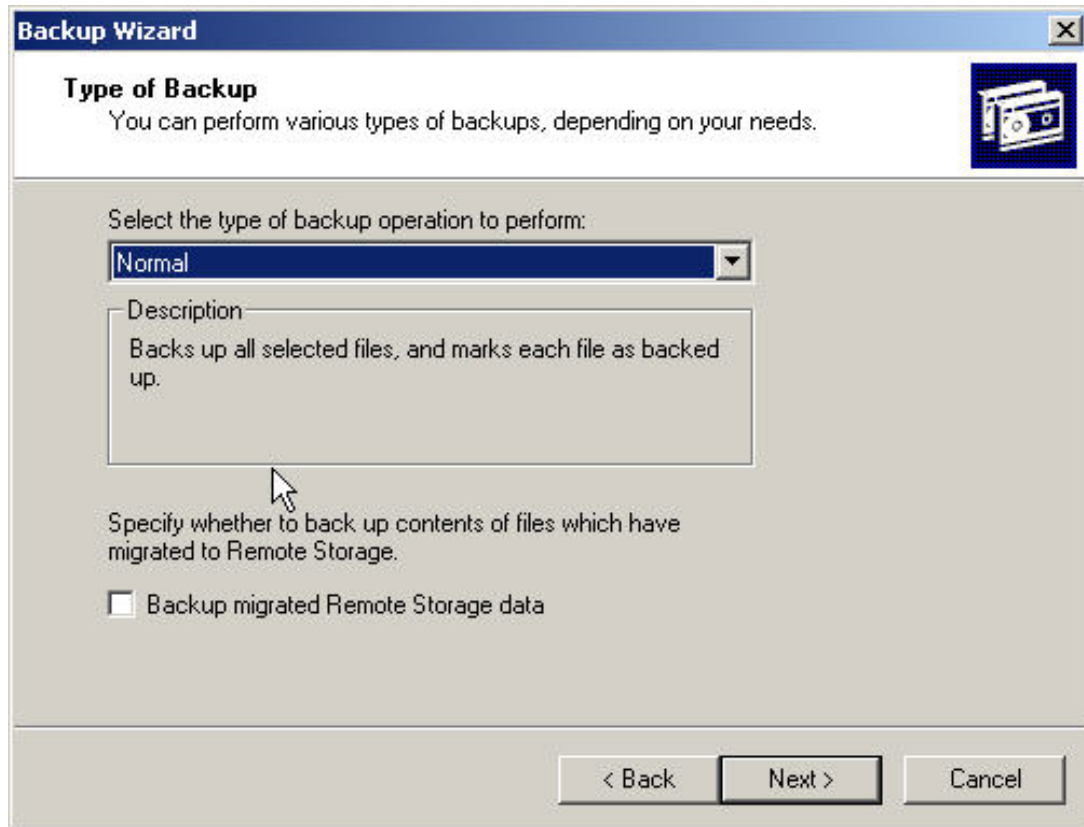
12. Click **Next**. The **How to Backup** screen should display. This allows verification of the backed up data after performing the backup.

13. Select the **Verify Data After Backup** check box, and then click **Next**.
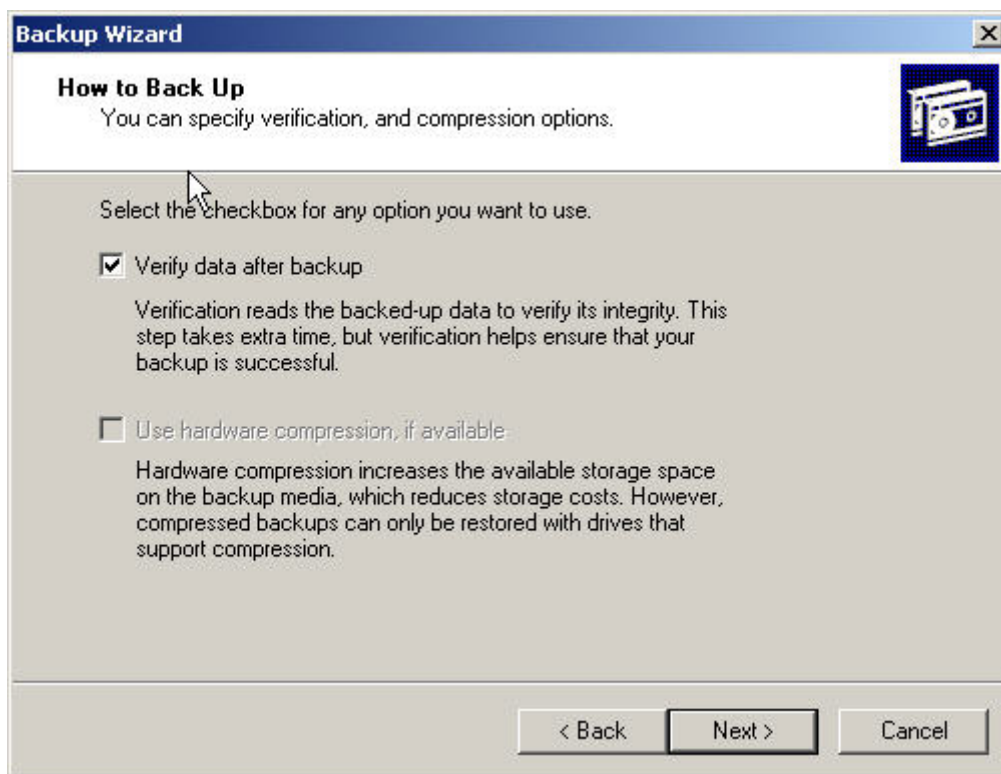
14. The **Media Options** page will display prompting to specify whether to **Append this backup to the media** or **Replace the data on the media with this backup** Click **Replace the data on the media with this backup** button. Click **Next**.
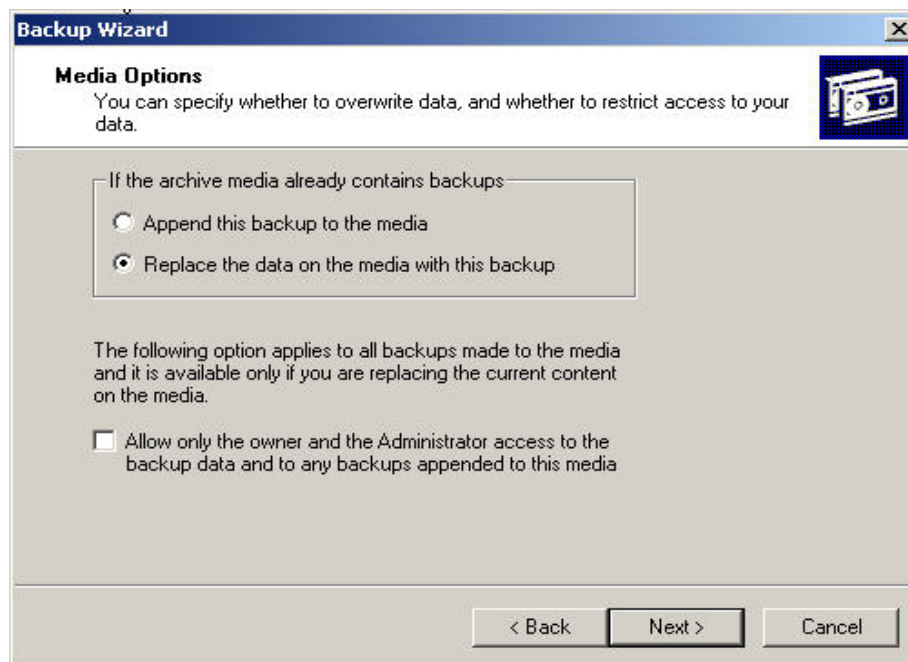
15. The **Backup Label** screen displays asking to supply a label for the backup job and for the backup media. If the label information is not entered, Windows will supply a backup label and media label by using the current date and time by default.

16. In the Backup Label text box, type `Boot.ini backup set created on xxx` (**xxx** is today's date and time). Do not change anything in the **Media Label** text box, click **Next**.
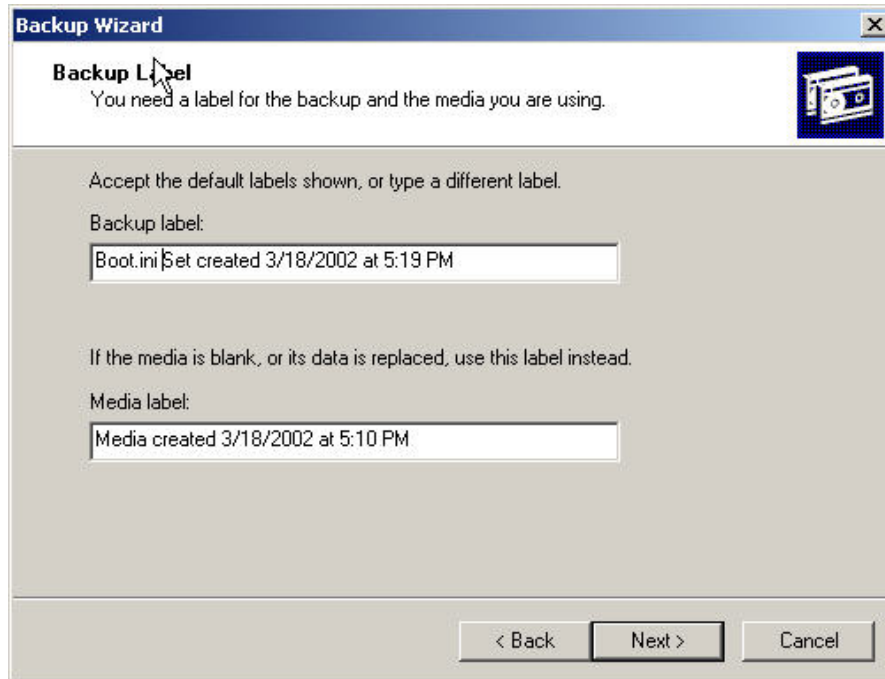
17. When the **When to Back Up** screen displays choose whether to run the backup job now or schedule this backup job. For this lab, select the **Now** radio button. Click **Next**.
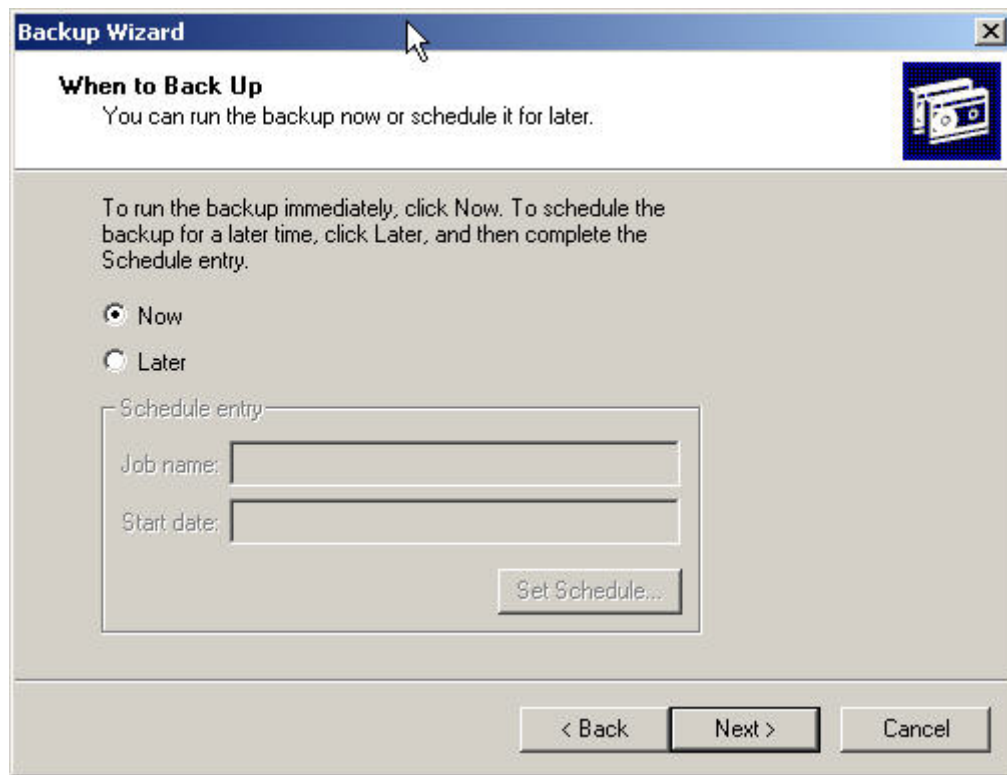
18. When the **Completing the Backup Wizard** screen displays, click **Finish** to start the backup job.
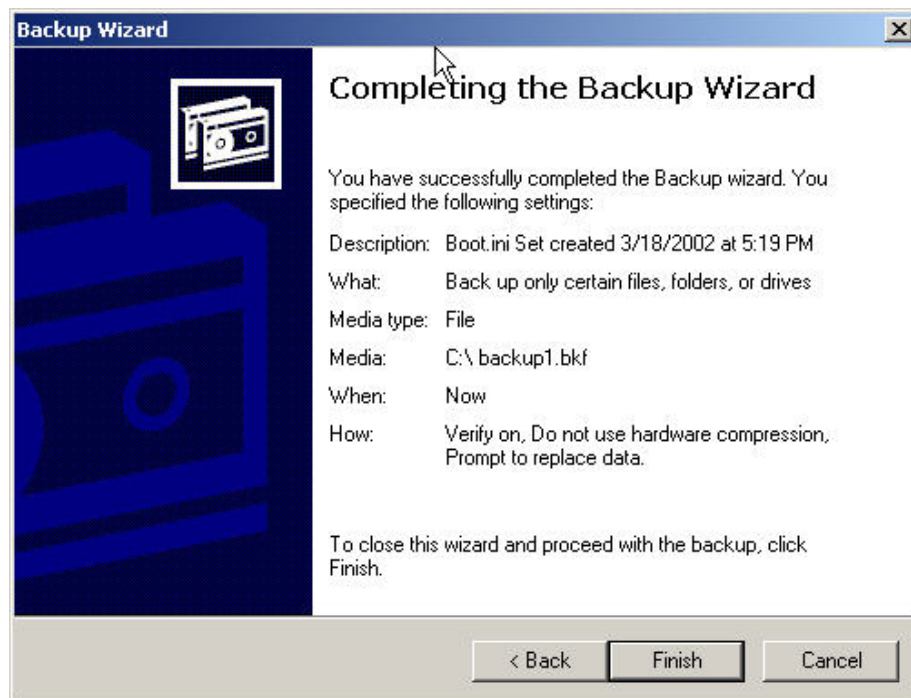
19. Windows Backup will display the **Selection Information** dialog box, indicating the estimated amount of data for the backup and the time to complete.

20. The Windows Backup will display the **Backup Progress** dialog box which shows the status of the backup operation, statistics on estimated and actual amount of data being processed, the time that has elapsed, and the estimated time that remains for the backup to complete.
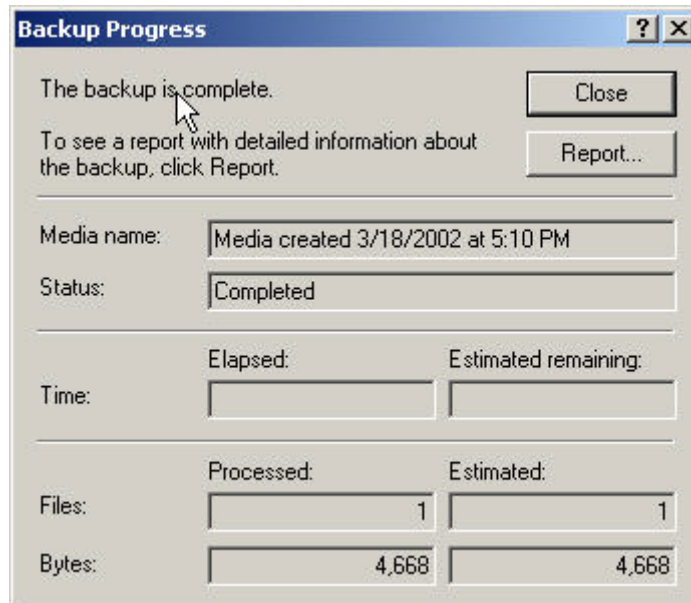
21. When the backup is complete, click the **Report** button. A backup report will be displayed. The backup report contains key details about the backup operation, such as the time it started and how many files were backed up. Review the report and close Notepad.
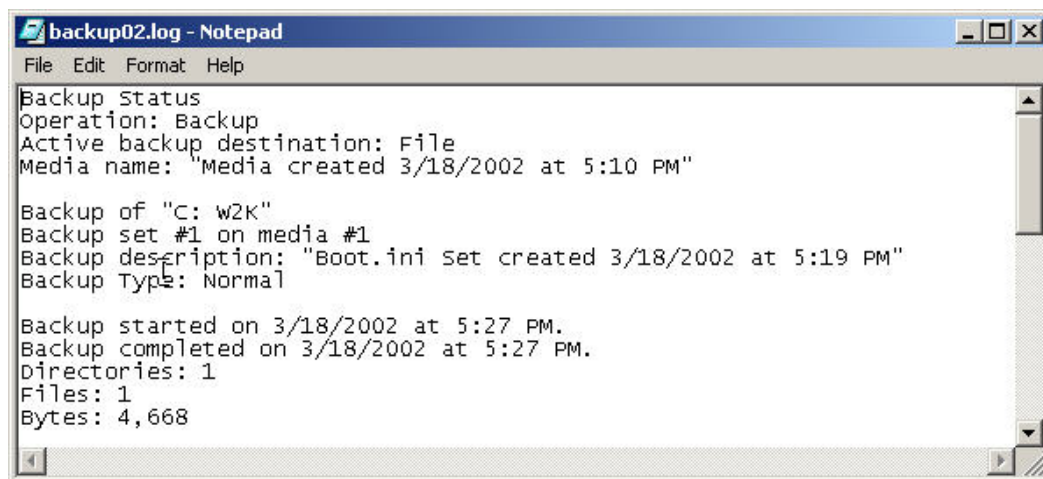
22. Close the **Backup Progress** dialog box and the **Backup** dialog box.

Reflection

1. This is just one way to perform a backup. Are there any other ways that a backup can be performed?

    _____

    _____

    _____

2. What information does the backup report contain?

    _____

    _____

Backing up with Linux
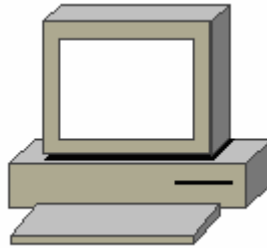
Estimated Time: 20 Minutes

Objective

To use the Backup utilities provided by the Linux operating system to perform a backup of directories and files on the hard disk.

Equipment

The following equipment is required for this exercise:

- A computer system with Linux Red Hat 7.X or greater installed.

Scenario

The System Administrator for the XYZ Company needs to back up some of the files on the server. These files are important to the company and losing these files would damage the company. It is the System Administrators job to perform backups as preventative maintenance and to back up important files as required.

Procedures

Use the Linux commands to perform a Back up procedure on the files that are going to be backed up. First, make a directory and create files in that directory. Then back up the files and verify that the action was successful.

Step 1: Creating the directories and files

1. Login with a student account and open a terminal window.

2. At the command prompt, type `mkdir bkupdir` and then press **Enter**. This will create the directory in which to create the files. Verify with the `ls` command. Is the dir bkupdir there? Y/N _____

3. Next type `cd bkupdir` and then press **Enter**.

4. Type `touch file_A file_B file_C` and then press **Enter**. The `touch` command will create three files. Verify with the `ls` command. Are the three files there? Y/N _____

5. Type `cd` and then press **Enter** to get back to the home directory.

6. Next type **ls - R bkupdir** and then press **Enter**. This will show the directory and the files just created within the directory.

Step 2: Performing the Backup

1. Next, backup the **bkupdir** directory. At the command prompt, type **tar −cv bkupdir > bkup.tar** and then press **Enter**.

   The > symbol is used to send the contents of the **bkupdir** directory to the **bkup.tar** backup file.

2. Type **ls −l** to confirm the backup file was created. Is it there? Y/N _____

3. Type **rm −fr bkupdir** and then press **Enter**. The **rm** command will delete the directory and the three files just created.

4. Type **ls −l** and then press **Enter** to confirm that the directory was deleted. Is it there? Y/N _____

5. Next, type **tar −xvf bkup.tar** and then press **Enter** to restore the directories and files. The **tar** command will run the backup program to restore the files.

6. Type **ls −l** and then press **Enter**, then type **ls −R bkupdir**.

   Did the original directory and its files reappear? Y/N _____

Reflection

Backing up data on a computer can be an important task, especially on servers that either have critical data that cannot be lost or on servers that are running critical services that must be running at all times. It is also to consider what might be some important factors in determining what kind of backup method is needed. For example the simple backup that was performed in this lab would be useful when a large or small amount of data needed to be achieved or backup. However a more elaborate kind of backup using an external device such as a tape drive or a RAID implementation may be needed for a backing up other kinds and data or hard drives.

1. Which tar switch will find differences between the archive and file system?

   _____-d _____

2. What does a .tar extension mean?

   _____Someone has bundled two or more files together (usually for backup purposes)._____

Syslog

Estimated Time: 25 Minutes

Step 1

1. *Log files* are text files that record interesting system events.

Background information:

- Log files contain messages about the system, kernel, services and applications.

- Log files are useful when troubleshooting a problem with the system or when looking for unauthorized attempts to access the system.

- Log files are controlled by the syslogd daemon. To see the list of log files the system maintains, examine the /etc/syslog.conf configuration file.

- Most log files are stored in the /var/log directory.

- Some applications such as apache and samba have a directory within the /var/log directory

- There are multiple files in the log file directory with numbers after them. A new log file is created when they are rotated. Log files are rotated to prevent their files from becoming too large.

- **logrotate** is a program that contains a cron task for automating log files rotation. The logrotate program default settings are stored in the /etc/logrotate.conf configuration file. By default, the logrotate is set to rotate once a week and keeps four weeks of previous log files.

2. Use the **ls** command and any of the **cat, less** or **more** commands to locate and examine the Linux log files on your system. Where does Linux store most of its log files?

    _____

    Using a text editor, open and describe the log files below

    <u>Log file</u>   <u>Description</u>

    /var/log/messages
    /var/log/secure
    /var/log/maillog
    /var/log/cron
    /var/log/boot.log

3. Describe the operation of the program syslog:

    _____

    _____

---

4. Can the syslogd daemon be started/stopped/restarted with the service command? Is this a good idea?

_____

_____

_____

5. Briefly describe some of the logging options of the /etc/syslog.conf file:

_____

_____

_____

6. How often are the logs rotated? (**more /etc/logrotate.conf**)

_____

7. For how long does Linux keep a log file? (**more /etc/logrotate.conf**)

_____

8. Run the **lastlog** command and briefly describe their output:

_____

9. Using the previous command, who was the last user to login to your Linux system?

_____

Checking Resource Usage on Windows 2000 Professional

Estimated Time: 20 Minutes

Objective

In this lab the student will use the System Performance Tool to monitor the Resource usage on the computer system.

Equipment

The following equipment is required for this exercise:

- A computer system with Windows 2000 Professional installed.

Scenario

It is discovered that the server seems to be running slow. In this case, it is a good idea to open the systems performance monitor in order to inspect the resource usage on the system. The option options would be to upgrade or add another server if the system resources have been used up.

Procedures

Open the performance monitor and inspect the system resource usage by graphing, and then analyzing the graph, to decide what might be causing the system to run slowly and what might need to be upgraded.

Step 1: Gathering Information

1. Open the performance monitor. Click **Start** > **Programs** > **Administrative Tools** > **Performance**.
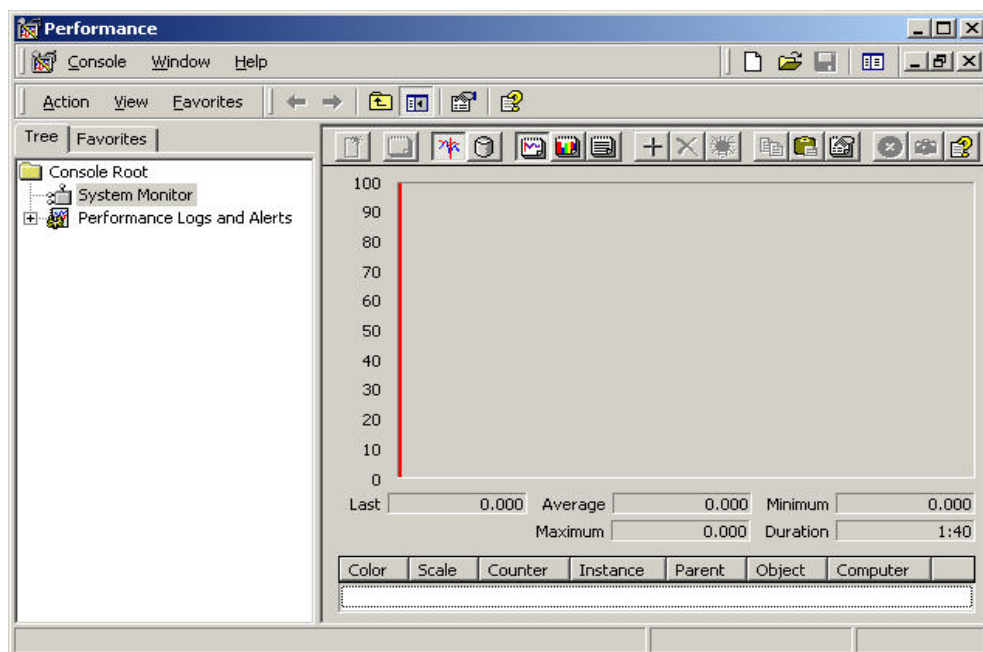
2.   Right-click in the right window and select **Add Counters**.
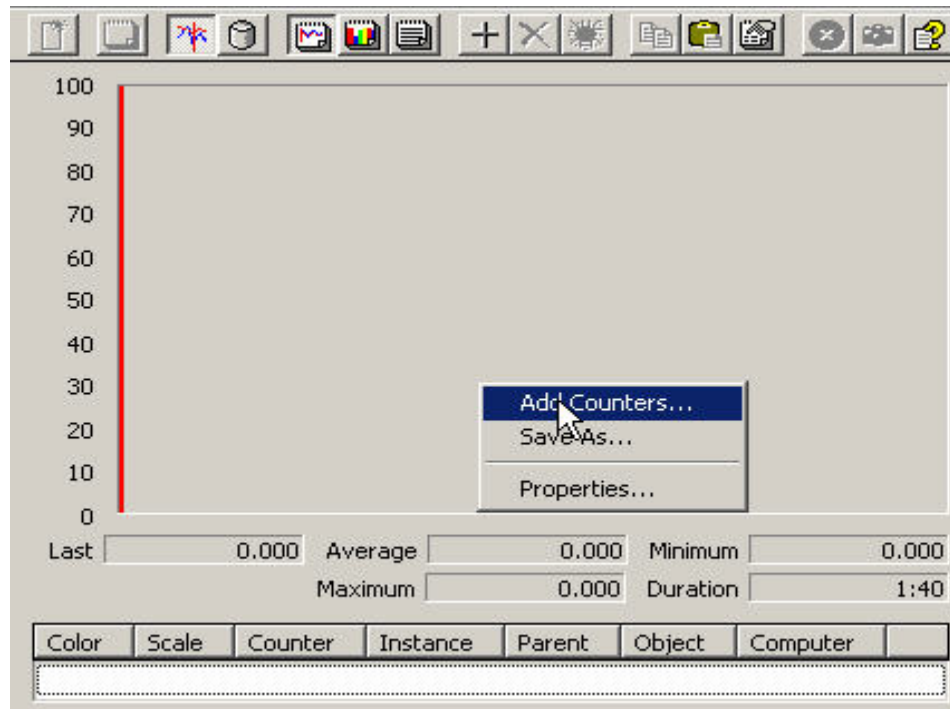
3.   Check to make sure **Add Counters** in the performance object drop-down box **Processor** is selected.

4.   Select the **Counters from the list** radio button.
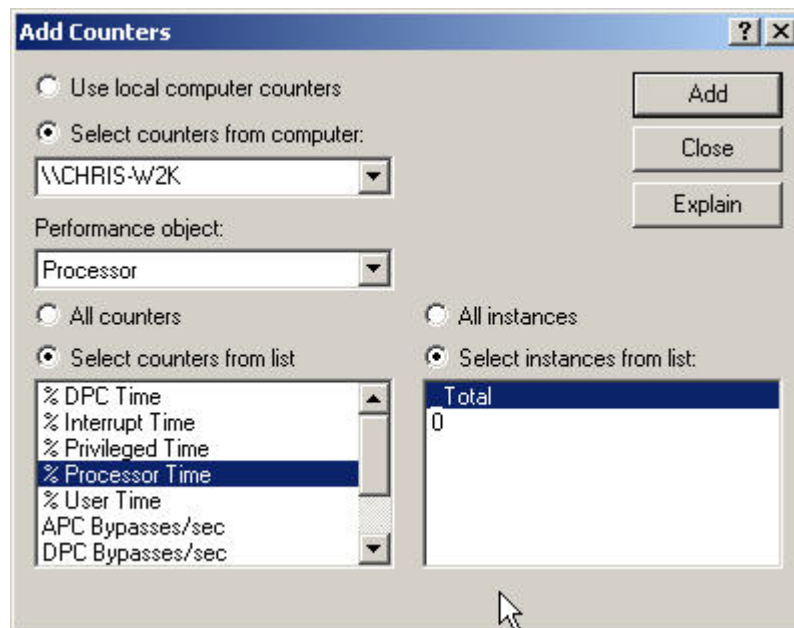
5.   While holding the Control Key down, use the mouse to select **%Interrupt Time**, **%Processor Time**, **%User Time**, and the **Interrupts/sec**.
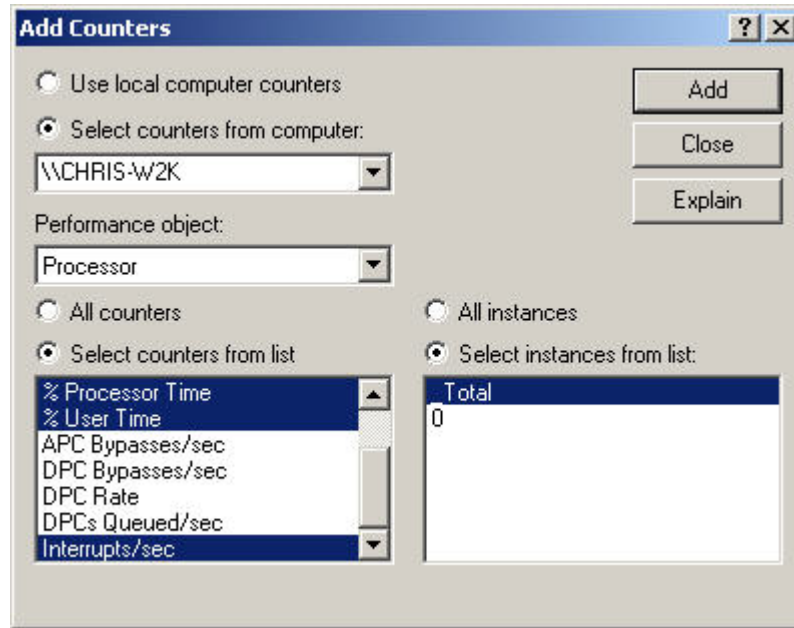
6. Click **Add** and then close the box.

7. Let the graph make a pass across the screen at least once. Then right-click in the graph area and select **Save As…**. Save the file as: **Lab Processor Graph**. While this is happening, open and close some programs to generate some activity on the system.
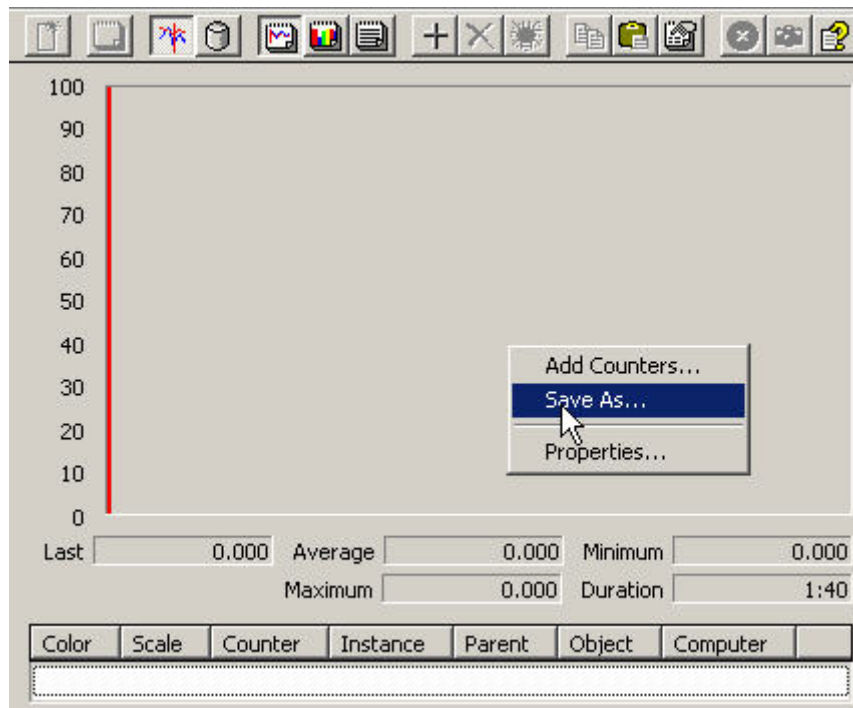
8. Locate the **X** in the menu bar across the top and delete the **%Interrupt Time**, **%Processor Time**, **%User Time**, and the **Interrupts/sec** monitors.
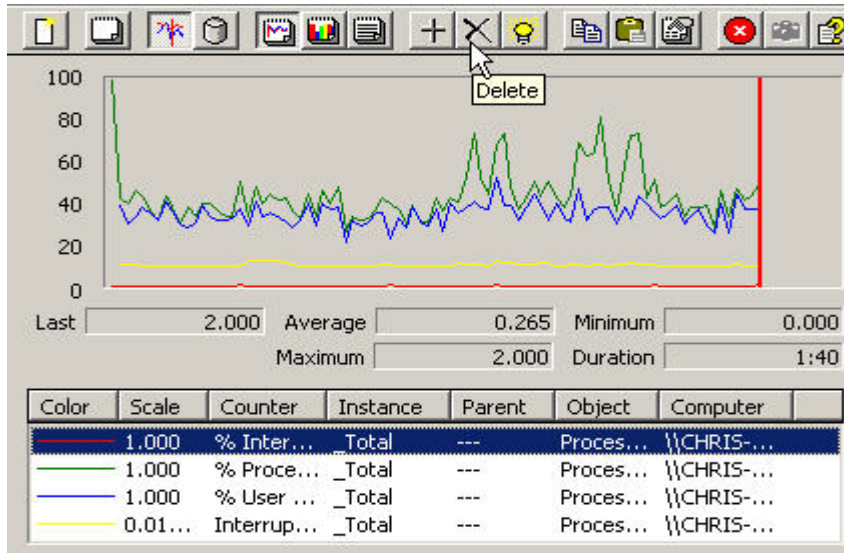
9. Right-click in the right windows and select **Add Counters**.

10. Go back to the performance object drop-down box and select **System**.
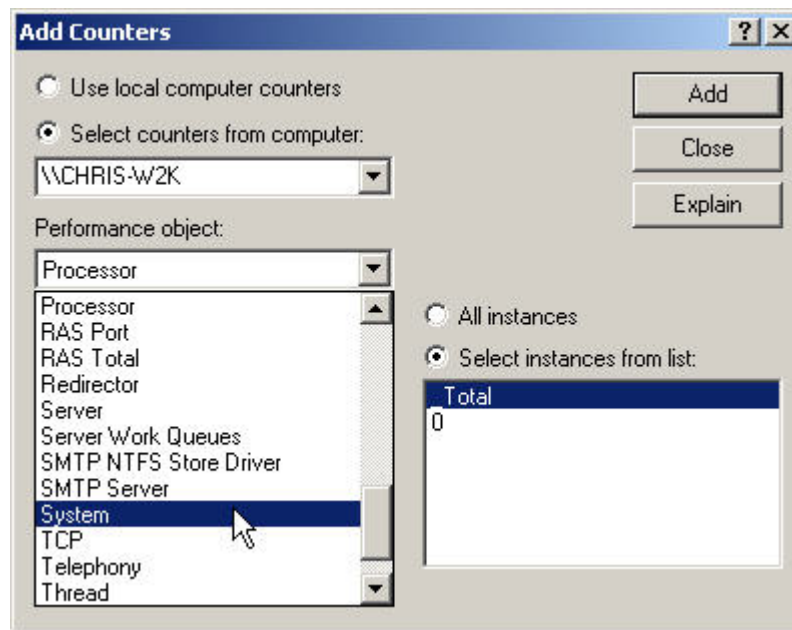
11. While holding the Control Key down, use the mouse to select **Processes** and **Threads**.
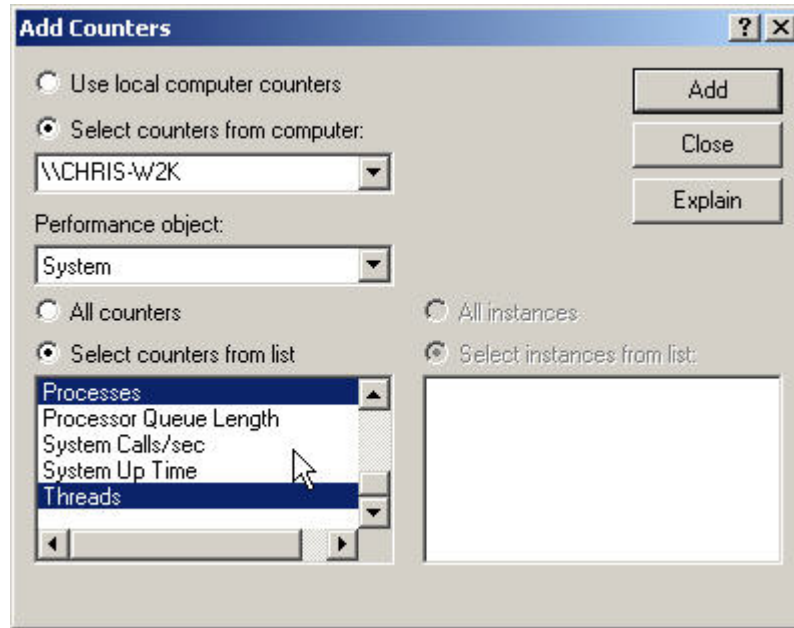
12. Click **Add**, and then close the box.

13. Let the graph make a pass across the screen at least once. Then right-click in the graph area and select **Save As…**. Save the file as: **Lab System Graph**.

14. Locate the **X** in the menu bar across the top and delete the **Processes** and **Threads** monitors.
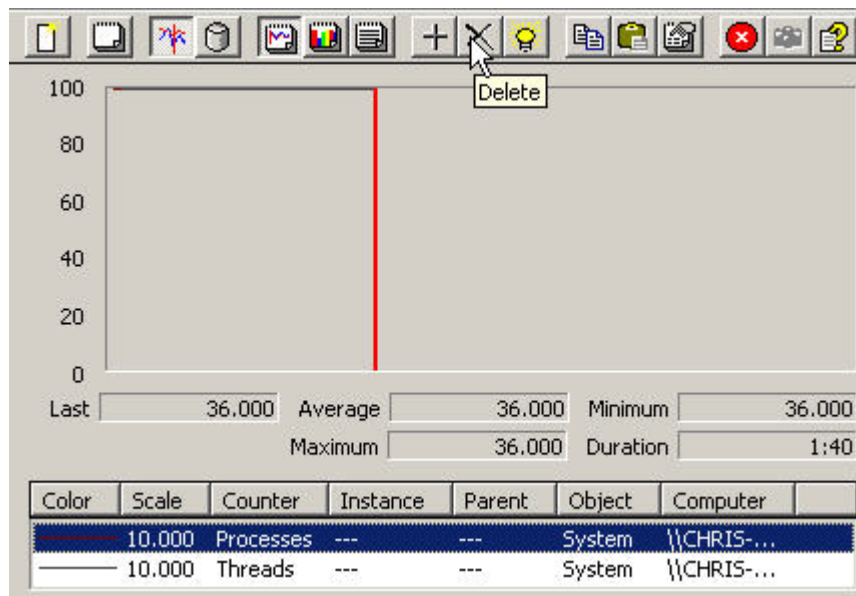
15. Right-click in the right windows and select **Add Counters**.

16. Go back up to the performance object drop-down box and select **PhysicalDisk**.
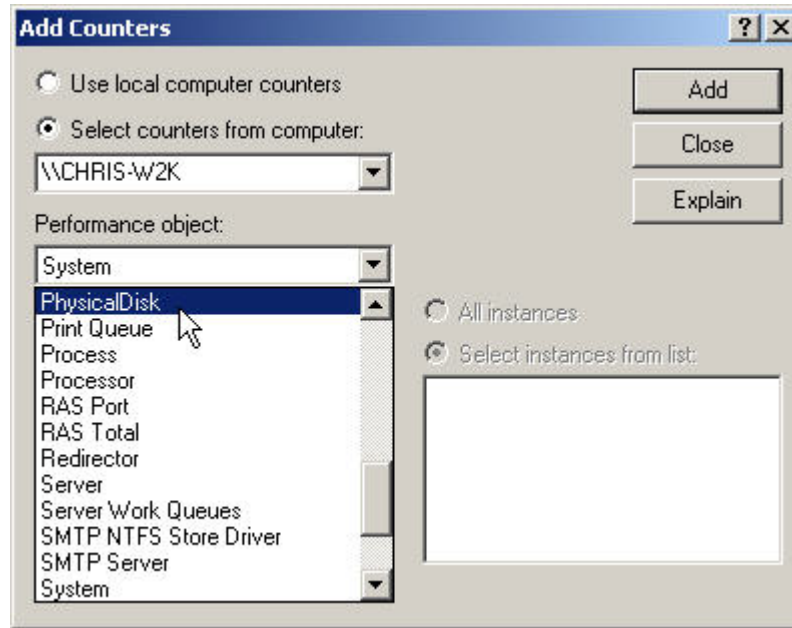
17. While holding the Control Key down, use the mouse to select **%Disk Read Time** and **%Disk Write Time**.
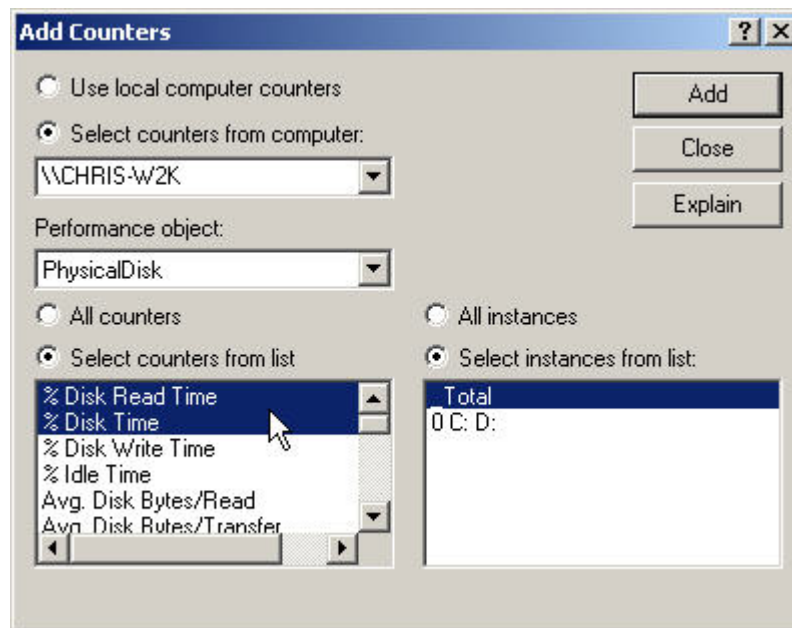
18. Click **Add**, and then close the box.

19. Let the graph make a pass across the screen at least once. Then right-click in the graph area and select **Save As…**. Save the file as: **Lab Physical Disk Graph**.

20. Locate the **X** in the menu bar across the top and delete the **%Disk Read Time** and **%Disk Write Time** monitors. While this is happening open and close some programs to generate some activity on your system.

21. Close the Performance Monitor.

Step 2: Evaluating the Information

1. Navigate to the folder where the performance monitor files were saved.

2. Open them up one by one and analyze them.

3. What conclusions can be drawn from these graphs?

   _____

   _____

4. What could be some reasons for using such graphs?

   _____

   _____

Troubleshooting

These performance monitor tools can very helpful in troubleshooting a system. They can
provide a lot of information about a system and the overall health of a system. By using
the performance monitor to check system resources a technician can effectively evaluate
what might be causing problems in the system.

Checking Resource Usage in Linux
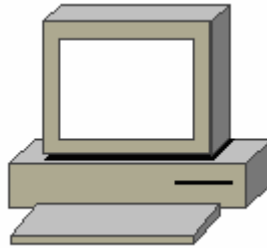
Estimated Time: 20 Minutes

Objective

In this exercise, the student will learn how to check the resources on a Linux system. This lab covers the following commands:

- `df`

- `du`

- `top`

Equipment

The following equipment is required for this exercise:

- A computer with Linux Red Hat 7.2 or greater installed.

Scenario

There is a server running Linux that has been running efficiently for a long time but the system resources might be reaching their limits. The technician decides to run a few of the commands to check the system resources to ensure that the system will continue to run properly.

Procedures

There are three basic Linux commands used to check and record the resource usage on a Linux system.

Step 1: The `df` Command (disk file system)

1. Login as the **root** user and open a terminal window.

2. Look in the **man** pages for information on the `df` command, type:

   `man df`

3. In the space below give a brief description of the `df` command.

_____

4. What does the −**h** switch do?

_____

5. To determine the amount of hard drive space that is being used by Linux, type:

    df

To make the output of the **df** command easier to read, type:

    df -h

Record the results in the table below.

Filesystem	Size	Used	Avail	Use%	Mounted on

```
[root@systemA1 boot]# df -h
Filesystem      Size   Used   Avail   Use%  Mounted on
/dev/hda2       1.9G   827M    1.0G    45%  /
/dev/hda1        30M   2.7M     26M    10%  /boot
none             62M      0     61M     0%  /dev/shm
[root@systemA1 boot]#
```

Example of the **df** command.

Step 2: The du Command (disk usage)

1. Remain logged in as the **root** user; Use the **man** command to learn about the **du** command. From a terminal window type:

    man du

2. In the space below, give a brief description of the **du** command.

_____

3. What does the −**h** switch do?

_____

4. What does the −**s** switch do?

_____

5. Go to a student home page, and type:

```
cd /home/studentA5
```

Note: studentA5 is used as an example only. Use the student account that the instructor has assigned.

6. From within the studentA5 home directory, type:

```
du
```

Next type:

```
du -hs
```

What is the difference in the commands when the -**hs** switches are added?

_____

How much space is being used in studentA5's home directory?

_____

7. The **du** command can useful in determining the size of any directory or file within a directory. To go to the **/etc** directory and determine the size of the directory and the size of the passwd file, type the following command sequence:

```
cd /etc

du

du -hs

du -hs passwd
```

What is the size of the /etc directory?

_____

What is the size of the passwd file?

_____

```
28        ./log.d/conf/logfiles
84        ./log.d/conf/services
120       ./log.d/conf
8         ./log.d/scripts/logfiles/cron
12        ./log.d/scripts/logfiles/samba
12        ./log.d/scripts/logfiles/xferlog
36        ./log.d/scripts/logfiles
144       ./log.d/scripts/services
32        ./log.d/scripts/shared
236       ./log.d/scripts
360       ./log.d
64        ./ssh
20        ./snmp
52        ./isdn
108       ./nmh
40        ./gimp/1.2
44        ./gimp
148       ./sane.d
8         ./httpd/conf/ssl.crl
272       ./httpd/conf/ssl.crt
4         ./httpd/conf/ssl.csr
24        ./httpd/conf/ssl.key
12        ./httpd/conf/ssl.prm
404       ./httpd/conf
408       ./httpd
8         ./mrtg
240       ./squid
6152      .
[root@systemA1 etc]# du -hs
6.1M      .
[root@systemA1 etc]# du -hs passwd
4.0k      passwd
[root@systemA1 etc]#
```

Example of the **du** command

Step 3: The **top** Command

1. Use the **man** command to learn about the top command. From a terminal window type:

   man top

2. In the space below, give a brief description of the **top** command.

   _____

3. From a terminal type:

   top

4. In the space below, write in information determined from the top output:

CPU idle time in %	
Number of users	
Number of processes	
Number of processes sleeping	
Amount of memory used	
Amount of memory free	

```
  2:09am  up  3:20,  3 users,  load average: 0.00, 0.01, 0.00
73 processes: 70 sleeping, 3 running, 0 zombie, 0 stopped
CPU states:  0.7% user,  1.5% system,  0.0% nice, 97.6% idle
Mem:    126704K av,  121508K used,    5196K free,     256K shrd,    3636K buff
Swap:   136544K av,   18180K used,  118364K free                  33508K cached

  PID USER     PRI  NI  SIZE  RSS SHARE STAT %CPU %MEM   TIME COMMAND
 2874 root      17   0  1052 1052   836 R     1.1  0.8  0:06 top
 1211 root      17  -1 26280  13M  1988 R <   0.7 10.9  5:27 X
 1324 root      11   0  5772 5320  4780 R     0.1  4.1  0:10 kdeinit
 2879 root      17   0   680  680   588 S     0.1  0.5  0:00 xwd
    1 root       8   0   120   72    72 S     0.0  0.0  0:03 init
    2 root       9   0     0    0     0 SW    0.0  0.0  0:00 keventd
    3 root       9   0     0    0     0 SW    0.0  0.0  0:00 kapm-idled
    4 root      19  19     0    0     0 SWN   0.0  0.0  0:00 ksoftirqd_CPU0
    5 root       9   0     0    0     0 SW    0.0  0.0  0:00 kswapd
    6 root       9   0     0    0     0 SW    0.0  0.0  0:00 kreclaimd
    7 root       9   0     0    0     0 SW    0.0  0.0  0:00 bdflush
    8 root       9   0     0    0     0 SW    0.0  0.0  0:00 kupdated
    9 root      -1 -20     0    0     0 SW<   0.0  0.0  0:00 mdrecoveryd
   13 root       9   0     0    0     0 SW    0.0  0.0  0:00 kjournald
   88 root       9   0     0    0     0 SW    0.0  0.0  0:00 khubd
  181 root       9   0     0    0     0 SW    0.0  0.0  0:00 kjournald
  627 root       9   0    56   44    44 S     0.0  0.0  0:00 dhcpcd
  703 root       9   0   212  160   116 S     0.0  0.1  0:00 syslogd
  708 root       9   0  1024  604   356 S     0.0  0.4  0:00 klogd
  729 rpc        9   0    88    4     4 S     0.0  0.0  0:00 portmap
  757 rpcuser    9   0   100    4     4 S     0.0  0.0  0:00 rpc.statd
  869 root       8   0    60    4     4 S     0.0  0.0  0:00 apmd
  925 root       9   0   676  556   484 S     0.0  0.4  0:00 sshd
  998 root       9   0  1328  972   784 S     0.0  0.7  0:00 sendmail
 1017 root       9   0   100   56    56 S     0.0  0.0  0:00 gpm
 1035 root       8   0   156  108    80 S     0.0  0.0  0:00 crond
```

Example of the `top` command

Troubleshooting

Network administrators use the top command to determine system processes. If one application is using too many system resources, it may be a runaway application. How can the application process id (pid) be identified?

_____

_____

Reflection

Monitoring system resources is an issue that network administrators must respond to daily. Develop a plan to track the resources of the Linux system(s). Could this plan be automated? If so, how?

_____

_____

Network Monitor

Estimated Time: 25 minutes

Objective

Upon completion of this lab, you will be able to setup monitoring agents to run tests and alerts for your system.

Equipment

You will need the following items in order to complete this lab:

- A PC with Windows 2000 Professional or Server installed

- The Network Monitor Agent service needs to be installed

Scenario

Your manager would like you to troubleshoot her slow PC. After checking the system, you have isolated the congestion to the network. Next, you decide to monitor some of the processes on your network to see what is causing the problem. (We are just going to use one PC to run the tests that would be done over an entire network.)

Procedures

In this lab, you will use the monitoring agent in the Windows 2000 administrator tools. First, you will begin by setting up review performances of the processor and then you will setup a counter log. Finally, you will setup an alert for the possessor.

Step 1

Click **Start**, point to **Programs**, point to **Administrative Tools**, and then click on **Performance**. (If your PC does not show the administrative tools, Right-click the **Taskbar** and click **Properties** click the **Advanced** tab. At the bottom put a **check** in the box next to **Display Administrator Tools**, click **Apply** and then **OK**.)

Click **System Monitor** in the left windowpane.

Step 2

In the right windowpane, locate the **+** sign button in the middle of the toolbar options. Click it.

What window opens? _____.

Step 3

In the Add Counters window click the **Use local computer counters**.

Next from the Performance object list use the drop down arrow and select **Processor.** Now in the box below, select the **% Processor Time** and click **Add**.

Repeat the step above to add the following counters; **% User Time**, **% Privileged Time**, **% Interrupt Time**. Then click **Close**.

Step 4

Now start several applications, such as Excel, Word, Paint, and Solitaire.

Click on the counter **% Processor Time**. Now in the tool bar above the chart click on the button that looks like a light bulb. What do you see happing with the possessor?

_____

Now click on the different counters you selected to see the utilization.

Right-click the desktop and watch the % Processor Time does this command utilize a lot of processor time? _____

Step 5

Now you will create a counter log. First delete all the counters that you just used by clicking on them and press the **Delete** key.

First click on the **Performance Logs and Alerts**. In the right window pane, right-click on **Counter Logs** and click **New Log Settings**.

In the name box type "TEST" And click **OK**. The TEST dialog box opens.

Step 6

Click **Add**, now the counters box opens. Click **Use local computer counters**.

Now from the Performance object list use the drop down arrow and select **Processor**. Now in the box below select the **% Processor Time** and click **Add**.

Form the drop down list select, **Memory** and then **% Committed Bytes In Use,** click **Add**. Then select **Physical Disk** from the drop down list and **% Disk Time** from the counters list, and click **Add**, and then **Close**.

Step 7

Click **Apply**, and click the tab **Log Files**. Change the End file names with option to yyyyddd.

Now click the **Schedule** tab. In the Start log box click **Manually**. In the Stop log box click **Manually**. In the After option enter 5 minutes. Then, click on **Apply** then **OK**.

Step 8

Click on **Counters Logs**, in the right windowpane right-click **TEST,** and then, click **Start**.

Step 9

Start several applications, such as Excel, Word, Paint, and Solitaire.

While you are waiting for the five minutes to expire use the application you opened. Doing this will show more results when the logging process is finished.

Step 10

When the TEST icon turns from green to red you are finished. (It may be necessary to refresh the screen. Click **Refresh** or push **F5**.)

Step 11

Now click the **System Monitor** in the left windowpane. Next, click the button forth from the left above the chart called **View Log File Data**.

Step 12

Select **TEST** and click **Open. Now** click the + sign button again to open the Add Counters dialog box. Add all counters and objects available. (Only the counters you selected for logging are available.)

Click Close. The data will appear in the chart. Did you use a lot of Processor Time or Memory? Is this chart helpful to see it in a graphical view?

Step 13

Now you will create an alert. In the left windowpane, click **Performance Logs and Alerts**, in the right windowpane right-click **Alerts** and click **New Alert Settings**.

Name this alert Processor Test, then click **Add**. The "Select Counters" window will appear. Select the **Processor** object. Then click the **% Processor Time** counter. Click **Add** and **Close**. In the "Alert when the value is:" list box, choose **Over**. Put **5** in the "Limit" box. Where it says "Sample data every" put the "interval" to every **30** seconds.

Step 14

Click the **Action** tab. Leave the checked box "Log an entry in the application event log" check the box "**Send a network message to**" and then enter your computer name. (If you do not know you computer name right-click **My Computer** and click **Properties**. Click **Network Identification** and you will see the full computer name.) Click the **Schedule** tab, click the **Start** scan Manually. Under "Stop scan" choose **After 2 minutes** and click **OK**.

Step 15

Right-click the **Processor alert**, select **Start**. Open a few applications this will increase your processor time. Now you will begin to receive system messages. Click **OK** to acknowledge the messages, wait 2 minutes.

Now click **Start** > **Programs** > **Administrative Tools** > **Event Viewer**. Click the **Application** Log**.** How many messages indicated that the processor exceeded the limit?

Windows Update

Estimated Time: 15 minutes

Objective

> To update service packages in Windows 2000.

Equipment

> The following equipment is needed for this exercise:

- A computer with Windows 2000 installed

Scenario

> As the system administrator of a small company, you are responsible for maintaining and upgrading the system and individual workstations. There is a new employee arriving next week, and the system that is going to be used needs to have upgrades installed.

Procedures

Step 1: Navigating to Windows Update website

1. Click on **Start** > **Windows Update**

   The following screen should appear.
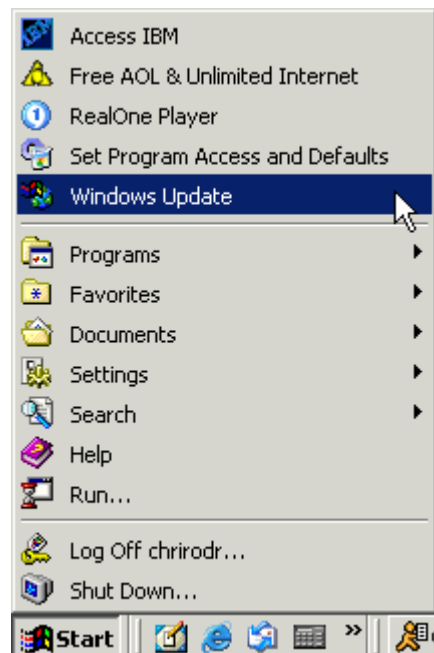
2. Click on **Windows Update**.

The screen should appear as follows.
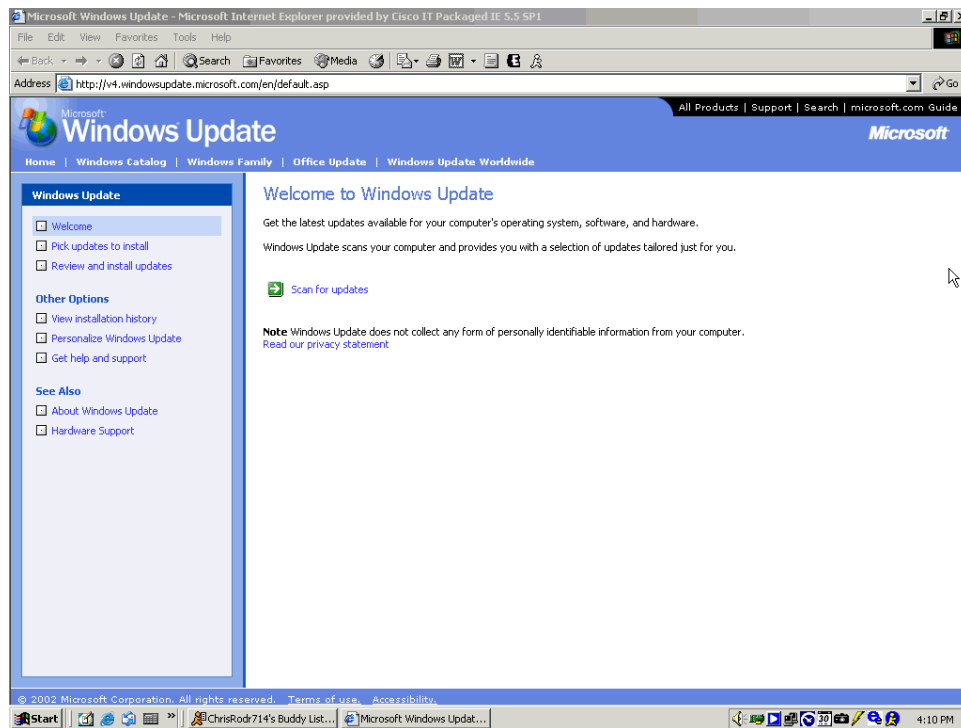
Step 2: Determining which upgrades to down load

1. Click on the **Scan for updates** radio button. Windows will scan the system and notify the user of the upgrades that are available. This may take some time depending on the system.
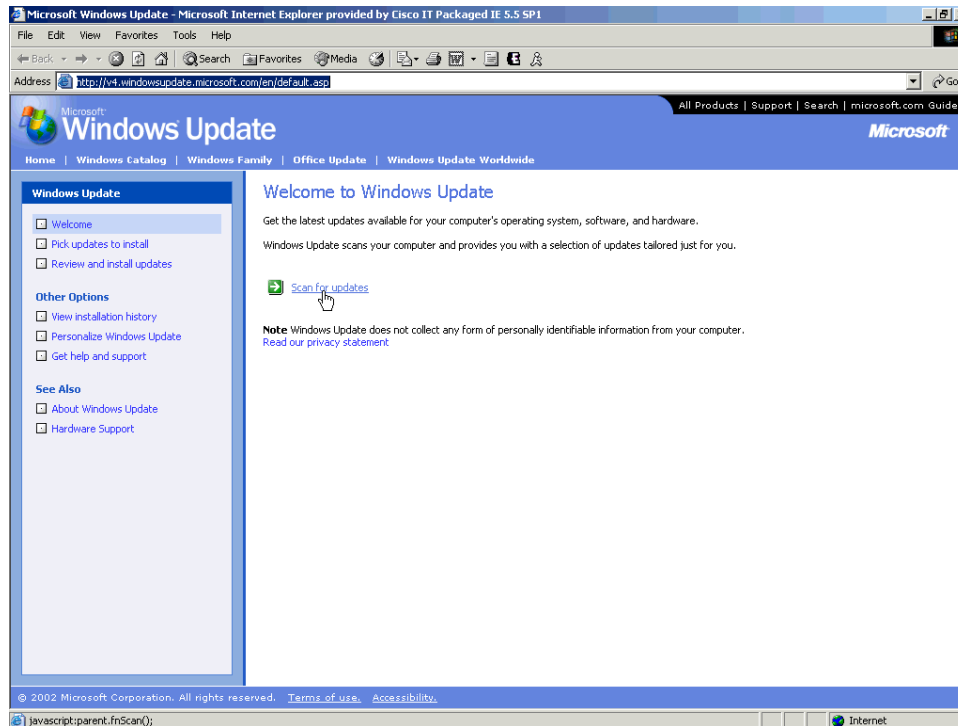
2. Once the scan is complete, the user must choose to add or remove an update.

   Note: The install packages in this picture will be different for other systems.

   The screen should look like the following.
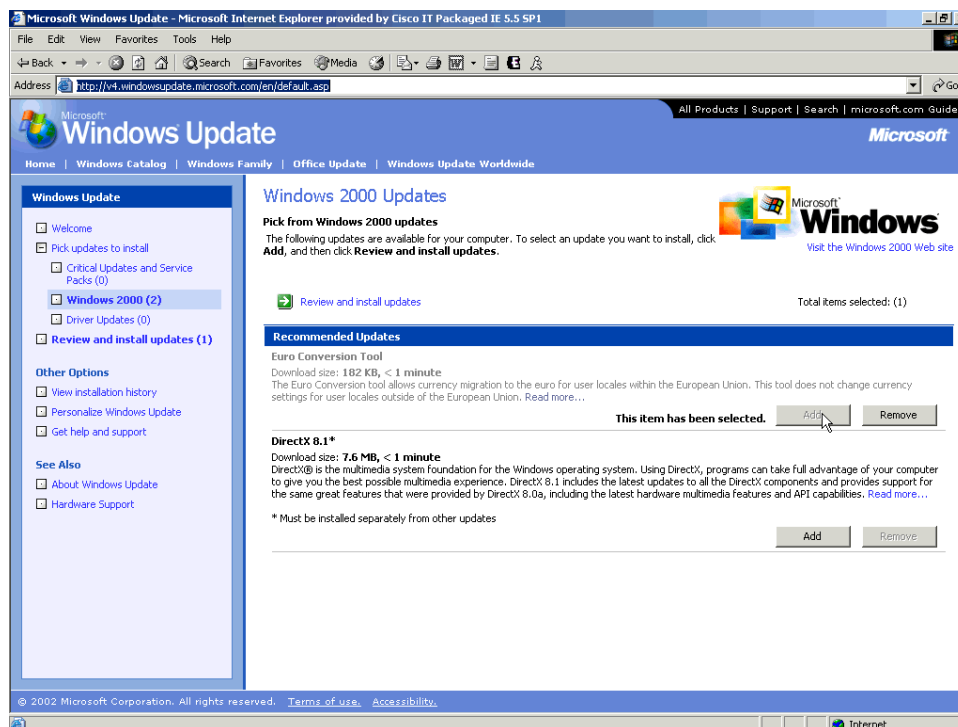
3. After the user has chosen the install packages, click on the **Install Now** button the screen will look like the screen below.
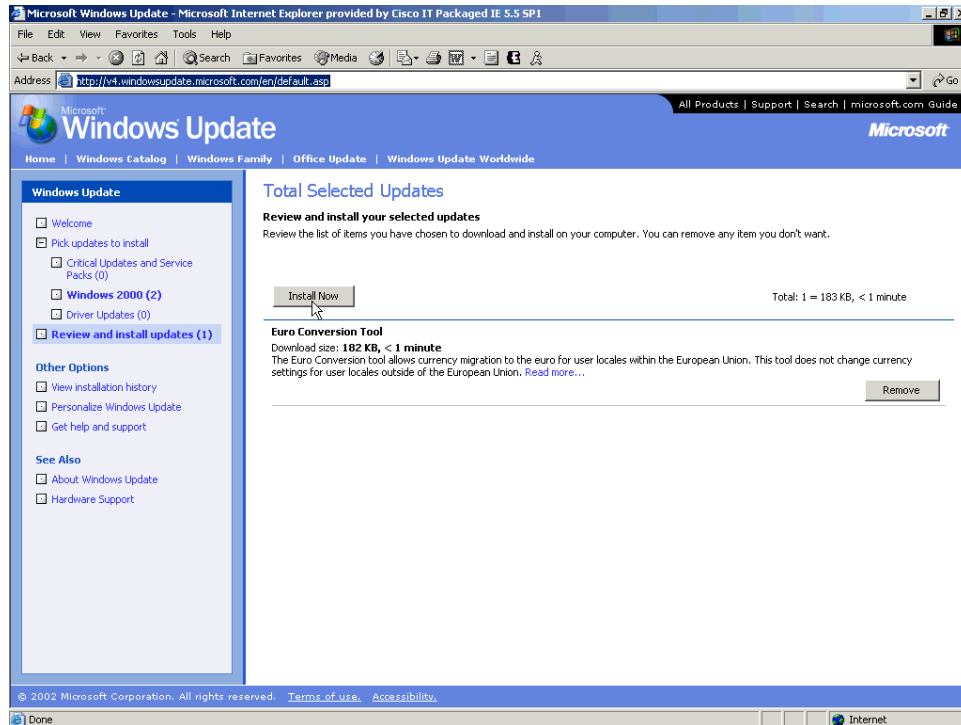
4. The Licensing agreement will pop up, click on the **Accept** button.
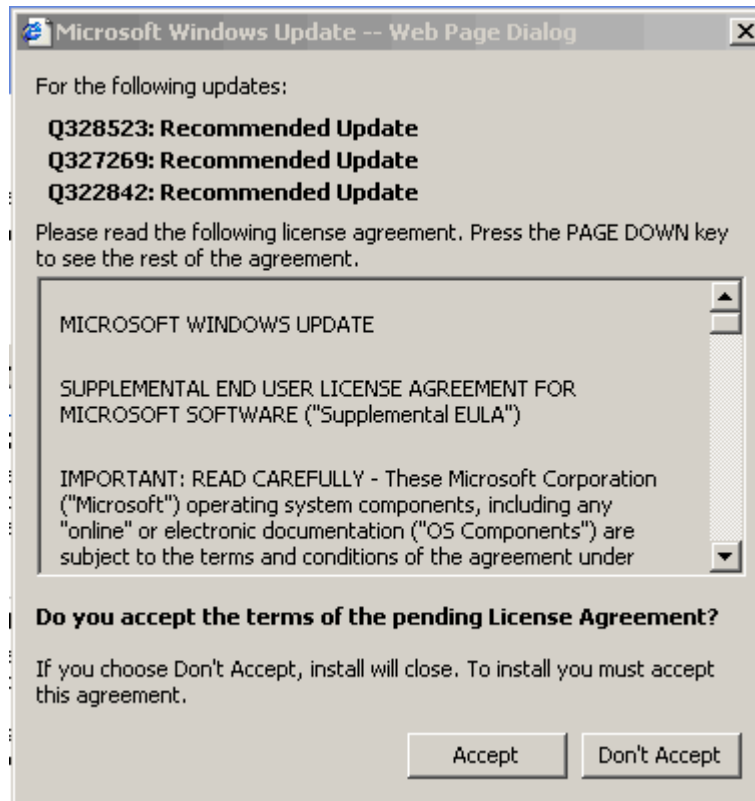
A dialog box will appear to inform the user of download and installation progress.
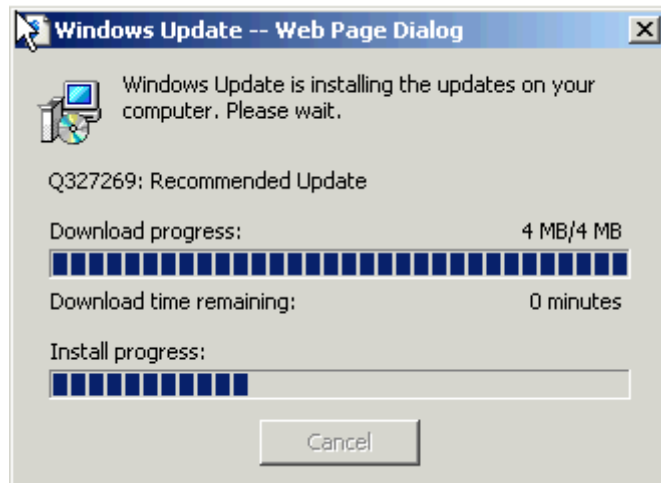
5. Once the down load and installation are complete, a message box will appear informing the user that the computer must be restarted to complete the installation. Click on the **OK** button.
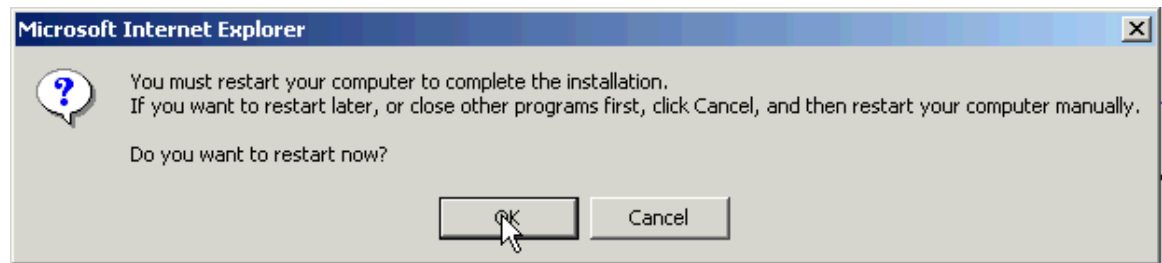
6. The upgrade to the system is complete.

Reflection

1. What are some circumstances that an upgrade would be needed?

   _____

   _____

2. What is another way to get a system upgraded? Why are upgrades beneficial for the system?

   _____

   _____

Operating System Basics

1. LANs were first created by installing _____ in the PCs and then connecting the adapters using _____ wire.

2. As network servers became more powerful, they began to take on the functions once handled by _____ and _____.

3. Whether designed for a stand-alone desktop computer or a multi-user network server, all operating system software includes the following components: _____, _____, and _____.

4. The _____ is a relatively small piece of code that is loaded into memory when the computer boots.

5. The _____ is the component of the OS that the user interacts with. It acts like a bridge between the user and the kernel.

6. Some GUI software can consume more than one hundred times the storage space that CLI software does. Because GUIs are more complicated than CLIs, GUI software requires significantly more _____ and _____.

7. When deployed as NOSs, UNIX and Linux are often configured without _____components.

8. Fill in the following Chart:

Operating System Supported	File System(s)
Windows 3.x	
Windows 95, 98, ME	
Windows NT, 2000	
Windows XP	
IBM OS/2	
Linux	

Microsoft Windows Basics

1. What are some reasons to use the CLI based MS-DOS operating system?

   _____

   _____

   _____

   _____

2. What are some disadvantages to using MS-DOS?

   _____

   _____

   _____

   _____

3. It was not until _____ was released in 1990 that Microsoft established its user interface as a major force in the industry.

4. _____ is an environment in which programs share memory addresses and exchange information.

5. A more efficient form of multitasking used by Windows 9x, Windows NT, and Windows 2000 is called _____.

6. _____ was the first Microsoft operating system to have networking components built in.

7. Windows 95 features, not available with previous versions of Windows include:
   _____, _____, _____, and _____.

8. Windows ME is generally recognized as part of the 9x family. List the main features of ME:

   a. _____

   b. _____

   c. _____

   d. _____

   e. _____

9. The Windows NT software featured improved _____, _____, _____, and _____.

---

10. Microsoft positioned Windows NT as an operating system for _____ and
    _____.

11. Windows XP and XP Professional offer many of the key features associated with a
    NOS. List these key features:

    a. _____

    b. _____

    c. _____

    d. _____

12. Fill in the following Chart:

Command	Result
dir	
cd *directory name*	
time	
date	
copy	
diskcopy [source] [destination]	
attrib	
find *text string*	
help	

UNIX and Linux on the Desktop

1. When UNIX first started to be marketed commercially in the 1980s, it was used to run _____, not _____.

2. What are some of the different distributions of Linux?

   a. _____

   b. _____

   c. _____

   d. _____

   e. _____

   f. _____

3. What distributions of Linux are making efforts to develop Linux as a viable operating system for the desktop?

   g. _____

   h. _____

   i. _____

4. Some advantages of Linux as a desk top operating system and network client include the following:

   _____

   _____

   _____

   _____

   _____

5. UNIX and Linux both rely on the _____ to display the GUI.

6. The _____ is the software responsible for sizing, positioning, and rendering the graphical windows that programs run in.

7. Users type commands that are interpreted by the _____, which in turn relays the user's instructions to operating system and other programs.

8. What are some of the tasks that can be done with the linuxconf tool?

    _____

    _____

    _____

    _____

    _____

Types of Networks

1. What characteristics define a LAN based network as opposed to a WAN based network?

   _____

   _____

   _____

2. What are the three basic types of Network topologies and what are the characteristics of each of these three network topologies?

   j.   _____

   k.   _____

   l.   _____

3. What purpose does a CSU/DSU provide in a WAN link?

   _____

   _____

   _____

4. Briefly describe a Peer-to-Peer Network and give examples of where this type of network can be implemented?

   _____

   _____

   _____

5. Describe a Client/Server Network and give some examples of the benefits of using a Client/Server approach.

   _____

   _____

   _____

The OSI Reference Model

1. This layer is responsible for providing reliable and unreliable data connections. _____

2. This layer specifies how addresses are assigned and how packets of data are forwarded from one network to another toward the destination. _____

3. This layer corresponds to the network hardware (cabling, media). This layer determines how binary data is translated into electrical, optical, or other types of physical signals transmitted between systems. _____

4. This layer provides the connection point for applications. It specifies the details of how an application makes requests and how the application on another machine responds. _____

5. This layer establishes the rules of the conversation between two applications. For example, will they take turns speaking, or can they send and receive at the same time. _____

6. This layer specifies how packets of data are organized into frames on a particular type of network and the rules for inserting frames on to the network media. _____

7. This layer specifies the arrangement, or syntax, of the data that the application expects. For example, .gif, .jpeg, .mpeg, .avi file extensions. _____

8. List the steps of encapsulation as if a user was creating the data to be sent out over the network to another user and explain what the corresponding OSI layer does to prepare the data to be sent over the network.

    a. _____

    b. _____

    c. _____

    d. _____

    e. _____

9. What layer of the OSI model does a router operate? _____

10. What layer of the OSI model does a switch operate? _____

Proprietary and Open Standards Comparison

This worksheet is designed to allow the students to research via the Internet some of the available options and software that is available in the open source market. Fill in the table with some examples of open source vs. proprietary applications and software.

Application Category	Proprietary Windows or 3rd Party Software	Open Source, Free, Downloadable Linux Software
1) Internet/Intranet		
Web browser		
Email client		
FTP-clients		
Firewall (packet filtering)		
Remote management		
2) File Management		
File manager		
HTML document viewer		
3) Utility Programs		
Achieve files, ZIP		
HTML editor		
CD burning software		
Graphic editor		
4) Office/Business		
Office suite		
Word processor		

Network Protocols

1. What are the some TCP/IP protocols that are used at the Application layer?

   a. _____

   b. _____

   c. _____

   d. _____

2. What are the two main protocols used at the Transport layer within the TCP/IP suite of protocols?

   a. _____

   b. _____

3. What are the defining characteristics of Transmission Control Protocol?

   _____

   _____

   _____

   _____

   _____

4. What are the defining characteristics of User Datagram Protocol?

   _____

   _____

   _____

   _____

   _____

5. What are some of the TCP/IP protocols that function at the Network layer of the OSI model.

a. _____

b. _____

c. _____

d. _____

e. _____

6. What is the protocol that you will use in a Novell Network to enable clients to locate the services they require, such as print or file services from servers.

a. _____

b. _____

Network Topologies

1. Describe the difference between a physical and logical topology.

   _____

   _____

   _____

   _____

   _____

2. Draw an example of a Bus topology.

3. Draw an example of a Star topology.

4. Draw an example of an extended Star topology.

5. The chapter lists some advantages of a Star topology. What are the advantages and disadvantages of a Start topology?

Advantages	Disadvantages

6. Draw an example of a Ring topology.

7. The lists some advantages of a Ring topology? What are the advantages and disadvantages of a Ring topology?

Advantages	Disadvantages

8. The _____ topology combines more than one type of topology. When a bus line joins two hubs of different topologies, the configuration is called a star bus.

9. Describe a scenario or environment where a hybrid topology would be used.

_____

_____

_____

_____

_____

Twisted Pair Cabling

1. Twisted wire pairs limit signal degradation caused by _____ and
    _____.

2. Category 5 and 5e have a maximum data transfer rate of _____
    Mbps.

3. What are the two types of twisted pair cabling?

    _____

    _____

4. How is the category of UTP cabling determined?

    _____

    _____

5. Category 3 cabling has a maximum data transfer rate of _____
    Mbps.

6. What categories of cabling are most commonly used on Ethernet connections?

    _____

    _____

7. There are _____ or _____ twisted pairs in a UTP
    cable.

8. UTP cabling relies solely on the _____ effect produced by the
    twisted pair wires.

9. Twisted pair is a type of cabling that is used for _____ and
    _____ connections.

10. What is the difference between category 5 and category 5e cabling?

    _____

    _____

11. What is the reasoning of twisting the wire pairs?

    _____

    _____

12. What do UTP and STP stand for?

_____

_____

13. In a shielded twisted pair cable eac h individual pair of wires is wrapped in a
_____, and then the four pairs of wires are wrapped in a
_____ to further shield the wires from noise.

14. UTP category 3 cabling is used for what type of connection?

_____

_____

15. Category 3 cabling has _____ pair of wires.

Physical Media Types

True or False

1. _____ An advantage of coaxial cable is that you can run the cable for much longer distances between nodes than twisted-pair cable.

2. _____ Ethernet cable is known to be more difficult to install than thicknet/coaxial cable.

3. _____ When installing cable in a ceiling that must conform to fire codes and be fire retardant you should use PVC grade cable.

4. _____ Coaxial cable is the common cable type that is used in Ethernet Networks.

5. _____ STP reduces electrical noise, both within the cable (crosstalk) and from outside the cable (EMI and RFI).

6. _____ Fiber-optic cable provides faster bandwidth speeds than Ethernet cable as well as provides for greater signal integrity over long distances. It is also not susceptible to cross talk and EMI because it uses beams of light to carry signals instead of copper wiring.

7. _____ FHSS and DSSS are two approaches currently being used to implement spread spectrum for Wireless LAN transmissions.

8. _____ A benefit of wireless networks is that they are entirely secure on the signaling frequency and not easily monitored by people not on the network.

9. _____ The most popular type of cabling used in an Ethernet network is Category 3 UTP.

Network Devices

1. Define the following terms:

    a. Active Hub – _____

    b. Passive Hub – _____

    c. Intelligent Hub – _____

    d. Bridge – _____

    e. Switch – _____

    f. Router – _____

2. Sometimes hubs are called _____. This is because they serve as a central connection point for an Ethernet LAN.

3. _____ can be computers with special network software installed on them or they can be other devices built by network equipment manufacturers.

4. Hubs operate at the _____ layer of the OSI model.

5. A _____, has many ports with many network segments connected to them. A _____ chooses the port to which the destination device or workstation is connected to.

6. _____ are the most sophisticated internetworking devices discussed so far and they operate at the Network layer of the OSI model.

7. _____ operate at the Data Link layer of the OSI model.

The TCP/IP Network Model

1. Fill in the blank TCP/IP Model as it corresponds to the OSI Model.

OSI Model	TCP/IP Model
Application	
Presentation	
Session	
Transport	
Network	
Data link	
Physical	

2. _____ and _____ are TCP/IP-based applications used for file transfer and are located at the Application layer of the TCP/IP Network Model.

3. List some of the other protocols that function at the Application Layer.

   a. _____

   b. _____

   c. _____

   d. _____

   e. _____

4. Unlike the transport layer of the OSI model, which defines protocols like Novell's SPX, the TCP/IP transport layer defines only _____ and _____.

5. _____ is achieved through the use of a technique called windowing, that allows communicating hosts to negotiate how much data will be transmitted during a given period.

6. _____ help define and keep track of all the different types of conversations that are taking place throughout the network.

7. Fill in the blank spaces with the appropriate port number that corresponds to the protocol.

FTP	Telnet	SMTP	DNS	TFTP	SNMP	RIP

8. The system administrator has the ability to specify which types of traffic will be allowed into a network by permitting or denying Internet traffic based on these port numbers. This process of filtering based on port numbers is usually accomplished with _____ or _____ devices.

9. The _____ layer of the TCP/IP model, as also sometimes called the network layer, defines addressing and path selection.

10. Some of the protocols defined at this layer are:

   a. _____

   b. _____

   c. _____

   d. _____

11. _____ is used to find the MAC address of a host, switch, or router, when given its IP address.

12. The _____ layer defines TCP/IP-specific functions related to the preparation of data for transmission over the physical media, including addressing. This layer also specifies what types of media can be used for the data transmission.

IPv4 Addressing Overview

1. Convert the binary number 1010 to decimal:

   _____

2. Convert the binary number 11110000 to decimal:

   _____

3. Convert the binary number 10101111 to decimal:

   _____

4. Convert the decimal number 100 to binary:

   _____

5. Convert the decimal number 249 to binary:

   _____

6. Convert the decimal number 128 to binary:

   _____

7. Convert the decimal number 65 to binary:

   _____

8. Convert the decimal number 63 to binary:

   _____

9. Convert the decimal number 198 to binary:

   _____

10. Convert the decimal number 400 to binary:

   _____

Subnetting

1. Define Subnetting.

    _____

    _____

    _____

    _____

    _____

2. 210.58.101.5 is a Class _____ address.

3. 10.2.1.1 is a Class _____ address.

4. 163.58.101.5 is a Class _____address.

5. Define the term Subnet Mask.

    _____

    _____

    _____

    _____

6. You are using a Class C subnet mask, how many hosts will you be allowed to have on this subnet? _____

7. You are using a Class A subnet mask, how many hosts will you be allowed to have on this subnet? _____

8. You are only using 22 bits of Subnetting your network. How many hosts will you be allowed to have on this subnet and what will your subnet mask be?

    _____

9. You are using 20 bits for Subnetting your network. How many hosts will you be allowed to have on this subnet and what will your subnet mask be?

    _____

10. You are using 27 bits for Subnetting your Network. How many hosts will you be allowed to have on this subnet and what will your subnet be?

    _____

Network/NOS Services

Match each term with its description:

1. _____ File Sharing
2. _____ Remote Administration
3. _____ Network Administration
4. _____ Internet Mail
5. _____ World Wide Web Server
6. _____ Directory Services (Internet)
7. _____ Automatic Network Address Configuration
8. _____ File Transfer

a. Telnet

b. SMTP, POP3, IMAP

c. HTTP

d. NFS

e. DHCP

f. FTP, TFTP

g. DNS, LDAP

h. SNMP

Windows 2000 Active Directory

1. The Active Directory information is stored in three files:

   a. _____

   b. _____

   c. _____

2. _____ is the means by which Windows 2000 administrators control user desktops, automatically deploy applications, and set user rights.

3. The logical structure of Active Directory is based on units called _____.

4. Windows NT uses a flat domain structure, and Windows 2000 arranges domains in hierarchical_____.

5. How can Administrative Authority be delegated in Windows 2000 as opposed to Windows NT?

   _____

   _____

   _____

6. **True or False:** _____ Windows 2000 Active Directory needs only one DNS server per domain to operate.

7. **True or False:** _____ It is recommended that you have one Domain Controller per Domain.

8. Active Directory uses _____to copy directory information between the domain controllers in a domain.

9. Define these two terms:

   Assigned Permissions – _____

   _____

   _____

   Inherited Permissions – _____

   _____

   _____

System Config Files

Describe the contents/operations of the following network config files. Use the cat or the more commands to examine the contents of the files.

1. /etc/hosts

   _____

   _____

   _____

2. /etc/resolv.conf

   _____

   _____

   _____

3. /etc/sysconfig/network

   _____

   _____

   _____

4. /etc/sysconfig/network-scripts/ifcfg-eth0

   _____

   _____

   _____

5. /etc/services

   _____

   _____

   _____

6. /etc/sysconfig/desktop

_____

_____

_____

7. /etc/sysconfig/clock

_____

_____

_____

8. /etc/sysconfig/hwconf

_____

_____

_____

9. /etc/sysconfig/harddisks

_____

_____

_____

10. /etc/sysconfig/init

_____

_____

_____

11. /etc/sysconfig/iptables

_____

_____

_____

12. /etc/sysconfig/ipchains

_____

_____

_____

13. /etc/sysconfig/irda

_____

_____

_____

14. /etc/sysconfig/sendmail

_____

_____

_____

Characteristics of a Network Operating System

1. What is the function of an operating system?

    _____

    _____

    _____

2. Compare and contrast a PC operating system and a NOS.

    _____

    _____

    _____

3. Define the term: Multitasking System

    _____

    _____

    _____

4. To achieve higher execution speeds, some systems are equipped with more than one processor. Such systems are called _____ systems.

5. _____ means that the server systems must be able to function effectively under heavy load and be able to survive the failure of one or more processes or components without experiencing a general system failure.

6. What are the five criteria for choosing a NOS?

    a. _____

    b. _____

    c. _____

    d. _____

    e. _____

7. Describe the benefits "Scalability" adds to a NOS?

_____

_____

_____

_____

_____

_____

Windows NT/2000

1. A _____ is a grouping of computers and users that serves as a boundary of administrative authority.

2. Microsoft uses the term _____ to describe the logon authentication servers that hold a copy of the security accounts database.

3. NT runs DOS and older Windows programs in _____. Using this method, if one application crashes, it does not affect other applications or require a reboot of the operating system.

4. Windows NT provides an administrative tool called the _____ that is accessed from the domain controller and is used to create, manage, and remove domain user accounts.

5. The _____ controls the authentication process when a user logs into the domain.

6. _____ technology allows an administrator to add components to the system and the OS will automatic ally recognize and install the drivers for the device.

7. Administrative tasks in Windows 2000 use a common framework, called the _____.

8. Compare and contrast the four operating systems in the Windows 2000 family of operating systems.

    a. Windows 2000 Professional: _____

    _____

    _____

    b. Windows 2000 Server: _____

    _____

    _____

    c. Windows 2000 Advanced Server: _____

    _____

    _____

    d. Windows .NET Server: _____

    _____

Linux Distribution Comparison

Estimated Time: 20 Minutes

Step 1

In the table below list three major Linux distributions.

Ref. site: http://distrowatch.com/

Linux Distribution	Pros	Cons
1.		
2.		
3.		

Which one would you use for a small company? Why?

_____

Would you change you answer above if you were going to install Linux in a large company?

_____

Step 2

In the space below list some of the highly desirable qualities of Linux.

_____

_____

_____

Name some ways to find software for your Linux system:

_____

_____

_____

Ref. site for RPM's: www.rpmfind.net

Linux

1. Linux is_____, which means you'll find versions running on name brand or clone PCs, Apple Macintoshes, Sun workstations, or Digital Equipment Corporation Alpha-based computers.

2. The _____ provides a trademark for software developers who want to share their code with others, who are then free to modify and redistribute the code.

3. _____ operating systems are used on high-end workstations such as Silicon Graphics and Sun machines.

4. What are some of the most popular or well-known versions of Linux?

   a. _____

   b. _____

   c. _____

   d. _____

   e. _____

   f. _____

5. Recently, versions of Linux that fit on one or two floppy disks have been created. One such trimmed version is called _____, which fits on one disk.

6. Windows clients can access Linux servers without client software if the UNIX servers run _____, which is a program that uses the _____ application layer protocol.

7. What are the criteria for meeting the Open Source trademark?

   _____

   _____

   _____

   _____

   _____

Planning the Installation

2. Name five items you need to verify prior to the actual installation.

   f. _____

   g. _____

   h. _____

   i. _____

   j. _____

3. List two things that need to be checked at the installation site before bringing in the equipment?

   _____

4. What is a digital multimeter? What would a correct reading be if you were in Africa?

   _____

   _____

5. What does UPS stand for? And how large should a UPS be for a server room?

   _____

   _____

6. What is the heat load of a server room measured in?

   _____

7. What is the ideal temperature in a server room?

   _____

8. What will ensure proper airflow and adequate cooling in the server room?

   _____

9. Why is it a good idea to test the network connection before installing?

   _____

   _____

   _____

Server Components

1. List three components of a typical server.

   a. _____

   b. _____

   c. _____

True or False Questions

2. _____ Multiple NICs can be installed on one server.

3. _____ RAID controllers can be configured after the network operating system is installed.

4. _____ SCSI-2 and SCSI-3 use the same cables to connect to a device.

5. _____ A SCSI external cable and internal cable look different.

6. _____ Only CD-R and CD-RW devices can be used for backups.

7. _____ A UPS can monitor the server only by a serial or USB cable.

Fill in the blank with the correct word below

KVM	Disk Drive	DVD	Memory	Processors
Server	chassis	Server Rack	3.5" floppy	CD-ROM

8. List three devices commonly found in both desktop computer systems and server systems.

   _____ , _____ , _____

9. _____ allows one keyboard/video/mouse to be hook ed up to multiple network servers.

10. IDE and SCSI a re two different types of _____.

11. Network servers require a large amount of _____.

12. _____ come in tower configuration or rack-mount configuration.

13. Network servers normally have more than one _____.

14. The _____ is a place to mount server components.

Hardware Requirements

Fill in the following charts with the correct information:

1. Windows 2000 Advanced Server:

Computer/Processor	
Memory	
Hard Disk	
Drive	
Display	
Peripheral	

2. Windows XP Professional

Computer/Processor	
Memory	
Hard Disk	
Drive	
Display	
Peripheral	

3. Linux Red Hat 7.1

Computer/Processor	
Memory	
Hard Disk	
Drive	
Display	
Peripheral	

File System

1. What are the file systems that Windows 2000 Server supports?

   a. _____

   b. _____

   c. _____

2. Name the different types of FAT and what each one contributes to the file system.

   a. _____

   b. _____

   c. _____

3. What are the benefits of NTFS version 5 over the different FAT file systems?

   _____

   _____

   _____

4. How does the Unix file system differ from the Windows file system?

   _____

5. What is the name of the Unix/Linux top level directory of the file system?

   _____

6. Which is the oldest Linux file system?

   _____

7. Linux supports which file systems?

   _____

The Boot Process

1. List the five stages of the Windows 2000 boot process:

   a. _____

   b. _____

   c. _____

   d. _____

   e. _____

2. The boot process will be slightly different on non-Intel based systems because NTLDR is not needed. On these systems there is a file called _____ that performs this function.

3. What function controls the boot process and why?

   _____

   _____

   _____

   _____

   _____

4. During the _____, a computer will test its memory and verify that it has all the necessary hardware, such as a keyboard, mouse, and so on.

5. After the POST routine is complete, the computer will locate a boot device, and load the _____ into memory, which in turn locates the active partition and loads it into memory. This component of the boot process allows the operating system to load into RAM.

6. What is the name of the "Operating System Loader" file, which is used to begin loading the operating system? _____

7. The _____ file will only be used in the event that the computer is set up to dual-boot.

8. If the computer is not dual boot capable, then NTLDR runs_____, which will gather information about the computer hardware.

---

9. Four additional steps will take place at a point in the boot process when the graphical user interface (GUI) is first seen and a status bar shows that the GUI is now loading. What are these four steps and briefly describe what is occurring in each step?

a. _____

_____

_____

_____

b. _____

_____

_____

_____

c. _____

_____

_____

_____

d. _____

_____

_____

_____

Linux Boot Process

True or False

1. _____ The Linux boot process is much more complicated and involved than the Windows 2000 boot process.

2. _____ The NTLDR file in Windows performs the same function as does the LILO file in Linux.

3. _____ The boot processes of Windows compared to Linux are very different.

4. _____ The Linux kernel file works in a similar fashion to only the NTOSKRNL file in Windows.

5. _____ What file in Linux performs the similar function of the SMSS.exe file in Windows?

Installing the OS

1. Microsoft has a tool called the _____ that can be used before installing Windows 2000 to verify that the hardware will actually work with Windows 2000.

2. The four steps in the Windows 2000 installation process are:

    a. _____

    b. _____

    c. _____

    d. _____

3. **True or False:** _____ You can convert a drive from FAT to NTFS as well as from NTFS to FAT.

4. By default, the Windows 2000 operating system files are installed in the _____ folder.

5. During the installation there is a built-in administrator account created that has privileges to make any changes to the computer. The password for this account can be changed later, but only by the user that has _____ to the system.

6. During the Networking Component stage of the Installation three key components are installed. What are they and what do they do?

    a. _____

    _____

    b. _____

    _____

    c. _____

    _____

7. What are the four types of installations that can be performed when installing Windows 2000?

    a. _____

    b. _____

    c. _____

    d. _____

---

8. If you want to view Microsoft's HCL how would you accomplish this , without going to Microsoft's Website?

_____

_____

_____

_____

User Accounts

1. Before logging on to any Windows 2000 client, a _____ must first be created on the appropriate network server.

2. The task of creating an account in Windows 2000 is performed with the _____ tool.

3. The "User name" is a required field, must be no longer than 20 characters in length, and cannot contain the following symbols: _____

4. The simplest user management technique is to right-click the user name listed in the right half of the Computer Management window and select the appropriate task from the menu. From here, the system administrator can instantly choose to _____, _____, or _____ the user.

The Linux Shells

1. The Linux shells operate as a _____.

2. **True or False:** _____ In Linux, the shell is integrated into the kernel and is always running.

3. Match the item below to the corresponding Linux Shell

   a. The Korn Shell _____

   b. The C Shell _____

   c. Bourne Again Shell _____

   d. The Bourne Shell _____

   A. This shell was created as an enhanced extension of the Bourne Shell. This shell is referred to as the Bash shell and is used for many "UNIX-like" systems such as Linux for example.

   B. This shell is not widely used because it is one of the more complicated shells to work with. It uses a much more complex syntax for shell programming than some of the other shells. For this reason, the C shell is not recommended for shell programming or for creating shell programs.

   C. This is known as the original UNIX shell. The program name is (sh) and is known as the bash shell in Linux systems. This shell provides all the (sh) functions as well as shell programming using shell script files.

   D. This shell combines the interactive features that make the C shell popular with the easier-to-use s hell programming syntax of the Bourne shell.

The vi Editor

1. Linux includes a powerful editing tool call the _____ that will allow editing of the configuration and script files as well as creation of some configuration and script files.

2. You can access "edit" mode by choosing the command _____.

3. There are three modes of operation in vi:

   a. _____

   _____

   b. _____

   _____

   c. _____

   _____

4. Fill in this chart:

Mode	Functions/Characteristics
Command Mode	
Entry Mode	
Last-Line Mode	

5. Describe the difference between vi Editor and another text editor such as Microsoft's notepad.

   _____

   _____

   _____

   _____

   _____

Bottlenecks

1. What is a bottleneck?

   _____

2. What effect can a bottleneck have on a network? Give some examples of
   bottlenecks.

   _____

3. What are some performance monitoring software utilities for Windows 2000 and
   UNIX/Linux?

   _____

4. When watching the processor on performance monitor what do you look for?

   _____

5. What are the solutions to a processor with a high utilization percentage?

   _____

6. How can you solve a memory bottleneck?

   _____

7. What are some initial signs of a memory bottleneck?

   _____

8. At what percent does the disk subsystem pose a bottleneck?

   _____

9. List the first three steps to resolving a disk performance problem?

   _____

   _____

   _____

10. What is the more costly approach to fixing a disk subsystem bottleneck?

   _____

   _____

   _____

11. At what percentage is the network utilization considered high?

_____

_____

_____

12. Would this scenario solve the network subsystem problem?

   Scenario: You want to make you network subsystem faster after you realize a bottleneck. You are running at 10 Mbps Ethernet network over CAT 3 wire. You believe higher transmission speeds will solve the problem, so you upgrade to 100Mbps NICs and replace all other 10Mbps hardware with 100Mbps hardware. Will this solve the bottleneck in the network subsystem? Explain your answer.

   _____

   _____

   _____

   _____

   _____

13. What are possibilities for upgrading the network to improve speed and thus removing bottlenecks?

   _____

   _____

   _____

   _____

   _____

Baselines

1. What does a baseline consist of?

   _____

2. What time is optimum to take a baseline reading of your network?

   _____

3. What are a few measurements that should be taken when performing a baseline?

   _____

4. What can be done to reduce heavy bandwidth users once they are identified?

   _____

5. What network monitoring application can use a lot of bandwidth and should be used during down times?

   _____

6. What is mapping of utilization patterns used for?

   _____

7. When is a good time to use network monitoring software?

   _____

8. How could you as an administrator find out if employees are gaming or web surfing?

   _____

Using TCP/IP Utilities

1. If the universal naming convention (UNC) path is known, the server can be reached as long as the connection is good. This is the format to use:

   _____

2. TCP/IP tools that test connectivity to another machine and determine the path that a packet takes to reach the destination include the following:

   a. _____

   b. _____

3. Ping stands for: _____

4. The first step in checking for a suspected connectivity problem is to _____ the host.

5. The term _____ refers to the amount of time that elapses between the sending of the Echo Request and receipt of the Echo Reply.

   _____

6. This tool combines the features of ping with those of tracert and provides additional information that is not displayed by either utility. With _____, it is possible to detect which routers are causing problems on the network and to measure how many packets are lost at a particular router.

7. _____ utilities are used to discover the route taken by a packet to reach its destination.

8. Each operating system includes a utility to display the IP configuration being used by the system or network adapter. The table below lists the commands used by various operating systems. Fill in this chart:

Operating system	Configuration display command
NetWare	
Windows 2000	
Linux and UNIX	

9. These utilities display TCP/IP and NetBios statistical information:

   _____

Windows 2000 Diagnostic Tools

1. This command runs a standard set of network tests and generates a report of the results, is not a standard Windows 2000 Server installation, and may be used without any flags.

   a. ipconfig

   b. tracert

   c. pathping

   d. netdiag

2. The command `C:\ > netstat -a` displays what information?

   _____

   _____

   _____

3. What information does the `tracert` command give that the ping command does not?

   _____

   _____

   _____

4. The _____ command allows you to test communications between the current network server and another computer, and can use an IP address or an IP name.

5. What is the name of the TCP/IP utility used to test name resolution from a DNS server? _____

6. What is the name of the TCP/IP utility that is used to test communications between the current network server and another server on the network? _____

7. What is the name of the TCP/IP utility that will report the routers that a communication packet passes through when traveling from one network server to another? _____

Threats to Network Security

1. Common services such as _____ and _____ must be secured on a corporate network, so that only authorized users have access to sensitive and personal information.

2. By the late 1990s, all of the major developers of NOSs, including Apple and Novell, built their software around _____ and _____ services.

3. List the risk s associated when TCP/IP services are run on a NOS connected to the Internet.

    a. _____

    b. _____

    c. _____

4. Several outside sources can be the cause of these attacks, including:

    a. _____

    b. _____

    c. _____

    d. _____

5. Describe the difference between a Hacker and a Cracker.

    _____

    _____

6. A _____ attack occurs when the targeted system cannot service legitimate network requests effectively because the system has become overloaded by illegitimate messages.

7. Denial of Service attacks come in many forms. Common DoS attacks try to take advantage of weak nesses with _____, or weaknesses in _____.

8. A _____ or _____ attack is designed to overwhelm the software running on the target system.

9. _____ attacks can be very difficult to stop because they can originate from hundreds or even thousands of coordinated hosts.

10. A _____ is a program that presents itself as another program to obtain information.

Implementing Security Measures

1. _____ involves converting data into a form that can't be easily understood by others.

2. When documents are encrypted on the disk, only a user who has the _____ can view them.

3. File encryption protects data stored on a disk, but it does not offer security for data as it is _____.

4. IPSec uses two protocols: (define both)

   a. _____

   b. _____

5. SSL was developed by Netscape to provide security for its web browser. It uses _____ and _____.

6. Popular e-mail protection programs include the following:

   a. _____

   b. _____

   c. _____

   d. _____

7. Public/Private Key Encryption is also referred to as _____.

DHCP and Firewalls

Use the text or Internet searches to briefly define/describe the following terms:

1. IP forwarding

   _____

   _____

   _____

2. Smurf Attack

   _____

   _____

   _____

3. IP Spoofing

   _____

   _____

   _____

4. VPN

   _____

   _____

   _____

5. NAT (IP Masquerading)

   _____

   _____

   _____

6. ipchains

   _____

   _____

   _____

7. iptables

_____

_____

_____

8. Non-Stateful Packet Filtering Firewall

_____

_____

_____

9. Stateful Packet Filtering Firewall

_____

_____

_____

Use the text, man command, or Internet searches to briefly define/describe the function(s) of the following commands:

1. netstat

_____

_____

_____

2. chkconfig

_____

_____

_____

3. lokkit

_____

_____

_____

4. `ifdown eth0`

_____

_____

_____

5. `ifup eth0`

_____

_____

_____

In the space below, list the ranges of the three private IP addresses.

_____ – _____

_____ – _____

_____ – _____