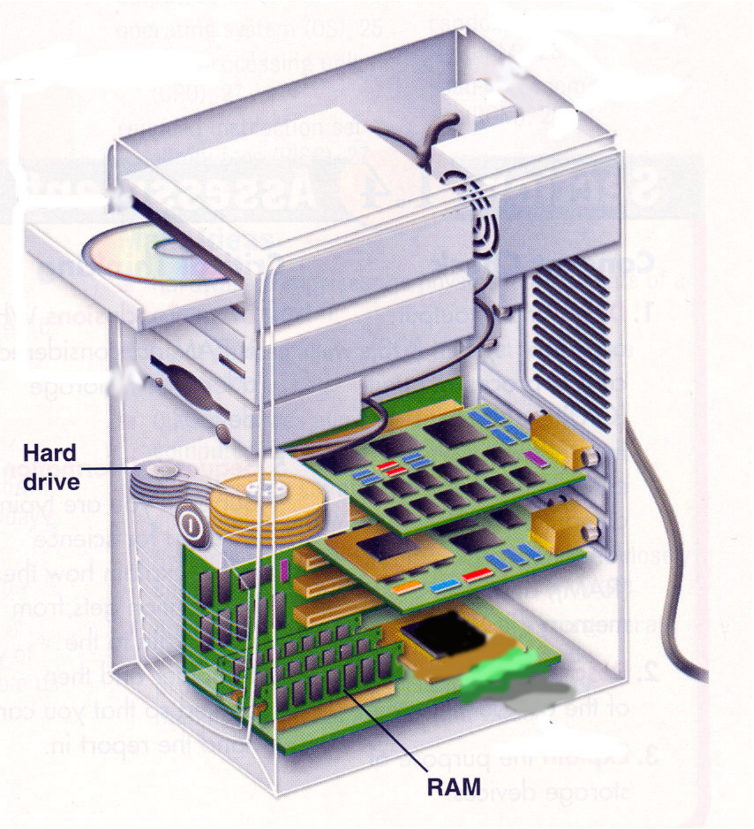
Cisco | Networking Academy®
Mind Wide Open™

CCNA Discovery 4.0

Networking for Home and Small Businesses

Student Lab Manual

Lab 1.3.2 Determining Data Storage Capacity



Objectives

- Determine the amount of RAM (in MB) installed in a PC.
- Determine the size of the hard disk drive (in GB) installed in a PC.
- Determine the used and available space on the hard disk drive (in GB).
- Check other types of storage devices (floppy, CD-ROM, DVD).

Background / Preparation

The storage capacity of many PC components is measured in megabytes (MB) and gigabytes (GB). These components include RAM, hard disk drives, and optical media, such as CDs and DVDs. In this lab, you will determine the capacity and space available for various computer components.

The following resources are required:

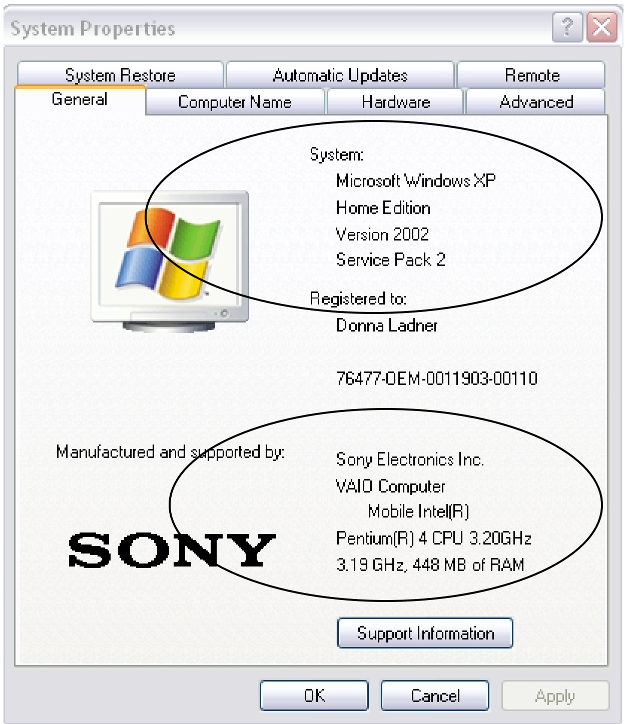
- Computer with Windows XP installed

Step 1: Identify the RAM in a computer

a. With Windows XP, there are two ways to view control panels: **Classic View** and **Category View**. The options available depend on which one of these two views you are using. If you see the **Switch to Category View** option on the left, you are currently in the classic view mode. If **Switch to Classic View** is displayed, you are currently in **Category View** mode. For this step, you want to use **Classic View** mode.

b. From the **Start** menu**,** select **Control Panel**. In the **Control Panel**, choose **System** to open the **System Properties** dialog box. Alternatively, you can get this information by clicking the **Start** button and right clicking the **My Computer** icon. Next, choose **Properties** from the drop-down menu.

The computer operating system and service pack information are listed in the upper part of the dialog box. The computer processor type, speed, and memory are listed in the lower portion.



System:
Microsoft Windows XP
Home Edition
Version 2002
Service Pack 2

Registered to:
Donna Ladner

76477-OEM-0011903-00110

Manufactured and supported by:
Sony Electronics Inc.
VAIO Computer
Mobile Intel(R)
Pentium(R) 4 CPU 3.20GHz
3.19 GHz, 448 MB of RAM

Computer operating system and service pack information

Computer processor type, speed, and memory

c. In this example, the computer processor is a Pentium 4 processor with a clock speed of 3.20 gigahertz (GHz). Clock speed is a measurement of the number of cycles per second that a processor is capable of doing. The number of cycles impacts the number of instructions per second that the CPU can process. A higher clock speed generally means that a processor is capable of executing more instructions per second.

The computer has 448 MB of RAM available for the CPU.

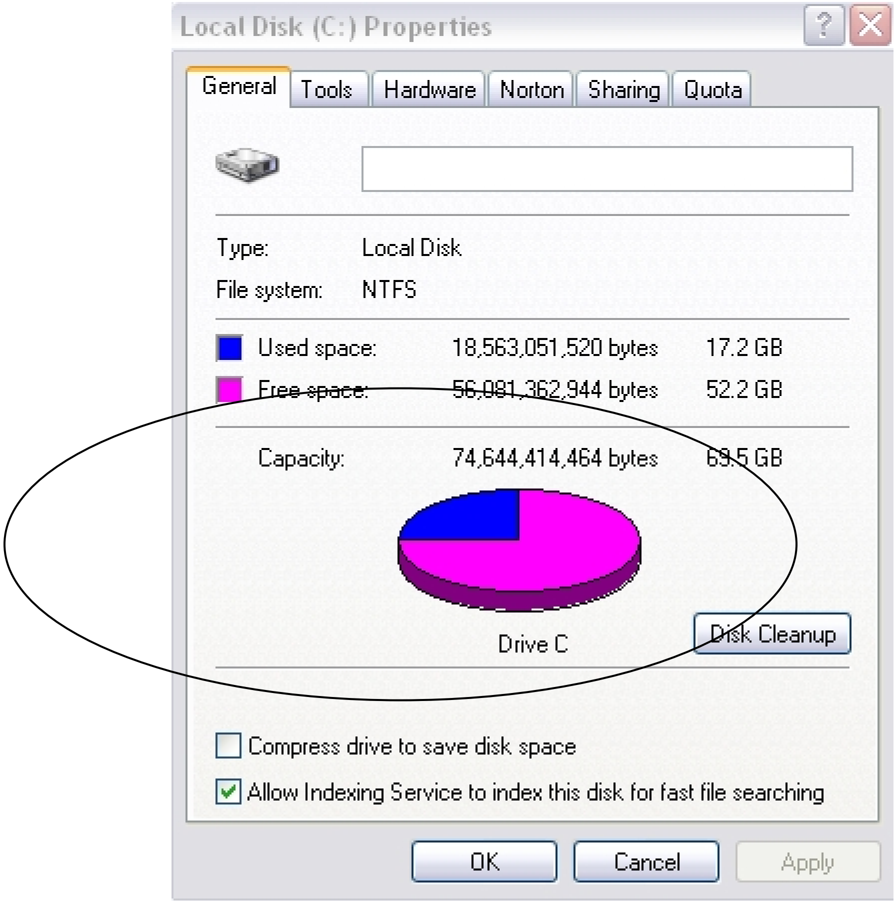
d. Check your computer and determine the amount of RAM available to the CPU. How much RAM is in your computer? ____

____

Step 2: Determine the size of the hard disk drive

a. Double-click the **My Computer** icon on your computer desktop. If you do not have a **My Computer** icon, click **Start** and choose **My Computer**.

b. Right-click the local disk drive under the Hard Disk Drives Section (which is usually the C drive), and select **Properties**. This opens the **Local Disk Properties** dialog box. The total capacity of the hard drive is shown above the Drive C icon.



Type: Local Disk

File system: NTFS

🟦	Used space:	18,563,051,520 bytes	17.2 GB
🟪	Free space:	56,081,362,944 bytes	52.2 GB
	Capacity:	74,644,414,464 bytes	69.5 GB

□ Compress drive to save disk space

☑ Allow Indexing Service to index this disk for fast file searching

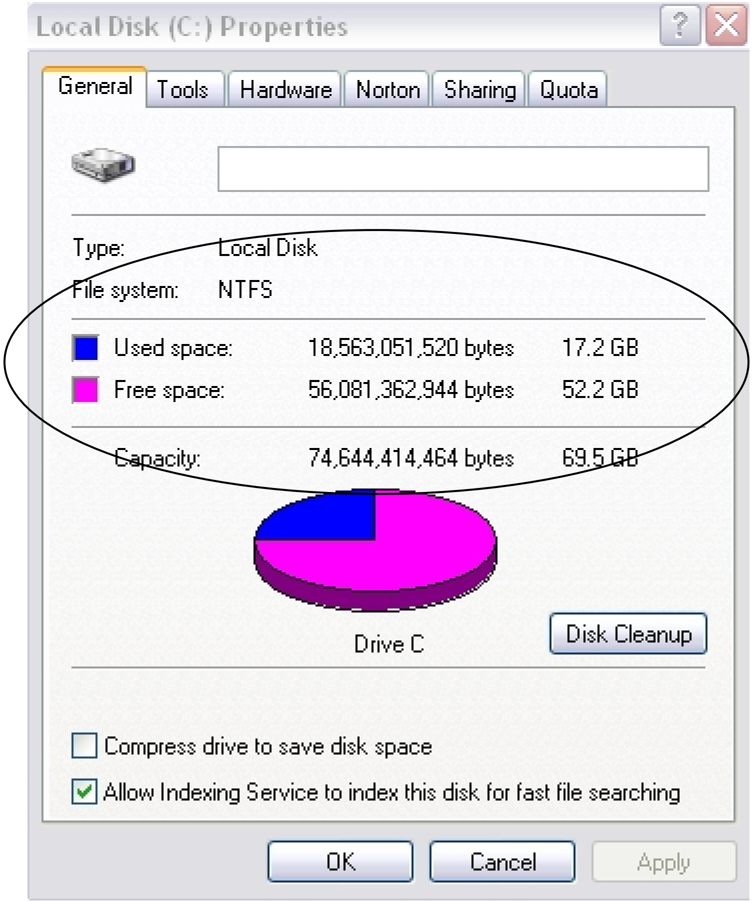
c. Determine the size of the hard drive on your computer. What is the total size of the hard drive in GB?

____

d. Keep the **Local Disk Properties** dialog box open for the next step.

Step 3: Determine the free space and used space on the hard drive

a. In the **Local Disk Properties** dialog box, the used and free space is shown in both bytes and GB above the Capacity.



Local Disk (C:) Properties

Type:	Local Disk	
File system:	NTFS	
🟦 Used space:	18,563,051,520 bytes	17.2 GB
🟪 Free space:	56,081,362,944 bytes	52.2 GB
Capacity:	74,644,414,464 bytes	69.5 GB

Drive C

□ Compress drive to save disk space

☑ Allow Indexing Service to index this disk for fast file searching

b. What is the used space of your hard drive in GB? ____________________________________

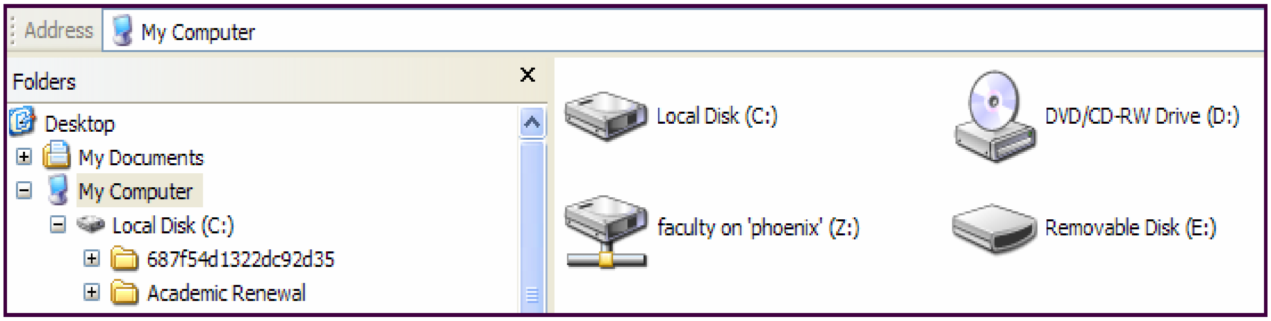
____

c. What is the free space of your hard drive in GB? ____________________________________

____

Step 4: Check for other storage devices

a. Right-click the **Start** button and select **Explore**. Select **My Computer** in the left pane.

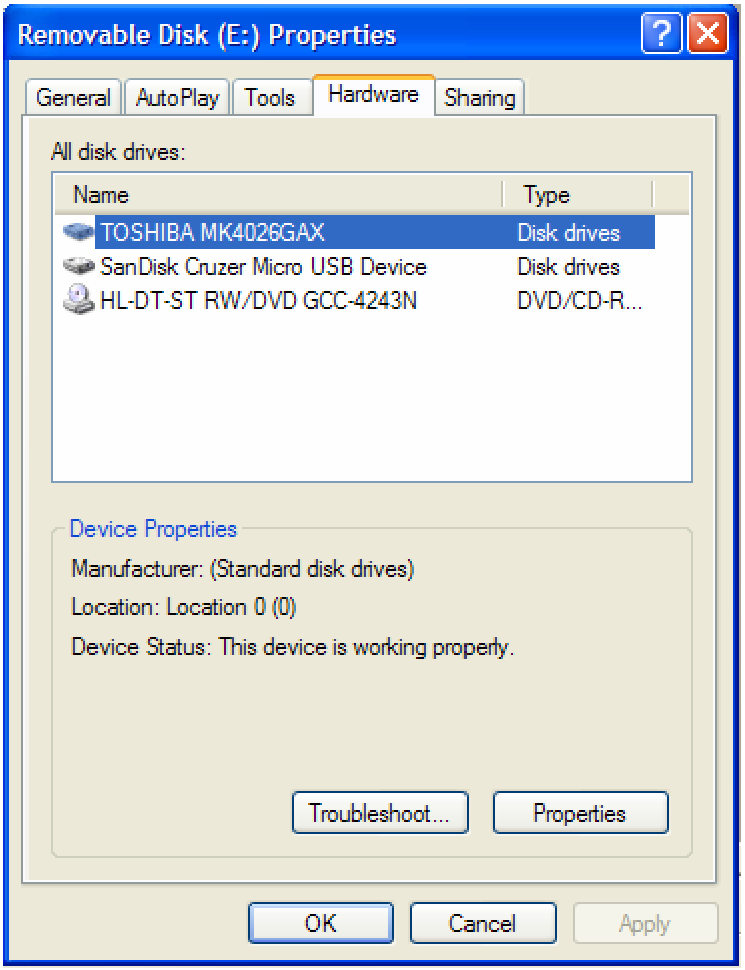


b. How many drive letters are shown in the window that appears? ____________________________

____

c. Right-click on a drive icon other than C: and select **Properties**. The **Removable Disk Properties** window appears.

d. Select the **Hardware** tab, which provides information on each device and whether it is working properly.



All disk drives:

Name	Type
TOSHIBA MK4026GAX	Disk drives
SanDisk Cruzer Micro USB Device	Disk drives
HL-DT-ST RW/DVD GCC-4243N	DVD/CD-R...

Device Properties

Manufacturer: (Standard disk drives)

Location: Location 0 (0)

Device Status: This device is working properly.

Step 5: Reflection

a. Why is it important to know the amount of RAM in your computer?

____

____

b. Why is the size of a hard drive as well as the space being used important?

____

____

____

Lab 1.3.3 Determining the Screen Resolution of a Computer

Objectives

- Determine the current screen resolution of a PC monitor.
- Determine the maximum resolution for the highest color quality.
- Calculate the number of pixels needed for resolution settings.
- Identify the type of monitor and graphics card installed.

Background / Preparation

The resolution of a monitor determines the quality of the screen display. The resolution is determined by the number of horizontal and vertical picture elements (pixels) that are used to produce the image on the monitor. The number of pixels is typically predefined by the manufacturers of graphics cards and PC monitors. The highest number of pixels that a monitor and graphics card can support is referred to as maximum resolution. An example of maximum resolution is 1280 x1024, which means the display is composed of 1280 horizontal pixels and 1024 vertical pixels. The higher the resolution is set, the sharper the display image. The maximum resolution of a PC monitor and the number of colors the monitor can display are determined by two factors:

- Capability of the monitor
- Capability of the graphics card, especially the amount of onboard memory

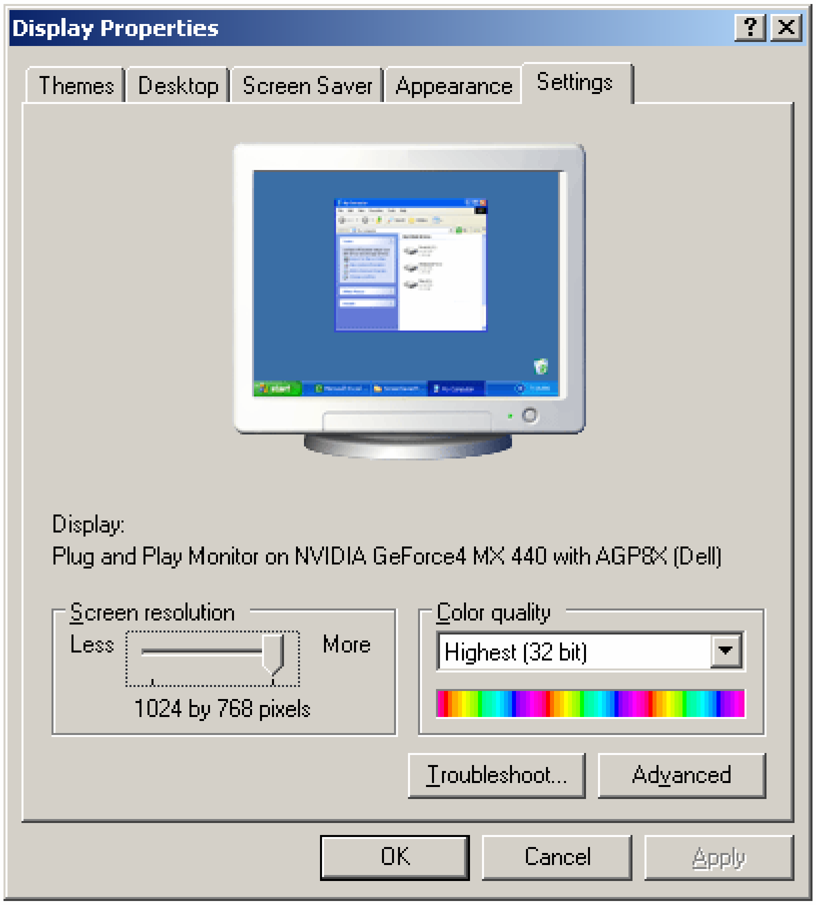
The following resources are required:

- Computer with Windows XP installed

Step 1: Determine the current screen resolution

a. To view the current screen resolution and color quality settings, right-click on any empty space on the desktop and select **Properties** from the context menu. In the **Display Properties** window, select the **Settings** tab.

You can also access **Display Properties** by opening the **Control Panel** and clicking the **Display** icon.



Display:
Plug and Play Monitor on NVIDIA GeForce4 MX 440 with AGP8X (Dell)

Screen resolution: 1024 by 768 pixels

Color quality: Highest (32 bit)

b. Use the **Display Properties Settings** tab to record the current settings on your PC:

The screen resolution is (H by V) ____

The horizontal resolution is: ____

The vertical resolution is: ____

The color quality value is: ____

Step 2: Determine the maximum resolution for the highest color quality

The slide bar under **Screen resolution** is used to configure the desired resolution.

a. Move the slide bar to see the range of screen resolutions that are available on your PC. (The range is determined by the operating system when it identifies the display card and the monitor.)

b. Use the **Display Properties Settings** tab to fill out the following table for the current settings on your PC:

Minimum screen resolution	
Maximum screen resolution	
Available color quality settings	

Step 3: Calculate the pixels for current and maximum resolution settings

The display on the screen consists of rows of pixels. The number of pixels in each row is the horizontal resolution. The number of rows is the vertical resolution. To determine the total number of pixels in a screen resolution, you multiply the horizontal resolution by the vertical resolution. For example, if the current resolution is 1280 x 1024, the total number of pixels is 1280 times 1024, or 1,310,720.

a. Calculate the total number of pixels for the lowest resolution: ____________________________

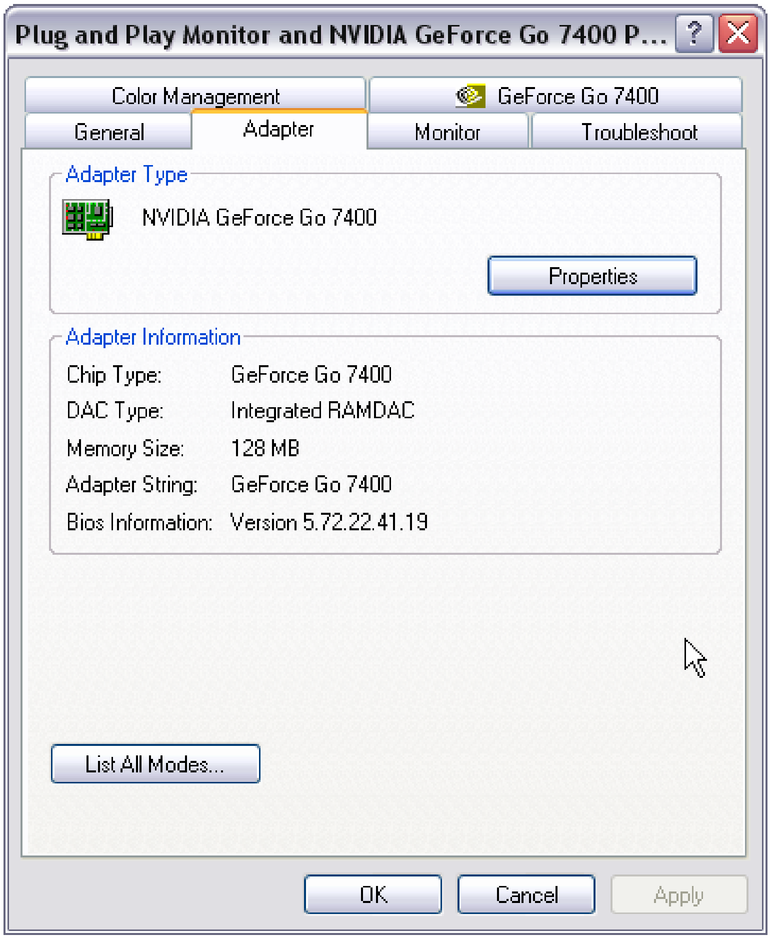
b. Calculate the total number of pixels for the maximum resolution: _________________________

Step 4: Identify the type of graphics card installed

You can get detailed information about the graphics card (also called the display adapter) in the **Display Properties** screen.

a. In the **Display Properties** screen, click the **Advanced** button.

b. Select the **Adapter** tab.

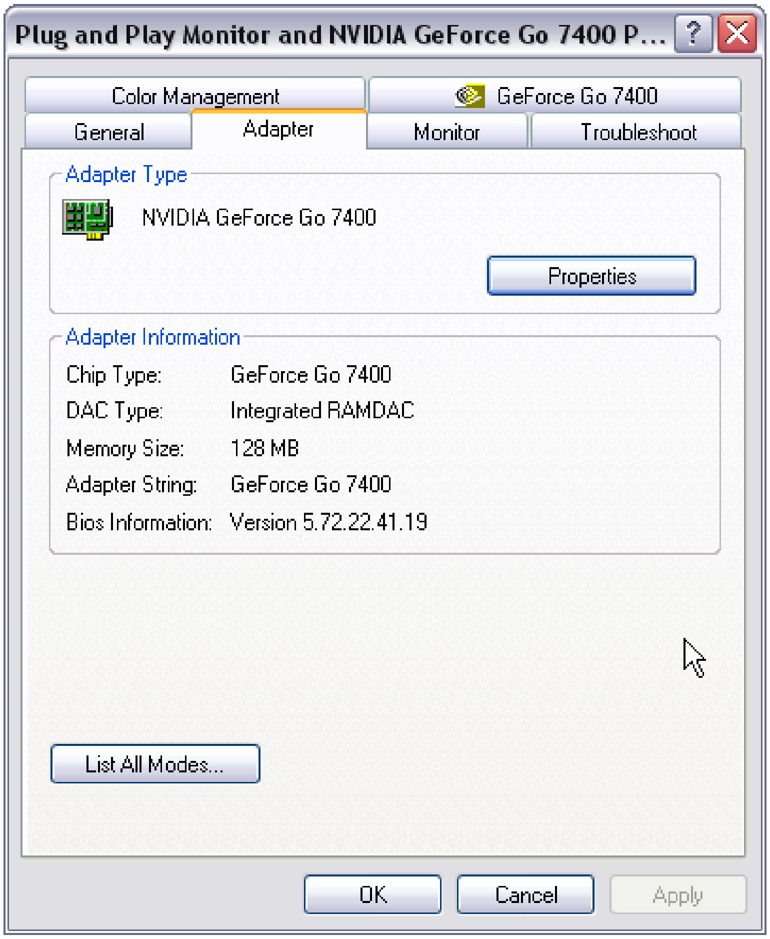


Adapter Type

NVIDIA GeForce Go 7400

Adapter Information

Chip Type: GeForce Go 7400
DAC Type: Integrated RAMDAC
Memory Size: 128 MB
Adapter String: GeForce Go 7400
Bios Information: Version 5.72.22.41.19



Adapter Type

NVIDIA GeForce Go 7400

Adapter Information

Chip Type: GeForce Go 7400
DAC Type: Integrated RAMDAC
Memory Size: 128 MB
Adapter String: GeForce Go 7400
Bios Information: Version 5.72.22.41.19

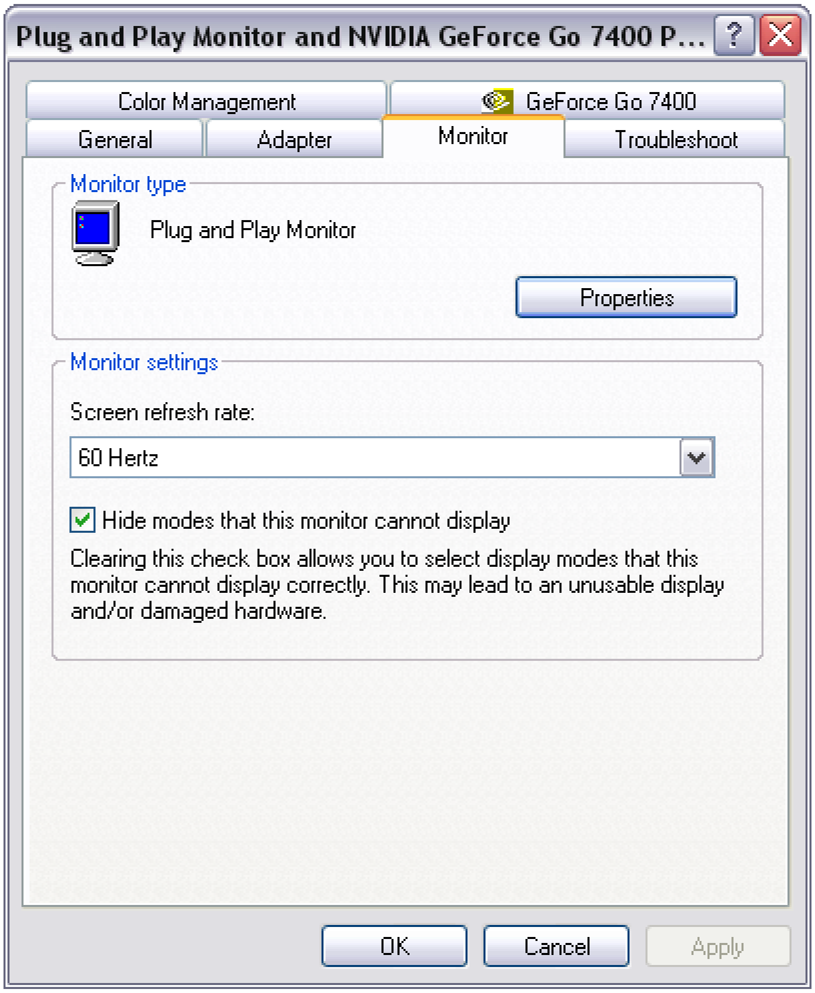
c. Use the information found in the **Adapter** tab to complete the following table:

Graphics card manufacturer and model (Adapter Type)	
Graphics memory on card (Memory Size)	

Step 5: Identify the type of monitor and available refresh rates

You can get detailed information about the monitor in the **Display Properties** screen. The screen refresh rate determines the number of times per second the screen is illuminated or redrawn. A refresh rate of 60 hertz means the screen is illuminated 60 times per second. Higher refresh rates provide less screen flicker, which reduces eye strain, but may adversely affect the monitor. You should set the refresh rate to the highest level the monitor can safely support.

a. Click on the **Monitor** tab to see the monitor type and current refresh rate.



Plug and Play Monitor and NVIDIA GeForce Go 7400 P...

Monitor type

Plug and Play Monitor

Monitor settings

Screen refresh rate:

60 Hertz

☑ Hide modes that this monitor cannot display

Clearing this check box allows you to select display modes that this monitor cannot display correctly. This may lead to an unusable display and/or damaged hardware.

b. Use the information found in the **Monitor** tab to complete the following table:

Monitor type	
Supported refresh rates	

c. What can occur if you select a refresh rate that is higher than what the monitor can safely display?

____

Lab 1.5.3 Installing a Printer and Verifying Operation

Objectives

- Manually install a printer using the default Windows XP driver.
- Verify printer and driver installation and troubleshoot any problems.
- Download and install the most recent driver from the printer manufacturer.

Background / Preparation

Many home and small office printers are plug-and-play, which means that Windows XP automatically discovers the printer and installs a functional driver. However, if you know the process for manually installing a printer and updating the printer driver, you have the knowledge to troubleshoot many types of printer problems.

In this lab, you will install a virtual printer on a Windows XP workstation. This lab is designed to work without an actual printer, but most steps are exactly the same for connecting a physical printer.

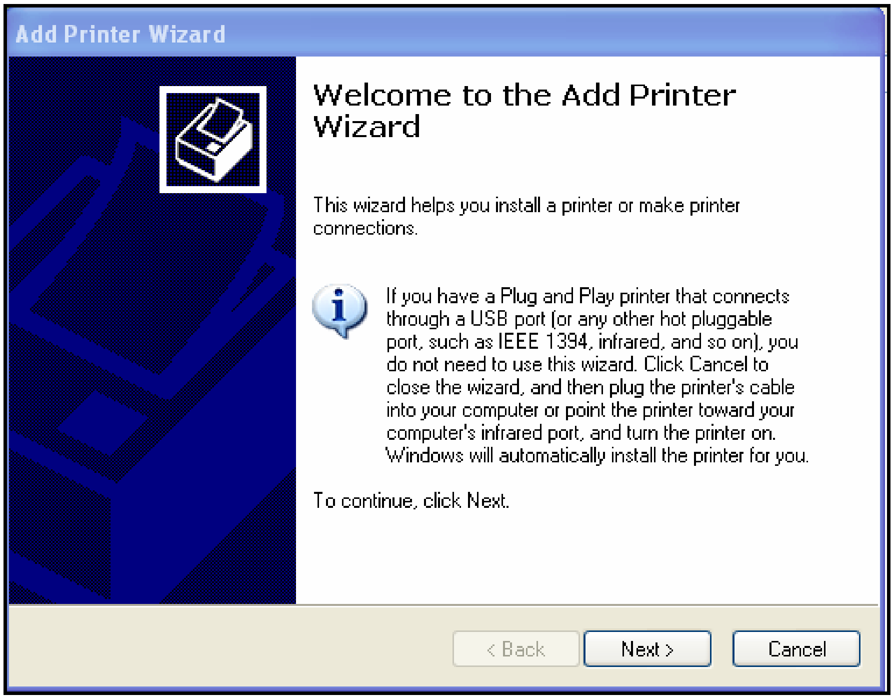
The following resources are required:

- Computer with Window XP installed
- Internet connection

Step 1: Add a printer

a. From the **Start** menu, select **Control Panel**. Double-click the **Printers and Faxes** icon. If this icon is not shown, click **Switch to Classic View** in the left pane.

b. In the **Printers and Faxes** window, click the **Add Printer** icon to open the Add Printer Wizard. Click **Next**.



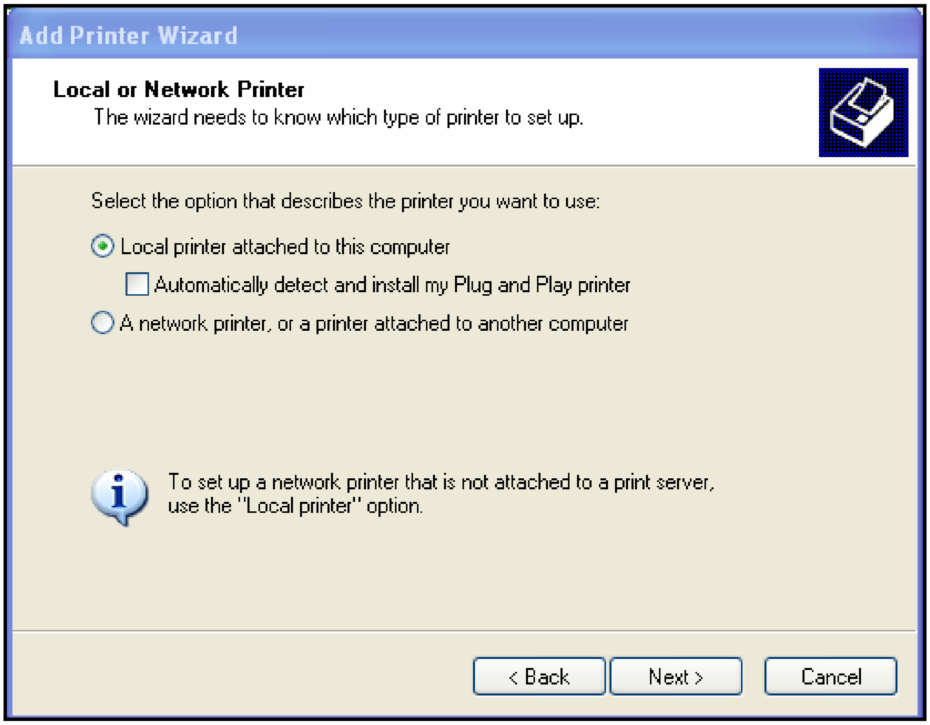
Welcome to the Add Printer Wizard

This wizard helps you install a printer or make printer connections.

If you have a Plug and Play printer that connects through a USB port (or any other hot pluggable port, such as IEEE 1394, infrared, and so on), you do not need to use this wizard. Click Cancel to close the wizard, and then plug the printer's cable into your computer or point the printer toward your computer's infrared port, and turn the printer on. Windows will automatically install the printer for you.

To continue, click Next.

c. For Local or Network Printer, click the Local printer attached to this computer radio button, and uncheck Automatically detect and install my Plug and Play printer. Click Next.



Add Printer Wizard

Local or Network Printer

The wizard needs to know which type of printer to set up.

Select the option that describes the printer you want to use:

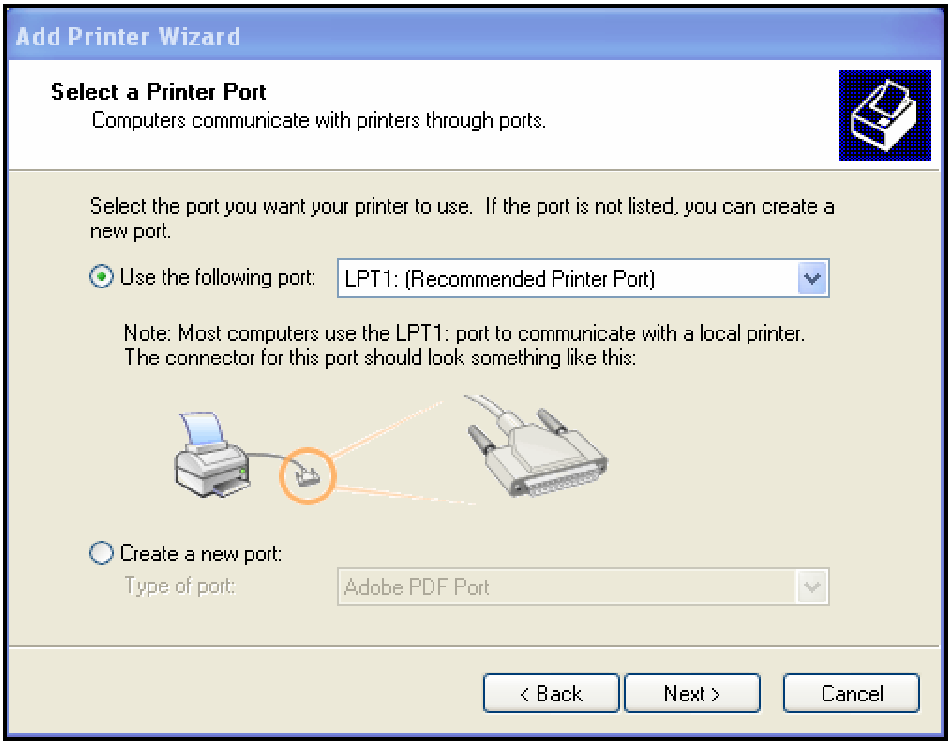
● Local printer attached to this computer

□ Automatically detect and install my Plug and Play printer

○ A network printer, or a printer attached to another computer

To set up a network printer that is not attached to a print server, use the "Local printer" option.

d. For Select a Printer Port, click the Use the following port radio button and choose LPT1: (Recommended Printer Port). Click Next.



Add Printer Wizard

Select a Printer Port

Computers communicate with printers through ports.

Select the port you want your printer to use. If the port is not listed, you can create a new port.

● Use the following port: LPT1: (Recommended Printer Port)

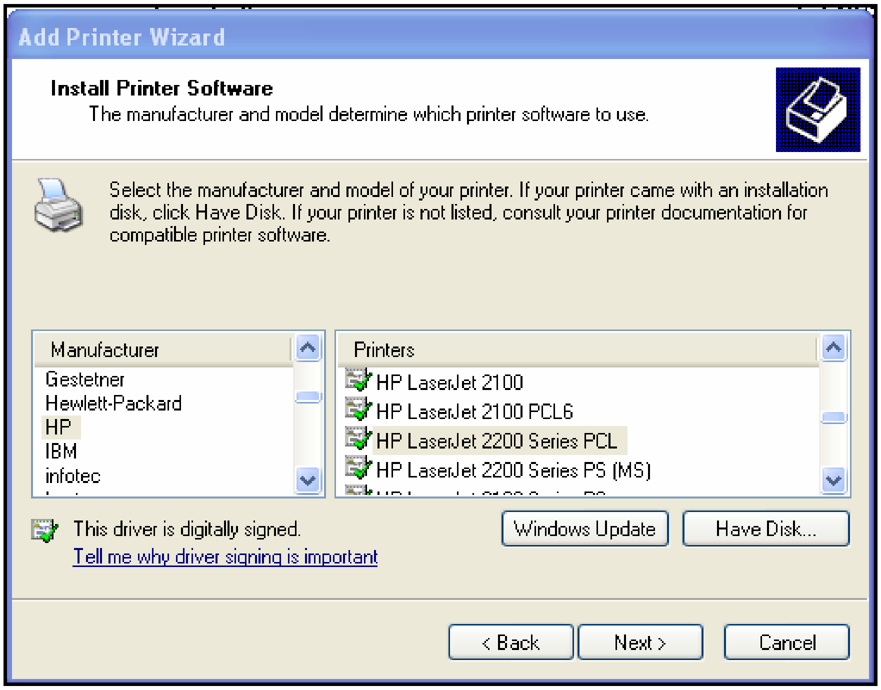
Note: Most computers use the LPT1: port to communicate with a local printer. The connector for this port should look something like this:

○ Create a new port:

Type of port: Adobe PDF Port

e. **Note:** In this step, you will choose a driver provided by Windows XP for an HP LaserJet 2200, a common home or small office, black-and-white laser printer. You do not have to physically have the printer to do these steps. However, if you are installing a printer that is actually attached to your computer, choose the manufacturer and printer model corresponding to your printer instead of the HP LaserJet 2200.

For **Install Printer Software**, select **HP** from the Manufacturer list. In the Printers list, locate **HP LaserJet 2200 Series PCL** and click to select it. Click **Next.**



Add Printer Wizard

Install Printer Software

The manufacturer and model determine which printer software to use.

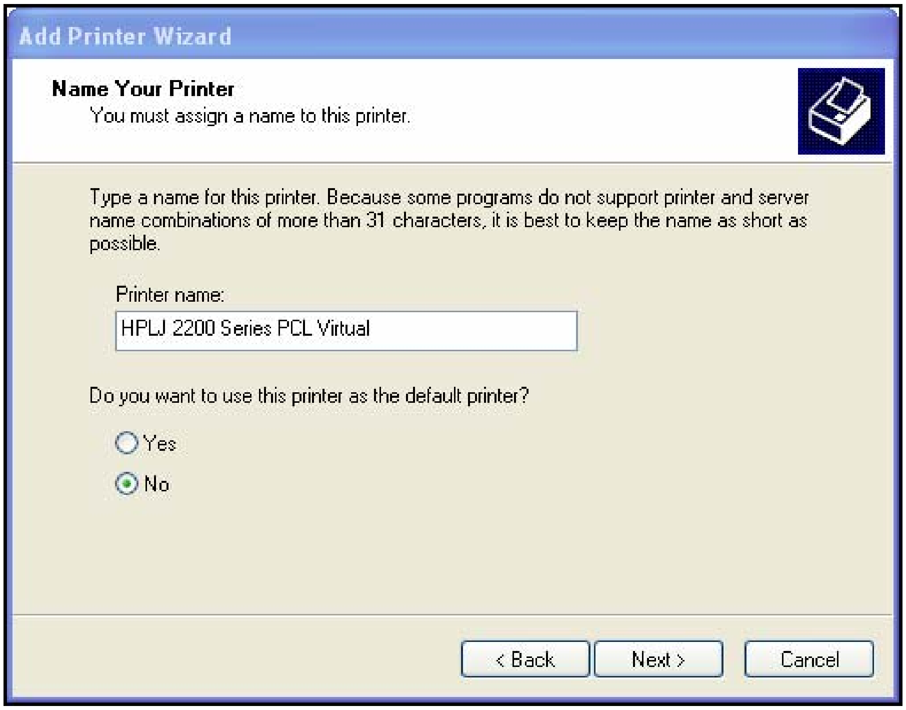
Select the manufacturer and model of your printer. If your printer came with an installation disk, click Have Disk. If your printer is not listed, consult your printer documentation for compatible printer software.

Manufacturer
Gestetner
Hewlett-Packard
HP
IBM
infotec

Printers
HP LaserJet 2100
HP LaserJet 2100 PCL6
HP LaserJet 2200 Series PCL
HP LaserJet 2200 Series PS (MS)

This driver is digitally signed.
Tell me why driver signing is important

f. For **Name Your Printer**, choose a descriptive name for the printer. In an environment like a large office that has several printers of the same make and model, it is helpful to give each printer a unique name so that it can easily be identified. Click **No** under **Do you want to use this printer as the default printer?** (If you are connecting an actual printer, click **Yes** if you want Windows applications to use this printer by default.) Click **Next**.



Add Printer Wizard

Name Your Printer
You must assign a name to this printer.

Type a name for this printer. Because some programs do not support printer and server name combinations of more than 31 characters, it is best to keep the name as short as possible.

Printer name:
HPLJ 2200 Series PCL Virtual

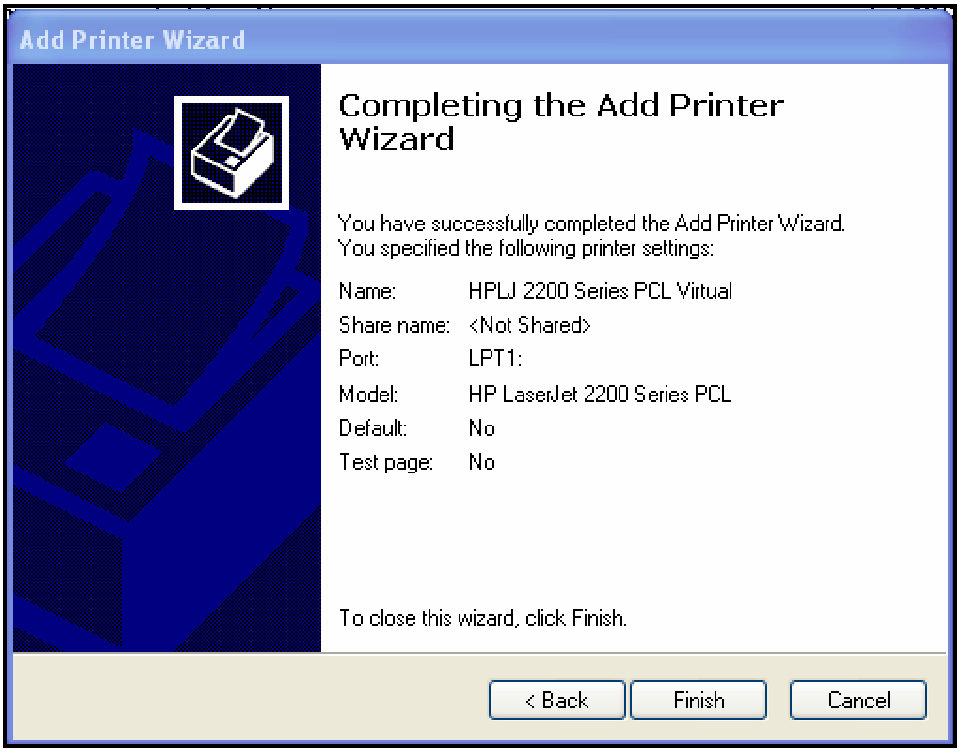
Do you want to use this printer as the default printer?

○ Yes
● No

g. In the **Printer Sharing** window, click **Next** to accept the default option to not share this printer.

h. If you are actually installing a printer, click **Next** in the **Print Test Page** window to print a test page. If you are installing a virtual HP LaserJet 2200, click the **No** radio button before clicking **Next**.

i. In the **Completing the Add Printer Wizard** window, review the printer settings, and then click **Finish**.



Add Printer Wizard

Completing the Add Printer Wizard

You have successfully completed the Add Printer Wizard.
You specified the following printer settings:

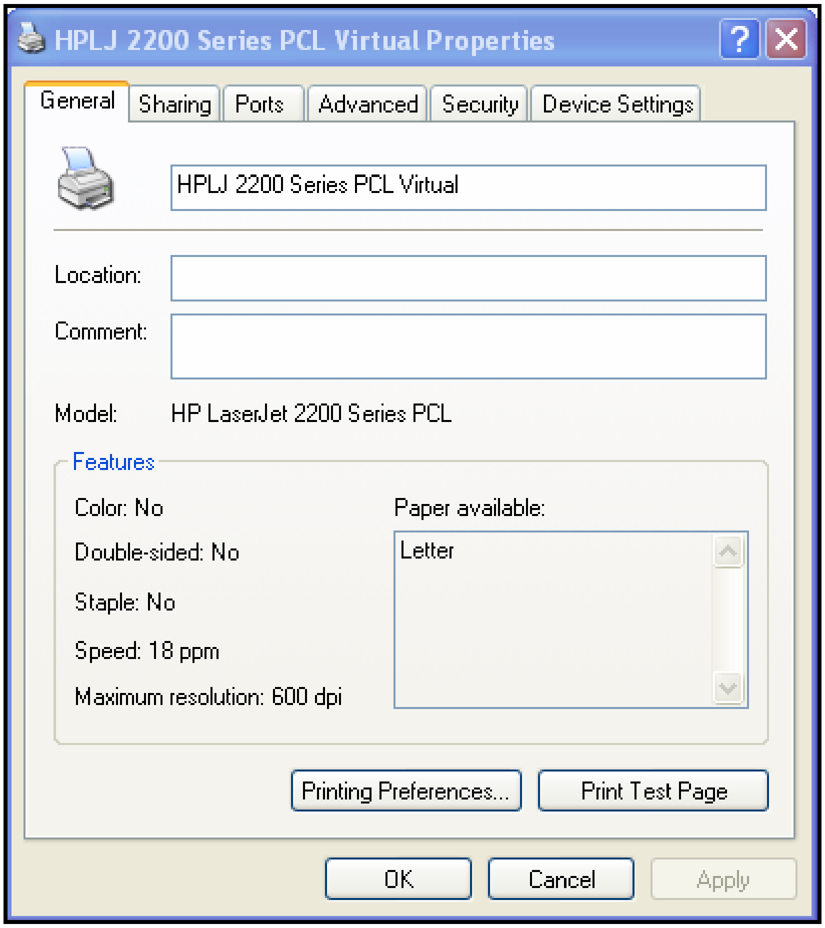
Name:	HPLJ 2200 Series PCL Virtual
Share name:	<Not Shared>
Port:	LPT1:
Model:	HP LaserJet 2200 Series PCL
Default:	No
Test page:	No

To close this wizard, click Finish.

Step 2: Verify the printer installation

a. Open the Printers and Faxes in control panel and check to see that the printer that you installed and named is shown. If it is not shown, repeat Step 1.

b. Right-click the icon for the new printer (HPLJ 2200 Series PCL Virtual), and then click Properties.



HPLJ 2200 Series PCL Virtual

Location:

Comment:

Model: HP LaserJet 2200 Series PCL

Features

Color: No

Double-sided: No

Staple: No

Speed: 18 ppm

Maximum resolution: 600 dpi

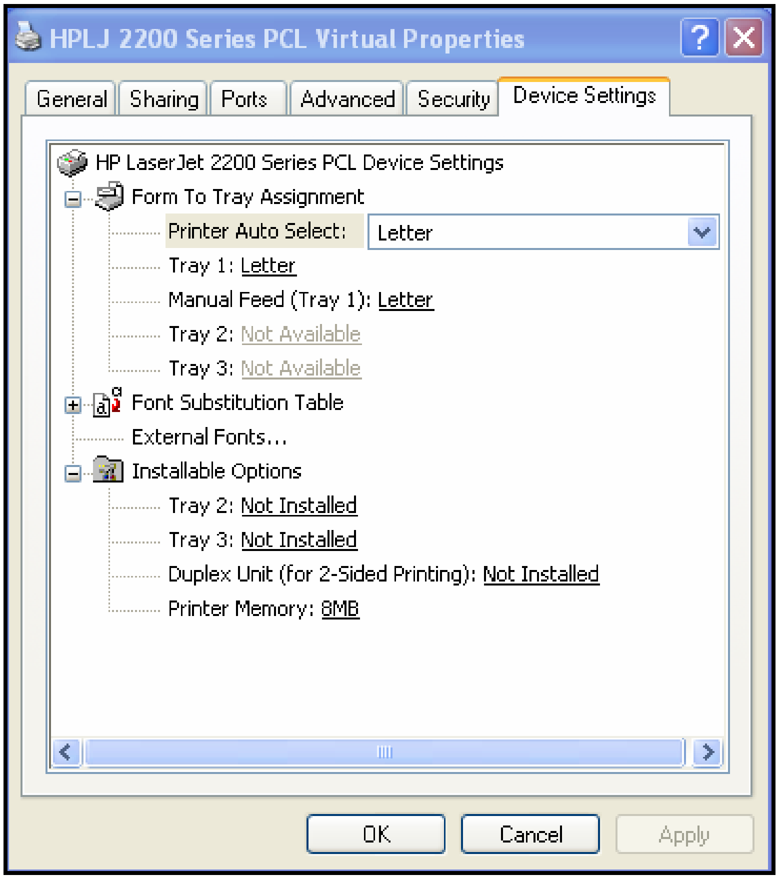
Paper available:

Letter

c. Click the Advanced tab and record the name of the driver shown in the Driver textbox.

Driver Name: ____

d. Click the Device Settings tab and examine the available options for the printer using this driver. To close the window, click Cancel.



HP LaserJet 2200 Series PCL Device Settings
Form To Tray Assignment
Printer Auto Select: Letter
Tray 1: Letter
Manual Feed (Tray 1): Letter
Tray 2: Not Available
Tray 3: Not Available
Font Substitution Table
External Fonts...
Installable Options
Tray 2: Not Installed
Tray 3: Not Installed
Duplex Unit (for 2-Sided Printing): Not Installed
Printer Memory: 8MB

Step 3: Download and install an updated printer driver

When you use the Add Printer Wizard to manually install a printer, the driver that is installed by default allows the device to function, but the Windows-installed driver does not always allow all features of the device to be used. The most full-featured drivers are usually those provided by the device manufacturer.

Updating a printer driver is one of the best ways to troubleshoot problems and to increase printer functionality. Most manufacturers continue to update drivers to improve compatibility with operating systems, so it is a good idea to periodically check for driver updates and to install them if they are available.

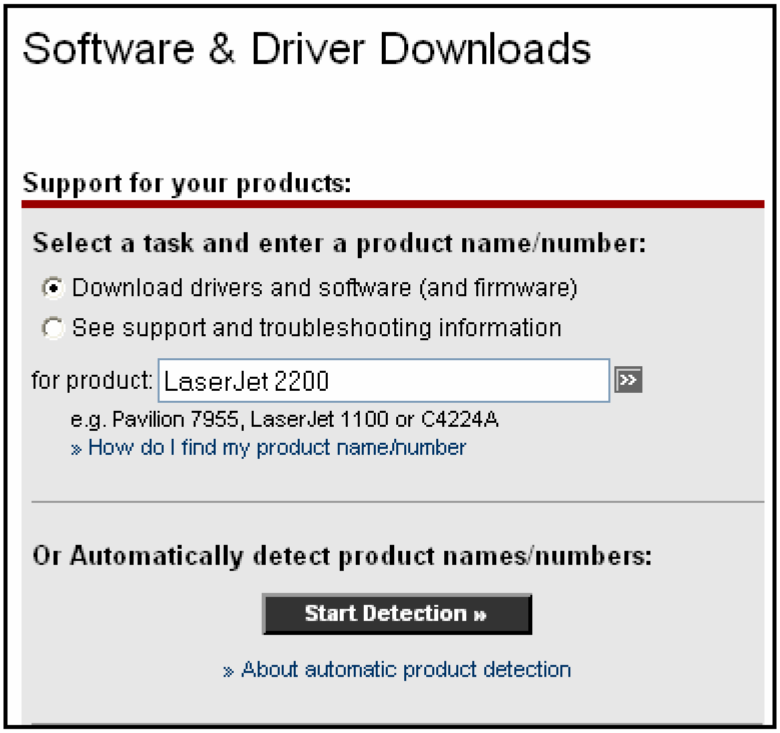
In this step, you will go to the Hewlett-Packard website to obtain an updated driver for the HP LaserJet 2200. If you have installed a different printer, modify these instructions as needed.

a. Open a web browser and go to **http://www.hp.com**.

b. Click on the Software and Driver Downloads link.

NOTE: Many manufacturers have a support link on their home page that leads to drivers and other downloads.

c. Click the **Download drivers and software (and firmware)** radio button. Enter the printer model in the **for product** text box and click the double arrow link to the right of the text box.



Software & Driver Downloads

Support for your products:

Select a task and enter a product name/number:

● Download drivers and software (and firmware)

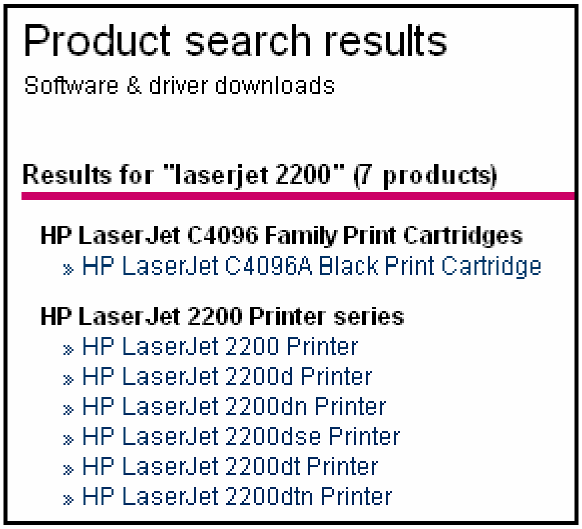
○ See support and troubleshooting information

for product: LaserJet 2200

e.g. Pavilion 7955, LaserJet 1100 or C4224A

» How do I find my product name/number
Or Automatically detect product names/numbers:
Start Detection »
» About automatic product detection

d. The search displays the available products. Click HP LaserJet 2200 Printer or the model of the printer for which you are downloading a driver.



Product search results

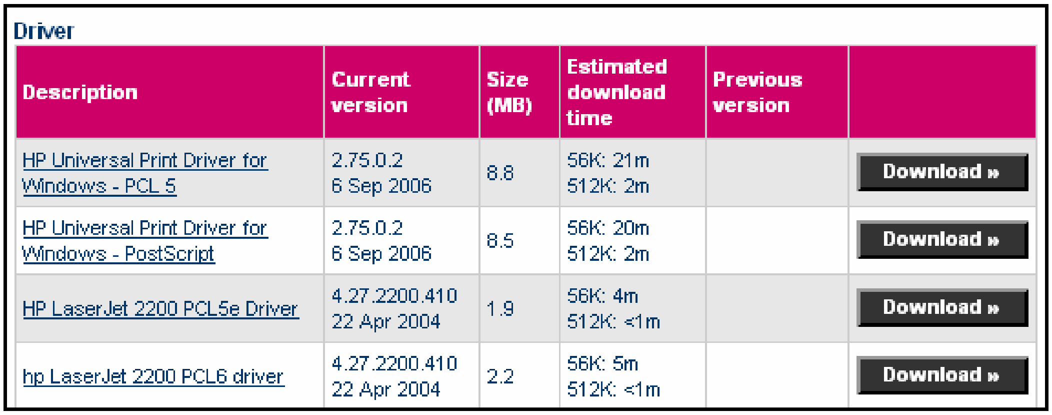
Software & driver downloads

Results for "laserjet 2200" (7 products)

HP LaserJet C4096 Family Print Cartridges
- » HP LaserJet C4096A Black Print Cartridge

HP LaserJet 2200 Printer series
- » HP LaserJet 2200 Printer
- » HP LaserJet 2200d Printer
- » HP LaserJet 2200dn Printer
- » HP LaserJet 2200dse Printer
- » HP LaserJet 2200dt Printer
- » HP LaserJet 2200dtn Printer

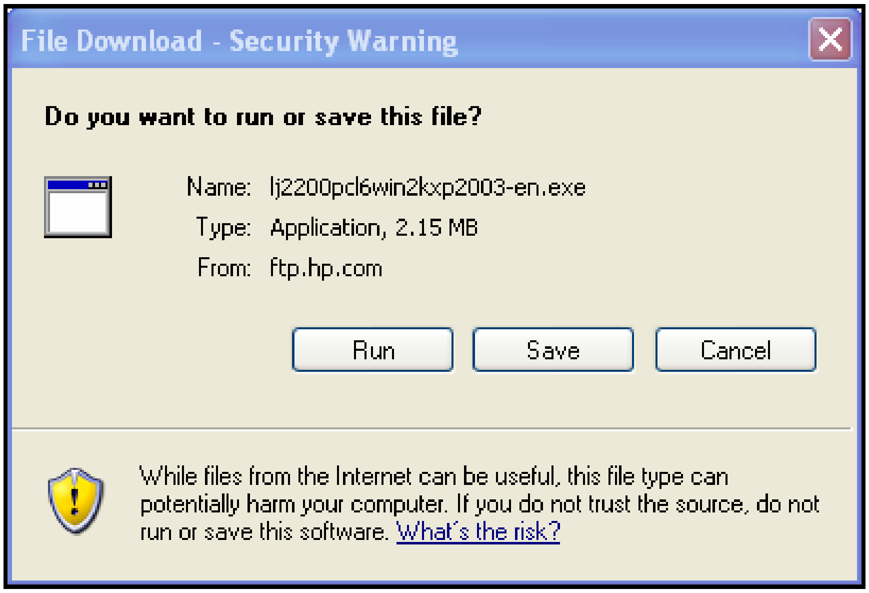
e. Click **Microsoft Windows XP** in the list of operating systems. In the list of drivers shown, click **Download** for the HP LaserJet 2200 PCL6 driver option.



Driver

Description	Current version	Size (MB)	Estimated download time	Previous version	
HP Universal Print Driver for Windows - PCL 5	2.75.0.2 6 Sep 2006	8.8	56K: 21m 512K: 2m		Download »
HP Universal Print Driver for Windows - PostScript	2.75.0.2 6 Sep 2006	8.5	56K: 20m 512K: 2m		Download »
HP LaserJet 2200 PCL5e Driver	4.27.2200.410 22 Apr 2004	1.9	56K: 4m 512K: <1m		Download »
hp LaserJet 2200 PCL6 driver	4.27.2200.410 22 Apr 2004	2.2	56K: 5m 512K: <1m		Download »

f. In the download dialog box, click **Save.**



File Download - Security Warning

Do you want to run or save this file?

Name: lj2200pcl6win2kxp2003-en.exe

Type: Application, 2.15 MB

From: ftp.hp.com

While files from the Internet can be useful, this file type can potentially harm your computer. If you do not trust the source, do not run or save this software. What's the risk?

g. In the **Save As** dialog box, click the **Desktop** icon in the left pane to save the driver installation file to your desktop. You can save the file anywhere, but it is important that you know where you have saved it.

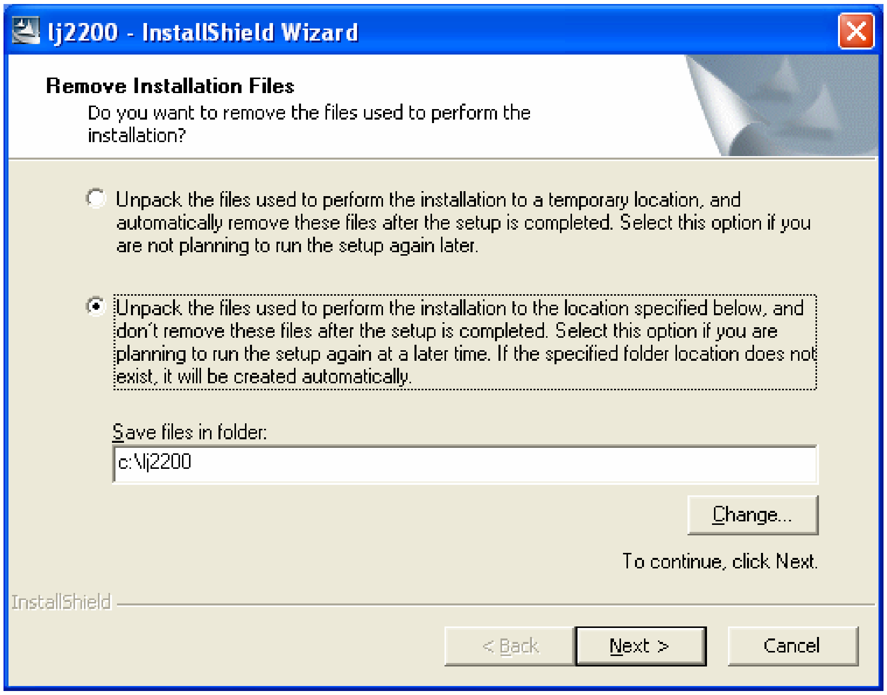
h. Write the name of the file: ____

i. Click on the **Save** button. Close the browser and any other open applications.

j. Double-click the icon for the downloaded file.

NOTE: You may not see the filename extension (**.exe**). File extensions are only visible if you disable the default **Hide extensions for known file types** from Windows Explorer. See your instructor for more information.

k. When prompted, click **Run**. In the dialog box, click the second radio button and then **Next** to unpack the files to c:\lj2200. Click **Finish**.


lj2200 - InstallShield Wizard

Remove Installation Files

Do you want to remove the files used to perform the installation?

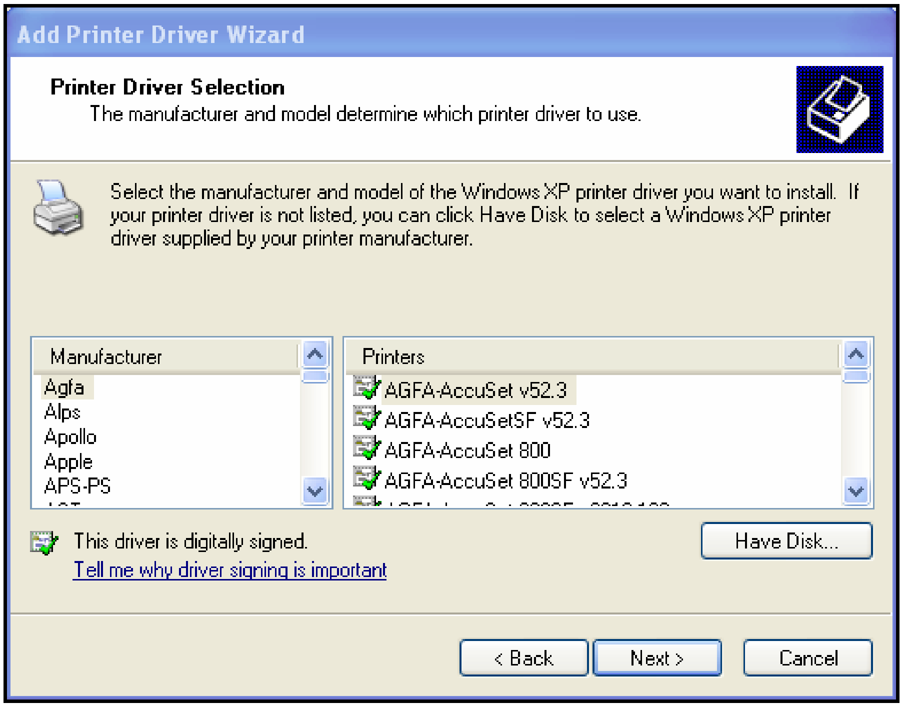
○ Unpack the files used to perform the installation to a temporary location, and automatically remove these files after the setup is completed. Select this option if you are not planning to run the setup again later.

● Unpack the files used to perform the installation to the location specified below, and don't remove these files after the setup is completed. Select this option if you are planning to run the setup again at a later time. If the specified folder location does not exist, it will be created automatically.

Save files in folder: c:\lj2200

l. Repeat Steps 2a and 2b to open the Properties page of the new printer. Click the **Advanced** tab. Click the **New Drive** button, and then click **Next** to begin the Add Printer Driver Wizard.

m. Click **Have Disk** in the Printer Driver Selection window.


Add Printer Driver Wizard

Printer Driver Selection

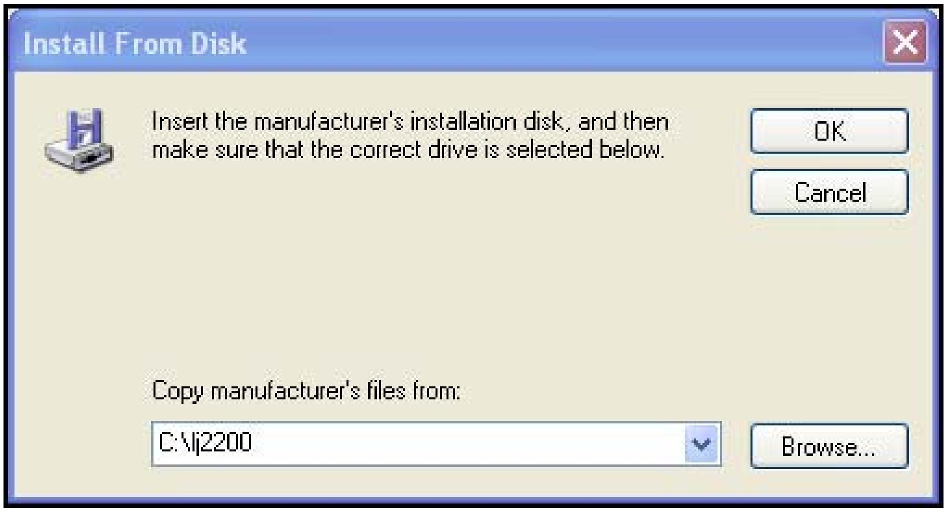
The manufacturer and model determine which printer driver to use.

Select the manufacturer and model of the Windows XP printer driver you want to install. If your printer driver is not listed, you can click Have Disk to select a Windows XP printer driver supplied by your printer manufacturer.

Manufacturer	Printers
Agfa	AGFA-AccuSet v52.3
Alps	AGFA-AccuSetSF v52.3
Apollo	AGFA-AccuSet 800
Apple	AGFA-AccuSet 800SF v52.3
APS-PS	

This driver is digitally signed.
Tell me why driver signing is important

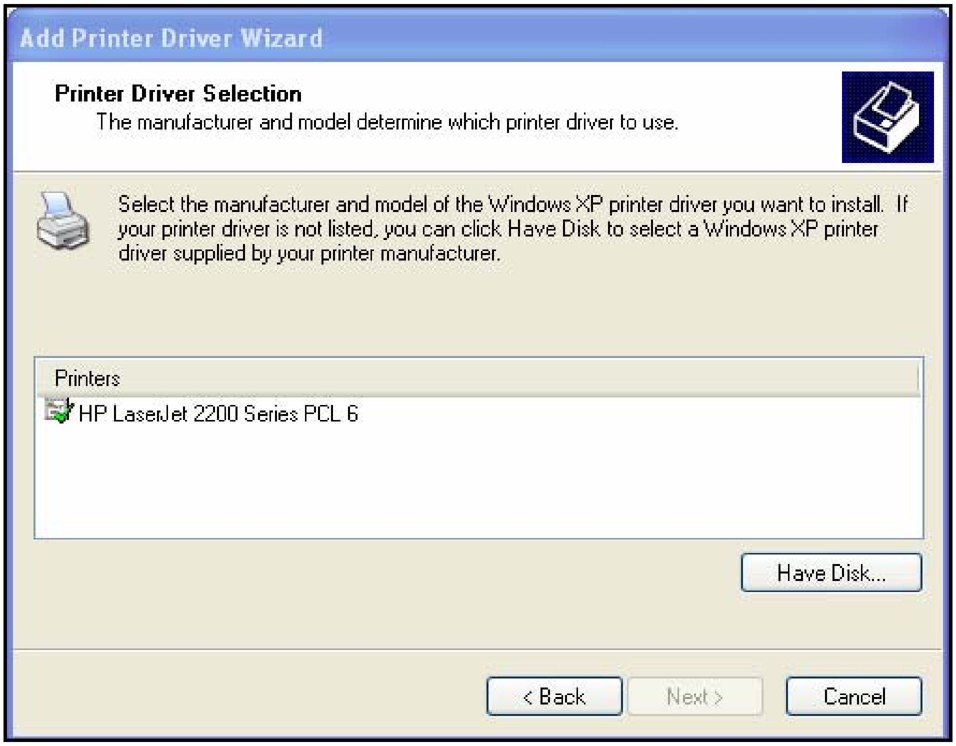
n. In the **Install From Disk** window, click **Browse** and locate the folder created in Step 3 by navigating to **My Computer > Local Disk C:\lj2200**. Click **Open** and you return to the **Install From Disk** window. Click **OK**.



Insert the manufacturer's installation disk, and then make sure that the correct drive is selected below.

Copy manufacturer's files from: C:\lj2200

o. In the Printer Driver Selection window, select **HP LaserJet 2200 Series PCL 6**, and then click **Next**. Click **Finish** in the window that follows.



Printer Driver Selection

The manufacturer and model determine which printer driver to use.

Select the manufacturer and model of the Windows XP printer driver you want to install. If your printer driver is not listed, you can click Have Disk to select a Windows XP printer driver supplied by your printer manufacturer.

Printers: HP LaserJet 2200 Series PCL 6

p. When the process is finished, return to the properties window of the printer and click the **Apply** button, and then click **OK**.

Step 4: Verify the new driver installation

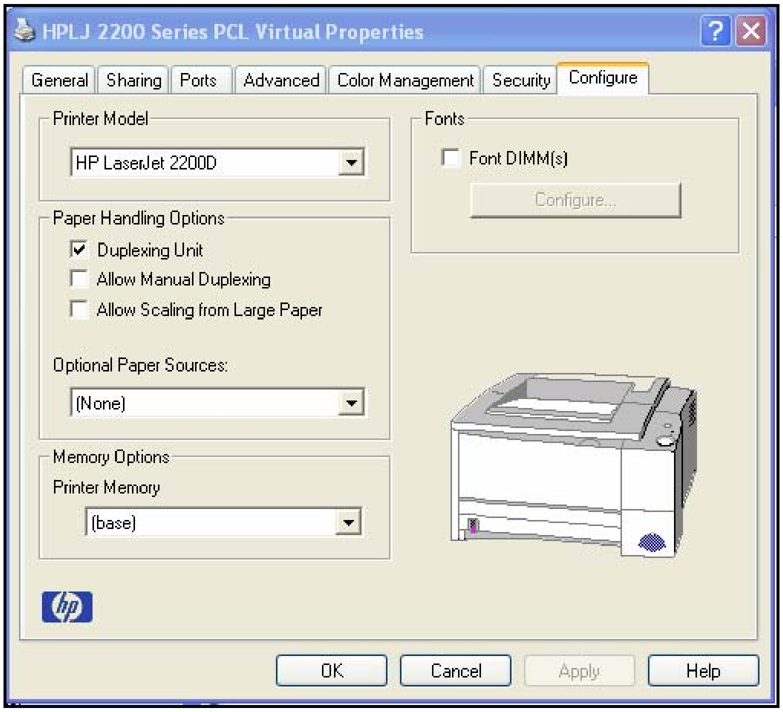
In this step, you will compare the Windows default driver installed in the first step to the newly installed driver from the manufacturer website.

a. In the properties window of the new printer, verify that the **Apply** button is grayed out.

b. Click the **Advanced** tab. What is the name of the driver?

Driver Name: ____

c. Click the **Configure** tab. The window for the HP LaserJet 2200 is shown in the figure.



Printer Model
HP LaserJet 2200D

Paper Handling Options
☑ Duplexing Unit
□ Allow Manual Duplexing
□ Allow Scaling from Large Paper

Optional Paper Sources:
(None)

Memory Options
Printer Memory
(base)

Fonts
□ Font DIMM(s)
Configure...

d. Compare this tab to the **Device Settings** tab in Step 2d. What are the differences?

1	
2	
3	
4	
5	
6	

e. Click on some of the other tabs in the properties window to compare the new and old drivers. Record some of the differences here.

1	
2	
3	

Lab 2.3.3 Examining Operating System and Application Versions

Objectives

- Determine the operating system (OS) version and revision.
- Examine the method used for configuring Windows XP updates.
- Determine the revision number of a particular application.

Background / Preparation

It is important to keep operating systems and applications up-to-date to ensure stable operation and to address security vulnerabilities. These updates are called revisions, updates, patches, or hot fixes. There are three ways to update the Windows XP operating system: automatic updating, downloading patches automatically and manually determining when they are installed, or manually downloading and installing the patches.

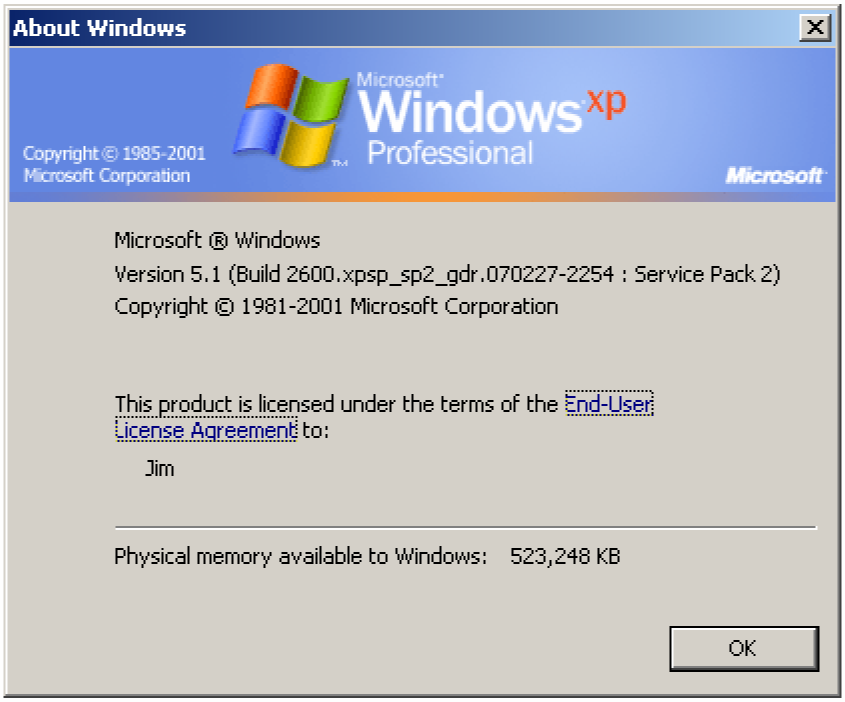
This lab can be done individually, in pairs, or in teams. The following resources are required:

- Computer with Windows XP and an application such as Microsoft Word installed

Step 1: Determine the Windows XP version and revision number

a. Click the Start button and select All Programs > Accessories > Windows Explorer.

b. From the **Help** menu, choose **About Windows**.



Microsoft ® Windows
Version 5.1 (Build 2600.xpsp_sp2_gdr.070227-2254 : Service Pack 2)
Copyright © 1981-2001 Microsoft Corporation

This product is licensed under the terms of the End-User License Agreement to:

Jim

Physical memory available to Windows: 523,248 KB

c. Which version of Windows XP and service pack is installed on your computer?

____

d. How much physical memory (RAM) is available to Windows XP?

____

e. Why is memory important to an operating system?

____

____

____

____

f. Click on the End-user License Agreement link on the About Windows screen.

According to the license agreement, how many backup copies of Windows XP can you legally make?

____

g. Close the end-user license agreement window. Close the About Windows window.

Step 2: Configure Windows XP for updates

a. Click on the **Start** button and select the **Control Panel** option.

b. If the right window pane shows **Pick a Category**, select the **Switch to Classic View** link in the left pane. Double-click the **Automatic Updates** option.

c. Which four options are available for automatic updates? ____________________________________

____

____

d. Click on the **How Does Automatic Updates Work?** link. Expand the **How Are Updates Downloaded**? section by clicking on the + (plus sign) beside the option.

e. Based on the information presented, what happens if you are using your computer, updates are being downloaded, and you disconnect from the Internet?

____

f. Expand the How Are Updates Installed? section.

Based on the output shown, what is the default time for when updates are installed?

____

g. Close the How Does Automatic Updates Work? window and return to the Automatic Updates window.

h. What is the current setting for automatic updates, and why do you think the person who set up the computer chose this option?

____

i. Close the **Automatic Updates** window.

j. Another way of configuring a system for automatic updates is through the **System** control panel. Click the **Start** button, click the **Control Panel** option, and double-click the **System** control panel icon. Click on the **Automatic Updates** tab.

k. Are the options the same as before? ____

l. Close the **System** control panel.

Step 3: Determine an application version

a. Open any Windows-based application such as Microsoft Word.

b. From the application **Help** menu option, choose the **About** option.

c. What is the application version? ____

d. If this is a Microsoft application, there may be a **System Info** button. If there is a button, click on it. If there is no button, skip to the next step. Explore the different options available under **System Info,** including information related to your specific application. **System Info** provides similar information to that provided by **winmsd.exe**.

e. Click on the **Help** menu again. If there are double down arrows at the bottom of the menu, click them to show all the menu options. Some applications have a **Check for Updates** option. Does the application have this option? ____

f. Do you think that Internet access is required for an application that has a **Check for Updates** option? Why or why not? ____

____

g. Close the application.

Step 4: Reflection

a. When is it important to get an update for an application or an operating system?

____

____

____

b. List one instance when you might need to know which version of the operating system or application is being used. ____

____

____

Lab 3.1.5 Building a Peer-to-Peer Network

Objectives

- Design and build a simple peer-to-peer network using a crossover cable supplied by the instructor.
- Verify connectivity between the peers using the **ping** command.

Background / Preparation

In this hands-on lab, you will plan and build a simple peer-to-peer network using two PCs and an Ethernet crossover cable.

The following resources are required:

- Two Window XP Professional PCs, each with an installed and functional Network Interface Card (NIC)
- An Ethernet crossover cable

Step 1: Diagram the network

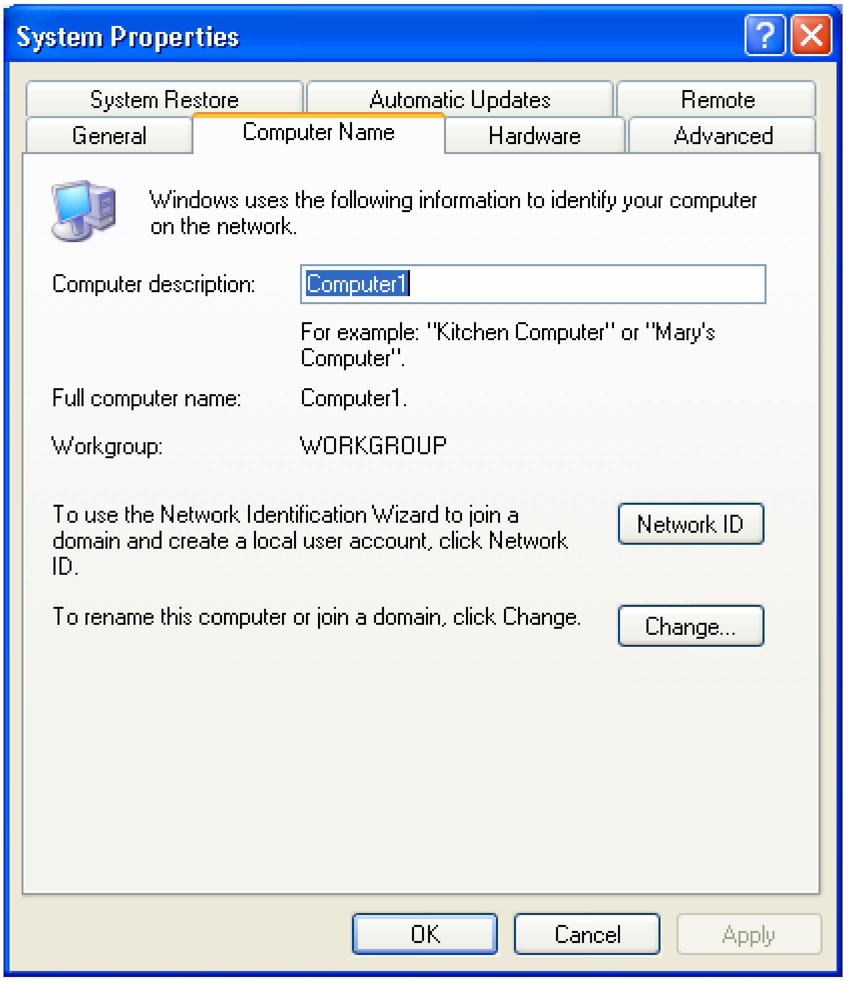
a. A network diagram is a map of the logical topology of the network. In the space below, sketch a simple peer-to-peer network connecting two PCs. Label one PC with IP address 192.168.1.1 and the other PC with IP address 192.168.1.2. Use labels to indicate connecting media and any necessary network devices.

b. A simple network like the one you designed can use a hub or switch as a central connecting device, or the PCs may be directly connected. Which kind of cable is required for a direct Ethernet connection between the two PCs? ____

Step 2: Document the PCs

a. Check the computer name settings for each PC and make adjustments as necessary. For each PC, select **Start** and **Control Panel.** Double-click the **System** icon, then click the **Computer Name** tab. Write down the computer name that is displayed following **Full computer name**:

PC1 Name:	
PC2 Name:	



Windows uses the following information to identify your computer on the network.

Computer description: Computer1

For example: "Kitchen Computer" or "Mary's Computer".

Full computer name: Computer1.

Workgroup: WORKGROUP

To use the Network Identification Wizard to join a domain and create a local user account, click Network ID.

To rename this computer or join a domain, click Change.

b. Check to see if the two PCs have the same name. If they do, change the name of one PC by clicking the **Change** button, typing a new name in the **Computer name** field, then clicking **OK**.

c. Click **OK** to close the **System Properties** window.

d. Why is it important that each PC on a network have a unique name?

____

Step 3: Connect the Ethernet cable

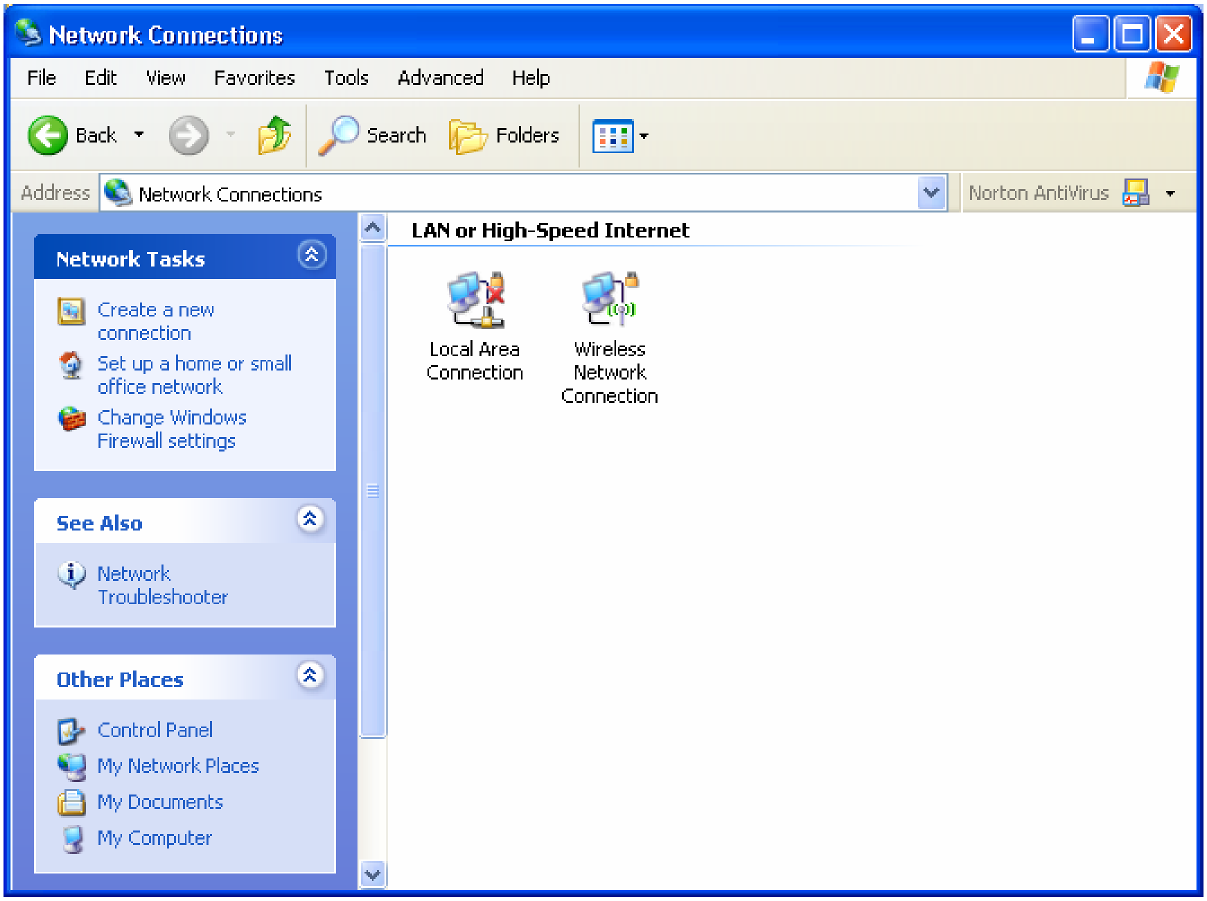
a. Use the Ethernet crossover cable provided by the instructor. Plug one end of the cable into the Ethernet NIC of PC1.

b. Plug the other end of the cable into the Ethernet NIC of PC2. As you insert the cable, you should hear a click which indicates that the cable connector is properly inserted into the port.

Step 4: Verify physical connectivity

a. After the Ethernet crossover cable is connected to both PCs, take a close look at each Ethernet port. A light (usually green or amber) indicates that physical connectivity has been established between the two NICs. Try unplugging the cable from one PC then reconnecting it to verify that the light goes off then back on.

b. Go to the **Control Panel**, double click the **Network Connections** icon, and confirm that the local area connection is established. The following figure shows an active local area connection. If physical connectivity problems exist, you will see a red **X** over the Local Area Connection icon with the words **Network cable unplugged**.

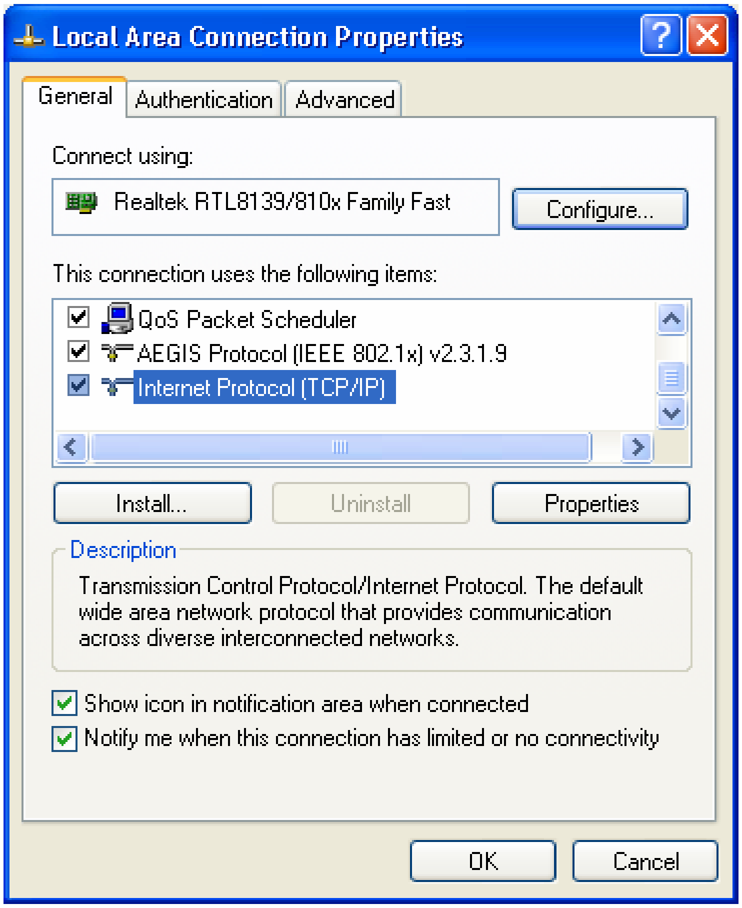


c. If the Local Area Connection does not indicate that it is connected, troubleshoot by repeating Steps 3 and 4. You may also want to ask your instructor to confirm that you are using an Ethernet crossover cable.

Step 5: Configure IP settings

a. Configure the logical addresses for the two PCs so that they are able to communicate using TCP/IP. On one of the PCs, go to the Control Panel, double click the Network Connections icon, and then right click the connected Local Area Connection icon. Choose Properties from the pull-down menu.

b. Using the scroll bar in the **Local Area Connection Properties** window, scroll down to highlight **Internet Protocol (TCP/IP)**. Click the **Properties** button.



Local Area Connection Properties

Connect using:

Realtek RTL8139/810x Family Fast

This connection uses the following items:

☑ QoS Packet Scheduler
☑ AEGIS Protocol (IEEE 802.1x) v2.3.1.9
☑ Internet Protocol (TCP/IP)

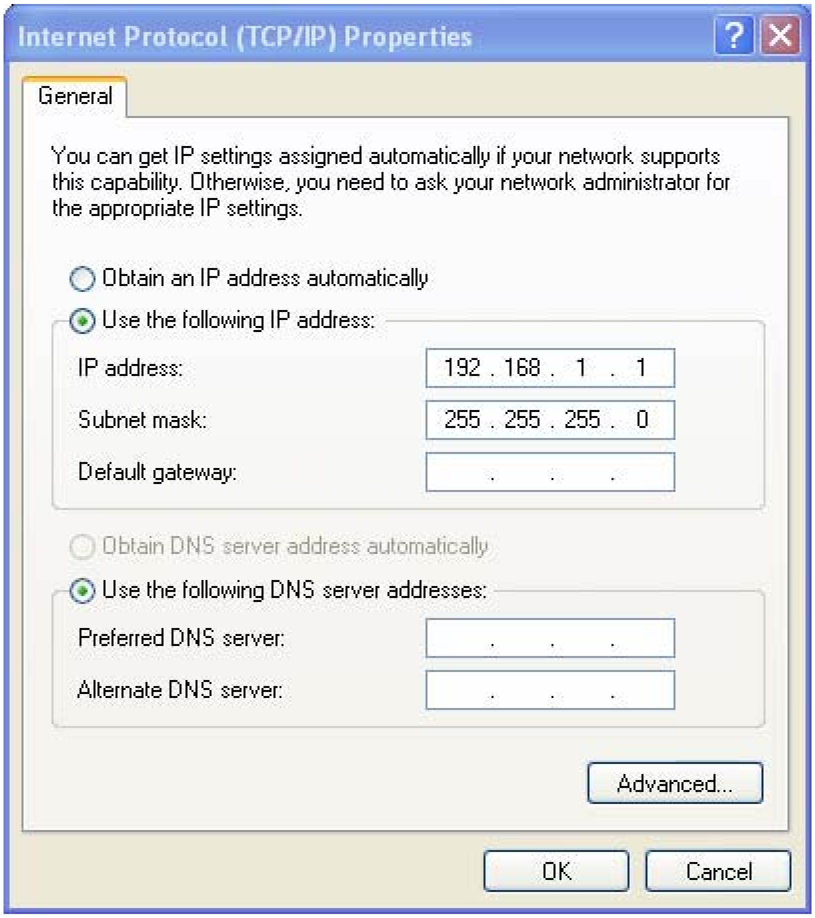
Description

Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.

☑ Show icon in notification area when connected
☑ Notify me when this connection has limited or no connectivity

c. Select the **Use the following IP address** radio button and enter the following information:

IP Address	**192.168.1.1**
Subnet Mask	**255.255.255.0**



Internet Protocol (TCP/IP) Properties

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

○ Obtain an IP address automatically

● Use the following IP address:

IP address: 192 . 168 . 1 . 1

Subnet mask: 255 . 255 . 255 . 0

Default gateway: . . .

○ Obtain DNS server address automatically

● Use the following DNS server addresses:

Preferred DNS server: . . .

Alternate DNS server: . . .

d. Click **OK**, which will close the **Internet Protocol (TCP/IP) Properties** window. Click the **Close** button to exit the **Local Area Connection Properties** window.

e. Repeat steps 5a – 5d for the second PC using the following information:

IP Address	**192.168.1.2**
Subnet Mask	**255.255.255.0**

Step 6: Verify IP connectivity between the two PCs

NOTE: To test TCP/IP connectivity between the PCs, Windows Firewall must be disabled temporarily on both PCs. Windows Firewall should be re-enabled after the tests have been completed.

a. On PC1, on the Windows XP desktop, click **Start**. From the Start menu, select **Control Panel**, and double-click **Network Connections**.

b. Right-click the Local Area Connection icon and select **Properties**. Click the **Advanced** tab. Locate and click the **Settings** button.

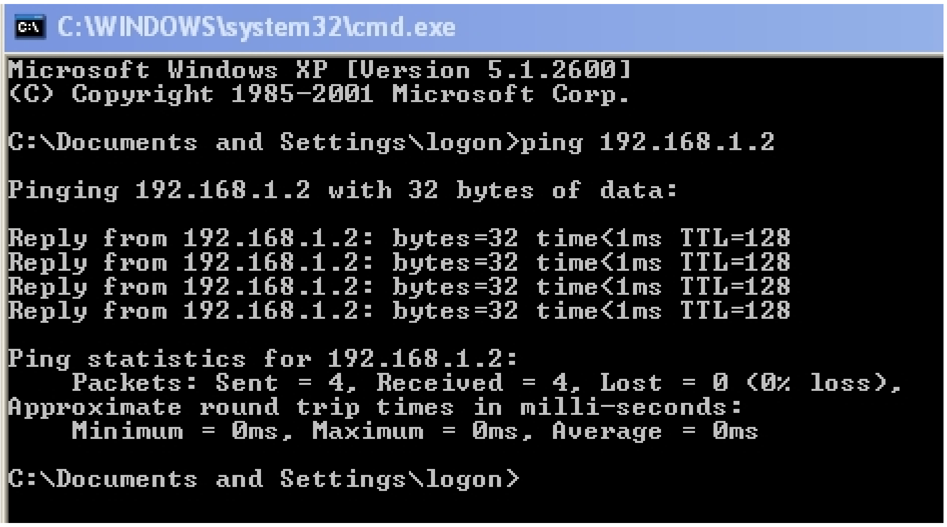
c. Make a note of whether the firewall settings are ENABLED (ON) for the Ethernet port or DISABLED (OFF) for the Ethernet port. ____

d. If the firewall settings are enabled, click the **Off (not recommended)** radio button to disable the firewall. The setting will be re-enabled in a later step. Click **OK** in this dialog box and the following to apply this setting.

e. Now that the two PCs are physically connected and configured correctly with IP addresses, we need to make sure they communicate with each other. The **ping** command is a simple way to accomplish this task. The **ping** command is included with the Windows XP operating system.

f. On PC1, go to **Start**, then **Run**. Type **cmd**, and then click **OK**. A Windows command prompt window will appear as shown in the figure below.

g. At the **>** prompt, type **ping 192.168.1.2** and press **Enter**. A successful **ping** will verify the IP connectivity. It should produce results similar to those shown in here.



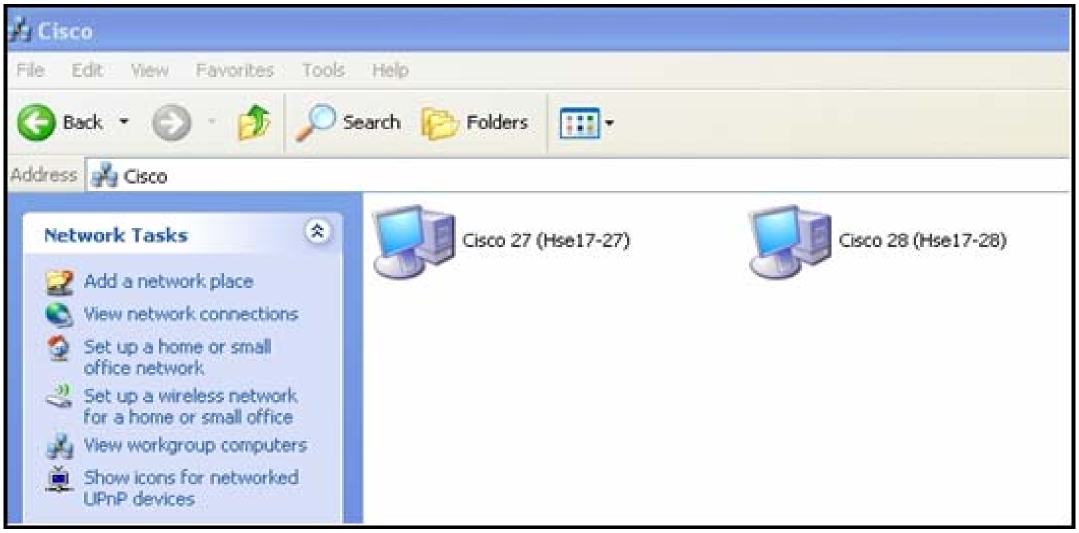
```
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\logon>ping 192.168.1.2

Pinging 192.168.1.2 with 32 bytes of data:

Reply from 192.168.1.2: bytes=32 time<1ms TTL=128
Reply from 192.168.1.2: bytes=32 time<1ms TTL=128
Reply from 192.168.1.2: bytes=32 time<1ms TTL=128
Reply from 192.168.1.2: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Documents and Settings\logon>
```

h. Repeat Steps 6a-6c on the second PC. The second PC will **ping** 192.168.1.1.

i. Close the Windows command prompt window on both PCs.

Step 7: Verify connectivity using My Network Places

a. A PC can share its resources with other PCs on the network. PCs with shared resources should be visible through **My Network Places**. On PC1, go to **Start**, click **My Network Places**, and then click **View workgroup computers** in the left panel.


Cisco
File Edit View Favorites Tools Help
Back
Search
Folders
Address Cisco
Network Tasks
Add a network place
View network connections
Set up a home or small office network
Set up a wireless network for a home or small office
View workgroup computers
Show icons for networked UPnP devices
Cisco 27 (Hse17-27)
Cisco 28 (Hse17-28)

b. Do you see an icon for the other PC in your peer-to-peer network? ________________________

c. What is the name of the other PC? ____

d. Is it the same name you recorded in Step 2? ____

e. Perform Step 7a on the second PC.

f. Close any open windows.

Step 8: (Optional – Use only if the Firewall was originally ENABLED) Re-enable the firewall

a. If you disabled the Windows Firewall in Step 6, click **Start**, select **Control Panel**, and open the **Network Connections** control panel.

b. Right-click the Ethernet network connection icon and select **Properties**. Click the **Advanced** tab. Locate and click **Settings**.

c. If the firewall settings are disabled (and they were enabled before this lab began), click the **On** radio button to enable the firewall. Click **OK** in this dialog box and the following one to apply this setting.

Lab 3.3.3 Determine the MAC Address of a Host

Objective

- Determine the MAC address of a Windows XP computer on an Ethernet network using the **ipconfig /all** command.
- Access to the **Run** command.

Background/Preparation

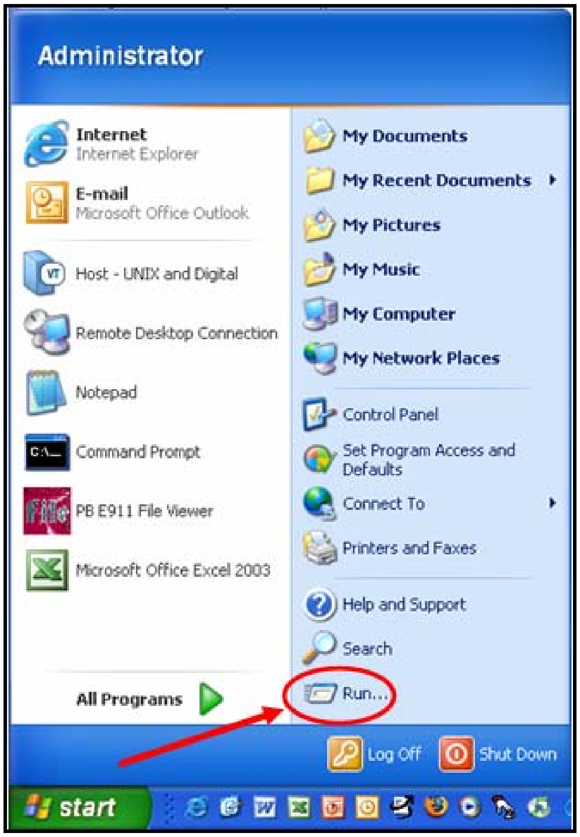
Every computer on an Ethernet local network has a Media Access Control (MAC) address that is burned into the Network Interface Card (NIC). Computer MAC addresses are usually displayed as 6 sets of two hexadecimal numbers separated by dashes or colons. (example: 15-EF-A3-45-9B-57). The **ipconfig /all** command displays the computer MAC address. You may work individually or in teams.

The following resources are required:

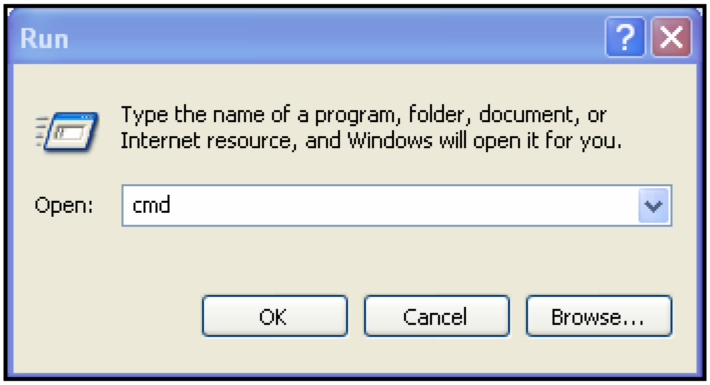
- Windows XP workstation with at least one Ethernet network interface card (NIC)

Step 1: Open a Windows command prompt window

a. From the Windows XP desktop, click **Start** then **Run.**



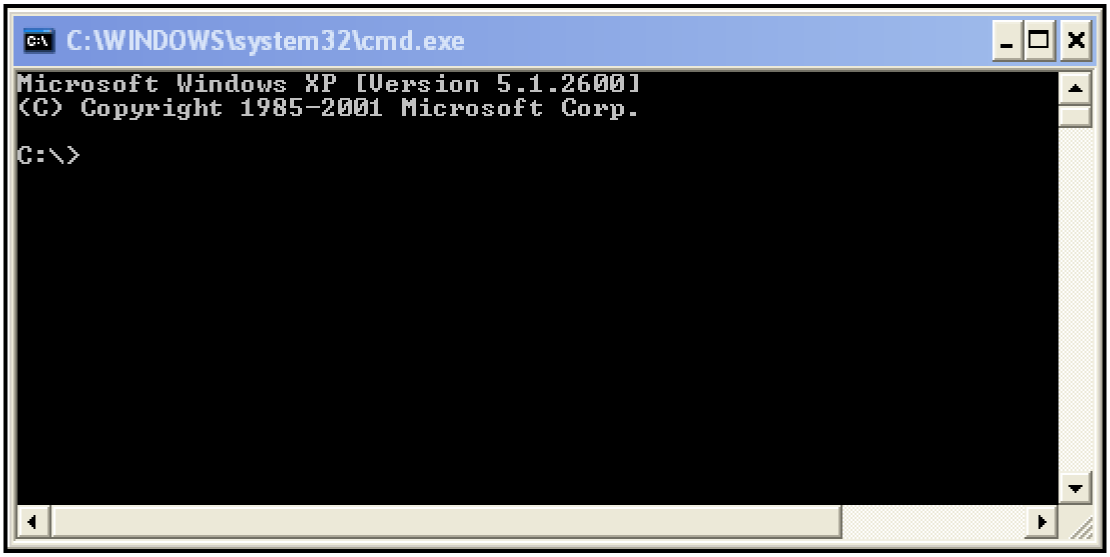
b. Type **cmd** in the Run dialogue box then click **OK**.



Type the name of a program, folder, document, or Internet resource, and Windows will open it for you.

Open: cmd

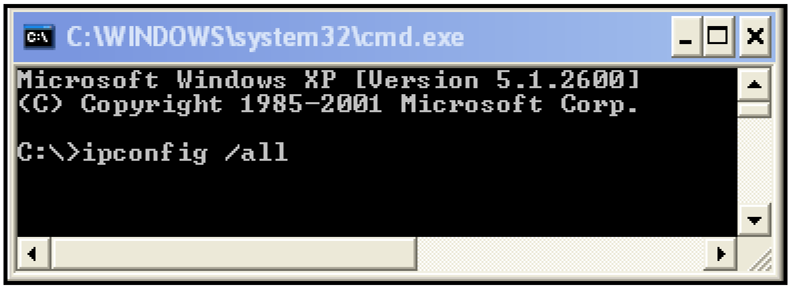
c. A Windows command prompt window opens.



```
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\>
```

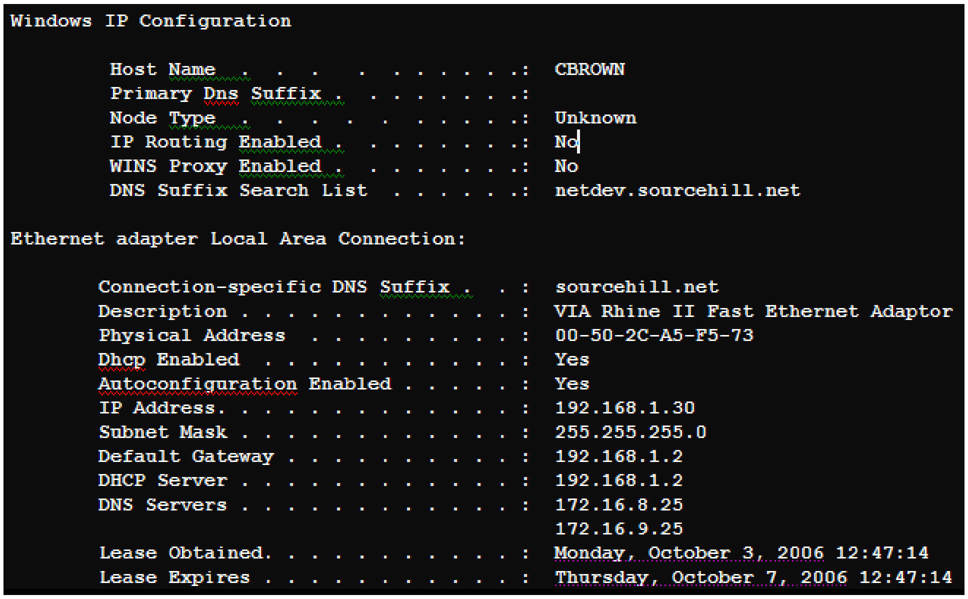
Step 2: Use the *ipconfig /all* command

a. Enter the **ipconfig /all** command at the command prompt.



```
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\>ipconfig /all
```

b. Press **Enter**. (Typical results are shown in the following figure, but your computer will display different information.)



```
Windows IP Configuration

        Host Name . . .  . . . . . . . .: CBROWN
        Primary Dns Suffix .  . . . . . . .:
        Node Type . . . . . . . . . . . .: Unknown
        IP Routing Enabled .  . . . . . . .: No
        WINS Proxy Enabled .  . . . . . . .: No
        DNS Suffix Search List  . . . . . .: netdev.sourcehill.net

Ethernet adapter Local Area Connection:

       Connection-specific DNS Suffix .  . : sourcehill.net
       Description . . . . . . . . . . . . : VIA Rhine II Fast Ethernet Adaptor
       Physical Address  . . . . . . . . . : 00-50-2C-A5-F5-73
       Dhcp Enabled  . . . . . . . . . . . : Yes
       Autoconfiguration Enabled . . . . . : Yes
       IP Address. . . . . . . . . . . . . : 192.168.1.30
       Subnet Mask . . . . . . . . . . . . : 255.255.255.0
       Default Gateway . . . . . . . . . . : 192.168.1.2
       DHCP Server . . . . . . . . . . . . : 192.168.1.2
       DNS Servers . . . . . . . . . . . . : 172.16.8.25
                                             172.16.9.25
       Lease Obtained. . . . . . . . . . . : Monday, October 3, 2006 12:47:14
       Lease Expires . . . . . . . . . . . : Thursday, October 7, 2006 12:47:14
```

Step 3: Locate the MAC (physical) address(es) in the output from the *ipconfig /all* command

a. Use the table below to fill in the description of the Ethernet adapter and the Physical (MAC) Address:

Description	Physical Address

Step 4: Reflection

a. Why might a computer have more than one MAC address?

____

____

b. The sample output from the **ipconfig /all** command shown previously had only one MAC address. Suppose the output was from a computer that also had wireless Ethernet capability. How might the output change?

____

____

c. Try disconnecting the cable(s) to your network adapter(s) and use the **ipconfig /all** command again. What changes do you see? Does the MAC address still display? Will the MAC address ever change?

____

____

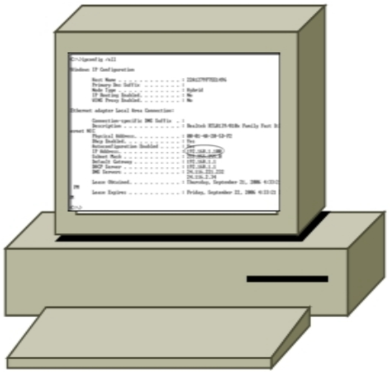
____

d. What are other names for the MAC address?

____

____

Lab 3.3.6 Determine the IP Address of a Computer



Objective

- Use the **ipconfig /all** command to determine the IP address of a Windows XP host on an Ethernet network.

Background / Preparation

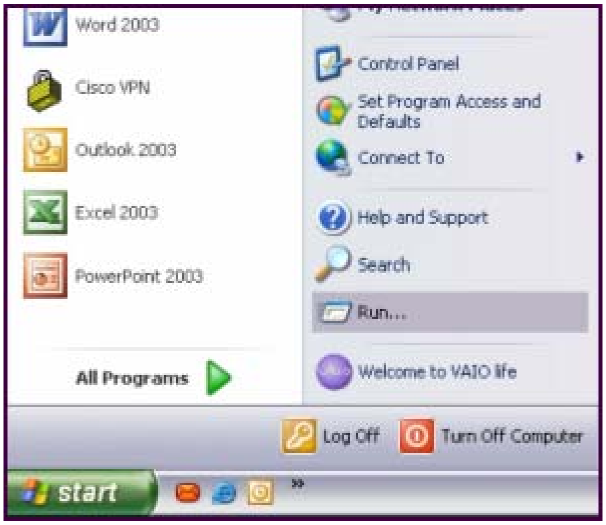
Every computer connected to the Internet has a unique identifier, called an IP address. IP addresses are displayed as four numbers, known as octets, separated by periods (example: 192.168.1.4). The **ipconfig /all** command displays your computer's IP address and information about the network. The following resources are required:

- A workstation that is attached to the local network and that has it's IP address already configured
- Access to the **Run** command

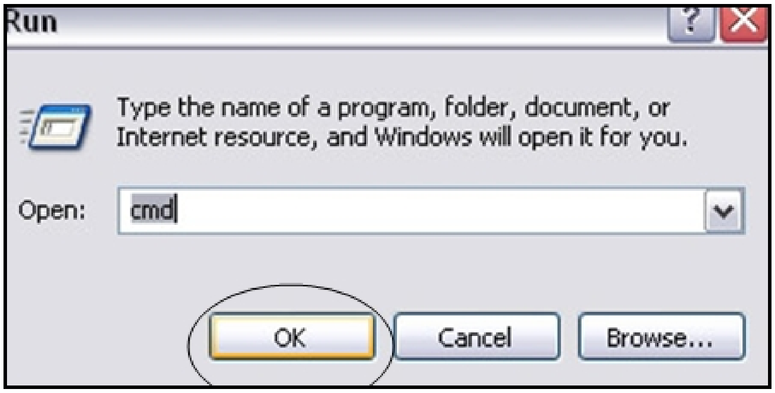
In this lab you will locate your computer's IP address to discover its unique number.

Step 1: Determine the IP address of the computer

a. From the Windows XP desktop, click the **Start** button, and then click **Run**.



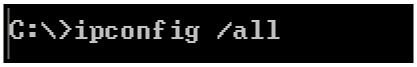
b. In the Run dialog box, type **cmd** then click the **OK** button.



Type the name of a program, folder, document, or Internet resource, and Windows will open it for you.

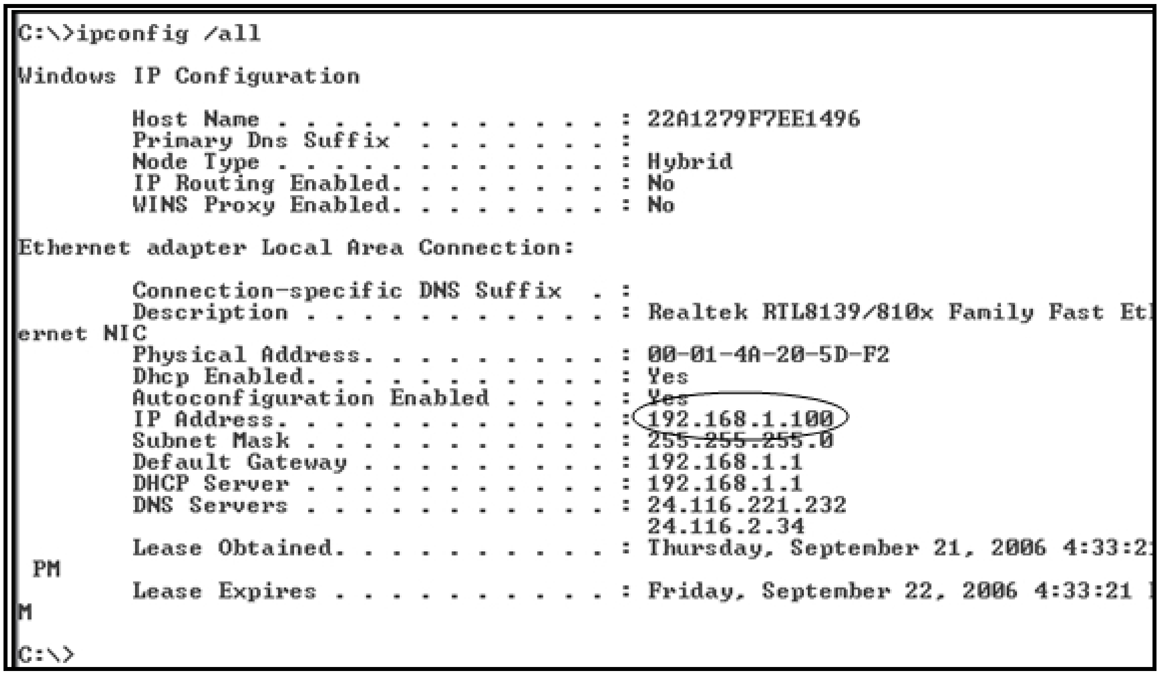
Open: cmd

c. At the command prompt, type **ipconfig /all** and press Enter.



```
C:\>ipconfig /all
```

d. The **ipconfig /all** command then displays a list of information about your computer's IP configuration. An example is shown in the following figure. The information displayed for your computer will be different.



```
C:\>ipconfig /all

Windows IP Configuration

        Host Name . . . . . . . . . . . . : 22A1279F7EE1496
        Primary Dns Suffix  . . . . . . . :
        Node Type . . . . . . . . . . . . : Hybrid
        IP Routing Enabled. . . . . . . . : No
        WINS Proxy Enabled. . . . . . . . : No

Ethernet adapter Local Area Connection:

        Connection-specific DNS Suffix  . :
        Description . . . . . . . . . . . : Realtek RTL8139/810x Family Fast Et
ernet NIC
        Physical Address. . . . . . . . . : 00-01-4A-20-5D-F2
        Dhcp Enabled. . . . . . . . . . . : Yes
        Autoconfiguration Enabled . . . . : Yes
        IP Address. . . . . . . . . . . . : 192.168.1.100
        Subnet Mask . . . . . . . . . . . : 255.255.255.0
        Default Gateway . . . . . . . . . : 192.168.1.1
        DHCP Server . . . . . . . . . . . : 192.168.1.1
        DNS Servers . . . . . . . . . . . : 24.116.221.232
                                            24.116.2.34
        Lease Obtained. . . . . . . . . . : Thursday, September 21, 2006 4:33:2
 PM
        Lease Expires . . . . . . . . . . : Friday, September 22, 2006 4:33:21 
M

C:\>
```

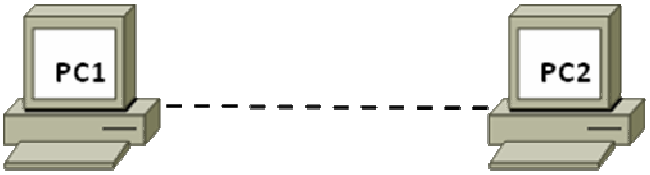
e. Locate the IP address and record the finding.

IP address ____

f. Why is it important that a computer get an IP address? ___________________________________

____

Lab 3.5.2 IP Addresses and Network Communication



Objectives

- Build a simple peer-to-peer network and verify physical connectivity.
- Assign various IP addresses to hosts and observe the effects on network communication

Background / Preparation

In this lab, you will build a simple peer-to-peer network using two PCs and an Ethernet crossover cable. You will assign various compatible and non-compatible IP addresses to the hosts and determine the effects on their ability to communicate.

The following resources are required:

NOTE: You may use the small peer-to-peer network that was built in Lab 3.1.5

- Two Windows XP Professional PCs, each with an installed and functional Network Interface Card (NIC)
- An Ethernet cross-over cable to connect the PCs (provided by instructor)
- (Optional lab setup) A hub or switch and two straight-through cables to connect the PCs (provided by instructor)

Step 1: Connect the PCs to create a peer-to-peer network

a. Obtain an Ethernet crossover cable provided by the instructor to connect the two PCs.

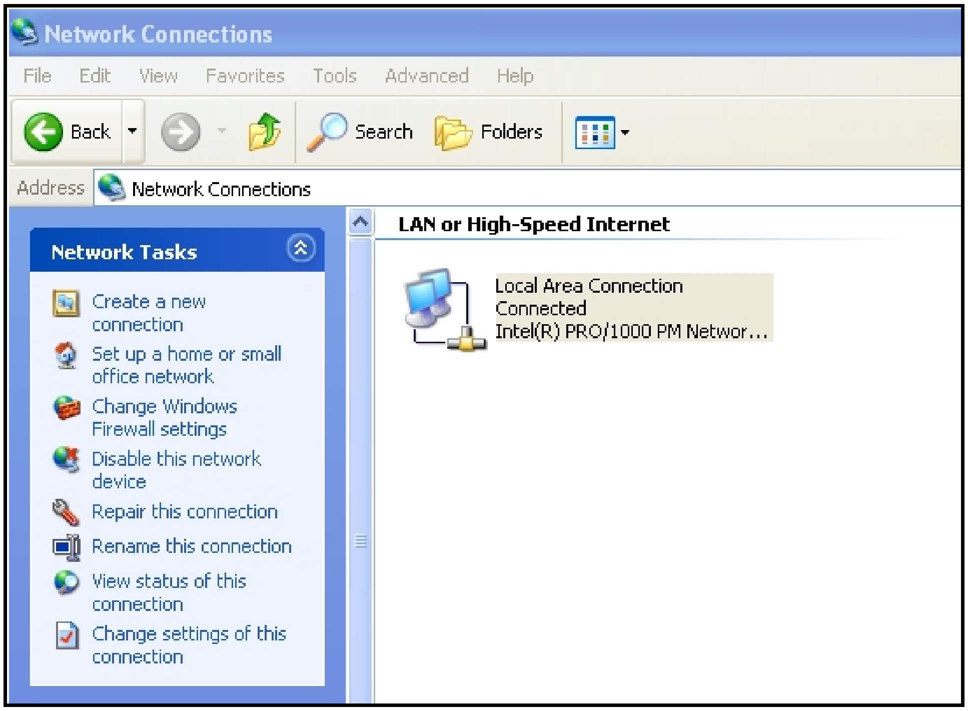
NOTE: (optional lab setup) The PCs may be connected to a hub (or switch) using two straight-through cables. The following instructions assume you are using a crossover cable.

b. Plug one end of the cable into the Ethernet NIC of PC1. Plug the other end of the cable into the Ethernet NIC of PC2. As you insert the cable, you should hear a click which indicates that the cable connector is properly inserted into the port.

Step 2: Verify physical connectivity

a. After the Ethernet crossover cable is connected to both PCs, take a close look at each Ethernet port. A link light (usually green or amber) indicates that physical connectivity has been established between the two NICs. Try unplugging the cable from one PC then reconnecting it to verify that the light goes off then back on.

b. Go to the **Control Panel**, double click the **Network Connections** icon, and confirm that the local area connection is established. The following figure shows an active local area connection. If physical connectivity problems exist, you will see a red **X** over the Local Area Connection icon with the words **Network cable unplugged**.


Network Connections
File Edit View Favorites Tools Advanced Help
Back
Search
Folders
Address Network Connections
Network Tasks
Create a new connection
Set up a home or small office network
Change Windows Firewall settings
Disable this network device
Repair this connection
Rename this connection
View status of this connection
Change settings of this connection
LAN or High-Speed Internet

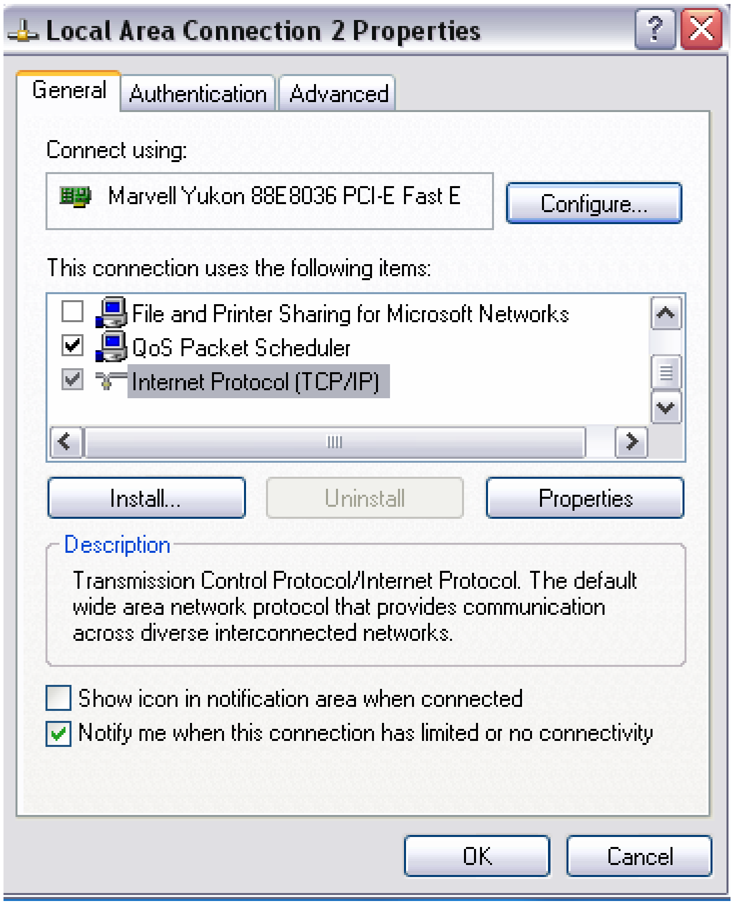
Local Area Connection
Connected
Intel(R) PRO/1000 PM Networ...

c. If the Local Area Connection does not indicate that it is connected, troubleshoot by repeating Steps 1 and 2. You may also want to ask your instructor to confirm that you are using an Ethernet crossover cable.

Step 3: Configure IP settings for the two PCs

a. Configure the logical IP addresses for the two PCs so that they are able to communicate using TCP/IP. On PC1, go to the Control Panel, double click the Network Connections icon, and then right click the connected Local Area Connection icon. Choose Properties from the pull-down menu.

b. Using the scroll bar in the Local Area Connection Properties window, scroll down to highlight Internet Protocol (TCP/IP). Click the Properties button.



Local Area Connection 2 Properties

Connect using: Marvell Yukon 88E8036 PCI-E Fast E

This connection uses the following items:

- □ File and Printer Sharing for Microsoft Networks
- ☑ QoS Packet Scheduler
- ☑ Internet Protocol (TCP/IP)

Description

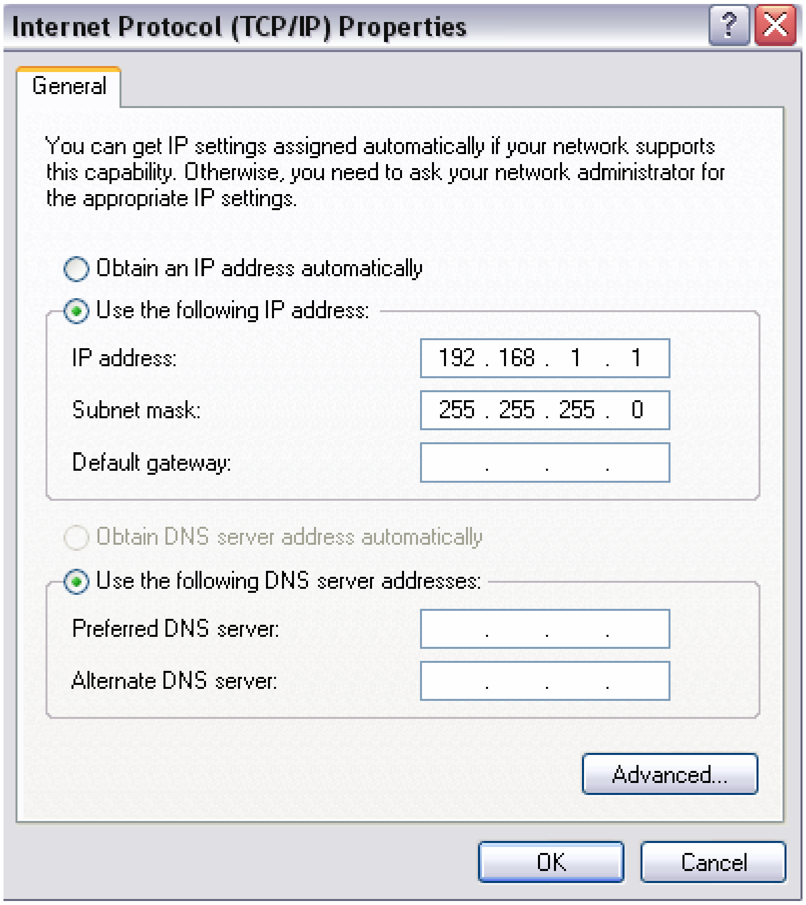
Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.

□ Show icon in notification area when connected

☑ Notify me when this connection has limited or no connectivity

c. Select the **Use the following IP address** radio button and enter an IP address of 192.168.1.1 and a subnet mask of 255.255.255.0. With this IP address and subnet mask, the network number the host is on is 192.168.1.0 and 192.168.1.1 is the first host on the 192.168.1.0 network :

IP Address	**192.168.1.1**
Subnet Mask	**255.255.255.0**



Internet Protocol (TCP/IP) Properties

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

○ Obtain an IP address automatically

● Use the following IP address:

IP address: 192 . 168 . 1 . 1

Subnet mask: 255 . 255 . 255 . 0

Default gateway: . . .

○ Obtain DNS server address automatically

● Use the following DNS server addresses:

Preferred DNS server: . . .

Alternate DNS server: . . .

d. Click **OK**, which will close the **Internet Protocol (TCP/IP) Properties** window. Click the **Close** button to exit the **Local Area Connection Properties** window.

e. Repeat steps 3a – 3d for the PC2 using an IP address of 192.168.1.2 and a subnet mask of 255.255.255.0. The network number this PC is on is 192.168.1.0 and 192.168.1.2 is the second host on the 192.168.1.0 network.

IP Address	**192.168.1.2**
Subnet Mask	**255.255.255.0**

Step 4: Verify IP connectivity between the two PCs

NOTE: To test TCP/IP connectivity between the PCs, Windows Firewall must be disabled temporarily on both PCs. Windows Firewall should be re-enabled after the tests have been completed.

a. On each PC, on the Windows XP desktop, click **Start**. From the Start menu, select **Control Panel**, and double-click **Network Connections**.

b. Right-click the Local Area Connection icon and select **Properties**. Click the **Advanced** tab. Locate and click the **Settings** button.

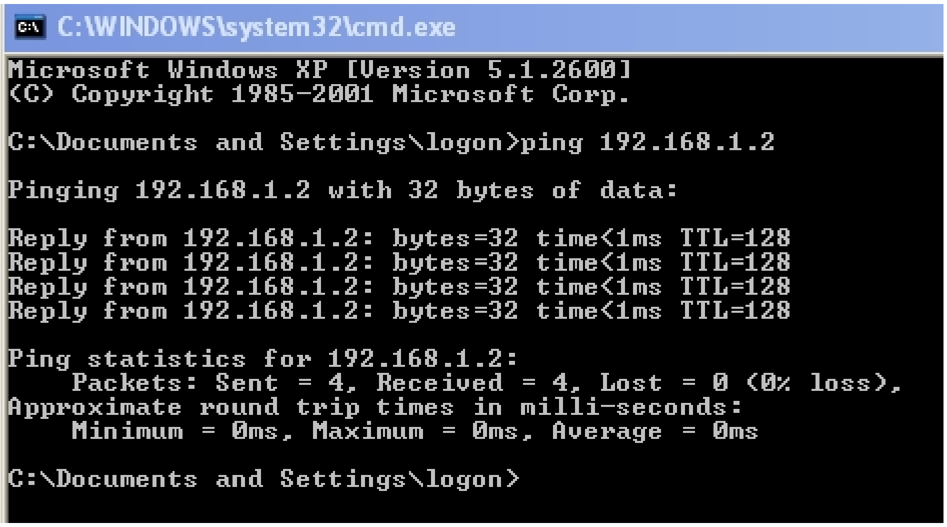
c. Make a note of whether the firewall settings are ENABLED (ON) for the Ethernet port or DISABLED (OFF) for the Ethernet port. ____

d. If the firewall settings are enabled, click the **Off (not recommended)** radio button to disable the firewall. The setting will be re-enabled in a later step. Click **OK** in this dialog box and the following to apply this setting. Repeat Steps 4a-4d on the second PC.

e. Now that the two PCs are physically connected and configured correctly with IP addresses, we need to make sure they communicate with each other. The **ping** command is a simple way to accomplish this task. The **ping** command is included with the Windows XP operating system.

f. On PC1, go to **Start**, then **Run**. Type **cmd**, and then click **OK**. A Window command prompt window will appear as shown in the following figure.

g. At the **>** prompt, type **ping 192.168.1.2** and press **Enter**. A successful **ping** will verify the IP connectivity. It should produce results similar to those shown in the figure that follows.



```
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\logon>ping 192.168.1.2

Pinging 192.168.1.2 with 32 bytes of data:

Reply from 192.168.1.2: bytes=32 time<1ms TTL=128
Reply from 192.168.1.2: bytes=32 time<1ms TTL=128
Reply from 192.168.1.2: bytes=32 time<1ms TTL=128
Reply from 192.168.1.2: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Documents and Settings\logon>
```

h. Repeat this procedure for PC2 but **ping** 192.168.1.1.

i. Close the Windows command prompt window on both PCs.

Step 5: Change IP address for PC2

a. On PC2, go to the Control Panel, double click the Network Connections icon, and then right click the connected Local Area Connection icon. Choose Properties from the pull-down menu.

b. Using the scroll bar in the Local Area Connection Properties window, scroll down to highlight Internet Protocol (TCP/IP). Click the Properties button.

c. Change the logical IP address for PC2 from 192.168.1.2 to 192.168.2.2 and leave the subnet mask set to 255.255.255.0. On what network is PC2 now? ________________________________

d. Click **OK**, which will close the **Internet Protocol (TCP/IP) Properties** window. Click the **Close** button to exit the **Local Area Connection Properties** window.

e. Refer back to Step 3c. On what network is PC1? ___________________________________

f. The two PCs are still on the same physical Ethernet network. Are they on the same logical IP network? _____________________

Step 6: Test network connectivity between the 2 PCs

a. On PC1, go to **Start**, then **Run**. Type **cmd**, and then click **OK**. A Window command prompt window will appear.

b. At the **>** prompt, type **ping 192.168.2.2** and press **Enter**. Was it successful? _________________

Why or why not? ____

c. What type of networking device would allow the PCs to communicate? ______________________

Step 7: Change IP address for PC1

a. Using the procedure previously described, change the logical IP address for PC1 from 192.168.1.1 to 192.168.2.99 and leave the subnet mask set to 255.255.255.0. On what network is PC1 now?

____

b. Click **OK**, which will close the **Internet Protocol (TCP/IP) Properties** window. Click the **Close** button to exit the **Local Area Connection Properties** window.

c. The two PCs are still on the same physical Ethernet network. Are they on the same logical IP network now? ____

Step 8: Test network connectivity between the 2 PCs

a. On PC2, go to **Start**, then **Run**. Type **cmd**, and then click **OK**. A Window command prompt window will appear.

b. At the **>** prompt, type **ping 192.168.2.99** and press **Enter**. Was it successful? _________________

Why or why not? ____

Step 9: (Optional – Use only if the Firewall was originally ENABLED) Re-enable the firewall

a. If you disabled the Windows Firewall in Step 4, click **Start**, select **Control Panel**, and click **Network Connections**.

b. Right-click the Ethernet network connection icon and select **Properties**. Click the **Advanced** tab. Locate and click **Settings**.

c. If the firewall settings are disabled (and they were enabled before this lab began), click the **On** radio button to enable the firewall. Click **OK** in this dialog box and the following one to apply this setting.

Lab 3.6.4 Connect and Configure Hosts

Objectives

- Connect a PC to a router using a straight-through cable.
- Configure the PC with an appropriate IP address.
- Configure the PC with a NetBIOS computer name.
- Verify the PC configuration using Windows XP and through a command prompt.

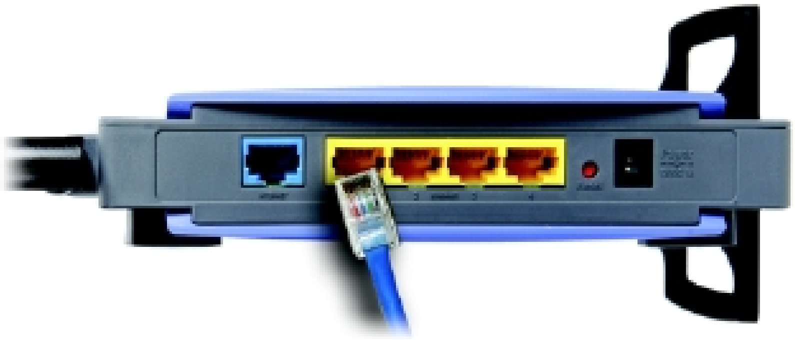
Background / Preparation

In order for the PC to participate in the local network and the Internet, it must be connected to a network device. The following resources will be required:

- Linksys Model WRT300N wireless router or equivalent SOHO router
- Two computers with Ethernet NICs and Windows XP Professional installed on both
- Two straight-through cables

Step 1: Identify Ethernet ports

a. On the Linksys router, locate the Ethernet (Local Area Network) LAN ports. The Ethernet LAN ports connect your network hosts and devices. The four LAN ports are grouped together in the center of the router as shown in the following figure.



b. On the PC, locate the Ethernet port. The port could be integrated into the motherboard or it could be an adapter. In either case, the port will be an RJ-45 port. The photo shows an Ethernet port on an adapter.

Step 2: Connect the cable between the PC and the router

a. Connect one end of the straight-through Ethernet cable to an Ethernet LAN port on the router.

b. Connect the other end of the cable to the PC Ethernet port.

c. Repeat this procedure for the second PC.

Step 3: Assign the PCs an IP address and default gateway

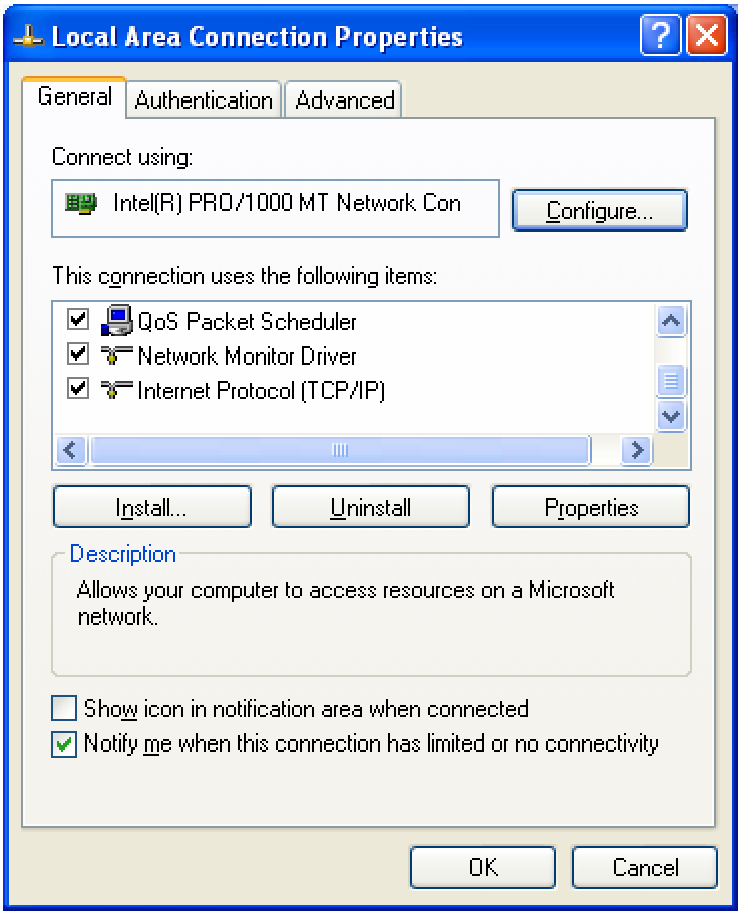
a. In order to assign an IP address and default gateway to a Windows XP host, from the **Start menu,** select **Control Panel.**

b. There are two ways to view Control Panels: Classic view and Category view. The options available depend on which one of these two views you are using. If you see an option on the left that says **Switch to Category View**, you are currently in the Classic view mode. If you see an option on the left that says **Switch to Classic View**, you are currently in Category view mode. Ensure that you are in Classic view mode.

c. Locate and double-click the **Network Connections** control panel icon.

d. Right-click the **Local Area Connection** icon that represents your NIC and click the **Properties** menu option.

e. In the middle window, scroll down until you see and can double-click the **Internet Protocol (TCP/IP)** option. The figure that follows shows this option.



Connect using:

Intel(R) PRO/1000 MT Network Con

This connection uses the following items:

- ☑ QoS Packet Scheduler
- ☑ Network Monitor Driver
- ☑ Internet Protocol (TCP/IP)

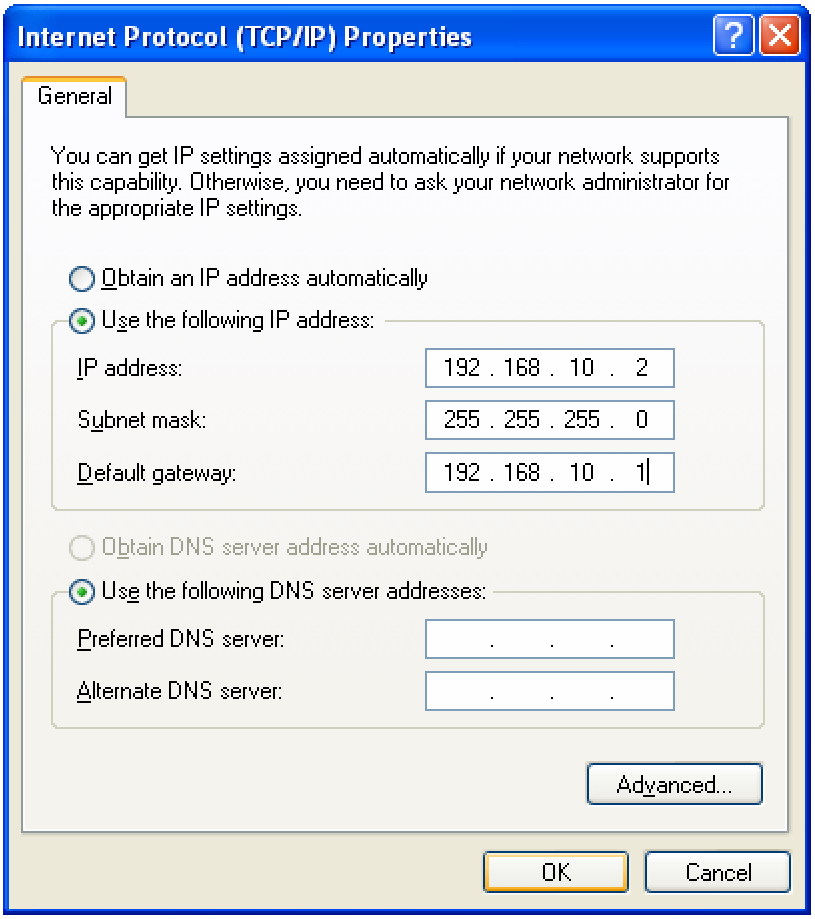
Allows your computer to access resources on a Microsoft network.

☐ Show icon in notification area when connected

☑ Notify me when this connection has limited or no connectivity

f. Click the **Properties** button and the Internet Protocol [TCP/IP] Properties window will appear.. Next, click the **Use the following IP address** button, which activates the IP address, Subnet mask, and Default gateway textboxes.

In the IP address field, enter **192.168.10.2**. Configure the subnet mask to **255.255.255.0**. Configure the default gateway to **192.168.10.1**. The figure that follows shows these settings. (DNS server information is not necessary at this time, so the fields under **Use the following DNS server addresses** don't need to be filled out.) When finished, click **OK**.



Internet Protocol (TCP/IP) Properties

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

○ Obtain an IP address automatically

● Use the following IP address:

IP address: 192 . 168 . 10 . 2

Subnet mask: 255 . 255 . 255 . 0

Default gateway: 192 . 168 . 10 . 1

○ Obtain DNS server address automatically

● Use the following DNS server addresses:

Preferred DNS server: . . .

Alternate DNS server: . . .

g. From the Internet Protocol [TCP/IP] Properties window, click **OK** to apply the changes. Be patient, since this step may take some time. After the changes are applied, you will be returned to the Network Connections window.

h. Since the two computers are on the same network, their IP addresses will be similar, their subnet masks will be identical, and their default gateways will be identical. Perform the same procedures on the second PC to assign an IP address, subnet mask, and default gateway using the following information:

IP address: 192.168.10.3

Subnet mask: 255.255.255.0

Default gateway: 192.168.10.1

i. Why do you think the IP addresses are different, but the subnet masks and default gateways are the same? ____

____

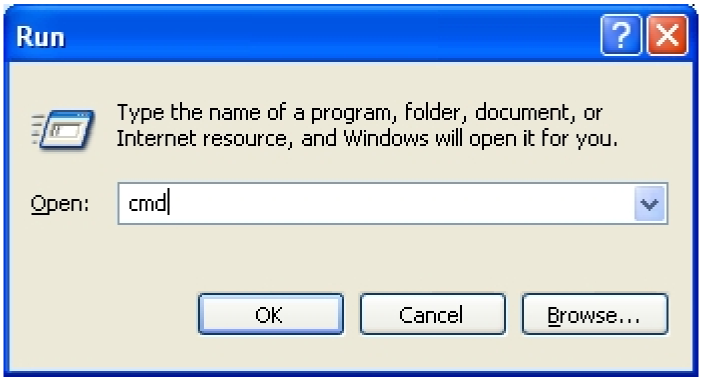
____

Step 4: Verify the IP address configuration

a. On the Windows XP desktop, click **Start**.

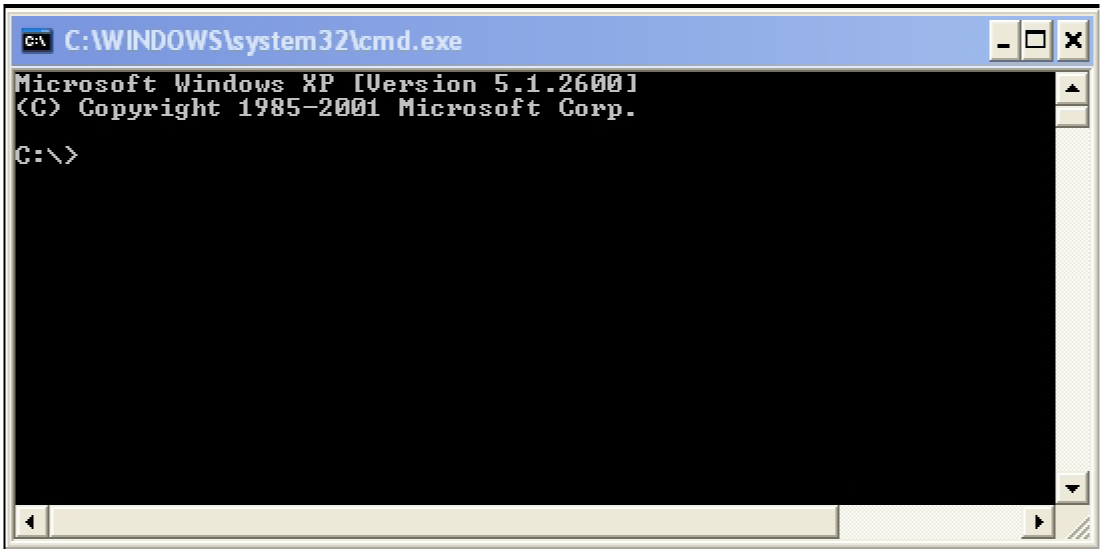
b. From the Start menu, Select the **Run** menu option.

c. In the **Open:** textbox, type **cmd** and press Enter. A command prompt appears. The figures that follow show this process.



Run
?
Type the name of a program, folder, document, or Internet resource, and Windows will open it for you.
Open:
OK
Cancel
Browse...

Open: cmd



```
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\>
```

d. In the command line prompt, type **ipconfig /all**. Verify that the IP address and the default gateway are the values that you entered in the earlier steps. If they are incorrect, repeat Steps 3 and 4.

e. Are the IP address, subnet mask, and default gateway correct for the first PC? _____________

f. Perform the same configuration check on the second PC. If the values are incorrect, repeat Steps 3 and 4.

g. Are the IP address, subnet mask, and default gateway correct for the second PC? ___________

Step 5: Test connectivity between the two PCs

NOTE: To test TCP/IP connectivity between the PCs, Windows Firewall must be disabled temporarily on both PCs. Windows Firewall should be re-enabled after the tests have been completed.

a. On PC1, on the Windows XP desktop, click Start. From the Start menu, select Control Panel, and double-click Network Connections.

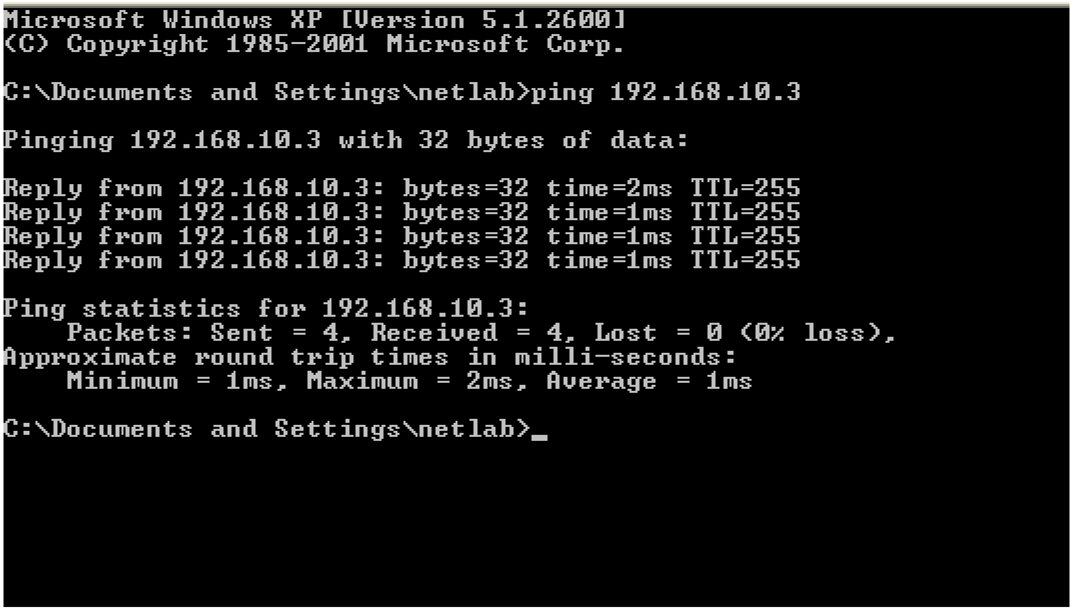
b. Right-click the Local Area Connection icon and select Properties. Click the Advanced tab. Locate and click the Settings button.

c. Make a note of whether the firewall settings are ENABLED (ON) for the Ethernet port or DISABLED (OFF) for the Ethernet port. ____

d. If the firewall settings are enabled, click the Off (not recommended) radio button to disable the firewall. The setting will be re-enabled in a later step. Click OK in this dialog box and the following to apply this setting.

e. From the same command prompt on the first PC, type ping 192.168.10.3 to test connectivity with the second PC.

f. If the ping is successful, you will see results similar to the following figure. If the ping is not successful, perform the appropriate troubleshooting steps such as checking the cabling and checking your IP address, subnet mask, and default gateway assignments.



```
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\netlab>ping 192.168.10.3

Pinging 192.168.10.3 with 32 bytes of data:

Reply from 192.168.10.3: bytes=32 time=2ms TTL=255
Reply from 192.168.10.3: bytes=32 time=1ms TTL=255
Reply from 192.168.10.3: bytes=32 time=1ms TTL=255
Reply from 192.168.10.3: bytes=32 time=1ms TTL=255

Ping statistics for 192.168.10.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 2ms, Average = 1ms

C:\Documents and Settings\netlab>_
```

g. From the command prompt on the second PC, type **ping 192.168.10.2 to** check connectivity to the first PC.

The **ping** should succeed.

Step 6: Configure the NetBIOS name

a. Right-click **Start** and select the **Explore** option.

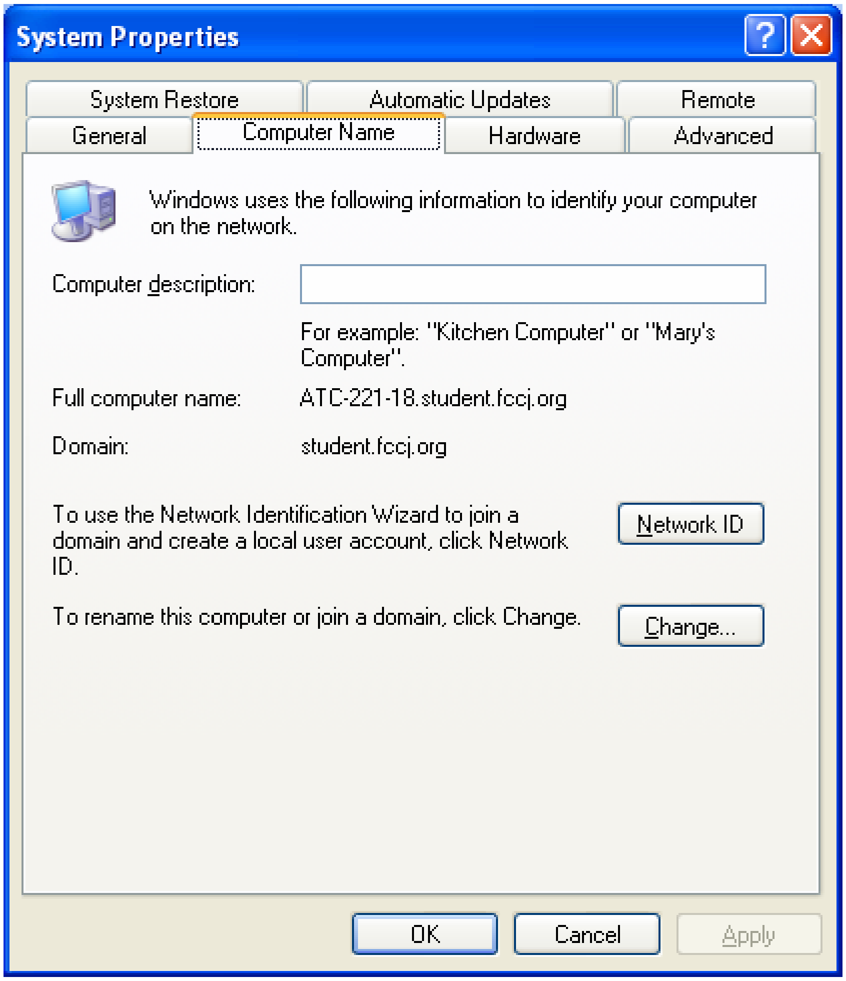
b. How many drive letters are shown in the window that appears? _________________________

c. Which drive letters are shown? ____

d. Right-click the **My Computer** icon on your Windows XP desktop and select the **Properties** option. The System Properties window appears.

NOTE: If the My Computer icon does not appear on the desktop, click **Start** then right-click **My Computer**.

e. Click the **Computer Name** tab. An example of the window that appears follows:



Windows uses the following information to identify your computer on the network.

Computer description:

For example: "Kitchen Computer" or "Mary's Computer".

Full computer name: ATC-221-18.student.fccj.org

Domain: student.fccj.org

To use the Network Identification Wizard to join a domain and create a local user account, click Network ID.

To rename this computer or join a domain, click Change.

f. Click **Change**. Make a note of the current computer name. _______________

g. In the Computer Name textbox, type **PC1**. Ensure the **Member of** radio button or field is set to **Workgroup**.

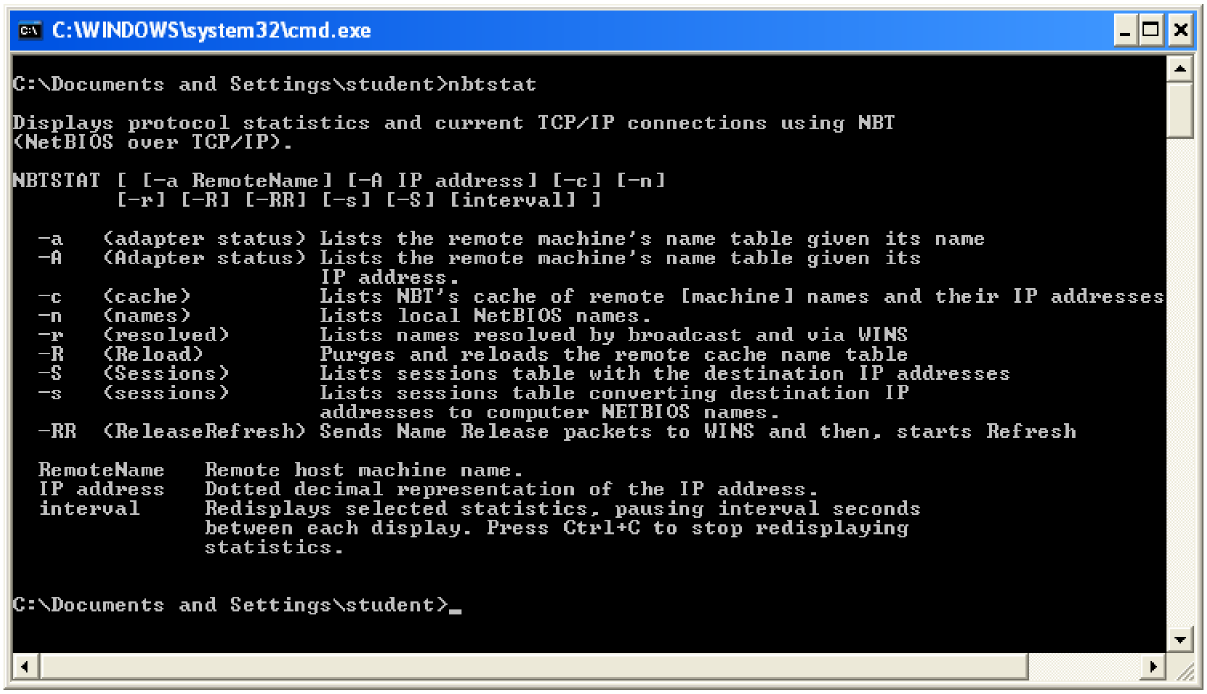
h. Make a note of the Workgroup name. ____

i. Click **OK**. If prompted to restart the computer, click **OK** to restart and follow the directions on the screen.

j. Use the same process to name the second computer **PC2.** Also ensure that the Workgroup name is set to the same value as **PC1**.

Step 7: Verify configuration

a. To verify the new configuration, open a command prompt on each computer. If you forgot how, refer to Steps 4a, b, and c.



```
C:\Documents and Settings\student>nbtstat

Displays protocol statistics and current TCP/IP connections using NBT
(NetBIOS over TCP/IP).

NBTSTAT [ [-a RemoteName] [-A IP address] [-c] [-n]
        [-r] [-R] [-RR] [-s] [-S] [interval] ]

  -a   (adapter status) Lists the remote machine's name table given its name
  -A   (Adapter status) Lists the remote machine's name table given its
                        IP address.
  -c   (cache)          Lists NBT's cache of remote [machine] names and their IP addresses
  -n   (names)          Lists local NetBIOS names.
  -r   (resolved)       Lists names resolved by broadcast and via WINS
  -R   (Reload)         Purges and reloads the remote cache name table
  -S   (Sessions)       Lists sessions table with the destination IP addresses
  -s   (sessions)       Lists sessions table converting destination IP
                        addresses to computer NETBIOS names.
  -RR  (ReleaseRefresh) Sends Name Release packets to WINS and then, starts Refresh

  RemoteName   Remote host machine name.
  IP address   Dotted decimal representation of the IP address.
  interval     Redisplays selected statistics, pausing interval seconds
               between each display. Press Ctrl+C to stop redisplaying
               statistics.

C:\Documents and Settings\student>_
```

b. Use the **nbtstat** command to view and gather information about remote computers. From the command prompt, type **nbtstat** and press Enter. Help for the command displays as shown:

The letters shown are options called switches that you can use with the **nbtstat** command.

a. On PC1, type **nbtstat –n** and press Enter to see the local NetBIOS name of PC1.

b. On PC2, type the same command to verify the NetBIOS name is set to PC2.

c. The **nbtstat –a** command can be used to look at a remote computer's name table. Type **nbtstat** again from the command prompt. Notice in the output that when you use the **–a** switch, you have to put a space and then type a remote computer's name (RemoteName).

From PC1, type **nbtstat –a PC2** and press Enter. The **nbtstat** information for PC2 shows on PC1's monitor.

What command would be used from the command prompt on PC2 to view information about PC1?

____

d. From PC2, type the appropriate command to view PC1's **nbtstat** information.

e. The **nbtstat –A** (notice that the switch is a capital A this time) can be used to view the same information using an IP address rather than a name. If you type **nbtstat** again, you can see that the command syntax tells us that we use **–A** followed by an IP address. The IP address is that of the remote computer.

From PC1, type **nbtstat –A 192.168.10.3** to see the same information that was returned by the **nbtstat –a PC2** command.

f. Write the command that would be typed on PC2 to view information about PC1, using the IP address of PC1 instead of the NetBIOS name. ____________________________________

g. From PC1, you can use the **ping** command to verify connectivity. However, instead of using an IP address, you can use the NetBIOS name. From the PC1 command prompt, type **ping PC2** (notice the capitalization). The result should be successful.

h. From PC1, type **ping pc2** (notice the capitalization).

i. Does the **ping** succeed using lower case letters? ____

j. You can use the **nbtstat –r** command to see NetBIOS names that have been resolved (they are known). From the PC1 and PC2 command prompt, type **nbtstat –r** to see that the remote computer is known using NetBIOS.

k. Close the command prompt window.

Step 8: (Optional – Use only if the Firewall was originally ENABLED) Re-enable the firewall

a. If the answer to Step 5c was OFF or ENABLED on PC1, click **Start**, select **Control Panel**, and open the **Network Connections** control panel.

b. Right-click the Ethernet network connection icon and select **Properties**. Click the **Advanced** tab. Locate and click **Settings**.

c. If the firewall settings are disabled (and they were enabled before this lab began), click the **On** radio button to disable the firewall. Click **OK** in this dialog box and the following one to apply this setting.

Step 9: Return IP Address and NetBIOS Name to original values

a. Return to Step 3 to change the IP address back to the original.

b. Return to Step 6d to change the NetBIOS name back to the original.

Step 10: Reflection

a. Check two or three computers in your lab at school. Complete the following table:

	Computer Name	**IP Address & Subnet Mask**	**Default Gateway**
1			
2			
3			

b. Either with a classmate assigned to you or by choosing one yourself, share this information with them.

In your opinion, are the names descriptive? ____

c. Are all of the computers in the classroom part of the same local network? How could you prove that?

____

CCNA Discovery

Networking for Home and Small Businesses

Lab 3.6.5 Sharing Resources

Objectives

Use Windows XP to complete the following tasks:

- Share files and folders.
- Map network drives.

Background/Preparation

One of the key benefits of having PCs networked together is that it provides access to be able to share information with other connected users. Whether it is a song, a proposal or your holiday pictures, there are many situations where you need to share data with friends or business colleagues.

Mapping drives, goes hand-in-hand with sharing folders because drive mappings provide quick access to commonly used folders. They also provide an easier way for users to navigate and find the files and/or folders they are looking for. Drive mappings redirect a local resource (drive letter) to a shared network resource (hard drive or folder on the network).

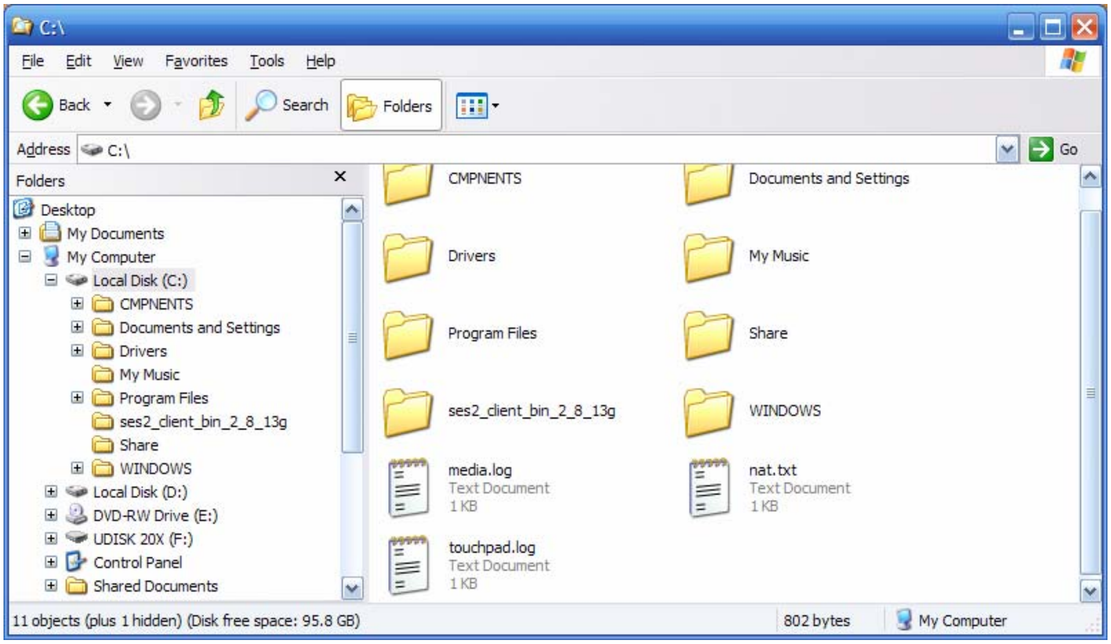
The following resources are required:

- Two configured Windows XP Professional workstations connected via a local network. Note: Use the previously configured network from lab activity 3.6.4.

Step 1: Share a folder

a. Click **Start**. from the Start Menu, select **All Programs**, **Accessories**, and then **Windows Explorer**.

b. In the Folders pane, click the plus sign (**+**) beside **My Computer**. Click the **C:** drive. From the **File** menu. select **New** and from the sub-menu, select the **Folder** option. Type **Share** as the name of the folder.

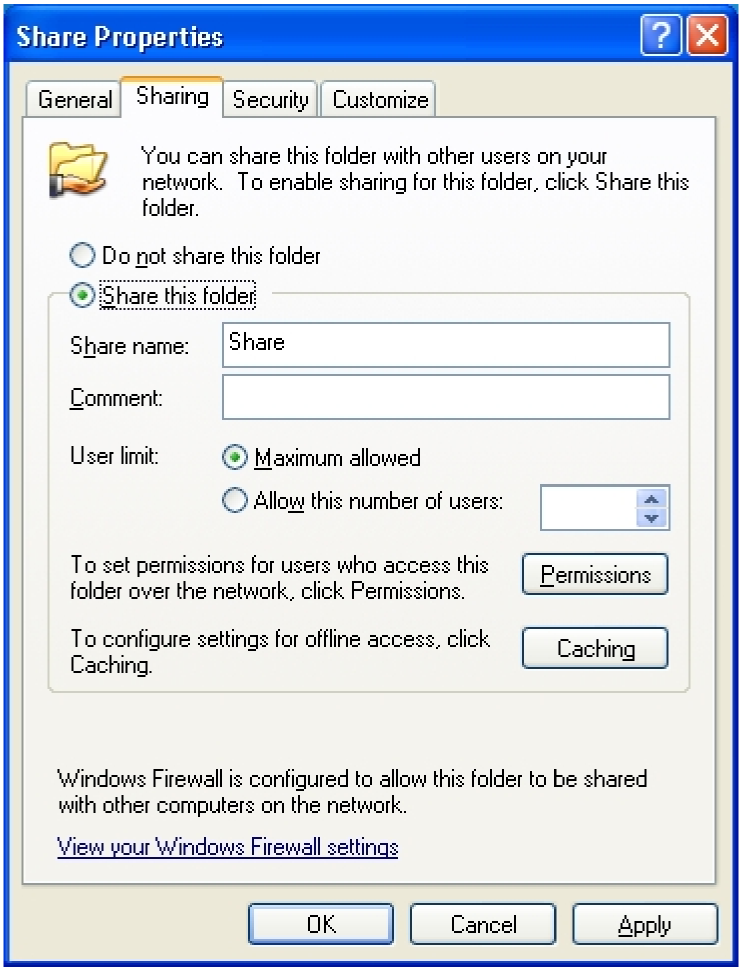


c. Right-click the new folder **Share** and choose **Properties.**

NOTE: The Sharing option is not available for the Documents and Settings, Program Files, and Windows system folders.

d. Select the **Sharing** tab. In the Share Properties dialog box, click the **Share this folder** radio button to share the folder with other users on your network. The default name for the shared folder is the same name as the original folder name.

NOTE: To change the name of the folder on the network, type a new name for the folder in the Share name text box. This will not change the name of the folder on your computer.



You can share this folder with other users on your network. To enable sharing for this folder, click Share this folder.

○ Do not share this folder
● Share this folder

Share name: Share
Comment:
User limit: ● Maximum allowed
○ Allow this number of users:

To set permissions for users who access this folder over the network, click Permissions.

To configure settings for offline access, click Caching.

Windows Firewall is configured to allow this folder to be shared with other computers on the network.

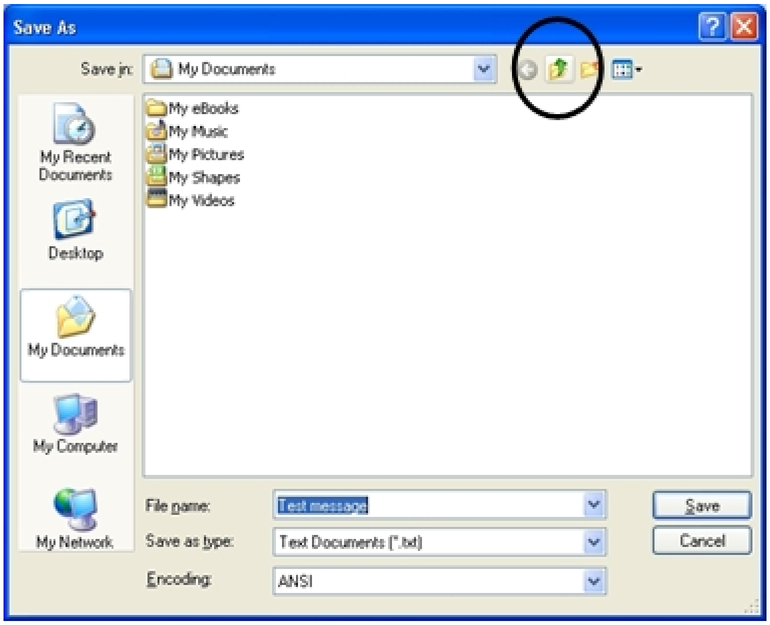
View your Windows Firewall settings

e. Click **Apply** and then **OK**.

f. Create a text file using Notepad and save it to the Share folder. On the Windows XP desktop, click **Start**, select **All Programs**, **Accessories**, then **Notepad**.

In the Notepad application, type the message “Hello World!”.

From the **File** menu, select **Save**. In the **File name** field, type “Test message”. Click the icon with the folder and up arrow as shown in the following figure.



File name: Test message

Save as type: Text Documents (*.txt)

Encoding: ANSI

g. Double-click **My Computer**, then double-click drive **C:**. Locate and double-click the **Share folder**, then click **Save**.

h. Close the Notepad application.

i. Repeat Steps 1 – 5 for the second Windows XP Professional machine with the following exceptions:

Share name: **Share2**

Text file contents: **Hello planet!**

Text file name: **Test Message 2**

Step 2: Map network drives to provide quick and easy access to shared folders

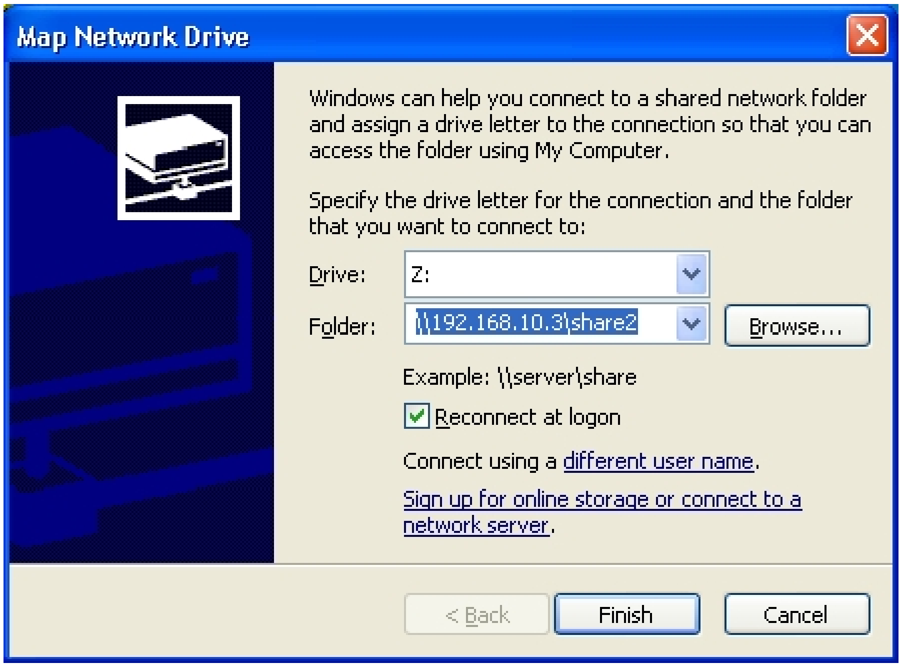
a. On the first Windows XP workstation, click Start, select All Programs, Accessories, and then Windows Explorer.

b. In the Folders pane, click My Computer. From Tools Menu, select Map Network Drive….

c. In the Drive textbox, select an unused drive letter using the pulldown menu.

d. Question: What drive letter did you choose? ____

e. In the Folder field, type the IP address of the remote PC and the name of the remote share using the format: <u>***\\ip_address\sharename***</u>



Map Network Drive

Windows can help you connect to a shared network folder and assign a drive letter to the connection so that you can access the folder using My Computer.

Specify the drive letter for the connection and the folder that you want to connect to:

Drive: Z:

Folder: \\192.168.10.3\share2

Example: \\server\share

☑ Reconnect at logon

Connect using a different user name.

Sign up for online storage or connect to a network server.

f. Click **Finish**.

A window will appear with the message **Attempting to connect to <u>\\192.168.10.3\share2</u>**. A window will open to display the contents of the shared folder called Share2 that has now been assigned a drive letter.

NOTE: The IP address can be replaced by the computer name.

g. Double-click the **Test Message 2** text document. Add the words **Techs rule** to the document. From the **File** menu and select **Save.**

Question: What message is displayed? Why do you think this happened? __________________

____

h. The files within a shared folder are automatically protected in the Windows XP Professional version. Click **OK** in the message box. Click **Cancel**, then click **Close** for the **Test Message 2** document.

i. In the message box, click **No** to close the document without saving the changes.

j. Repeat procedures a-e under Step 2 to map a drive on the second Windows XP workstation. This drive should be mapped to the share you configured in Step 1.

Step 3: Verify work

a. From the first Windows XP Professional machine, click **Start**, select **All Programs**, then **Accessories**, and **Windows Explorer**.

b. Expand **My Computer** by clicking on the plus sign (**+**) beside the option.

c. The Windows Explorer list should display a drive with the drive letter label that you chose for the remote share.

d. Repeat procedures a-c for the second Windows XP Professional machine.

If the drive letter appears on both computers, then the folders are shared and drives are mapped properly on both Windows XP workstations. You can perform the same steps on any folder. When a drive is properly mapped to shared folders, all files and folders within the shared folder will be accessible from the workstations.

Step 4: Reflection

a. What are some of the benefits of mapped drives and shared folders in a home or small office network?

____

____

____

b. Which folders cannot be shared? Can you think of reasons why an operating system might not allow certain types of folders to be shared?

____

____

____

c. A mapped drive provides a pointer to a network resource, but mapped drive letters are said to be locally significant only. What do you think is meant by *locally significant*?

____

____

____

Lab 4.2.3 Tracing Internet Connectivity

Objectives

- Use software that shows how data travels through the Internet.
- Use the **ping** utility to test connectivity to a remote network.
- Construct a visual map of connectivity from your network to a remote network.

Background / Preparation

In order to perform this lab, Internet connectivity is required. On a PC, open a web browser to ensure connectivity exists before beginning this lab.

This lab has an optional first step of downloading and installing a free program that can be used to determine the path a packet takes through the Internet. This program may be free, but it also may be copyrighted. Also, it may be that you are not permitted on a campus computer to download and install software. Check with the instructor or student assistant if you are unsure.

The following resources will be required:

- Windows-based computer with Internet connectivity
- Ability to download and install freeware software (optional)
- Access to the Run command

Step 1: (Optional) Download and install a free program

a. Open a search engine such as Google (www.google.com), Yahoo (www.yahoo.com), or Search (http://search.com).

b. Which words do you think would give you the best result if you are searching for a visual program that allows you to trace how data (a packet) travels through the Internet? Write your search words.

____

c. Type the words you chose in the Search field. Locate and download the software and install it. Normally, the website has a link to the download site or you can click the words “Download” or “Download Now”. When you download any freeware, remember the location on the hard drive, flash drive, or disk media where you saved the program. Write down where the download is saved.

____

d. What is the name of the program you installed? ____

____

Step 2: Locate web sites

a. Using the search engine again, locate five businesses with a web server, which are located in a country different from your own.

b. Write the names of the five business web sites.

____

____

____

c. Using the search engine again, locate a business in your own country that has a web site that is accessible.

d. Write the URL of the web site. An example URL is www.cisco.com.

____

Step 3: (Optional) Use downloaded visual trace route tool

a. Using the software you have downloaded and installed, use the tool to determine the path which the packet takes to reach one of the remote country destinations. Each tool normally allows you to type a URL. The program should either list or visually display the path taken by the packet.

b. How many hops does the packet take to get from your computer to the destination computer?

____

c. If your tool also provides time information, write down how long it took for the packet to reach the first hop? ____

d. Use the tool to determine the path to another foreign country site.

e. How many hops does the packet take to get from your computer to the destination computer?

____

f. Use the tool to determine the path to a web site in your own country.

g. Was the time it took to reach a web site in your own country shorter or longer? _____________

h. Try to think of an instance where the time it takes to reach a web server in your own country would be longer than it takes to reach another country's web server? ____________________________

____

____

Step 4: Use the *tracert* command

a. Click the **Start** button, click the **Run** option, type **cmd**, and press **Enter**. An alternate way to get to the command prompt is to click **Start > All Programs > Accessories > Command Prompt**.

b. From the command prompt, type **tracert** and press **Enter**. Options that can be used with the **tracert** command are shown. Items shown in square brackets [ ] are optional. For example, the first option that can be used with the **tracert** command is –d. If someone was to type **tracert –d** www.cisco.com, then the command issued to the computer is to trace the route to www.cisco.com, but do not try to resolve IP addresses to names. The *target_name* parameter is mandatory (it does not have brackets around it) and it is replaced with the destination network. In the previous example of **tracert –d** www.cisco.com, www.cisco.com is the *target_name*.

c. Which **tracert** option would be used to designate that only 5 hops could be used to search for the device address on the destination network? ____

d. Write the full command that would be typed to trace a route to www.cisco.com and instruct the computer to not search for it after seven hops. ______________________________________

e. Using one of the remote country destination addresses (use the same address as the one you used with the visual tool if possible) use the **tracert** command to determine how many hops it takes to reach the remote web server. Write the number of hops and the destination.

____

f. The **tracert** command uses Internet Control Message Protocol (ICMP) echo request messages to determine the path to the final destination. The path displayed is a list of IP addresses assigned to routers that connect to one another to form the path. The ICMP packets contain a value called a

Time To Live (TTL). The TTL value is 30 by default on a Microsoft-based PC and each router through which the packet passes, decrements that value by 1 before sending the packet on to the next router in the path. When the TTL value reaches 0, the router that has the packet sends an ICMP time exceeded message back to the source.

The **tracert** command determines the path by sending the first ICMP echo request message with a TTL of 1 and then increases that TTL value by 1 until the target responds or the maximum number of hops is reached. The path is determined by examining the ICMP time exceed messages that are sent back by routers along the way and by the ICMP echo reply message that is returned from the destination. Routers that do not return the ICMP time exceed messages are shown by a row of asterisks (*).

How many hops does your **tracert** command show that the packet went through? ___________

Step 5: Use the pathping command

a. A similar command that can be used on a Windows XP computer is **pathping**. This command combines the abilities of the **tracert** command with the **ping** command. From the command prompt, use the **pathping** command to determine the IP addresses of the routers used to create the packet path to another foreign country address. An example of the **pathping** command used to trace the path to Cisco is **pathping** www.cisco.com.

b. How many hops did the **pathping** command display to your remote destination?

____

c. When do you think that you would ever use a tool like **pathping** or **tracert**?

____

Step 6: (Optional) Use the whois function

a. Some of the freeware tools include an option to perform a **whois** function. **Whois** is a separate program or integrated with a tool similar to **tracert** or **pathping**. It displays (and sometimes has a link) who owns the web link of either the destination URL (such as cisco.com) or any of the links along the path. Explore the freeware tool that you have downloaded and installed and determine if it has a **whois** function. If it does, use it to determine who owns the domain name of one of the previous destinations used.

b. Why would you want to use the **whois** function? ______________________________________

____

____

Step 7: Reflection

With a classmate, compare all of the commands used in this lab. Describe the purpose and benefit of each one. Which do you think is the most useful command?

____

____

____

Lab 4.5.3 Building Straight-Through and Crossover UTP Cables

Objective

- Build and test straight-through and crossover Unshielded Twisted Pair (UTP) Ethernet network cables.

Background / Preparation

In this lab you will build and terminate Ethernet straight-through patch cables and crossover cables. With a straight-through cable, the color of wire used by pin 1 on one end is the same color used by pin 1 on the other cable end, and similarly for the remaining seven pins. The cable will be constructed using either TIA/EIA T568A or T568B standards for Ethernet, which determine which color wire is used on each pin. Straight-through patch cables are normally used to connect a host directly to a hub or switch or to a wall plate in and office area.

With a crossover cable the second and third pairs on the RJ-45 connector at one end of the cable are reversed at the other end. The pinouts for the cable are the T568A standard on one end and the T568B standard on the other end. Crossover cables are normally used to connect hubs and switches or can be used to directly connect two hosts to create a simple network. This is a two-part lab that can be done individually, in pairs, or in groups.

The following resources will be required:

- Two 0.6 to 0.9m (2 to 3 ft.) lengths of cable, Category 5 or 5e
- A minimum of four RJ-45 connectors (more may be needed if mis-wiring occurs)
- An RJ-45 crimping tool
- An Ethernet cable tester
- Wire cutters

T568A Standard			
Pin No.	**Pair No.**	**Wire Color**	**Function**
1	2	White/Green	Transmit
2	2	Green	Transmit
3	3	White/Orange	Receive
4	1	Blue	Not used
5	1	White/Blue	Not used
6	3	Orange	Receive
7	4	White/Brown	Not used
8	4	Brown	Not used

T568B Standard			
Pin No.	**Pair No.**	**Wire Color**	**Function**
1	2	White/Orange	Transmit
2	2	Orange	Transmit
3	3	White/Green	Receive
4	1	Blue	Not used
5	1	White/Blue	Not used
6	3	Green	Receive
7	4	White/Brown	Not used
8	4	Brown	Not used

Part A: Build and test an Ethernet straight-through patch cable

Step 1: Obtain and prepare the cable

a. Determine the length of cable required. This could be from a device such as a computer to the device to which it connects (like a hub or switch) or between a device and an RJ-45 outlet jack. Add at least 30.48 cm (12 in.) to the distance. The TIA/EIA standard states the maximum length is 5 m (16.4 ft.). Standard Ethernet cable lengths are usually .6 m (2 ft.), 1.83 m (6 ft.), or 3.05 m (10 ft.).

b. Which length of cable did you choose and why did you choose this length?

____

c. Cut a piece of cable to the desired length. Stranded UTP cable is commonly used for patch cables (the cables between an end network device such as a PC and an RJ-45 connector) because it is more durable when bent repeatedly. It is called stranded because each of the wires within the cable is made up of many strands of fine copper wire, rather than a single solid wire. Solid wire is used for cable runs that are between the RJ-45 jack and a punch-down block.

d. Using wire strippers, remove 5.08 cm (2 in.) of the cable jacket from both ends of the cable.

Step 2: Prepare and insert the wires

a. Determine which wiring standard will be used. Circle the standard.

[T568A | T568B]

b. Locate the correct table based on the wiring standard used.

c. Spread the cable pairs and arrange them roughly in the desired order based on the standard chosen.

d. Untwist a short length of the pairs and arrange them in the exact order needed by the standard. **It is very important to untwist as little as possible. The twists are important because they provide noise cancellation.**

e. Straighten and flatten the wires between your thumb and forefinger.

f. Ensure the cable wires are still in the correct order as the standard.

g. Cut the cable in a straight line to within 1.25 to 1.9 cm (1/2 to 3/4 in.) from the edge of the cable jacket. If it is longer than this, the cable will be susceptible to crosstalk (the interference of bits from one wire with an adjacent wire).

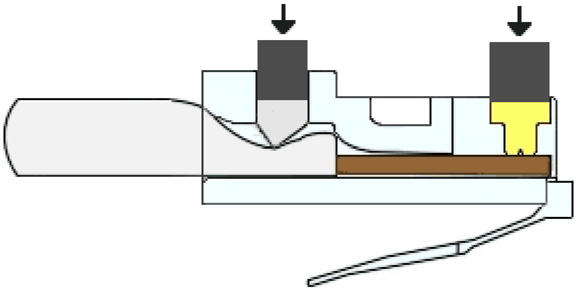
h. The tang (the prong that sticks out from the RJ-45 connector) should be on the underside pointing downward when inserting the wires. Insert the wires firmly into the RJ-45 connector until all wires are pushed as far as possible into the connector.

Step 3: Inspect, crimp, and re-inspect

a. Visually inspect the cable and ensure the right color codes are connected to the correct pin numbers.

b. Visually inspect the end of the connector. The eight wires should be pressed firmly against the end of the RJ-45 connector. Some of the cable jacket should be inside the first portion of the connector. This provides strain relief for the cable. If the cable jacket is not far enough inside the connector, it may eventually cause the cable to fail.

c. If everything is correctly aligned and inserted properly, place the RJ-45 connector and cable into the crimper. The crimper will push two plungers down on the RJ-45 connector.



d. Visually re-inspect the connector. If improperly installed, cut the end off and repeat the process.

Step 4: Terminate the other cable end

a. Use the previously described steps to attach an RJ-45 connector to the other end of the cable.

b. Visually re-inspect the connector. If improperly installed, cut the end off and repeat the process.

c. Which standard [T568A | T568B] is used for patch cables in your school? ___________________

Step 5: Test the cable

a. Using a cable tester, test the straight-through cable for functionality. If it fails, repeat the lab.

b. (Optional) Use the cable to connect a PC to a network.

c. (Optional) Click the **Start** button and select the **Run** option.

d. (Optional) Type **cmd** and press **Enter**.

e. (Optional) From the command prompt, type **ipconfig**.

f. (Optional) Write down the default gateway IP address. ___________________________________

g. (Optional) From the command prompt, type **ping** followed by the default gateway IP address. If the cable is functional, the ping should be successful (provided that no other network problem exists and the default gateway router is connected and functional).

Part B: Build and test an Ethernet crossover cable

Step 1: Obtain and prepare the cable

a. Determine the length of cable required. This could be from a hub to a hub, hub to switch, switch to switch, computer to router, or from one computer to another computer. Add at least 30.48 cm (12 in.) to the distance. Which length of cable did you choose and why did you choose this length?

____

b. Cut a piece of cable to the desired length and, using wire strippers, remove 5.08 cm (2 in.) of the cable jacket from both ends of the cable.

Step 2: Prepare and insert the T568A wires

a. Locate the T568A table at the beginning of the lab.

b. Spread the cable pairs and arrange them roughly in the desired order based on the T568A standard.

c. Untwist a short length of the pairs and arrange them in the exact order needed by the standard. It is very important to untwist as little as possible. Twists are important because they provide noise cancellation.

d. Straighten and flatten the wires between your thumb and forefinger.

e. Ensure the cable wires are in the correct order based on the standard.

f. Cut the cable in a straight line to within 1.25 to 1.9 cm (1/2 to 3/4 in.) from the edge of the cable jacket. If it is longer than this, the cable will be susceptible to crosstalk (the interference of bits from one wire with an adjacent wire).

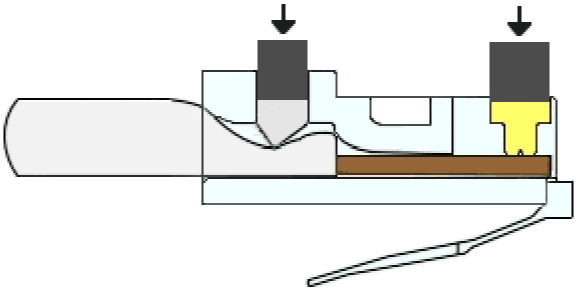
g. The tang (the prong that sticks out from the RJ-45 connector) should be on the underside pointing downward when inserting the wires. Insert the wires firmly into the RJ-45 connector until all wires are pushed as far as possible into the connector.

Step 3: Inspect, crimp, and re-inspect

a. Visually inspect the cable and ensure the right color codes are connected to the correct pin numbers.

b. Visually inspect the end of the connector. The eight wires should be pressed firmly against the RJ-45 connector. Some of the cable jacket should be inside the first portion of the connector. This provides for cable strain relief which can eventually cause the cable to fail.

c. If everything is correctly aligned and inserted properly, place the RJ-45 connector and cable into the crimper. The crimper will push two plungers down on the RJ-45 connector.



d. Visually re-inspect the connector. If improperly installed, cut the end off and repeat the process.

Step 4: Terminate the T568B cable end

a. On the other end, use the previously described steps (but use the T568B table and standard) to attach an RJ-45 connector to the cable.

b. Visually re-inspect the connector. If improperly installed, cut the end off and repeat the process.

c. Which standard [T568A | T568B] would you rather use at home if you have or would like to have a home network?

Step 5: Test the cable

a. Using a cable tester, test the crossover cable for functionality. If it fails, repeat the lab.

b. Use the cable to connect two PCs.

c. On both computers, click the **Start** button and select **Run**.

NOTE: If the **Run** command is unavailable on your PC, visually check the LED status lights on the NIC card. If they are on (usually green or amber) the cable is functional.

d. On both computers, type **cmd** and press **Enter**.

e. On both computers from the command prompt, type **ipconfig**.

f. Write the IP address of both computers.

Computer 1: ___________________________

Computer 2: ___________________________

g. From the command prompt of one computer, type **ping** followed by the IP address of the other computer. If the cable is functional, the ping should be successful. Do the ping on the other computer as well.

NOTE: The Windows Firewall on the target computer must be temporarily disabled for the ping to be successful. Refer to Lab 3.1.5 if you need help with this. If you disable the firewall, be sure to re-enable it.

Step 6: Reflection

a. Which part of making these cables did you find the most difficult? Compare your views with a classmate.

b. Are all four pairs of cables twisted the same amount? Discuss the reasons why or why not.

c. Ask a local business or check a site such as http://www.workopolis.com/ to see how much a beginning cable installer earns and which criteria they look for in a cable installer. Write the information you discover in the space provided.

____

____

d. Many technicians keep a crossover cable in their toolkit. When do you think that you would use a crossover cable and when do you think a network technician would use this cable?

____

____

Lab 4.5.4 Terminating UTP Cables

Objectives

- Use a punch down tool to terminate an RJ-45 wall jack.
- Install an RJ-45 jack in a wall plate.
- Use a punch down tool to terminate a UTP cable at a patch panel.

Background / Preparation

In this lab you will wire an RJ-45 data jack for installation in a wall plate using a punch-down tool. This is done frequently when installing cabling in an office environment. The punch tool is also used to terminate the other end of the cable at a patch panel punch-down block. The punch tool uses spring-loaded action to push wires between metal pins, while at the same time skinning the sheath away from the wire. This ensures that the wire makes a good electrical connection with the pins inside the jack. The punch tool also cuts off any extra wire.

A Category 5/5e straight-through patch cable with an RJ-45 connector normally plugs into a data jack or outlet to connect a PC to the network. It is important to use Category 5 or 5e rated jacks and patch panels with Category 5 or 5e cabling in order to support Fast Ethernet (100 Mbps) and Gigabit Ethernet (1000 Mbps). The process of punching down wires into a data jack in an office area is the same as punching them down at a patch panel in a wiring closet. This lab can be performed individually, in pairs, or in groups.

The following resources are required:

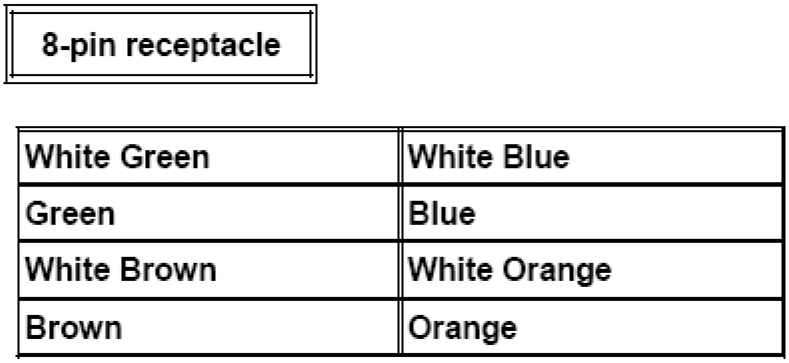
- 60-90 cm (2-3 feet) length of cable, either Category 5 or 5e.
- RJ-45 data jack—If RJ-45 data jacks are installed on both ends of the cable, two jacks will be needed and the installation can be tested by inserting cable with RJ-45 connectors and a simple cable continuity tester. More jacks may also be needed if errors are made.
- Category 5/5e wall plate.
- Patch panel.
- Punch tool, type 110.
- UTP cable stripper.
- Wire cutters.
- Two known good straight-through patch cables for testing (optional).

Step 1: Strip the sheath

a. Remove the cable sheath 2.54 cm (1 inch) from the end of the cable.

Step 2: Position wires in data jack

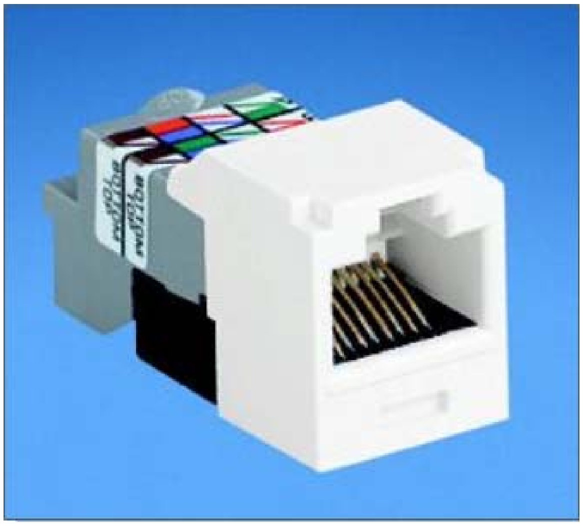
a. Position wires in the proper channels on the RJ-45 jack maintaining the twists as close to the jack as possible. The diagram that follows shows an example of how to place the wires with one type of jack.



8-pin receptacle

White Green	White Blue
Green	Blue
White Brown	White Orange
Brown	Orange

b. Most jacks have the channels color-coded to indicate where the wires go. The following photo of the jack shows one model. Jacks are typically stamped to indicate whether they are T568A or T568B.



Step 3: Punch down the data jack

a. Use the punch tool to push conductors into the channels. Make sure to position the cutting side of the punch tool so that it faces the outside of the jack. If this is not done, it will cut the wire being punched. Try tilting the handle of the punch tool a little to the outside, so it will cut better.

b. If any wire remains attached after using the punch tool, simply twist the ends gently to remove them. Then place the clips on the jack, and tighten them. Make sure that no more than 1.27 cm (one half inch) of untwisted wire is between the end of the cable jacket and the channels on the jack.
Step 4. Attach the faceplate.

c. Snap the jack into the faceplate by pushing it from the back side. Make sure when this is done, that the jack is right-side up so the clip faces down when the wall plate is mounted.

d. Use the screws to attach the faceplate to either the box or to the bracket. If there is a surface-mounted box, keep in mind that it might hold 30-60 cm (1-2 feet) of excess cable. Then it will be necessary to either slide the cable through the tie-wraps, or pull back the raceway that covers it, in order to push the excess cable back into the wall. If there is a flush-mounted jack, all that is needed is to push the excess cable back into the wall.

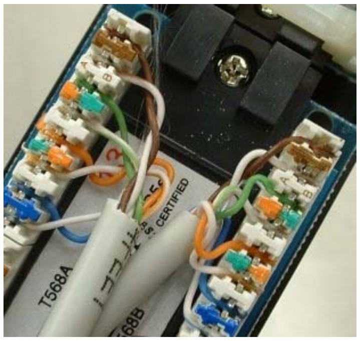
Step 5: Punch down the patch panel

a. On the opposite end of the cabling, remove the jacket 2.54 cm (1 inch) from the cable.

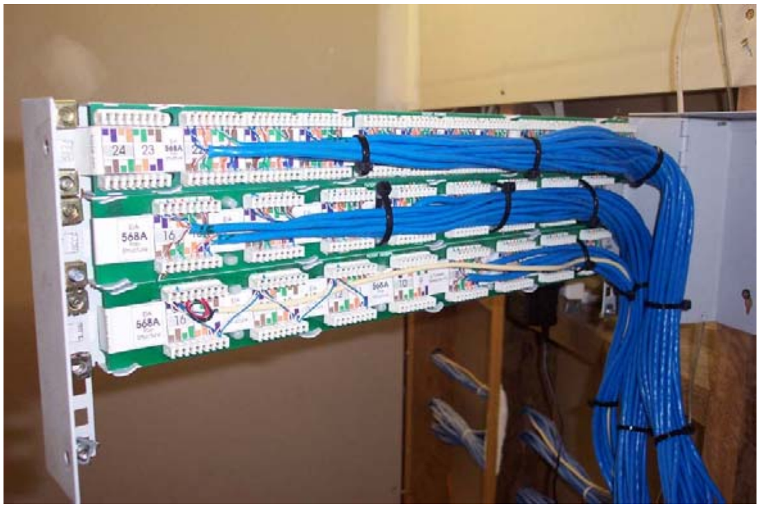
b. Lay the wires down in the patch panel so that the colors of the wires correspond exactly to the colors indicated on the pin locations in the same manner as the data jack was punched down.

c. Keep the sheath within .64 cm (¼ inch) of where the wires begin branching out to their pin locations.

d. Do not untwist the wires more than necessary to lay them down at the pin locations. A good way to keep from untwisting too much is to hold down the wires next to the patch panel with one finger while using the other hand to pull apart each end as you lay it across the connector.



e. The following figure shows a large punch down patch panel with carefully routed cabling.



Step 6: Test the data jack and patch panel terminations with a basic cable tester (optional)

a. Obtain two straight-through Ethernet patch cables and verify they both function properly using a simple cable tester.

b. Connect one end of one of the straight-through Ethernet patch cables to the data jack outlet and one end of the other straight-through cable to the jack at the patch panel.

c. Insert the opposite ends of the two cables into a simple cable tester and check for continuity from end to end through both patch cables, the data jack, and the patch panel. Did the cable run test good from end to end?

____

____

Step 7: Reflection (optional)

a. Take a tour of a wiring closet that contains patch panels and punch-down blocks. Was there any other type of devices that might use similar techniques to attach wires? What do you think attaches to these cables? ____

____

b. What do you think are some of the drawbacks and advantages of having a job installing network cabling? ____

____

Lab 4.5.5 Testing UTP Cables

Objectives

- Explore the wire mapping features of the Fluke 620 LAN CableMeter or equivalent.
- Explore the Cable Test feature—Pass/Fail features of the Fluke 620 LAN CableMeter or equivalent.
- Explore the Cable Length feature of the Fluke 620 LAN CableMeter or equivalent.
- Use a cable tester to check for the proper installation of unshielded twisted-pair (UTP) Category 5/5e according to TIA/EIA-568 cabling standards in an Ethernet network.

Background / Preparation

Wire maps can be very helpful in troubleshooting cabling problems with UTP cable. A wire map allows the network technician to verify which pins on one end of the cable are connected to which pins on the other end.

Basic cable tests can be very helpful in troubleshooting cabling problems with UTP. The cabling infrastructure or cable plant in a building is expected to last at least ten years. Cable-related problems are one of the most common causes of network failure. The quality of cabling components used, the routing and installation of the cable, and quality of the connector terminations will be the main factors in determining how trouble-free the cabling will be.

Prior to starting the lab, the teacher or lab assistant should have several correctly-wired Category 5 cables to test. The cables should include both straight-through and crossover. There should also be several Category 5 cables created with problems such as poor connections and split pairs to be used in testing. Cables should be numbered to simplify the testing process and to maintain consistency. A cable tester should be available that can test at least continuity, cable length, and wire map. This lab can be performed individually, in pairs, or in groups.

The following resources are required:

- Good Category 5 straight-through cables of different colors
- Good Category 5 crossover cables (T568A on one end and T568B on the other end)
- Category 5 straight-through cables of different colors and different lengths with open connections in the middle, or one or more conductors shorted at one end
- Category 5 straight-through cable with a split pair mis-wire
- Fluke 620 LAN CableMeter or similar instrument to test cable length, continuity, and wire map

Step 1: Set up the Fluke 620 LAN CableMeter

a. On the Fluke 620 meter, turn the rotary switch selector on the tester to the WIRE MAP position.

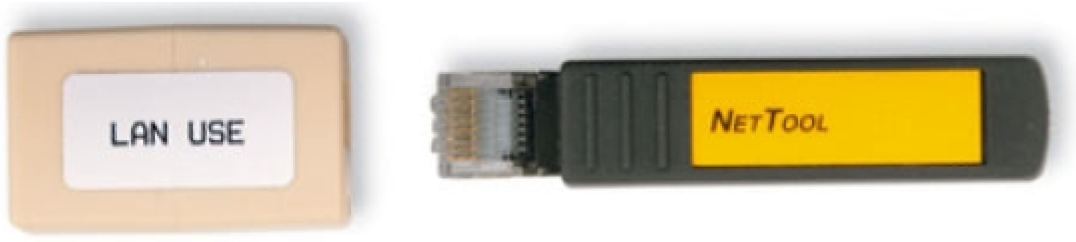
b. Press the **SETUP** button to enter the setup mode and observe the LCD screen on the tester. Press the **UP** or **DOWN** arrow buttons until the desired cable type of UTP is selected. Press **ENTER** to accept that setting and go to the next one. Continue pressing the **UP/DOWN** arrows and pressing **ENTER** until the tester is set to the following cabling characteristics.

Tester Option	**Desired Setting - UTP**
CABLE:	UTP
WIRING:	10BASE-T OR EIA/TIA 4PR
CATEGORY:	CATEGORY 5
WIRE SIZE:	AWG 24
CAL TO CABLE?	NO
BEEPING:	ON or OFF
LCD CONTRAST:	From 1 through 10 (brightest)

c. Once the meter is set up, press the **SETUP** button to exit setup mode.

Step 2: Test Cabling Procedure

a. For each cable to be tested use the following procedure. Place one end of the cable into the RJ-45 jack labeled UTP/FTP on the tester. Place the other end of the cable into the RJ-45 female coupler, and then insert the cable identifier into the other side of the coupler. The coupler and the cable identifier are accessories that come with the Fluke 620 LAN CableMeter.



Step 3: Use the Wire Map meter function

a. The Wire Map function and a Cable ID Unit can be used to determine the wiring of both the near and far end of the cable. The top set of numbers displayed on the LCD screen is the near end, and the bottom set is the far end. Perform a Wire Map test on each of the cables provided. Fill in the following table based on the testing results for each Category 5 cable. For each cable, write down the identifying number of the cable and the cable color. Also write down whether the cable is straight-through or crossover, the tester screen test results, and a description of the problem.

Cable No.	**Cable Color**	**Straight-through or Crossover**	**Displayed Test Results** (Note: Refer to the meter manual for detailed description of test results for the wire map test.)	**Problem/Description**
			Top: Bot:	
			Top: Bot:	
			Top: Bot:	
			Top: Bot:	
			Top: Bot:	

Step 4: Use the Length meter function

a. Using the tester LENGTH function, perform a basic cable test on the same cables used previously. Fill in the additional information for each cable.

Cable No.	**Cable Length**	**Tester Test Results (Pass/Fail)**

Step 5: Test data jack and patch panel terminations for wire map, length and mis-wire (optional)

a. Using the data jack and patch panel cable from the previous lab, connect one end of one of the straight-through Ethernet patch cables to the data jack outlet and one end of the other straight-through cable to the jack at the patch panel.

b. Insert the opposite end of one of the cables into the Fluke 620 and the other into the coupler and cable identifier. Check for wire map, length and mis-wire from end to end through the patch cables, the data jack, and the patch panel. Did the cable run test good from end to end? What were the results?

Wire map: _________________________

Total cable run length: _______________

Any mis-wires? _____________________

____

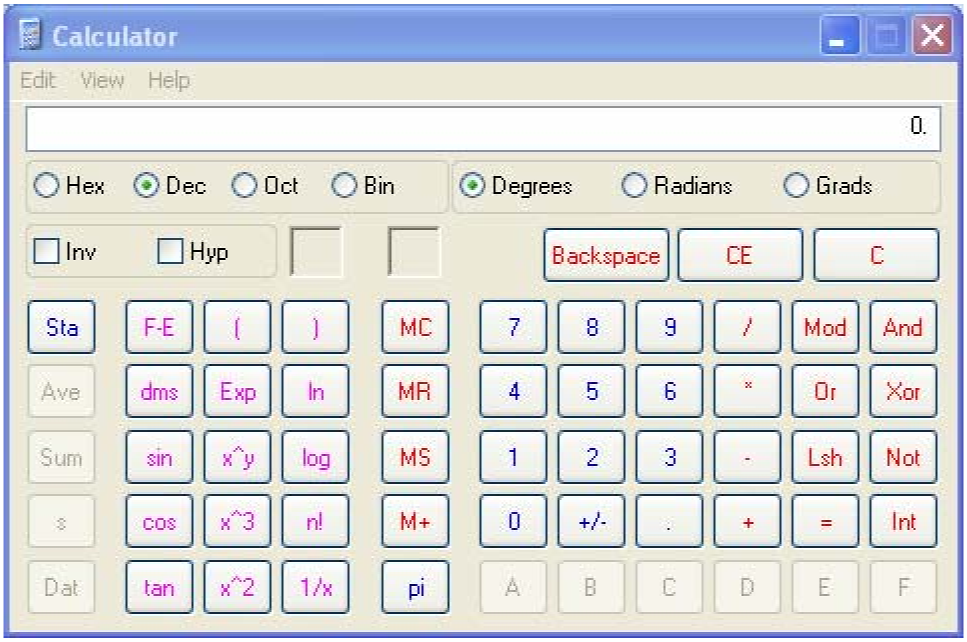
Step 6: Reflection

a. If you were on a job and did not have a cable meter to test, what other methods can be used?

____

____

Lab 5.1.4 Using the Windows Calculator with Network Addresses


Calculator
Edit View Help
0.
○ Hex ● Dec ○ Oct ○ Bin
● Degrees ○ Radians ○ Grads
□ Inv □ Hyp
Backspace CE C
Sta F-E ( ) MC 7 8 9 / Mod And
Ave dms Exp ln MR 4 5 6 * Or Xor
Sum sin x^y log MS 1 2 3 - Lsh Not
s cos x^3 n! M+ 0 +/- . + = Int
Dat tan x^2 1/x pi A B C D E F

Objectives

- Switch between the two Windows Calculator modes.
- Use Windows Calculator to convert between decimal, binary, and hexadecimal.
- Use Windows Calculator to determine the number of hosts in a network with powers of 2.

Background / Preparation

Network technicians work with binary, decimal, hexadecimal numbers with computers and networking devices. In this lab you will use the Windows Calculator application to convert between the binary, decimal, and hexadecimal number systems. You will also use the powers function to determine the number of hosts that can be addressed based on the number of bits available.

The following resources are required:

- PC with Windows XP installed and functional

Step 1: Access Windows Calculator and determine mode of operation

a. From the Start button menu, select **All Programs > Accessories**, and click on **Calculator**. An alternate method of starting the Calculator application is to access the **Start** menu, click on **Run**, type **calc** and press **Enter**. Try both methods.

b. Once the Calculator application opens, select the **View** menu option.

c. Which mode [Standard | Scientific] is currently active? ______________________________________

d. Select the Standard mode. This is a basic mode for simple calculations. How many mathematical functions are available in this mode? ____

e. From the View menu option, select the Scientific Calculator mode.

f. How many mathematical functions are available in this mode? ___________________________

Step 2: Convert between number systems

a. Access **Scientific** mode. Notice the number system modes available—Hex (Hexadecimal), Dec (Decimal), Oct (Octal), and Bin (Binary).

b. Which number system is currently active? ____

c. Which numbers on the number pad are active in Decimal mode? _________________________

Click on the **Bin** (Binary) mode radio button. Which numbers on the number pad are now active? ____

d. Why do you think the other numbers are grayed out? __________________________________

e. Click on the **Hex** (Hexadecimal) mode radio button.

f. Which characters on the number pad are now activated? _______________________________

g. Click on the **Dec** radio button. Using your mouse, click on the number **1** followed by the number **5** on the number pad. The decimal number 15 has now been entered. Click on the **Bin** radio button.

h. What happened to the number 15 listed in the textbox at the top of the window? _____________

i. By selecting different modes, numbers are converted from one number system to another. Select **Dec** mode again. The number in the window converts back to decimal. Select the **Hex** mode.

j. Which hexadecimal character (0 through 9 or A through F) represents decimal 15? ___________

k. Clear the number 15 in the window. Select **Dec** mode again. Not only can the mouse be used to enter numbers, but the numerical keypad on the keyboard as well as numbers on the keyboard can also be used. Using the numerical keypad to the right of the ENTER key, type the number **22**. Note that if the number does not enter into the calculator, press the **Num Lock** key to enable the numeric keypad. While the number 22 is showing in the calculator, use the number keys across the top of the keyboard to add a **0** to the number 22 (220 should now be on the calculator). Select the **Bin** radio button.

l. What is the binary equivalent of 220? ____

m. Clear the number 220 in the window. From Binary mode, type in the following binary number: **11001100**. Select the **Dec** radio button.

n. What is the decimal equivalent to the binary number of 11011100? _________________________

o. Convert the following decimal numbers to binary.

Decimal	Binary
86	
175	
204	
19	

p. Convert the following binary numbers to decimal.

Binary	Decimal
11000011	
101010	
111000	
10010011	

Step 3: Convert host IP addresses

a. Computer hosts usually have two addresses, an Internet Protocol (IP) address and an Ethernet Media Access Control (MAC) address. For the benefit of humans, the IP address is normally represented as a dotted decimal notation, such as 135.15.227.68. Each of the decimal octets in the address or a mask can be converted to 8 binary bits. Remember that the computer only understands binary bits. If all 4 octets were converted to binary, how many bits would there be? _____________

b. IP addresses are normally shown with four decimal numbers ranging from 0 to 255 and separated by a period. Convert the 4 parts of the IP address 192.168.10.2 to binary.

Decimal	Binary
192	
168	
10	
2	

c. Notice in the previous problem how the 10 converted to only four digits and the number 2 converted to only two digits. When IP addresses can have any number from 0 to 255 in each position, eight digits are normally used to represent each number. In the previous example, eight digits were needed to convert 192 and 168 to binary, but 10 and 2 did not need as many digits. Normally 0s are added to the left of the digits to have eight digits in binary for each IP address number. The number 10 would be shown as 00001010. Four extra zeros are added to the front of the other four binary digits.

d. On the calculator in Binary mode, enter the digits **00001010** and select the **Dec** radio button.

e. Which decimal number is equivalent to 00001010? ___________

f. Did adding “leading” zeros affect the number any? ____________

g. What would the number 2 (in the previous example) be if you were to make it eight digits? ________

Step 4: Convert host IP subnet masks

a. Subnet masks, such as 255.255.255.0, are also represented as dotted decimal. A subnet mask will always consist of four 8-bit octets, each one represented as a decimal number. With the exception of decimal 0 (all 8 binary zeros) and decimal 255 (all 8 binary ones), each octet will have some number of ones on the left and some number of zeros on the right. Convert the 8 possible decimal subnet octet values to binary.

Decimal	Binary
0	
128	
192	
224	
240	
248	
252	
254	
255	

b. Convert the four parts of the subnet mask 255.255.255.0 to binary.

Decimal	Binary
255	
255	
255	
0	

Step 5: Convert broadcast addresses

a. Computer hosts and network devices use broadcast addresses to send messages to all hosts. Convert the following broadcast addresses.

Address	Binary
IP broadcast 255.255.255.255	
MAC broadcast FF:FF:FF:FF:FF:FF	

Step 6: Convert IP and MAC addresses for a host

a. Click the **Start** button, select **Run**, type **cmd**, and press **Enter**. From the command prompt, type **ipconfig /all**.

b. Make a note of the IP address and physical address (also known as a MAC address).

IP Address: ____

MAC Address: ____

c. Using the calculator, convert the four numbers contained in the IP address to binary.

Decimal	Binary

d. The MAC or physical address is normally represented as 12 hexadecimal characters, grouped in pairs and separated by dashes (-). Physical addresses on a Windows-based computer are shown in a format of xx-xx-xx-xx-xx-xx, where each x is a number from 0 to 9 or a letter from a to f. Each of the hex characters in the address can be converted to 4 binary bits which is what the computer understands. If all 12 hex characters were converted to binary, how many bits would there be?

____

____

e. Convert each of the hexadecimal pairs to binary. For example, if the number CC-12-DE-4A-BD-88-34 was the physical address, convert the hexadecimal number CC to binary (11001100). Then convert the hexadecimal number 12 to binary (00010010) and so on. Be sure to add the leading zeros for a total of 8 binary digits per pair of hex digits.

Hexadecimal	Binary

Step 7: Manipulate powers of 2 to determine the number of hosts on a network

a. Binary numbers use two digits, 0 and 1. When you calculate how many hosts can be on a subnetwork, you use powers of two because binary is being used. As an example, we have a subnet mask that leaves six bits in the host portion of the IP address. In this case, the number of hosts on that network is 2 to the 6th power minus 2 (because you need a number to represent the network and a number that can be used to reach all the hosts—the broadcast address). The number 2 is always used because we are working in binary. The number 6 is the number of bits that are used for the host bits.

b. On the calculator, in **Dec** mode, input the number **2**. Select the **x^y** key, the key which raises a number to a power. Input the number **6**. Click on the **=** key, press **Enter** on the keyboard, or press the **=** key on the keyboard—all give the total. The number 64 appears in the output. To subtract two, click on the minus (-) key and then the **2** key followed by the **=** key. The number 62 appears in the output. This means 62 hosts could be utilized.

c. Using the previously described process, determine the number of hosts if the following number of bits are used for host bits.

No. of Bits Used for Hosts	No. of Hosts
5	
14	
24	
10	

d. Using a similar technique as learned previously, determine what 10 to the 4th power equals.

____

e. Close the Windows Calculator application.

Step 8: (Optional) Determine the network number and number of hosts based on subnet mask

a. Given the IP network address of 172.16.203.56 and a subnet mask of 255.255.248.0, determine the network portion of the address and calculate how many hosts can be created from host bits left.

b. Start by converting the 4 octets of the decimal IP address to binary and then convert the decimal subnet mask to binary. Remember to include leading zeros when converting to binary in order to make a total of 8 bits per octet.

Decimal IP address and subnet mask	**Binary IP address and subnet mask**
172.16.203.56	
255.255.248.0	

c. Align the 32 bits of the subnet mask to the 32 bits of the IP address and compare them. The bits in the IP address that align with the ones bits in the subnet mask represent the network number. What is the binary and decimal network number for this IP address? Determine the binary address first (include all 32 bits) and then convert it to decimal.

Binary network address: ____

Decimal network address: ____

d. How many ones bits are in the subnet mask? ____

e. How many bits are left for host bits? ____

f. How many hosts can be created with the bits left? _______________________________________

Step 9: Reflection

a. List one other thing for which you might use the Windows Calculator scientific mode. It does not have to be related to networking.

____

____

____

Lab 6.2.1 Observing DNS Name Resolution

Objectives

- Observe the conversion of a URL to an IP address.
- Observe DNS lookup using the nslookup command.

Background / Preparation

Domain Name System (DNS) is invoked when you type a Uniform Resource Locator (URL), such as **http://www.cisco.com**, into a web browser. The first part of the URL describes which protocol is being used. Common ones are HTTP (Hypertext Transfer Protocol), HTTPS (Hypertext Transfer Protocol over Secure Socket Layer), and FTP (File Transfer Protocol).

DNS uses the second part of the URL, which in this example is www.cisco.com. DNS translates the domain name (like www.cisco.com) to an IP address in order to allow the source host to reach the destination host. Work in pairs to complete this lab.

The following resources are required:

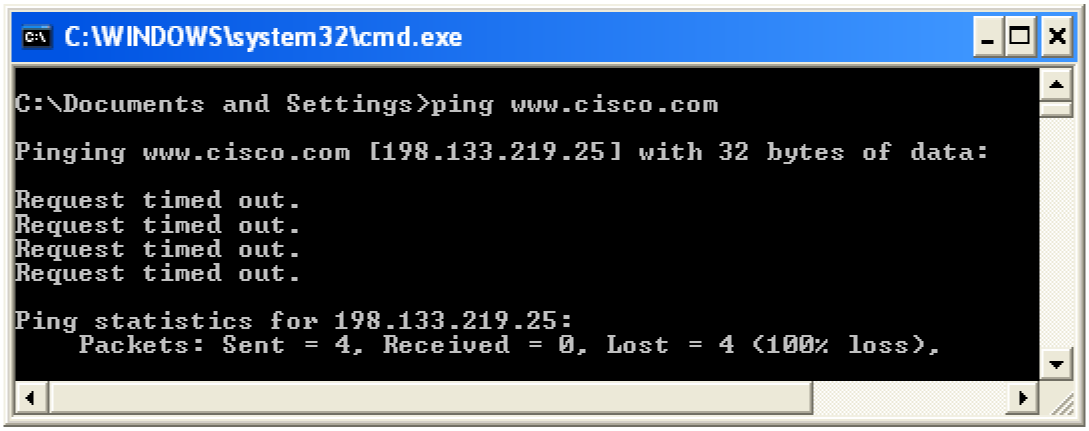
- Windows-based computer with Internet connectivity
- Access to the Run command

Step 1: Observe DNS conversion

a. Click the **Start** button, select **Run**, type **cmd,** and then click **OK**. The command prompt window appears.

b. At the command prompt, type **ping www.cisco.com**. The computer needs to translate www.cisco.com into an IP address so it knows where to send the Internet Control Message Protocol (ICMP) packets. Ping is a type of ICMP packet.

c. The first line of the output shows www.cisco.com converted to an IP address by DNS. You should be able to see the effect of DNS even if your school has a firewall that prevents pinging, or if Cisco has prevented people from pinging their web server.



```
C:\Documents and Settings>ping www.cisco.com

Pinging www.cisco.com [198.133.219.25] with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 198.133.219.25:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

d. Which IP address is shown on the screen? ____

e. Is it the same as the one shown in the figure? _________ Why do you think this occurred?

____

f. Work together with another student and discuss one or two other instances (besides the **ping** command) in which the computer would use DNS.

____

Step 2: Verify DNS operation using the nslookup command

a. At the command prompt, type the **nslookup** command.

b. What is the default DNS server being used? ____

c. Notice how the command prompt changed. This is the **NSLOOKUP** prompt. From this prompt, you can enter commands related to DNS.

d. At the prompt, type **?** to see a list of all the available commands that you can use in **NSLOOKUP** mode.

e. Write three commands that you can use with **NSLOOKUP**. _______________________________

____

____

f. At the **NSLOOKUP** prompt, type **www.cisco.com**.

g. What is the translated IP address? ____

h. Is it the same as the IP address shown with the **ping** command? __________________________

i. At the prompt, type the IP address of the Cisco web server that you just found. You can use **NSLOOKUP** to get the domain name of an IP address if you do not know the URL.

Using the previous procedures, find an IP address associated with www.google.com.

____

Step 3: Identify mail servers using the nslookup command

a. At the prompt, type **set type=mx** to have **NSLOOKUP** identify mail servers.

b. At the prompt, type **www.cisco.com**.

c. What is the primary name server, the responsible mail address, and the default Time to Live (TTL)?

____

____

d. At the prompt, type **exit** to return to the regular command prompt.

e. At the prompt, type **ipconfig /all**.

f. Write the IP addresses of all the DNS servers that your school uses.

____

g. Type **exit** to close the command prompt window.

Step 4: Reflection

a. If your school did not have a DNS server, what effect would this have on your use of the Internet?

____

____

____

b. Some companies do not dedicate a single server for DNS. Instead, the DNS server provides other functions as well. Which functions do you think might be included on a DNS server? Use the **ipconfig /all** command to help you with this.

____

CCNA Discovery

Networking for Home and Small Businesses

Lab 6.2.3 Exploring FTP

Objective

- Demonstrate how to use FTP from the command prompt and GUI.

Background / Preparation

File Transfer Protocol (FTP) is part of the TCP/IP suite. FTP is used to transfer files from one network device to another network device. Windows includes an FTP application that you can execute from the command prompt. There are also many free GUI versions of FTP that you can download. The GUI versions are easier to use than typing from a command prompt.

When using FTP, one computer is normally the server and the other computer is the client. When accessing the server from the client, you need to provide a username and password. Some FTP servers have a userID named *anonymous*. You can access these types of sites by simply typing “anonymous” for the userID, without a password. Usually, the site administrator has files that can be copied but does not allow files to be posted with the anonymous userID.

If your class does not have an FTP server available, you can download and install a freeware version, such as Home FTP Server or Cerberus FTP server. The FTP Server on a computer running the CCNA Discovery Live CD may also be used. Another computer will act as the FTP client by using FTP from the command line, a web browser, or download a freeware version of an FTP client, such as SmartFTP Client or Core FTP LE client. Work in teams of two to complete this lab.

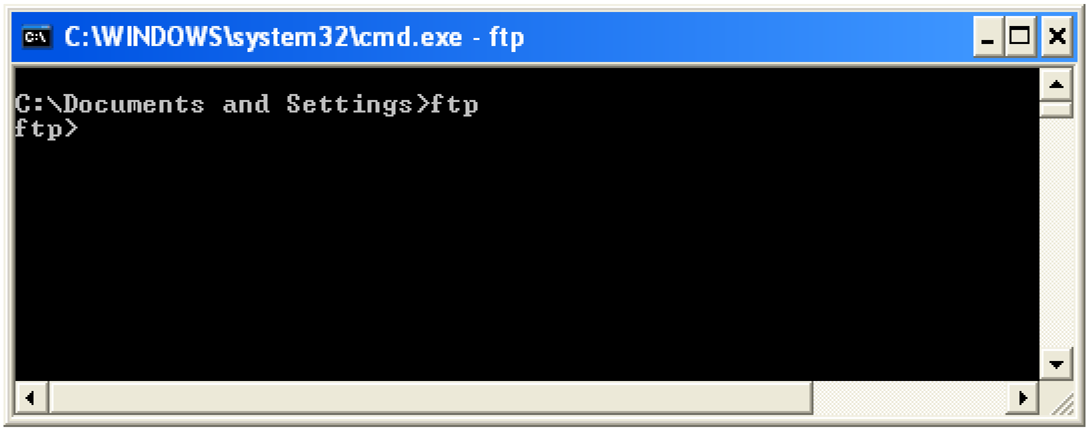
The following resources are required:

- Windows-based computer with an FTP client
- FTP server (Existing FTP server, downloaded freeware, or use Live CD)

Step 1: Examine FTP from the command prompt

a. Click the **Start** button, select **Run**, type **cmd** on the command line, and then click **OK**.

b. At the prompt, type **ftp** to start the FTP application. The prompt changes.



```
C:\Documents and Settings>ftp
ftp>
```

c. From the **ftp** prompt, type **?** to see a list of the commands that can be used in this mode.

d. List three FTP commands. ____

e. At the prompt, type **help put** to see a short description of the **put** command.

f. What is the purpose of the **put** command? ______________________________________

g. Use the **help** command again to get the purpose of the **get**, **send**, and **recv** commands.

get ____

send ____

recv ____

NOTE: The original FTP commands were PUT to send a file to an FTP server and GET to download a file from the FTP server. You also had to select ASCII or binary file mode. If you download a binary file in ASCII mode it could end up being corrupted. Some of the newer graphical programs now use send and receive in their place.

h. Partner with another student. Using procedures demonstrated in previous labs, write down the names and IP addresses of each partner computer. It is very important to get these names correct. Some FTP applications allow you to use either the IP address or the computer name.

Computer 1: ____

Computer 2: ____

Step 2: Use a GUI FTP client or web browser

a. If you are using a web browser as the FTP client, open the web browser and type ftp://*ip_address_of_FTP_server*. If the FTP server is configured to use an anonymous userID, connect directly to the FTP server. Using the FTP client, download an available file from the server.

b. If you are using a GUI FTP client, open the application. For most FTP clients, you must configure a new connection by giving it a name, the IP address of the FTP server, and a username and password. You may have to type **anonymous** if the FTP server allows this type of connection. Some applications have a checkbox that allows an anonymous login. When you have configured the connection, connect to the FTP server and download a file.

c. What is the name of the file you downloaded from the FTP server? ________________________

d. List one example of when FTP might be beneficial to a computer technician. ____________

____

____

Step 3: (Optional) Use both an FTP server and client

a. If you control both the FTP server and client, practice sending files to and getting files from the client and the server.

b. Show your transferred files to another group of students.

c. Close the FTP server and client applications.

Lab 6.2.4 Configuring an Email Client

Objectives

- Set up an email client.
- Send and receive mail from a mail server.
- Add an email account or change an existing one.

Background / Preparation

An email application gives the user the ability to send and receive messages from another user located on the same local network or on the Internet. The messages are sent by the sending client and stored on an email server. Another email client with a mailbox on the server can then access the server at any time to receive stored messages that are destined for that client.

The following resources are required:

- Windows-based computer with Internet connectivity
- Microsoft Outlook or other email client software

Step 1: Open Microsoft Outlook

a. From the **Start** menu, select **All Programs.** Locate the Microsoft Office software.

b. Select Microsoft Office Outlook as the email program. If your computer does not have the Microsoft Office software, there are many free email software packages available on the Internet. Search the Internet to find a free email client that can be installed on your computer. The following instructions may vary depending on your email client.

Step 2: Set up an email account

a. When you first start Microsoft Outlook, a screen appears with **Email Upgrade Options**. You can choose to import email messages or address books from another account. Because this is your first email account, select the **Do Not Upgrade** button.

b. The next screen is the **Email Accounts** screen where you are asked if you want to configure an email account. Click **Yes.**

c. If Outlook has already been installed and setup for e-mail previously, you can start the Outlook application and click **Tools**, **E-Mail Accounts** and then select **View or change existing e-mail account** to see how the existing account is set up.

Step 3: Enter POP3 e-mail account information

a. The next screen requires the user of the new account to fill in information. Enter your name and email address. Your can get your email address from your Internet provider.

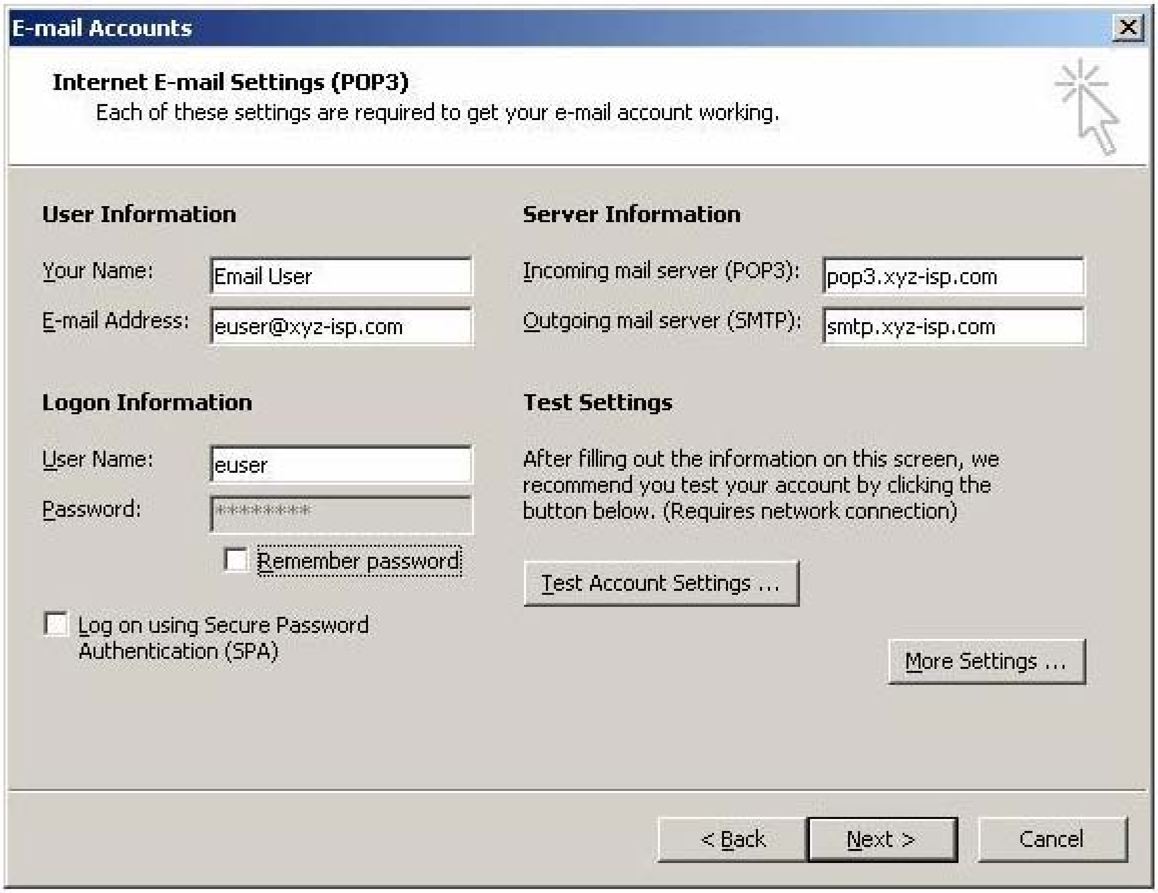
NOTE: If you do not have a real ISP email account, this step can be treated as a simulation. Just enter the information requested to become familiar with the process of creating an email account.

b. Enter your server information. Contact your Internet provider to locate the server information for the incoming and outgoing mail servers. Usually Internet providers put this information on their website in their help section.

c. What is your incoming (POP3) mail server? ____

d. What is your outgoing (SMTP) mail server? ____

e. Enter your username and password. Do not check the box to remember your password. This option is used when only one person uses the computer. If anyone else were to use the computer, they could easily gain access to all of the information in your email.



E-mail Accounts

Internet E-mail Settings (POP3)

Each of these settings are required to get your e-mail account working.

User Information

Your Name: Email User

E-mail Address: euser@xyz-isp.com

Server Information

Incoming mail server (POP3): pop3.xyz-isp.com

Outgoing mail server (SMTP): smtp.xyz-isp.com

Logon Information

User Name: euser

Password: *********

□ Remember password

□ Log on using Secure Password Authentication (SPA)

Test Settings

After filling out the information on this screen, we recommend you test your account by clicking the button below. (Requires network connection)

f. Click the **Test Account Settings** button. If everything is correct, the screen displays that the test was successful. If not, correct your information and try again.

NOTE: If this is a simulation, the test will not be successful and you can go to Steps 4 and 5.

g. Test your new account by sending an email to a friend in class.

Step 4: (Optional) Add another account or change an account

a. Open Microsoft Outlook. From the **Tools** menu, select **Email Accounts.**

b. In this screen, you can add another email account or you can change information in an existing account.

Step 5: Reflection

a. What are the advantages or disadvantages to using email over regular postal mail?

____

____

b. What are the advantages or disadvantages to using email over an instant messaging program?

____

____

c. With a partner, discuss five (5) recommendations for email etiquette that should be considered when emailing friends and business colleagues.

____

____

____

____

Lab 7.2.5 Configuring a Wireless Access Point

Objective

- Configure the wireless access point (AP) portion of a multi-function device to allow access to a wireless client.

Background / Preparation

The Linksys WRT300N includes an integrated 4-port switch, a router and a wireless Access Point (AP). In this lab, you will configure the AP component of the multi-function device to allow access for wireless clients. The basic wireless capabilities of the multi-function device will be configured but this will not be a secure wireless network. Setting up a secure wireless network will be covered in a later lab.

The following resources are required:

- Windows XP based computer that is cabled to the multi-function device
- Linksys WRT300N

Step 1: Verify connectivity between the computer and the multi-function device

a. The computer used to configure the AP should be attached to one of the multi-function device's switch ports.

b. On the computer, click the **Start** button and select **Run**. Type **cmd** and click **OK** or press **Enter**.

c. At the command prompt, ping the multi-function device using the default IP address 192.168.1.1 or the IP that has been configured on the multi-function device's port. Do not proceed until the ping succeeds.

d. Write down the command used to ping the multi-function device.

____

NOTE: If the ping is not successful, try these troubleshooting steps:

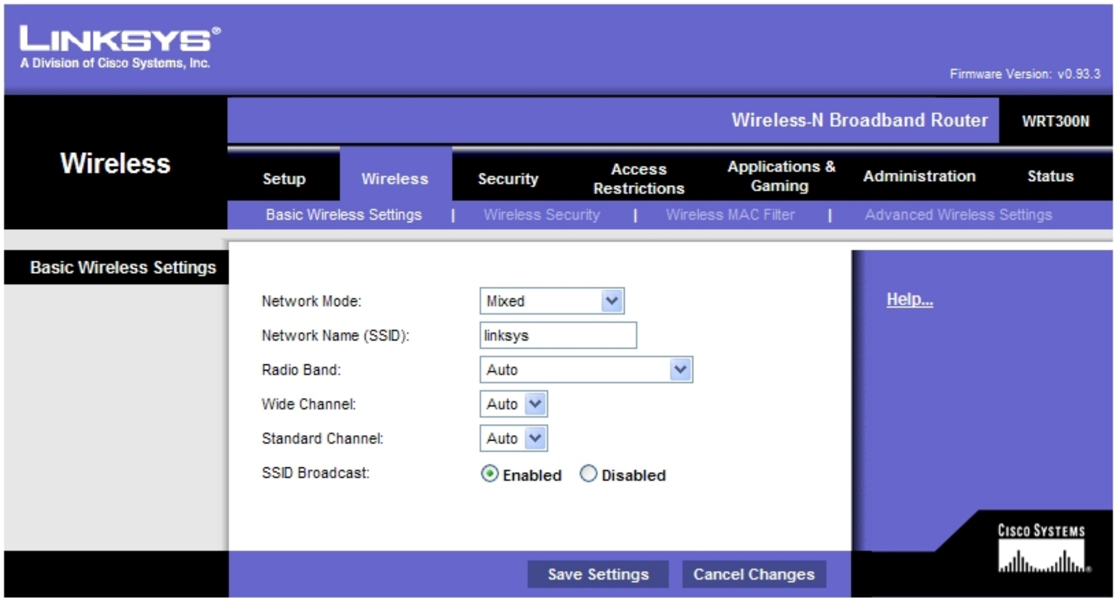
- Check to make sure the IP address of the computer is on the 192.168.1.0 network. The computer must be on the same network as the multi-function device to be able to ping it. The DHCP service of the multi-function device is enabled by default. If the computer is configured as a DHCP client it should have a valid IP address and subnet mask. If the computer has a static IP address, it must be in on the 192.168.1.0 network and the subnet mask must be 255.255.255.0.
- Make sure the cable is a known-good straight-through cable. Test to verify.
- Verify that the link light for the port where the computer is attached is lit.
- Check whether the multi-function device has power.

If none of these steps correct the problem, check with your instructor.

Step 2: Log in to the multi-function device and configure the wireless network

a. Open a web browser. In the address line, type **http://*ip_address***, where *ip_address* is the IP address of the wireless router (default is 192.168.1.1). At the prompt, leave the user name textbox empty, but type the password assigned to the router. The default password is **admin**. Click **OK**.

b. In the main menu, click on the **Wireless** option.


LINKSYS®
A Division of Cisco Systems, Inc.
Firmware Version: v0.93.3
Wireless-N Broadband Router
WRT300N
Wireless
Setup
Wireless
Security
Access Restrictions
Applications & Gaming
Administration
Status
Basic Wireless Settings | Wireless Security | Wireless MAC Filter | Advanced Wireless Settings
Basic Wireless Settings
Help...
Save Settings
Cancel Changes
Cisco Systems

Network Mode: Mixed

Network Name (SSID): linksys

Radio Band: Auto

Wide Channel: Auto

Standard Channel: Auto

SSID Broadcast: ● Enabled ○ Disabled

c. In the **Basic Wireless Settings** window, the **Network Mode** shows **mixed** by default, because the AP supports 802.11b, g, and n wireless devices. You can use any of these standards to connect to the AP. If the wireless portion of the multi-function device is ***NOT*** being used, the network mode would be set to **Disabled**. Leave the default of **Mixed** selected.

d. Delete the default SSID (linksys) in the **Network Name (SSID)** textbox. Enter a new SSID using your last name or name chosen by your instructor. SSIDs are case-sensitive.

e. Write down the exact SSID name that you are using. ________________________________

____

f. Click on the **Radio Band** drop-down menu and write down the two options.

____

g. For a wireless network that can use 802.11b, g, or n client devices, the default is **Auto**. Auto allows the **Wide Channel** option to be chosen and gives the best performance. The **Standard Channel** option is used if the wireless client devices are 802.11b or g, or both b and g. The **Wide Channel** option is used if only 802.11n client devices are being used. Leave the default of **Auto** selected.

h. **SSID Broadcast** is set to **enabled** by default, which enables the AP to periodically send out the SSID using the wireless antenna. Any wireless devices in the area can detect this broadcast. This is how clients detect nearby wireless networks.

i. Click on the **Save Settings** button. When the settings have been successfully saved, click on **Continue.**

j. The AP is now configured for a wireless network with the name (SSID) that you gave it. It is important to write down this information before starting the next lab or attaching any wireless NICs to the wireless network.

Step 3: Reflection

a. How many wireless networks do you think could be configured in one classroom? What would limit this?

____

____

____

b. What do you see as a potential security problem when you broadcast your SSID from the AP?

____

____

____

Lab 7.2.6 Configuring a Wireless Client

Objective

- Install and configure a driver for a wireless USB NIC for a wireless client computer.
- Determine the version of the driver installed and check the Internet for updates.

Background / Preparation

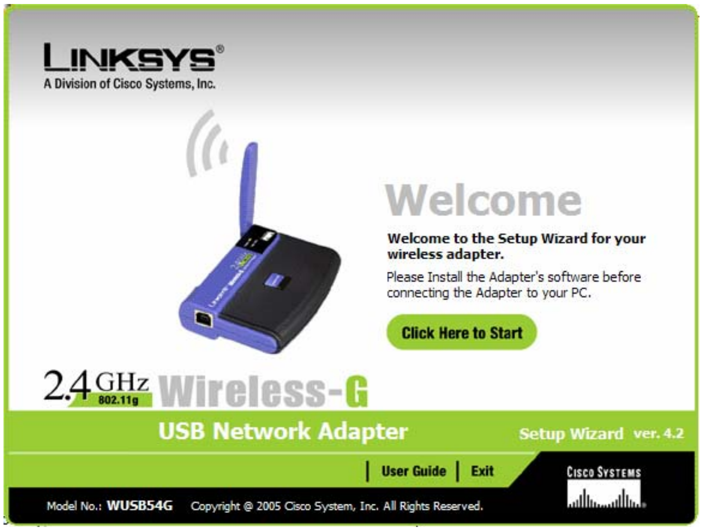
In this lab you will install a driver for a wireless USB NIC in a computer. The driver is a type of software that controls the wireless NIC. The driver comes on a CD with the NIC or can be downloaded from the Internet. Many manufacturers require that the driver is installed before the adapter is connected. The procedure described in this lab is for a Linksys USB 802.11g wireless NIC, but is similar to others. You should always follow the procedure recommended by the wireless NIC manufacturer.

The following resources are required:

- Windows XP-based computer with an available USB port
- Wireless USB NIC and associated driver
- Administrator rights to install the driver
- Linksys WRT300N with wireless access configured from previous lab

Step 1: Install the wireless NIC driver

a. Insert the CD that contains the wireless NIC driver into the CD/DVD drive and install the driver according to the manufacturer recommendations. Most USB devices require that the driver be installed before the device is physically attached. Note that you may do part of the installation process now and part of it after the wireless NIC is installed.



LINKSYS®
A Division of Cisco Systems, Inc.

Welcome

Welcome to the Setup Wizard for your wireless adapter.

Please Install the Adapter's software before connecting the Adapter to your PC.

Model No.: WUSB54G Copyright @ 2005 Cisco System, Inc. All Rights Reserved.

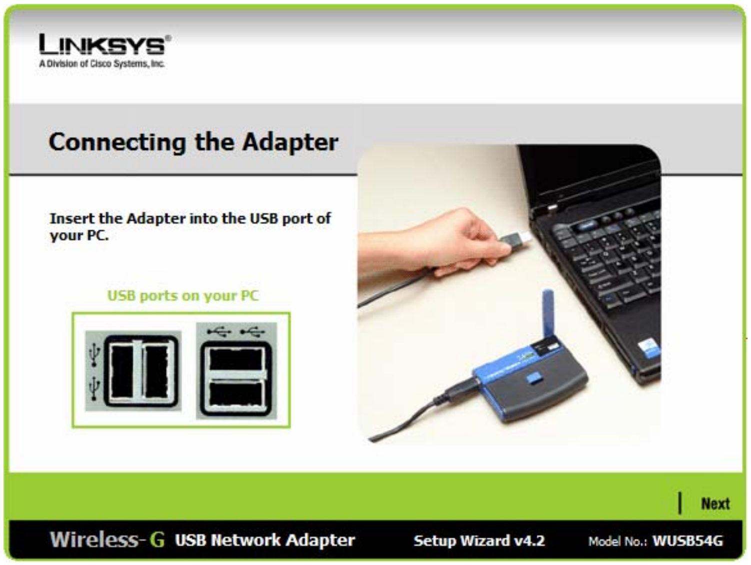
b. Who is the manufacturer of the wireless NIC? ____

c. Describe how you installed the wireless NIC driver. ____________________________________

____

Step 2: Install the wireless NIC

a. When prompted, connect the USB NIC cable to an available USB port. Click **Next** to continue.

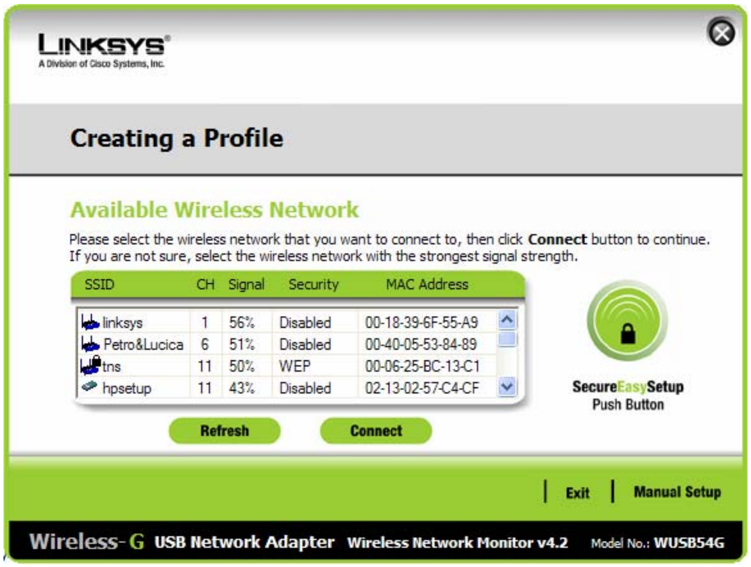


Connecting the Adapter

Insert the Adapter into the USB port of your PC.

Step 3: Attach to the wireless network

a. Most wireless NIC adapters have client software to control the NIC. The software shows any wireless networks that are discovered. Select the SSID of the wireless network that you configured on the AP in a previous lab.


LINKSYS
A Division of Cisco Systems, Inc.
SecureEasySetup
Push Button
Refresh
Connect
Exit
Manual Setup
Wireless-G USB Network Adapter
Wireless Network Monitor v4.2
Model No.: WUSB54G

Creating a Profile

Available Wireless Network

Please select the wireless network that you want to connect to, then click **Connect** button to continue.
If you are not sure, select the wireless network with the strongest signal strength.

SSID	CH	Signal	Security	MAC Address
linksys	1	56%	Disabled	00-18-39-6F-55-A9
Petro&Lucica	6	51%	Disabled	00-40-05-53-84-89
tns	11	50%	WEP	00-06-25-BC-13-C1
hpsetup	11	43%	Disabled	02-13-02-57-C4-CF

b. Which SSID are you using? ____

c. If the wireless NIC did not connect to the wireless network, perform the appropriate troubleshooting.

d. What is the signal strength for the wireless NIC? __________________________________

e. Did the wireless NIC see any other wireless networks in the area? _______ Why or why not?

____

f. Show your active wireless connection to a fellow student or the lab assistant.

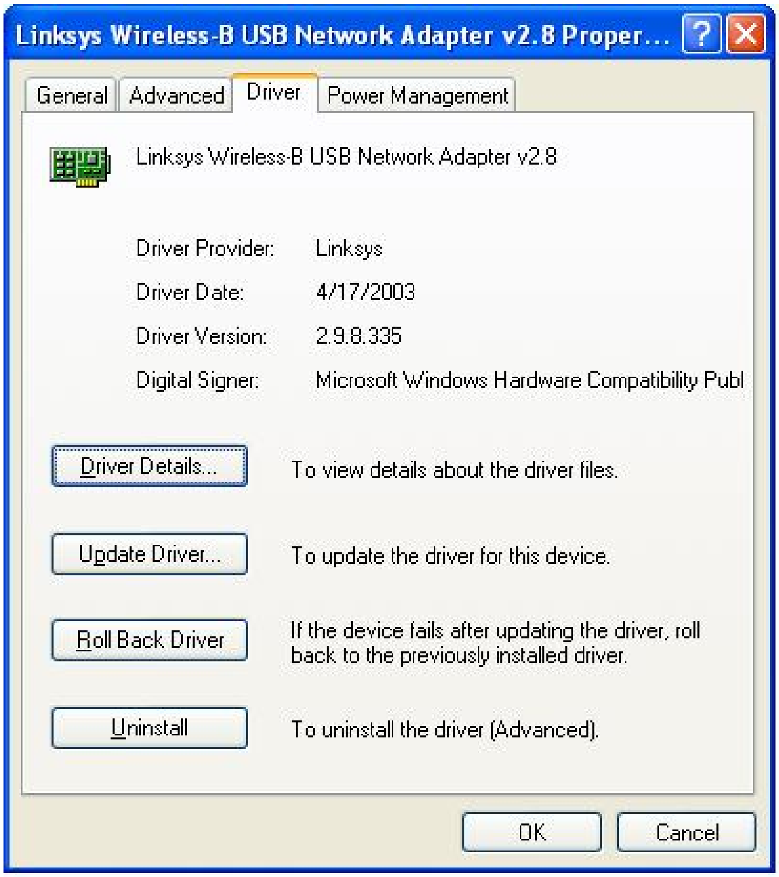
g. What is another name for a wireless host? ____

h. Is it better to use the client software from the wireless NIC manufacturer or let Windows XP control the wireless NIC? ____

Step 4: Determine the NIC driver version

a. Hardware manufacturers continually update drivers. The driver that ships with a NIC or other piece of hardware is frequently not the most current.

b. To check the driver version for the NIC you installed, click **Start,** select **Control Panel** and then **Network Connections**. Right-click on the wireless connection and select **Properties**. Click the **Configure** button for the NIC and then the **Driver** tab. What is the name and version of the driver you installed? ____



Linksys Wireless-B USB Network Adapter v2.8 Proper...

Linksys Wireless-B USB Network Adapter v2.8

Driver Provider: Linksys

Driver Date: 4/17/2003

Driver Version: 2.9.8.335

Digital Signer: Microsoft Windows Hardware Compatibility Publ

Driver Details... To view details about the driver files.

Update Driver... To update the driver for this device.

Roll Back Driver If the device fails after updating the driver, roll back to the previously installed driver.

Uninstall To uninstall the driver (Advanced).

Step 5: Determine if the NIC driver is the most current

a. Search the NIC manufacturer web site for drivers that support the wirelss NIC you installed. Are there more current ones available? ____

b. What is the most current one listed? ____

c. If there is a more current driver, how would you apply it? _________________________________

____

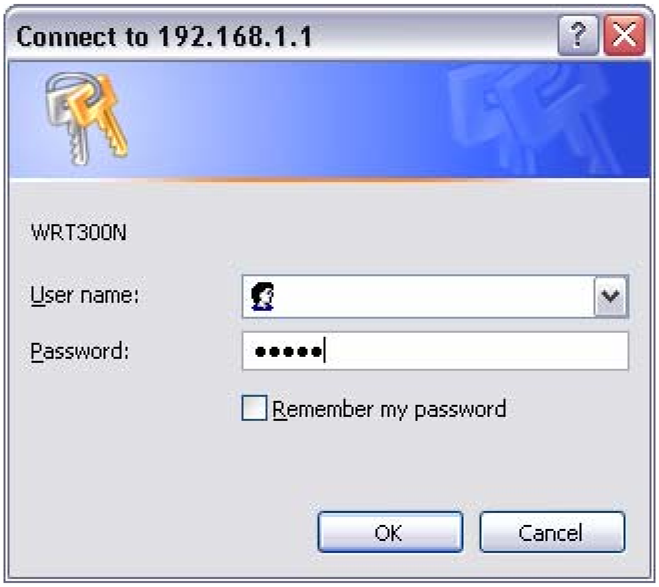
Step 6: Verify connectivity

a. Once you have installed the NIC, it is time to verify connectivity with the Linksys WRT300N.

b. Open a web browser such as Windows Internet Explorer or Mozilla Firefox.

c. In the address line type http://192.168.1.1, which is the default setting on the AP.

d. In the Connect to 192.168.1.1 dialog box, leave the username text box empty, and type **admin** in the password text box. Leave the Remember my password checkbox unchecked. Click **OK**.



Connect to 192.168.1.1

WRT300N

User name:

Password: •••••

□ Remember my password

e. If you receive the Linksys Setup screen, you have established connectivity with the AP. If you do not establish connectivity, you will have to troubleshoot the connection by checking to ensure the devices are turned on and the IP addresses on all devices are correct. Which IP address should be configured on the wireless NIC?

____

Step 7: Reflection

a. Do you think the process of setting up a wireless network at a food store or book store is any different from what you just did? _________________ Why or why not?

____

____

____

b. Do you think the AP model that you are using would be sufficient for the food store in your neighborhood? Why or why not? ____

____

Lab 7.3.5 Configuring Wireless Security

Objectives

- Create a security plan for a home network.
- Configure the wireless access point (AP) portion of a multi-function device using security best practices.

Background / Preparation

A well-planned security implementation is critical to the safety of a wireless network. This lab goes over the steps that must be taken to ensure the safety of the network using the following scenario.

You have just purchased a Linksys WRT300N wireless router, and you want to set up a small network in your home. You selected this router because the IEEE 802.11n specification claims that it has 12 times the speed of an 802.11g and 4 times the range. Because the 802.11n uses 2.4 GHz, it is backward compatible with both the 802.11b and 802.11g and uses MIMO (multiple-in, multiple-out) technology.

You should enable security mechanisms *before* connecting your multi-function device to the Internet or any wired network. You should also change the default values provided, because they are well-known values that are easily obtainable on the Internet.

The following resources are required:

- Windows-based computer
- Linksys WRT300N
- Straight-through Ethernet cable

Step 1: Plan the security for your home network

a. List at least six security best practices that you should implement to secure your multi-function device and wireless network.

1) ____

2) ____

3) ____

4) ____

5) ____

6) ____

b. Describe what the security risk is for each item.

1) ____

2) ____

3) ____

4) ____

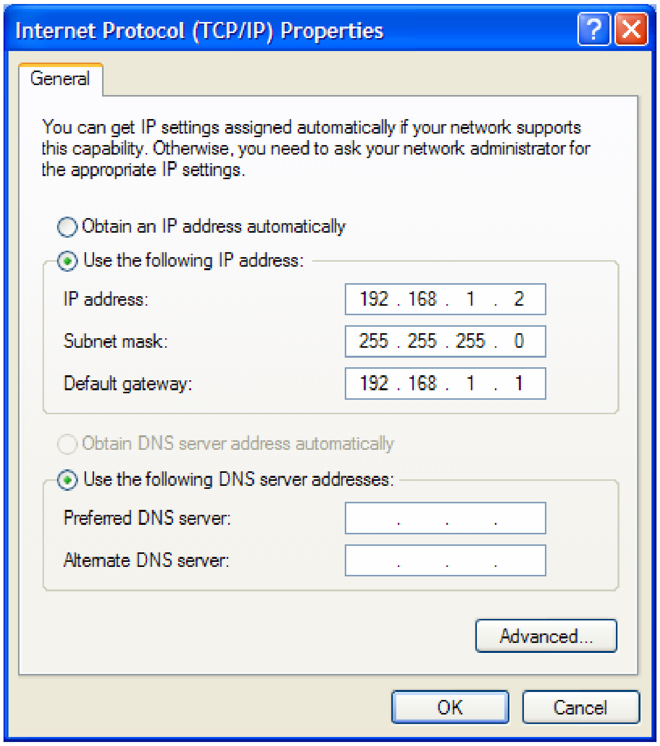
5) ____

6) ____

Step 2: Connect a computer to the multi-function device and log in to the web-based utility

a. Connect your computer (Ethernet NIC) to the multi-function device (port 1 on the Linksys WRT300N) by using a straight-through cable.

b. The default IP address of the Linksys WRT300N is 192.168.1.1, and the default subnet mask is 255.255.255.0. The computer and Linksys device must be on the same network to communicate with each other. Change the IP address of the computer to 192.168.1.2, and verify that the subnet mask is 255.255.255.0. Enter the internal address of the Linksys device (192.168.1.1) as the default gateway. Do this by clicking, **Start > Control Panel > Network Connections**. Right click on the wireless connection and choose **Properties**. Select the Internet Protocol (TCP/IP) and enter the addresses as shown below.



You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

○ Obtain an IP address automatically

● Use the following IP address:

IP address: 192 . 168 . 1 . 2

Subnet mask: 255 . 255 . 255 . 0

Default gateway: 192 . 168 . 1 . 1

○ Obtain DNS server address automatically

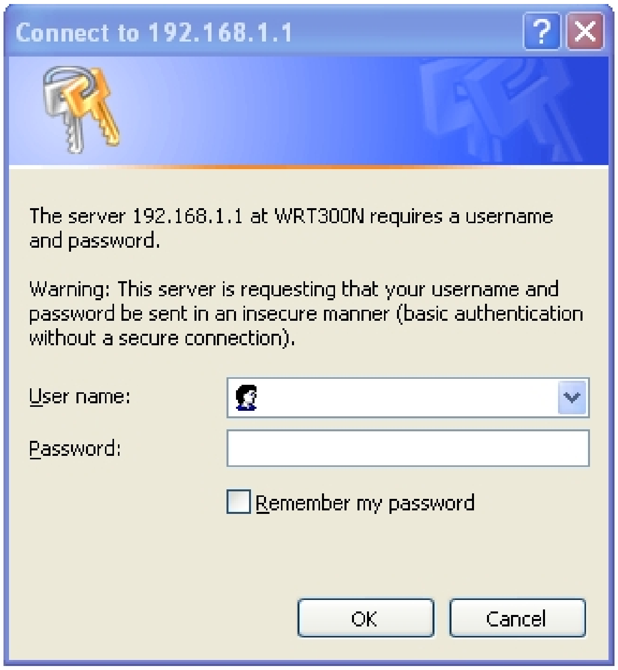
● Use the following DNS server addresses:

Preferred DNS server: . . .

Alternate DNS server: . . .

c. Open a web browser, such as Internet Explorer, Netscape, or Firefox and enter the default IP address of the Linksys device (192.168.1.1) into the address field and press **Enter**.

d. A screen appears, requesting your user name and password.



The server 192.168.1.1 at WRT300N requires a username and password.

Warning: This server is requesting that your username and password be sent in an insecure manner (basic authentication without a secure connection).

User name:

Password:

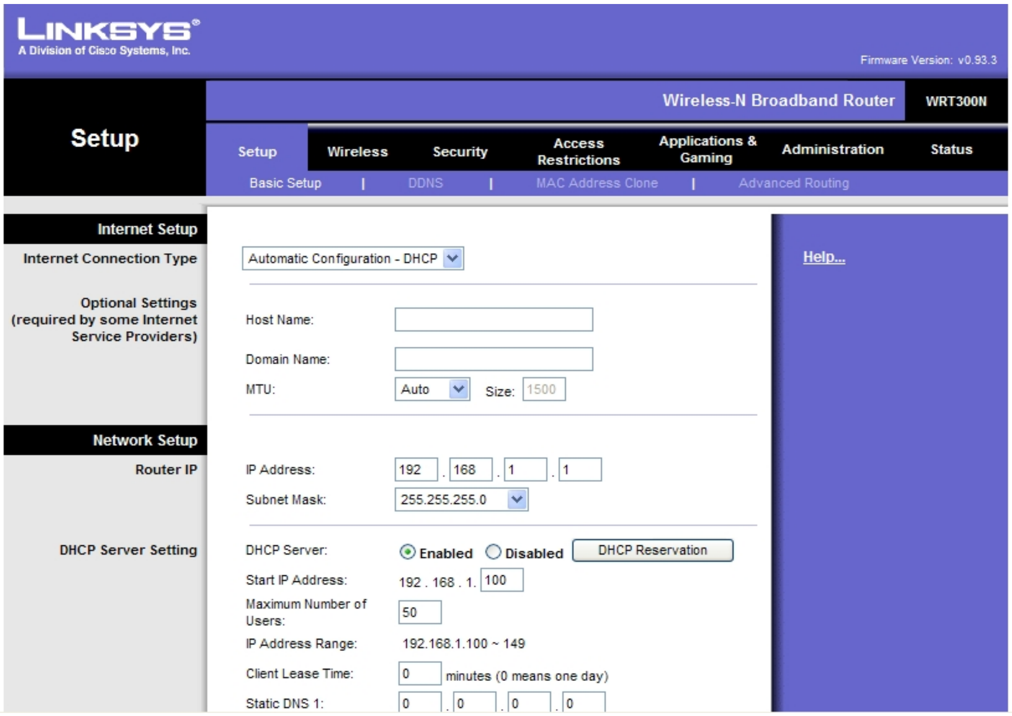
□ Remember my password

b. Leave the User name field blank and enter **admin** for the password. It is the default password on the Linksys device. Click **OK.** Remember that passwords are case-sensitive.

c. As you make the necessary changes on the Linksys device, click **Save Settings** on each screen to save the changes or click **Cancel Changes** to keep the default settings.

Step 4: Change the Linksys device password

a. The initial screen displayed is the **Setup > Basic Setup** screen.


LINKSYS®
A Division of Cisco Systems, Inc.
Firmware Version: v0.93.3
Wireless-N Broadband Router
WRT300N
Setup
Setup
Wireless
Security
Access Restrictions
Applications & Gaming
Administration
Status
Basic Setup | DDNS | MAC Address Clone | Advanced Routing
Help...

Internet Setup

Internet Connection Type: Automatic Configuration - DHCP

Optional Settings (required by some Internet Service Providers)

Host Name:

Domain Name:

MTU: Auto Size: 1500

Network Setup

Router IP

IP Address: 192 . 168 . 1 . 1

Subnet Mask: 255.255.255.0

DHCP Server Setting

DHCP Server: ● Enabled ○ Disabled [DHCP Reservation]

Start IP Address: 192 . 168 . 1. 100

Maximum Number of Users: 50

IP Address Range: 192.168.1.100 ~ 149

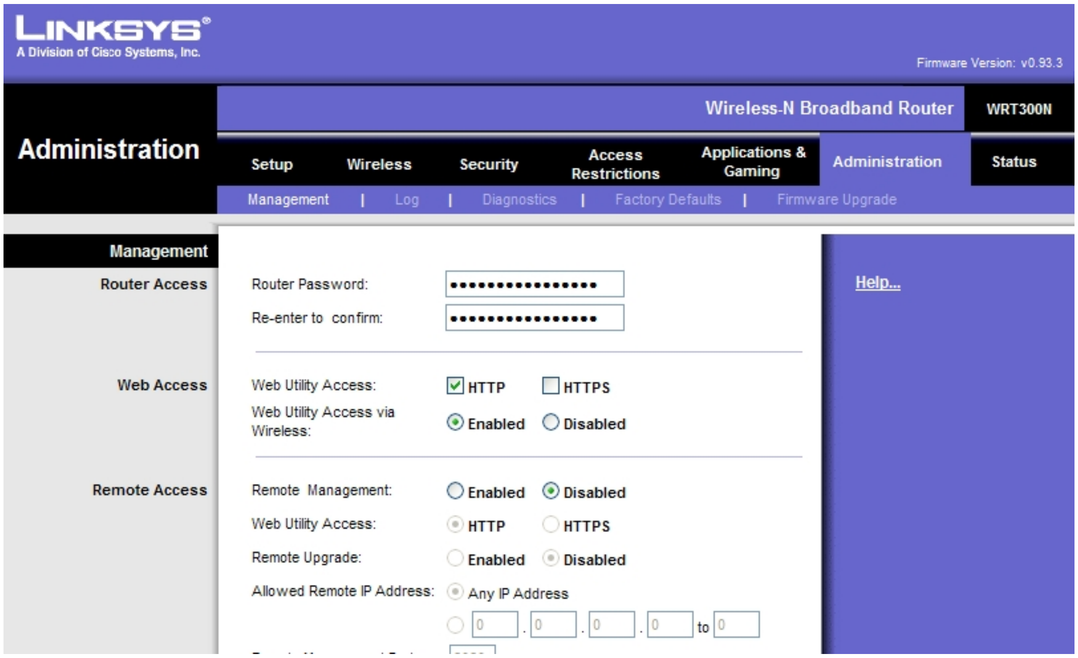
Client Lease Time: 0 minutes (0 means one day)

Static DNS 1: 0 . 0 . 0 . 0

b. Click the **Administration** tab. The **Management** tab is selected by default.

c. Type in a new password for the Linksys device, and then confirm the password. The new password must not be more than 32 characters and must not include any spaces. The password is required to access the Linksys device web-based utility and Setup Wizard.

d. The Web Utility Access via Wireless option is enabled by default. You may want to disable this feature to further increase security.


LINKSYS®
A Division of Cisco Systems, Inc.
Firmware Version: v0.93.3
Wireless-N Broadband Router
WRT300N
Administration
Setup
Wireless
Security
Access Restrictions
Applications & Gaming
Administration
Status
Management | Log | Diagnostics | Factory Defaults | Firmware Upgrade
Help...

Management

Router Access

Router Password: ••••••••••••••••

Re-enter to confirm: ••••••••••••••••

Web Access

Web Utility Access: ☑ HTTP ☐ HTTPS

Web Utility Access via Wireless: ● Enabled ○ Disabled

Remote Access

Remote Management: ○ Enabled ● Disabled

Web Utility Access: ● HTTP ○ HTTPS

Remote Upgrade: ○ Enabled ● Disabled

Allowed Remote IP Address: ● Any IP Address

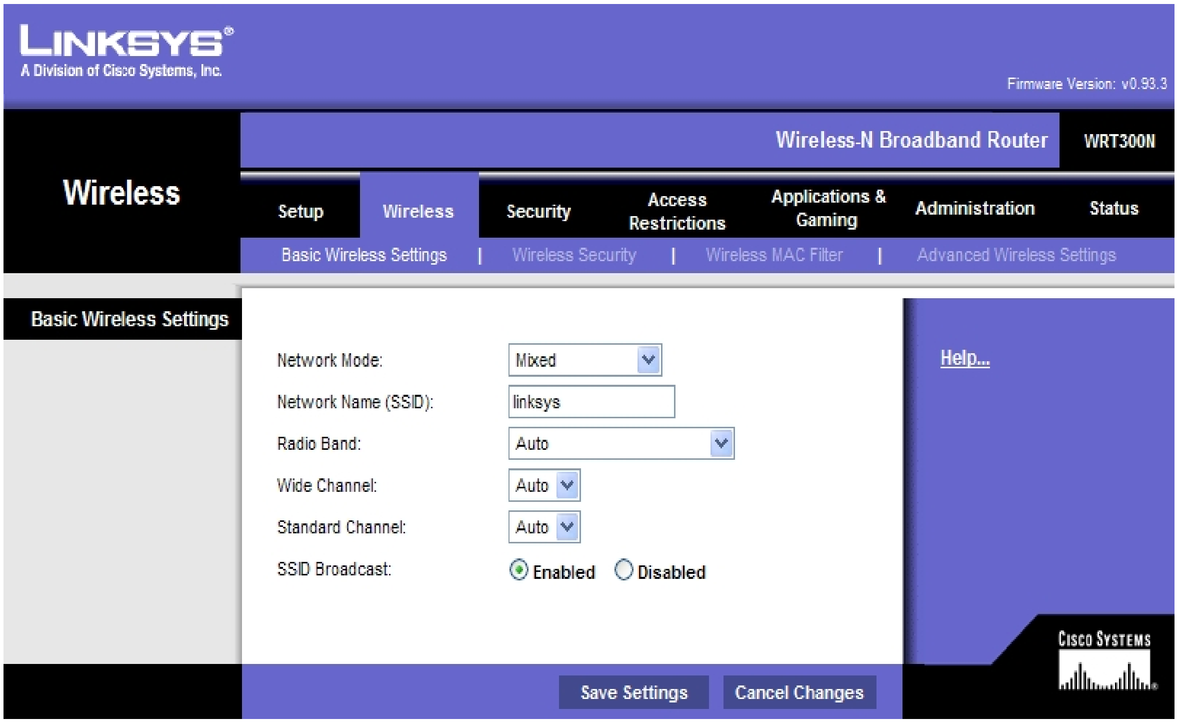
○ 0 . 0 . 0 . 0 to 0

e. Click the **Save Settings** button to save the information.

NOTE: If you forget your password, you can reset the Linksys device to the factory defaults by pressing the RESET button for 5 seconds and then releasing it. The default password is **admin**.

Step 5: Configure the wireless security settings

a. Click the **Wireless** tab. The **Basic Wireless Settings** tab is selected by default. The **Network Name** is the SSID shared among all devices on your network. It must be identical for all devices in the wireless network. It is case-sensitive and must not be more than 32 characters.


LINKSYS®
A Division of Cisco Systems, Inc.
Firmware Version: v0.93.3
Wireless-N Broadband Router
WRT300N
Wireless
Setup
Wireless
Security
Access Restrictions
Applications & Gaming
Administration
Status
Basic Wireless Settings | Wireless Security | Wireless MAC Filter | Advanced Wireless Settings
Basic Wireless Settings
Help...
Save Settings
Cancel Changes
Cisco Systems

Network Mode: Mixed
Network Name (SSID): linksys
Radio Band: Auto
Wide Channel: Auto
Standard Channel: Auto
SSID Broadcast: ● Enabled ○ Disabled

b. Change the SSID from the default of **linksys** to a unique name. Record the name you have chosen:

____

c. Leave the Radio Band set to **Auto**. This allows your network to use all 802.11n, g, and b devices.

d. For SSID Broadcast, select the Disabled button to disable the SSID broadcast. Wireless clients survey the area for networks to associate with and will detect the SSID broadcast sent by the Linksys device. For added security, do not broadcast the SSID.

e. Save your settings before going to the next screen.

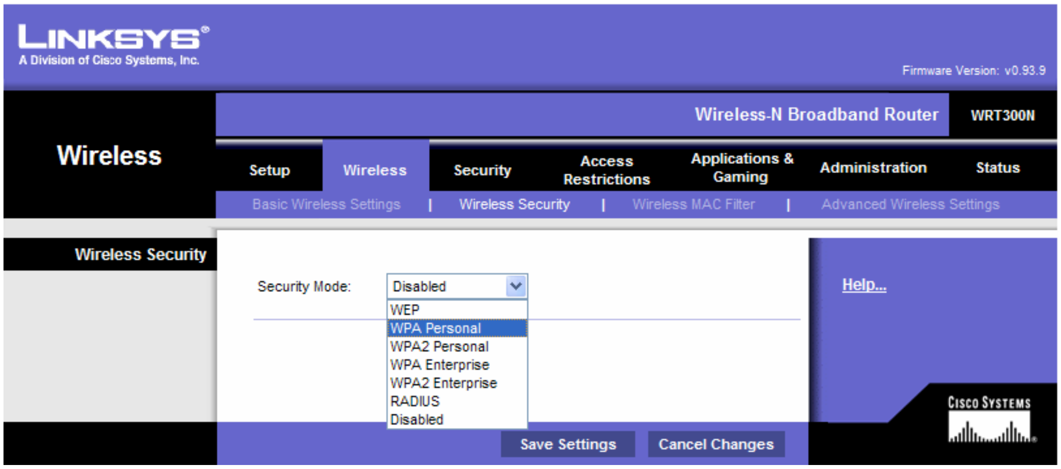
Step 6: Configure encryption and authentication

a. Choose the **Wireless Security** tab on the **Wireless** screen.

b. This router supports four types of security mode settings:

- WEP (Wired Equivalent Privacy)
- WPA (Wi-Fi Protected Access) Personal, which uses a pre-shared key (PSK)
- WPA Enterprise, which uses Remote Access Dial In User Service (RADIUS)
- RADIUS

c. Select WPA Personal Security Mode.



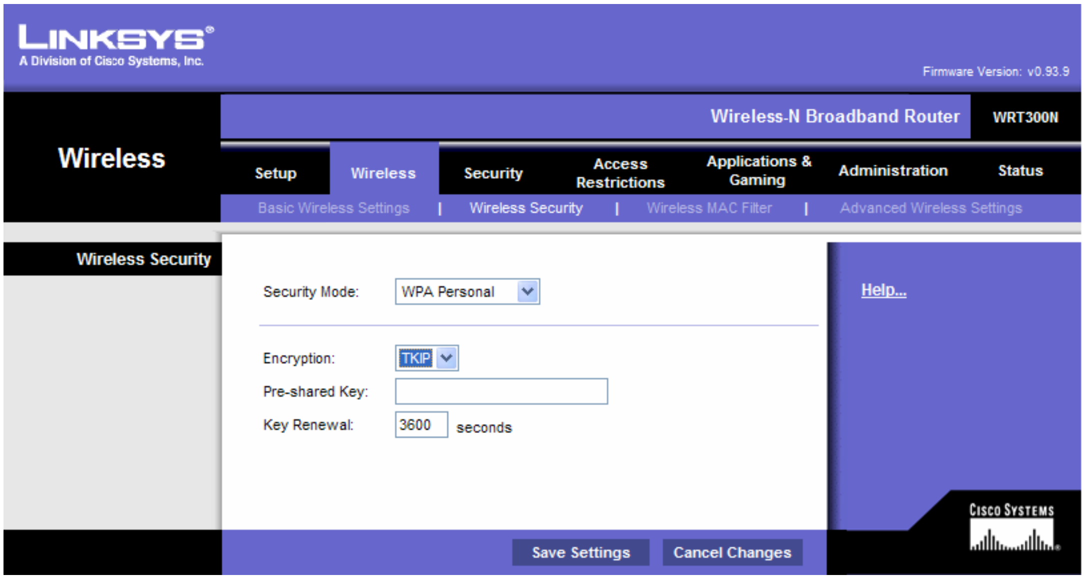
Security Mode: Disabled

d. On the next screen, choose an Encryption algorithm.

To secure a network, use the highest level of encryption possible within the Selected Security mode. The following Security Modes and Encryption levels are listed from least secure (WEP) to most secure (WPA2 with AES)

- WEP
- WPA
  - TKIP (Temporal Key Integrity Protocol)
  - AES (Advanced Encryption System)
- WPA2
  - TKIP
  - AES

AES is only supported by newer devices that contain a co-processor. To ensure compatibility with all devices, select TKIP.


LINKSYS®
A Division of Cisco Systems, Inc.
Firmware Version: v0.93.9
Wireless-N Broadband Router
WRT300N
Wireless
Setup
Wireless
Security
Access Restrictions
Applications & Gaming
Administration
Status
Basic Wireless Settings | Wireless Security | Wireless MAC Filter | Advanced Wireless Settings
Wireless Security
Help...
Save Settings
Cancel Changes
Cisco Systems

Security Mode: WPA Personal

Encryption: TKIP

Pre-shared Key:

Key Renewal: 3600 seconds

e. For authentication, enter a pre-shared key between 8 and 63 characters. This key is shared by the Linksys device and all connected devices.

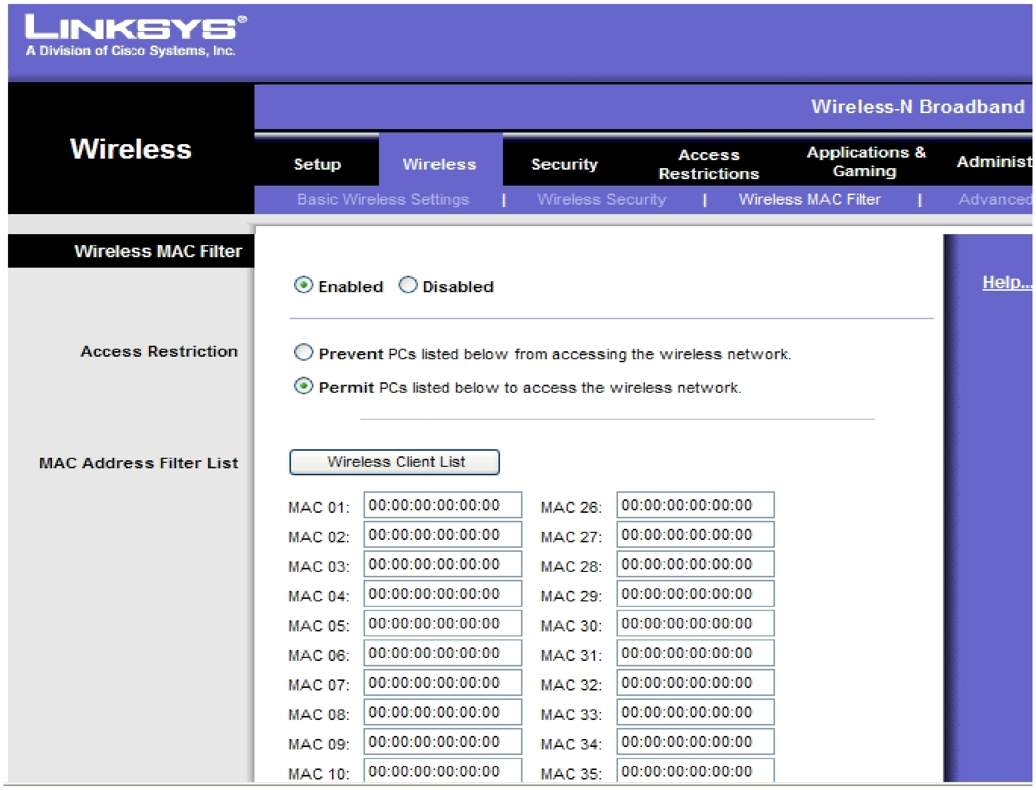
f. Choose a key renewal period between 600 and 7200 seconds. The renewal period is how often the Linksys device changes the encryption key.

g. Save your settings before exiting the screen.

Step 7: Configure MAC address filtering

a. Choose the **Wireless MAC Filter** tab on the **Wireless** screen.

b. MAC address filtering allows only selected wireless client MAC addresses to have access to your network. Select the radio button to **Permit PCs listed below to access the wireless network**. Click the **Wireless Client List** button to display a list of all wireless client computers on your network.



Wireless MAC Filter ● Enabled ○ Disabled

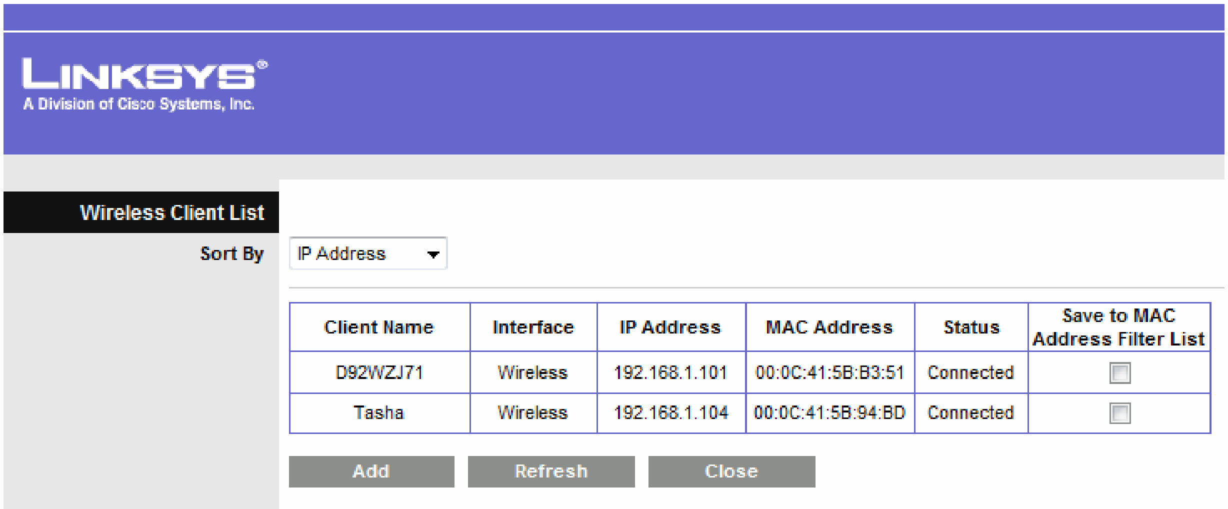
Access Restriction
○ **Prevent** PCs listed below from accessing the wireless network.
● **Permit** PCs listed below to access the wireless network.

MAC Address Filter List

Wireless Client List

MAC 01:	00:00:00:00:00:00	MAC 26:	00:00:00:00:00:00
MAC 02:	00:00:00:00:00:00	MAC 27:	00:00:00:00:00:00
MAC 03:	00:00:00:00:00:00	MAC 28:	00:00:00:00:00:00
MAC 04:	00:00:00:00:00:00	MAC 29:	00:00:00:00:00:00
MAC 05:	00:00:00:00:00:00	MAC 30:	00:00:00:00:00:00
MAC 06:	00:00:00:00:00:00	MAC 31:	00:00:00:00:00:00
MAC 07:	00:00:00:00:00:00	MAC 32:	00:00:00:00:00:00
MAC 08:	00:00:00:00:00:00	MAC 33:	00:00:00:00:00:00
MAC 09:	00:00:00:00:00:00	MAC 34:	00:00:00:00:00:00
MAC 10:	00:00:00:00:00:00	MAC 35:	00:00:00:00:00:00

c. The next screen allows you to identify which MAC addresses can have access to the wireless network. Click the **Save to MAC Address Filter List** check box for any client device you want to add, and then click the **Add** button. Any wireless clients, other than those in the list will be prevented from accessing your wireless network. Save your settings before exiting the screen.



Sort By: IP Address

Client Name	Interface	IP Address	MAC Address	Status	Save to MAC Address Filter List
D92WZJ71	Wireless	192.168.1.101	00:0C:41:5B:B3:51	Connected	□
Tasha	Wireless	192.168.1.104	00:0C:41:5B:94:BD	Connected	□

Step 8: Reflection

a. Which feature that you configured on the Linksys WRT300N makes you feel the most secure and why?

____

____

____

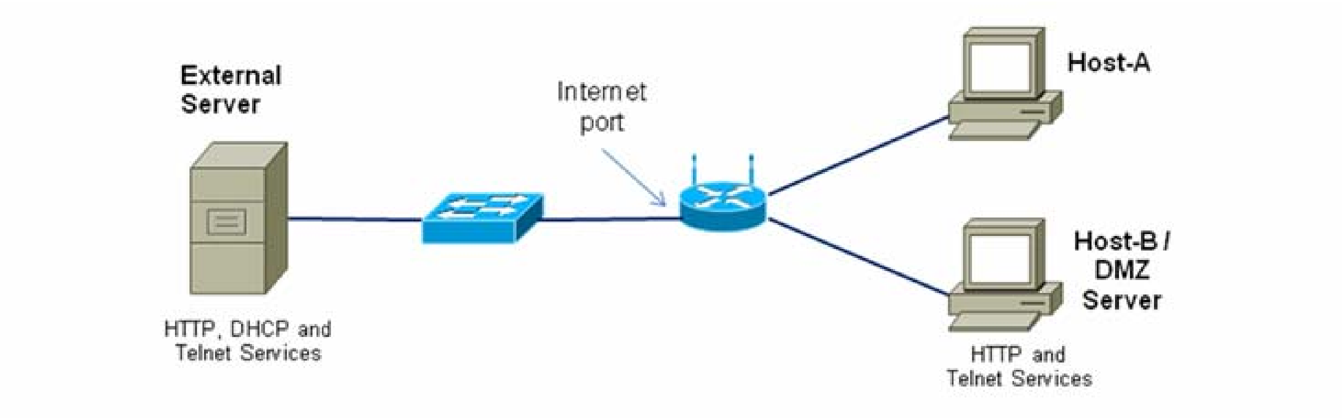
b. Make a list of other items that could be done to make your network even more secure.

____

____

____

Lab 8.4.2 Configuring Access Policies and DMZ Settings



Objectives

- Log in to a multi-function device and view security settings.
- Set up Internet access policies based on IP address and application.
- Set up a DMZ for an open access server with a static IP address.
- Set up port forwarding to limit port accessibility to only HTTP.
- Use the Linksys WRT300N Help features.

Background / Preparation

This lab provides instructions for configuring security settings for the Linksys WRT300N. The Linksys provides a software-based firewall to protect internal, local-network clients from attack by external hosts. Connections from internal hosts to external destinations can be filtered based on the IP address, destination website, and application. The Linksys can also be configured to create a demilitarized zone (DMZ) to control access to a server from external hosts. This lab is done in teams of two, and two teams can work together to test each other's access restrictions and DMZ functionality. It is divided into 2 parts:

- Part 1 – Configuring access policies
- Part 2 – Configuring DMZ settings

The following resources are required:

- Linksys WRT300N or other multi-function device with the default configuration
- User ID and password for the Linksys device if different than the default
- Computer running Windows XP Professional to access the Linksys GUI
- Internal PC to act as a server in the DMZ with HTTP and Telnet servers installed (preconfigured or Discovery Live CD server)
- External server to represent the ISP and Internet (with preconfigured DHCP, HTTP, and Telnet servers running (real server with services installed or Discovery Live CD server)
- Cabling to connect the PC hosts, Linksys WRT300N or multi-function device, and switches

Part 1 – Configuring access policies

Step 1: Build the network and configure the hosts

a. Connect the host computers to switch ports on the multi-function device as shown in the topology diagram. Host-A is the console and is used to access the Linksys GUI. Host-B is initially a test machine but later becomes the DMZ server.

b. Configure the IP settings for both hosts using Windows XP Network Connections and TCP/IP properties. Verify that Host-A is configured as a DHCP client. Assign a static IP address to Host-B in the 192.168.1.x range with a subnet mask of 255.255.255.0. The default gateway should be the internal local network address of the Linksys device.

   NOTE: If Host-B is already a DHCP client, you can reserve its current address and make it static using the DHCP Reservation feature on the Linksys Basic Setup screen.

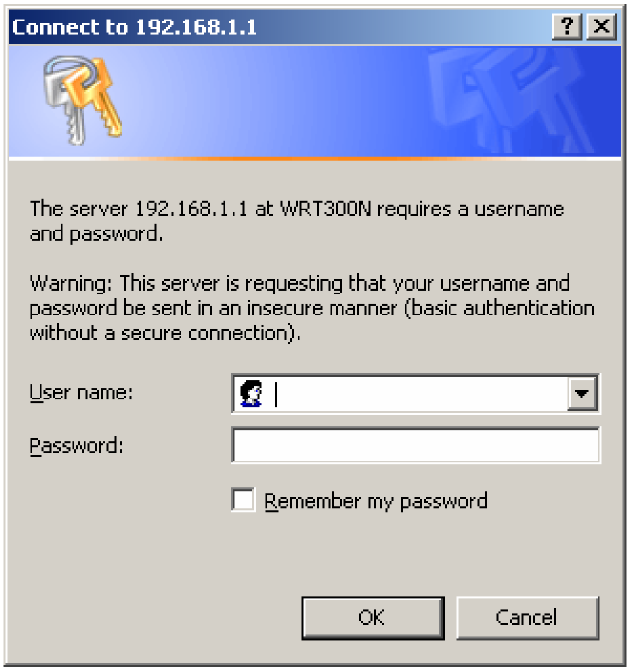
c. Use the *ipconfig* command to display the IP address, subnet mask, and default gateway for Host-A and Host-B and record them in the table. Obtain the IP address and subnet mask of the external server from the instructor and record it in the table.

Host	**IP Address**	**Subnet Mask**	**Default Gateway**
Host-A			
Host-B / DMZ Server			
External Server			

Step 2: Log in to the user interface

a. To access the Linksys or multi-function device web-based GUI, open a browser and enter the default internal IP address for the device, normally 192.168.1.1.

b. Log in using the default user ID and password, or check with the instructor if they are different.



The server 192.168.1.1 at WRT300N requires a username and password.

Warning: This server is requesting that your username and password be sent in an insecure manner (basic authentication without a secure connection).

User name:

Password:

□ Remember my password

c. The multi-function device should be configured to obtain an IP address from the external DHCP server. The default screen after logging in to the multi-function device is Setup > Basic Setup. What is the Internet connection type?

____

d. What is the default router (internal) IP address and subnet mask for the multi-function device?

____

e. Verify that the multi-function device has received an external IP address from the DHCP server by clicking the Status > Router tab.

f. What is the external IP address and subnet mask assigned to the multi-function device?

____

Step 3: View multi-function device firewall settings

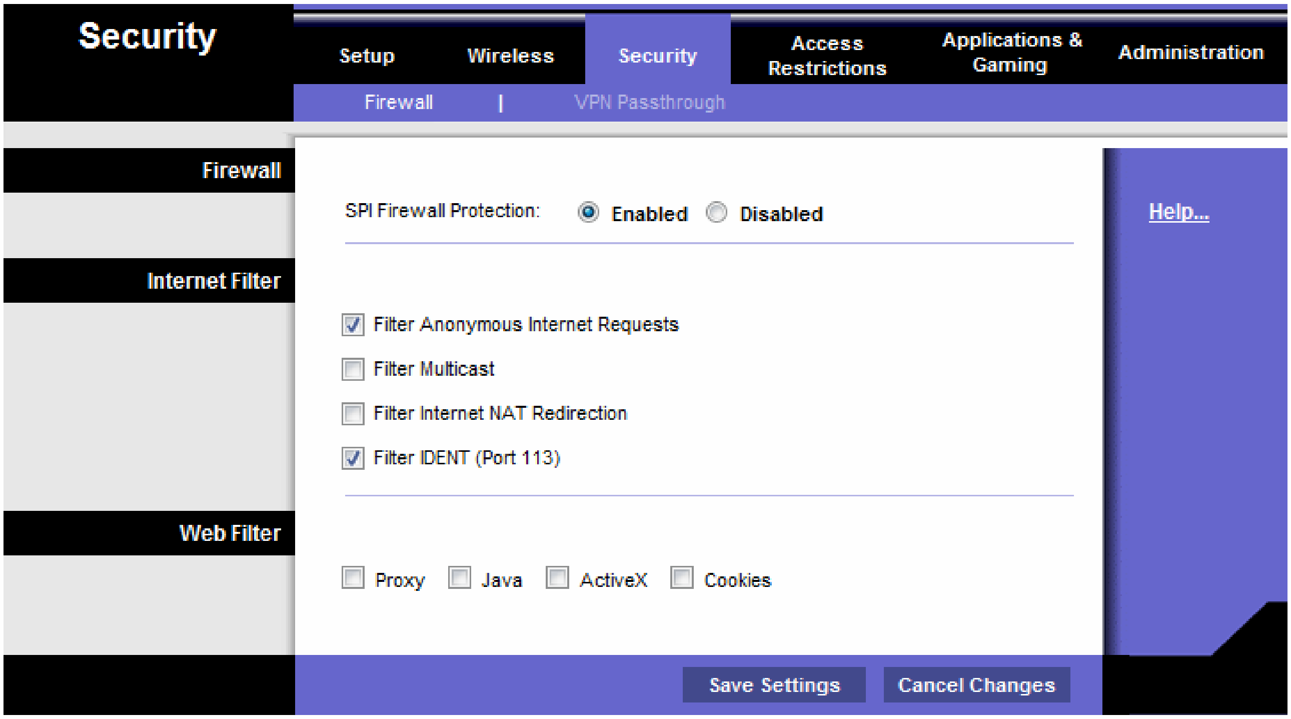
a. The Linksys WRT300N provides a basic firewall that uses Network Address Translation (NAT). In addition, it provides additional firewall functionality using Stateful Packet Inspection (SPI) to detect and block unsolicited traffic from the Internet.

b. From the main screen, click the **Security** tab to view the **Firewall** and **Internet Filter** status. What is the status of SPI Firewall protection? ____

c. Which **Internet Filter** checkboxes are selected? ____________________________________

d. Click **Help** to learn more about these settings. What benefits does filtering IDENT provide?

____



Firewall

SPI Firewall Protection: ● Enabled ○ Disabled

Internet Filter

☑ Filter Anonymous Internet Requests

□ Filter Multicast

□ Filter Internet NAT Redirection

☑ Filter IDENT (Port 113)

Web Filter

□ Proxy □ Java □ ActiveX □ Cookies

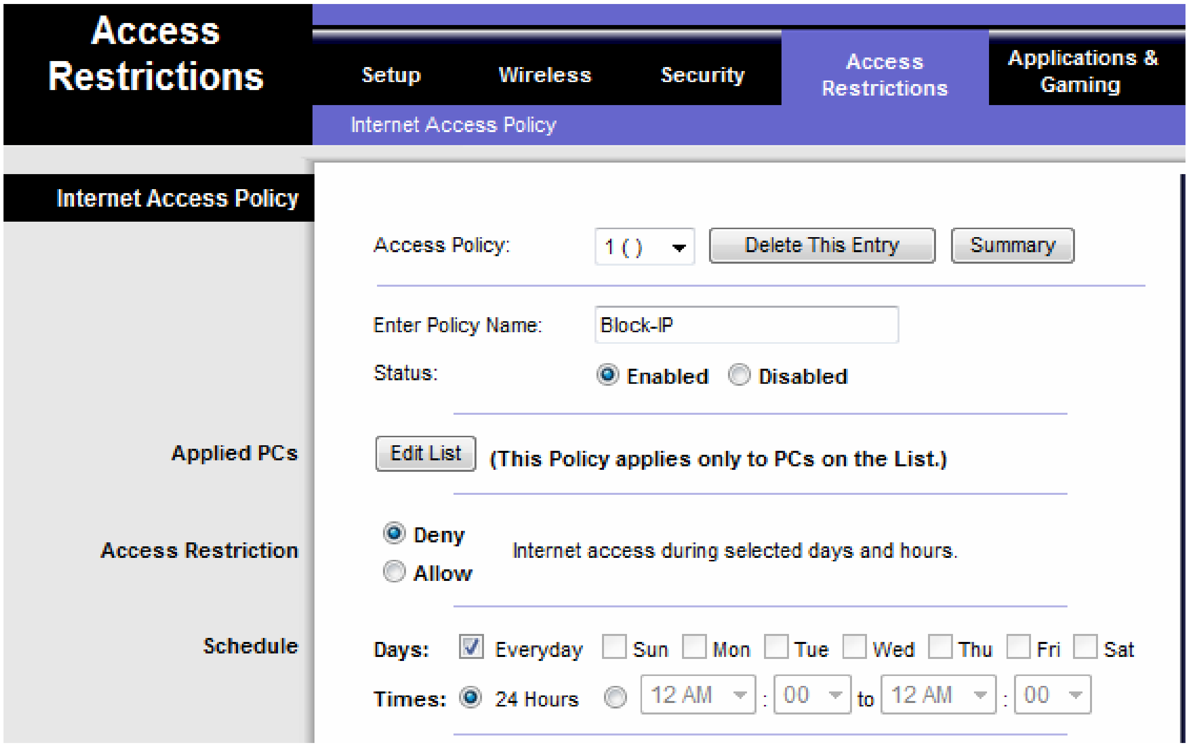
Step 4: Set up Internet access restrictions based on IP address

In Lab 7.3.5, you saw that wireless security features can be used to control which wireless client computers can access the multi-function device, based on their MAC address. This prevents unauthorized external computers from connecting to the wireless access point (AP) and gaining access to the internal local network and the Internet.

The multi-function device can also control which internal users can get out to the Internet from the local network. You can create an Internet access policy to deny or allow specific internal computers access to the Internet based on the IP address, MAC address, and other criteria.

a. From the main multi-function device screen, click the **Access Restrictions** tab to define **Access Policy 1**.

b. Enter **Block-IP** as the policy name. Select **Enabled** to enable the policy, and then select **Deny** to prevent Internet access from a specified IP address.



Access Policy: 1 ( )

Enter Policy Name: Block-IP

Status: ● Enabled ○ Disabled

Applied PCs: (This Policy applies only to PCs on the List.)

Access Restriction: ● Deny ○ Allow Internet access during selected days and hours.

Schedule

Days: ☑ Everyday □ Sun □ Mon □ Tue □ Wed □ Thu □ Fri □ Sat

Times: ● 24 Hours ○ 12 AM : 00 to 12 AM : 00

c. Click the **Edit List** button and enter the IP address of Host-B. Click **Save Settings** and then **Close**. Click **Save Settings** to save Internet Access Policy 1 – Block IP.

d. Test the policy by attempting to access the external web server from Host-B. Open a browser and enter the IP address of the external server in the address area. Are you able to access the server?

____

e. Change the status of the Block-IP Policy to **Disabled** and click **Save Settings**. Are you able to access the server now? ____

f. What other ways can access policies be used to block Internet access?

____

Step 5: Set up an Internet access policy based on an application

You can create an Internet access policy to block specific computers from using certain Internet applications or protocols on the Internet.

a. From the main Linksys GUI screen, click the Access Restrictions tab to define an Internet Access Policy.

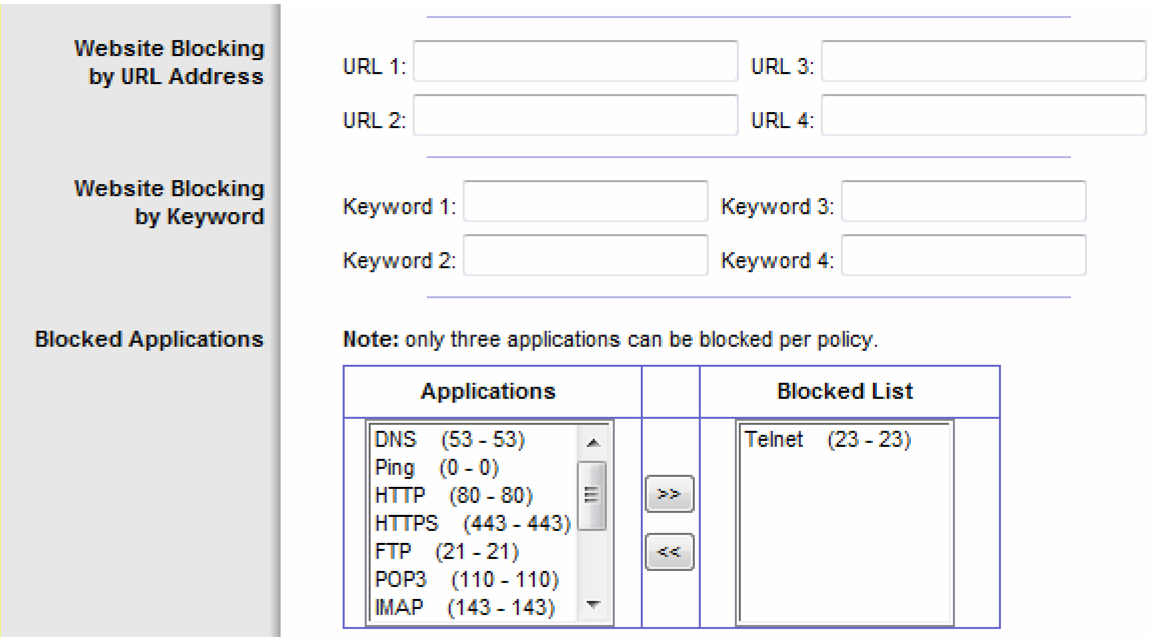
b. Enter Block-Telnet as the policy name. Select Enabled to enable the policy, and then click Allow to permit Internet access from a specified IP address as long as it is not one of the applications that is blocked.

c. Click the Edit List button and enter the IP address of Host-B. Click Save Settings and then Close.

What other Internet applications and protocols can be blocked?

____

d. Select the **Telnet** application from the list of applications that can be blocked and then click the double right arrow to add it to the **Blocked List**. Click **Save Settings**.



Website Blocking by URL Address

URL 1:

URL 2:

URL 3:

URL 4:

Website Blocking by Keyword

Keyword 1:

Keyword 2:

Keyword 3:

Keyword 4:

Blocked Applications

Note: only three applications can be blocked per policy.

Applications		Blocked List
DNS (53 - 53) Ping (0 - 0) HTTP (80 - 80) HTTPS (443 - 443) FTP (21 - 21) POP3 (110 - 110) IMAP (143 - 143)	>> <<	Telnet (23 - 23)

e. Test the policy by opening a command prompt using **Start > All Programs > Accessories > Command Prompt**.

f. Ping the IP address of the external server from Host-B using the **ping command**.

Are you able to ping the server? ____

g. Telnet to the IP address of the external server from Host-B using the command telnet A.B.C.D (where A.B.C.D is the IP address of the server).

Are you able to telnet to the server? ____

NOTE: If you are not going to perform lab Part 2 at this time and others will be using the equipment after you, skip to Step 3 of Part 2 and restore the multi-function device to its default settings.

Part 2 – Configuring a DMZ on the multi-function device

Step 1: Set up a simple DMZ

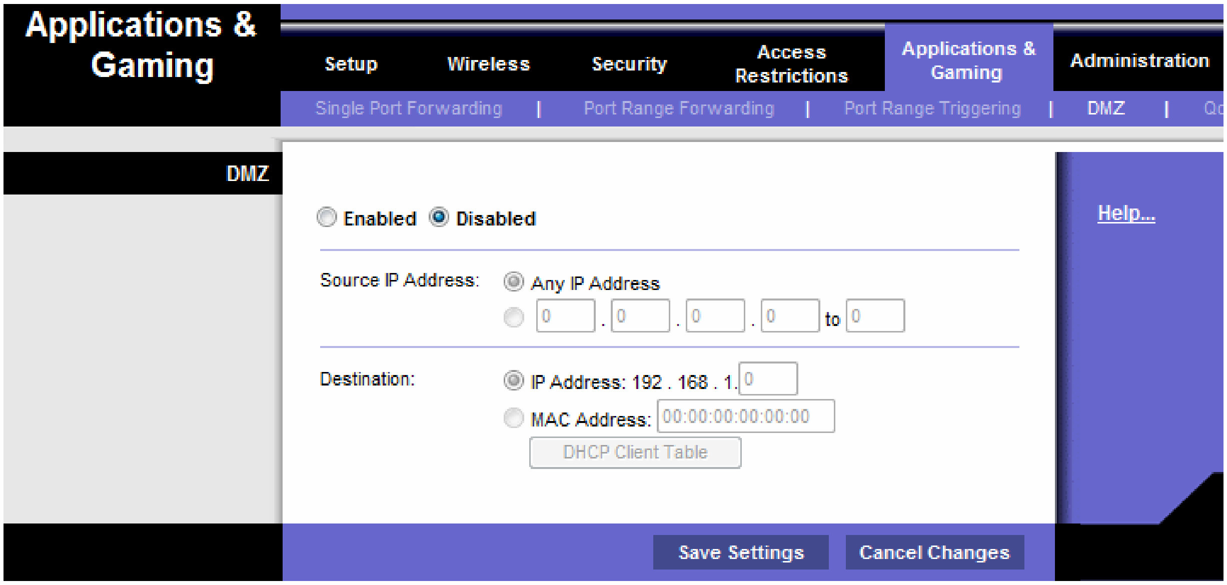
It is sometimes necessary to allow access to a computer from the Internet while still protecting other internal local network computers. To accomplish this, you can set up a demilitarized zone (DMZ) that allows open access to any ports and services running on the specified server. Any requests made for services to the outside address of the multi-function device will be redirected to the server specified.

a. Host-B will act as the DMZ server and should be running HTTP and Telnet servers. Verify the Host-B has a static IP address or, if Host-B is a DHCP client, you can reserve its current address and make it static using the **DHCP Reservation** feature on the Linksys device **Basic Setup** screen.

b. From the main Linksys GUI screen, click the **Applications & Gaming** tab then click **DMZ.**

c. Click **Help** to learn more about the DMZ. For what other reasons might you want to set up a host in the DMZ?

____



○ Enabled ● Disabled

Source IP Address: ● Any IP Address
○ 0 . 0 . 0 . 0 to 0

Destination: ● IP Address: 192 . 168 . 1. 0
○ MAC Address: 00:00:00:00:00:00

d. The DMZ feature is disabled by default. Select **Enabled** to enable the DMZ. Leave the **Source IP Address** selected as **Any IP Address,** and enter the IP address of Host-B in the **Destination IP address**. Click **Save Settings** and click **Continue** when prompted.

e. Test basic access to the DMZ server by pinging from the external server to the outside address of the multi-function device.   Use the **ping –a** command to verify that it is actually the DMZ server responding and not the multi-function device. Are you able to ping the DMZ server?

____

f. Test HTTP access to the DMZ server by opening a browser on the external server and pointing to the external IP address of the multi-function device. Try the same thing from a browser on Host-A to Host-B using the internal addresses.

Are you able to access the web page? ______________________________________

g. Test Telnet access by opening a command prompt as described in Step 5. Telnet to the outside IP address of the multi-function device using the command **telnet** *A.B.C.D* (where A.B.C.D is the outside address of the multi-function device).

Are you able to telnet to the server? ____

Step 2: Set up a host with single port forwarding

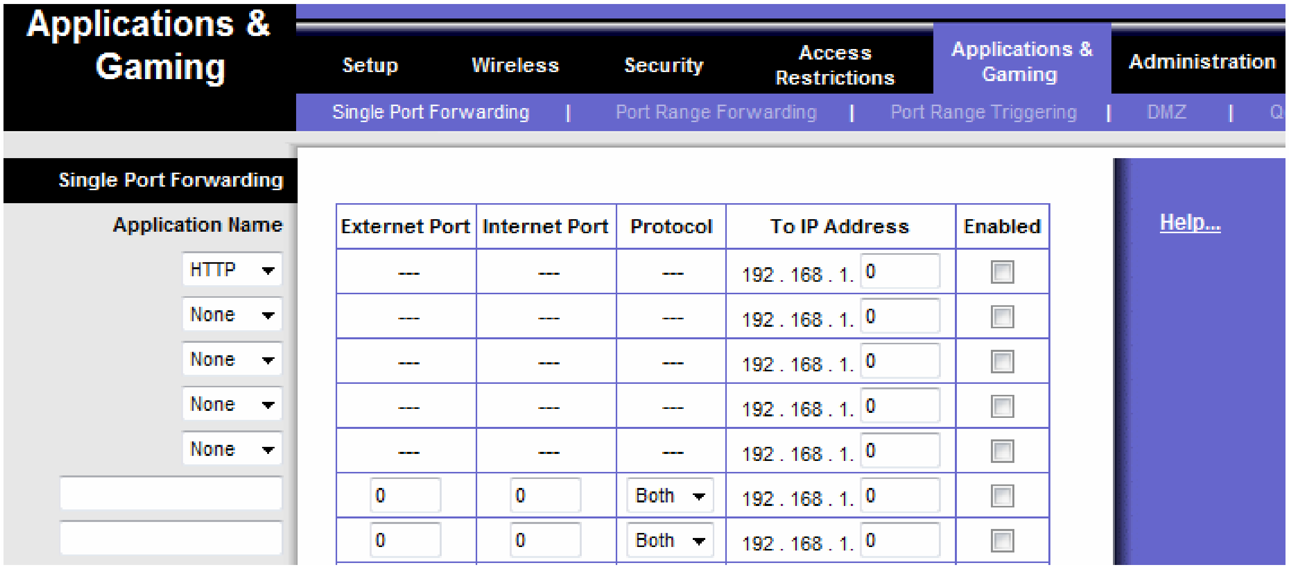
The basic DMZ hosting set up in Step 6 allows open access to all ports and services running on the server, such as HTTP, FTP, and Telnet,. If a host is to be used for a particular function, such as FTP or web services, access should be limited to the type of services provided. Single port forwarding can accomplish this and is more secure than the basic DMZ, because it only opens the ports needed. Before completing this step, disable the DMZ settings for step 1.

Host-B is the server to which ports are forwarded, but access is limited to only HTTP (web) protocol.

a. From the main screen, click the **Applications & Gaming** tab, and then click **Single Port Forwarding** to specify applications and port numbers.

b. Click the pull-down menu for the first entry under **Application Name** and select **HTTP**. This is the web server protocol port 80.

c. In the first **To IP Address** field, enter the IP address of Host-B and select **Enabled**. Click **Save Settings**.



Application Name	Externet Port	Internet Port	Protocol	To IP Address	Enabled
HTTP	---	---	---	192 . 168 . 1. 0	□
None	---	---	---	192 . 168 . 1. 0	□
None	---	---	---	192 . 168 . 1. 0	□
None	---	---	---	192 . 168 . 1. 0	□
None	---	---	---	192 . 168 . 1. 0	□
	0	0	Both	192 . 168 . 1. 0	□
	0	0	Both	192 . 168 . 1. 0	□

d. Test HTTP access to the DMZ host by opening a browser the external server and pointing to the outside address of the multi-function device. Try the same thing from a browser on Host-A to Host-B.

Are you able to access the web page? ____

e. Test Telnet access by opening a command prompt as described in Step 5. Attempt to telnet to the outside IP address of the multi-function device using the command **telnet** *A.B.C.D* (where A.B.C.D is the outside IP address of the multi-function device).

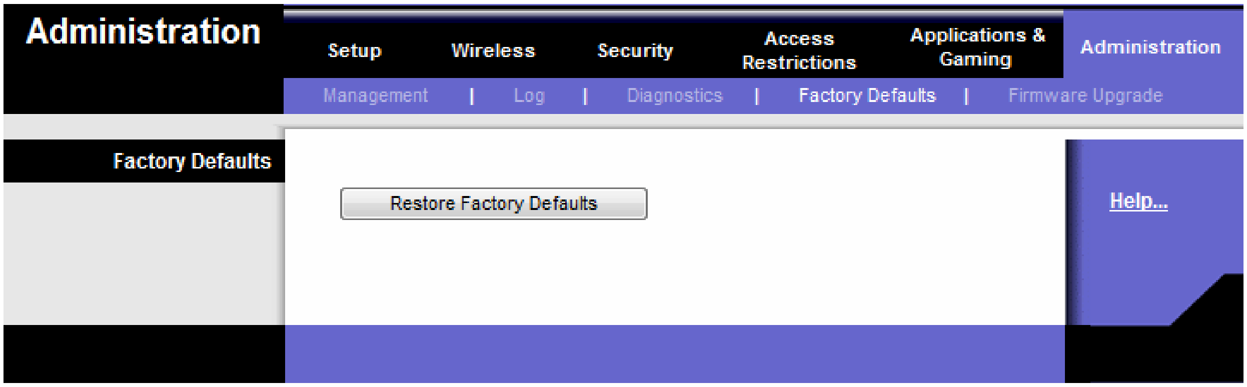
Are you able to telnet to the server? ____

Step 3: Restore the multi-function device to its default settings

a. To restore the Linksys to its factory default settings, click the **Administration > Factory Defaults** tab.

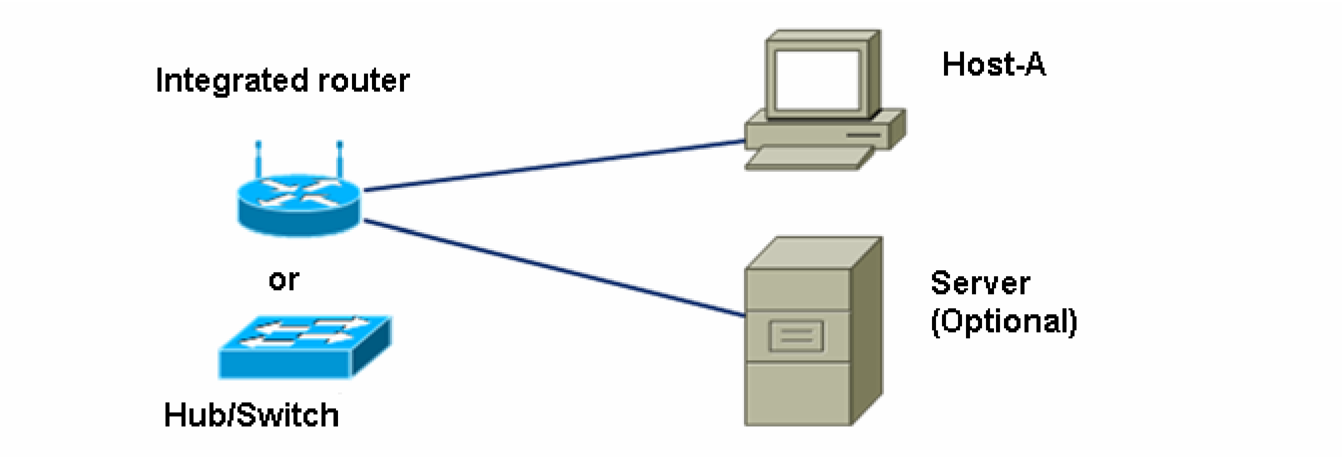
b. Click the **Restore Factory Defaults** button. Any entries or changes to settings will be lost.

NOTE: The current settings can be saved and restored at a later time using the **Administration > Management** tab and the **Backup Configuration** and **Restore Configuration** buttons.



Lab 8.4.3 Performing a Vulnerability Analysis

CAUTION: This lab may violate legal and organizational security policies. The security analyzer downloaded in this lab should only be used for instructional purposes in a lab environment. Before using a security analyzer on a live network, check with your instructor and network administration staff regarding internal policies concerning the use of these tools.



Objectives

- Download and install security analyzer software.
- Test a host to determine potential security vulnerabilities.

Background / Preparation

Security analyzers are valuable tools used by network administrators and auditors to identify network and host vulnerabilities. There are many vulnerability analysis tools, also known as security scanners, available to test host and network security. In this lab, you will download and install the Microsoft Baseline Security Analyzer (MBSA). MBSA is designed to identify potential security issues related specifically to Microsoft operating systems, updates, and applications. It also identifies unnecessary services that may be running, as well as any open ports.

MBSA runs on Windows Server and Windows XP systems and scans for common security misconfigurations and missing security updates for the operating system as well as most versions of Internet Information Server (IIS), SQL Server, Internet Explorer (IE), and Office products. MBSA offers specific recommendations to correct potential problems.

This lab can be done individually or in teams of two.

The following resources are required:

- Computer running Windows XP Professional to act as the test station.
- High-speed Internet connection for downloading MBSA (unless pre-installed).
- Computer must be attached to the integrated router switch or a standalone hub or switch.
- Optionally, you can have a server running a combination of DHCP, HTTP, FTP, and Telnet (preconfigured).

Step 1: Download and install MBSA

a. Open a browser and go to the MBSA web page at: http://www.microsoft.com/technet/security/tools/mbsa2/default.mspx

b. What is the latest version of MBSA available? ____

c. What are some of the features MBSA provides? ______________________________________

____

d. Scroll down the page and select the desired language to begin the download process.

e. Click **Continue** to validate the copy of Microsoft Windows you are running.

f. Click **Download Files below** and select the file you want to download. (The English setup file is MBSASetup-EN.msi). Click the **Download** button on the right of this file. How many megabytes is the file to download? ____

g. When the **File Download – Security Warning** dialog box displays, click **Save** and download the file to a specified folder or the desktop. You can also run it from the download website.

h. Once the download is complete, make sure all other applications are closed. Double-click the downloaded file. Click **Run** to start the Setup program, and then click **Run** if you are prompted with a Security Warning. Click **Next** on the MBSA Setup screen.

i. Select the radio button to accept the license agreement and click **Next**. Accept the defaults as the install progresses, and then click **Finish**. Click **OK** on the final MBSA Setup screen, and close the folder to return to the Windows desktop.

Step 2: Build the network and configure the hosts

a. Connect the host computer(s) to the integrated router, a hub, or a switch as shown in the topology diagram. Host-A is the test station where MBSA will be installed. The server is optional.

b. Set the IP configuration for the host(s) using Windows XP Network Connections and TCP/IP properties. If the host is connected to the integrated router, configure it as a DHCP client; otherwise go to Step 1d.

c. If the host is connected to a hub or switch and a DHCP server is not available, configure it manually by assigning a static IP address.

Which IP address and subnet mask does Host-A and the server (optional) have?

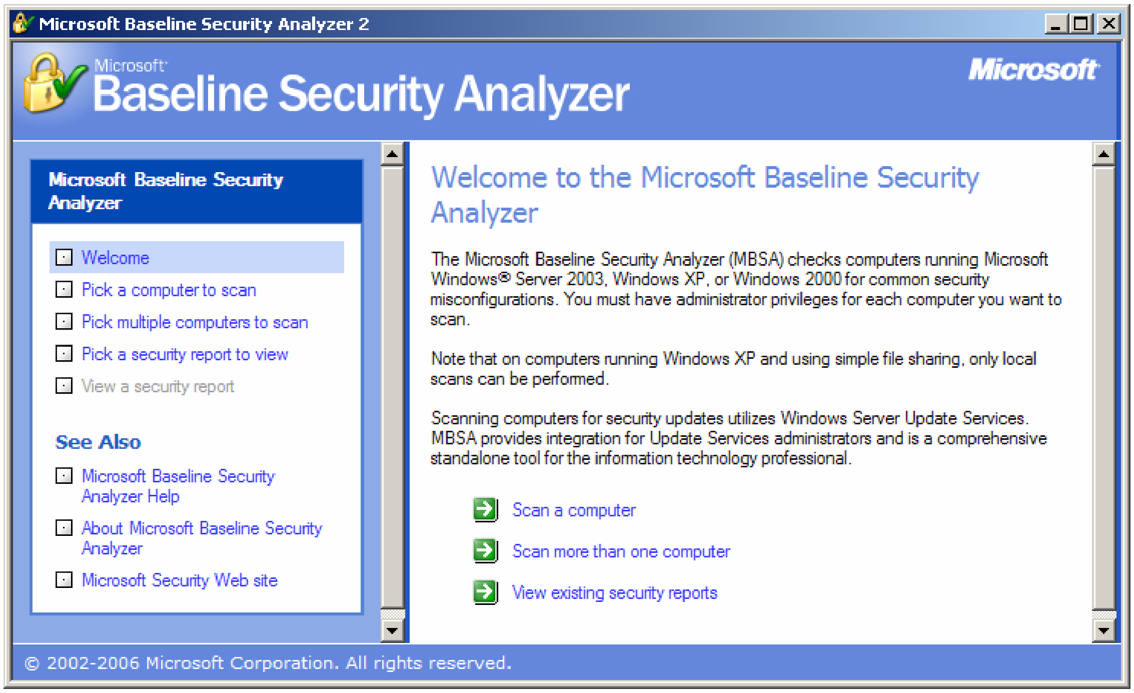
____

Step 3: Run MBSA on a host

a. Double-click the desktop icon for MBSA or run it from **Start > All Programs**.

When the main screen displays, which options are available? ______________________________

____


Microsoft Baseline Security Analyzer 2
Microsoft
Baseline Security Analyzer
Microsoft
Microsoft Baseline Security Analyzer
□ Welcome
□ Pick a computer to scan
□ Pick multiple computers to scan
□ Pick a security report to view
□ View a security report
See Also
□ Microsoft Baseline Security Analyzer Help
□ About Microsoft Baseline Security Analyzer
□ Microsoft Security Web site
Scan a computer
Scan more than one computer
View existing security reports

Welcome to the Microsoft Baseline Security Analyzer

The Microsoft Baseline Security Analyzer (MBSA) checks computers running Microsoft Windows® Server 2003, Windows XP, or Windows 2000 for common security misconfigurations. You must have administrator privileges for each computer you want to scan.

Note that on computers running Windows XP and using simple file sharing, only local scans can be performed.

Scanning computers for security updates utilizes Windows Server Update Services. MBSA provides integration for Update Services administrators and is a comprehensive standalone tool for the information technology professional.

© 2002-2006 Microsoft Corporation. All rights reserved.

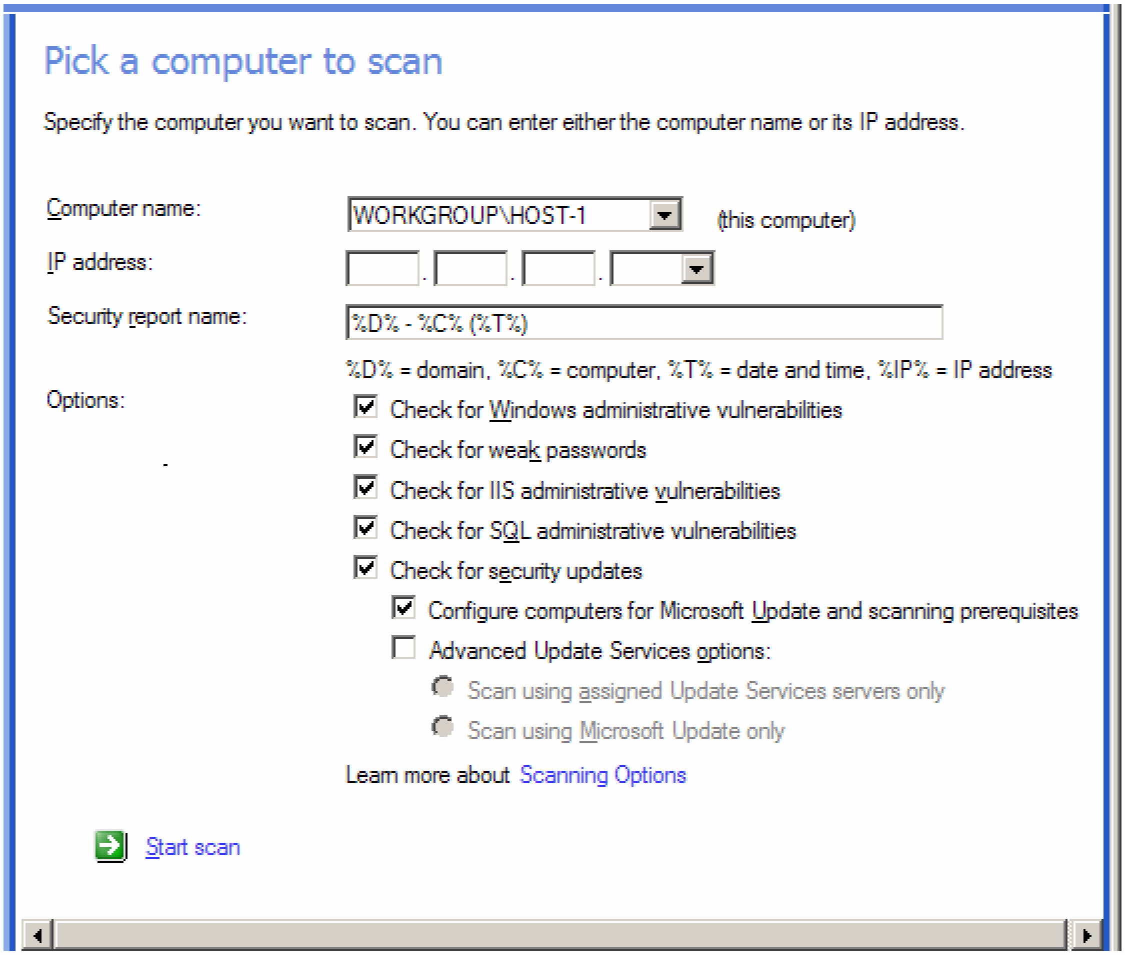
Step 4: Select a computer to scan

a. On the left side of the screen, click **Pick a computer to scan**. The computer shown as the default is the one on which MBSA is installed.

b. What are the two ways to specify a computer to be scanned? ____________________________

____

c. Accept the default computer to be scanned. De-select Check for IIS and SQL administrative vulnerabilities, since these services are not likely to be installed on the computer being scanned. Click **Start Scan**.



Pick a computer to scan

Specify the computer you want to scan. You can enter either the computer name or its IP address.

Computer name: WORKGROUP\HOST-1 (this computer)

IP address: . . .

Security report name: %D% - %C% (%T%)

%D% = domain, %C% = computer, %T% = date and time, %IP% = IP address

Options:

☑ Check for Windows administrative vulnerabilities
☑ Check for weak passwords
☑ Check for IIS administrative vulnerabilities
☑ Check for SQL administrative vulnerabilities
☑ Check for security updates
  ☑ Configure computers for Microsoft Update and scanning prerequisites
  ☐ Advanced Update Services options:
    ○ Scan using assigned Update Services servers only
    ○ Scan using Microsoft Update only

Learn more about Scanning Options

Start scan

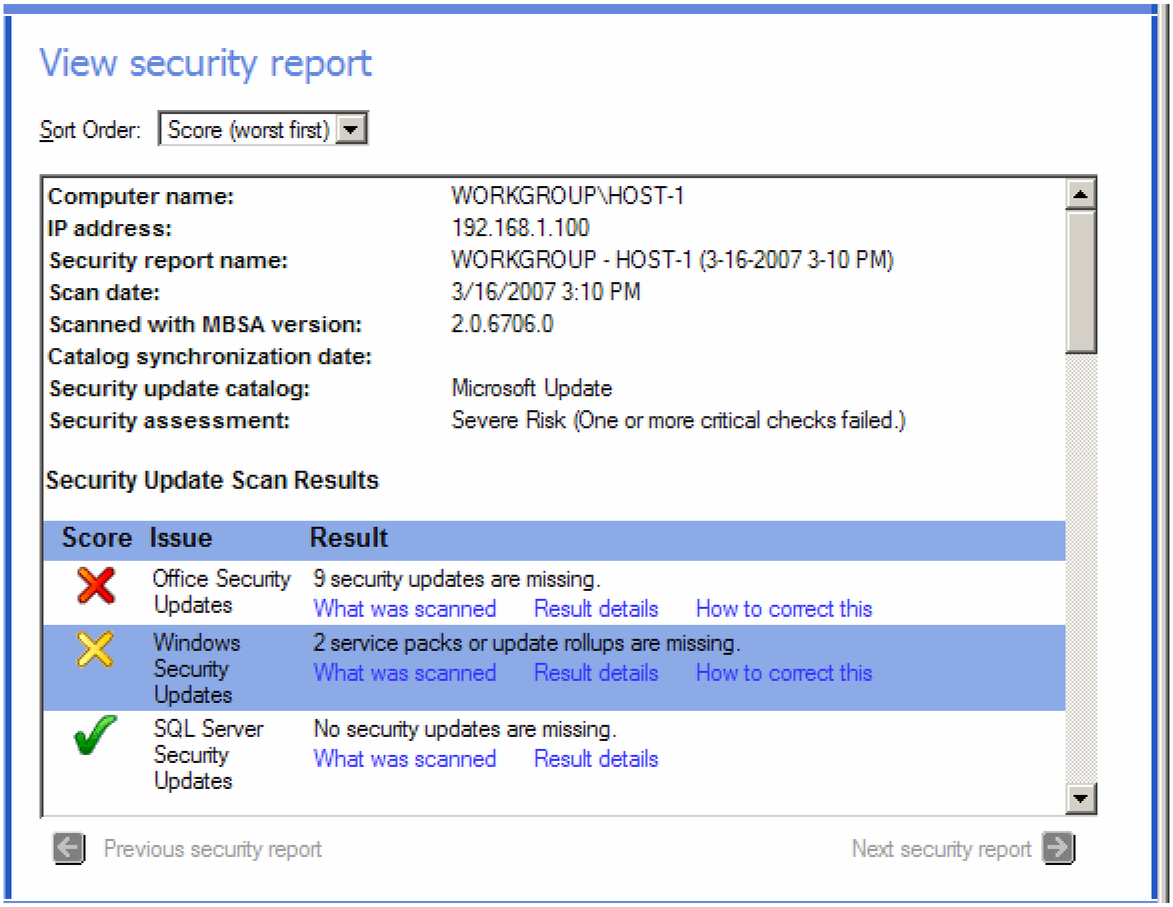
Step 5: View security update scan results

a. View the security report. What are the results of the security update scan? ________________

____

b. If there are any red or yellow Xs, click **How to correct this**. Which solution is recommended?

____



View security report

Sort Order: Score (worst first)

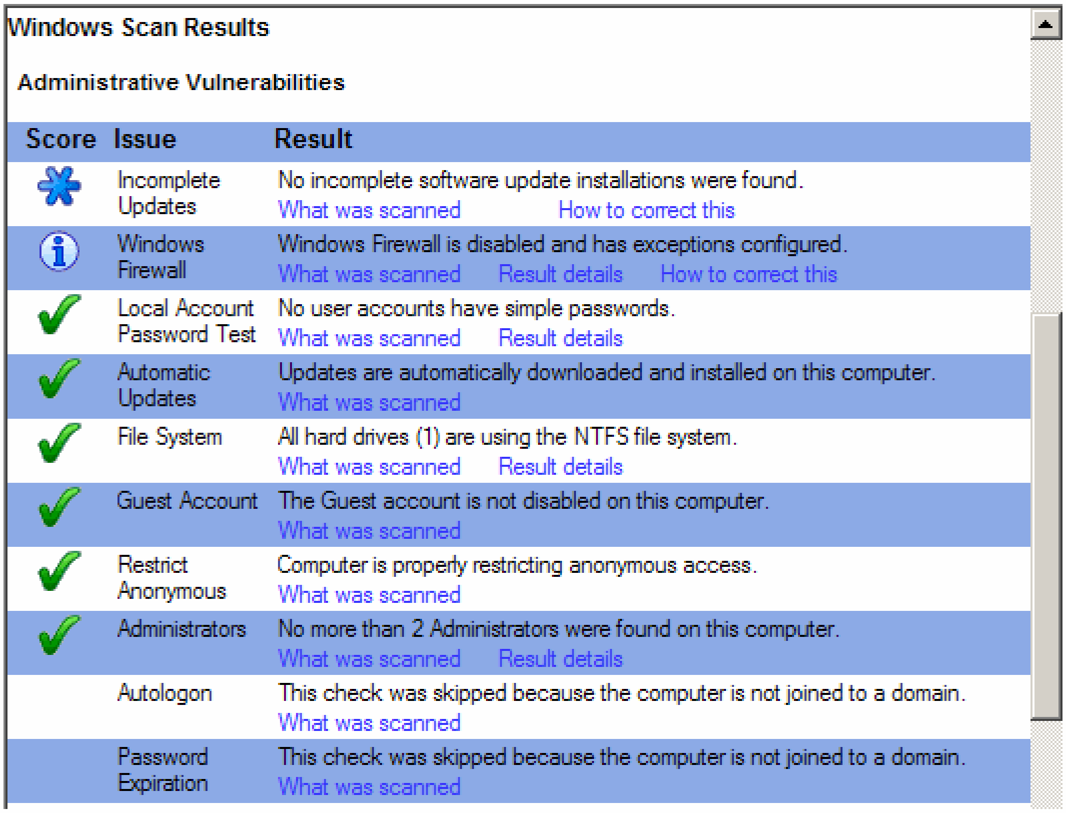
Computer name: WORKGROUP\HOST-1
IP address: 192.168.1.100
Security report name: WORKGROUP - HOST-1 (3-16-2007 3-10 PM)
Scan date: 3/16/2007 3:10 PM
Scanned with MBSA version: 2.0.6706.0
Catalog synchronization date:
Security update catalog: Microsoft Update
Security assessment: Severe Risk (One or more critical checks failed.)

Security Update Scan Results

Score	Issue	Result
✗	Office Security Updates	9 security updates are missing. What was scanned Result details How to correct this
✗	Windows Security Updates	2 service packs or update rollups are missing. What was scanned Result details How to correct this
✓	SQL Server Security Updates	No security updates are missing. What was scanned Result details

Step 6: View Windows scan results in the security report

a. Scroll down to view the second section of the report that shows **Windows Scan Results**. Were there any administrative vulnerabilities identified?

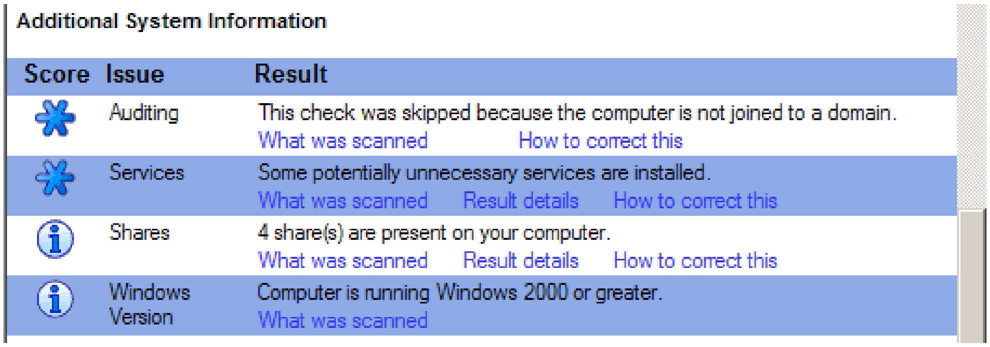


Windows Scan Results

Administrative Vulnerabilities

Score	Issue	Result
✱	Incomplete Updates	No incomplete software update installations were found. What was scanned How to correct this
ⓘ	Windows Firewall	Windows Firewall is disabled and has exceptions configured. What was scanned Result details How to correct this
✓	Local Account Password Test	No user accounts have simple passwords. What was scanned Result details
✓	Automatic Updates	Updates are automatically downloaded and installed on this computer. What was scanned
✓	File System	All hard drives (1) are using the NTFS file system. What was scanned Result details
✓	Guest Account	The Guest account is not disabled on this computer. What was scanned
✓	Restrict Anonymous	Computer is properly restricting anonymous access. What was scanned
✓	Administrators	No more than 2 Administrators were found on this computer. What was scanned Result details
	Autologon	This check was skipped because the computer is not joined to a domain. What was scanned
	Password Expiration	This check was skipped because the computer is not joined to a domain. What was scanned

b. On the **Additional System Information** section of the screen (below), in the **Issue** column for **Services**, click **What was scanned,** and click **Result details** under the **Result** column to get a description of the check that was run. What did you find? When finished, close both popup windows to return to the security report.



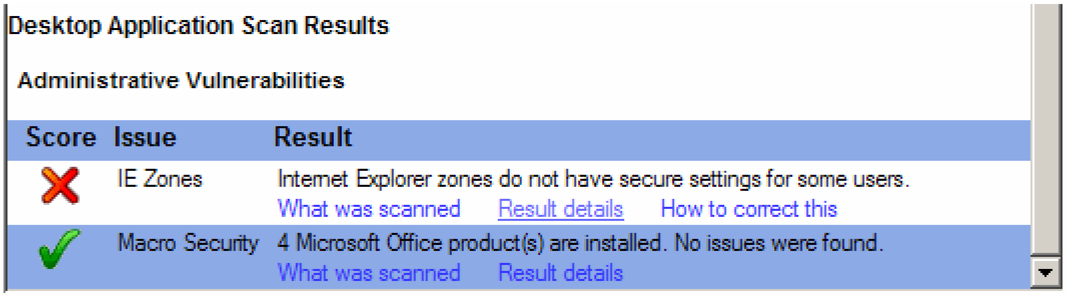
Additional System Information

Score	Issue	Result
✱	Auditing	This check was skipped because the computer is not joined to a domain. What was scanned How to correct this
✱	Services	Some potentially unnecessary services are installed. What was scanned Result details How to correct this
ⓘ	Shares	4 share(s) are present on your computer. What was scanned Result details How to correct this
ⓘ	Windows Version	Computer is running Windows 2000 or greater. What was scanned

Step 7: View Desktop Application Scan Results in the Security report

a. Scroll down to view the last section of the report that shows **Desktop Applications Scan Results**. Were there any administrative vulnerabilities identified?

____



Desktop Application Scan Results

Administrative Vulnerabilities

Score	Issue	Result
✗	IE Zones	Internet Explorer zones do not have secure settings for some users. What was scanned Result details How to correct this
✓	Macro Security	4 Microsoft Office product(s) are installed. No issues were found. What was scanned Result details

b. How many Microsoft Office products are installed? ___________________________________

c. Were there any security issues with **Macro Security** for any of them?

____

Step 8: Scan a server, if available

a. If a server with various services is available, click Pick a computer to scan from the main MBSA screen and enter the IP address of the server, and then click Start Scan. Which security vulnerabilities were identified?

____

____

____

b. Were there any potentially unnecessary services installed? Which port numbers were they on?

____

____

Step 9: Uninstall MBSA using Control Panel Add/Remove Programs

a. This step is optional, depending on whether the host will be automatically restored later by a network process.

b. To uninstall MBSA, click **Start > Control Panel > Add/Remove Programs**. Locate the MBSA application and uninstall it. It should be listed as Microsoft Baseline Security Analyzer 2.0.1. Click **Remove**, and then click **Yes** to confirm removal of the MBSA application. When finished, close all windows to return to the desktop.

Step 10: Reflection

a. The MBSA tool is designed to identify vulnerabilities for Windows-based computers. Search the Internet for other tools that might exist. List some of the tools discovered.

____

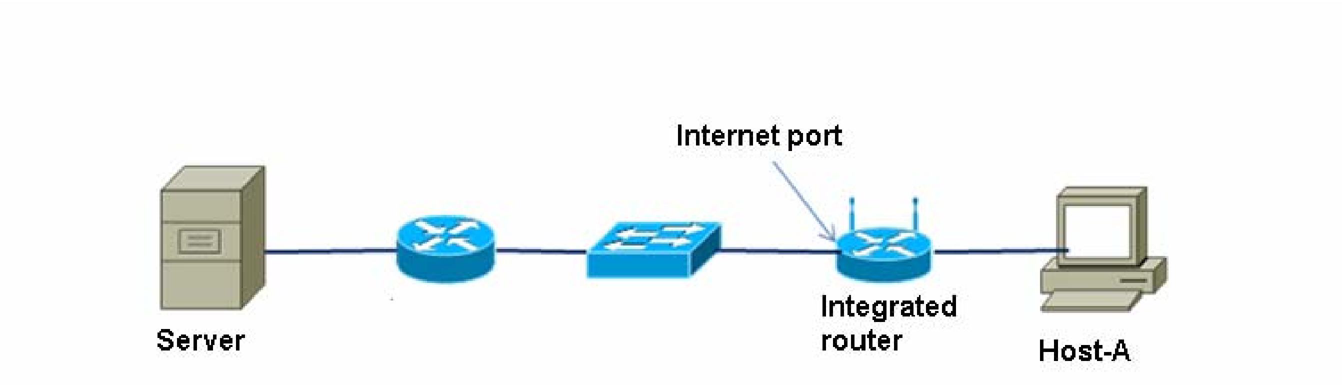
b. Which tools might there be for non-Windows computers? Search the Internet for other tools that might exist and list some of them here.

____

c. Which other steps could you take to help secure a computer against Internet attacks?

____

Lab 9.2.7 Troubleshooting Using Network Utilities



Objectives

- Use network utilities and the integrated router GUI to determine device configurations.
- Select the appropriate network utilities to help troubleshoot connectivity problems.
- Diagnose accessibility problems with Web, FTP, Telnet, and DNS servers.
- Identify and correct physical problems related to cable types and connections.

Background / Preparation

In this lab, you use the browser and various troubleshooting utilities, such as **ipconfig**, **ping**, **tracert**, **netstat**, and **nslookup** to diagnose and correct connectivity problems. These command line interface (CLI) utilities are available on most current operating systems, although the exact command and syntax may vary. Windows XP commands and syntax are used in this lab.

Your instructor will set up the network topology similar to the one shown here and will preconfigure the client computer, integrated router, server, and external router for each scenario in the lab. Various software and hardware connectivity problems will be introduced, and you will diagnose the cause from the client computer.

There are six scenarios. Work in teams of three, with each person taking the lead in two of the scenarios, and the other team members assisting.

The following resources are required:

- Computer running Windows XP Professional with Web, FTP, and Telnet clients (CLI or GUI).
- Server running a combination of DNS, HTTP, FTP, and Telnet services (preconfigured). This server will simulate Internet connections and can be a server with these services actually installed and running or a server running the Discovery Live CD.
- Integrated router configured as a DHCP server and client (default configuration).
- Router with two Ethernet interfaces configured as a DHCP server to integrated router (preconfigured).
- Ethernet Cat-5 (minimum) straight and crossover cabling to connect hosts and network devices.

Step 1: Build the network and configure the hosts

a. Have your instructor set up a network topology similar to the one shown with the Host-A client computer, integrated router, server, and router preconfigured.

b. Work from Host-A to issue commands to troubleshoot problems introduced by the instructor.

c. All commands are issued from a command prompt window. Open a command prompt window by clicking Start > All Programs > Accessories > Command Prompt. Keep the window open for the duration of the lab.

Step 2: Record the baseline IP address information for computers and integrated router

NOTE: Perform this step before the instructor introduces problems.

a. Host-A configuration—Issue the command that displays the IP address information for Host-A, including the DNS server, and record the information below. Which command did you use? __________________

IP address: ________________________________

Subnet mask: ______________________________

Default gateway IP address: __________________

DNS server IP address: _______________________

DHCP server IP address: _____________________

How did Host-A obtain its IP address? ___________

b. Integrated router configuration—From Host-A, open a browser and go to the integrated router GUI by entering 192.168.1.1 as the URL address. Log in to the integrated router using the default user ID and password (check with your instructor if necessary). Check the internal and external IP address information and record it below.

Internal IP address: _________________________

Subnet mask: ______________________________

Is the DHCP server enabled? __________________

External (Internet) IP address: _________________

Subnet mask: ______________________________

Default gateway IP address: __________________

DNS server IP address: _______________________

c. Server configuration—Obtain the Server IP configuration from your instructor and record the information below.

IP address: ________________________________

Subnet mask: ______________________________

Default gateway IP address: __________________

Web Server 1 protocol and name: ________________________

Web Server 2 protocol and name: ________________________

FTP Server 1 protocol and name: ________________________

FTP Server 2 protocol and name: ________________________

Step 3: Scenario 1—Diagnose Web server access

a. After your instructor sets up the problem for this scenario, use various utilities to diagnose the problem.

b. Open your browser and enter the name of the Web Server 1 from Step 2. What happened?

____

c. Which commands did you use to diagnose the problem? ________________________________

d. Report the problem or suspected problem to the instructor. What was the problem?

____

e. What did you do to correct the problem, if anything?

____

f. You may need to contact the instructor to correct the problem. When the problem is corrected, retest and verify access to the server.

Step 4: Scenario 2—Diagnose Web server access

a. After your instructor sets up the problem for this scenario, use various utilities to diagnose the problem.

b. Open your browser and enter the name of the Web Server 2 from Step 2. What happened?

____

c. Which commands did you use to diagnose the problem? ________________________________

____

____

d. Report the problem or suspected problem to the instructor. What was the problem?

____

____

____

e. What did you do to correct the problem, if anything?

____

____

____

f. You may need to contact the instructor to correct the problem. When the problem is corrected, retest and verify access to the server.

Step 5: Scenario 3—Diagnose FTP server access

a. After your instructor sets up the problem for scenario, use various utilities to diagnose the problem.

b. Use your FTP client (CLI or GUI) to connect to FTP Server 1 from Step 2. What happened?

____

c. Which commands did you use to diagnose the problem? ________________________________

____

____

d. Report the problem or suspected problem to the instructor. What was the problem?

____

____

e. What did you do to correct the problem, if anything?

____

f. You may need to contact the instructor to correct the problem. When the problem is corrected, retest and verify access to the server.

Step 6: Scenario 4—Diagnose FTP server access

a. After your instructor sets up the problem for this scenario, use various utilities to diagnose the problem.

b. Use your FTP client (CLI or GUI) to connect to FTP Server 2 from Step 2. What happened?

____

c. Which commands did you use to diagnose the problem? ______________________________

____

____

d. Report the problem or suspected problem to the instructor. What was the problem?

____

____

____

e. What did you do to correct the problem, if anything?

____

f. You may need to contact the instructor to correct the problem. When the problem is corrected, retest and verify access to the server.

Step 7: Scenario 5—Diagnose Telnet server access problem

a. After your instructor sets up the problem for this scenario, use various utilities to diagnose the problem.

b. Use a Telnet client (CLI or GUI) to connect to the name of **Server 1 identified in Step 2.** What happened? ____

c. Which commands did you use to diagnose the problem? _______________________________

____

____

d. Report the problem or suspected problem to the instructor. What was the problem?

____

____

____

e. What did you do to correct the problem, if anything?

____

f. You may need to contact the instructor to correct the problem. When the problem is corrected, retest and verify access to the server.

Step 8: Scenario 6—Analyze TCP connections to Host-A

a. Ask your instructor to verify that all problems introduced with the lab setup have been corrected. Using the appropriate clients, connect to the Web, FTP, and Telnet servers simultaneously from Host-A.

b. From the command line, issue a command to display the current active TCP connections to Host-A with names of the servers and protocols. Which command did you use? ____________________

c. Which named connections did you see? ____

d. From the command line, issue a command to display the current active TCP connections to Host-A with IP addresses and protocol port numbers. Which command did you use? __________________

e. Which IP addresses and port numbers did you see?

   ____

   ____

f. From the command line, issue a command to display the current active TCP connections to Host-A, along with the program that created the connection. Which command did you use? ___________________

g. Which program executable (filename with an .exe extension) is listed for each of the connections?

   ____

   ____

Step 9: Reflection

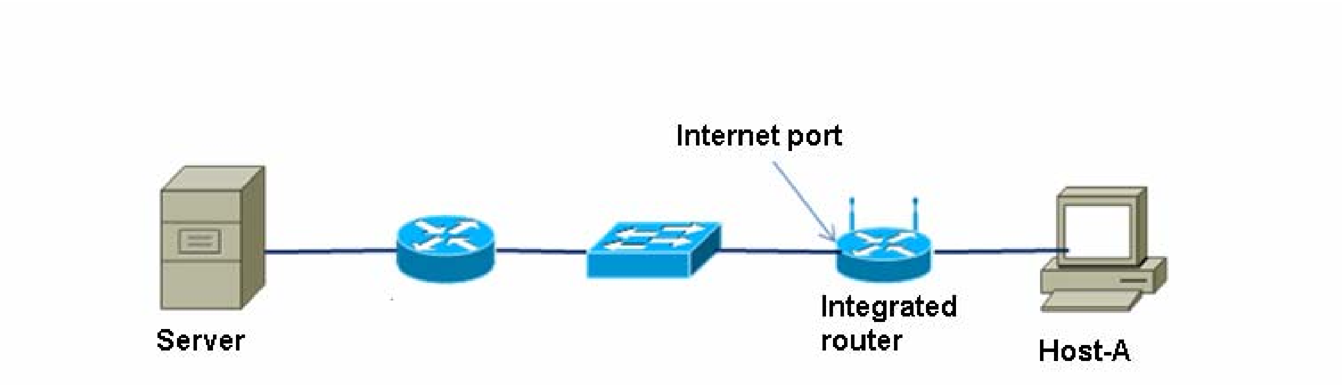
a. When troubleshooting the problem scenarios during this lab, which troubleshooting technique did you use primarily (top-down, bottom-up, or divide and conquer)?

   ____

b. Which utility or command do you feel was the most useful for network troubleshooting?

   ____

Lab 9.3.3 Troubleshooting Physical Connectivity



Objectives

- Examine device LEDs to determine proper Ethernet connectivity.
- Select the correct Ethernet cable for use between various types of devices.
- Visually inspect cables for potential problems.
- Use a cable tester to help identify cabling problems.

Background / Preparation

Physical cabling is one of the most common sources of network problems. This lab focuses on connectivity issues related to network cabling. You will visually inspect cabling and LED link lights to evaluate physical connections and to determine if the correct type of cable is being used based on the devices they interconnect. You will also use a cable tester to identify problems with cables.

The instructor will set up the network topology similar to the one shown and will preconfigure the hosts and network devices. The instructor will introduce various connectivity problems, and you will diagnose the cause of these problems by inspecting link lights and testing cables between devices. Various cable types, both good and bad, will be used to interconnect devices for each scenario in the lab.

Work in teams of two, with each person taking the lead in half of the problem scenarios.

The following resources are required:

- Computer running Windows XP Professional (preconfigured)
- Server (preconfigured)
- Integrated router configured as a DHCP server and client (default configuration)
- Router with two Ethernet interfaces configured as the DHCP server to integrated router (preconfigured)
- Mix of Ethernet Cat-5 (minimum) straight-through and crossover cabling, both good and bad, to connect hosts and network devices
- Basic Cat-5 Ethernet cable tester (RJ-45 pin-to-pin continuity checker)
- Advanced cable tester (optional), such as Fluke 620 (or similar)

Step 1: Build the network and configure the hosts

a. Ask your instructor to set up a network topology similar to the one shown with a preconfigured Host-A client computer, integrated router, server, and router. Initially, correct and properly functioning cabling is used so that end-to-end connectivity can be verified. The instructor then introduces cabling problems in each scenario.

b. Problems can consist of using the wrong type of` cable between two devices (straight-through or crossover) or using a defective cable (miswired or improperly terminated). Observe device interface link lights, visually inspect cables, and use a cable tester to determine the problems.

c. Complete steps 2 and 3 of this lab before the instructor introduces problems.

Step 2: Record the correct cable types used between devices

a. Refer to the topology diagram and record the cable type that should be used (straight-through or crossover) based on the devices being connected. Have your instructor verify this information before proceeding.

b. Which type of cable should be used from Host-A to the integrated router?
____

c. Which type of cable should be used from the integrated router (router portion) to Hub/Switch?

____

d. Which type of cable should be used from Hub/Switch to Router? _________________________

e. Which type of cable should be used from Router to Server? _____________________________

Step 3: Record the IP address information for the computers

a. Use the ipconfig command, or get the IP address of Host-A from your instructor, and record it here.

Host-A IP address: ____

b. Get the server IP address from your instructor and record it here.

Server IP address: ____

c. Before starting on problem scenarios, verify end-to-end connectivity by pinging from Host-A to Server. If you do not get a reply from the server, check with your instructor. There may be a problem with the initial hardware or software setup.

Step 4: Scenario 1

a. After your instructor sets up the problem, use visual inspection and a cable tester to isolate the problem.

b. Ping from Host-A to Server. What happened?

____

c. Check the LED link lights on the various device interfaces. Write down any that are not lit.

____

d. Disconnect and inspect the cable connecting the network interfaces that were not lit. Describe the problem and how you were able to identify it.

____

____

____

e. What did you do to correct the problem?

____

f. When the problem is corrected, retest and verify end-to-end connectivity by pinging from Host-A to Server. Was the ping successful? ________

Step 5: Scenario 2

a. After your instructor sets up the problem, use visual inspection and a cable tester to isolate the problem.

b. Ping from Host-A to Server. What happened?

____

c. Check the LED link lights on the various device interfaces. Write down any that are not lit.

____

d. Disconnect and inspect the cable connecting the network interfaces that were not lit. Describe the problem and how you were able to identify it.

____

____

____

e. What did you do to correct the problem?

____

f. When the problem is corrected, retest and verify end-to-end connectivity by pinging from Host-A to Server. Was the ping successful? ________

Step 6: Scenario 3

a. After your instructor sets up the problem, use visual inspection and a cable tester to isolate the problem.

b. Ping from Host-A to Server. What happened?

____

c. Check the LED link lights on the various device interfaces. Write down any that are not lit.

____

d. Disconnect and inspect the cable connecting the network interfaces that were not lit. Describe the problem and how you were able to identify it.

____

____

____

e. What did you do to correct the problem?

____

f. When the problem is corrected, retest and verify end-to-end connectivity by pinging from Host-A to Server. Was the ping successful? ________

Step 7: Scenario 4

a. After your instructor sets up the problem, use visual inspection and a cable tester to isolate the problem.

b. Ping from Host-A to Server. What happened?

____

c. Check the LED link lights on the various device interfaces. Write down any that are not lit.

____

d. Disconnect and inspect the cable connecting the network interfaces that were not lit. Describe the problem and how you were able to identify it.

____

____

____

e. What did you do to correct the problem?

____

f. When the problem is corrected, retest and verify end-to-end connectivity by pinging from Host-A to Server. Was the ping successful? ________

Step 8: Reflection

a. What are some general rules to help you determine which type of Ethernet cable (straight-through or crossover) to use to connect different types of network hosts and devices?

____

____

____

b. Which types of problems can a cable tester detect that might not be determined by visual inspection?

____

Capstone Project – Putting It All Together

Objectives

- Understand the steps involved in planning and implementing a technical solution for a small business.
- Gather relevant information to help devise a technical solution to a problem.
- Devise a technical solution for a small office environment.
- Prototype a proposed technical solution using Packet Tracer 4.1.
- Plan the installation of a technical solution for a small business environment.
- Prepare and present a technical report to a diverse group.
- Configure a wireless router to support the requirements of a small business environment.

Background / Preparation

You have just successfully completed the first course in the CCNA-Discovery series and have obtained a contract position at a small advertising company called AnyCompany Corporation to help them update their IT resources. The company originally started with two partners who produced print flyers for local businesses. Their list of customers has greatly expanded, and their customers are demanding more interactive advertising media, including video presentations. The partners recognize the business potential in this new market and have hired you to review their existing IT resources and produce a proposal that allows the company to take advantage of this new market. The partners have stated that if the proposal meets their requirements, they may hire you full-time to implement and manage these new resources.

Step 1: Gather information and determine customer requirements

You now have an idea of the scope of the project that you have undertaken, but do not have all of the information required to proceed. The first step in any IT project is to gather information. What is really required? What are the budget and the time frame to complete this project? What restrictions, if any, are there in equipment and resource selection? What resources are currently in place? The more information that you gather at the beginning of any project, the better.

A good way to start the information gathering process is to conduct interviews with the key individuals within the company, who are usually divided into three main groups: managers, end users, and IT support. Each group can provide valuable information.

Managers – Managers can answer questions regarding budget, expectations, and future plans. Any IT solution must take into account the plans that the company may have for growth, either in the number of employees or the technology being deployed. Managers can also provide you with information regarding company policies that may affect the proposed solution. Policies could include such things as access, security, and privacy requirements.

The following information is normally gathered from managers:

- Budget
- Requirements and expectations
- Restrictions
- Staffing
- Future growth

End users – End users are the people directly impacted by the solution you design. While managers are also end users, their requirements may differ drastically from the majority of the employees. It is important to talk to as many employees from as many departments or work areas as possible to determine their requirements. It is also important to determine the actual, rather than perceived, requirements. From a customer service perspective, including employees in the initial discussions improves their buy-in and acceptance of the final solution.

The following information is normally gathered from end users:

- Requirements and expectations
- Current perceived performance of the equipment
- Applications used
- Work patterns

IT department – Most small businesses do not have an IT department and responsibilities may fall on one or more individuals, depending on their job role and expertise. Larger businesses may have a separate IT department. Those individuals who handle the IT can provide you with more technical information. For example, an end user may complain that an existing network has become slow, but an IT person can provide the technical information to determine if performance has been degraded.

The following information is normally gathered from IT:

- Applications used
- Work patterns
- Hardware resources
- Network infrastructure (physical and logical topology)
- Network performance and issues

Activity 1

AnyCompany Corporation has provided a written summary containing a floor plan, and a verbal interview with a company manager. Gather as much information as possible from these two sources to help you plan a technical solution for AnyCompany Corporation.

AnyCompany Corporation Information

Because AnyCompany Corporation is a very small business, it has no IT department. Everyone has taken care of their own resources. If they could not fix the problem, they would call in an outside service technician. The machines are connected together through a 10 Mbps hub using Category 3 cable. The two partners and the secretary all have P2-300 MHz machines with 256 MB of RAM and 13 GB hard disk drives. The systems are all running Windows 98SE, and each a low-capacity, monochrome laser printer is attached to each machine. These machines are not capable of running the software required for video development.

The office will be reorganized, and additional employees will be hired to handle the new video production work. The company will have the following employees:

Administrative Manager (currently the secretary) – Duties include scheduling work, hiring and managing part-time workers, weekly payroll, and project tracking. The administrative manager uses spreadsheet and database software and must be able to use e-mail provided by the ISP.

Film and Graphics Production Editor (one of the partners) – Requires special editing software that uses very high-resolution graphics and requires at least 2 GB of memory to run effectively. The software also interfaces with a video capture interface board that uses a PCI slot in the computer. This specialized software only works in a Windows XP environment. It is important that the computer purchased for this position support high-resolution video and have enough memory to enable the editor to work quickly. The production editor produces the final copies of the films and works within very tight deadlines. The editor must also be able to use e-mail provided by the ISP.

Film Crew – The other six employees are mobile workers, consisting of two production assistants, two camera people, a production manager (one of the partners), and a film director. They are in the office an average of two days per week. The rest of the time is spent either at customer sites or on film locations.

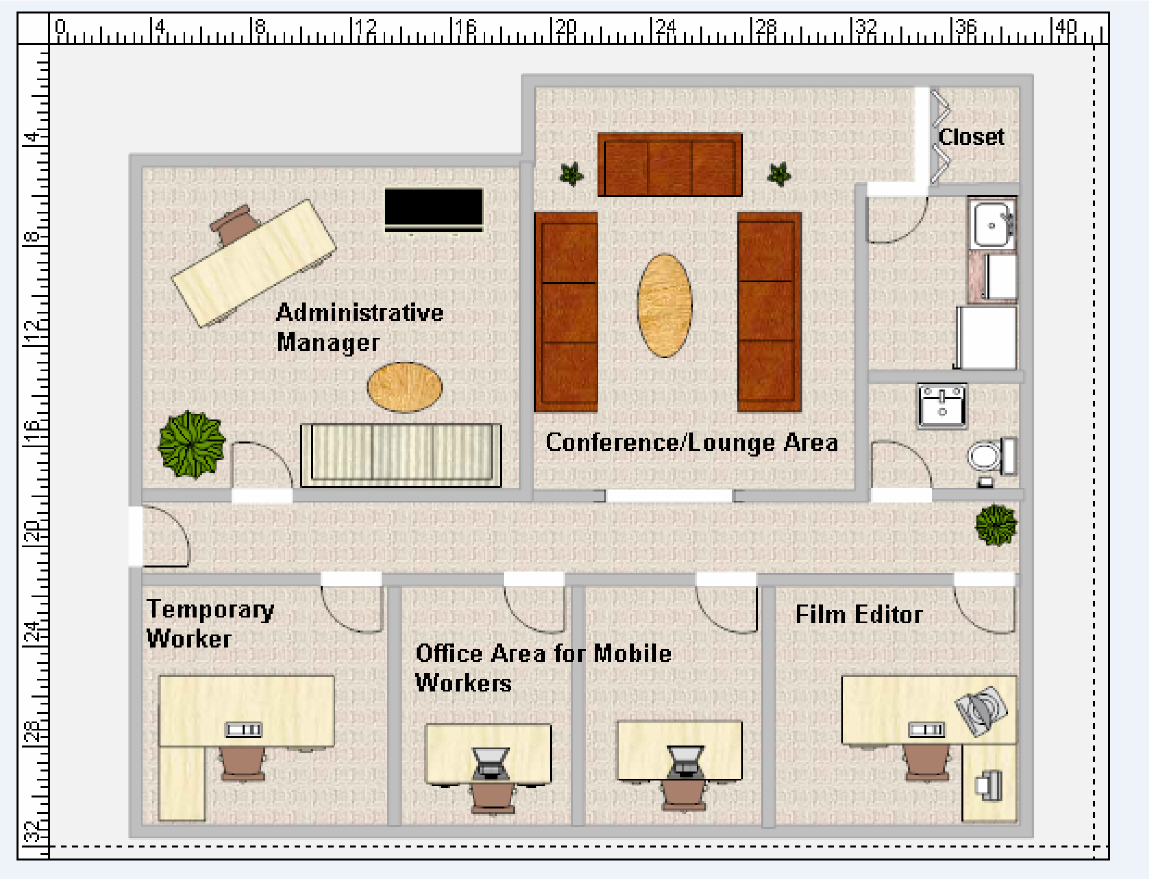
Because all of the mobile workers are required to have access to e-mail and production schedules, both at the office and while on location, it is important for them to be able to connect to the main office from anywhere. They have no special software requirements, but they do need a large hard drive to store the film files while they are working on them. The mobile workers must work at various locations and may not always be able to plug into a data port. It is important that they are able to connect to the internal network wirelessly.

Because of the sensitive nature of some of the documents and records required by the administrative manager, a private color laser printer must be installed in the manager's office. A combination copier/printer and high-resolution scanner must also be purchased and shared among all employees.

For the purposes of training and compatibility, all of the computers should use the same operating system and applications, if possible.

No budget has yet been established for the completion of this project. The company is moving into this area to prevent bankruptcy, so it is important that the project be completed with the lowest possible expenditures.

Office Floor Plan



Interview with the Administrative Manager

Susan Roberts: I am the new administrative manager for AnyCompany Corporation. I am very glad that we have hired you to help us plan our IT requirements and would like to discuss these with you. I understand that you have already been supplied with a list of our planned staff and some information about how they use their computers. I have some details that might be important as you select equipment and media for our new facilities.

You: It is nice to meet you, Susan. Yes, I received a letter that listed the numbers and types of employees working at the redesigned office. It is my understanding that there will be eight employees: two office employees and six mobile workers. Any information you can provide about how these workers will use the network can help me prepare the proposal for your local network.

Roberts: Both Fred Michaels, the film and graphics production editor, and I are in our offices during regular business hours. We need access to e-mail, which we currently get from our ISP. The e-mail system that they provide uses a web client that we can access over the Internet. We are also able to access this e-mail from our home computers

It is necessary for both of us to share files between ourselves and also with the mobile workers. These files are usually spreadsheets and documents, but sometimes, when we are close to deadlines, we have to send large film files back and forth between the mobile workers and the office. Files must be available for download during the day, and also at night, when we are away from the office. These film files are usually between 512 MB and 2 GB in size.

You: The information I received also indicated that you require a shared printer. How do you plan on using this printer?

Roberts: We want to have a color printer that is also capable of making copies. Since we expect this printer to be expensive, it is necessary for everyone to be able to print to it when they are in the office. Some of our storyboard documents are over 100 pages, with lots of graphics.

You: How often are the mobile workers in the office? What do they need access to when they are in the office?

Roberts: Our mobile workers can be in the office anytime, day or night. They usually work out of their homes or on location, but when we are near a deadline, they can be in the office for 24 hours at a time. When they are in the office, they need to be able to use the printer and scanner. I do not want to keep files that the mobile workers need to use on my computer, because they might need them at times when I am not in the office, and the computer is not turned on. I also need to share files with Fred while we are working in the office. These files can be kept on my computer or his.

You: I understand that your e-mail accounts are provided over the web by your ISP. Do you see a need for locally hosted web or e-mail accounts?

Roberts: We also employ temporary, part-time employees when we need them. We want to be able to set up e-mail accounts for them to use while they are working with us. We usually don't have more than five or six temporary employees at any one time. All of them work from their homes and use their own computers.

You: Thank you for your time. I think I have enough information to get started. Are you the contact person if I have any further questions?

Roberts: Yes, please call me if you need more information. Thank you.

At this point, it is a good idea to review the notes and information that you have gathered and clearly summarize the requirements. If something is not clear, go back to the information-gathering step. Do not guess or assume anything, because mistakes can be very costly.

Step 2: Select the appropriate services and equipment

Once you have gathered all the appropriate information, it is time to do some research. You must now use your knowledge and research skills to propose an appropriate technical solution for their limited budget and time requirements. Proposing a solution that is beyond the financial capabilities is of no benefit. However, it can be helpful to propose a solution within the current budget, and offer suggestions that would improve network performance or productivity if additional funding becomes available. If you can justify these extra expenditures, the company may consider them for later implementation or may even find the extra funding needed.

When developing a plan, it is often easier to start at the end user and then work back toward the network and any shared resources, and then finally, any external connections to the Internet or other networks. Many different forms have been developed to help with planning and equipment selection. It is a good idea to use one of these forms or to design your own to keep everything organized.

Activity 2

Use the following form to develop a proposed computer system for each of the employees at AnyCompany Corporation. Search the Internet or local sources for availability and pricing information. Use the same form to propose a server that can support their e-mail and FTP requirements.

Computer System Planning Form	
Job Role:	
Location:	
Component	**Recommendation**
Processor: (manufacturer/model/speed)	
Memory: (type, amount)	
Hard Drive: (type, capacity)	
CD-ROM/DVD: (R, R/W, speed)	
USB Ports: (number, location)	
Video Card: (manufacturer, model, video RAM)	
Sound Card: (manufacture, model)	
Modem (internal/external, speed, standard)	
Network Card(s): (Ethernet: speed, wireless, standard)	
Operating System: (manufacturer, version, compatibility)	
Monitor: (size, resolution, refresh)	
Printer: (manufacturer, model, type, speed)	
Speakers: (manufacturer, model, type)	
Internet connection: (USB/Ethernet/wireless)	

After the end-user systems have been selected, it is time to look at the workflow and decide on any shared components and network technology to support this workflow. This can include such things as shared printers, scanners, and storage as well as any routers, switches, access points and ISRs. When planning a network infrastructure, always plan into the future. For larger companies, because it is usually a substantial investment, the infrastructure should have a lifetime of about 10 years. For smaller companies and home users, the investment is significantly less and change occurs more frequently.

Activity 3

Using the Internet and locally available resources, select a high-speed, color copier/printer for the AnyCompany Corporation office.

Activity 4

Propose a network layout for AnyCompany Corporation. Because the company has limited funds available for this project, it is important that only equipment designed for the small business and home markets be used.

It is important to plan the Internet connectivity, and which services are provided by the ISP and which services must be provided in-house. Larger companies usually provide services in-house while small businesses and individuals normally rely on an ISP to provide these services. Most ISPs offer a variety of services and service levels. Selecting an ISP is complicated, and not all technologies and services are available in all regions of the world. There are a number of excellent online tools to assist in the selection process. One such tool has been produced by the Australian government and is available at http://toolkit.acma.gov.au/internet/form.asp.

Activity 5

Using the curriculum and other available resources, select a local ISP to provide connectivity for AnyCompany Corporation. It will rely upon this ISP for DNS and web mail, and also needs the ISP to provide 99.999% uptime for access to the internal FTP/e-mail server. Because you are the only IT person at AnyCompany Corporation, it is also important that the ISP provides a high-level of technical support. Create a comparison worksheet for several local ISPs, including costing.

Activity 6

Which internal services must be offered by AnyCompany Corporation, and which devices provide these services?

Activity 7

Complete the following network planning form as it relates to the proposed AnyCompany Corporation network.

Are wired connections required?	Number:
Are wireless connections required?	Number:
Wireless standard	Choice of a/b/g/n
Firewall required?	Yes/No
ISP connectivity required?	Yes/No
Type of ISP connectivity	Choice of DSL, cable, serial, dialup
Internal or external modem required?	Yes/No (if Yes, then type of modem)
Cables required?	Yes/No (if Yes, then type of cable)
Battery backup required?	Yes/No

Step 3: Plan the installation

After the equipment has been selected and the required services planned, the physical and logical installation is planned out. Physical installation includes the location of equipment and devices, along with how and when these devices are to be installed. In the business environment, it is important to minimize disruption of the normal work processes. Therefore, most installations, changes, and upgrades are done during hours when there is minimal business activity. For the home, this is less important but should still be considered. Physical installation should also consider such things as adequate power outlets and ventilation, as well as the location of any necessary data drops.

Activity 8

Using the provided floor plan and other appropriate information, plan the physical layout of all equipment data drops and power outlets. In addition, devise an implementation schedule that takes into account the work practices within AnyCompany Corporation.

Equally as important as planning the physical layout of the network and equipment is planning the logical layout. This includes such things as addressing, naming, data flow, and security measures. Servers and network devices are assigned static IP addresses to allow them to be easily identified on the network and to also provide a mechanism for controlling access to these devices. Most other devices can be assigned addresses using DHCP.

Activity 9

Devise an addressing scheme for AnyCompany Corporation. The scheme must provide all network devices and servers with a static address and allow all other hosts to be configured via DHCP. Assign all devices an appropriate name.

Activity 10

AnyCompany Corporation is concerned that their files and resources may be vulnerable through the wireless network. Provide a security plan that allows only AnyCompany Corporation employees to connect to the wireless network and gain access to company information and resources.

After the network is planned, it is important to verify that it works as expected. This is the prototyping stage and is not normally done for home or small business installations. Many different prototyping tools exist in the enterprise world.

Activity 11

Use Packet Tracer to prototype the planned network. Test various scenarios such as traffic coming from the Internet to the internal servers and host traffic moving to the Internet. Also confirm that the wireless network behaves as expected. Not all features of the designed network will be able to be tested using Packet Tracer.

Step 4: Prepare and present the proposal

All of the gathered information and the proposed technical solution must be assembled into a format that makes sense to the company or individual who has asked you to provide a solution. In the small business and home markets, this may be simply a summary report that lists the key points in a manner that is easily understood. In the enterprise market, this process becomes much more structured and formal. The formal report usually contains many different sections, including:

- Cover letter
- Title page and table of contents
- Executive summary
- Project proposal, comprising needs statement; goals and objectives; methodology and timetable; evaluation; budget summary; detailed budget; future funding plans
- Appended information

The report is often presented to various groups for approval. When presenting the report, present it in a confident, professional, and enthusiastic manner. This includes dressing appropriate to the target audience. The report and presentation must be technically accurate and free from spelling and grammatical errors. Always proof read your report and presentation before delivery. Have it reviewed by peers as well. A good technical solution does not overcome a bad proposal or presentation.

Activity 12

Prepare a proposal for AnyCompany Corporation that includes all the components listed above. Be sure to include all cost information and network diagrams. After the report is prepared, have it reviewed by a peer. When you are confident in the proposal, present it to the class for consideration.

Step 5: Install and configure the network

After the proposal has been accepted by the individual or company, it is time to do the installation. This is another stage where planning is important. If devices can be preconfigured and tested before installation, it saves a great deal of time and frustration.

Activity 13

AnyCompany Corporation has decided to accept your proposal for the installation of their new network. All of the recommended equipment is on order and scheduled for delivery within a month.

1) Create a checklist for the installation of the PCs at the customer site.

2) Create a checklist for the configuration and installation of the network equipment at the customer site.

3) Create a checklist for the implementation of the standard security necessary at a small business.

Activity 14

Configure the ISR as per the proposed plan.

Step 6: Test and troubleshoot

During the installation, it is important to test the network under as many diverse situations as possible. Use the various troubleshooting tools available in most operating systems and network devices to ensure that the network behaves as expected under the normal workflow that it will be exposed to. Document all tests.

Activity 15

Test all aspects of the ISR configuration and document your results.

Step 7: Document and sign-off

Sign-off is when the customer indicates satisfaction that the solution performs as promised. This is usually the point that payment is made. Many internal IT departments also request sign-off when a job is completed to the end user satisfaction.

When sign-off occurs, printed copies of the performance and testing reports are delivered, along with the configuration information. For larger networks, much more information is required at sign-off, including physical and logical topology maps.

Activity 16

Prepare documentation for sign-off from the manager at AnyCompany Corporation. This includes the testing and performance documentation generated, along with any other prepared documentation. Have this information reviewed by a peer and then submit it to your instructor for final sign-off.

Step 8: Support

The last step in any solution is the provision of ongoing technical support. This requires a thorough understanding of the solution, technology, and customer requirements. The more thorough the documentation, the easier this stage is. Equally as important at this stage is an excellent grasp of customer service skills.

Activity 17

Take turns playing the technical support and customer roles. The customer contacts the technical support person and reports a problem with the newly implemented AnyCompany Corporation network. The problem should be realistic. The support person tries to determine the problem by interacting with the customer.