



## Chapter 15: Advanced Networks



### IT Essentials: PC Hardware and Software v4.0

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Chapter 15

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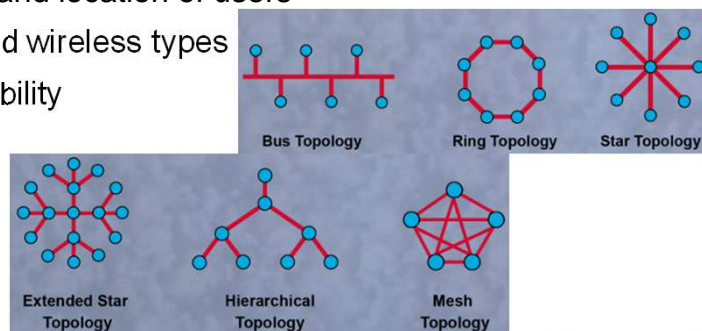
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## Determine a Network Topology

A **site survey** is a physical inspection of the building that will help determine a basic logical topology, which is the flow of data and protocols.

Considerations for topology choice:

- Number and location of users
- Cable and wireless types
- Expandability



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## Protocol Ports

When the TCP/IP protocol stack is enabled, other protocols become available on specific ports:

Protocols	Port	Purpose
HTTP	Port 80	Transports web pages over a TCP/IP network
HTTPS	Port 443	Securely transports web pages over a TCP/IP network
SMTP	Port 25	Sends email over a TCP/IP network
TELNET/SSH	Ports 23/22	Provides connections to computers over a TCP/IP network
FTP/TFTP	Ports 20 or 21/69	Transports files over a TCP/IP network
DNS	Port 53	Translates URLs to IP address
DHCP	Port 67	Automates assignment of IP address on a network

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## Components of a Network



- The network topology chosen determines the type of devices, cables, and network interface that will be required to construct the network.
- A connection to an Internet service provider (ISP) must be established.

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## Cable Types

Which cable type is most beneficial and cost effective for the customer?

- Types of twisted-pair copper cable: Cat5, Cat5e, Cat6, and Cat6A
- Cat5e is the most common type of cable used in a network
- Cat6A is the most recent type and it carries signals at a rate of 10 Gbps



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## Considerations for Cable Choice

- Installing cables is expensive, but after a one-time **expense**, a wired network is normally inexpensive to maintain.
- To make a wireless network as **secure** as wired network requires the use of encryption.
- Install the highest-grade cable available to ensure the network will handle **future network speeds**.
- A **wireless** solution may be possible in places where cables cannot be installed.

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## ISP Connection Types

Considerations when selecting an ISP connection type: speed, reliability, availability, and cost.

	Advantages	Disadvantages	Speed
<b>POTS</b>	Very common	Very slow speeds Cannot receive phone calls while connected	Max 56kbps
<b>ISDN</b>	Higher speeds than POTS	Still much slower than other broadband technologies	BRI – up to 128kbps PRI – up to 2.048Mbps
<b>DSL</b>	Low cost	Must be close to carrier	256kbps – 24Mbps
<b>Cable</b>	Very high speed	Slow upload speeds	384kbps – 27Mbps
<b>Satellite</b>	Available when DSL and cable are not	Significant lag, more expensive than other broadband technologies	9kbps – 24Mbps
<b>Wireless</b>	Scalable to customer needs	Very expensive Limited market availability	Up to 45Mbps

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## Select Network Interface Cards (NICs)

Considerations include speed, form factor, and capabilities of NIC and of hub or switch.

- Most NICs for desktops are either integrated into the motherboard or are an expansion card that fits into an expansion slot.
- Most NICs for laptops are either integrated into the motherboard or fit into a PC Card or ExpressBus expansion slot.
- USB network adapters plug into any available USB port and can be used with both desktops and laptops.


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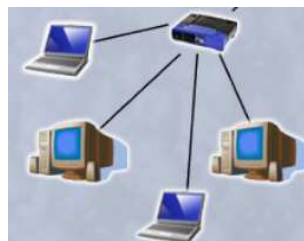
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## Select Network Device

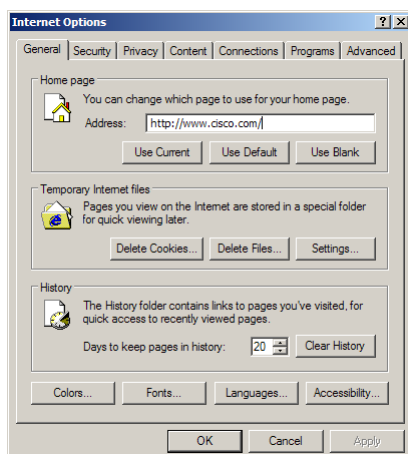
- Hub
  - Sends all traffic received out all ports
  - Regenerates traffic that passes through it
- Switch
  - Filter and segment network traffic by sending only to the destination device
  - Higher dedicated bandwidth provided to each network device
- Router
  - Connects networks together (example: connects a home network to the Internet)
  - Wireless routers also act as a firewall
- ISP equipment
  - A cable or DSL modem



## Network Installation

1. To install cable in ceilings and behind walls, perform a **cable pull**. Terminate each end of every cable. Label the ends of every cable.
2. Test the cables for shorts or interference.
3. Install NICs in network devices. Configure client software and IP address information on all devices.
4. Install switches and routers in a secured, central location.
5. Install patch cables from wall connections to devices. Check NICs for link lights on all devices.
6. Test the network for connectivity. Configure and test network applications.

## Configure a Web Browser

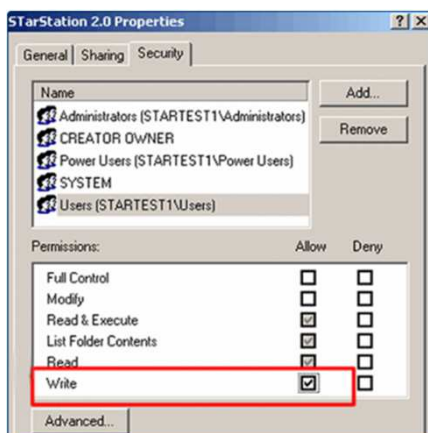


- Configure settings and perform maintenance tasks  
**Microsoft Internet Explorer (IE)**  
> **Tools menu > Internet Options...**
- Occasionally delete the **Temporary Internet files**
- Confirm which web browser is the default browser  
Select **Start > Run**, enter a website address and click **OK**

## Share Network Resources

To share a single file, multiple folders filled with files and folders, or an entire drive:

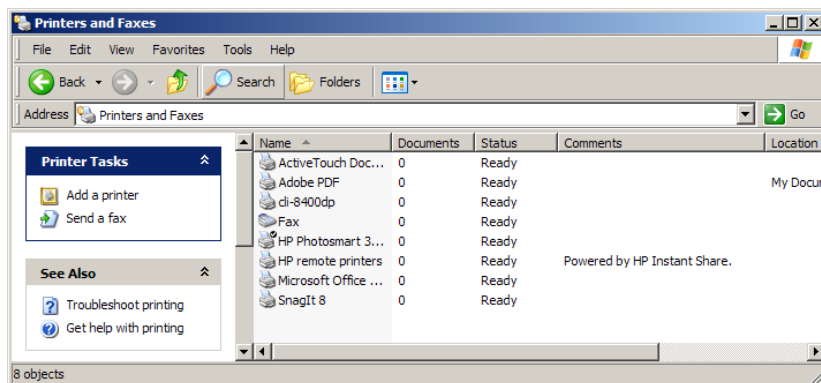
- Copy the item to share to a folder
- Right-click the folder and select **Sharing and Security**
- Select **Share this folder**
- Identify who can access the folder and which permissions they have



## Share Network Resources

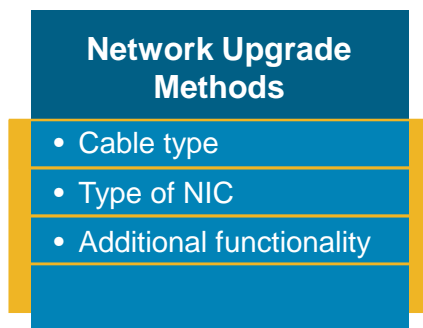
To share a printer:

1. Select **Start > Control Panel > Printers and Faxes**



## Network Upgrades

- You must be able to upgrade, install, and configure components when a customer asks for increased speed or new functionality to be added to a network.



## Install and Configure Wireless Adapter

- Before purchasing a wireless adapter, make sure it is compatible with other wireless equipment that is already installed on the network.
- To install a PCI wireless adapter:
  - The adapter must be the correct form factor to fit the computer
  - Remove the case cover
  - Install the NIC into an open PCI slot or PCI express slot
  - Configure device drivers
  - Enter network address information



## Install and Configure Wireless Router

1. Position wireless router for maximum coverage.
2. Connect the wireless router to the existing network. Connect a DSL or cable modem to the wireless router. Connect one computer to any of the remaining ports to access the configuration web pages.
3. Turn on the broadband modem and plug in the power cord to the router. When the modem finishes establishing connection to the ISP, the router automatically communicates with the modem to receive network information from the ISP: IP address, subnet mask, and DNS server addresses.

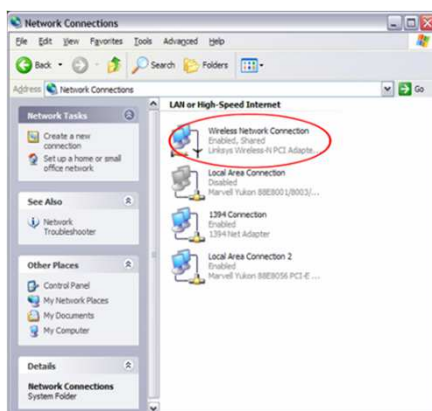
## Install and Configure Wireless Router

The following steps are specific to the Linksys WRT300N router:

4. Turn on the computer that is connected to the router and open a web browser. In the Address field, enter **192.168.1.1** to go to the default address for router configuration and management.
5. A security window opens prompting you for authentication to access the router configuration screens. The user name field should be left empty. Enter **admin** as the default password.
6. Click **Save Settings** at the bottom of each screen after making any changes.

## Test Network Connection

- Open a web browser and see if the Internet is available.



- To troubleshoot a wireless connection, you can use the Windows GUI or CLI.

Select **Start > Control Panel > Network Connections**.

Double-click on the wireless network connection to display the status.

## Connection Status

The **Connection Status** screen displays the number of packets that have been sent and received.

connection status

duration of connection

# of packets sent

# of packets received

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## Support Tab of Connection Status

Static or dynamic

View MAC address and other information

Reset the connection information and establish new

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## Ipconfig Commands

- Used to verify basic IP address information

ipconfig Commands	Purpose
ipconfig /all	Displays full configuration of all network adapters
ipconfig /release	Releases the IP address of a network adapter
ipconfig /renew	Renews the IP address of a network adapter
ipconfig /flushdns	Empties the cache that stores DNS information
ipconfig /registerdns	Refreshes DHCP leases and re-registers the adapter with DNS
ipconfig /displaydns	Shows DNS information in the cache

## Ping Command

- To confirm that your adapter is working properly, ping your NIC.  
Select **Start > Run > cmd**.  
At the command prompt, enter **ping localhost**.
- To confirm that your WAN connection is working properly, ping your default gateway.  
Find the address for the default gateway by using the ipconfig command.
- To test the Internet connection and DNS, ping a popular website.
- The response shows replies from the ping or that the request timed out because there is a problem.

## Tracert Command

- Traces the route that packets take from your computer to a destination address.  
Select **Start > Run > cmd**.  
At the command prompt, enter **tracert**.
- The first listing in the window for the tracert result is your default gateway.
- Each listing after that is the router that packets are traveling through to reach the destination.
- Tracert will show you where packets are stopping, indicating where the problem is occurring.

## Email Protocol Comparison

A technician should know the advantages and disadvantages of each email protocol.

Protocol	Advantages	Disadvantages	Port	Send Mail	Retrieve Mail
<b>SMTP</b>	Delivers email from one server to another Can send mail directly to the destination	Client upload only	25	Yes	No
<b>POP</b>	Simple Supports intermittent connections	Download only Cannot manage the mail on the server	110	No	Yes
<b>IMAP</b>	Simple More features than POP Stores mail on server Faster than POP Allows simultaneous access by multiple clients	Requires more disk space and CPU resources	143	No	Yes

## Email Server Setup

- Active directory servers, global catalog servers, and domain name servers (DNS) servers must all be in place and functioning before Exchange can be installed and work properly.
- Test the environment before installing Exchange.
- Set up the services required and install Exchange on a dedicated set of servers away from the main network.
- Keep the installation of Exchange separated from your production network until you are sure that it is functioning properly.

## Prepare for Email Installation

Be prepared with proper equipment and information:

- DNS deployment
- Active Directory domain
- At least one Global Catalog
- Windows 2000 or higher native domain functionality
- Exchange server software
- Windows server support tools
- Schema master server
- High-speed Internet connection

## Email Installation

- Add Internet Information Services (IIS) using the Add/Remove Windows Components wizard before initiating the installation of the Exchange server.
- Insert the Exchange installation CD and begin the New Exchange installation wizard.
- The wizard will verify that Exchange is ready to be installed.
- Once Exchange is installed, the Microsoft Management Console provides access to many settings. The Exchange System Manager is used to manage the options of the server.
- Use the Active Directory Users and Computer (ADUC) console to configure a user's mailbox.

## Preventive Maintenance

- Check the condition of cables, network devices, servers, and computers to make sure that they are kept clean and are in good working order.
- Develop a plan to perform scheduled maintenance and cleaning at regular intervals.
- If you notice equipment is failing, damaged, or making unusual sounds, then inform the network administrator to prevent unnecessary network downtime.
- Educate network users by demonstrating to them how to properly connect, disconnect, and move cables.

