

Objectives

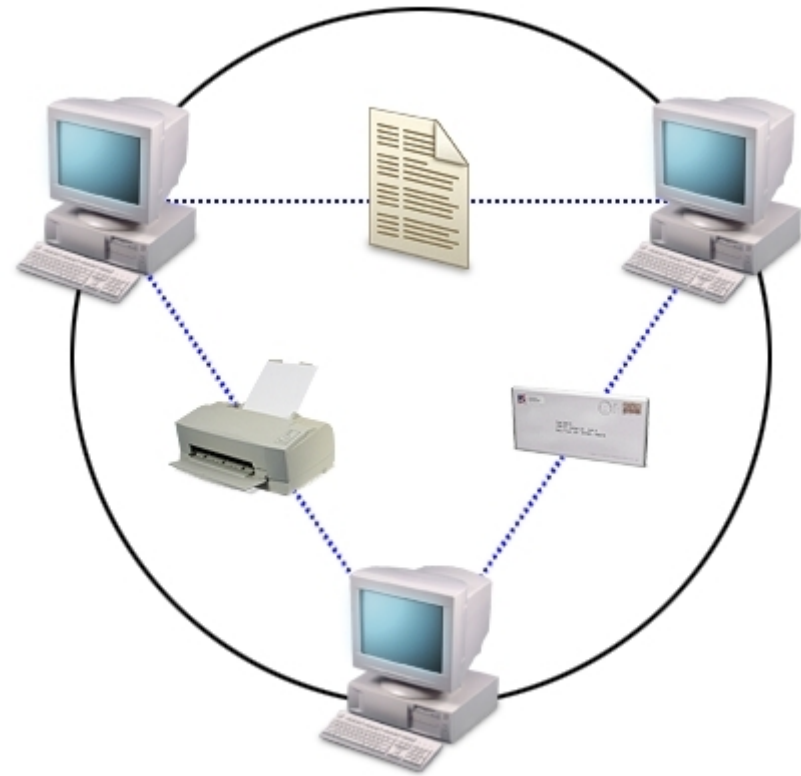
- ◆ In this session, you will learn to:
 - ◆ Identify fundamental concepts of computer networks.
 - ◆ Identify network communications technologies.
 - ◆ Identify network connectivity technologies.
 - ◆ Identify Internet technologies.

Network concepts

- ◆ For learning networking concepts, you need to understand the following:
 - ◆ Networks
 - ◆ Network models
 - ◆ Network interface card characteristics
 - ◆ Twisted pair cables
 - ◆ RJ-45 twisted pair connectors
 - ◆ Coaxial cables
 - ◆ Coaxial cable and connector types
 - ◆ Fiber optic cables
 - ◆ Fiber optic connectors
 - ◆ Other network connection types

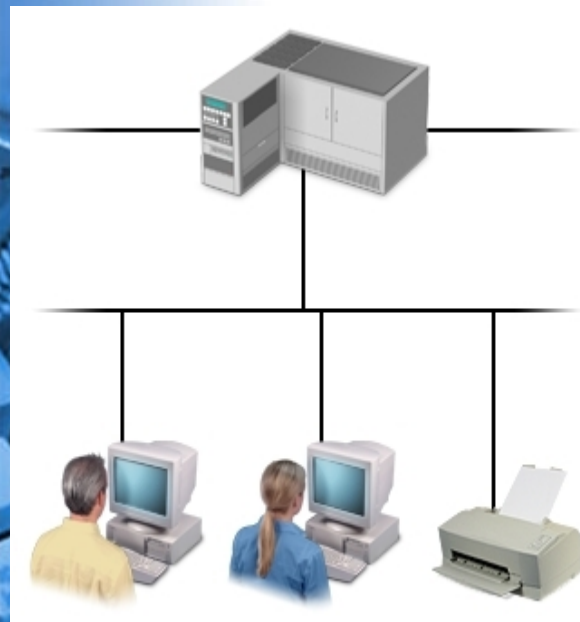
Networks

- ◆ A network:
 - ◆ Group of computers
 - ◆ Share resources
- ◆ A network includes:
 - ◆ Network media
 - ◆ Network adapter
 - ◆ Network operating system
 - ◆ Network protocol

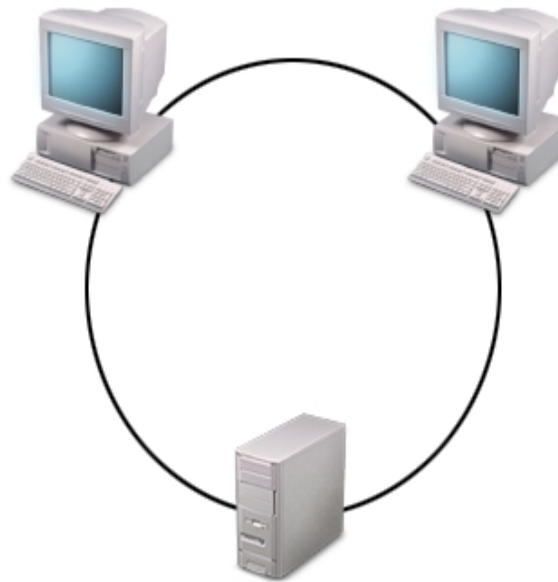


Network Models

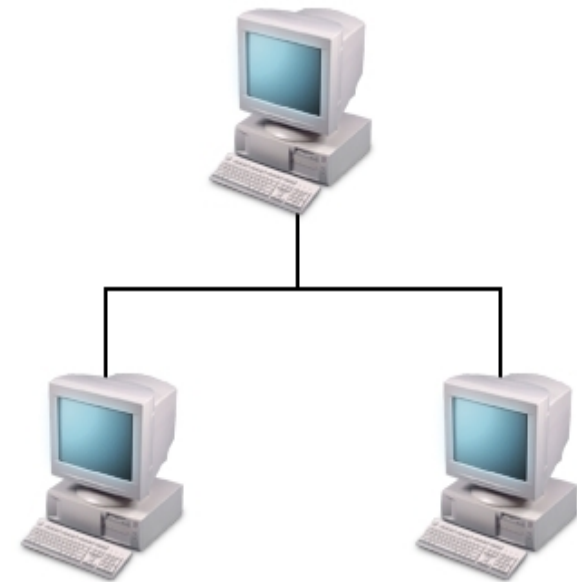
- ◆ Network models:
 - ◆ Centralized
 - ◆ Client-server
 - ◆ Peer-to-peer



Centralized



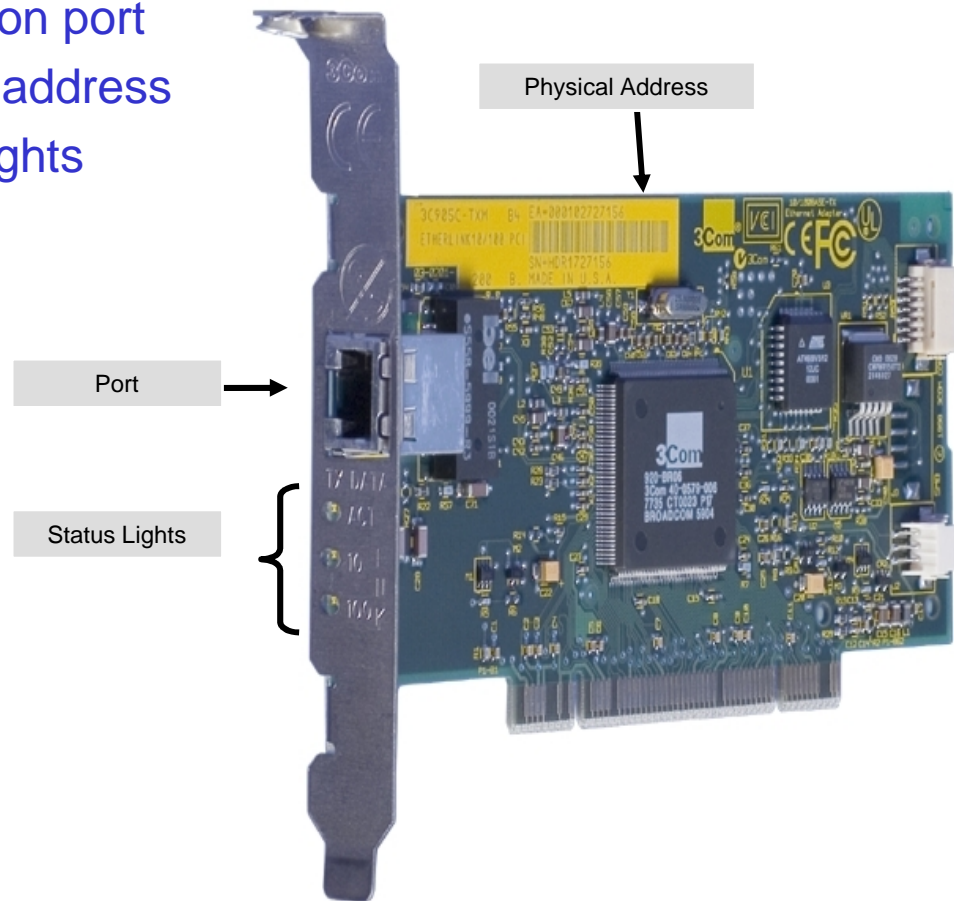
Client-server



Peer-to-peer

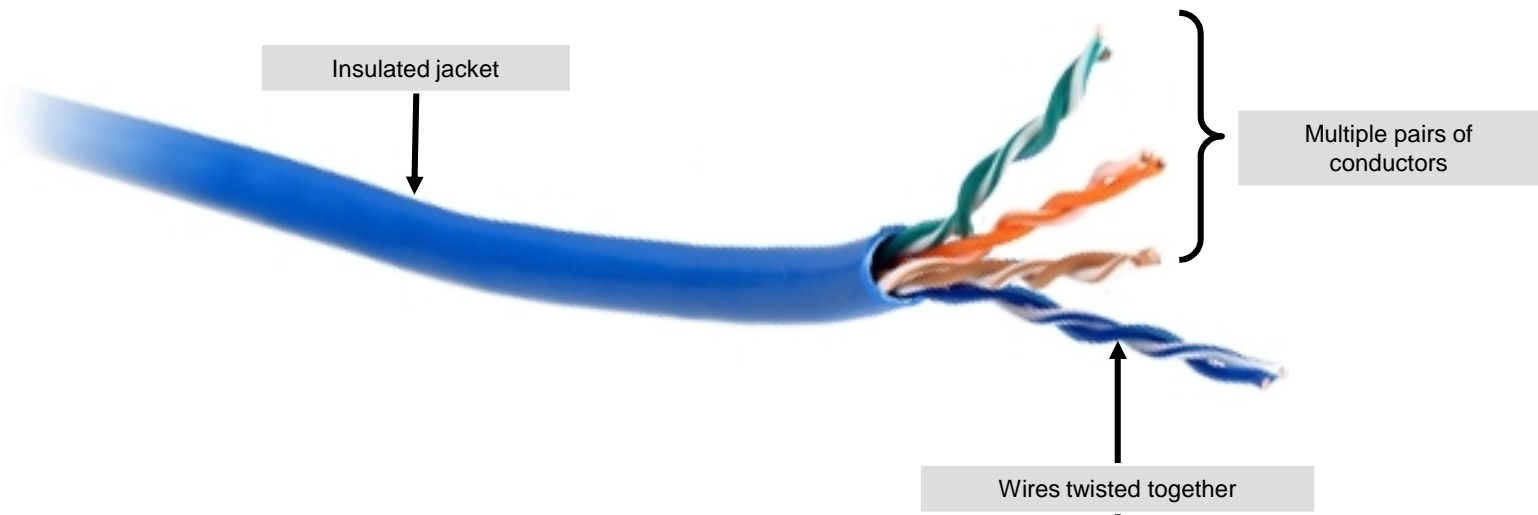
Network Interface Card Characteristics

- ◆ Network interface card characteristics:
 - ◆ Network connection port
 - ◆ Physical network address
 - ◆ Status indicator lights



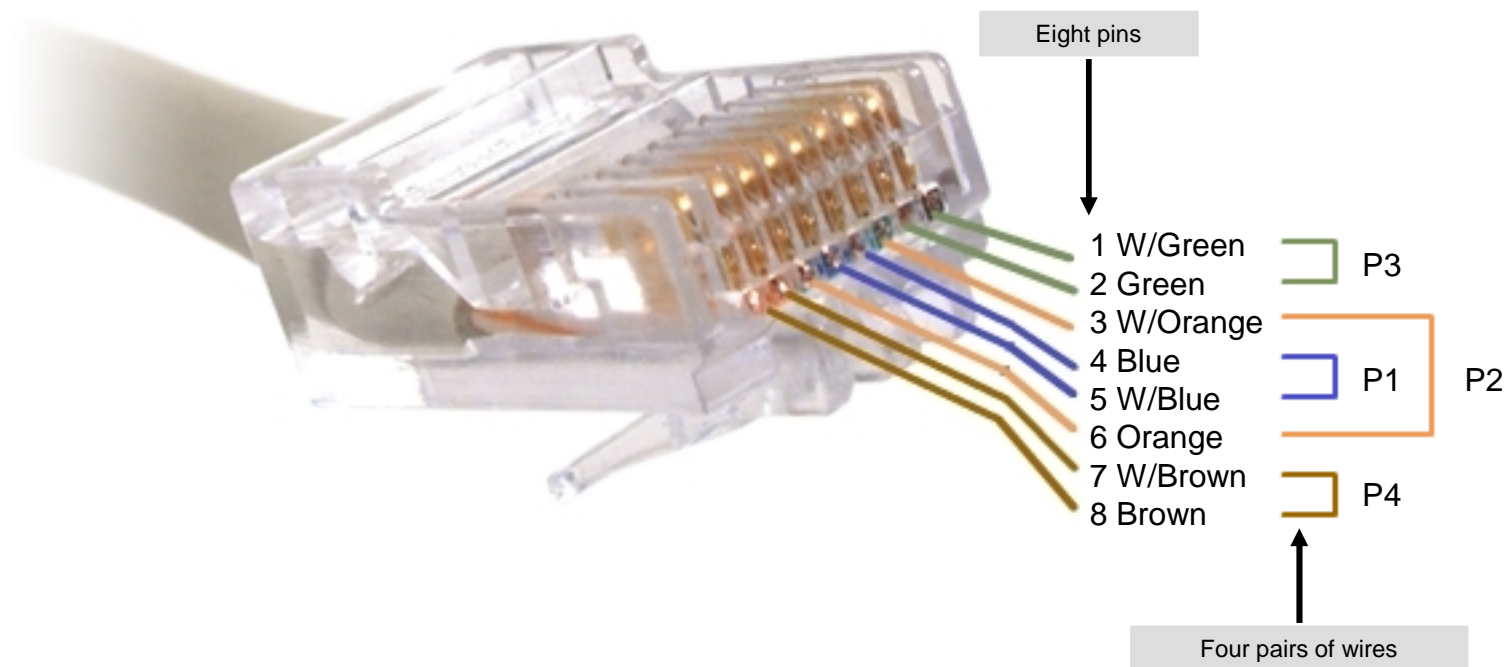
Twisted Pair Cables

- ◆ The **twisted pair** is a type of cable in which multiple insulated conductors are twisted around each other in pairs and clad in a protective and insulating outer jacket.
- ◆ Types:
 - ◆ Unshielded Twisted Pair (UTP)
 - ◆ Shielded Twisted Pair (STP)



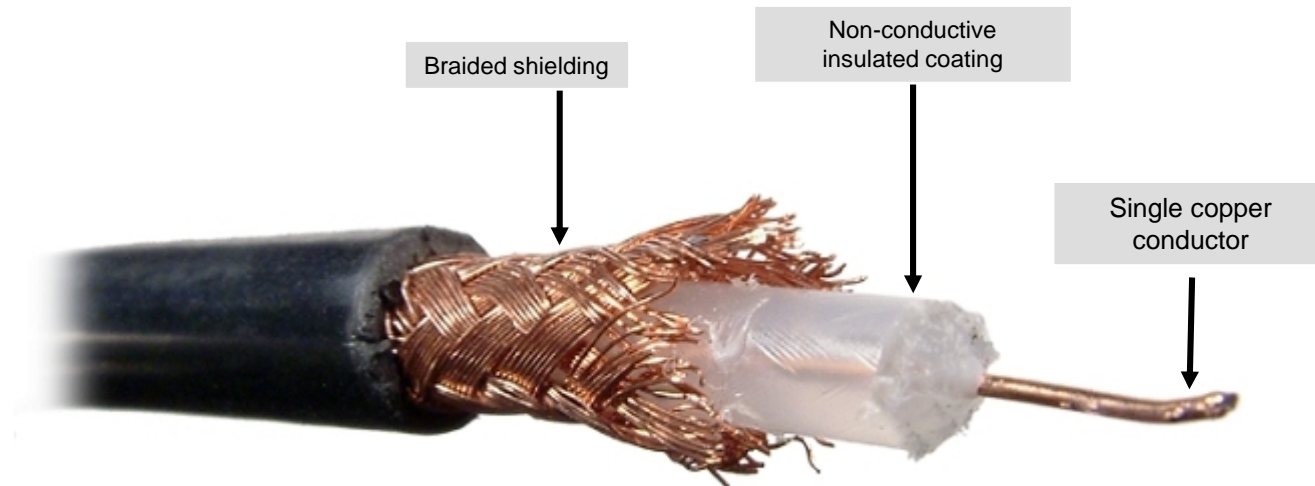
RJ-45 Twisted Pair Connectors

- ◆ The RJ-45 connector is used on twisted pair cable.



Coaxial Cables

- ◆ The **coaxial cables**, or coax, is a type of copper cable that features a central conductor surrounded by braided or foil shielding.



Coaxial Cable and Connector Types

- ◆ Coaxial cable type:
 - ◆ 5 mm/0.25 inch (“Thinnet”)
 - ◆ 10 mm/0.5 inch (“Thicknet”)
- ◆ Connector types:
 - ◆ BNC connector
 - ◆ T-connector



BNC connector on thin
net cable



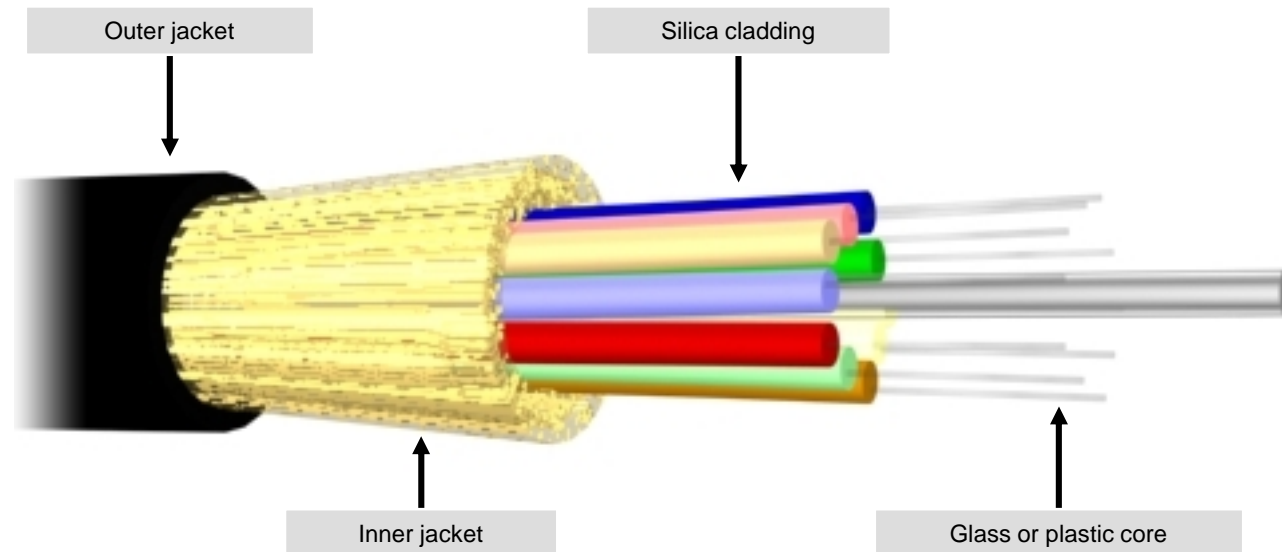
T-connector



50-ohm resistor on T-
connector

Fiber Optic Cables

- ◆ The ***fiber optic cable*** is a type of network cable in which the core is one or more glass or plastic strands.
- ◆ Fiber optic cable mode types:
 - ◆ Single-mode fiber
 - ◆ Step index multimode fiber
 - ◆ Graded index multimode fiber



Fiber Optic Connectors

◆ Fiber Optic Connectors are:



ST



SC



FC



FDDI



Mini-BNC



Biconic



LC



SMA



MT-RJ

Other Network Connection Types

◆ Other network connection types:

- ◆ USB
- ◆ Firewire
- ◆ RS-232
- ◆ Wireless

USB



Firewire



RS-232



Wireless



Activity 10-2

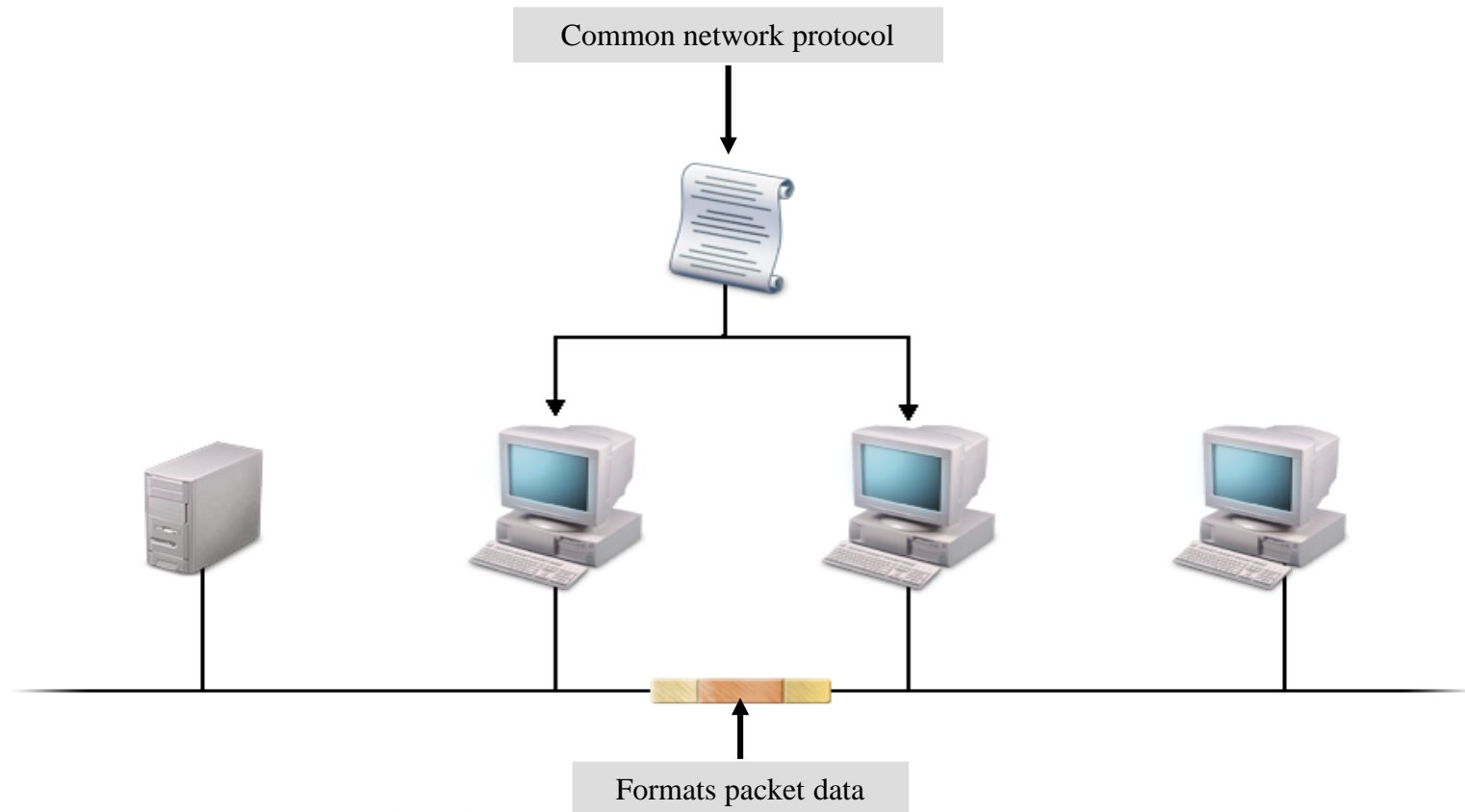
Activity on Identifying the Local MAC Address

Network Communications

- ◆ For learning network communication, you need to understand following:
 - ◆ Network protocols
 - ◆ Network addresses
 - ◆ The TCP/IP protocol
 - ◆ IP addresses
 - ◆ Subnet masks
 - ◆ IP address classes
 - ◆ The IPX/SPX and NWLink protocols
 - ◆ NetBIOS
 - ◆ NetBEUI
 - ◆ Network bandwidth
 - ◆ Full and half duplex communications

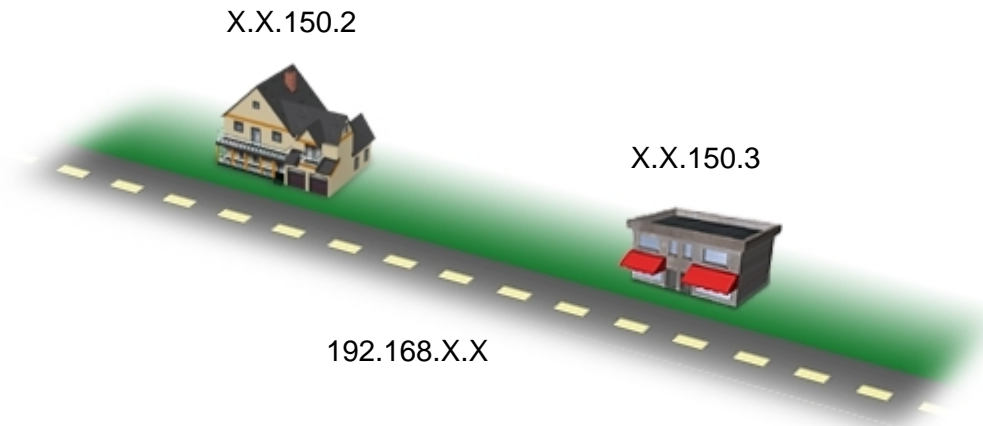
Network Protocols

- ◆ A **network protocol** is software that provides the rules to conduct network operations.



Network Addresses

- ◆ A **network address** is a numeric identification code assigned to a network computer according to network protocol.
- ◆ Network addresses consist:
 - ◆ Network portion
 - ◆ Node portion



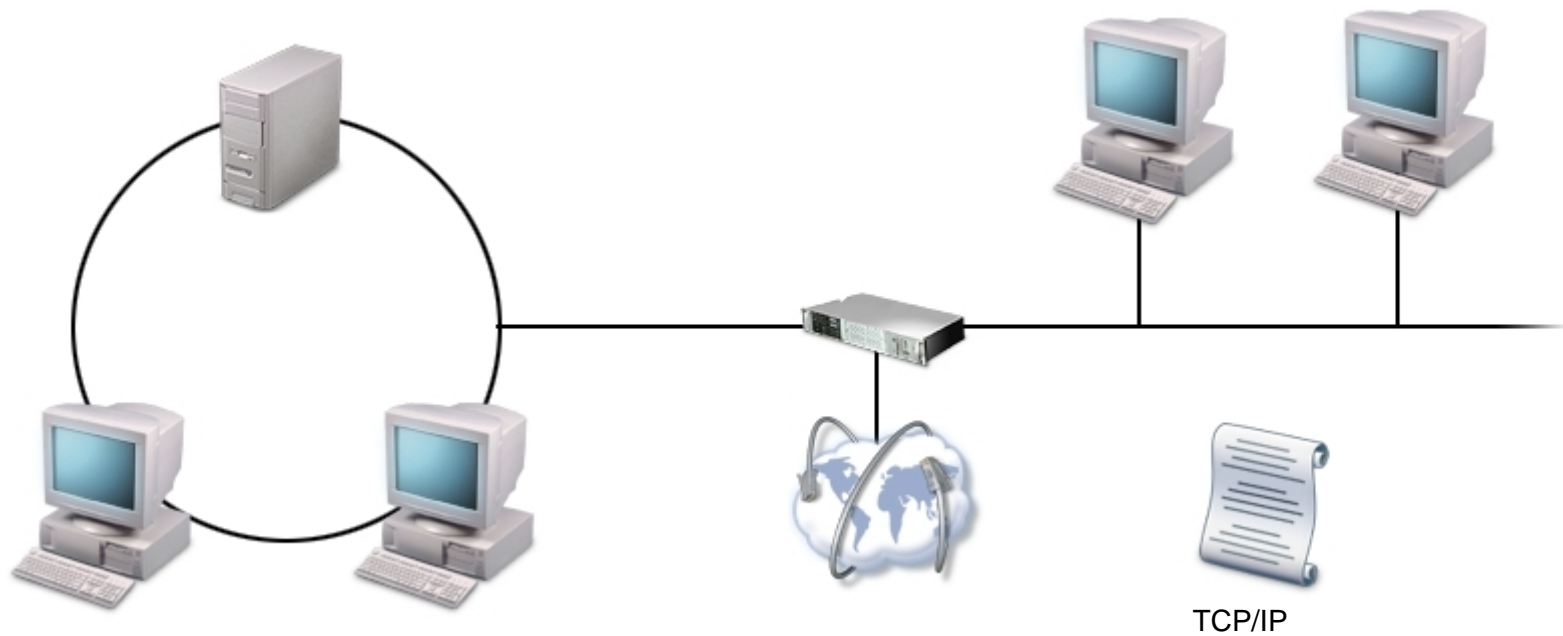
Network portion of address = Street name

Node portion of address = House number

Complete address = Street name and house number

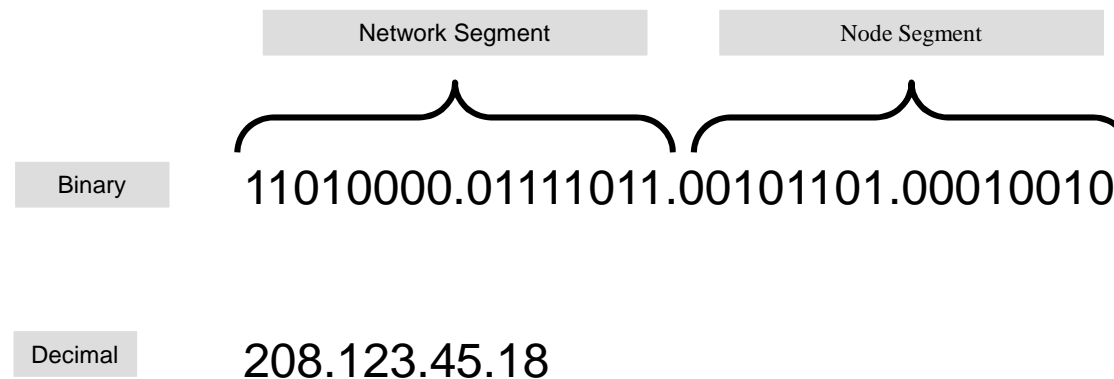
The TCP/IP Protocol

- ◆ Transmission Control Protocol/Internet Protocol (TCP/IP):
 - ◆ A nonproprietary, routable network protocol
 - ◆ Helps computers to communicate over all types of networks



IP Addresses

- ◆ An **IP address** is a 32-bit binary number assigned to a computer on a TCP/IP network.
- ◆ An IP address consists:
 - ◆ Network segment
 - ◆ Node segment



Subnet Masks

- ◆ A **subnet mask** is a 32-bit number assigned to each system.
- ◆ Subnet mask divide the 32-bit binary IP address into: and node portions.
 - ◆ Network portion
 - ◆ Node portion

IP address	139.87.140.76	
Subnet mask	255.255.255.0	← Removes the node portion of the IP address
Network ID	139.87.140.0	

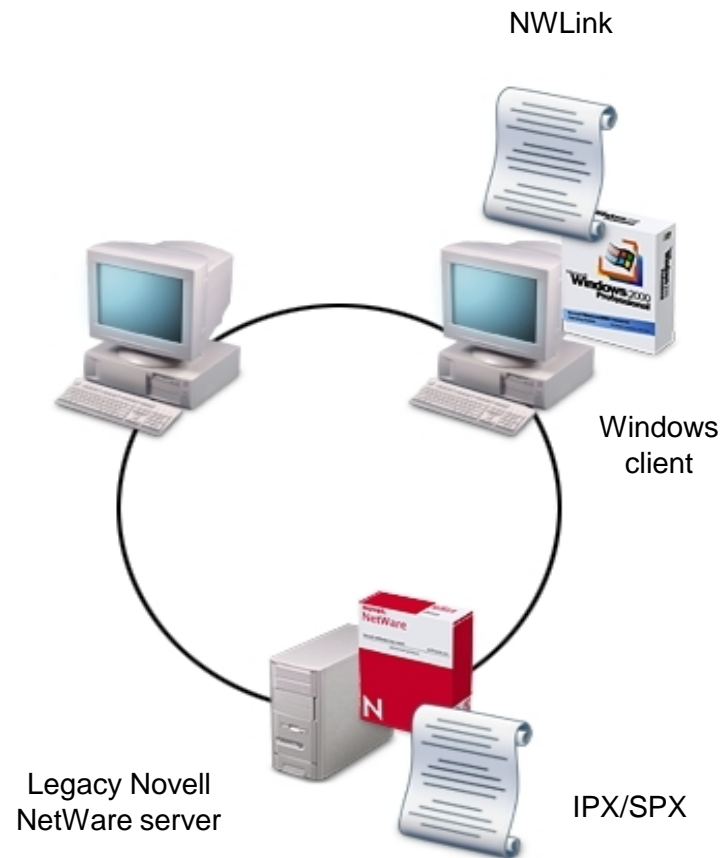
IP Address Classes

◆ The IP address classes:

Address Class	Range	Default Subnet Mask	Networks/Nodes
Class A	1.0.0.0 to 127.255.255.255	255.0.0.0	126 networks of up to 16,777,214 nodes each
Class B	128.0.0.0 to 191.255.255.255	255.255.0.0	16,382 networks of up to 65,534 nodes each
Class C	192.0.0.0 to 223.255.255.255	255.255.255.0	2,097,150 networks of up to 254 nodes each
Class D	224.0.0.0 to 239.255.255.255	None	All members of the multicast session share the same IP address
Class E	240.0.0.0 to 255.255.255.255	None	Strictly for research and experimentation purposes

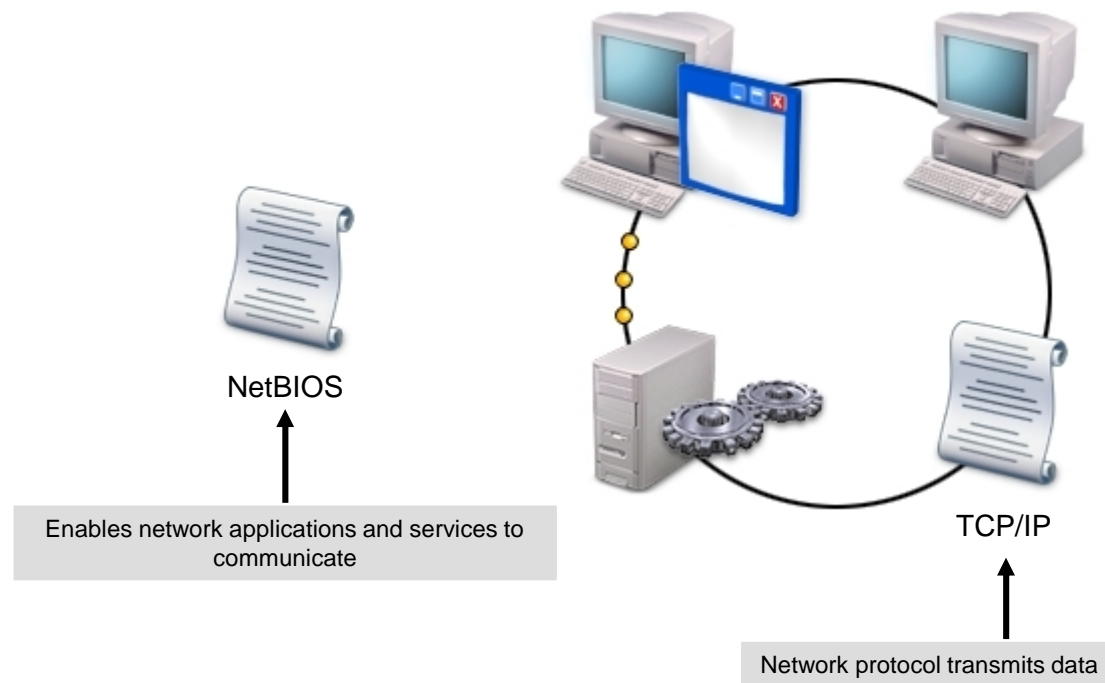
The IPX/SPX and NWLink Protocols

- ◆ Internetwork Packet Exchange/Sequenced Packet Exchange (IPX/SPX) is a proprietary, routable network protocol suite.



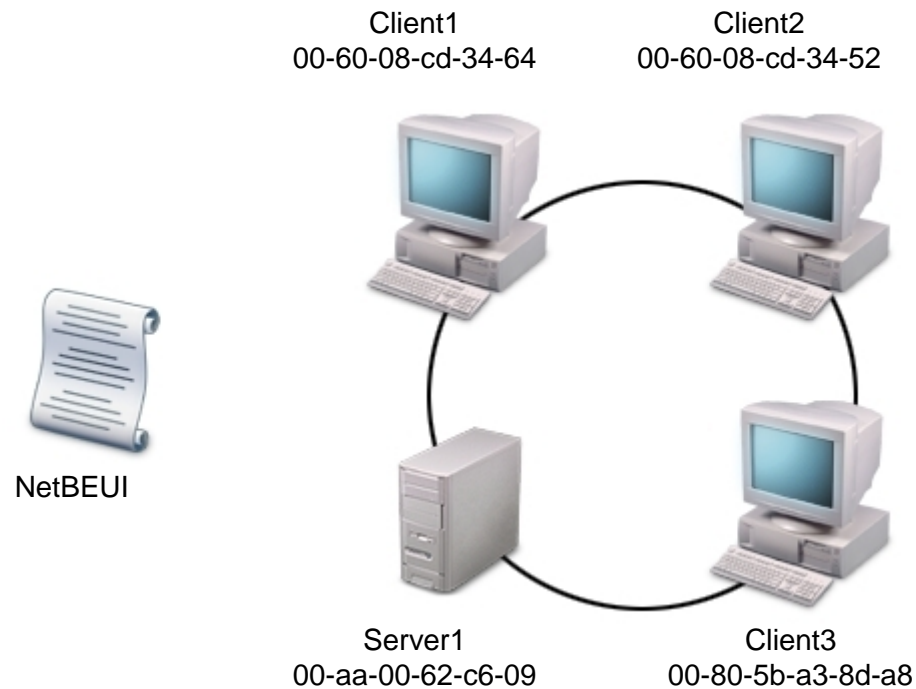
NetBIOS

- ◆ Network Basic Input/Output System (NetBIOS) a specification enables applications and services to use different network protocols for network communicate.



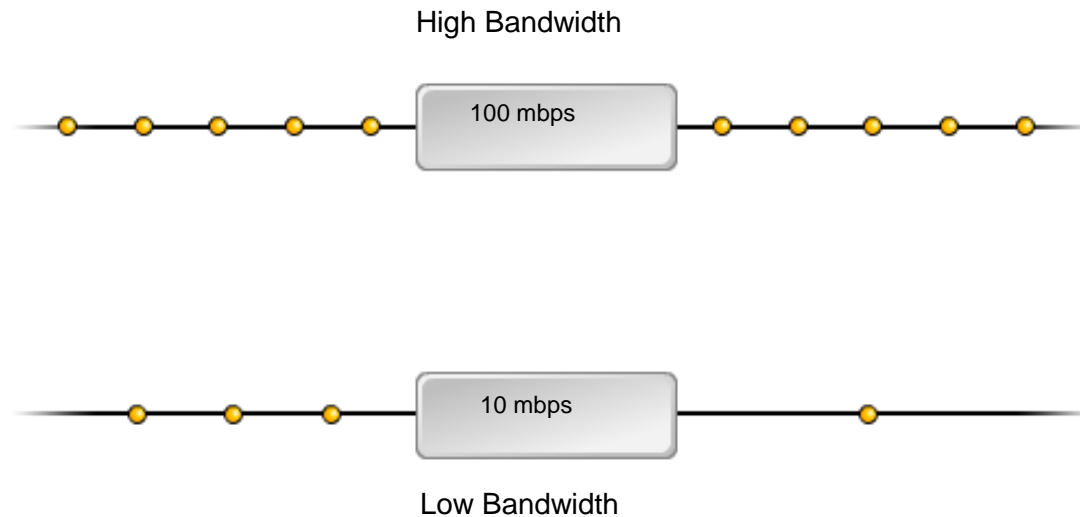
NetBEUI

- ◆ NetBIOS Extended User Interface (NetBEUI) is a legacy protocol found only in Windows Networks.



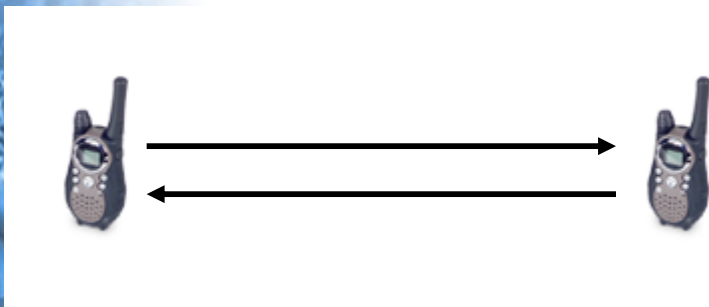
Network Bandwidth

- ◆ The **bandwidth** helps measure how much data a network can carry.

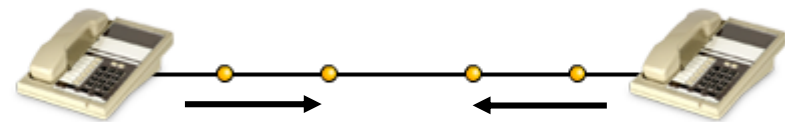


Full and Half Duplex Communications

- ◆ The **full duplex** mode communications permit simultaneous two-way communications.
- ◆ The **half duplex** mode communications permit two-way communications, but in only one direction at a time.



Half duplex
One direction at a time



Full duplex
Both directions simultaneously

Activity 10-4

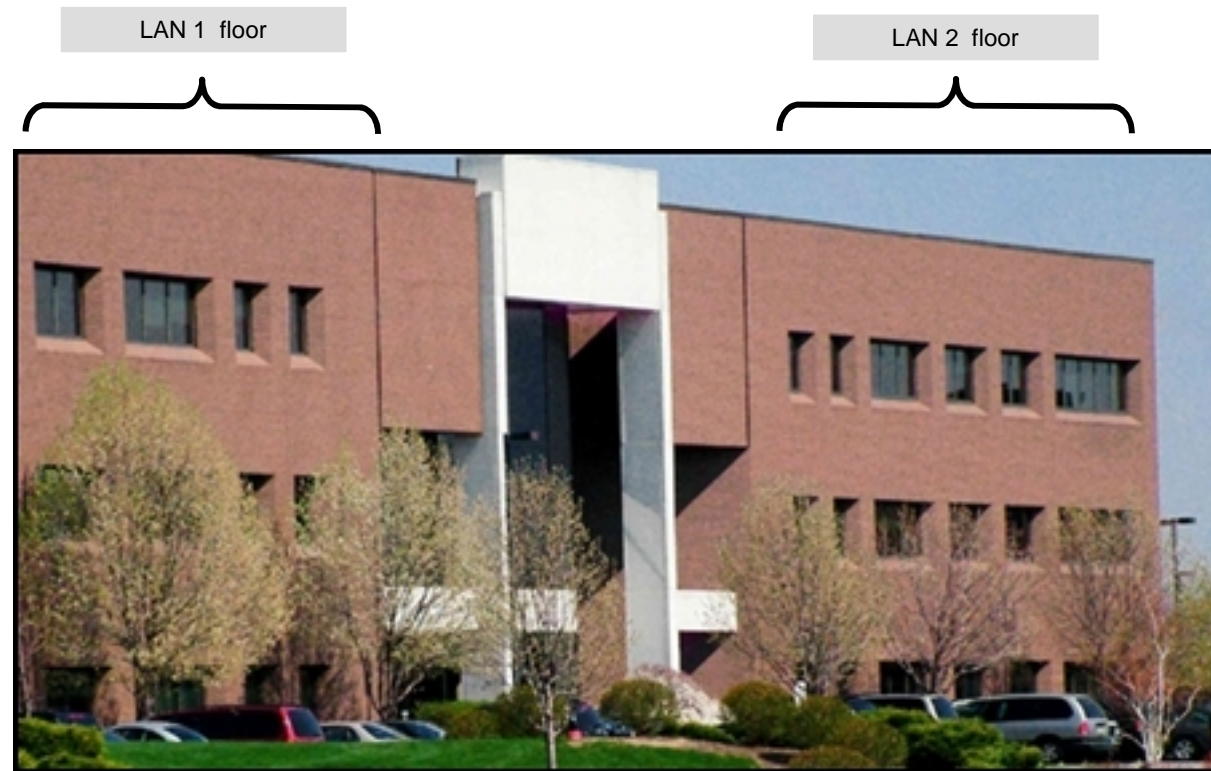
Activity on Identifying Local Network Characteristics

Network Connectivity

- ◆ For learning networking connectivity, you need to understand the following:
 - ◆ Local Area Networks (LANs)
 - ◆ Wide Area Networks (WANs)
 - ◆ Ethernet
 - ◆ Dial-up Connections
 - ◆ Wireless Connections
 - ◆ 802.11 Wireless Standards
 - ◆ Wireless Access Points (WAPs)
 - ◆ Bluetooth Communications
 - ◆ Infrared Connections
 - ◆ Cellular WAN Communications
 - ◆ Broadband Communications
 - ◆ Types of Broadband Communications

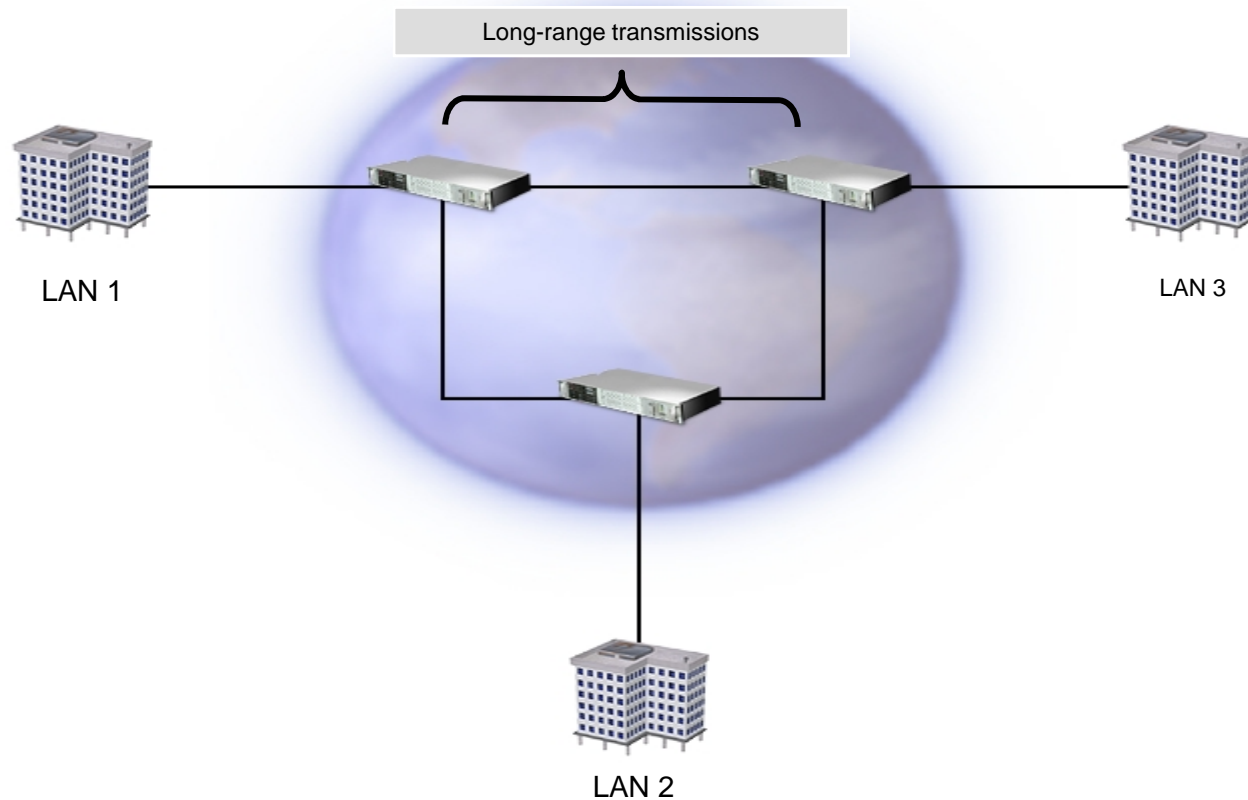
Local Area Networks (LANs)

- ◆ A **LAN** is a network that spans a small area, such as a single building, floor, or room.



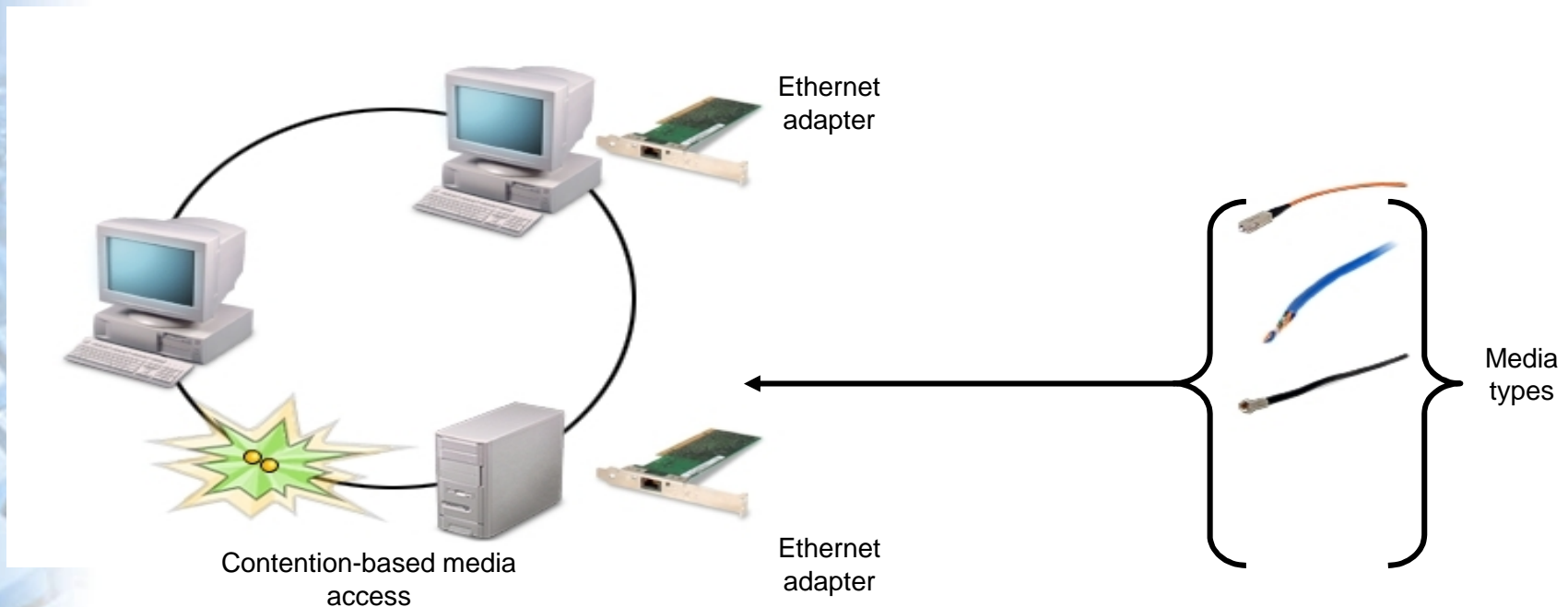
Wide Area Networks (WANs)

- ◆ A **WAN** is a network that spans multiple geographic locations.



Ethernet

- ◆ An ***Ethernet*** network is a popular LAN implementation.
- ◆ Ethernet network consists of:
 - ◆ Adapters
 - ◆ Contention-based media access
 - ◆ Twisted pair, coax, or fiber media



Dial-up Connections

- ◆ The ***dial-up connections*** are network connections that use telecommunications media.



Wireless Connections

- ◆ The **wireless connections** transmit signals without using physical network media.



Infrared



Satellite



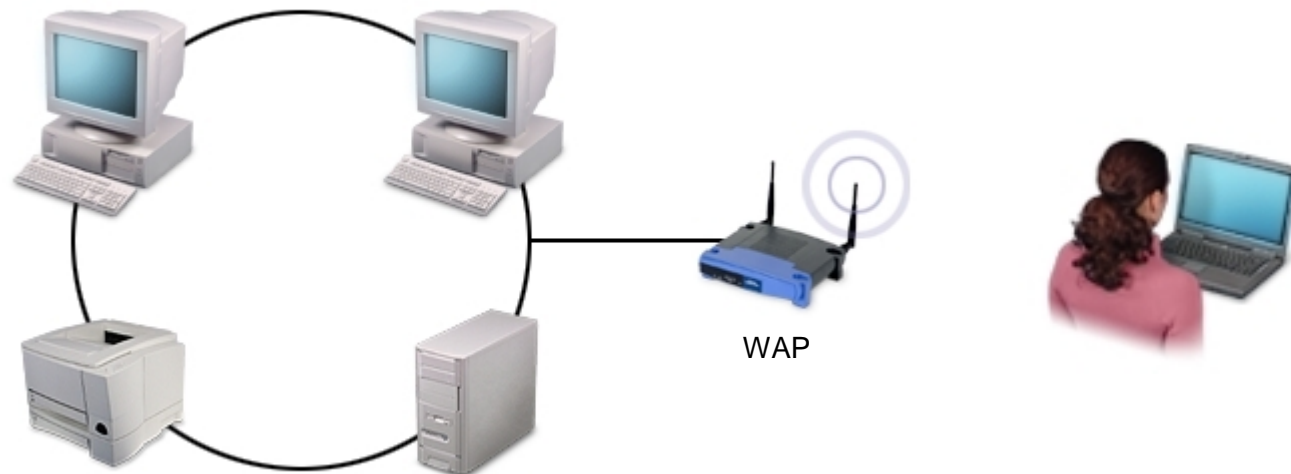
Radio

802.11 Wireless Standards

- ◆ The 802.11 standard is a family of specifications for wireless LAN technology.
- ◆ 802.11 – IEEE working group
- ◆ Important standards within the group:
 - ◆ 802.11
 - ◆ 802.11a
 - ◆ 802.11b (“Wi-Fi”)
 - ◆ 802.11e
 - ◆ 802.11g

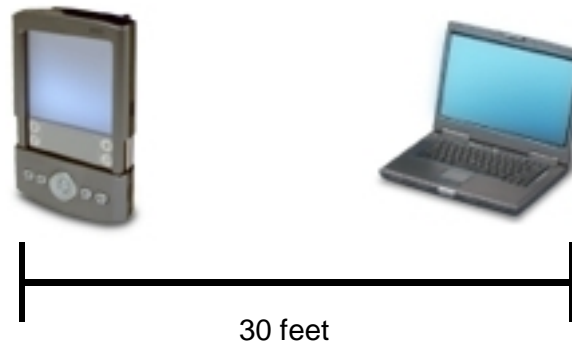
Wireless Access Points (WAPs)

- ◆ A **Wireless Access Point (WAP)** a device:
 - ◆ Provides connection between wireless devices
 - ◆ Enables wireless networks to connect to wired networks



Bluetooth Communications

- ◆ Bluetooth is a wireless radio protocol.



Infrared Connections

- ◆ Infrared is a form of wireless connection in which signals are sent via pulses of infrared light.



Infrared receiver



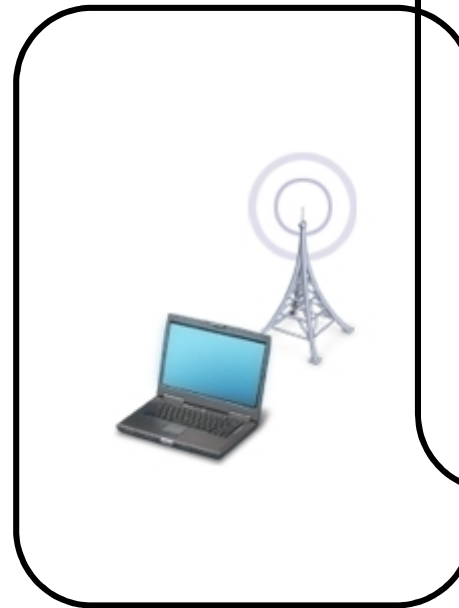
Infrared mouse

Cellular WAN Communications

- ◆ A cellular WAN technology uses cellular radio signals to transmit data over the cellular telephone system.



Cell



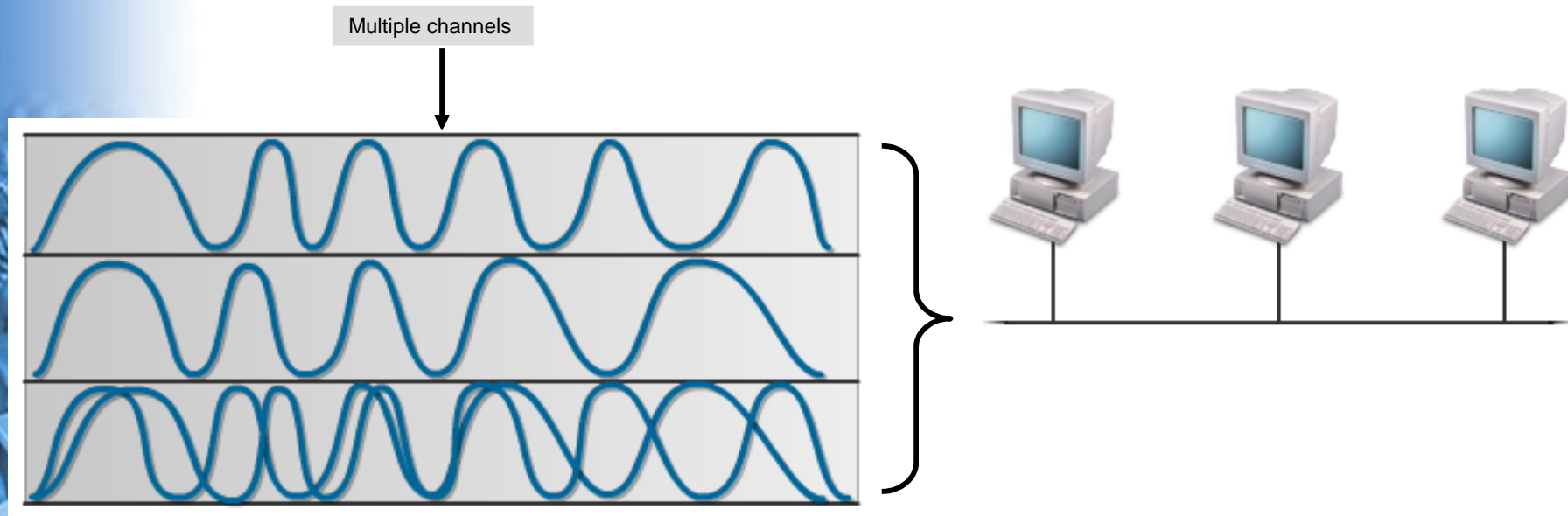
Cell



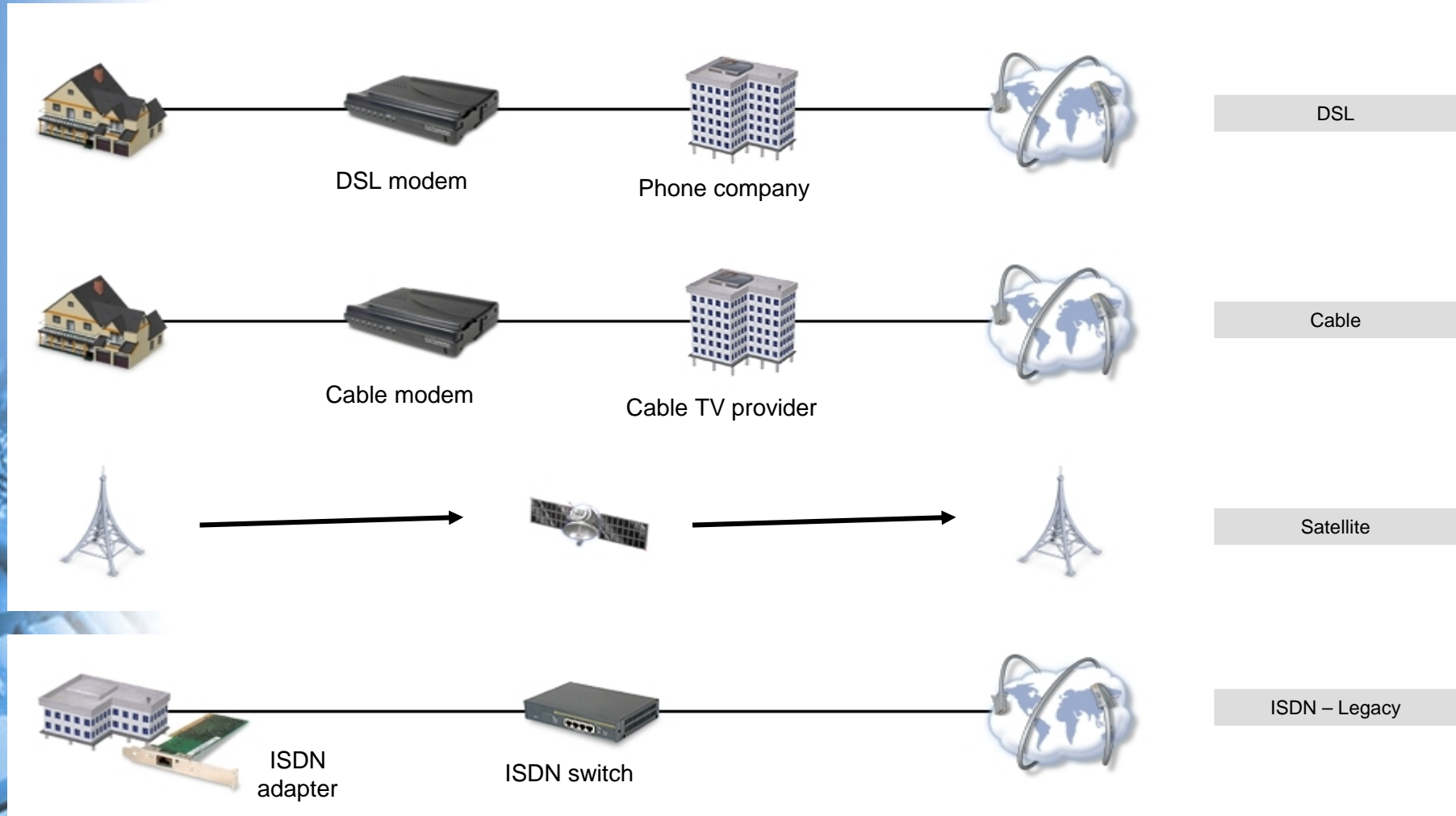
Cell

Broadband Communications

- ◆ Broadband is a category of network transmission technologies.



Types of Broadband Communications

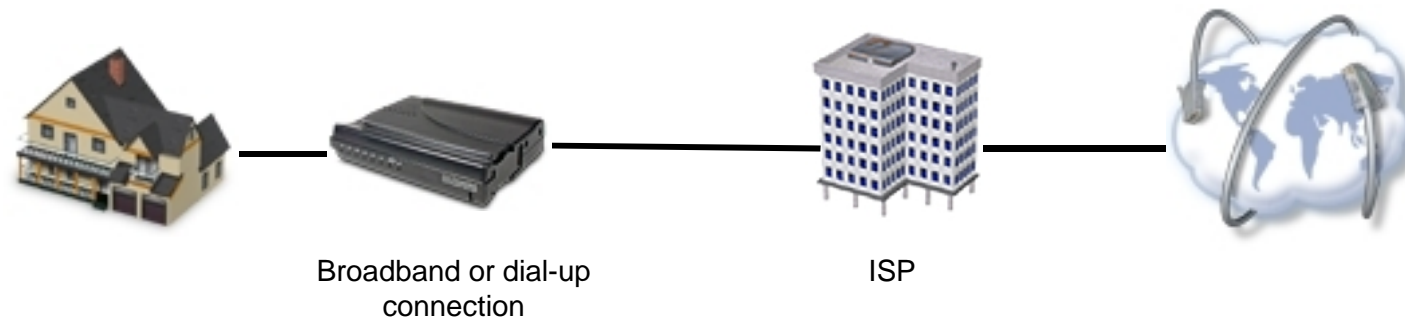


Internet Technologies

- ◆ For learning internet technologies, you need to understand the following:
 - ◆ Internet Service Providers (ISPs)
 - ◆ SMTP
 - ◆ POP3
 - ◆ IMAP4
 - ◆ HTML
 - ◆ HTTP
 - ◆ SSL
 - ◆ HTTPS
 - ◆ Telnet
 - ◆ FTP
 - ◆ Voice Over IP (VoIP)

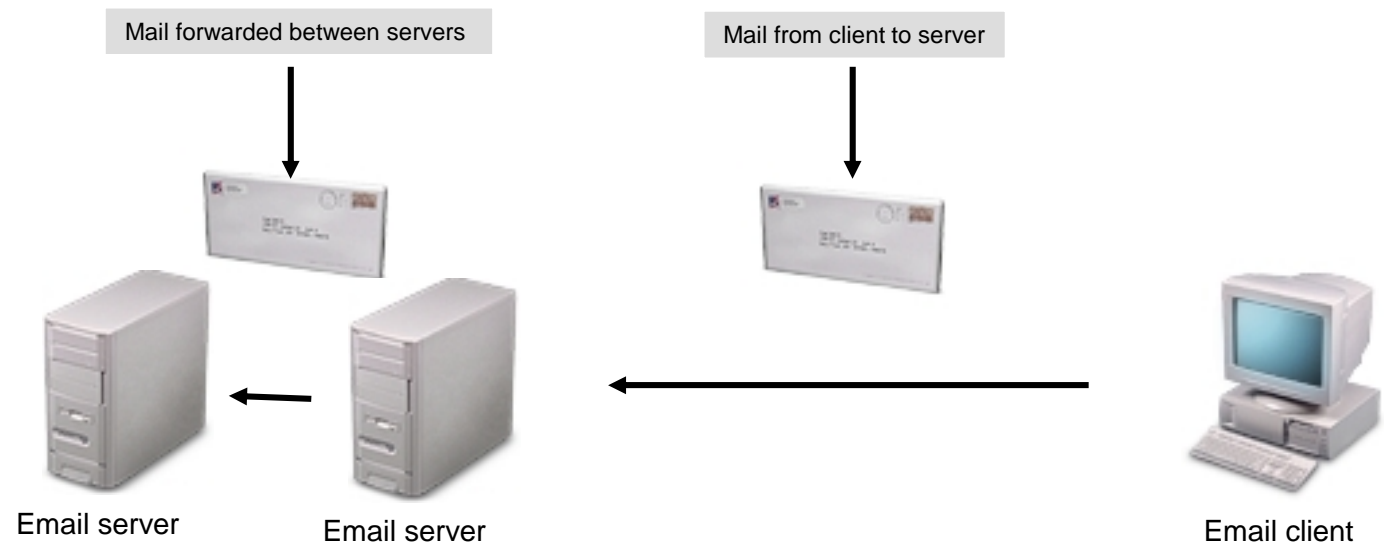
Internet Service Providers (ISPs)

- ◆ An **Internet Service Provider (ISP)** is a company that provides Internet access.



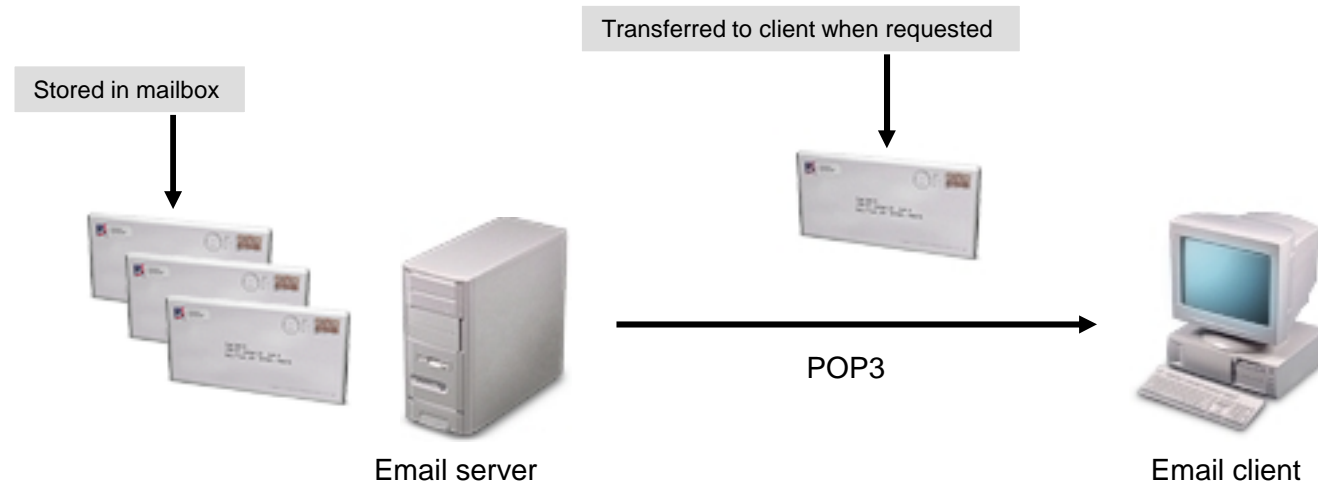
SMTP

- ◆ Simple Mail Transfer Protocol (SMTP) sends email
 - ◆ Client to server
 - ◆ Between server



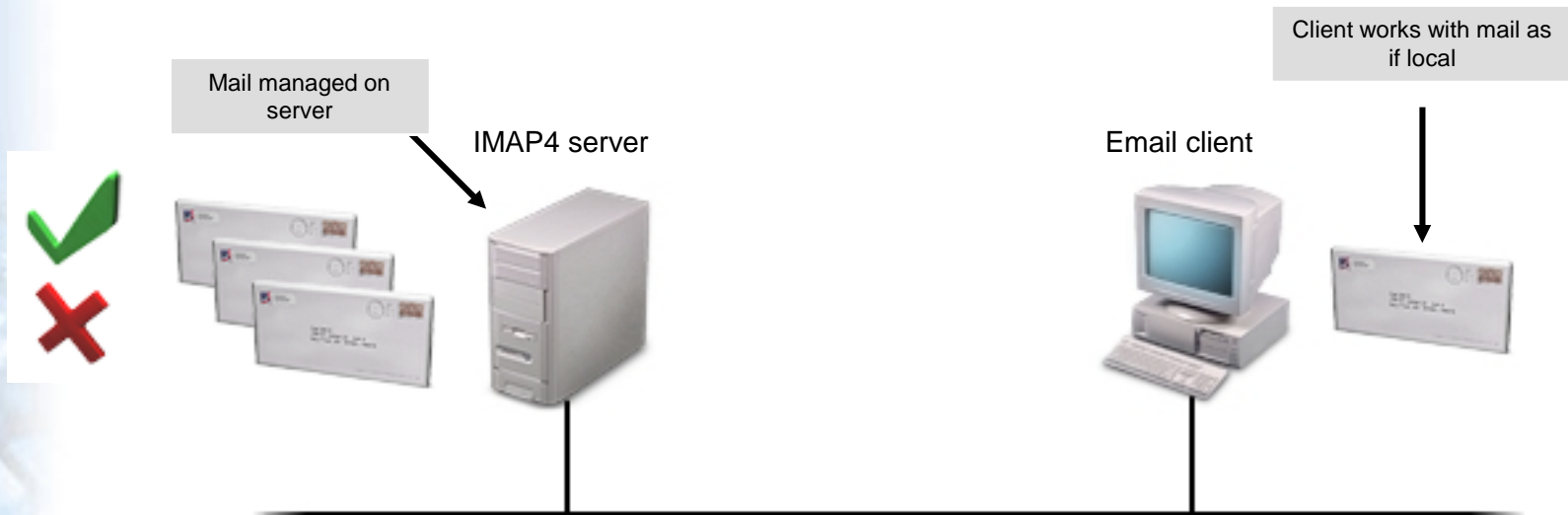
POP3

- ◆ Post Office Protocol version 3 (POP3):
 - ◆ Helps email client to retrieve email from mail server



IMAP4

- ◆ Internet Mail Access Protocol version 4 (IMAP4):
 - ◆ Helps web browser to retrieve messages from a mail server



HTML

- ◆ Hyper Text Markup Language (HTML) is the language to create web based documents.

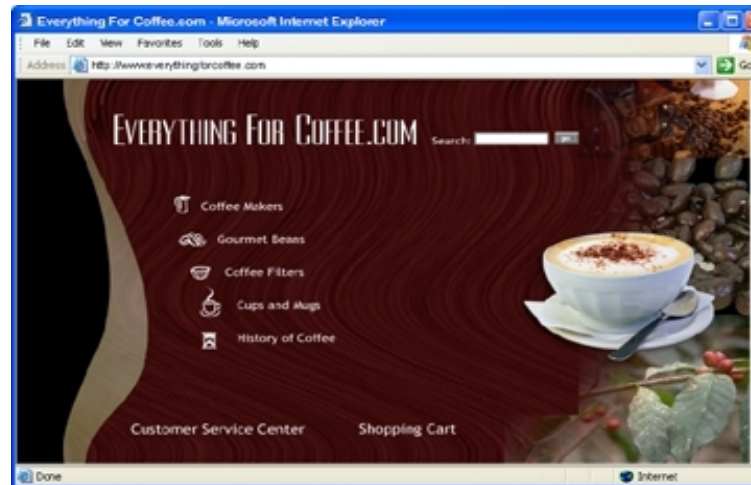
```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN">
<html>
  <head>
    <title>Simple HTML Page</title>
    <meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1">
  </head>
  <body>
    <p>
      This is the text of the web page.
    </p>
  </body>
</html>
```

Diagram illustrating the structure of an HTML document:

- Page structure:** A bracket on the left side of the code groups the opening tags from `<html>` to `</body>`.
- Page content:** An arrow points from the text "This is the text of the web page." to a label "Page content".

HTTP

- ◆ Hypertext Transfer Protocol (HTTP):
 - ◆ TCP/IP service
 - ◆ Helps clients to connect and interact with websites



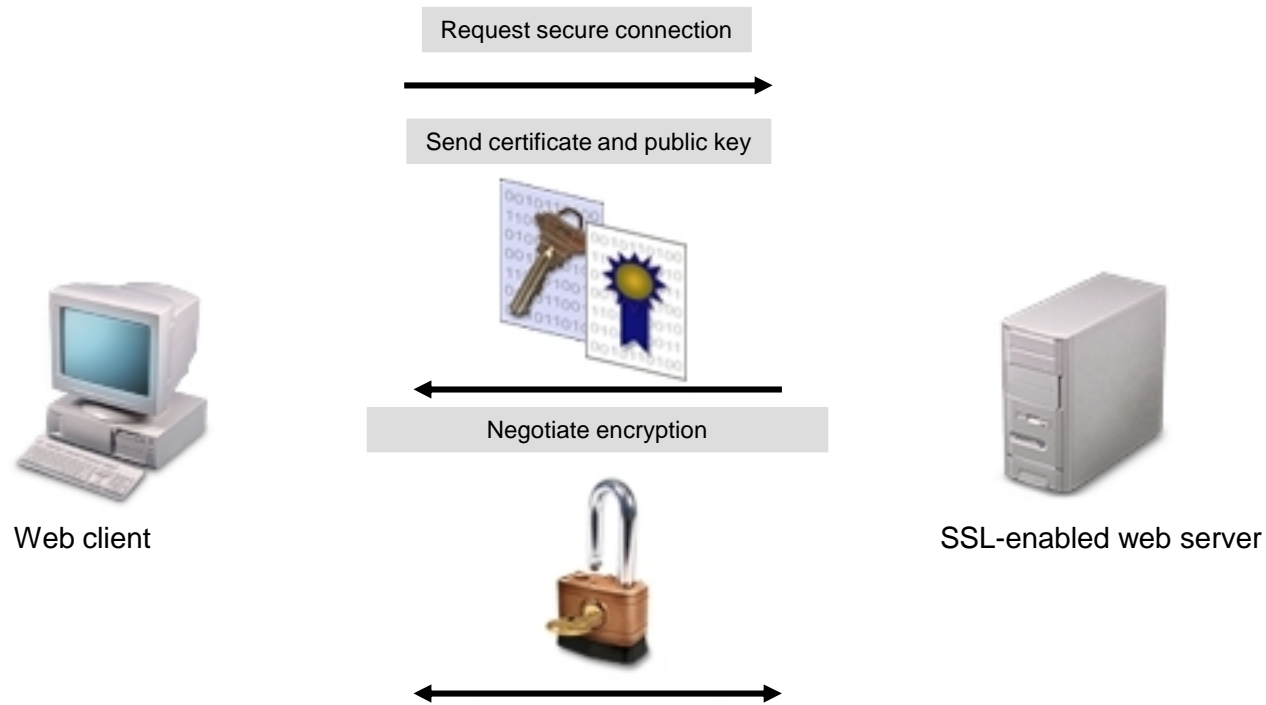
Web client

Web server



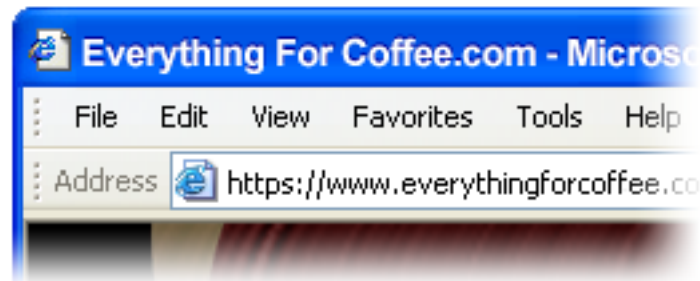
SSL

- ◆ Secure Sockets Layer (SSL):
 - ◆ A security protocol
 - ◆ Combines digital certificates with public-key data encryption for authentication



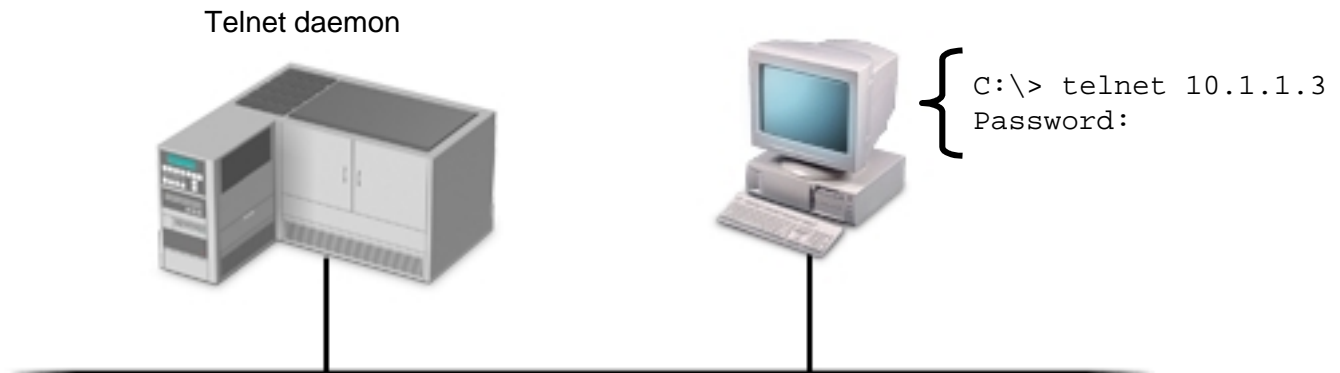
HTTPS

- ◆ Hypertext Transfer Protocol Secure (HTTPS) is a secure version of HTTP



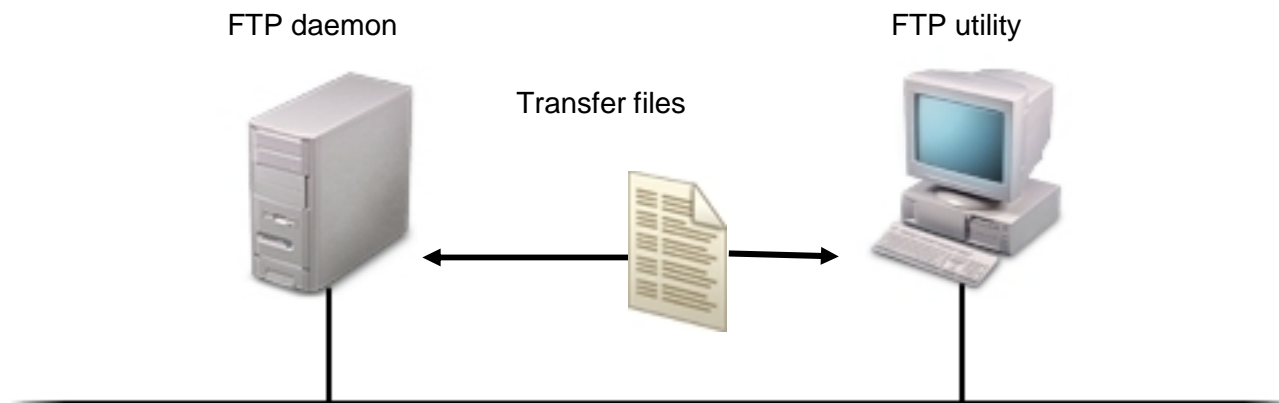
Telnet

- ◆ Telnet:
 - ◆ A terminal emulation protocol
 - ◆ Helps user to simulate a session on a remote host



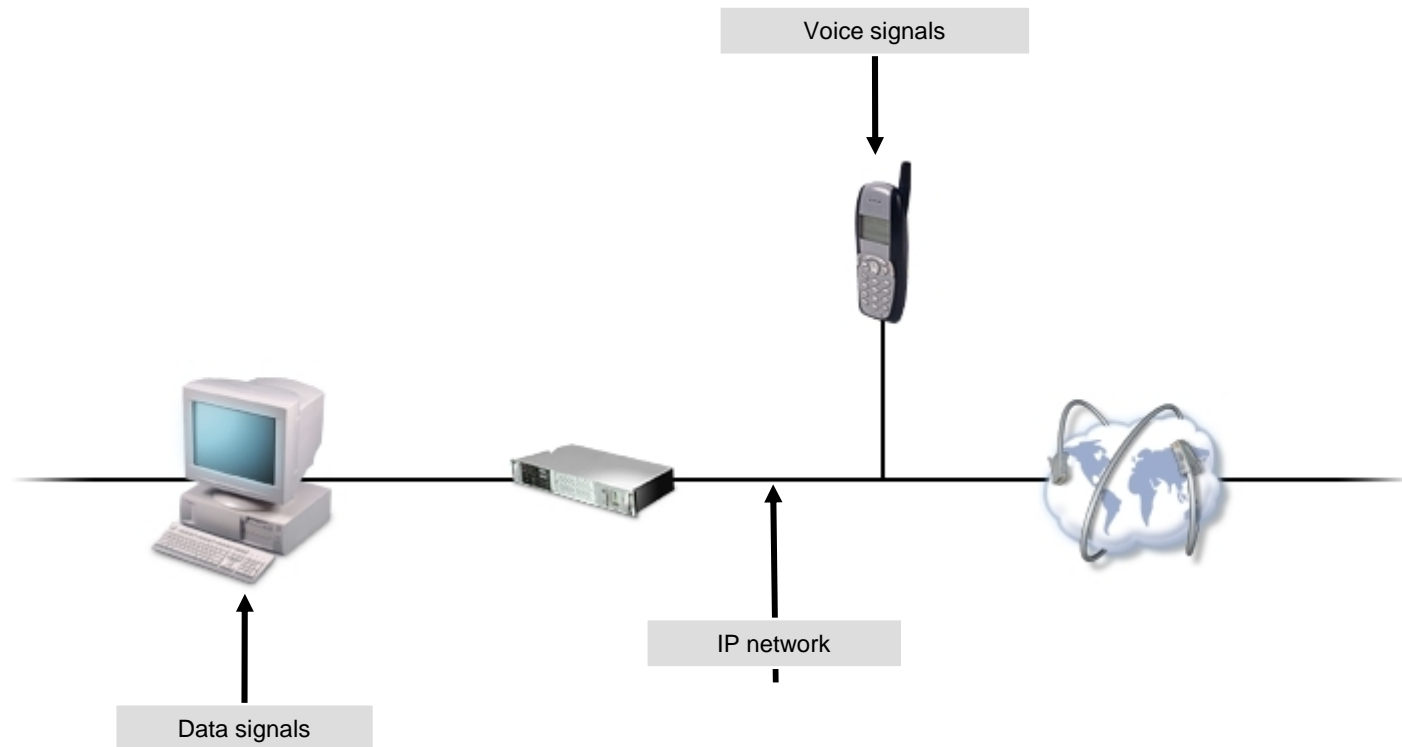
FTP

- ◆ File Transfer Protocol (FTP):
 - ◆ Helps upload or download files from an FTP file server



Voice Over IP (VoIP)

- ◆ Voice over IP (VoIP) is a transmission medium in which voice signals are transmitted over IP data networks.



Summary

- ◆ In this session, you learned that:
 - ◆ There are various network related concepts, such as network models and network connection types.
 - ◆ Network connections uses different kind of cables and connectors.
 - ◆ Network uses network protocols and address for setting up communication between computers.
 - ◆ Network connectivity processes uses LAN and WAN concepts.
 - ◆ ISPs provides internet technology related supports.