

Chapter Nine

# Communications and Networks

Discovering  
Computers 2011

Living in a Digital World



# Objectives Overview

Discuss the purpose of the components required for successful communications and identify various sending and receiving devices

Describe the uses of computer communications

List advantages of using a network, and differentiate among LANs, MANs, and WANs

Differentiate between client/server and peer-to-peer networks, and describe how a P2P network works

Differentiate among a star network, bus network, and ring network

Describe the various network communications standards

# Objectives Overview

---

Explain the purpose of communications software

Describe various types of lines for communications over the telephone network

Describe commonly used communications devices

Discuss different ways to set up a home network

Describe various physical and wireless transmission media

# Communications

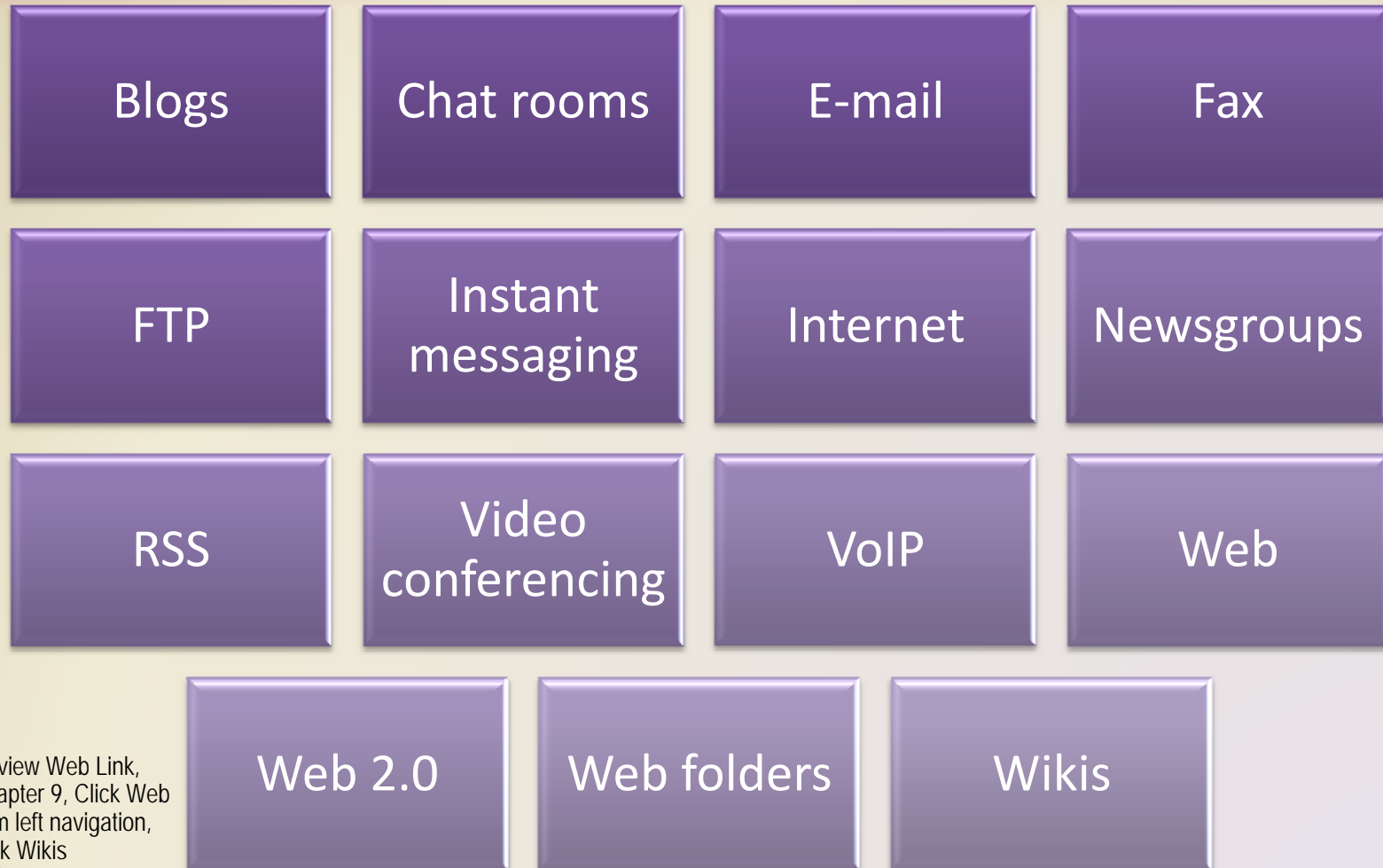
- Computer **communications** describes a process in which two or more computers or devices transfer data, instructions, and information



# Communications



# Uses of Computer Communications



Click to view Web Link,  
click Chapter 9, Click Web  
Link from left navigation,  
then click Wikis  
below Chapter 9

# Uses of Computer Communications

- Users can send and receive wireless messages using wireless messaging services



# Uses of Computer Communications

**Text messaging** allows users to send and receive short text messages on a phone or other mobile device or computer

**Picture messaging** allows users to send pictures and sound files

**Video messaging** allows users to send short video clips

Wireless instant messaging allows wireless users to exchange real-time messages with one or more other users

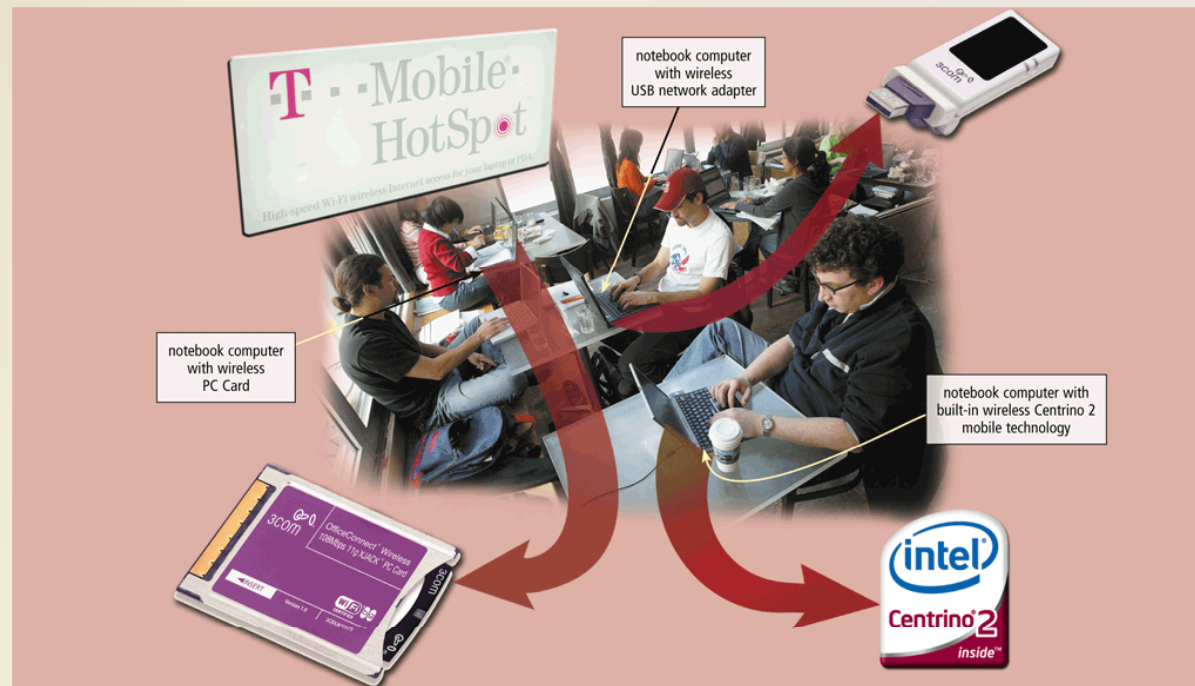


Click to view Web Link,  
click Chapter 9, Click Web  
Link from left navigation,  
then click Video Messaging  
below Chapter 9



# Uses of Computer Communications

- **Wireless Internet access points** allow people to connect wirelessly to the Internet from home, work, school, and in many public locations



# Uses of Computer Communications

- A **cybercafé** is a coffeehouse, restaurant, or other location that provides personal computers with Internet access to its customers



# Uses of Computer Communications

- A **global positioning system (GPS)** is a navigation system that consists of one or more earth-based receivers that accept and analyze signals sent by satellites in order to determine the GPS receiver's geographic location
- GPS receivers are:

Built into  
many mobile  
devices

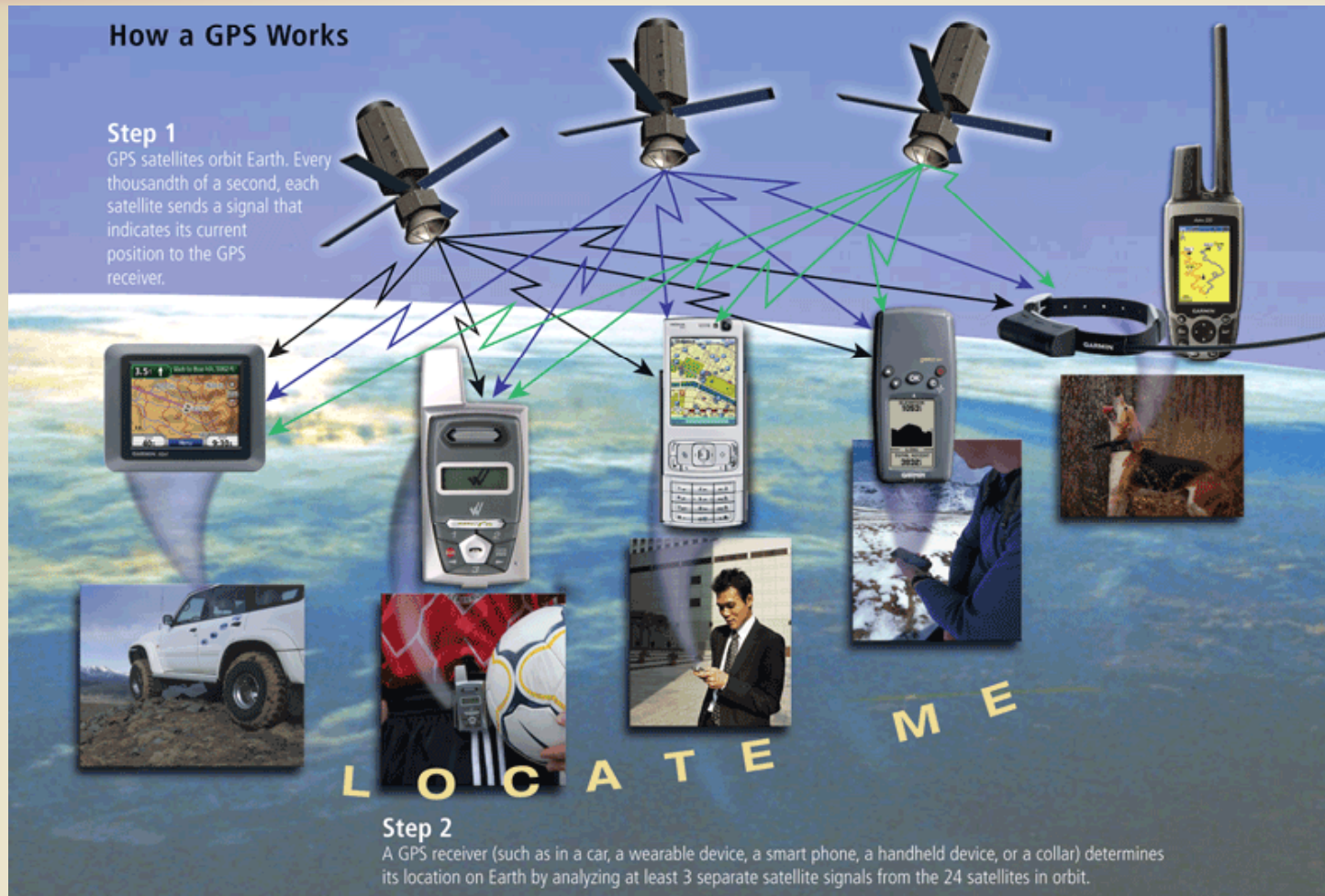
Available as a  
handheld  
device

Available with  
new vehicles



Click to view Web Link,  
click Chapter 9, Click Web  
Link from left navigation,  
then click GPS  
below Chapter 9

# Uses of Computer Communications



# Uses of Computer Communications

## Groupware

- Helps groups of people work together on projects and share information over a network
- Component of workgroup computing
- Major feature is group scheduling

## Voice mail

- Allows someone to leave a voice message for one or more people
- Computer in voice mail system converts an analog voice message into digital form
- A voice mailbox is a storage location on a hard disk in the voice mail system

# Uses of Computer Communications

- Collaboration software includes tools that enable users to share documents via online meetings and communicate with other connected users

Online  
meetings

Web  
conferences

Document  
management  
systems



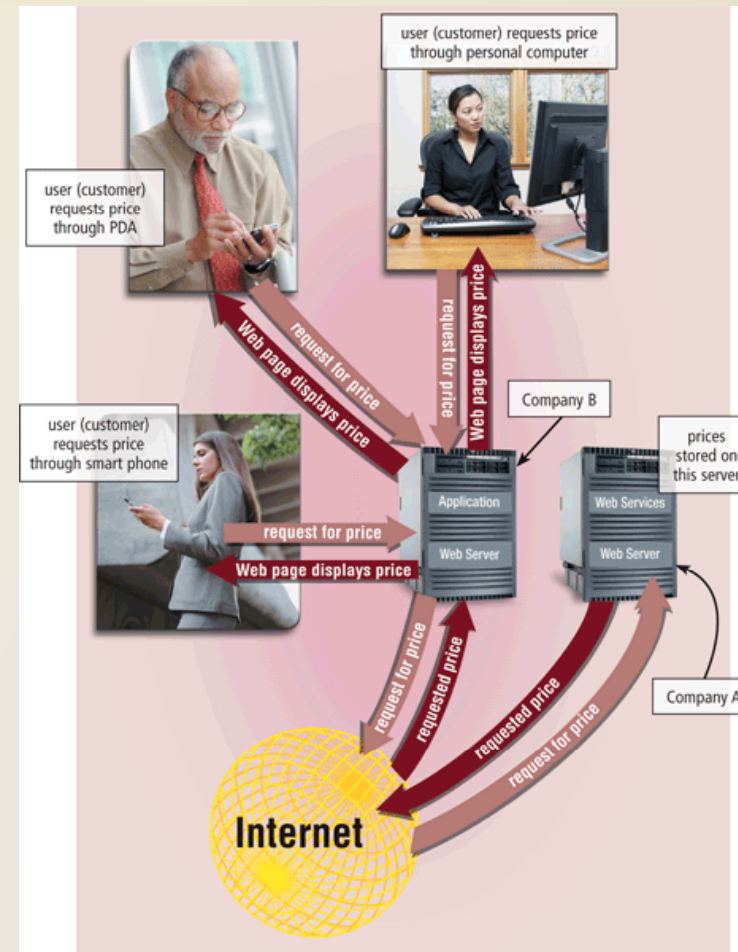
Click to view Web Link,  
click Chapter 9, Click Web  
Link from left navigation,  
then click Microsoft Groove  
below Chapter 9

# Uses of Computer Communications



# Uses of Computer Communications

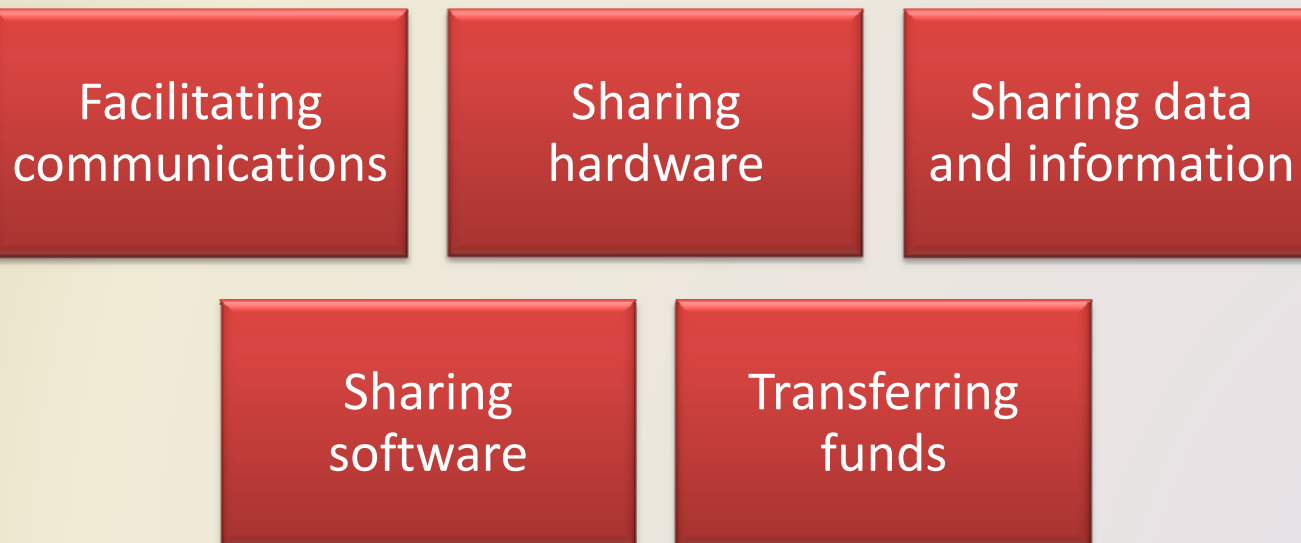
- Web services enable programmers to create applications that communicate with other remote computers over the Internet or on an internal business network
- A mashup is a Web application that combines services from two or more sources



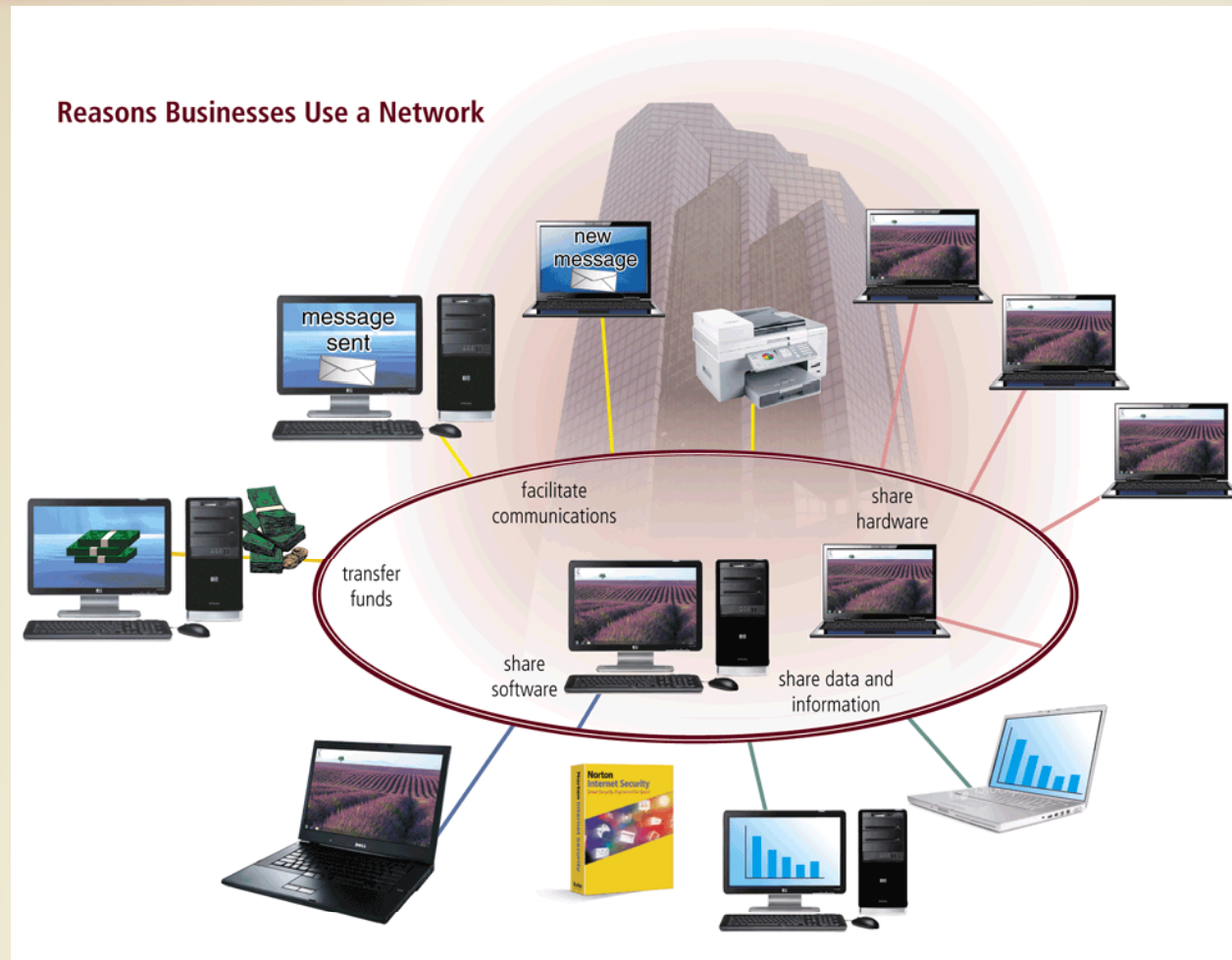


# Networks

- A **network** is a collection of computers and devices connected together via communications devices and transmission media
- Advantages of a network include:

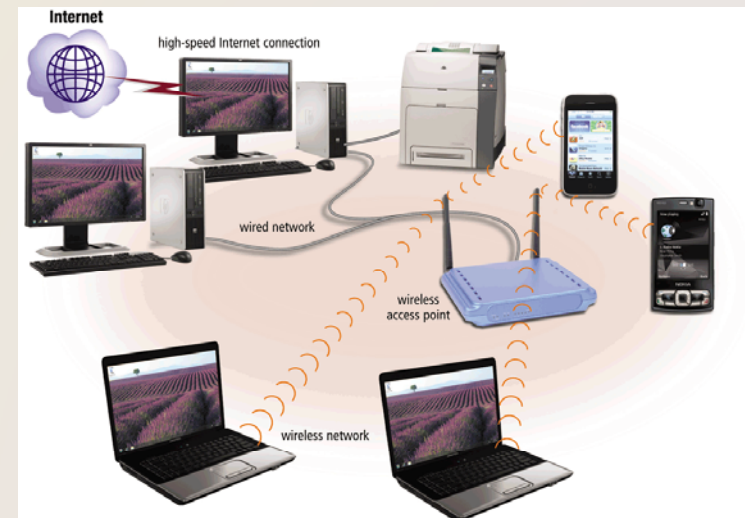
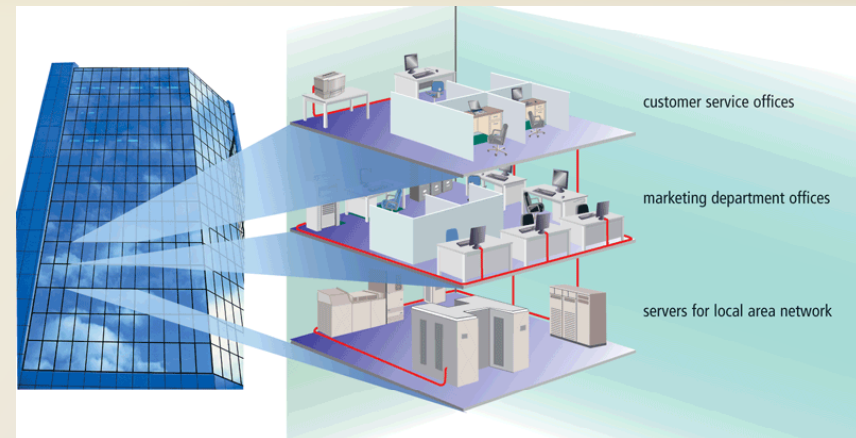


# Networks



# Networks

- A **local area network (LAN)** is a network that connects computers and devices in a limited geographical area
- A **wireless LAN (WLAN)** is a LAN that uses no physical wires



# Networks

- A metropolitan area network (MAN) connects LANs in a metropolitan area
- A **wide area network (WAN)** is a network that covers a large geographical area



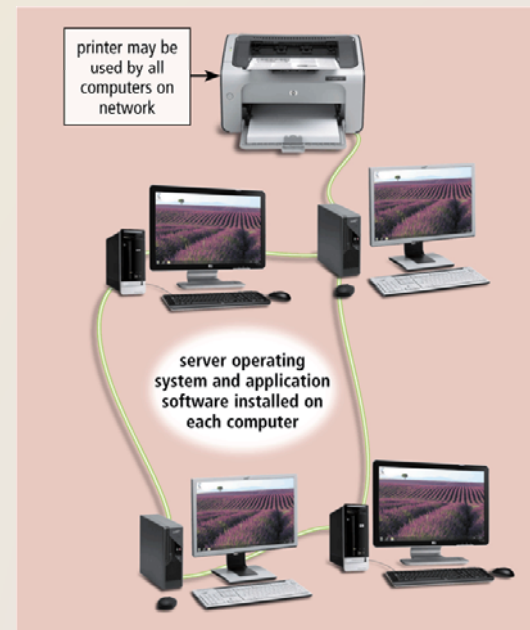
# Networks

- The design of computers, devices, and media on a network is sometimes called the network architecture

**Client/server network**

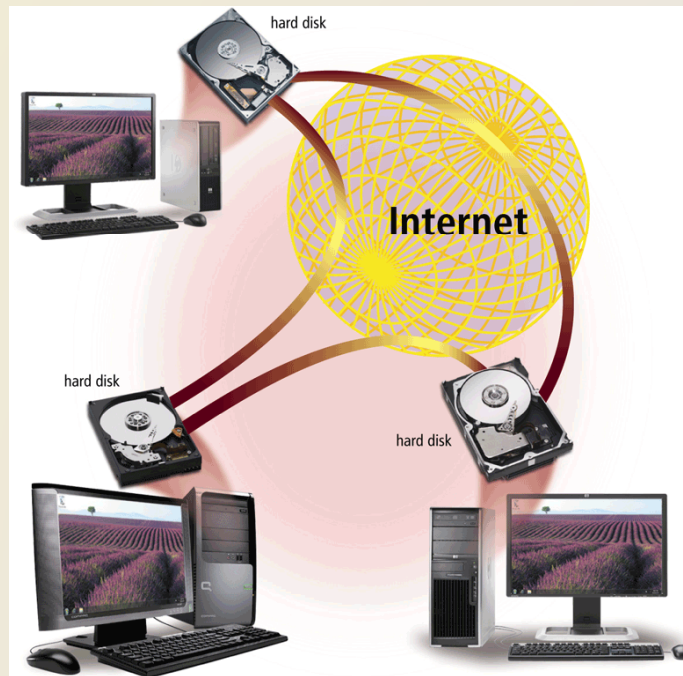


**Peer-to-peer network**



# Networks

- P2P describes an Internet network on which users access each other's hard disks and exchange files directly over the Internet

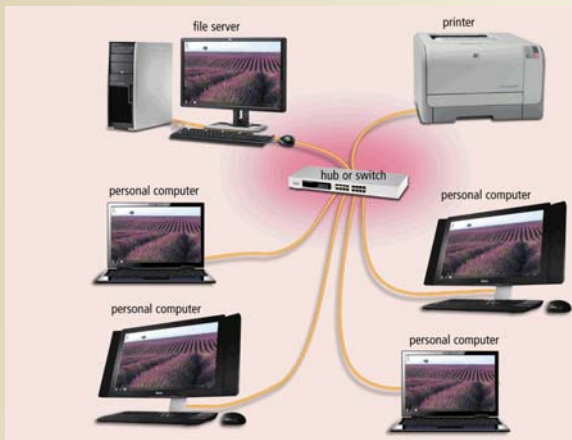


Click to view Web Link,  
click Chapter 9, Click Web  
Link from left navigation,  
then click P2P  
below Chapter 9

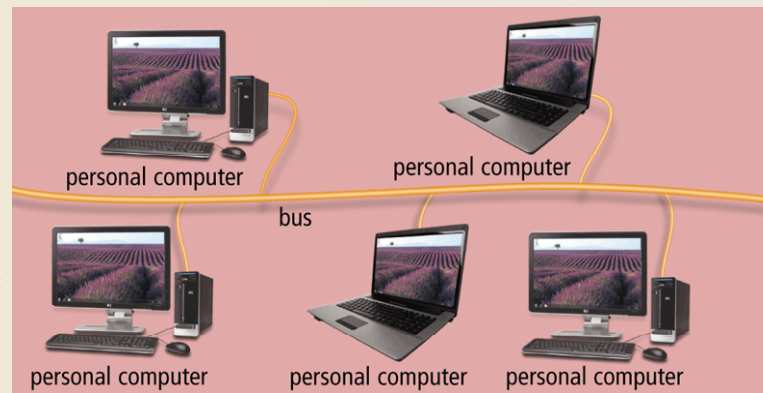
# Networks

- A **network topology** refers to the layout of the computers and devices in a communications network

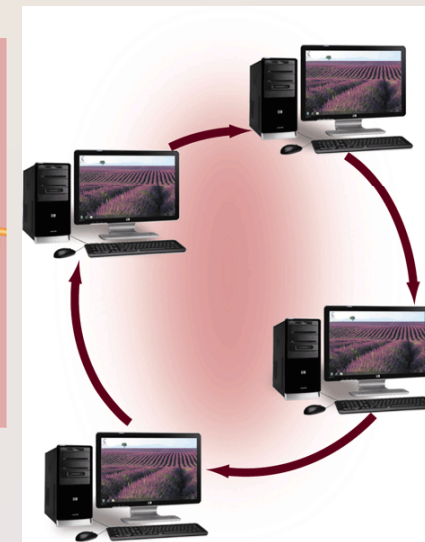
Star network



Bus network

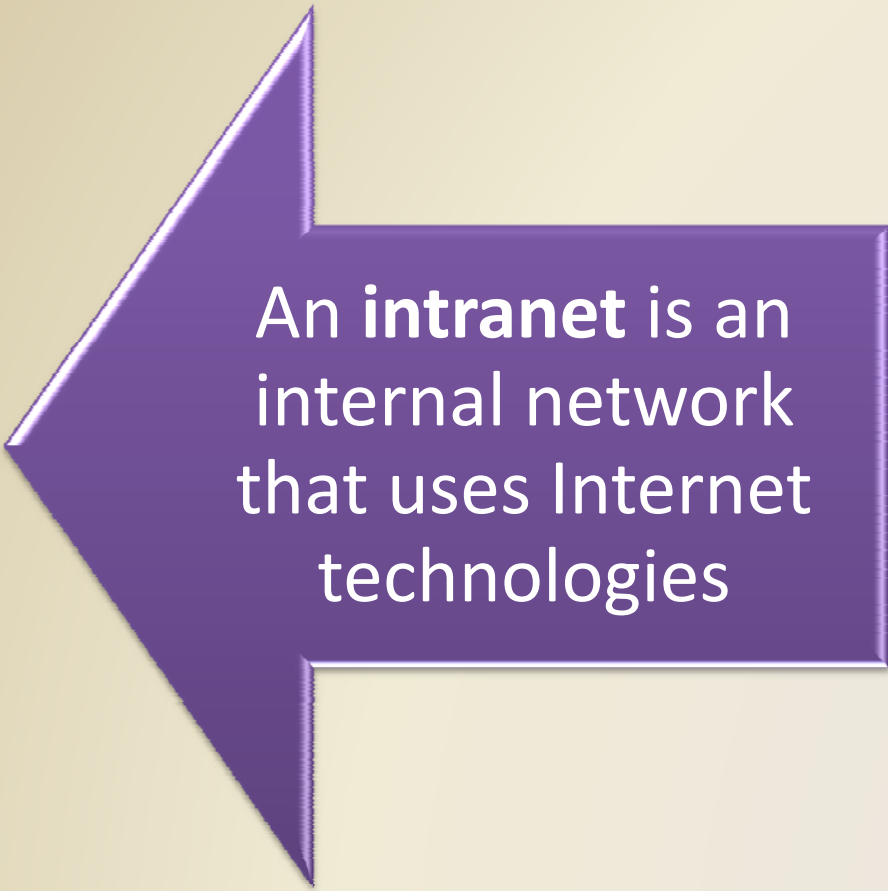


Ring network




# Networks

---



An **intranet** is an internal network that uses Internet technologies



An **extranet** allows customers or suppliers to access part of its intranet



# Network Communications Standards

Ethernet

Token  
ring

TCP/IP

Wi-Fi

Bluetooth

UWB

IrDA

RFID

WiMAX

WAP

# Network Communications Standards

**Ethernet** is a network standard that specifies no computer controls when data can be transmitted

The **token ring** standard specifies that computers and devices on the network share or pass a special signal (token)

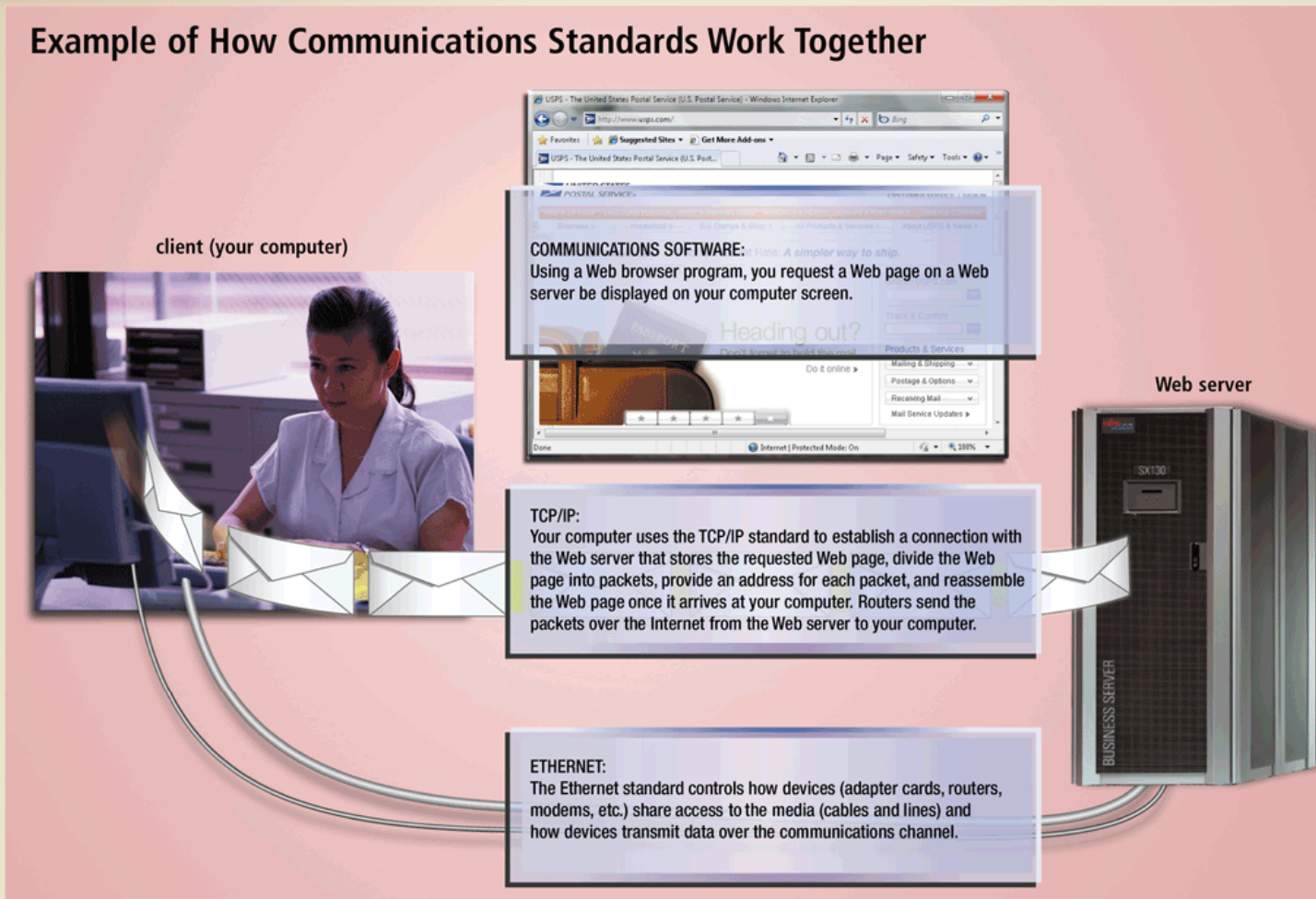
**TCP/IP** is a network standard that defines how messages are routed from one end of a network to another



Click to view Web Link,  
click Chapter 9, Click Web  
Link from left navigation,  
then click Ethernet  
below Chapter 9

# Network Communications Standards

## Example of How Communications Standards Work Together



# Network Communications Standards

- **Wi-Fi** identifies any network based on the **802.11** standard that facilitates wireless communication
- Sometimes referred to as wireless Ethernet

## 802.11 Series of Standards

Standard	Transfer Rates
802.11	1 or 2 Mbps
802.11a	Up to 54 Mbps
802.11b	Up to 11 Mbps
802.11g	54 Mbps and higher
802.11n	108 Mbps and higher

# Network Communications Standards

- **Bluetooth** defines how two Bluetooth devices use short-range radio waves to transmit data
- **UWB (ultra-wideband)** specifies how two UWB devices use short-range radio waves to communicate at high speeds
- **IrDA** transmits data wirelessly via infrared (IR) light waves
- **RFID** uses radio signals to communicate with a tag placed in or attached to an object, animal, or person



Click to view Web Link,  
click Chapter 9, Click Web  
Link from left navigation,  
then click RFID  
below Chapter 9

# Network Communications Standards

## How Electronic RFID Toll Collection Works

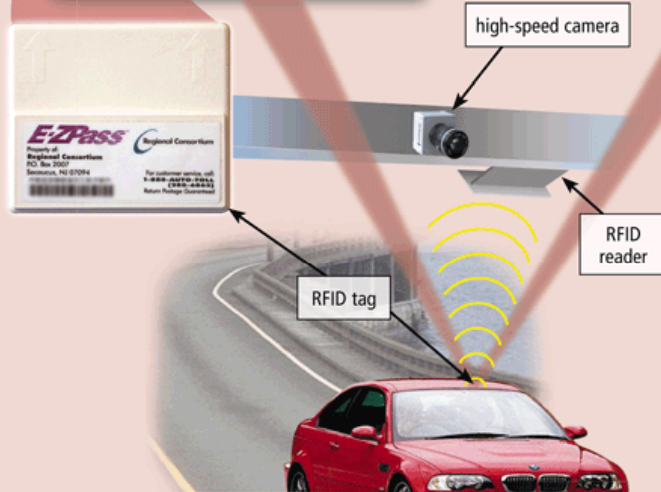
### Step 1

Motorist purchases an RFID transponder or RFID tag and attaches it to the vehicle's windshield.



### Step 2

As the vehicle approaches the tollbooth, the RFID reader in the tollbooth sends a radio wave that activates the windshield-mounted RFID tag. The activated tag sends vehicle information to the RFID reader.



### Step 3

The RFID reader sends the vehicle information to the lane controller. The lane controller, which is part of a local area network, transmits the vehicle information to a central computer that subtracts the toll from the motorist's account. If the vehicle does not have an RFID tag, a high-speed camera takes a picture of the license plate and the computer prints a violation notice, which is mailed to the motorist.



# Network Communications Standards

## WiMAX (802.16)

- Developed by IEEE
- Towers can cover a 30-mile radius
- Two types are fixed wireless and mobile wireless
- Provides wireless broadband Internet access

## Wireless Application Protocol (WAP)

- Specifies how some mobile devices can display the content of Internet services
  - Web
  - E-mail
  - Chat rooms
- Uses a client/server network

# Communications Software

- **Communications software** consists of programs that:

Help users establish a connection to another computer or network

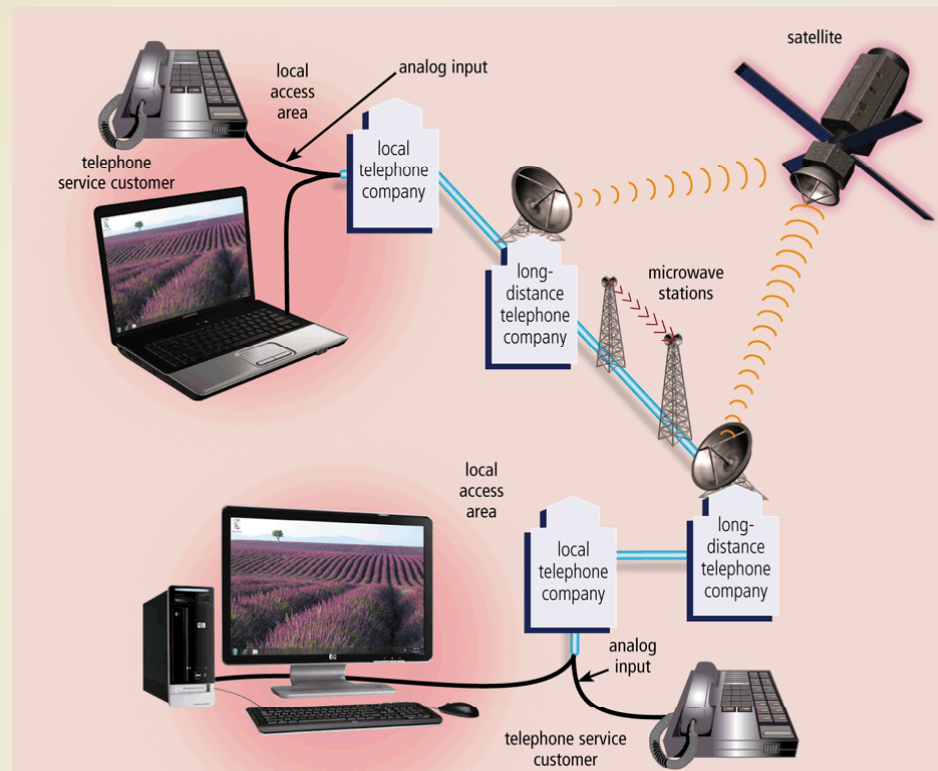
Manage the transmission of data, instructions, and information

Provide an interface for users to communicate with one another



# Communications Over the Telephone Network

- The public switched telephone network (PSTN) is the worldwide telephone system



# Communications Over the Telephone Network

**Dial-up lines**

**Dedicated line**

ISDN line

**DSL**

**FTTP**

**T-carrier line**

**ATM**



Click to view Web Link,  
click Chapter 9, Click Web  
Link from left navigation,  
then click DSL  
below Chapter 9

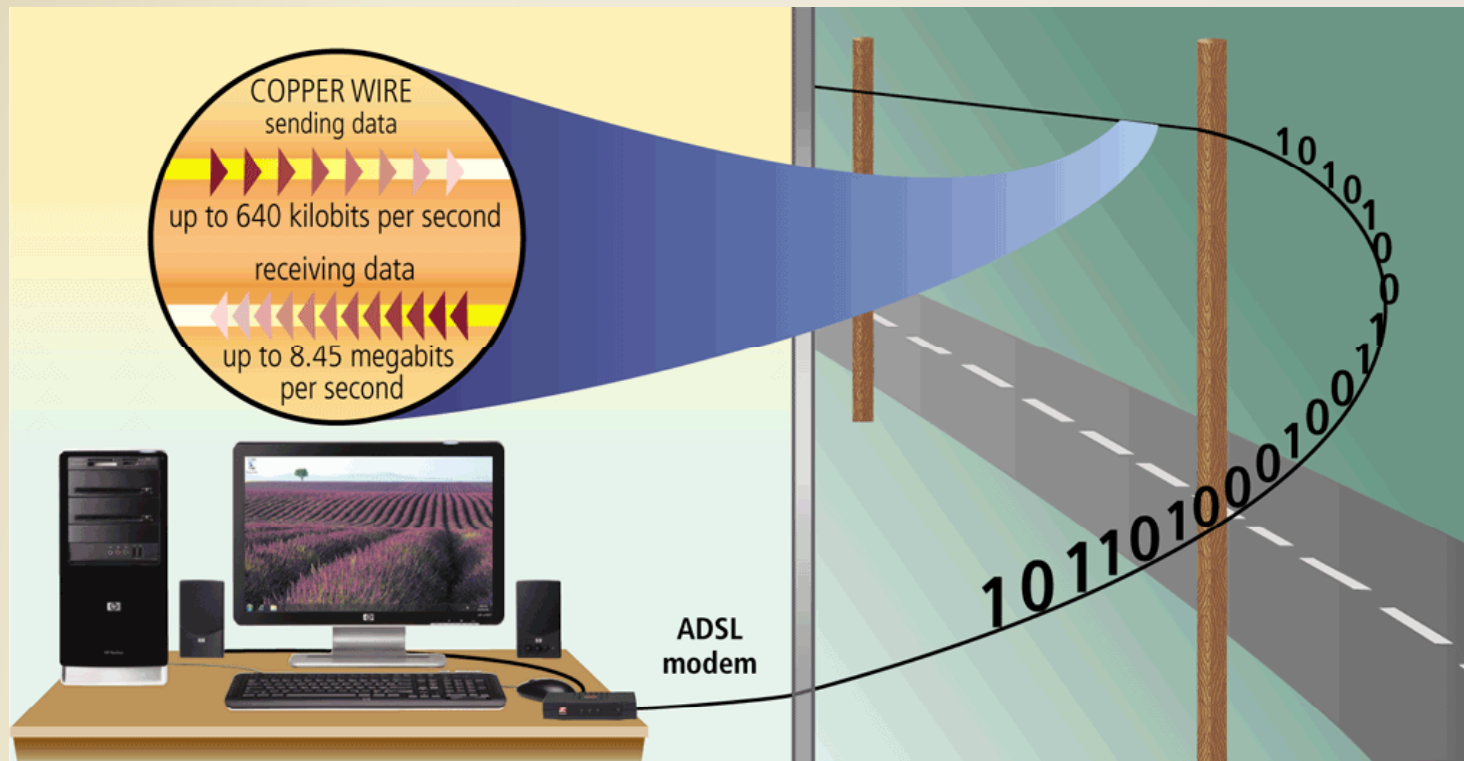
# Communications Over the Telephone Network

## Speeds of Various Internet Connections

Type of Line	Approximate Monthly Cost	Transfer Rates
Dial-up	Local or long-distance rates	Up to 56 Kbps
ISDN	\$10 to \$40	Up to 1.54 Mbps
DSL	\$13 to \$70	128 Kbps to 8.45 Mbps
Cable TV (CATV)	\$20 to \$50	128 Kbps to 52 Mbps
FTTP	\$35 to \$180	5 Mbps to 100 Mbps
Fixed wireless	\$35 to \$80	256 Kbps to 10 Mbps
Fractional T1	\$200 to \$700	128 Kbps to 768 Kbps
T1	\$400 to \$1,600	1.544 Mbps
T3	\$5,000 to \$15,000	44.736 Mbps
ATM	\$3,000 or more	155 Mbps to 622 Mbps, can reach 10 Gbps

# Communications Over the Telephone Network

- ADSL connections transmit data downstream at a much faster rate than upstream

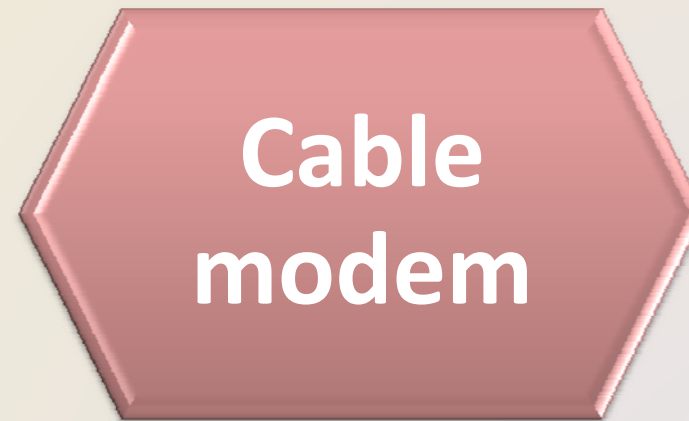


# Communications Devices

- A **communications device** is any type of hardware capable of transmitting data, instructions, and information between a sending device and a receiving device
- A dial-up modem converts signals between analog and digital

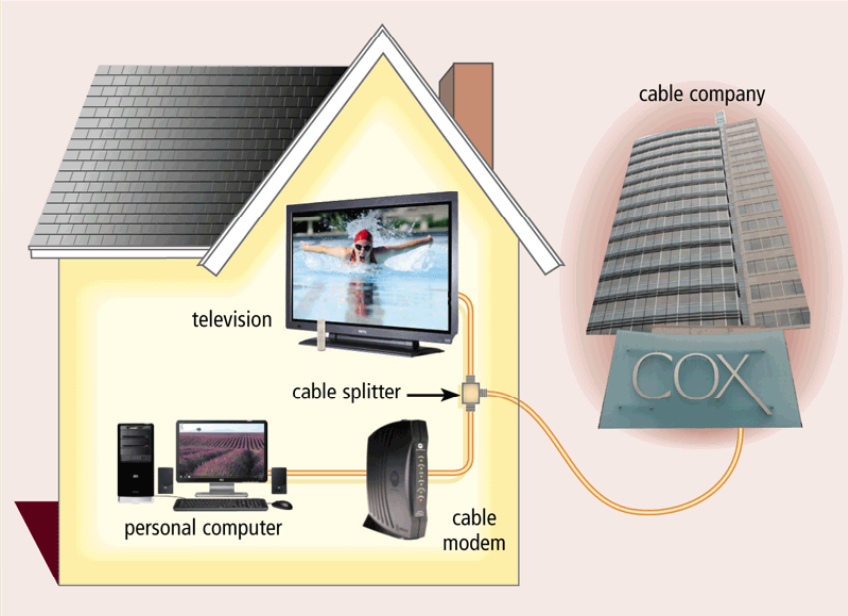
# Communications Devices

- A digital modem sends and receives data and information to and from a digital line



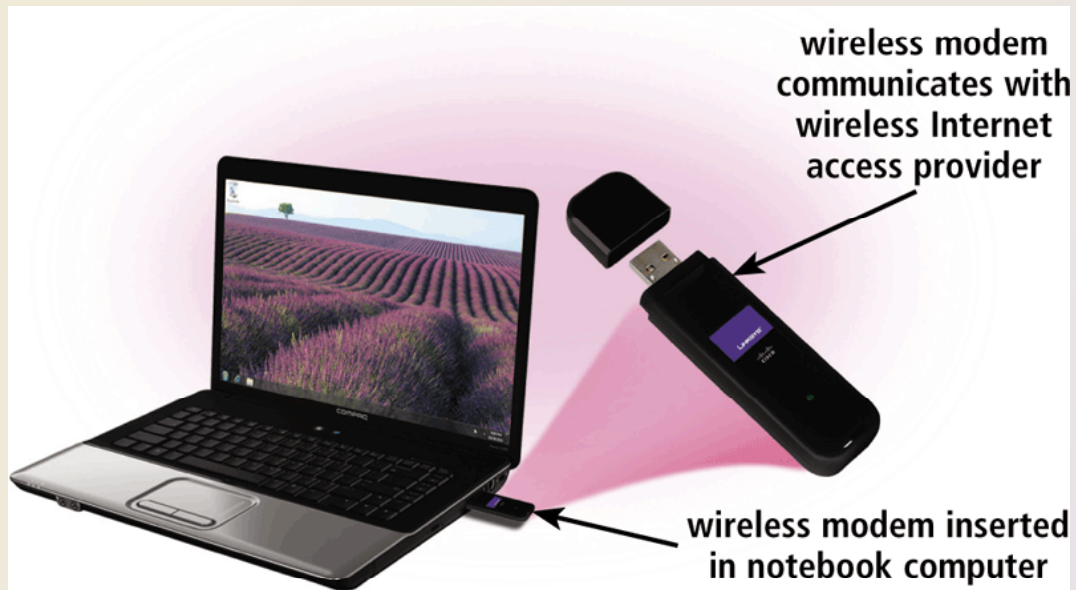
Click to view Web Link,  
click Chapter 9, Click Web  
Link from left navigation,  
then click Cable Modems  
below Chapter 9

# Communications Devices



# Communications Devices

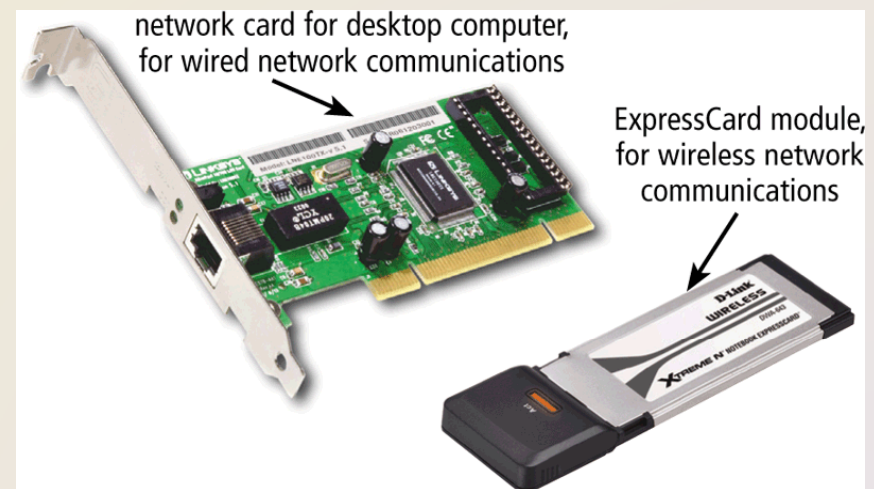
- A **wireless modem** uses the cell phone network to connect to the Internet wirelessly from a notebook computer, a smart phone, or other mobile device





# Communications Devices

- A **network card** enables a computer or device to access a network
- Available in a variety of styles
- Wireless network cards often have an antenna



# Communications Devices

- A wireless access point is a central communications device that allows computers and devices to transfer data wirelessly among themselves or to a wired network



# Communications Devices

- A router connects multiple computers or other routers together and transmits data to its correct destination on a network
- Many are protected by a hardware firewall



Click to view Web Link,  
click Chapter 9, Click Web  
Link from left navigation,  
then click Wireless Routers  
below Chapter 9

# Communications Devices

- A hub or switch connects several devices in a network together



# Home Networks

- Home networks provide computers with the following capabilities:

Connect to the Internet at the same time

Share a single high-speed Internet connection

Access files and programs on other computers

Share peripherals

Play multiplayer games

Connect game consoles to the Internet

Subscribe to and use VoIP



Click to view Web Link, click Chapter 9, Click Web Link from left navigation, then click Home Networks below Chapter 9

# Home Networks

---

- Types of wired home networks:



Ethernet

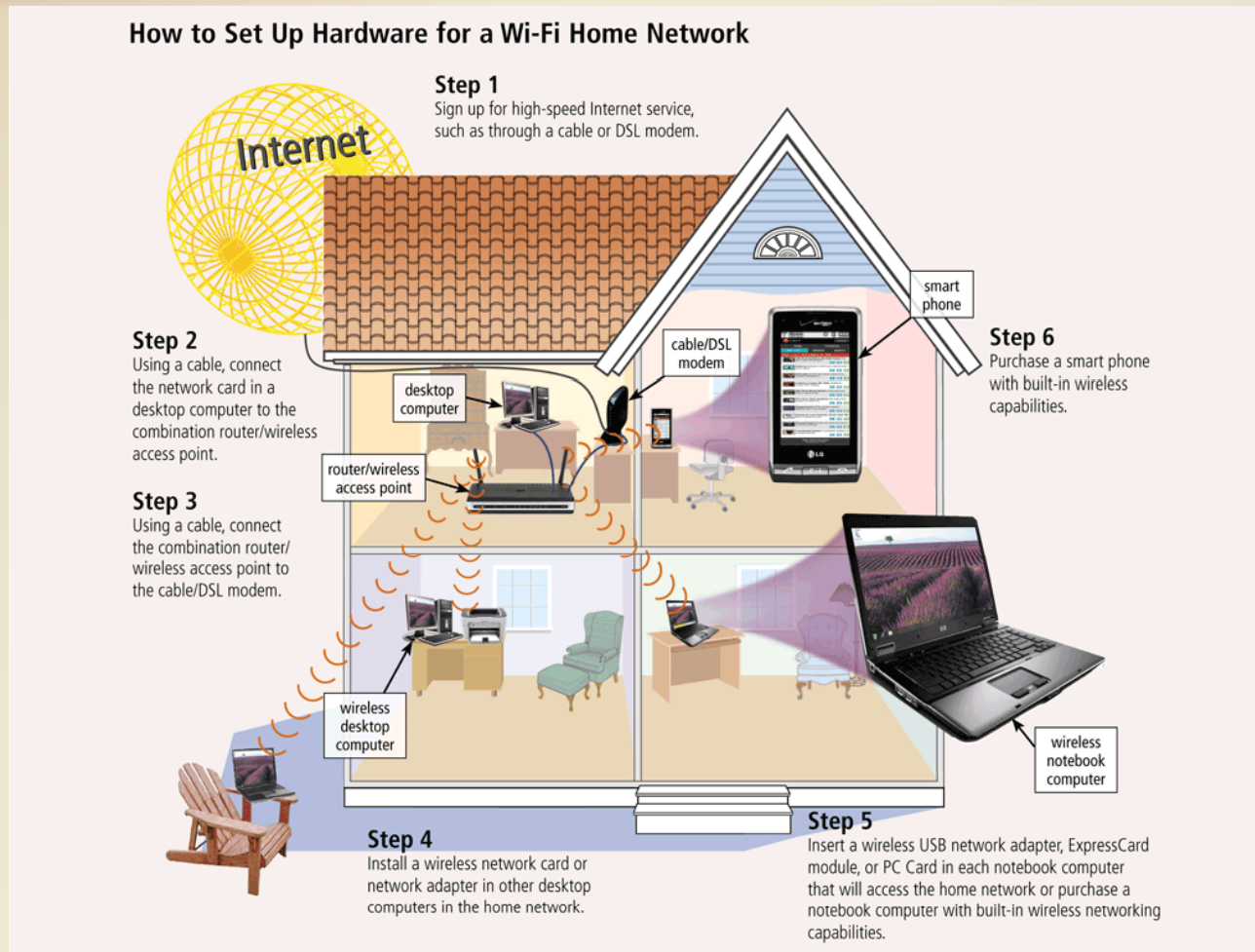


Powerline cable



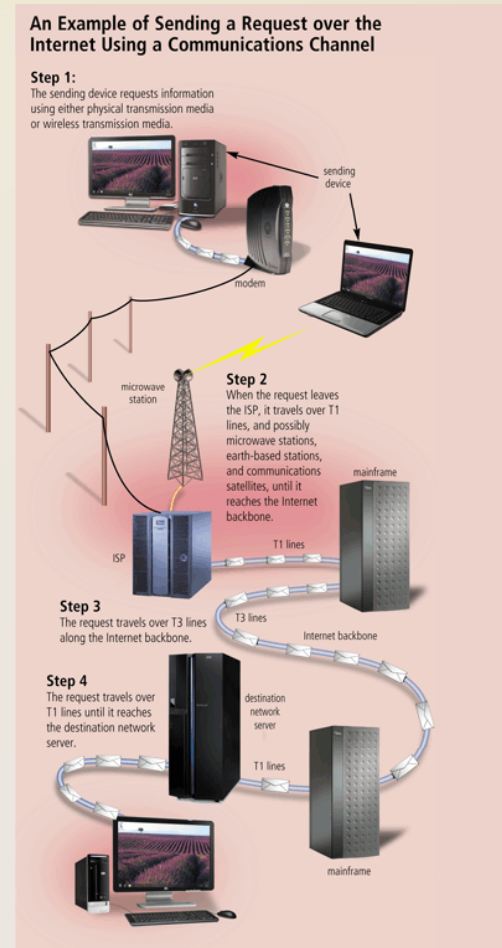
Phoneline

# Home Networks



# Communications Channel

- The amount of data that can travel over a communications channel sometimes is called the **bandwidth**
- **Latency** is the time it takes a signal to travel from one location to another on a network
- **Transmission media** carries one or more signals
- **Broadband** media transmit multiple signals simultaneously





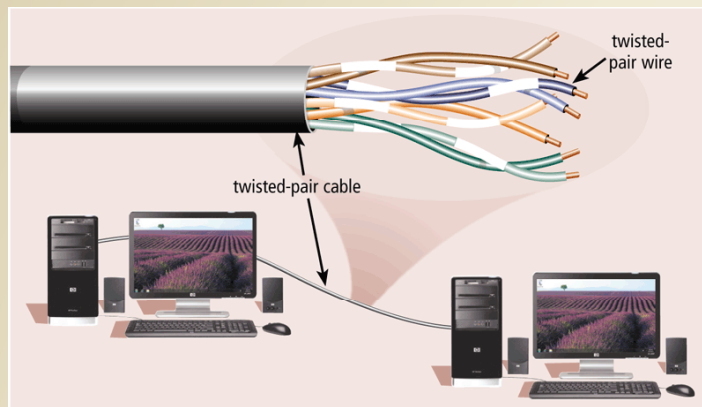
# Physical Transmission Media

## Transfer Rates for Various Types of LANs Using Physical Transmission Media

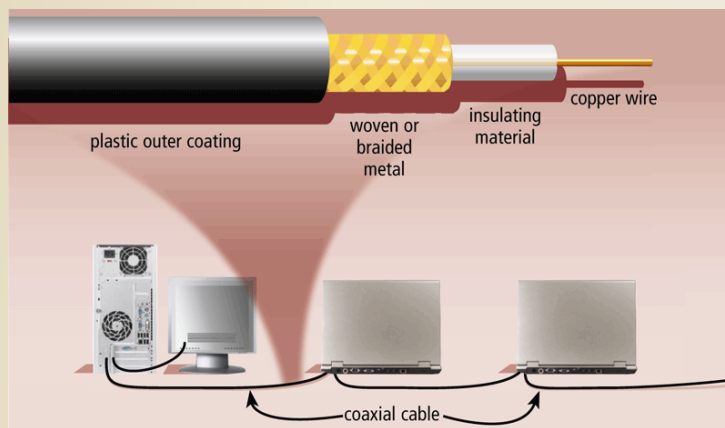
Type of Cable and LAN	Maximum Transfer Rate
<b>Twisted-Pair Cable</b>	
• 10Base-T (Ethernet)	10 Mbps
• 100Base-T (Fast Ethernet)	100 Mbps
• 1000Base-T (Gigabit Ethernet)	1 Gbps
• Token ring	4 Mbps to 16 Mbps
<b>Coaxial Cable</b>	
• 10Base2 (ThinWire Ethernet)	10 Mbps
• 10Base5 (ThickWire Ethernet)	10 Mbps
<b>Fiber-Optic Cable</b>	
• 10Base-F (Ethernet)	10 Mbps
• 100Base-FX (Fast Ethernet)	100 Mbps
• FDDI (Fiber Distributed Data Interface) token ring	100 Mbps
• Gigabit Ethernet	1 Gbps
• 10-Gigabit Ethernet	10 Gbps
• 40-Gigabit Ethernet	40 Gbps
• 100-Gigabit Ethernet	100 Gbps

# Physical Transmission Media

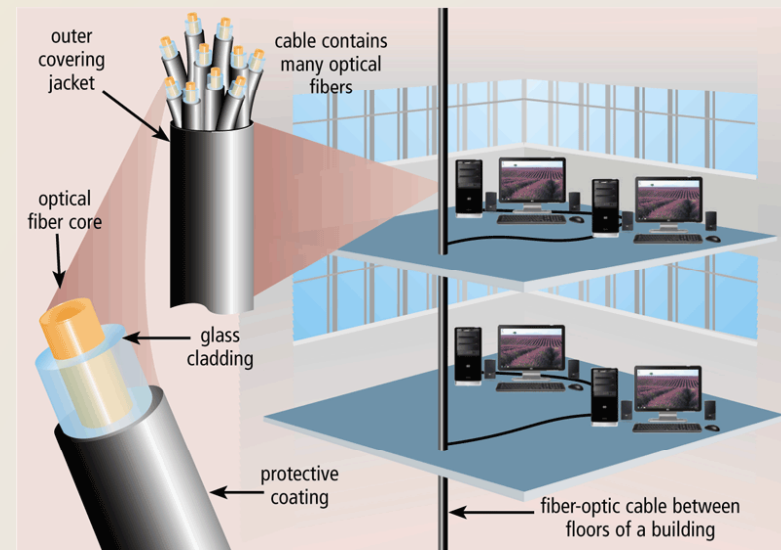
## Twisted-pair cable



## Coaxial cable



## Fiber-optic cable



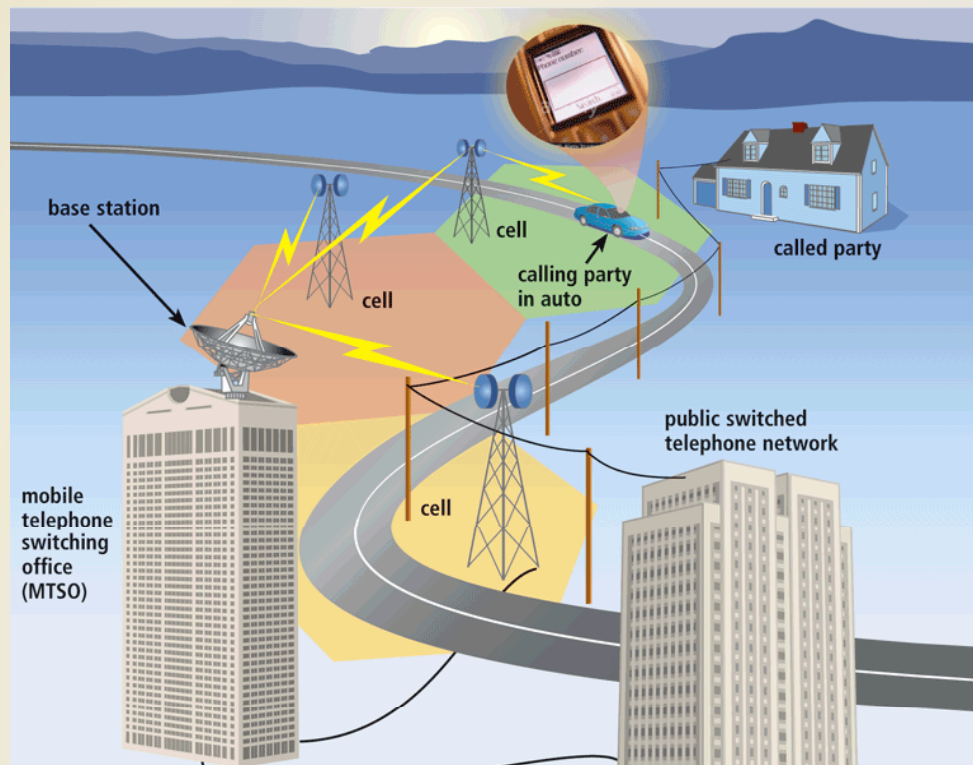
# Wireless Transmission Media

## Transfer Rates for Various Types of Wireless Transmission Media

Medium	Maximum Transfer Transmission Rate
<b>Infrared</b>	115 Kbps to 4 Mbps
<b>Broadcast radio</b>	<ul style="list-style-type: none"><li>• Bluetooth 1 Mbps to 2 Mbps</li><li>• HomeRF 1.6 Mbps to 10 Mbps</li><li>• 802.11b 11 Mbps</li><li>• 802.11a 54 Mbps</li><li>• 802.11g 54 Mbps</li><li>• 802.11n 108 Mbps</li><li>• UWB 110 Mbps to 480 Mbps</li></ul>
<b>Cellular radio</b>	<ul style="list-style-type: none"><li>• 2G 9.6 Kbps to 19.2 Kbps</li><li>• 3G 144 Kbps to 2.4 Mbps</li><li>• 4G Up to 15 Mbps</li></ul>
<b>Microwave radio</b>	150 Mbps
<b>Communications satellite</b>	1 Gbps

# Wireless Transmission Media

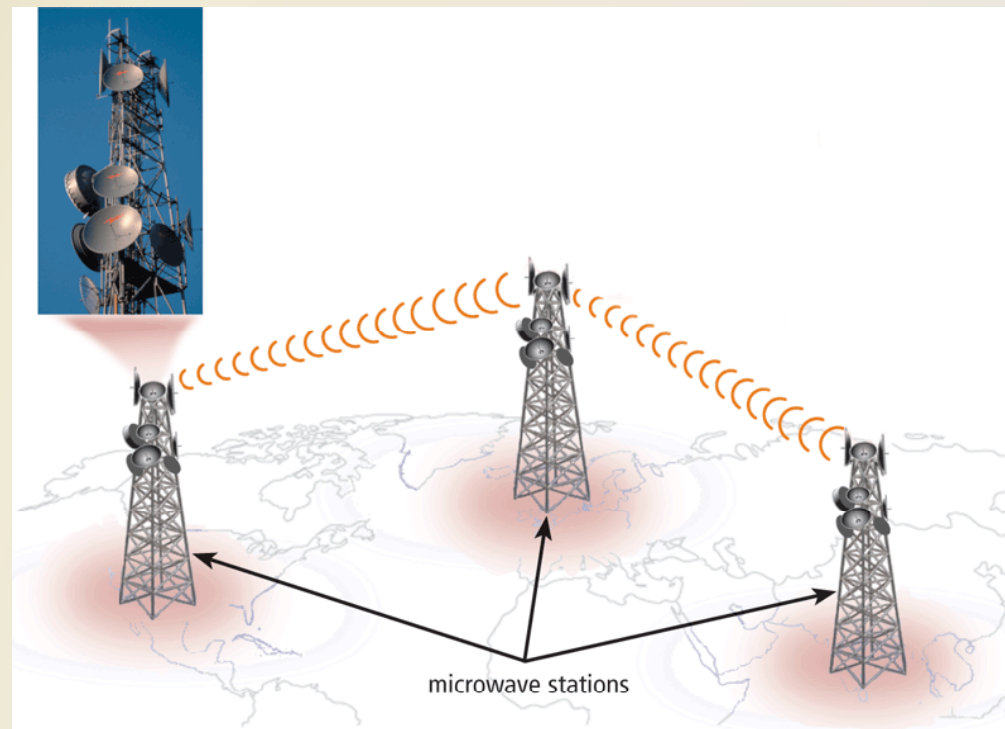
- **Cellular radio** is a form of broadcast radio that is used widely for mobile communications



Click to view Web Link, click Chapter 9, Click Web Link from left navigation, then click Mobile TV below Chapter 9

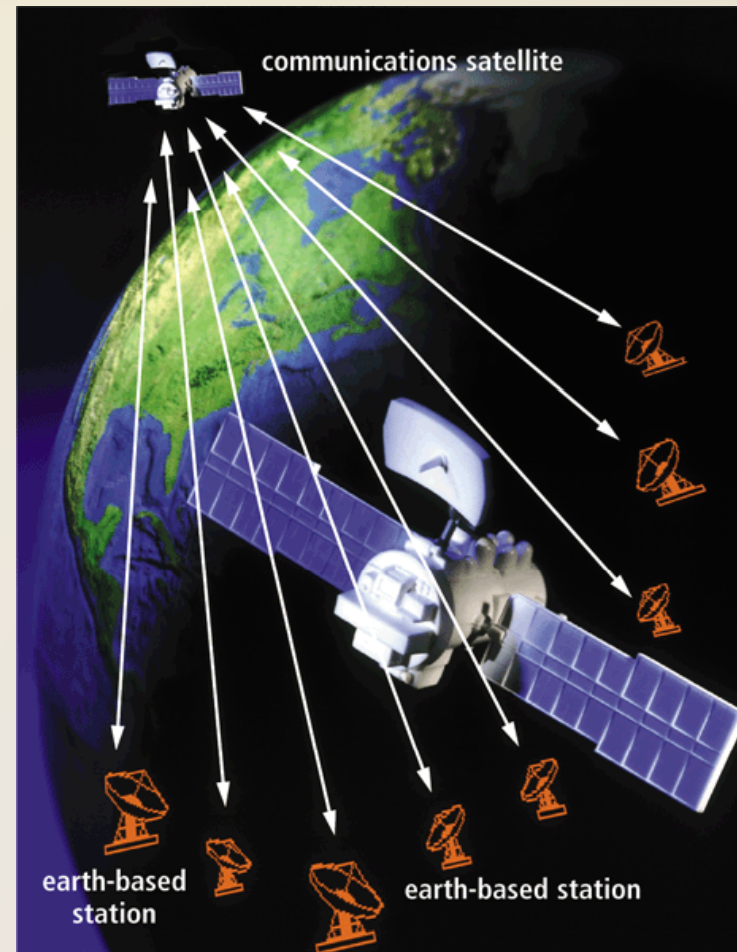
# Wireless Transmission Media

- **Microwaves** are radio waves that provide a high-speed signal transmission



# Wireless Transmission Media

- A **communications satellite** is a space station that receives microwave signals from an earth-based station, amplifies it, and broadcasts the signal over a wide area



# Video: Got Your Video Right Here



[CLICK TO START](#)

# Summary

---

Overview of  
communications  
terminology and  
applications

How to join  
computers into a  
network

Various  
communications  
devices, media,  
and procedures



Chapter Nine

# Communications and Networks

Discovering  
Computers 2011

Living in a Digital World

**Chapter 9 Complete**

