Discovering Computers

Technology in a World of Computers, Mobile Devices, and the Internet

Chapter 10

Communications and Networks

Objectives Overview

- Discuss the purpose of the components required for successful communications and identify various sending and receiving devices
- Differentiate among LANs, MANs, WANs, and PANs
- Differentiate between client/server and peer-to-peer networks
- Differentiate among a star network, bus network, and ring network
- Describe the various network communications standards and protocols
- Explain the purpose of communications software

See Page 416 for Detailed Objectives

Objectives Overview

Describe various types of communications lines

Describe commonly used communications devices

Discuss different ways to set up and configure a home network

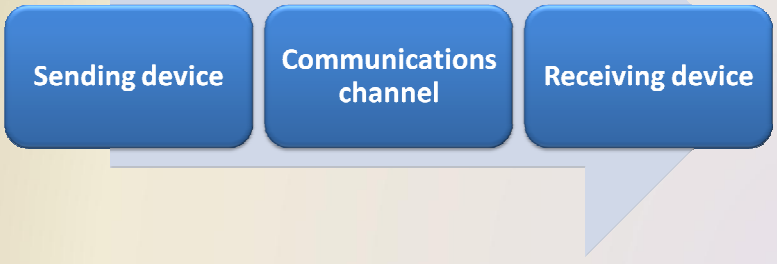
Differentiate among physical transmission media

Differentiate among wireless transmission media

See Page 416
for Detailed Objectives

Communications

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



Communications

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Figure 10-1

Networks

- A **network** is a collection of computers and devices connected together via communications devices and transmission media
- Advantages of a network include:
  - Facilitating communications
  - Sharing hardware
  - Sharing data and information
  - Sharing software
  - Transferring funds

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Networks

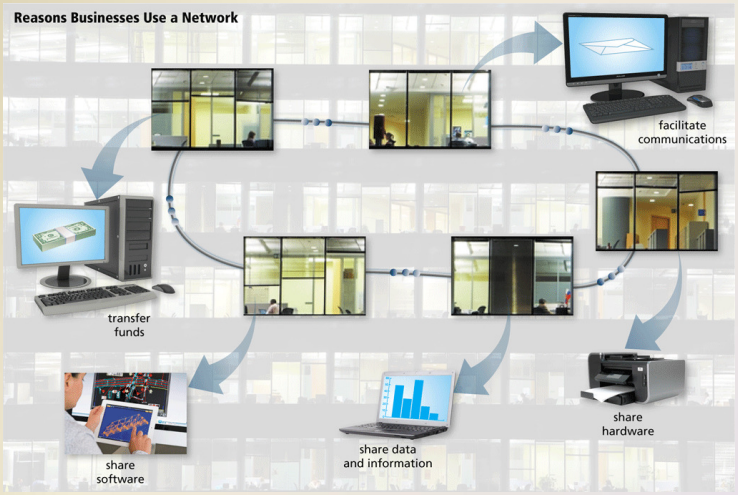

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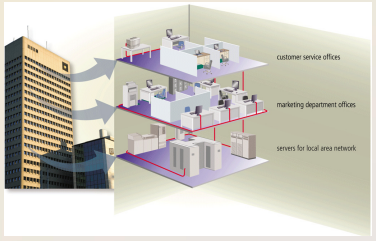
Figure 10-2

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



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Figures 10-3 – 10-4

Networks

- A metropolitan area network (MAN) connects LANs in a metropolitan area
- A **wide area network** (**WAN**) is a network that covers a large geographic area
- A **personal area network** (**PAN**) is a network that connects computers and devices in an individual's workspace with wired and wireless technology

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Figure 10-5

Networks

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

Client/server network

Peer-to-peer network

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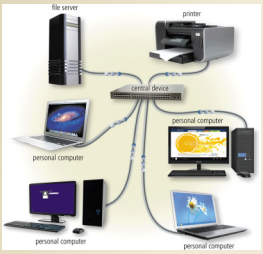
Figures 10-6 – 10-7

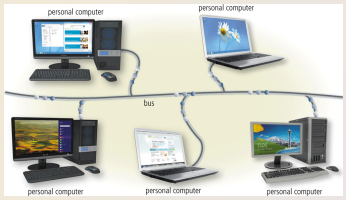
Networks

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

Star network



Bus network



Ring network

Pages 423– 424
Figures 10-8 – 10-10

Network Communications Standards and Protocols

Ethernet	Token ring	TCP/IP	Wi-Fi
Bluetooth	UWB	IrDA	RFID
	NFC	WiMAX	

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Network Communications Standards and Protocols

Ethernet is a network standard that specifies no central computer or device on the network (nodes) should control 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 protocol that defines how messages (data) are routed from one end of a network to another

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Network Communications Standards and Protocols

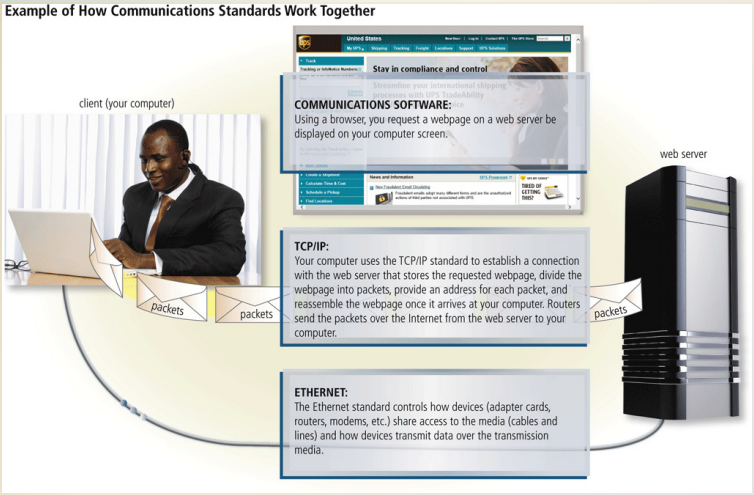

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Figure 10-11

Network Communications Standards and Protocols

- **Wi-Fi** identifies any network based on the **802.11** standard that specifies how two wireless devices communicate over the air with each other
- **Bluetooth** is a network protocol that defines how two Bluetooth devices use short-range radio waves to transmit data
- **UWB** (**ultra-wideband**) is a network standard that specifies how two UWB devices use short-range radio waves to communicate at high speeds with each other
- **IrDA** transmits data wirelessly via infrared (IR) light waves
- **RFID** is a protocol that defines how a network uses radio signals to communicate with a tag placed in or attached to an object, an animal, or a person

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Network Communications Standards and Protocols

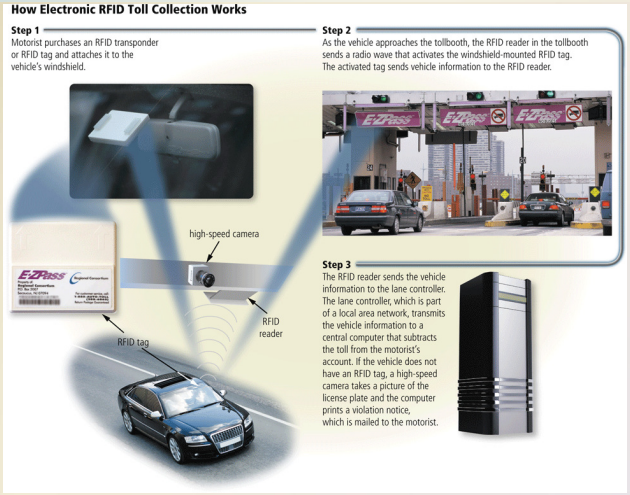

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Figure 10-12

Network Communications Standards and Protocols

NFC

- Protocol based on RFID
- Uses close-range radio signals
- Devices or objects should be placed within an inch or two of each other

WiMAX (802.16)

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

Communications Software

- **Communications software** consists of programs and apps that:
  - Help users establish a connection to another computer, mobile device, or network
  - Manage the transmission of data, instructions, and information
  - Provide an interface for users to communicate with one another

Communications Lines

- Dedicated line
- Cable
- DSL
- ISDN
- FTTP
- T-Carrier
- ATM

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Communications Lines

Table 10-2 Speeds of Various Dedicated Digital Lines

Type of Line	Transfer Rates
Cable	256 Kbps to 52 Mbps
DSL	256 Kbps to 8.45 Mbps
ISDN	Up to 1.54 Mbps
FTTP	5 Mbps to 300 Mbps
Fractional T1	128 Kbps to 768 Kbps
T1	1.544 Mbps
T3	44.736 Mbps
ATM	155 Mbps to 622 Mbps, can reach 10 Gbps

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Table 10-2

Communications Lines

- ADSL is a type of DSL that supports faster transfer rates when receiving data

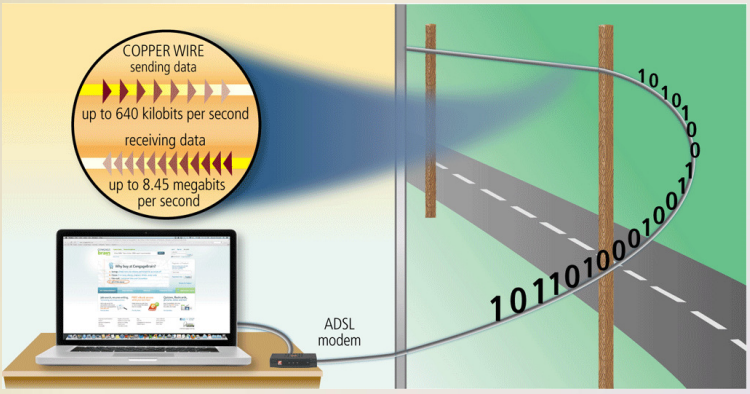

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Figure 10-14

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

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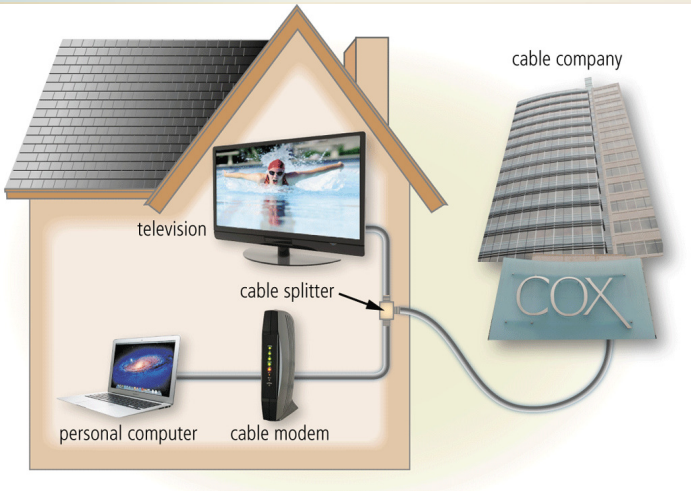
Communications Devices

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

Cable modem

DSL modem

Communications Devices



Communications Devices

- A wireless modem uses a mobile phone provider's network to connect to the Internet wirelessly from a computer or mobile device

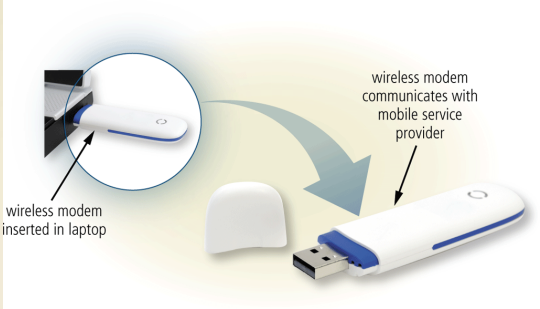


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Figure 10-16

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

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Figure 10-17

Communications Devices

- A router connects multiple computers or other routers together and transmits data to its correct destination on a network

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Figure 10-18

Communications Devices

- A network card enables a computer or device that does not have built-in networking capability to access a network
- Available in a variety of styles

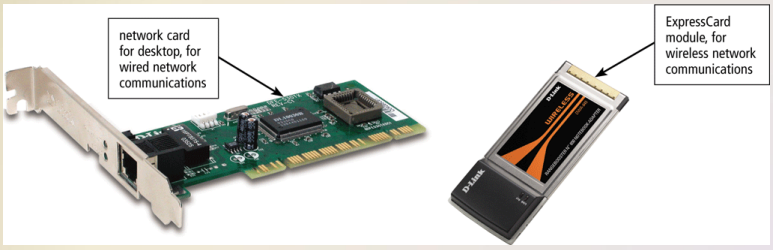

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Figure 10-20

Communications Devices

- A hub or switch is a device that provides a central point for cables in a network

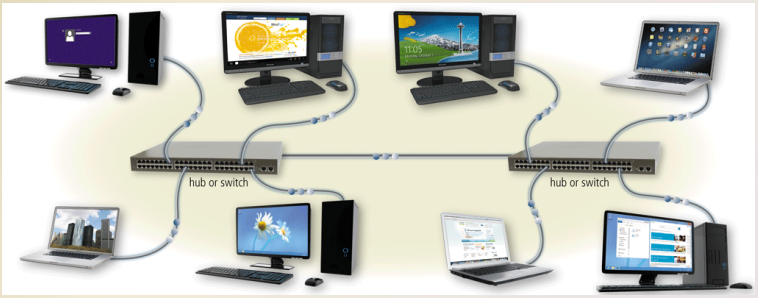

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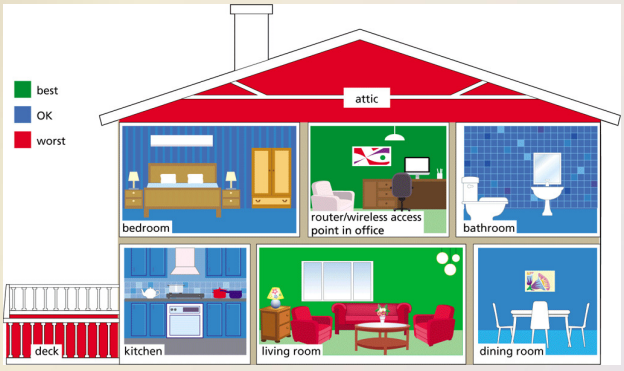
Figure 10-21

Home Networks

- Many home users connect multiple computers and devices together in a **home network**



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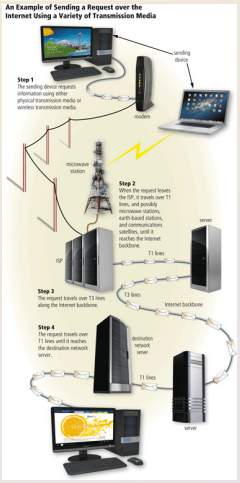
Transmission Media

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



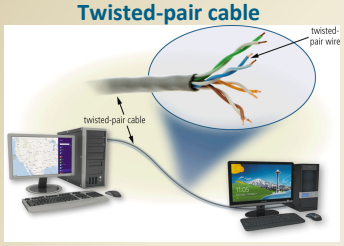
Physical Transmission Media

Table 10-3 Transfer Rates for Physical Transmission Media Used in LANs

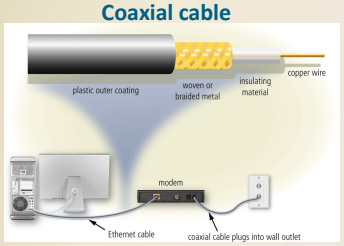
Type of Cable and LAN	Maximum Transfer Rate
Twisted-Pair Cable	
• 10Base-T (Ethernet)	10 Mbps
• 100Base-T (Fast Ethernet)	100 Mbps
• 1000Base-T (Gigabit Ethernet)	1 Gbps
• Token ring	4 Mbps to 16 Mbps
Coaxial Cable	
• 10Base2 (ThinWire Ethernet)	10 Mbps
• 10Base5 (ThickWire Ethernet)	10 Mbps
Fiber-Optic Cable	
• 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

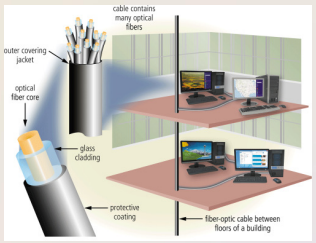
Twisted-pair cable



Coaxial cable



Fiber-optic cable



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Figures 10-23 – 10-25

Wireless Transmission Media

Table 10-4 Wireless Transmission Media Transfer Rates

Medium		Maximum Transfer Transmission Rate
Infrared		115 Kbps to 4 Mbps
Broadcast radio	• Bluetooth	1 Mbps to 24 Mbps
	• 802.11b	11 Mbps
	• 802.11a	54 Mbps
	• 802.11g	54 Mbps
	• 802.11n	300 Mbps
	• 802.11ac	500 Mbps to 1 Gbps
	• 802.11ad	up to 7 Gbps
	• UWB	110 Mbps to 480 Mbps
Cellular radio	• 2G	9.6 Kbps to 144 Kbps
	• 3G	144 Kbps to 3.84 Mbps
	• 4G	Up to 100 Mbps
Microwave radio		10 Gbps
Communications satellite		2.56 Tbps

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Table 10-4

Wireless Transmission Media

- **Broadcast radio** is a wireless transmission medium that distributes radio signals through the air over long distances
- **Cellular radio** is a form of broadcast radio that is used widely for mobile communications

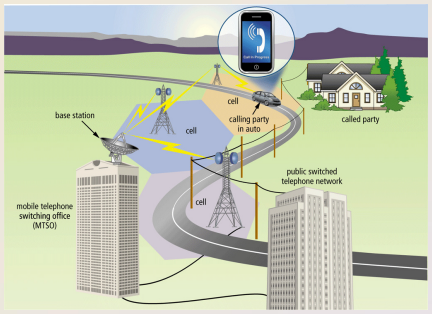

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Figure 10-26

Wireless Transmission Media

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

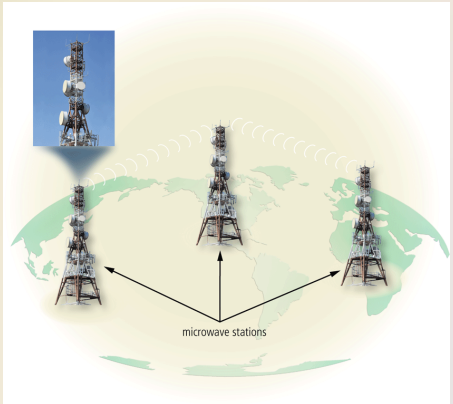

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Figure 10-27

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

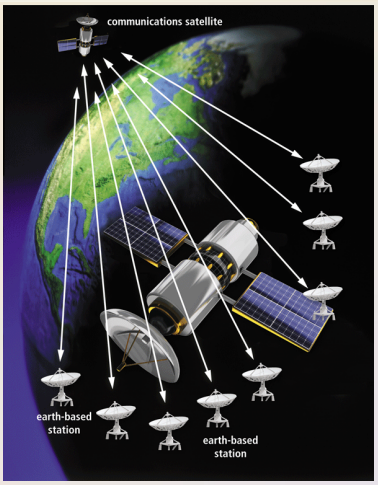

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Figure 10-28

Wireless Transmission Media

- 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 receiver's geographical location

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Wireless Transmission Media

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Figure 10-29

Summary

- Various types of network architectures, topologies, and standards and protocols
- Communications software
- Communications lines and communications devices
- How to create a home network
- Physical transmission media and wireless transmission media

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Chapter 10

Communications and Networks

Chapter 10 Complete