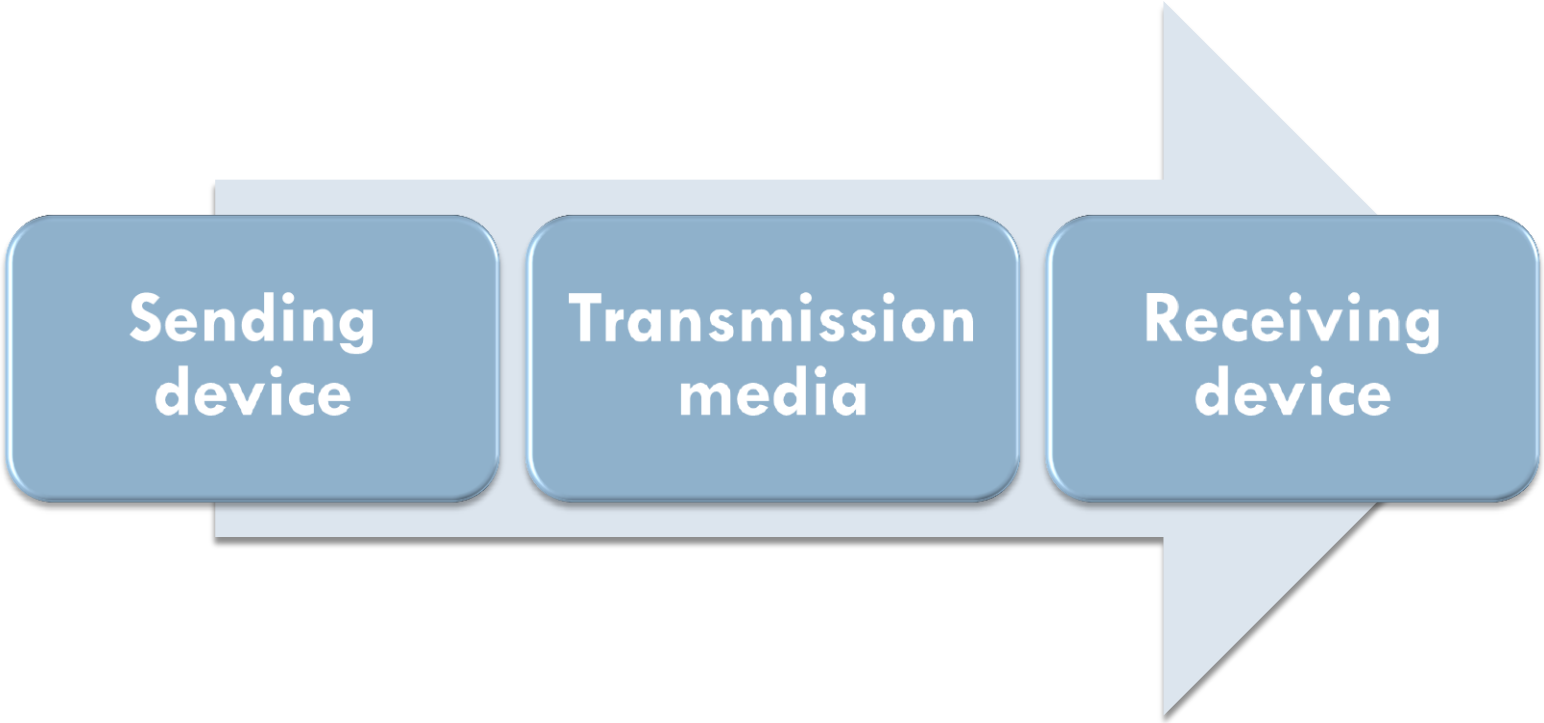
COMMUNICATING DIGITAL CONTENTS

Malik Adnan Jaleel

Communications

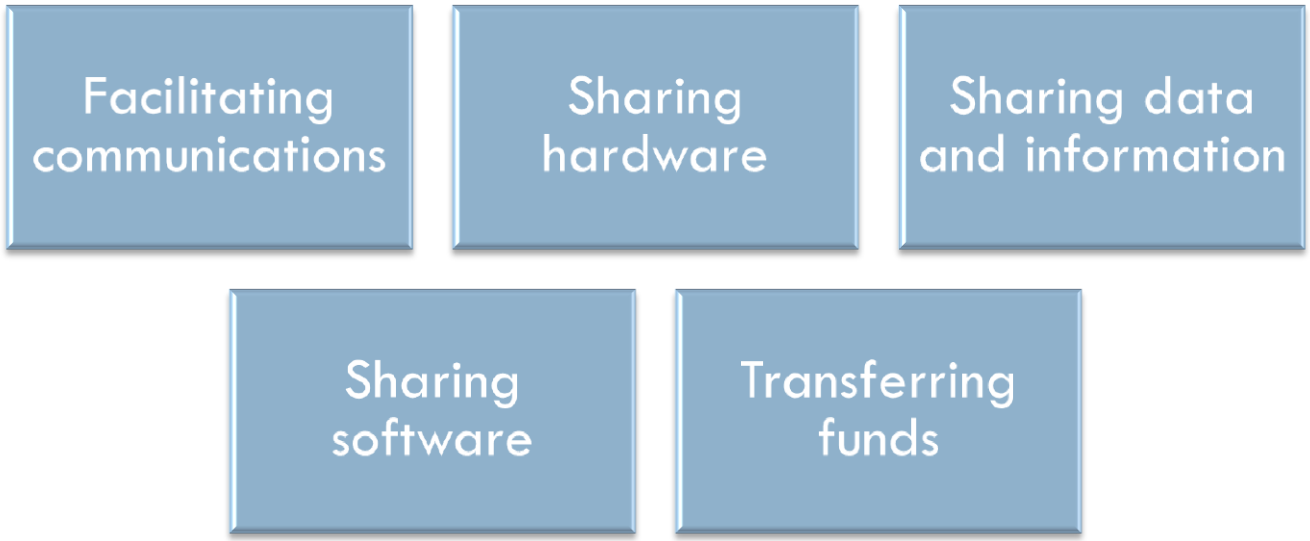
- Digital communications describes a process in which two or more computers or devices transfer data, instructions, and information



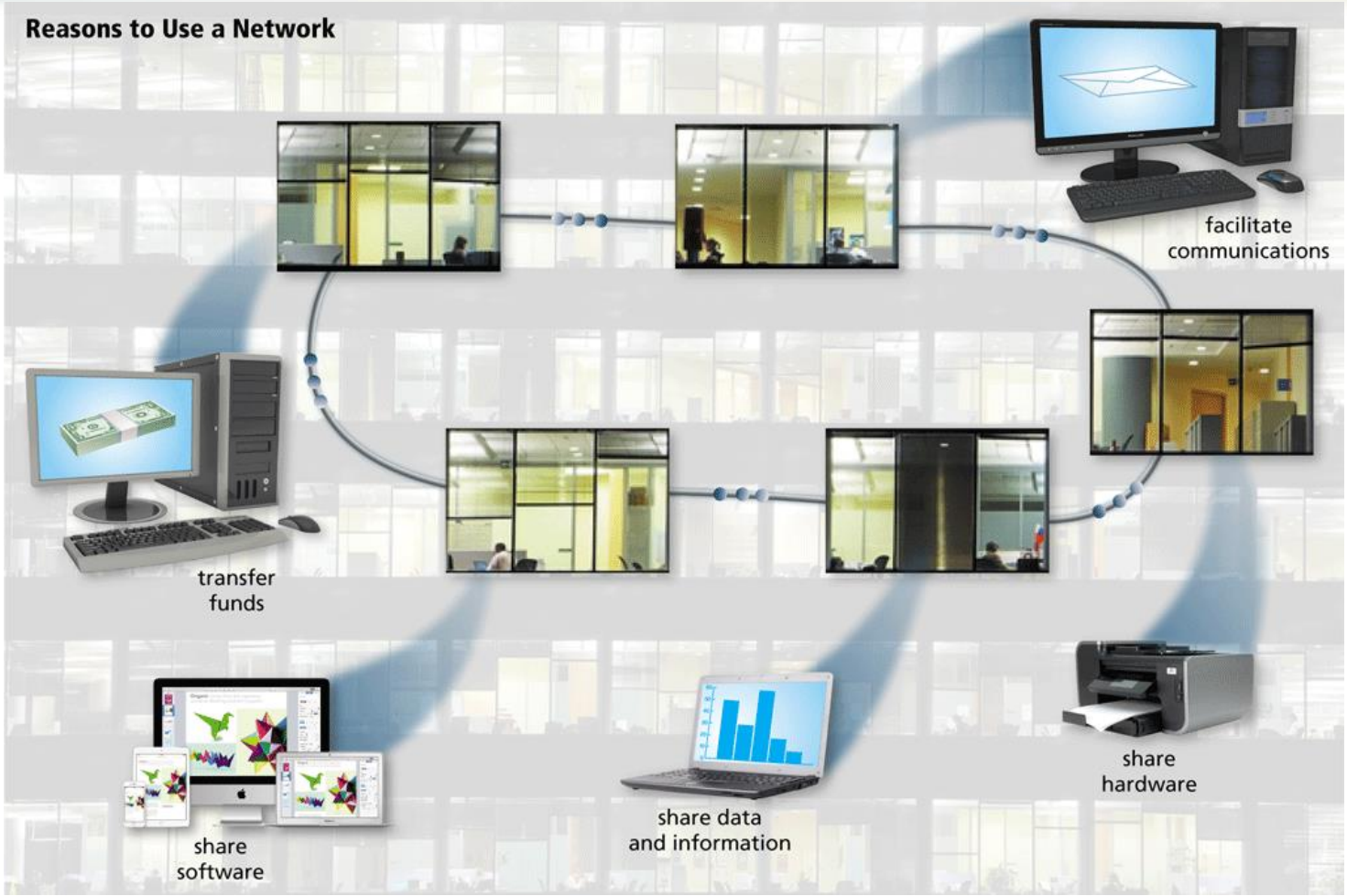
Communications

Networks

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

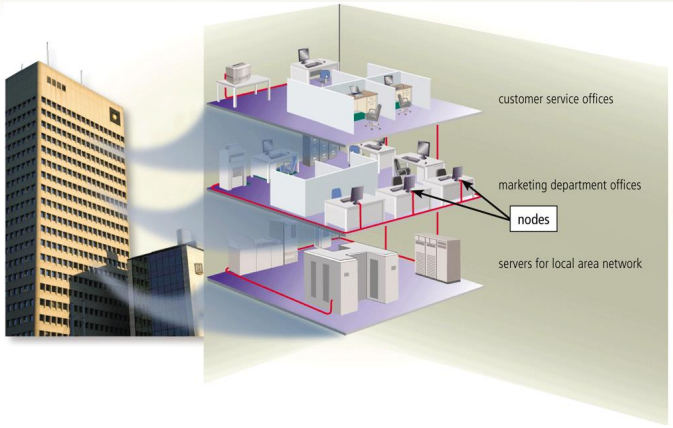


Networks


Reasons to Use a Network
facilitate communications
transfer funds
share software
share data and information
share hardware

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 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

Networks

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

Client/server network

Peer-to-peer network

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

Network Communications Standards and Protocols

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

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)

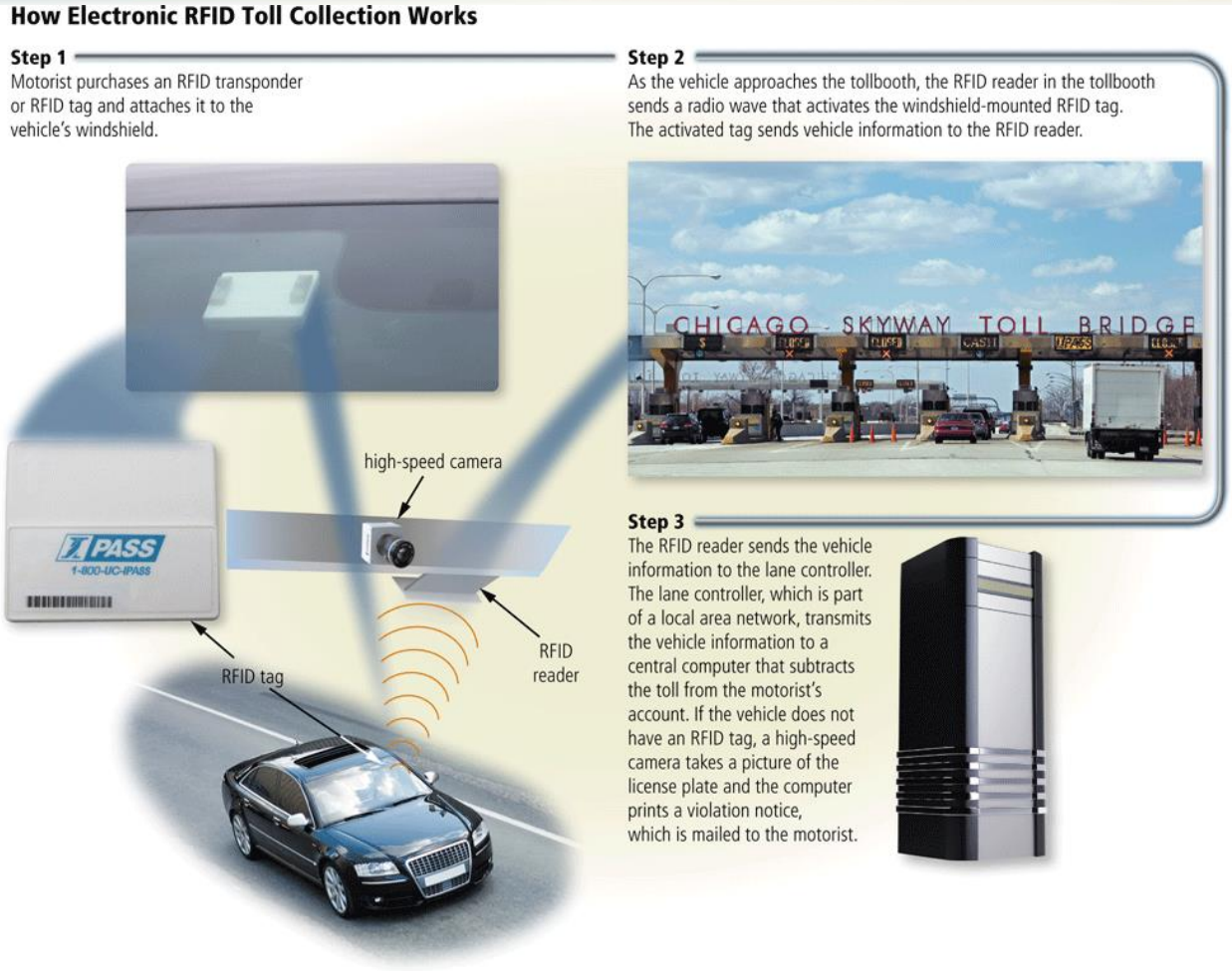
TCP/IP is a network protocol that defines how messages (data) are routed from one end of a network to another

Network Communications Standards and Protocols

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
- **LTE** is a network standard that defines how high-speed cellular transmissions use broadcast radio to transmit data for mobile communications
- **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

Network Communications Standards and Protocols



Network Communications Standards and Protocols

- **NFC** (near field communication) is a protocol, based on RFID, that defines how a network uses close-range radio signals to communicate between two devices or objects equipped with NFC technology

Communications Lines

Dedicated line

Cable

DSL

ISDN

FTTP

T-Carrier

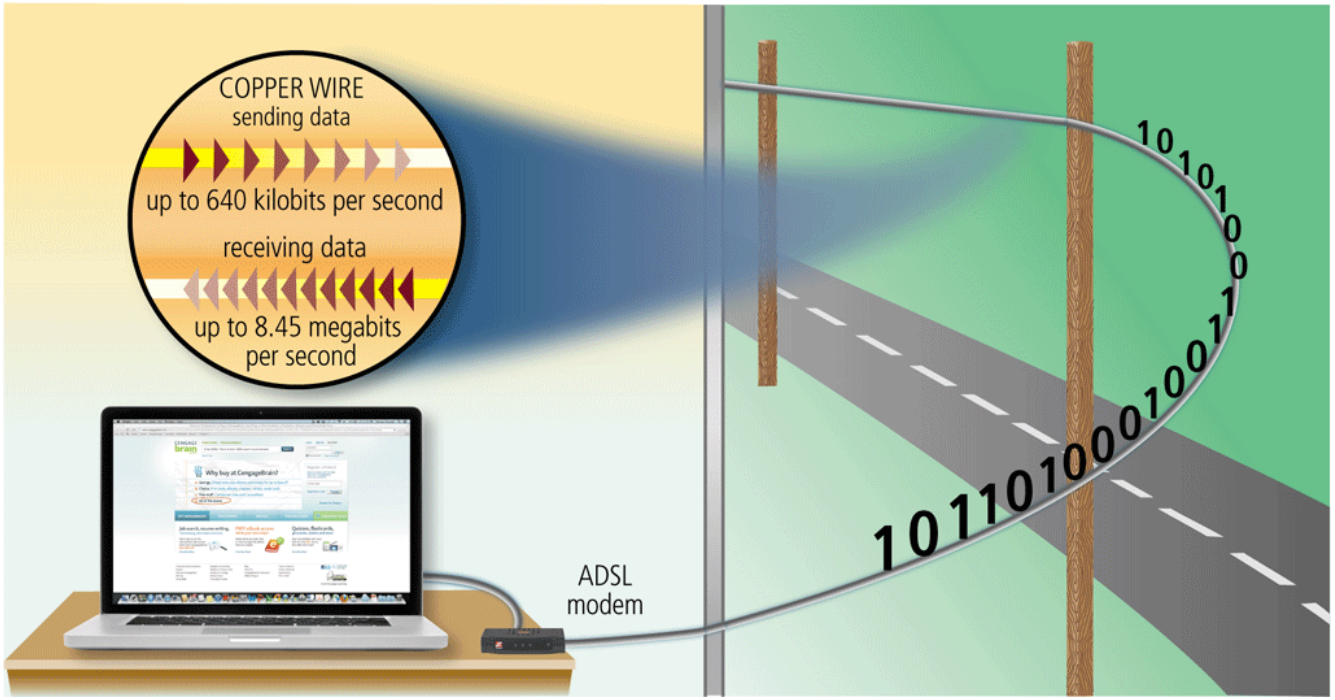
ATM

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

Communications Lines

- ADSL is a type of DSL that supports faster downstream rates than upstream rates

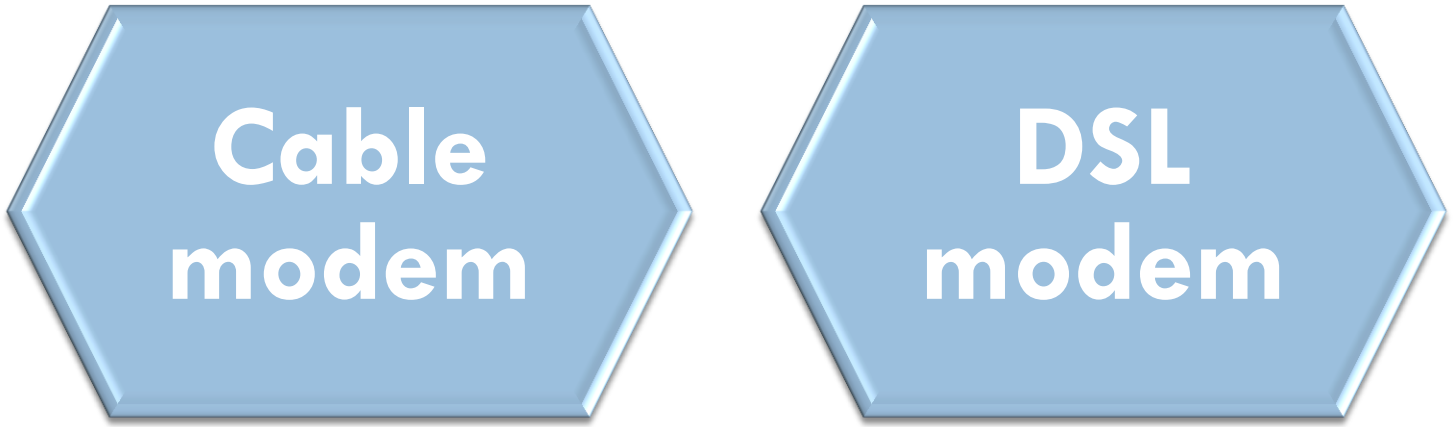


Communications Devices

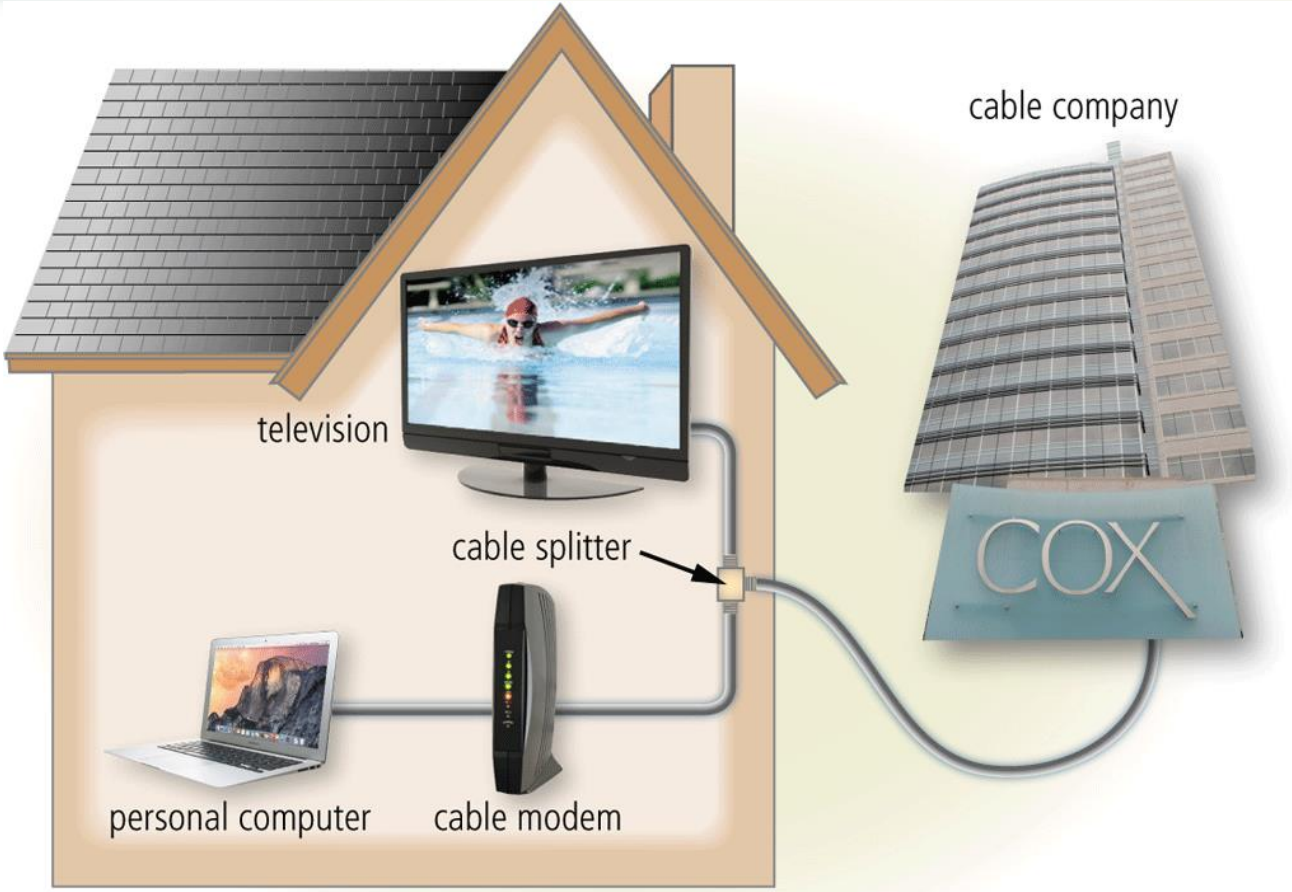
- A **communications device** is any type of hardware capable of transmitting data, instructions, and information between a sending device and a receiving device

Communications Devices

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



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

Communications Devices

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

Communications Devices

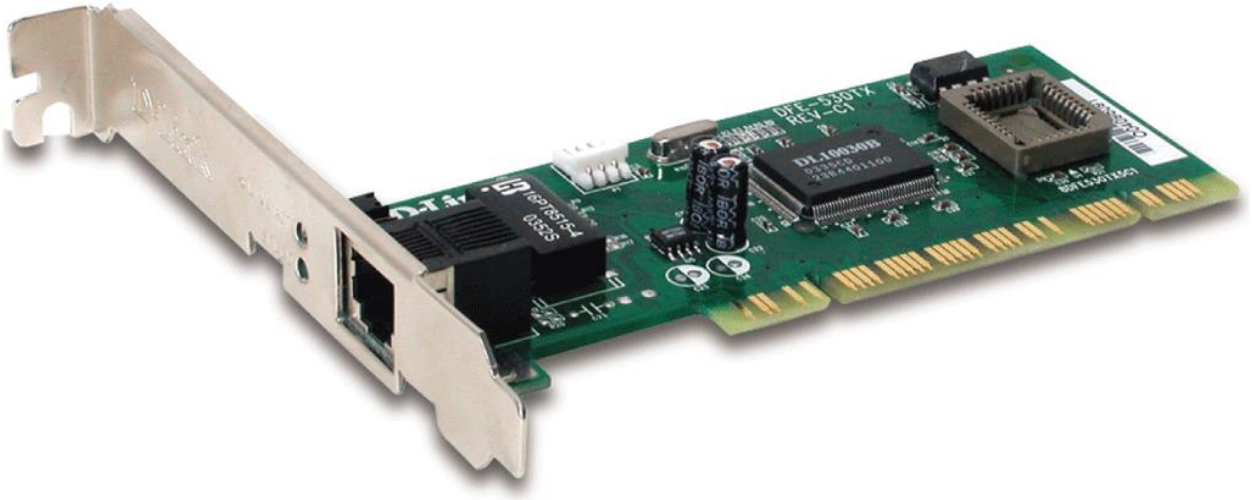
- A router connects multiple computers or other routers together and transmits data to its correct destination on a network

Communications Devices

- Some routers provide additional functionality:
  - Wireless router
  - Broadband router
  - Broadband wireless router
  - Mobile broadband wireless router

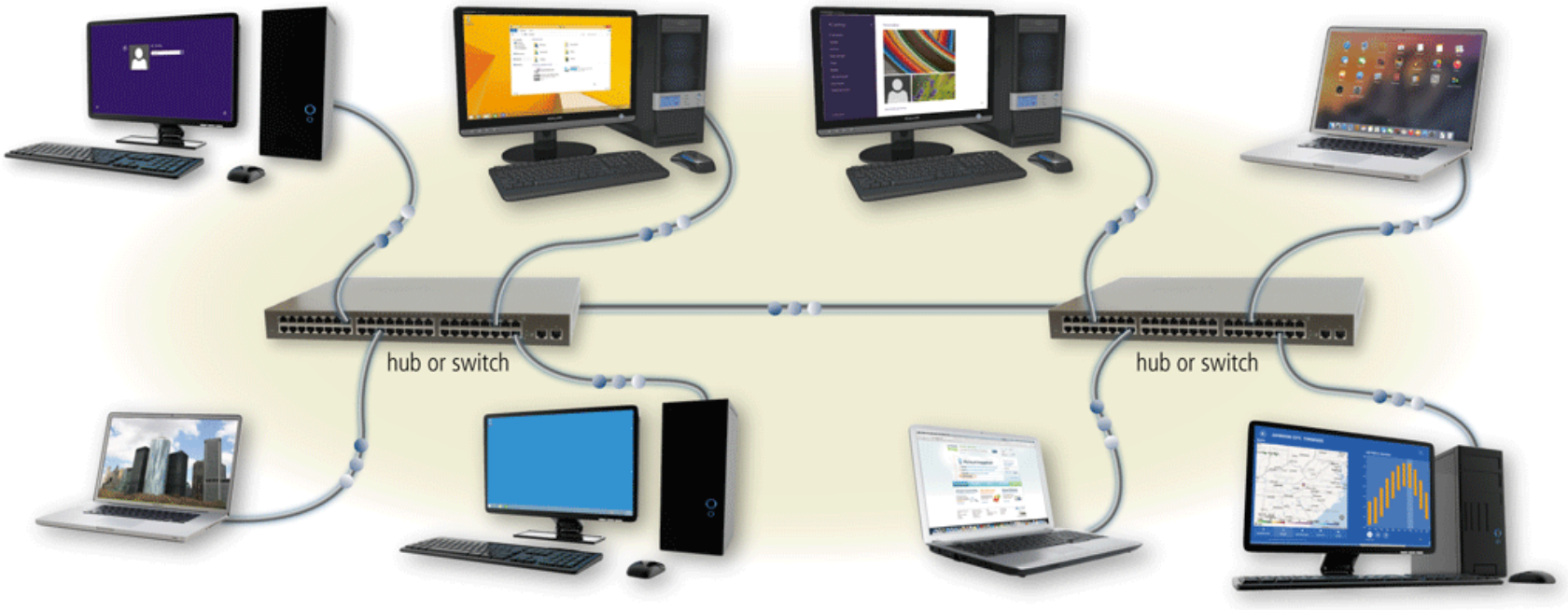
Communications Devices

- 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



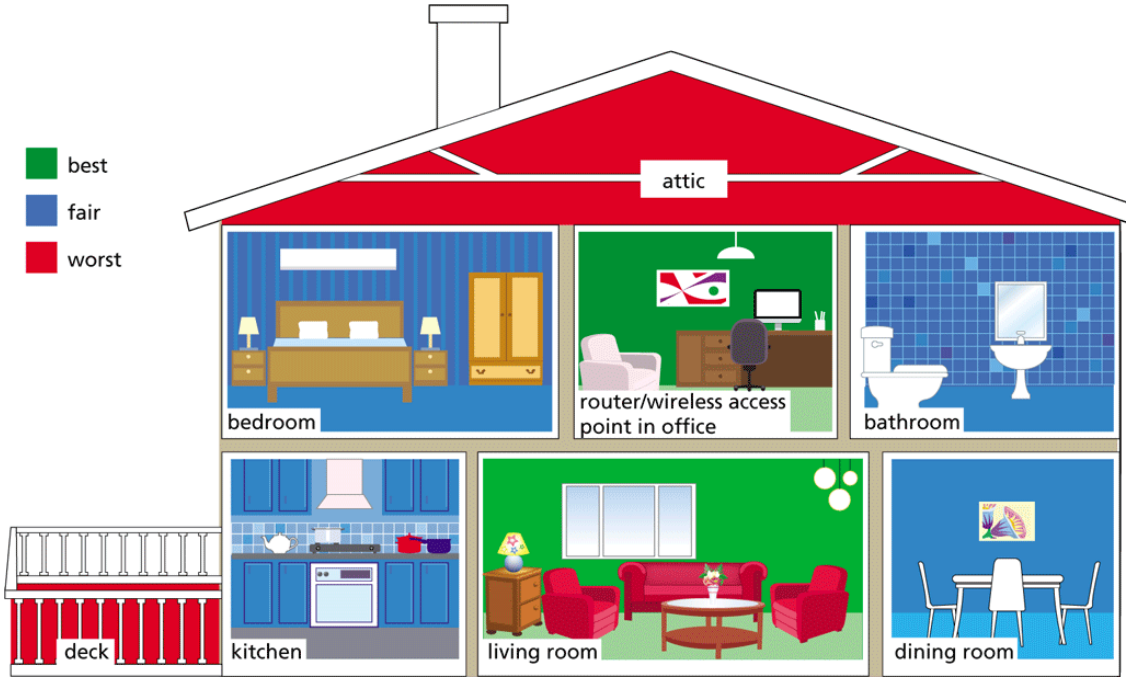
Communications Devices

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



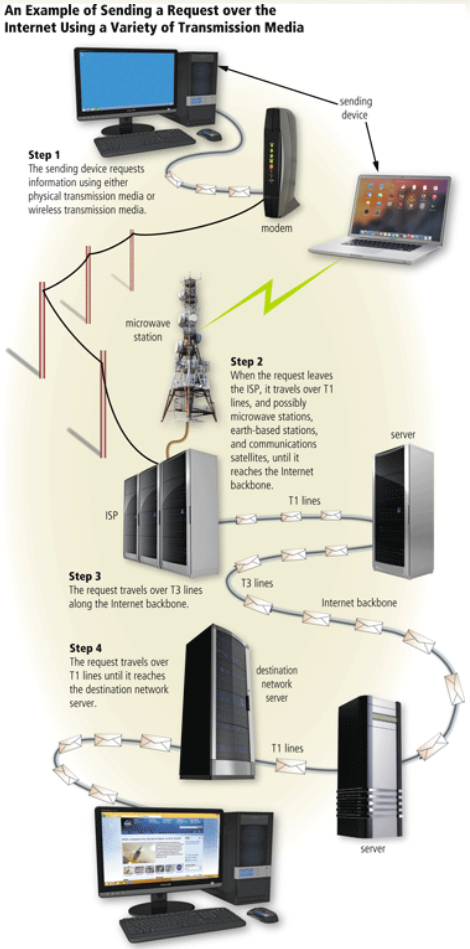
Home Networks

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



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



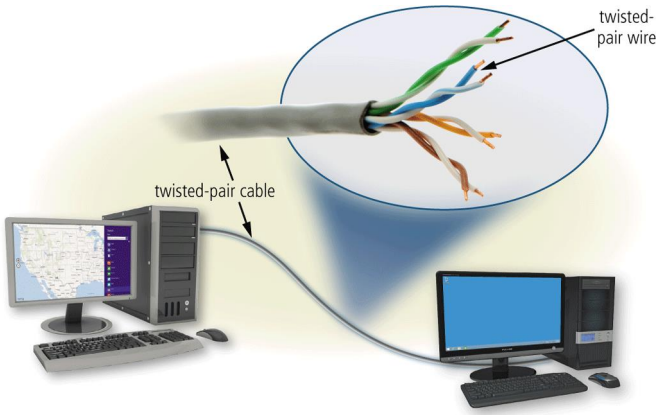
Physical Transmission Media

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

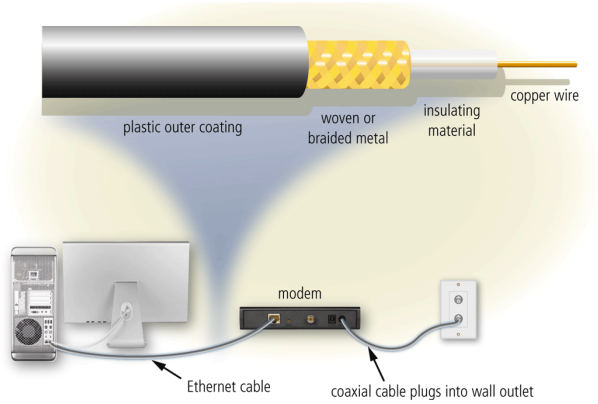
Type of Cable and LAN	Maximum Transfer Rate
Twisted-Pair Cable	
• 10Base-T (Ethernet)	10 Mbps
• 100Base-T (Fast Ethernet)	100 Mbps
• 1000Base-T (Gigabit Ethernet)	1 Gbps
• Token ring	4 Mbps to 16 Mbps
Coaxial Cable	
• 10Base2 (ThinWire Ethernet)	10 Mbps
• 10Base5 (ThickWire Ethernet)	10 Mbps
Fiber-Optic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

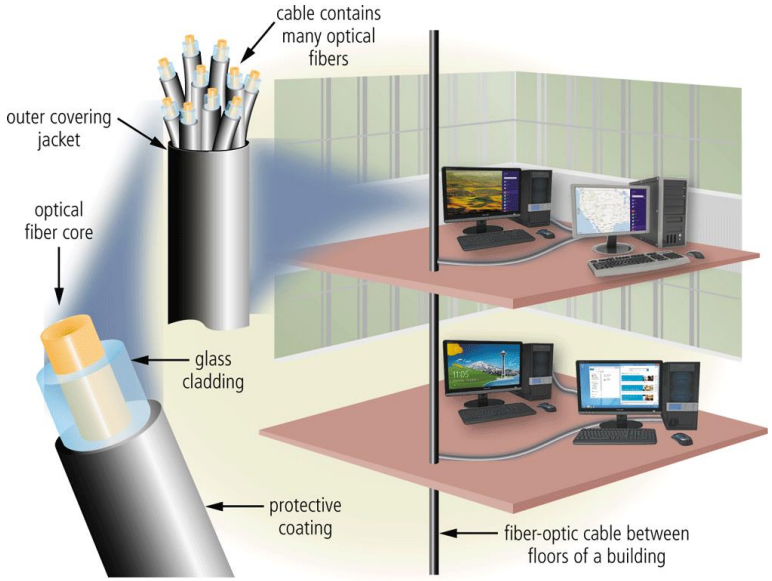
Twisted-pair cable



Coaxial cable



Fiber-optic cable

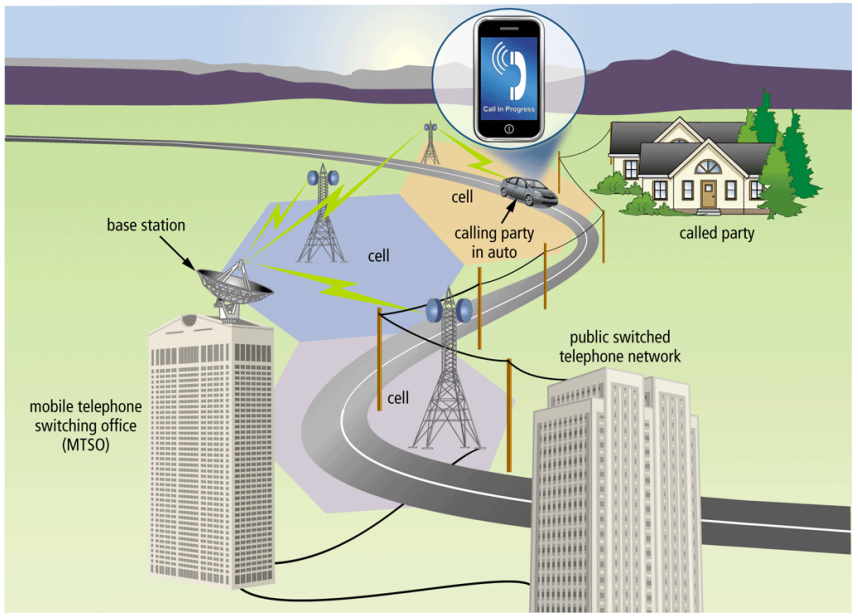


Wireless Transmission Media

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		Up to 10 Gbps
Communications satellite		Up to 2.56 Tbps

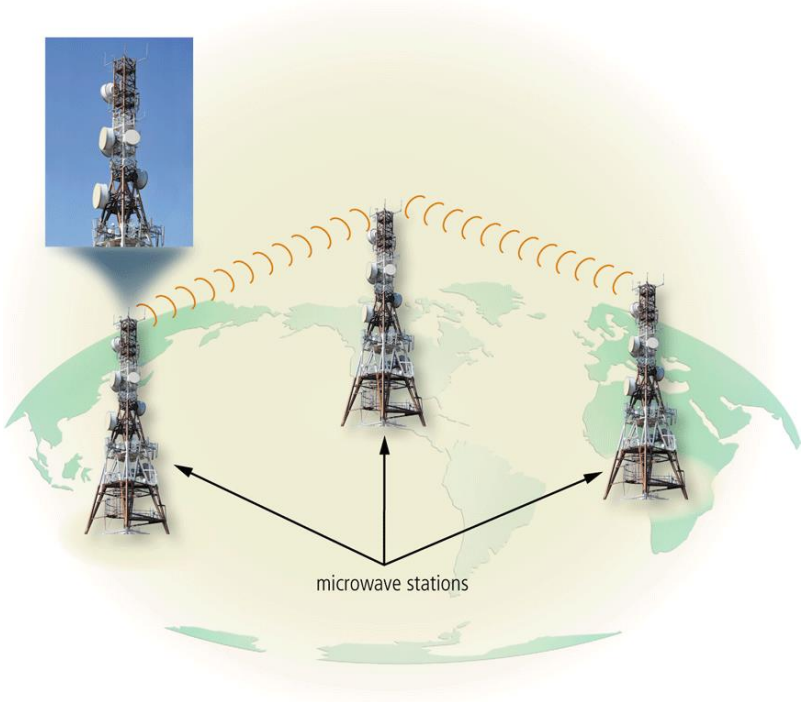
Wireless Transmission Media

- **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 in wide use for mobile communications



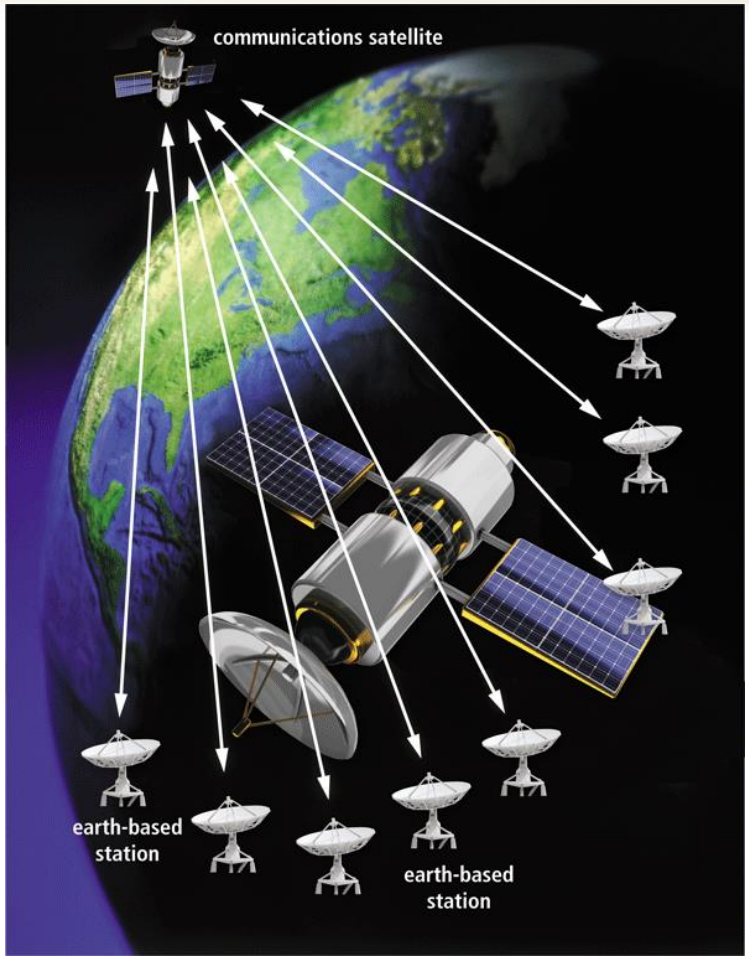
Wireless Transmission Media

- **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 to any number of earth-based stations



Wireless Transmission Media

- A **GPS** (global positioning system) 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

Wireless Transmission Media