

I.Ch 9 Communications and Networks

A.Competencies page 238

- 1.Discuss connectivity, the wireless revolution, and communications systems.**
- 2.Describe physical and wireless communications channels.**
- 3.Discuss connection devices, including modems, T1, DSL, cable modem, and satellite connections.**
- 4.Describe data transmission factors, including bandwidths and protocols.**
- 5.Discuss networks and key network terminology.**
- 6.Describe different types of networks including local area, metropolitan area, and wide area networks.**
- 7.Describe network architectures, including configurations and strategies.**
- 8.Describe organizational uses of Internet technologies, including intranets, extranets, and firewalls.**

B.Introduction page 239

- Communications has extended our uses for the microcomputer.
- Communication systems are the electronic systems that transmit data over communications lines from one location to another.
- You can set up a network in your home or apartment using existing telephone lines.
- Competent end users need to understand the concept of connectivity, the impact of the wireless revolution, and the elements of a communications system.
- They must also understand the basics of communications channels, connection devices, data transmission, networks, network architectures, and network types.

C.Communications page 240

- Computer communications is the process of sharing data, programs, and information between two or more computers.
- Some applications that depend on communication systems include:

- E-mail
- Instant Messaging
- Internet Telephony
- Electronic Commerce

1.Connectivity

- Connectivity is a concept related to using computer networks to link people and resources
- You can use telephone lines to link to nearly any computer in the world.

2.The Wireless Revolution

- The single most dramatic change in connectivity and communications in the past five years has been the widespread use of mobile or wireless telephones.
- In 2002, it was estimated that there are over 600 million mobile telephones in use worldwide, and by 2004, almost 1.5 billion (source: Newsweek, June 7, 2004 page 51 Next Frontiers: Your Next Computer).
- This wireless technology allows individuals to stay connected with one another from almost anywhere at any time.
- Originally developed for voice, the wireless revolution can transmit nearly any kind of information

3.Communications systems page 241

- Communications systems have four basic elements

a)Sending and receiving devices

- Often a computer or specialized communications device.

b)Communication channel (aka transmission medium)

- The actual connection that carries the message
- Can be a physical wire, or a wireless connection

c)Connection device (aka communications device

- Act as an interface between the sending and receiving devices. They convert outgoing messages into a digital format, and back again at the receiving (incoming) end.

d)Data transmission specifications

- The rules and procedures that coordinate the sending and receiving devices by precisely defining how the message will be sent across the communication channel.

D.Communication Channels page 242

1.Physical Connections

a)Telephone lines

- Typically use twisted pair cables, copper wires covered with an insulating jacket
- Relatively inexpensive way to connect devices
- Now being phased out by more technically advanced and reliable media

b)Coaxial cable

- A high frequency transmission cable, it can be used to replace multiple lines of twisted pair cable with one single, solid copper core.
- Can carry 80 times the capacity of one twisted pair cable

c)Fiber-optic cable

- Transmit data as a pulse of light through tiny tubes of glass
- Has over 26,000 times the capacity as one twisted pair cable
- Fiber optic cables are rapidly replacing twisted pair telephone wires

2.Wireless Connections

a)Infrared

- Use infrared light waves to communicate
- Known as a “line of sight” communication medium
- Commonly used to transmit data from a PDA to a desktop PC

b)Broadcast radio

- Uses special sending and receiving towers called “transceivers”
- The transceiver sends and receives many signals from different wireless devices
- Cellular telephones communicate using this technology
- WiFi (Wireless Fidelity aka 802.11 technologies) are used to build wireless local area networks

c)Microwave

- Uses high frequency radio waves
- Line of sight medium

- Transmit data over relatively short distances (within 10-20 miles) due to curvature of the earth
- Microwave signals are sometimes repeated at microwave stations with microwave dishes
- Bluetooth is a short-range wireless communication standard that uses microwaves to transmit data over very short distances (less than 33 feet). This may become popular for connecting peripheral devices to computers

d)Satellite

- Uses satellites orbiting up to 22,000 miles above the earth to send large volumes of data
- Uplink is sending data to a satellite
- Downlink is receiving data from a satellite
- GPS (Global Positioning Systems) use satellite data to pinpoint locations nearly anywhere on the earth. They are used for both military and commercial navigation systems

E.Connection Devices page 244

- A great deal of communication takes place over telephone lines
- Since telephone was used for voice, the technology typically used analog signals to transmit calls
- Computers use digital signals
- To connect computers via telephone lines, a system was needed to transmit data from digital to analog to digital again. Modems were created to do this.

1.Modems

- Modem is an acronym meaning “modulator – demodulator”
- Modulation converts a digital signal to an analog signal
- Demodulation converts an analog signal back to digital
- Speed at which modems communicate is measured in bits per second (bps).
- Typically modem speeds are 33.6 and 56 kbps (kilo bits per second)

a)External modem

- Modem circuitry housed in a separate case
- Connected to computer using a serial port, and to telephone using a phone wire and an RJ-11 jack

b)Internal modem

- Modem circuitry is housed inside the computer
- Connects to telephone wall jack using a phone wire

c)PC Card modem

- Serves as an “external modem” for a laptop
- Credit card sized expansion board to connect a laptop computer to a telephone line

d)Wireless modem

- Can be an external, internal, or PC Card modem, but rather than connecting to the telephone system using a wire, it connects via wireless technology (e.g. a cellular phone connection)

2.Connection Service page 245

- Standard telephone lines and modems are called dial-up services
- Large organizations use higher speed connections such as T1, T2, T3, and T4 lines.
- These support all digital communications, so they don’t use modems but do require special equipment.
- They tend to be expensive, but can transmit data at high speeds, e.g. 1.5 Mbps (1,500 kbps) almost 26 times faster than standard dial up service

a)Digital Subscriber Line (DSL)

- A high speed Internet service offered by phone companies

b)Cable modems

- A high speed Internet service offered by Cable TV companies

c)Satellite/air connection services

- Another competitor for high speed Internet services, often offered in areas where Cable or DSL is not available

F.Data Transmission page 246

- Several factors affect how data is transmitted across a communication medium, including:

1.Bandwidth

a)Voice band (aka voice grade or low bandwidth)

- Standard telephone connections
- Typical speed is 56 kbps
- Low cost, but lower speed

b)Medium band

- Bandwidth used in special leased lines to connect minicomputers and main frames as well as transmitting data over long distances
- Typically used by businesses and not individuals

c)Broadband

- Used for high-capacity transmissions
- Microcomputers with DSL, cable, or satellite connections use this
- Speeds are typically 1.5 Mbps, but can go higher

2.Protocols page 247

- Protocols are the rules for exchanging data across a network
- A standard for the Internet is the TCP/IP protocol – Transmission Control Protocol / Internet Protocol
- Essential features of TCP/IP is for identifying the sending and receiving devices, and reformatting the data so it can be sent via the Internet

a)Identification

- Every computer on the Internet has an IP address (Internet Protocol address). This is a numeric address such as 198.45.19.151
- A Domain Name Server (DNS) converts a text based address, e.g. <http://www.McGraw-Hill.com> into the IP address 198.45.19.151

b)Reformatting

- Information sent or transmitted across the Internet usually travels through numerous interconnected networks.
- The data is broken into a series of “packets” and sent separately over the Internet.
- At the receiving end, these packets are reassembled into the correct order, and the transmission is complete

G.Networks

- A computer network is a communication system that connects two or more computers so that they can exchange information and share resources.

1.Terms

a)Node

- Any device connected to a computer; a printer, a PC, storage device, etc.

b)Client

- A node that requests and uses resources available from other nodes

c)Server

- A node that shares resources with other nodes
- Dedicated servers include application servers, communication servers, database servers, file servers, printer servers or web servers

d)Hub

- The center or central node for other nodes
- It may be a server or a central connection point

e)Network Interface Card (NIC)

- An adapter card for connecting a node to a network

f)Network Operating System (NOS)

- Controls and coordinates the activities of all computers and other devices on a network

g)Distributed Processing

- A system in which computing power is located and shared at different locations

h)Host Computer

- A large, centralized computer, usually a minicomputer or a main frame

i)Network Manager

- A computer specialist, also known as a network administrator, responsible for maintaining the network operations

H.Network Types page 249

1.Local Area Networks (LANs)

- Networks with nodes that are in a close physical proximity

- Typically LANs span distances less than a mile and are owned and operated by individual organizations
- LANs offer two primary benefits: economy and flexibility – users can share key resources such as printers and data storage
- Network gateways allow users on a LAN to connect to other networks, e.g. a shared Internet connection
- The most common standard for connecting nodes is the Ethernet standard.

2.Home Networks page 250

- A “LAN in a home”
- Tend to be less sophisticated than business LANs
- Often set up as a wireless LAN (WLAN) to share Internet services
- WLAN require a wireless receiver or base station

3.Metropolitan Area Networks (MANs)

- The next step up from a LAN
- Span distances of up to 100 miles
- Frequently used as links between office buildings located throughout a city
- Typically not owned by a single organization
- Cellular phone systems expand the flexibility of MANs

4.Wide Area Networks (WANs) page 251

- Country wide and world wide networks
- Span distances greater than 100 miles
- Use microwave relays and satellites to reach users over long distances
- Internet is the widest of all WANs

1.Making IT Work for You – Home Networking page 252

- This section briefly describes how you can set up a WLAN at home so you can share a printer, storage, an Internet connection or other computer resources.

1.Installing the Network

- Wireless access cards are needed for the nodes
- May use Microsoft’s Network Wizards to set up the devices

2.Using the Network

- You can share files, printers, Internet access, or run multiplayer games

J.Network Architecture page 251

- Network architecture describes how a network is arranged and how resources are coordinated and shared

1.Configurations

- Topology: the arrangement of a network – four principal network topologies include the star, bus, ring, and hierarchical topology
- Star Network: a number of small computers or peripherals are linked to a central unit. Central unit is called a network hub. Communication control is maintained by polling. Often used for time-sharing systems (older technology used on minicomputers and mainframes)
- Bus Network: each device on the network handles its own communications control. There is no host. All communications travel along a connecting cable called a bus or backbone. Typically used with only a few computers are hooked together
- Ring Network: each device is connected to two other devices, forming a ring. There is no central server. It's used to link mainframe computers rather than microcomputers. Often used in distributed data processing systems since the processors can share data and other resources (tape drives, printers, etc.)
- Hierarchical network (aka hybrid network) consists of several computers hooked up to a central host, but they also might serve as smaller hubs to other computers. Often used in centralized office systems, where departmental microcomputers share a server, and these servers are tied to a mainframe.

2.Strategies page 255

- A network strategy is the way of coordinating the sharing of information and resources.
- Common network strategies are terminal, client server, and peer-to-peer systems
- Terminal network system: processing power is centralized on the server/host. Nodes are typically terminals (dumb terminals with just input – keyboard and output – monitor but no processing capabilities) or microcomputers with terminal emulators (allowing them to act like a terminal). Many airline reservations systems use this approach. An advantage is the centralized control of the system. The disadvantage is the lack of control and flexibility for the end user. These are slowly being phased out.
- Client server network systems: the server coordinates the main services, but the clients will do some processing. Napster has gone with this type of system – the server provided a list of music – and the clients would share the music. Client server networks work very well for large networks

- Peer-to-peer network system: nodes have equal authority to act as both clients and servers. Gnutella is a widely used peer-to-peer network for Internet music sharing. These are easy to install, but can have performance problems in very large networks.

K.Organizational Internets: Intranets and Extranets page 257

- Networks have grown in complexity over time.
- One approach to managing them is to apply Internet technologies to support communications between organizations using intranets and extranets.

1.Intranets page 258

- An intranet is a private network that resembles the Internet
- Intranets use browsers, web sites, and web pages, but the access is restricted to those users within the organization
- They are commonly used to provide information to the employees, such as job openings, human resource information, etc.

2.Extranets

- An extranet is a private network that resembles the Internet, but it connects more than one organization
- A company may set one up to link key suppliers and customers of the organization

3.Firewalls

- A firewall is a security system that is designed to protect the organizations network against external threats.
- Firewalls consist of both hardware and software to block access to those people who shouldn't connect with an Intranet or Extranet.
- Proxy servers act as a gateway to block IP traffic between the organizations network and the Internet. The proxy server looks at the addresses of all messages, and decides whether to let them pass or not.

L.A Look to the Future page 259

1.Toyota and Sony Create Wireless Robotic Car.

- This section provides some background about a concept car introduced by Toyota to showcase technology.

M. Visual Summary at a glance – Communications and Networks page 260

1. Communications

a) Connectivity

b) The Wireless Revolution

c) Communications Systems

(1) Sending and receiving devices

(2) Communication channel (transmission medium)

(3) Connection (communication) devices

(4) Data transmission specifications

2. Communication channels

a) Physical connections

b) Wireless connections

(1) Infrared

(2) Broadcast radio

(3) Microwave

(4) Satellite

3. Connection devices

a) Modems

b) Connection Service

4. Data transmission

5. Networks

(1) Node

(2) Client

(3)Server

(4)Hub

(5)NIC

(6)NOS

(7)Distributed processing

(8)Host computer

(9)Network manager (administrator)

6.Network Types

(1)Local area networks (LAN)

(2)Home networks – Wireless LANs

(3)Metropolitan area networks (MAN)

(4)Wide area networks (WAN)

7.Network Architecture

a)Configurations

b)Strategies

(1)Terminal network system

(2)Client/Server network system

(3)Peer-to-peer network system

8.Organizational Intranets

a)Intranets

b)Extranets

c)Firewalls

N.Key Terms page 263

- 1 802.11
- 2 analog signal

IEEE standard for WiFi networks
continuous wave form used for standard telephone transmissions

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3	application server		dedicated host computer which provides software programs to clients on a network
4	asymmetric digital subscriber line	ADSL	one type of DSL service used to provide high speed Internet service
5	backbone		the main bus or line connecting nodes on a network
6	bandwidth		term for measurement of capacity of a network connection
7	base station		device connected to a network which provides wireless signals to other devices on a WLAN
8	bits per second	bps	measurement typically used for network communication devices such as modems
9	Bluetooth		technology used for transmitting data short (less than 30 ft) using radio waves to wireless peripheral devices
10	broadband		term used to describe high speed communications such as cable, microwave, etc.
11	broadcast radio		communication using transceivers to send and receive wireless signals
12	bus		the main backbone or line connecting nodes on a network
13	bus network		network topology using devices connected directly to a bus or backbone
14	cable modem		routing device providing high speed Internet access for home and business users
15	cellular phone system		links portable phones to land based telephone lines
16	client		a node that requests resources from a network, e.g. a PC or printer
17	client/server network system		network with a main computer, and other nodes that request data and resources from it
18	coaxial cable communication		wire with a solid core of copper, often used for connecting computers on a wired network
19	channel		the wired or wireless connection for carrying data on a network
20	communication device		any equipment used to transmit data on a computer/communications network
21	communication server		dedicated host computer which provides connections for a computer network, e.g. provides link to a host or other networks
22	communication system		all the components used to connect computers and other devices so they can share data and resources
23	communications		process of sharing data and resources
24	computer network		communications system connecting two or more computers
25	connection device		equipment that acts as an interface between sending and receiving components on a network
26	connectivity		term used to describe the ability to share resources via a network, e.g. tie many resources into one system
27	data transmission specification		rules to determine how data will be shared and transmitted over a network
28	database server		dedicated server providing organized data, forms, reports and queries to clients on a network
29	dedicated server		host computer that specializes in performing specific tasks, such as printing, files sharing, etc.
30	demodulation		converting an analog signal from a standard phone line into a digital signal for use on a computer
31	dial-up service		term used to describe "slower" Internet service provided via standard phone lines
32	digital signal		discrete signal used by computers when communicating or transmitting data
33	digital subscriber line	DSL	specialized high speed line used to offer high speed Internet access via phone lines
34	dish		metallic bowl used to amplify radio signals, typically coming from a satellite or microwave system
35	distributed data processing system		method of splitting up the processing of data over several computers
36	distributed processing		method of splitting up the processing of data over several computers
37	domain name server	DNS	specialized computer that translates standard URLs into IP addresses, e.g. www.McGraw-Hill.com to 198.45.19.151
38	downlink		process of receiving data from a satellite
39	electronic commerce		buying and selling of goods electronically
40	e-mail		provides a fast, efficient alternative to traditional mail by sending and receiving electronic documents
41	Ethernet		common standard for connecting nodes on a network
42	Ethernet LAN		a local area network set up using the common Ethernet standard for connecting devices
43	external modem		circuitry housed in a separate unit used to transmit data over a standard phone line
44	extranet		"private" network using Internet technologies for an organization and its suppliers and customers
45	fiber-optic cable		glass tube used to transmit data using laser light; transmits data very quickly
46	file server		dedicated computer used to deliver data files to clients on a network
47	firewall		specialized hardware and software used to restrict access to a network
48	global positioning system		determining the location anywhere on the earth via satellite signals
49	global positioning system	GPS	determining the location anywhere on the earth via satellite signals
50	Gnutella		popular Internet peer-to-peer networking system often used to share music and multimedia files
51	hierarchical network		complex network using a series of connected servers tying together many nodes
52	home network		connecting a few computing devices in a home; typically done using WLAN technology
53	host computer		the central server, typically a mainframe, on a computer network

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54	hub		the central connecting point on a network, can be a computer or just a connection for the communication channel
55	hybrid network		complex network using a series of connected servers tying together many nodes
56	infrared		technology used to transmit data short distances using invisible light waves
57	instant messaging		communication service to allow immediate text & video messages via the Internet
58	internal modem		circuitry housed in the system unit used to transmit data over a standard phone line
59	Internet telephone		telephone system using Internet technologies, typically resulting in reduced costs
60	intranet		"private" network using Internet technologies for an organization but restricted to outsiders
61	IP address (Internet Protocol address)		a unique numeric address for each node on a network
62	line of sight communication		light or radio waves requiring a clear connection between devices, e.g. microwave or infrared
63	local area network	LAN	small network of computers
64	low bandwidth		slower speed communication channel, such as standard phone lines
65	medium band metropolitan area network		certain frequencies used to transmit data, faster than voiceband, but slower than broadband
66	network	MAN	computer/communications system set up in a city
67	microwave		high speed radio wave, often used for transmitting data over a communication network
68	microwave station		location holding equipment to repeat high speed radio waves
69	modem		device used to convert digital to analog to digital signals; permits computers to communicate via standard phone lines
70	modulation		converting a digital signal to an analog signal
71	Napster		former peer-to-peer network for sharing music via Internet
72	network administrator		person(s) in charge of maintaining the quality of a computer/communications network
73	network architecture		the design for a computer network
74	network gateway		device allowing different networks to connect to one another
75	network hub		device to connect several communication lines on a network
76	network interface card	NIC	a circuit board used to control/interface the communication channel with the node on the network
77	network manager		person(s) in charge of maintaining the quality of a computer/communications network
78	network operating system	NOS	system software used to control a computer network
79	node		any device connected to a network, e.g. a PC or a printer
80	packet		small number of bytes with an address and message used to transmit data over a network
81	PC card modem		credit card sized device to provide external modem access for a notebook computer
82	peer-to-peer network system		simple network system in which ever node can act as both a client and a server
83	polling		checking to see if nodes on a network have something to transmit
84	printer server		dedicated computer used to control the printing on a network
85	protocol		rules to determine how data will be shared and transmitted over a network
86	proxy server		dedicated server used to control packets sent and received on a network - acts as a gateway or firewall for the network
87	receiving device		communication equipment which gets data and sends it on to a computer
88	regional network		covers several states or cities with computer network access
89	ring network		network design which connects computers with each other
90	satellite		equipment that orbits the earth and can be used to send communication signals
91	satellite/air connection service		network provider using satellite technology to send and receive data
92	sending device		communication equipment which transmits data from a computer
93	server		specialized computer that processes file, print, database, etc. requests
94	star network		network design with a central host which handles all the communication requests on the network
95	strategy		way to coordinate the method for sharing data and resources on a network, e.g. terminal, peer to peer, client server
96	T1, T2, T3, T4 lines		different grades of specialized phone lines for transmitting high speed voice and data
97	TCP/IP (transmission control protocol/Internet protocol)		standard rules used on the Internet to send and receive data
98	telephone line		connection for voice and data traffic
99	terminal network system		system with a central host and nodes with input and output capability

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100	time-sharing system		older technology used to share the amount of processing time on a central host
101	topology		the configuration of a network, e.g. star, bus, ring, and hierarchical
102	transceiver		a radio receiver/transmitter
103	transfer rate		how fast devices on a network can send and receive data
104	transfer speed		how fast devices on a network can send and receive data
105	transmission medium		a communication channel, wired or wireless
106	twisted pair		two thin copper wires covered with insulation used to transmit voice and data traffic
107	uplink		sending data to a satellite
108	voice grade		low level bandwidth, typically used with standard phone lines
109	voiceband		low level bandwidth, typically used with standard phone lines
110	Web server		dedicated host for sending HTML pages over a network
111	wide area network	WAN	large, country wide communications system
112	Wi-Fi (wireless fidelity)		technology using transceivers for sending data without a physical connection, often used for home networks
113	wireless LAN	WLAN	technology using transceivers for sending data without a physical connection, often used for home networks
114	wireless modem		special equipment to send data over a wireless telephone system e.g. over a cell phone network
115	wireless receiver		network device to broadcast radio waves to nodes on a network

O.Chapter Review page 264

1.Crossword

a)Across

4	NETWORKGATEWAY	Device that allows links between LANs
5	BUSNETWORK	Each device in the network handles its own communications
7	MODULATION	Process that converts digital to analog
9	HUB	Central node for other nodes
11	BLUETOOTH	Short range wireless communication standard
14	CLIENT	Node that requests and uses resources available from other nodes
15	PACKETS	Pieces of a message sent over the Internet
16	UPLINK	Relating to sending data to a satellite
17	ANALOG	Not digital

b)Down

1	BANDWIDTH	Measurement of the width of the communication channel
2	NODE	Any device that is connected to a network
3	BASESTATION	Interprets and routes incoming radio frequencies
6	DOWNLINK	Relating to receiving data from a satellite
8	NIC	Network Interface Card
10	DSL	Uses existing telephone lines to provide high-speed connections
12	TOPOLOGY	Configuration of a network
13	GPS	Global Positioning System

2.Multiple Choice page 265

1	C	GPS
2	C	Dial-up service
3	D	Modem
4	E	Bandwidth
5	E	IP address
6	B	NOS
7	A	WLANs

8	A	Topology
9	A	Bus
10	B	Peer-to-peer

3. Matching page 266

communication system	F	1	Transmits data over communication lines between locations
infrared	M	2	Wireless connection that uses light waves over short distances
coaxial cable	E	3	High frequency transmission cable with a single solid-copper core
Bluetooth	C	4	Uses microwaves to transmit data over short distances up to 33 feet
transfer speed	S	5	Measured in bits per second
ADSL	A	6	Type of DSL
bandwidth	B	7	Measurement of the width of a communication channel
TCP/IP	Q	8	Standard protocol for the Internet
protocol	O	9	Rules for exchanging data between computers
packets	N	10	Broken-down parts of a message sent over the Internet
host	K	11	A large centralized computer
dedicated	H	12	The type of server that performs specific tasks Communications system connecting two or more computers that work together to exchange information and share resources
computer network	G	13	
client	D	14	A node that requests resources from other nodes
wide area network	T	15	Countrywide and world wide networks
topology	R	16	The configuration of a network
star	P	17	This type of network links computers and other devices to a central unit
distributed processing	I	18	System in which computing power is located and shared at different locations
hybrid network	L	19	Also know as a hierarchical network
firewall	J	20	Protects network from external threats

4. Open-ended

a) Define and discuss connectivity, the wireless revolution, and communications.

- Connectivity provides incredible power to you while at and away from your desk. It is a concept related to using computer networks to link people and resources. For example, you can link many computer/communication devices together to access data from almost anywhere.
- The wireless revolution extends wireless voice communication to computer communications to free users from their desks. One of the most dramatic changes in connectivity and communications in the past five years has been the widespread use of mobile telephones. Wireless communications are now being used to support all types of communications, especially computer communications.
- (Computer) Communication is the process of sharing data, programs, and information between two or more computers. Each has four basic elements including sending & receiving devices, communication channels, connection devices, and data transmission specifications.

b) Identify and describe the various physical and wireless communication channels.

- Physical connections include
 - telephone lines: twisted pair copper wires often referred to as POTS – Plain Old Telephone System
 - Coaxial cable: high frequency single strand copper cable
 - Fiber-optic cable: thin tubes of glass used to transmit high volumes of data via light rather than electricity.
- Wireless channels include:
 - Infrared: line of sight communications to communicate over a short distance, e.g. notebooks or PDAs to desktop computers
 - Broadcast radio: use special sending and receiving towers called transceivers. Used for cell networks and 802.11 devices
 - Microwave: use high frequency radio waves for line of sight communications, e.g. sending data between buildings or remote Internet access
 - Satellite: sends large amounts of data via space uplinks and downlinks, e.g. GPS systems to provide location data

c) Identify the standard Internet protocol and discuss its essential features

- Computer communication protocols are rules used to transmit data over a network
- TCP/IP (Transmission Control Protocol / Internet Protocol) is a key standard protocol for communicating via the Internet. It has two key parts, one for identifying devices connected on the internet via DNS addressing, and second, the reformatting of information into packets to be sent over the network.
- One of the keys to TCP/IP is it is an open standard compared to some network standards that are vendor specific.

d) Define and discuss the four principal network topologies

- A network topology describes the general arrangement or configuration of a computer network. Four principal topologies include:
 - Star: number of computers & peripherals (nodes) are connected to a central unit (host or hub)
 - Bus: no host computer, each device handles its own communications by being connected via a backbone (bus) cable. Often used when connecting just a few devices.

- Ring: each device (node) is connected to two other devices, forming a ring, with no central server
- Hierarchical: aka hybrid, consists of several computers connected to a host, yet these computers can also act as a hub for additional devices.

e) Define and discuss the three most common network strategies

- Terminal Network Systems: one host (typically a mainframe) connected to a number of dumb/smart terminals (devices with or without a processor, typically without storage). Examples include airline reservation systems
- Client/Server Network Systems: one server connected to several client computers – the server typically holds key files, applications, and/or provides print services.
- Peer-to-Peer Network Systems: several computers tied together for file sharing, but none acts as the central server, often used for small networks and/or sharing files via the Internet.

P. Using Technology page 267

1. Home Networking

- This section refers you to Making IT Work for You: Home Networking on the text's CD and/or Web site
- Describe the setup of a wireless base station: you need to install the wireless adapters in your computer, and configure them to work with the wireless base station.
- Four common uses of a home network: sharing files, printers, Internet access, and playing multiplayer games
- Names of the folder: depends on how you set up your own folders, e.g. shared documents, etc.

2. Distributed Computing

- Encourage students to check out the text's Web site and select Using Technology to link to a site that features distributed computing.
- You can learn how to use and donate computing power to a distributed computing network.

Q. Expanding Your Knowledge page 268

1. How Wireless Home Networks Work

- Focus is on setting up home networks and discussing terms such as:
- Nodes – the devices attached to the home network

- Base stations – the radio stations for broadcasting network signals
- Wireless cards – the transceiver needed on each node in the network

2.Napster and Gnutella

- Have students view the CD expansion on “Napster and Gnutella”.
- Compare the file sharing systems based on Napster’s client/server approach vs. Gnutella’s peer-to-peer approach.

R.Building Your Portfolio page 269

1.User Connection

- Students are asked to write a one page paper titled “Internet Connections” and answer questions discussed in the text, such as
a) Define voiceband, medium band, and broadband, etc.

2.Digital Rights Management

- This section encourages students to use the Internet to research “Digital Rights Management” and write a one page paper looking at the issues involved with digital rights (e.g. online piracy, just compensation, free sharing of ideas, etc.).