Chapter 8
Networking and Digital Communication

Tomorrow's Technology and You 8/e

Chapter 8
Objectives

- ✓ Describe the basic types of technology that make telecommunication possible.
- ✓ Describe the nature and function of local area networks and wide area networks.
- ✓ Discuss the uses and implications of email, instant messaging, blogging, teleconferencing, and other forms of online communication.




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Chapter 8
Objectives (continued)

- ✓ Explain how wireless network technology is transforming the ways people work and communicate.
- ✓ Describe current and future trends in telecommunications and networking.




Basic Network Anatomy

Basic Network Anatomy

- A computer **network** is any system of two or more computers that are linked together.
- How is networking important?
  - People share computer hardware, thus reducing costs.
  - People share data and software programs, thus increasing efficiency and production.
  - People work together in ways that are otherwise difficult or impossible.




Basic Network Anatomy

- A computer **network** is any system of two or more computers that are linked together.
- How is networking important (cont'd)?
  - Allows for distributed computing on large scale




Basic Network Anatomy

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- How is networking important (cont'd)?
  - Allows for distributed computing on large scale
    - as opposed to centralized computing.




Basic Network Anatomy

Networks Near and Far

- In a **local area network (LAN)** computers are physically close to each other, usually in the same building.
  - Computers are linked within a building or cluster of buildings.
  - Each computer and peripheral is an individual node on the network.
  - Nodes are usually connected by cables, which may be either twisted pair (copper wires) or coaxial cable.




Basic Network Anatomy

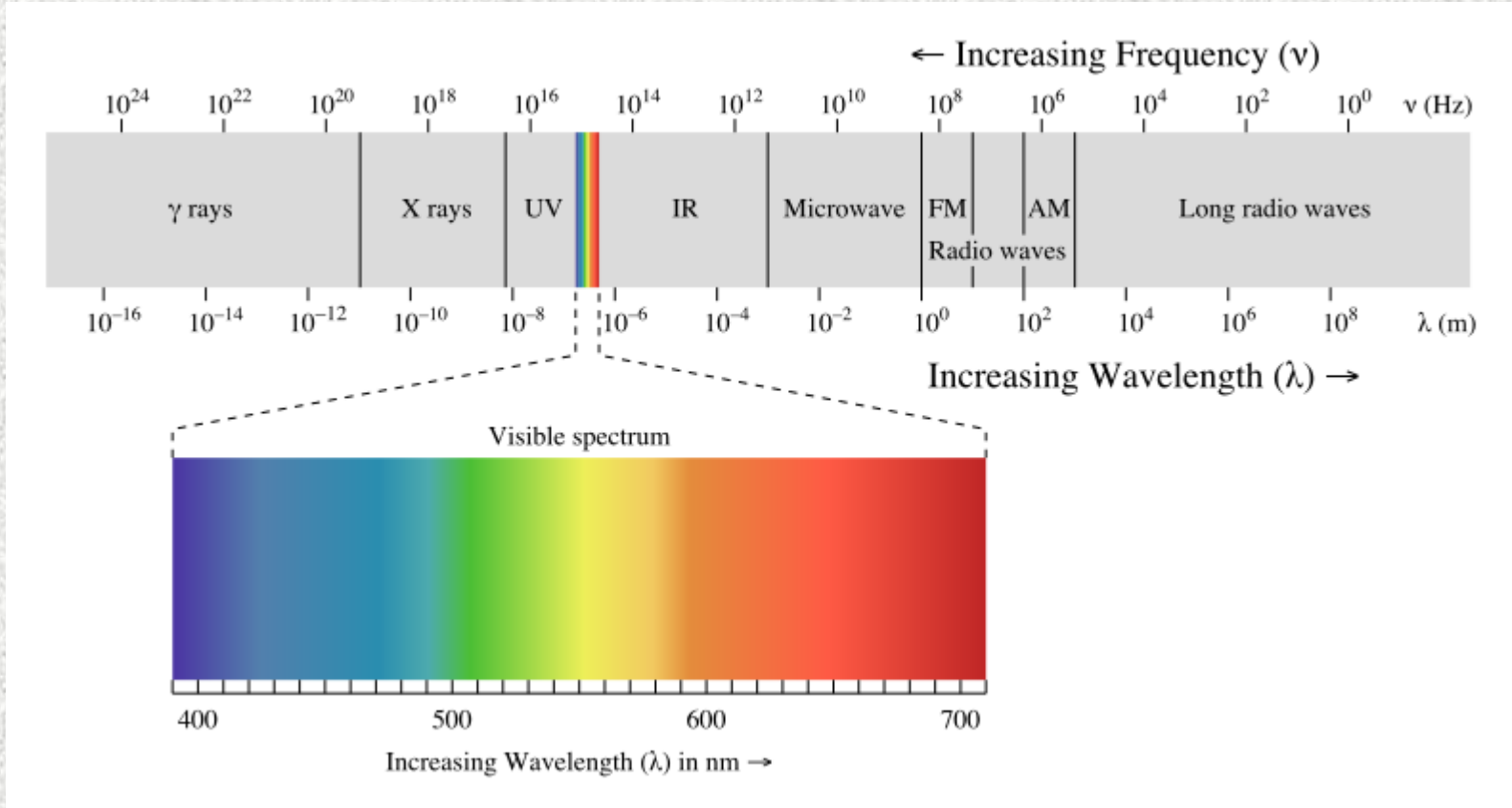
Networks Near and Far

- In a **wireless network** each node has a tiny radio (or, less commonly, infrared) transmitter connected to its network port.
  - Computers send and receive data through the air rather than through cables.

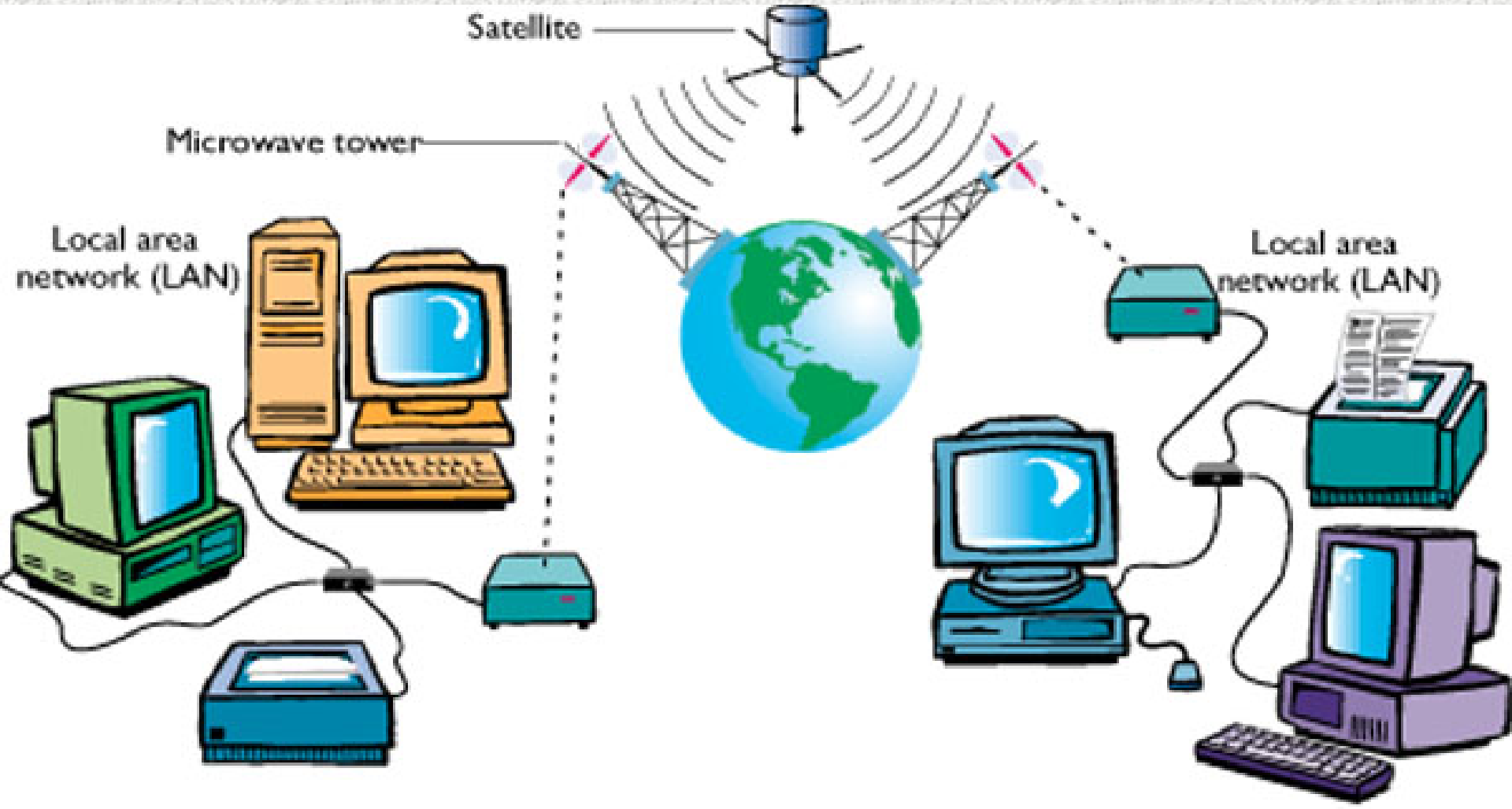



Basic Network Anatomy

Networks Near and Far



Basic Network Anatomy



Basic Network Anatomy

- A **metropolitan area network (MAN)** links two or more LANs within a city.
- A **wide area network (WAN)** extends over a long distance.
  - Each networked LAN site is a node on the WAN.
  - Data transmitted over common pathways called a **backbone.**




Basic Network Anatomy

- Communication frequently happens between LANs and WANs
  - **Routers:** hardware devices or software programs that route messages as they travel between networks
  - **Mesh networks:** an alternative to today's networks; usually, wireless and ad-hoc
    - Used to set up small, temporary communication systems
    - Example: emergency personnel use at fire scenes to coordinate actions

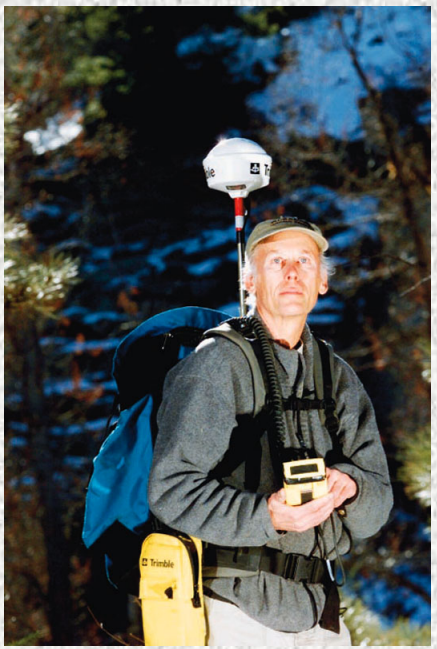



Basic Network Anatomy

Specialized Networks: From GPS to Financial Systems

Global Positioning System (GPS)

- GPS is a specialized network developed by U.S. Department of Defense.
- It includes 24 satellites that circle the
- Earth.
- Each satellite contains a computer, an
- atomic clock, and a radio.
- On the ground, a **GPS receiver** can use signals broadcast by three or four visible satellites to determine its position.



Basic Network Anatomy

- Networks that keep our global financial systems running:
  - **Automated Teller Machine (ATM):** a specialized terminal linked to a bank's main computer through a commercial banking network

Basic Network Anatomy

Basic Network Anatomy

The Network Interface

- A **network interface card (NIC)** permits direct network connection:
  - Adds an additional serial port to the computer
  - Controls the flow of data between the computer's RAM and the network cable

Basic Network Anatomy

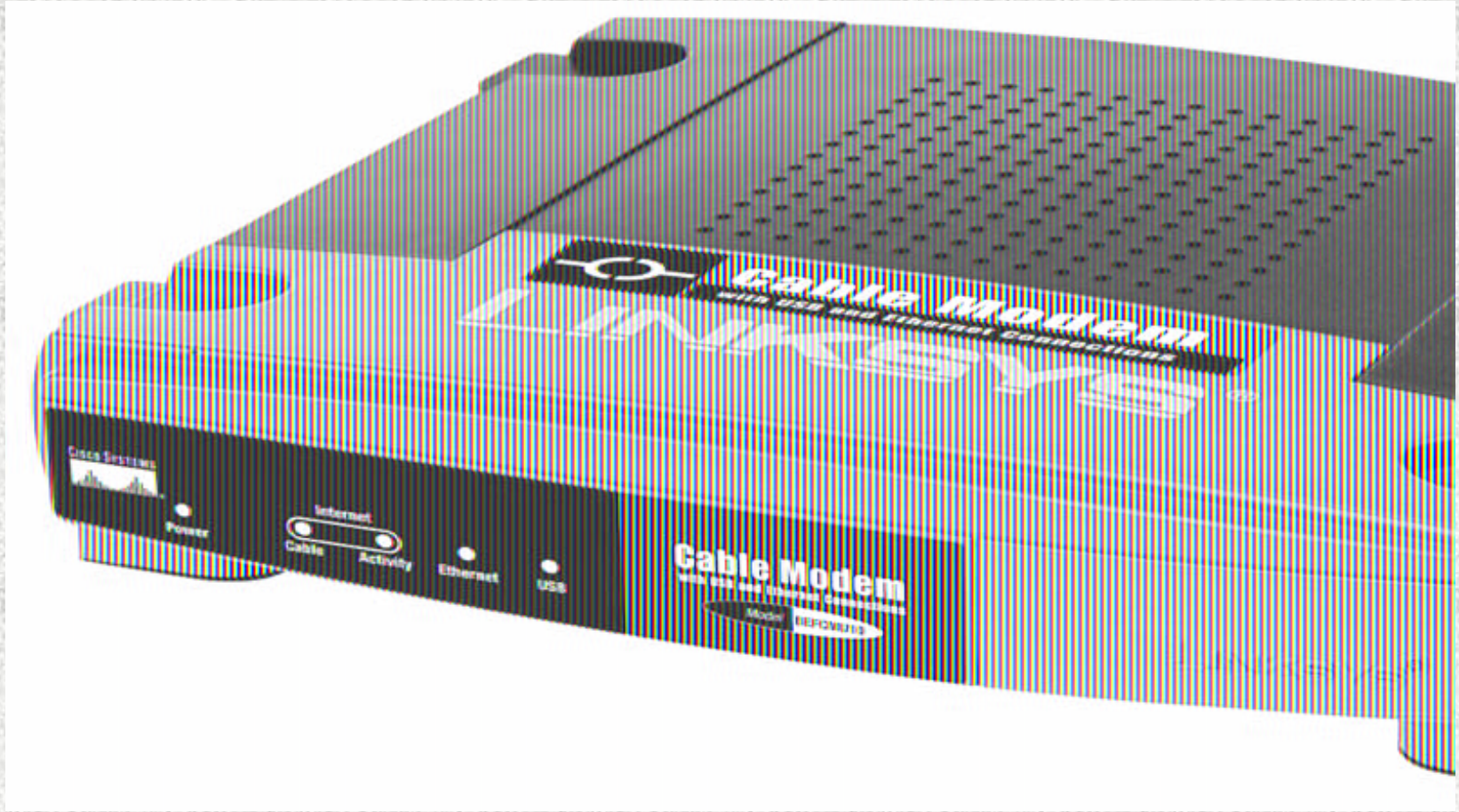
The Network Interface

- The most common types of networks today require some kind of Ethernet card or port in each computer.
  - Ethernet is a popular networking architecture developed in 1976 at Xerox.
  - Most newer PCs include an Ethernet port on the main circuit board, so they don't require NICs to connect to Ethernet networks.




Basic Network Anatomy

Communication via Modem

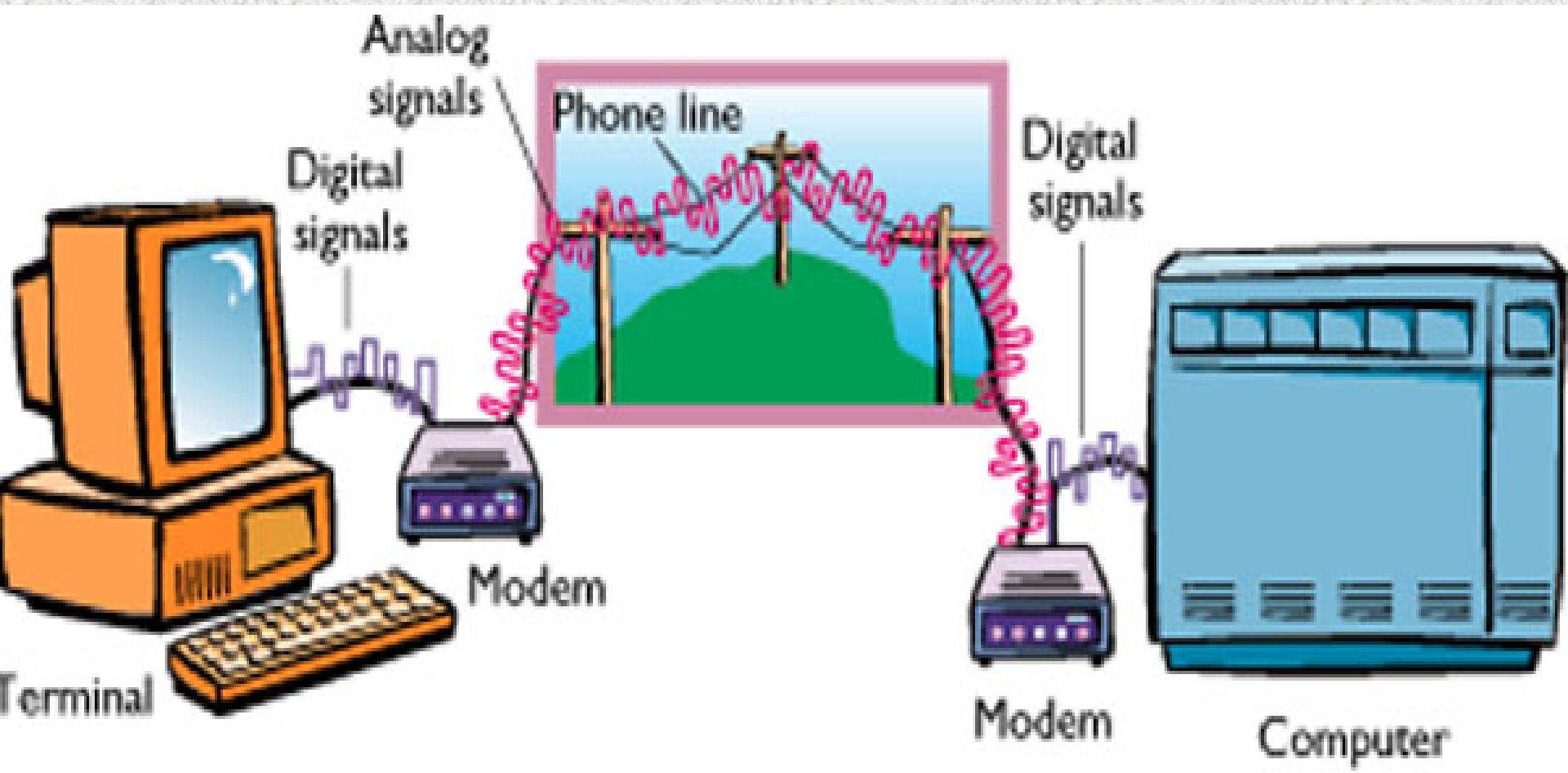


Basic Network Anatomy

Communication via Modem

- Voice-band **modem:** a hardware device that connects a computer's serial port to a telephone line (for remote access)
- May be internal on the system board or external, sitting in a box linked to a serial port
- Modem transmission speed measured in bits per second (bps)
- Transmit at 28,000 bps to 56.6K bps (more with compression – up to 1 Mbps)

Basic Network Anatomy



Basic Network Anatomy

- **Broadband connection**—a connection with much greater bandwidth than modems have
  - DSL (up to 20 Mbps) uses standard phone lines and is provided by phone companies in many areas.
  - Cable modems provide fast (up to 400 Mbps) network connections through cable television networks in many areas.
  - High-speed wireless connections can connect computers to networks using radio waves rather than wires.
  - Satellite dishes can deliver fast (up to 1 Gbps) computer network connections as well as television programs.

Basic Network Anatomy

Fiber Optic Connections

- DSL and cable modems have nowhere near the bandwidth of the **fiber optic cables** that are replacing copper wires in the worldwide telephone network.
- A fiber optic network can rapidly (up to 1 Gbps) and reliably transmit masses of multimedia data at the same time that it's handling voice messages.




Basic Network Anatomy

Wireless Network Technology

- A lightning-fast (11 Mbps as a minimum supported standard) network connection to your desktop is of little use if you're away from your desk most of the time; when bandwidth is less important than mobility and portability, wireless technology can provide practical solutions.

  - The fastest growing wireless LAN technology is known as **Wi-Fi** or **802.11b.**

Basic Network Anatomy

- **Bluetooth:** another type of wireless technology
  - Named for a Danish king who overcame his country's religious differences
  - Overcomes differences between mobile phones, handheld computers, and PCs, making it possible for all of these devices to communicate with each other regardless of operating system
  - Speed is up to 24 Mbps




Basic Network Anatomy

Communication Software

- **Protocol** is a set of rules for the exchange of data between a terminal and a computer or between two computers.
- **Communication software** implements a protocol that is followed by the computer's hardware.




Basic Network Anatomy

- Communication software takes many forms:
  - **Network operating system** (NOS)
    - System handles communications among many workstations.




Basic Network Anatomy

- Communication software takes many forms:
  - **Client/server model**
    - One or more computers act as dedicated servers and all the remaining computers act as clients.



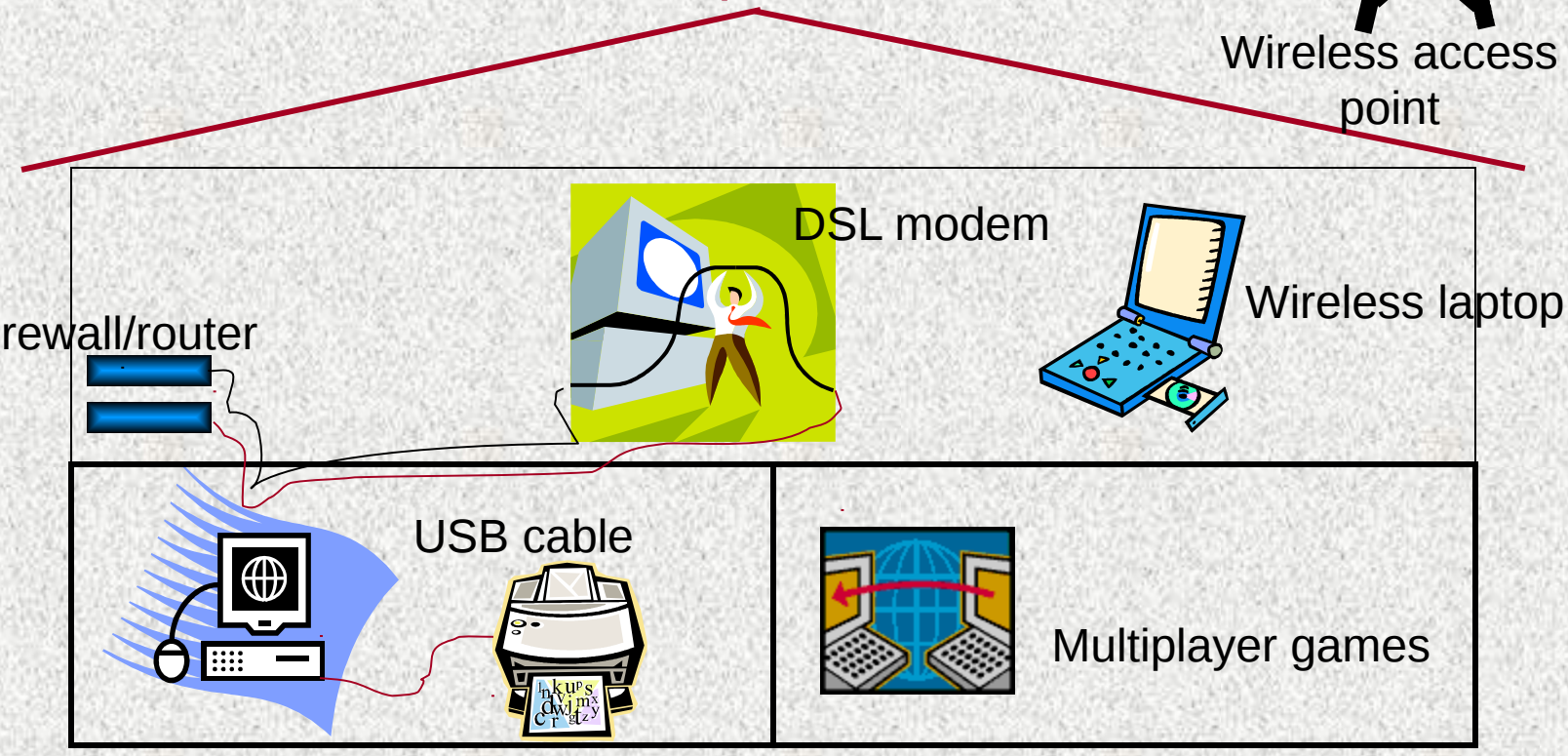

Basic Network Anatomy

- Communication software takes many forms:
  - **Peer-to-peer model**
    - Every computer on the network is both client and server.
  - Many networks are **hybrids**, using features of the client/server and peer-to-peer models.




Basic Network Anatomy

A Home Computer Network



Interpersonal Computing: From Email to Social Networks

The Many Faces of Email

- Email systems enable you to send and receive messages to others on the network.
- Web-based email systems and many older UNIX-based programs require that read and unread messages be stored in post office boxes or folders on the remote mail servers.
- Many email messages are plain ASCII text.

Interpersonal Computing: From Email to Social Networks

Mailing Lists

- **Mailing lists** enable you to participate in email discussion groups on special-interest topics.
- Subscribing to a busy list might mean receiving hundreds of messages each day.
  - To avoid being overwhelmed by incoming mail, many list members sign up to receive them in daily digest form.
  - Some lists are moderated to ensure that the quality of the discussion remains high.

Interpersonal Computing: From Email to Social Networks

Newsgroups

- **Newsgroup:** a public discussion on a particular subject
  - Notes are written to a central Internet site.
  - Notes are redistributed through a worldwide newsgroup network called USENET.
  - Listserv mail messages are delivered automatically to your mailbox, but you have to seek out information in newsgroups.
  - Mailing list messages are sent to a specific group of people, whereas newsgroup messages are available for anyone to see.

Interpersonal Computing: From Email to Social Networks

Computer Telephony

- **Voice mail** is a messaging system with the ability to store, organize, and forward messages.
  - An example of a growing trend toward **computer telephony integration (CTI)** is the linking of computers and telephones to gain productivity.
- It's also possible to send voice signals through a LAN, a WAN, or the Internet, bypassing the phone companies (and their charges) altogether.




Interpersonal Computing: From Email to Social Networks

Social Networks and Information Sharing

- ✓ Online communities such as MySpace and Facebook
- ✓ Massively multiplayer role playing games (MMORPG)
- ✓ Common information resources such as Flickr and Wikipedia. Everybody can add and edit entries, so beware of inaccuracies and biases.




Online Risks

Email Issues

- ✓ Problems with Spam – more than 50% of e-mails are unsolicited.
- ✓ Email and teleconferencing are vulnerable to machine failures, network glitches, human errors, and security breaches.
- ✓ Email volume can be overwhelming.
- ✓ Email can pose a threat to privacy – identity theft.




Online Risks

- ✓ Cookies – Can be used by snoopers to get information about you
- ✓ Wireless issues of access, security, and privacy
- ✓ Perils of posting too much information on blogs and websites
- ✓ Internet Addiction – Some game players spend 40-80 hrs a week online

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Chapter 8
Lesson Summary

- ✓ Networking is one of the most important trends in computing today.
- ✓ LANs are made up of computers that are close enough to be directly connected with cables or wireless radio transmitters/receivers.
  - ➢ Most LANs include shared printers and file servers.
- ✓ WANs are made up of computers separated by considerable distance.
- ✓ Many computer networks are connected together through the Internet so messages and data can pass back and forth among them.
- ✓ Some specialized networks, including global positioning systems and financial systems serve unique functions.




Tomorrow's Technology and You 8/e
Chapter 8
Lesson Summary (continued)

- ✓ Most computer networks today use the Ethernet architecture; an Ethernet port is a standard feature on most modern PCs.
- ✓ Communication software takes care of the details of communication between machines—details like protocols that determine how signals will be sent and received.
- ✓ Email, instant messaging, and teleconferencing are the most common forms of communication between people on computer networks.
- ✓ It's not clear how all of these emerging technologies will converge; what is clear is that the wireless revolution is far from over.