Computers Are Your Future

Computers Are Your Future

Chapter 3

Wired and Wireless Communication

What You Will Learn . . .

- ✓ The definition of bandwidth
- ✓ The bandwidth needs of a typical user
- ✓ How modems change digital signals into analog
- ✓ Transmission media and methods
- ✓ Limitations of public switched telephone network (PTSN) for sending and receiving data

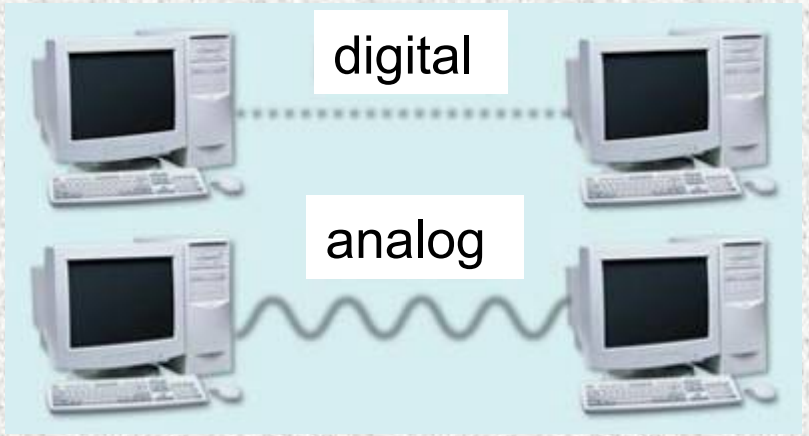
What You Will Learn . . .

- ✓ Multiplexing and digital telephony and their impact on line usage
- ✓ Examples of how digitization and convergence are blurring the boundaries between popular communication devices
- ✓ Various wired and wireless applications


Connectivity
the ability to link various media and devices

Moving Data: Bandwidth and Modems

- ✓ Communications – sending and receiving messages
- ✓ Communications channels – paths through which messages are passed
- ✓ Signals can be:
  - ➢ Analog – data is in continuous waveforms
  - ➢ Digital – data is in discontinuous pulses (0's & 1's)



Moving Data: Bandwidth and Modems

- **Bandwidth** – the amount of data that can be transmitted through a given communications channel
  - Determines the capacity of the data for communication channel depending on its bandwidth
  - The more bandwidth is the more amount of data transmitted

  It is measured as
  - Analog measured in cycles per second (Hz)
  - Digital measured in bits per second (bps)
- **Broadband** – refers to a telecommunications signal or device of greater bandwidth (i.e. multimedia support)
  - any transmission medium that transports high volumes of data at high speeds

Moving Data: Bandwidth and Modems

- ✓ Modems
  - ➢ Transmit data over telephone lines
  - ➢ ***Mod***ulation – converts digital (from computer) to analog to cross telephone lines
  - ➢ ***Dem***odulation – converts analog (phone lines) to digital for computer

Wireless Transmission Media

- **Wireless transmission media** refers to the methods of carrying data through the air or space using infrared, radio, or microwave signals

Wireless Transmission Media: Twisted Pair

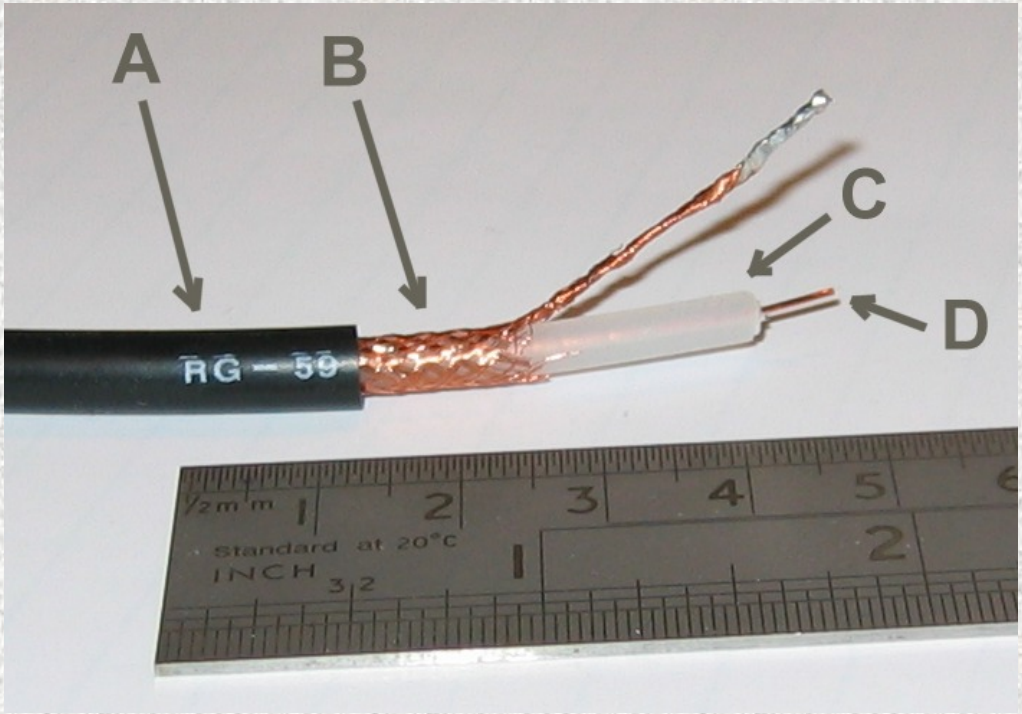
Twisted Pair

- Twisted pair cabling is a type of wiring in which two conductors (the forward and return conductors of a single circuit) are twisted together
- two insulated wires twisted around each other – used for telephone wires

Wireless Transmission Media: Coaxial Cable

Coaxial Cable –

- center copper wire surrounded by insulation, surrounding a layer of braded wire
- The term coaxial comes from the inner conductor and the outer shield sharing the same geometric axis
- Coaxial cable is used as a transmission line for radio frequency signals



Wireless Transmission Media: Fiber Optic

Fiber-optic cable – thin strands of glass that carry data by light pulses

- An optical fiber cable is a cable containing one or more optical fibers. The optical fiber elements are typically individually coated with plastic layers.
- Optical fibers are inherently very strong

Wireless Transmission Media: Infrared

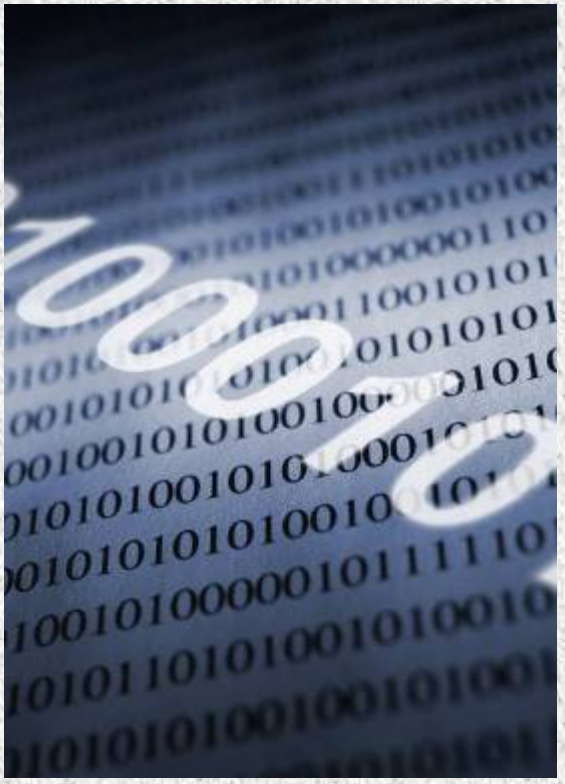
- **Infrared** is a wireless transmission medium that carries data via light beams
  - Transmitter and receiver must be in line of sight
  - An IrDa port is needed to use infrared with a computer

Wireless Transmission Media: Radio

- **Radio** is a wireless transmission medium that carries data via radio frequency signals
  - Wireless LANs in a home or business are one type of radio technology
  - Radio signals can be long range (between cities or regions) and short range (within a building)
  - Radio signals are susceptible to noise and electrical interference

Wireless Transmission Media: Bluetooth

- **Short-range radio transmission technology**
  - Devices identify each other by identification number
  - Connection is confirmed before it is made final
  - Does not require a line of site



Wireless Transmission Media: Microwaves

- **Microwaves** are high-frequency radio waves
  - Much of long-distance telephone service is carried by microwaves
  - Microwaves travel in a straight line
  - Microwave relay stations are built about 30 miles apart

Wireless Transmission Media: Satellites

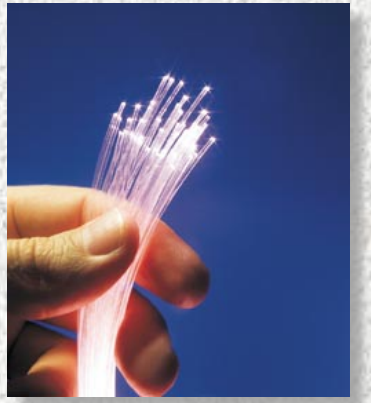
- **Satellites** are microwave relay stations suspended in space
  - They are positioned in **geosynchronous orbits**
- Satellites use microwave signals to transmit data to and from earth-based microwave relay stations

Wired Communication via the PSTN

- The **public switched telephone network (PSTN)** is the world telephone system
  - It consists of telephone lines, fiber optic cables, microwave transmission links, cellular networks, communications satellites, and undersea telephone cables, all inter-connected by switching centers, thus allowing any telephone in the world to communicate with any other.
  - It is used for data as well as voice communications
  - Twisted-pair wire and fiber-optic cable provide the connections for the system
  - Home and business phones are connected to **subscriber loop carriers (SLCs)**
  - The area serviced by SLCs is called the **local loop**

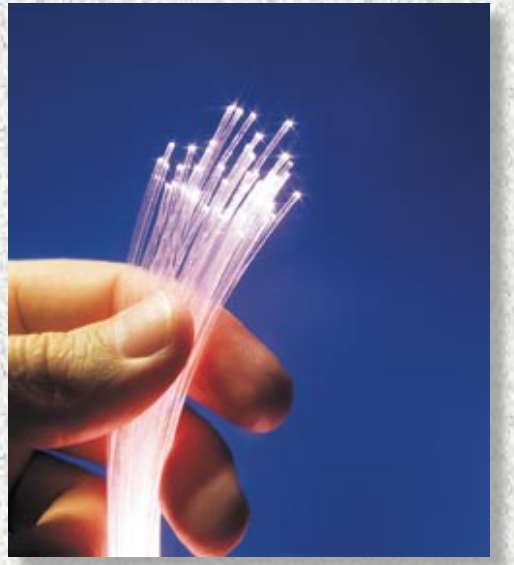
Multiplexing

- **Multiplexing** technology enables simultaneous multi-use of transmission lines
- In telecommunications and computer networks, multiplexing (also known as muxing) is a method by which multiple analog message signals or digital data streams are combined into one signal over a shared medium. The aim is to share an expensive resource
  - Copper wire allows up to 24 simultaneous calls per wire
  - Fiber-optic cable permits up to 43,384 calls per strand



Last Mile Technologies

- The "last mile" refers to the phone lines that connect homes and businesses to the local loop
  - The inability of users to access the high-speed fiber-optic cable creates a bottleneck of data called the **last mile problem**



Last Mile Technologies

- Digital telephony technologies that use twisted-pair wire are referred to as **last mile technologies**
  - ISDN (Integrated Services Digital Network)

    a set of communications standards for simultaneous digital transmission of voice, video, data, and other network services over the traditional circuits of the public switched telephone network.
  - DSL (Digital subscriber line)
  - Cable Modems
  - SONET (Synchronous optical networking)
  - MMDS (Multichannel Multipoint Distribution Service)

Cellular Telephones

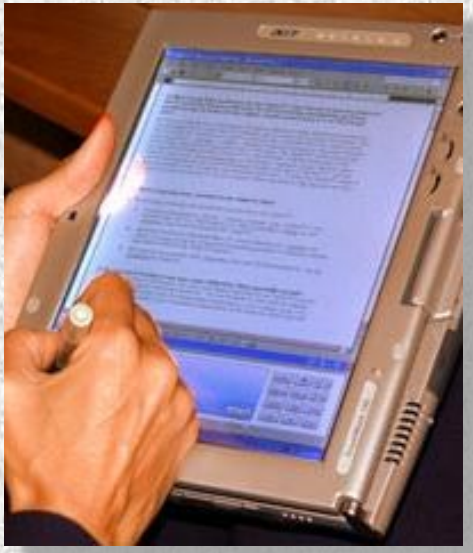
- **Cellular telephones** enable calls to be placed through a wireless telecommunications system
  - Cellular phones use radio or infrared signals
  - **Cells** are limited geographic transmission areas
- A **mobile telephone switching office** (**MTSO**) monitors the signal strength of cellular phones

Personal Communication Service (PCS)

- **Personal Communication Service (PCS)** refers to digital cellular telephone service technologies
- Digital cellular phones offer:
  - Noise-free sound
  - Improved coverage
  - Protection from eavesdropping and phone fraud
  - Voice recognition
  - High-speed Internet access

Web-Enabled Devices

- ✓ A **Web-enabled device** is any device that can display and respond to HTML or XML
- ✓ PDAs, cell phones, and tablet PCs are Web-enabled devices



Wired and Wireless Applications

- ✓ Internet telephone – using the Internet for real-time voice communications

Wired and Wireless Applications

- ✓ Videoconferencing – using sound and video technologies to meet with others

Facsimile (Fax) Transmission

- ✓ Fax transmission is the means of sending an image of a document over telephone lines
- ✓ Fax modems support fax as well as data protocols

Satellite Radio, GPS

- ✓ Satellite radio - broadcasts are transmitted through a satellite
- ✓ GPS – global positioning systems
  - ➢27 earth orbiting satellites
  - ➢Navigation systems

Text, Picture, and Video Messaging

- ✓ Text messaging – sending text communications over a cell phone
- ✓ Picture messaging – using camera phones to send pictures to other cell phones

Chapter 3 Summary

- Bandwidth is the data transfer capacity of a communication channel
- A modem is used to send digital data over a phone line
- Physical and wireless media are used to communicate with technology
- The public switched telephone network (PSTN) is mostly digital

Chapter 3 Summary

- Multiplexing is the transmission of more than one communication on a single line
- Digitization is the transformation of data into digital form
- Internet telephony and faxing can be accomplished through the Internet