Networking and Telecommunication

**Communications**

**Definition**
- Any kind of method or procedure to transfer information. This includes the equipment, devices, and systems for the communication.

**Communications**

**History**
- Indians - smoke signals (sight)
- Africans - drums (sound)
- Telegraph - Morse code (sound)
- Navy - flags (sight)
Communications

History
- Indians - smoke signals (sight)
- Africans - drums (sound)
- Telegraph - Morse code (sound)
- Navy - flags (sight)
- Light houses (sight)

Communications

Two basic types of information sharing.

- BROADCASTING
- NETWORKING

Communication à la Modem

- A modem is a hardware device that connects a computer’s serial port to a telephone line (for remote access).
- Modem transmission speed is measured in bits per second (bps) and generally transmit at 28,000 bps to 56.6K bps (bits per second)
- Cable Modem Depends on how many users are on same system.

Conversion of Signals

The modern (modulator/demodulator) converts the analog signals back to digital signals that are understood by the computer.
**Fiber Optic Cables**

- Fiber optic cables use light waves and are replacing aging cooper lines with high-capacity fiber optic cables.
- **Multiplexing** technology enables simultaneous multi-use of transmission lines:
  - Copper wire allows up to 24 simultaneous calls per wire
  - Fiber-optic cable permits up to 43,384 calls per strand
- A single fiber optic cable can transmit half a gigabit (500 million bits) per second, replacing 10,000 standard telephone cables.
- Data is transmitted more accurately and reliably.
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.

**Digital telephony technologies that use twisted-pair wire are referred to as last mile technologies**
- ISDN
- DSL
- Cable Modems
- Leased lines

**Satellite System-High Altitude**
- Geosynchronous (predicted in 1945)
- Stationary, but some delay time
- Need only three to cover the earth

**Satellite System-MEO/LEO**
- MEO-Medium Earth Orbit
  - 12 satellites at altitudes of 6434 miles
- LEO-Low Earth Orbit
  - 48 satellites at altitude of 736 miles
- Since these satellites are moving, antennas do not need to be pointing at any particular one. Similar to cellular phones

**Microwave-Line of sight**
- Line of sight, 30 miles max
- Need repeaters for longer distances

**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
  - Keyboards, mouse, PDA’s, TV remote etc.
**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 sight

**Moving Data: Bandwidth and Modems**

- **Bandwidth** – the amount of data that can be transmitted through a given communications channel
  - Analog measured in cycles per second (Hz)
  - Digital measured in bits per second (bps)
- **Broadband** – any transmission medium that transports high volumes of data at high speeds

**Networks classified by Signal**

- **Baseband (narrowband)**
  - employs entire bandwidth for one signal
- **Networks Classified by Signal**
  - **Broadband**
    - multiple signals on the same channel simultaneously
    - channel is divided into separate frequency bands, each capable of carrying a signal
    - Ch 2 54-60MHz
    - Ch 13 210-216 MHz
    - Ch 61 444-450 MHz
    - Cable TV wants wider range so they can split into many different channels
    - frequency range for standard telephone is 300Hz-3300Hz
  - **bandwidth is 3000Hz**

**Cellular Telephones**

- **Cellular telephones** enable calls to be placed through a wireless telecommunications system
  - Analog and digital
  - 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.

Satellite Radio, GPS

- Satellite radio - broadcasts are transmitted through a satellite.
- GPS – global positioning systems.
  - 27 earth orbiting satellites
  - Each device must use three satellites to triangulate their position.