TRANSMISSION BASICS & NETWORKING MEDIA

Transmission Basics

- **Transmit means** to issue signals to the network medium
- **Transmission** refers to either the process of transmitting or the progress of signals after they have been transmitted

Transmission Basics

- **Analog and Digital Signaling**
  - On a data network, information can be transmitted via one of two signaling methods: analog or digital
    - Both types of signals are generated by electrical current, the pressure of which is measured in volts

Transmission Basics (continued)

- **An analog signal, like other waveforms, is characterized by four fundamental properties: amplitude, frequency,wavelength, and phase**
  - A wave's amplitude
  - Frequency
  - Phase

Transmission Basics (continued)

- **Digital signals composed of**
  - pulses
  - precise
  - positive voltages and zero voltages
- **Data Modulation**
  - used to modify analog signals in order to make them suitable for carrying data over a communication path

Transmission Basics (continued)

- Modem reflects this device's function as a modulator/demodulator
  - Modulates digital signals into analog signals
- Modulation
  - Frequency modulation (FM)
  - Amplitude modulation (AM)

Transmission Basics (continued)

- **Transmission Direction**
  - Simplex
  - Half-duplex
  - Full-duplex
  - Channel

Transmission Basics (continued)

- **Multiplexing**
  - Allows multiple signals to travel simultaneously over one medium
  - In order to carry multiple signals, the medium's channel is logically separated into multiple smaller channels, or sub channels
  - A device that can combine many signals on a channel, a multiplexer (mux), is required at the sending end of the channel
  - At the receiving end, a demultiplexer (demux) separates the combined signals and regenerates them in their original form

Transmission Basics (continued)

- Time division multiplexing (TDM)
- Wavelength division multiplexing (WDM)
  - WDM enables one fiber-optic connection to carry multiple light signals simultaneously
  - Using WDM, a single fiber can transmit as many as 20 million telephone conversations at one time
- Statistical multiplexing

Transmission Basics (continued)

- **Throughput and Bandwidth**
  - Throughput is the measure of how much data is transmitted during a given period of time
  - Bandwidth is a measure of the difference between the highest and lowest frequencies that a medium can transmit
    - The higher the bandwidth, the higher the throughput

Transmission Basics (continued)

- **Baseband and Broadband**
  - Baseband is a transmission form in which (typically) digital signals are sent through direct current (DC) pulses applied to the wire
    - Supports half-duplexing
    - Ethernet is an example of a baseband system found on many LANs

Transmission Basics (continued)

- Broadband is a form of transmission in which signals are modulated as radio frequency (RF) analog waves that use different frequency ranges
  - Does not encode information as digital pulses
  - Is used to bring cable TV to your home
  - Is generally more expensive than baseband
  - Can span longer distances than baseband

Transmission Basics (continued)

- **Transmission Flaws**
  - Noise is any undesirable influence that may degrade or distort a signal
  - Crosstalk occurs when a signal traveling on one wire or cable infringes on the signal traveling over an adjacent wire or cable
  - Attenuation is the loss of a signal's strength as it travels away from its source

Transmission Basics (continued)

- Latency is a delay between the transmission of a signal and its eventual receipt
  - The most common way to measure latency on data networks is by calculating a packet's round trip time (RTT), or the length of time it takes for a packet to go from sender to receiver, then back from receiver to sender
  - RTT is usually measured in milliseconds

Media Characteristics

- **Five characteristics are considered when choosing a data transfer media:**
  - Throughput
  - Costs
  - Size and Scalability
  - Connectors
  - Noise Immunity
  - The type of media least susceptible to noise is fiber-optic cable