5460/4550

Network Introduction - Jones

Course Related: Listserv, Server Groups

Introduction to Educational Networking

7 layer model (physical, datalink, network, etc)

Physical Layer

- Analog vs Digital
- Network Delay and Signal Propagation
- Latency
- Bandwidth and Throughput
Introduction to Educational Networking

- What is Networking.
- How does Networking work.
- What are the advantages / disadvantages of different approaches.
- How to manage Networking.
- Pitfalls and Tips about Networking.
7 layer OSI Model

- Not the only model
  - TCP/IP, SNA, etc
- Academic model vs real-world
- Physical, Data-link, Network, Transport, Session, Presentation, Application
- Protocols are the glue
  - Set of rules for communications
Physical Layer

- How raw data gets from one place to another
- How multiple computers can simultaneously use the network without interfering
- CSMA/CD, TokenBus, etc
Data-Link Layer

- Normally handled as two layers
  - Logical Link Control (LLC)
    - Coordinates data transfer between connected devices
    - Ensures reliable data transfer
  - Medium Access Control
    - Manages access to the physical medium.
    - Controls the access and use to the physical layer
Network, Transport, Session Layers

- Network
  - Establishes, maintains, and terminates logical and physical connections

- Transport
  - Ensures data is sent between connections

- Session
  - Controls the flow of data across the connection

- These have been combined into existing protocols
  - TCP/IP, IPX/SPX, NetBIOS
Presentation, Applications Layers

- Presentation
  - Performs code conversion or data reformatting
  - Network Translation, etc

- Applications
  - Interface between server software and network.
Physical Layer

- Bit pipe
  - Copper
  - Fiber
  - Radio

- Constrained by Physics (bandwidth) and Regulations (FCC)
Analog vs Digital Communications

- Analog Signals
  - vary continuously
  - Represent particular values
    - Volume, pitch, color, etc
  - FSK, AFSK, QAM, PSK (p27)

- Digital Signals
  - Discrete levels
    - Voltages represent on/off, present/absent, 1 or 0.
Network Delay and Signal Propagation

- Velocity of a signal wave
  - How fast does the signal go
  - Theory says 300,000km/sec (abbvr ‘c’)
  - Fiber is about 68% of c (205,000km/s)
  - Copper is between 55% and 80% of c (165,000km/s and 240,000km/s)
Latency

- The delay between the occurrence of two events
  - Hard Drives
  - Modems
- End-to-end trip (ack)
- Data vs VOIP
Bandwidth and Throughput

- Bandwidth is how fast between points
- Throughput is how fast across all points.