Introduction to LAN/WAN

CS 513

CS 513 Midterm Review

- Monday, April 5, 2010

- In-class, 2 hours

- No cheat sheets, formula sheets:
  - Why? Only two formulas covered (Nyquist and Shannon)

Review

☞ Uses of networks

- Business

- Home

- Mobile users

☞ Classification of networks

- Transmission technology – broadcast, multicast, point-to-point

- Size – LAN, MAN, WAN

- Topology – star, ring, tree

Review

- ☞ Performance measures
  - Throughput
  - Delay
- ☞ Sockets programming
  - Client/server model
  - Sockaddr and sockaddr_in data structures
  - Socket functions (socket, connect, bind, listen, accept, close)
  - Types of ports (reserved, registered, ephemeral)
  - When to use specific calls (e.g. recv Vs. recvfrom, etc)

Review

- ☞ Layering
  - OSI
  - TCP/IP
  - Pros and cons of each model
- ☞ Multiplexing (FDM, TDM)
- ☞ Switching
  - Circuit switching
  - Message switching
  - Packet switching

Review

- ☞ Services
  - Connection-oriented
  - Connectionless
  - Datagram
- ☞ Physical layer (baud, data rate, bandwidth)
- ☞ Nyquist theorem
- ☞ Shannon's result
  - Signal-to-noise ratio
  - Decibel
- ☞ Causes of noise: thermal, impulse, crosstalk, ISI

Review

- ☞ Analog Vs. Digital
  - – Data
  - – Signals
  - – Transmissions
  - – Attenuation
  - – Repeaters
  - – Modem
- ☞ Telephone system (switching office, local loop and trunk)
- ☞ Modulation techniques (PSK, QPSK, FSK, AM, QAM)
- ☞ Constellation diagrams
- ☞ Digital encoding (Manchester, differential manchester, etc)

Review

- ☞ PCM
- ☞ T1 carrier
- ☞ Transmission media (guided Vs. unguided)
  - Twisted pair (UTP)
  - Coaxial cables (baseband, broadband)
  - Fiber
  - Radio waves, cellular (frequency reuse)
- ☞ Framing (character, bit and byte stuffing)

Review

- ☞ Hop-by-hop Vs. end-to-end
- ☞ Data link functions (flow, error control, etc)
- ☞ Error detection (CRC, polynomial arithmetic, generating function, etc)
- ☞ Error correction (Hamming code, parity bits, etc)
- ☞ Tanenbaum's Data Link protocols
  - Utopia
  - Stop-and-wait
  - Go-Back-N
  - Selective repeat
  - Piggyback ACKS, NAKs, timers, window size Vs max. seq. No.
- ☞ Real world Data Link protocols (HDLC, PPP, etc)

Review

- ☞ MAC Protocols
- ☞ The Channel Allocation Problem
  - Assumptions
- ☞ S, G and P (throughput, offered load and probability of error)
- ☞ ALOHA (slotted and non-slotted)
- ☞ CSMA (non-persistent, 1-persistent, p-persistent)
- ☞ CSMA/CD and Ethernet
- ☞ Contention free: bitmap, binary countdown
- ☞ Limited contention: adaptive tree walk
- ☞ Binary exponential backoff algorithm
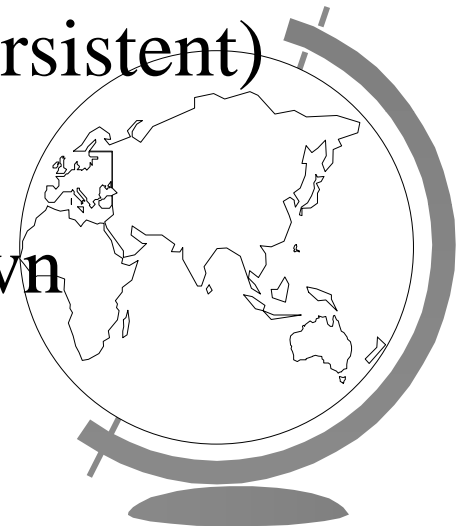
Review

- ☞ Fast Ethernet
- ☞ Switched Ethernet
- ☞ Gigabit Ethernet
- ☞ Wireless LAN (MACA, MACAW)
- ☞ IEEE 802.11
  - Hidden, exposed terminal
  - PCF, DCF
  - ISM Bands, spread spectrum (FHSS, DHSS, HR-DSSS), Infrared, OFDM
  - RTS, CTS, ACK, NAV
  - SIFS, DIFS, PIFS, EIFS
  - CSMA/CA
  - Services: association, reassociation, authentication, etc
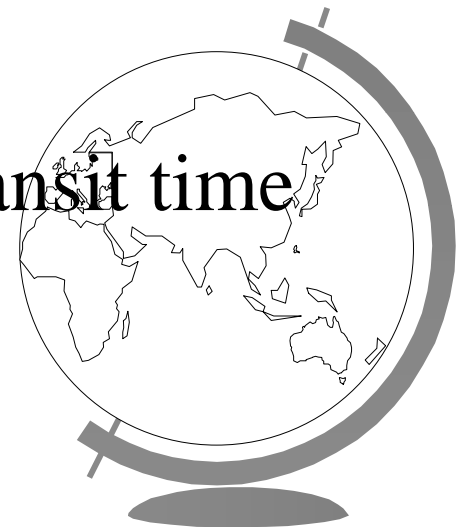- ☞ Bridges (packet conversion, data rates, security, QoS)
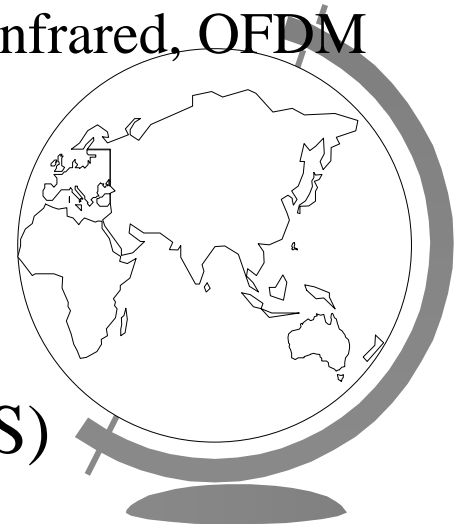
Review: Network layer

- Routing design issues
  - Store-and-forward
  - Connection Vs. connectionless
  - Datagram Vs. Virtual circuit
- Routing algorithms
  - Static Vs. adaptive
  - Metrics: hops, distance, bandwidth, transit time

Review: Network Layer

- ☞ Static routing algorithms
  - Dijkstra's algorithm
    - What is exchanged?
    - How to build table from a given node to all others
  - Flooding (issues, selective flooding, uses, etc)
- ☞ Adaptive routing algorithms
  - Distance vector
    - What is exchanged?
    - how to update tables
    - Issues and problems (bad news, good news)
  - Link state routing

Review: Network Layer

- Link state routing
  - Steps
    - Measuring link costs (echo packets, include queue time, etc)
    - Build link state packets
    - Distribute link state packets
    - Keeping track of packets
    - Computing new routes
- Trade-offs between static and adaptive
- Hierarchical routing (just know what it is...)

Review: Network Layer

- ☞ Internet Protocol (IP)
  - – IP addresses: classes (A, B, C), and problems with classes
  - – CIDR
- ☞ IP Address resolution
  - – ARP (what is it?)
  - – RARP (when do we use this again?), DHCP
- ☞ Routing on the Internet (high level, what's what?)
  - – Autonomous Systems (AS's)
  - – Routing within AS's (Interior Gateway Protocol, OSPF)
  - – Routing between AS's (Exterior Gateway Protocol, EGP)