

Midterm Review

- I. Seven Layer ISO OSI Reference Model
 - A. Network architecture, protocols
 - B. OSI stack versus TCP/IP suite
 - 1. Layer interfaces
 - 2. encapsulation
- II. Introduction
 - A. Definitions
 - 1. performance measures
 - a. throughput
 - b. utilization
 - c. response time
 - d. end-to-end delay
 - i. processing delay
 - ii. queueing delay
 - iii. transmission delay
 - iv. propagation delay
 - e. latency
 - f. goodput
 - g. fairness
 - h. store-and-forward networks
 - i. cut-through routing
- III. Data Link Layer
 - A. Tanenbaum's DL protocols
 - 1. Utopia
 - 2. Stop-and-Wait {introduce ACKs}
 - 3. PAR {noisy channel}
 - a. old version
 - 1. ACK, timer, duplicate frames
 - b. "new version" {ACKs, timers, premature timeouts}
 - 4. Sliding Window Protocols
 - a. piggybacking ACKs
 - b. 1-bit sliding window (protocol 4)
 - c. Go Back N (protocol 5)
 - d. Selective Repeat (protocol 6)
 - e. NAKs, ACKtimer
 - A. Synchronous vs asynchronous transmissions
 - 1. bit, character, block level
 - B. Framing
 - 1. bit stuffing
 - 2. byte stuffing
 - 3. HDLC

4. PPP
- C. Transmission Errors
 1. error detection and error correction
 2. Hamming distance
 3. CRC
 - a. polynomial code
 - b. generating function $G(x)$
 - c. CRC algorithm
- IV. Miscellaneous topics before physical layer
 - A. Multiplexing *{Note – multiplexing was covered just before PCM in the Physical Layer section}*
 1. TDM
 2. FDM
 3. statistical multiplexing {concentrator}
 4. WDM
- V. Physical Layer
 - A. Definitions
 1. baud {modulation rate}
 2. data rate {capacity}
 3. bandwidth
 4. voice-grade line
 - B. Nyquist Theorem
 1. signal constellations
 - C. Shannon's Result
 1. signal-to-noise ratio
 2. decibel definition
 - D. Analog vs Digital
 1. data
 2. signals
 3. transmissions
 4. attenuation
 5. amplifiers vs repeaters
 6. modems
 7. codec
 8. advantages vs disadvantages
 - E. Data Encoding Techniques
 1. digital data, analog signals
 - a. Amplitude modulation
 - b. Frequency modulation
 - c. Phase modulation
 - d. Keying acronyms
 - e. QAM, MFSK
 2. digital data, digital signals
 - a. NRZL
 - b. NRZI
 - i. differential codes

- c. Bi-phase codes
 - i. Manchester
 - ii. differential Manchester
 - d. Bi-polar
 - 3. analog data, digital signals
 - a. PCM
 - b. T1 carrier
 - c. delta modulation
 - F. Transmission Media
 - 1. twisted pair
 - a. UTP Cat 5e,6,7
 - b. Dial up connections
 - c. ADSL, VDSL
 - d. Hub topology (10BASET)
 - 2. Coaxial cable
 - a. baseband
 - i. 10BASE2
 - ii. 10BASE5
 - b. broadband {CATV}
 - i. HFC
 - 3. Optical Fiber
 - a. three types of fiber
 - b. three different wavelengths
 - c. FTTH
 - i. FiOS
 - VI. Medium Access Sublayer (MAC)
 - A. "The Channel Allocation Problem"
 - 1. assumptions
 - B. LAN Performance Notation
 - 1. relative propagation time - **a**
- only up to here for Mid Term!!**-----
- 2. S, I, and G {throughput, input load, offered load}
 - C. ALOHA
 - D. Slotted ALOHA
 - E. CSMA
 - 1. non-persistent
 - 2. 1-persistent
 - 3. p-persistent
 - 4. collisions
 - F. CSMA/CD
 - G. Token Ring
 - H. Ethernet
 - 1. binary exponential backoff
 - 2. Ethernet evolution (10Base5, 10Base2, 1Base5, 10BaseT)

- I. Switched Ethernet
 - 1. backward (self) learning
- J. Bridges
 - 1. backward learning
 - 2. collision domains
 - 3. loops
 - a. transparent bridges (spanning tree)
 - b. source routing bridges