

Final Review

- VII. Medium Access Sublayer (MAC)
 - A. "The Channel Allocation Problem"
 - 1. assumptions
 - B. LAN Performance Notation
 - 1. relative propagation time - **a**
 - 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
 - F. CSMA/CD
 - G. Token Ring
 - H. Ethernet
 - 1. binary exponential backoff
 - 2. Ethernet evolution (10Base5, 10Base2, 1Base5, 10BaseT)
 - I. Switched Ethernet
 - 1. backward learning
 - J. Bridges
 - 1. backward learning
 - 2. collision domains
 - 3. loops
 - a. transparent bridges
 - b. source routing bridges

----- *Final Coverage Begins Here* -----

- VIII. High Speed LANs
 - A. FDDI
 - 1. differences from 802.5 token ring
 - 2. 4B/5B encoding
 - 3. dual ring
 - 4. TTRT
 - B. Fast Ethernet
 - 1. 100 Base T4
 - a. four twisted pairs
 - b. 8B/6T encoding
 - c. 33-1/3 Mbps per pair
 - 2. 100 Base TX
 - 3. 100 Base FX
 - C. Gigabit Ethernet
 - 1. Fiber Channel technology
 - 2. 8B/10B encoding
 - 3. 1000 Base SX
 - 4. 1000 Base LX

5. 1000 Base CX
 6. 1000 Base T
 7. carrier extension
 8. frame bursting
 9. buffered distributor
- IX. Wireless LANs
1. RFID
 - A. Classification
 1. Infrastructure
 2. Ad Hoc
 3. MANET
 4. single vs multi-hop
 - B. 802.11 Protocols
 1. infrared
 2. FHSS
 3. DSSS
 - a. 11-bit chipping Barker sequence
 - b. CDMA
 4. 802.11a
 - a. OFDM
 5. 802.11b
 - a. HR_DSSS
 6. 802.11g
 7. 802.11n
 - a. OFDM
 - b. MIMO
 - C. Management Functions
 1. Channel Selection and Power Management
 2. Authentication, Association, Beacon Management
 3. Passive and Active Scanning
 - D. MAC Sublayer
 1. Hidden Terminal Problem
 2. Exposed Station Problem
 3. DCF
 - a. CSMA/CA
 - i. MACA
 - ii. RTS/CTS
 - ii. MACAW with Virtual channel sensing
 - iv. 1-persistent physical carrier sensing
 - v. timer countdown
 - vi. SIFS, DIFS
 4. 802.11 frame addresses
 5. Frame fragmentation
 6. PCF
 - a. beacon frames

- 7. Implementation Details
 - a. Dynamic Rate Adaptation
- X. Cellular and Mobile Wireless Networks
 - A. Cellular Architecture
 - 1. Base Station and MSC
 - 2. combined FDM/TDM
 - 3. CDMA
 - 4. GSM
 - B. 2G {voice}
 - 1. BSS, BTC, BSC
 - C. 2.5G {voice and data}
 - 1. GPRS, EDGE, CDMA-2000
 - 2. SGSN, GGSN (parallel data network)
 - D. 3G {voice/data}
 - 1. UTMS, CDMA-2000,
 - 2. EVDO
 - E. 4G LTE
 - 1. OFDM
 - 2. Physical Resource Block
 - F. Mobile Networks
 - 1. home network, agents, correspondent, visited network
 - 2. permanent address, care-of-address (COA), registration
 - 3. Indirect Routing
 - 4. Direct Routing
 - a. anchor foreign agent
- XI. Wireless Measurement
 - A. Performance Measurement Approaches
 - 1. analytic models, simulation models, empirical measurement
 - B. *"Performance Analysis of the Intertwined Effects between Network Layers for 802.11g Transmissions"*
 - C. *"Characterization of 802.11 Wireless Networks in the Home"*
 - D. *"Performance Anomaly for 802.11b"*
- XII. Wireless Sensor Networks
 - A. Details
 - 1. Network Lifetime
 - 2. Energy wastes:
 - a. Idle listening, collisions, overhearing, control overhead, overmitting
 - 3. Communication patterns
 - a. Broadcast, multicast, convergecast, local gossip
 - 4. Lower Duty Cycle
 - a. TDMA
 - b. Scheduling
 - c. LPL
 - B. WSN Types
 - 1. Tiered

- 2. Cluster-based
- C. Power-Aware MAC protocols
 - 1. S-MAC
 - 2. T-MAC
 - 2. LPL
 - 3. X-MAC
- XIII. Network Layer
 - A. Introduction
 - 1. Role of Network Layer
 - 2. Routing vs Forwarding Table
 - B. IP Issues
 - 1. IP Datagram Packet
 - 2. IP Fragmentation and Reassembly
 - 3. Subnets
 - a. Network Classes
 - b. Subnet Mask
 - 4. CIDR (Classless Interdomain Routing)
 - a. Contiguous blocks
 - b. Related to BGP
 - c. Route Aggregation
 - C. Routing Algorithm Classification
 - 1. Non-Adaptive
 - a. flooding
 - b. static
 - i. Dijkstra's Shortest Path routing algorithm **{not covered}**
 - 2. Adaptive
 - a. centralized RCC
 - b. distributed
 - i. intradomain routing
 - ii. interdomain routing
 - c. isolated
 - D. Distance Vector Routing
 - 1. Algorithm details
 - 2. Good news/Bad news
 - a. counting to infinity problem
 - E. Link State Routing
 - 1. Algorithm details
 - a. reliable flooding
 - F. Hierarchical Routing
 - 1. AS's
 - G. Routing in the Internet
 - 1. RIP
 - 2. OSPF
 - a. partitioning domains into areas
 - b. router types (area border, backbone, boundary)

- c. Five types of LSA's
 - d. advanced OSPF features
- 3. Border Gateway Protocols (BGP)
- H. More IP Issues
 - 1. ARP (Address Resolution Protocol)
 - a. address pairs
 - 2. DHCP (Dynamic Host Configuration Protocol)
 - a. UDP and ports
 - 3. NAT (Network Address Translation)
- I. ICMP
- XIV. Transport Layer
 - A. TCP Sliding Windows
 - 1. advertised window
 - 2. congestion window
 - B. General Congestion Control
 - 1. congestion control versus flow control
 - 2. soft state
 - 3. CC taxonomy
 - a. router-centric
 - b. host-centric
 - c. reservation-based
 - d. feedback-based
 - e. window-based
 - 1. power and Jain's Fairness
 - 2. router queuing
 - a. FIFO {Drop Tail}
 - b. Priority Queuing
 - c. Fair Queuing (FQ)
 - d. Weighted FQ (WFQ)
 - C. TCP Congestion Control
 - 1. router congestion notification
 - 2. congestion window (cwnd)
 - 3. AIMD
 - a. congestion avoidance
 - 4. slow start
 - 5. fast retransmit
 - 6. fast recovery
 - 7. TCP Tahoe vs. TCP Reno
 - 8. TCP New Reno
 - 9. RIO vs RTO
 - a. estimating RTT
- XV. SONET
 - A. optical fiber standard
 - 1. common master clock
 - 2. byte interleaved TDM

- B. SONET architecture
 - 1. ADM - add/drop multiplexor
 - 2. REG - regenerator for optical signals
 - 3. section/line/path
- C. SONET frame
 - 1. SPE Synchronous Payload Envelope
 - 2. Overhead
- D. Multiplexing hierarchy
 - 1. up to STS-3 and beyond
 - 2. down to virtual tributaries
- XVI. ATM {Asynchronous Transfer Mode}
 - A. Basics
 - 1. 53 byte cell-switching technology
 - 2. virtual circuit design
 - B. Conceptual Model Assumptions
 - C. Header Details
 - 1. UNI versus NNI
 - 2. VPI/VCI
 - D. Architecture
 - 1. variety of traffic types
 - a. original four types
 - b. revised traffic types
 - 2. AALs
 - a. AAL1
 - b. AAL3/4
 - c. AAL5
 - 3. CS and SAR sublayers
 - E. Cell Switching Issues
 - 1. cells not reordered
 - 2. non-blocking switches
 - 3. PVCs versus SVCs
- Final Covers up to Here** ----
- XVII. Firewalls and IDS {Only covered briefly}
 - A. Why Firewalls?
 - B. Stateless Packet Filters
 - 1. Access Control Lists
 - C. Statefull Packet Filters
 - D. Application Gateways
 - E. Intrusion Detection Systems
- XVIII. Distributed Denial of Service Tutorial {may not cover}
 - A. Flooding DDoS Attacks
 - B. Direct Attacks
 - 1. TCP-SYN Flooding
 - C. Indirect Attacks