

Final Review

IX. DNS

- A. Services provided
- B. Hierarchy
 - a. Root Name servers
 - b. TLD servers
 - c. Authoritative DNS servers
 - d. Local DNS servers
- C. Iterative vs Recursive Queries
- D. RR format

----- Mid Term covered up to here -----

X. Introduction to Security

- A. Malware definitions
 - 1. Spyware, botnet, virus, worm, Trojan horse
- B. Denial of Service (DoS) and Distributed DOS (DDoS) attacks
 - 1. Using packet sniffing
 - a. Masquerading attacks
 - b. Man-in-the-Middle Attacks

XI. Transport Layer (front part)

- A. TCP vs UDP
 - 1. TCP demultiplexing (only)
- B. UDP
 - 1. Some details (e.g., UDP header)
 - 2. Checksum

XII. Reliable Data Transfer Protocols {Treatment is TCP(end-to-end) and data link layer concurrently}

- A. Framing at DL Layer
- B. Tanenbaum's Data Link Layer protocols
 - 1. Modeling Assumptions
 - a. ARQ
 - 2. Utopia
 - 3. Stop-and-Wait {introduce ACKs}
 - 4. PAR {noisy channel}
 - a. old version
 - 1. ACK, timer, duplicate frames
 - b. "new version" {ACKs, timers, premature timeouts}
 - 5. Sliding Window Protocols
 - a. piggybacking ACKs
 - b. 1-bit sliding window (protocol 4)
 - c. Go Back N (protocol 5)
 - i. cumulative ACKs
 - d. Selective Repeat (protocol 6)
 - e. NAKs, ACKtimer

XIII. Transport Layer (middle)

- A. Pipelining and Window Buffers
 - 1. max window size relative to sequence number range
- B. TCP Flow Control
 - 1. advertised window (rwnd)
- XIV. TCP Congestion Control (Transport Layer –back)
 - A. Causes and Effects of Congestion
 - 1. Two of K&R scenarios discussed
 - B. General Approaches to Congestion Control
 - 1. network-assisted with explicit indicators (e.g. ECN)
 - 2. end-to-end (e.g., TCP congestion control)
 - C. AIMD
 - 1. cwnd – congestion window
 - 2. linear increase (AI) – congestion avoidance approach
 - D. TCP Tahoe
 - 1. Slow Start
 - a. ssthresh
 - 2. Fast Retransmit
 - E. TCP Reno
 - 1. Fast Recovery
 - F. TCP New Reno
 - G. Other TCP ‘flavors’ : SACK, Cubic and Compound!
 - H. TCP three-way handshake
 - I. RIO and RTO
- XV. Network Layer (part 1)
 - A. Forwarding versus Routing (Lookup Tables)
 - B. Routing Overview/Categorization
 - 1. Non-Adaptive
 - a. flooding, shortest path
 - 2. Adaptive
 - a. isolated and centralized
 - b. link metrics (hops, delay, inverse of capacity)
 - C. Distributed Routing
 - 1. IGP versus EGP
 - D. Distance Vector Routing
 - 1. Bellman-Ford algorithm
 - 2. DV packets
 - 3. neighbors
 - 4. bad news slowly, good news quickly
 - 5. RIP (covered later)
- XV. Network Layer (part 2)
 - A. IP Issues
 - 1. fragmentation/reassembly and IP header
 - 2. subnets, subnet masks, CIDR
 - B. DHCP
 - 1. dynamic addressing protocol over UDP

- C. NAT
 - 1. Motivation – problems addressed
 - 2. Operation
- D. Link State Routing
 - 1. Dijkstra’s Algorithm (not covered)
 - 2. Reliable Flooding
 - 3. LSP details
- E. Hierarchical Routing using AS’s
 - 1. Intra-routing – OSPF
 - a. multiple router types and LSA’s
- F. Inter-routing –BGP
 - 1. reachability
- XVI. Introduction to LANs, Ethernet and ARP
 - A. IEEE802
 - B. CSMA
 - C. CSMA-CD
 - D. Ethernet definition
 - 1. 1-persistent CSMA
 - 2. BEB – Binary Exponential Backoff
 - E. ARP
 - 1. mapping Ethernet addresses to IP addresses
 - F. Hubs versus Switches
 - G. Taking turns
 - 1. polling
 - 2. token ring
- XVII. Wireless
 - A. RFID
 - B. WiFi - IEEE802.11a,b,g,n,ac