EE 450 Homework 5

Spring 2013 Nazarian

Score:___/100

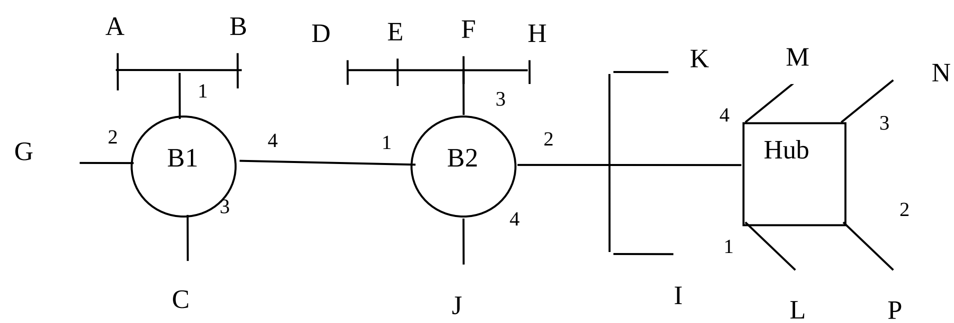
Student ID: ________________________ Name: ________________________

Assigned: Friday 4/5/2013 Perfect Score: 100, Maximum: 160

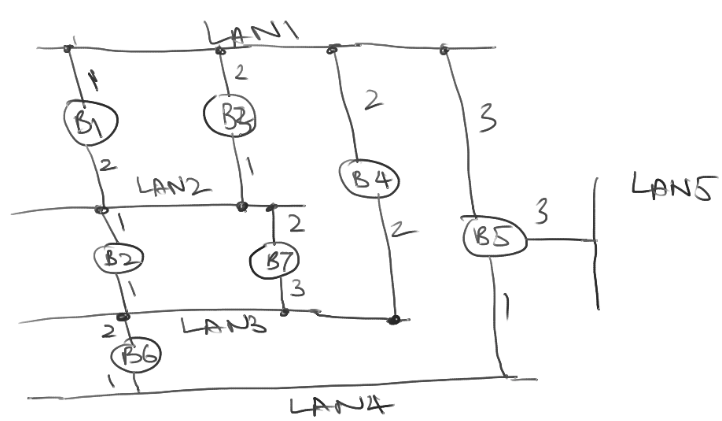
Due: Thursday 4/11/2013, at 5pm (EE450 HW locker, on the 3rd floor of EE Building.) Late submissions are accepted for two days with a maximum penalty of 15% per day. For each day, submissions between 5pm-6pm: 2%, 6-7pm: 4%, 7-8pm: 8%. After 8pm: 15%. Solutions will be posted during the weekend (4/14).

1) Learning Bridges (20 pts) Consider the extended LAN connected using the learning bridges B1 and B2 in the following figure. Suppose the bridge tables are originally empty. List all ports a frame will be forwarded for the following sequence of data transmission. Also show how the B1 and B2 tables are updated based on the information of each transmission in the order state below:

a) G sends a frame to A.
b) D sends a frame to F.
c) A sends a frame to L.
d) P sends a frame to A.
e) J sends a packet to F.
f) C sends a packet to D.



2) Bridge Loop Problem (20 pts) Construct a minimum spanning tree topology for the following interconnected network to resolve the bridge loop problem. Assume B2 has the lowest ID, i.e., it's the root bridge. Also assume the LAN segments have equal costs. i. Show the 4 steps presented in class similarly to the example in unit 8 slides.



3) IEEE802.5 Token Ring (20 pts) There are one hundred 1Mbps nodes in a LAN connected with a 1Km ring. Calculate the best-case throughput for 1500 byte messages using delayed release model II presented in lectures. If model II is not applicable, then node applies delayed release model I. Assume the propagation speed is 5km/ms and each node adds 1 bit delay for processing.

4) WiFi (IEEE802.11) (20 pts) Suppose an 802.11b station is configured to always reserve the channel with the RTS-CTS sequence. Suppose this station suddenly wants to transmit 1500 bytes of data and all other stations are idle at this time. Using the RTS-CTS flow in the following figure, calculate the time required to transmit the frame and receive the acknowledgement in terms of the end-to-end d_{prop}. Assume DIFS = $3d_{prop}$, SIFS = $1.3^* d_{prop}$, transmission rate = 11Mbps, no bit errors and ignore any processing and queuing latency. Also consider only 256 bits for any control frame.

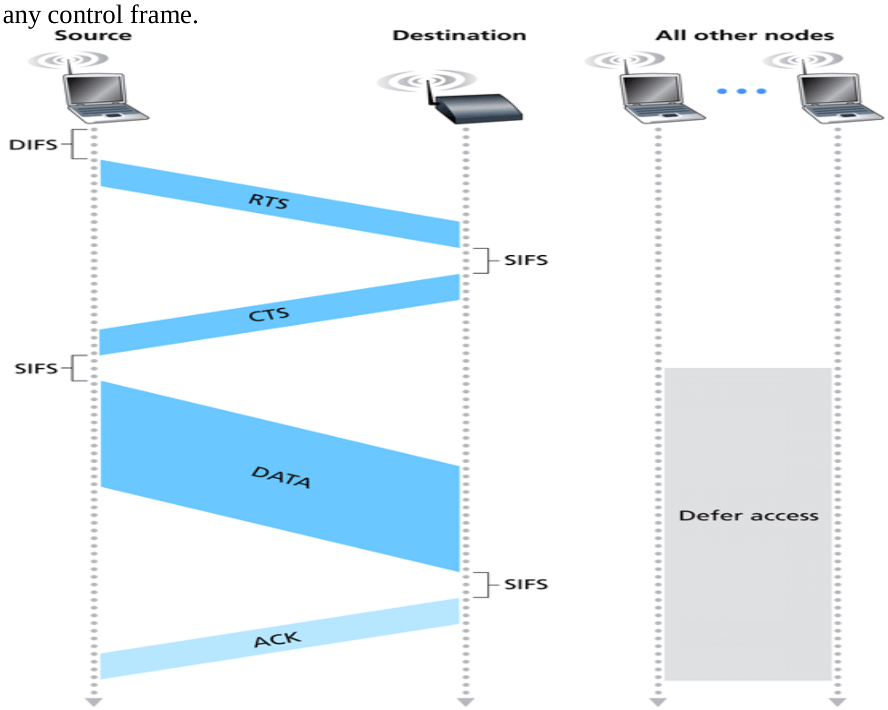


Figure 6.12 ◆ Collision avoidance using the RTS and CTS frames

5) Checksum Error Detection (20 pts) Node A plans to send a data message (013A, 58BE, ABCD, E450) to node B.

a) What would be the checksum that it should send to B, in addition to the data, assuming it follows the checksum protocol presented in class (for IP header checksum)?

b) Assume the message and checksum are received with no error. Show that the checksum validation at node B passes.

6) Extra Credit: Packet Fragmentation (20 extra credit pts) Fragment a 10000Byte packet to be able to send it through a network which has its MTU set to 1500 bytes. For each fragment show the M flag, identification number, and the offset.

7) Extra Credit: IP Addressing (20 extra credit pts) Show the range of IP addresses, the range of host IP addresses, the direct broadcast address and the network address for each of the following networks.

a) 200.150.122.87/26

b) 250.87.10.254/16

8) Extra Credit: Subnetting (20 extra credit pts) Extra Credit: Packet Fragmentation (20 extra credit pts) Divide the USC network into 2048 subnets. Assume the subnets are numbered from 0 to 2047, according to the value of their subnet bits. Specify the range of IP addresses, the range of host IP addresses, the direct broadcast address and the network address for subnets 35, 798, and 2031.