

## Link Layer Questions

### **Problem 1: Parity**

Show that two-dimensional parity checks can correct and detect a single bit error. Show (give an example of) a double-bit error that can be detected but not corrected. Use examples other than the example given in class or ones in the text book.

### **Problem 2:**

Suppose nodes A, B and C are part of the same subnet.

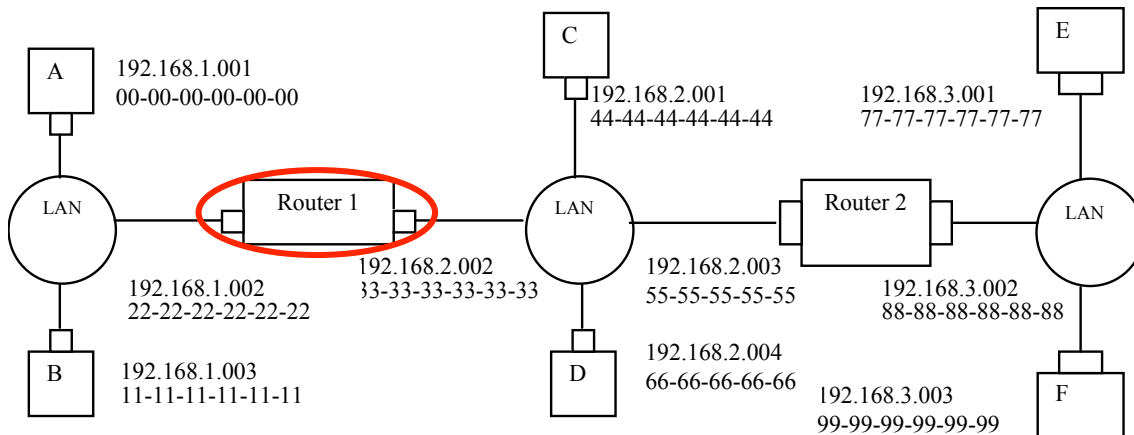
- If A sends IP datagrams to B with the encapsulating frames addressed to the MAC address of B, will C's adapter process these frames?
- If so, will C's adapter pass the IP datagrams in these frames to the network layer in host C?
- How would your answers change if A sends the frames for B with the MAC broadcast address rather than B's MAC address?

### **Problem 3: Ethernet**

Suppose nodes A and B are on the same 10 Mbps broadcast channel, and the propagation delay between the two nodes is 245 bit times. Suppose A and B send Ethernet frames at the same time, the frames collide, and then A and B choose different values of K in the CSMA/CD algorithm.

- Assuming no other nodes are active, can the *retransmissions* from A and B collide?
- At what time does A's signal ultimately reach B? Does B need to refrain from retransmitting at its scheduled time as defined by the exponential back-off algorithm?

Think through the following: Suppose A and B initially begin transmission at  $t = 0$ . They both detect collisions at  $t = \_\_?$  bit times. After the collision, let  $K_A = 0$  and  $K_B = 1$ . What time does B re-schedule for its retransmission? At what time does A begin transmission? Recall that the nodes must wait for an idle channel after returning to Step 2—see the protocol. ***Do not ignore the jam signal or the short delay while the hosts sense for an idle channel.***

**Problem 4: ARP**

- a) Using the figure from the class example, and completing the example we started in class, consider sending an IP datagram from Host E to Host B. Assume all ARP tables are empty. State any assumptions you would like to make.
- i) Enumerate all the steps for the packet to successfully be sent from Host E to Host B.
- b) **Now replace** the left router with a switch, and assume that the hosts A, B, C and D and the right router are all star-connected into this new switch. Assume Host A is now sending a packet to Host F. Provide the source and destination MAC addresses and IP addresses in the frame and the encapsulated IP datagram as the frame is transmitted
- i) from A to the switch,
  - ii) from the switch to the right router,
  - iii) from the right router to F.

**Problem 5: Switch Table**

Consider the operation of a link-layer switch in a subnet that has 6 nodes labeled A through F. The switch table is initially empty. The nodes are star connected into the Ethernet switch. Suppose that **(i)** B sends a frame to E, **(ii)** E replies with a frame to B, **(iii)** A sends a frame to B, **(iv)** B replies with a frame to A.

- a) Show the state of the switch table before and after each of these events.
- b) For each of these events, identify the link(s) on which the transmitted frame will be forwarded, and briefly explain your answers.