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CSE 30264
Homework 3

P1. When two hosts share a hardware address, the hosts are indistinguishable on the network. On Ethernet, the hardware address of the sender/receiver is used to fill in the header destination/source address. When a different node receives a message from one of the hosts that is sharing a hardware address and this node would want to send an acknowledgement packet or a different message in return, the receiving node is unable to determine which of the two hosts sharing the address should receive these packets. Thus, the sender may not receive the ACK packet and would resend the data, which is inefficient use of the bandwidth. Additionally, if one of the hosts sharing a hardware address is the receiver of a packet, then the adaptors for both of the hosts would receive the packet, since the adaptor passes the frames with its address to the host. This reduces security, since the message is only intended for one of the hosts.

P2. (a) transmit = size/bandwidth
original → 46.4 us = 464 bits / 10 Mbs
sig rate increased → 46.4 = x bits / 100 Mbs
x = 4640 bits delay + 48 bits jam signal = **4688 bits minimum size**

(b) A minimum packet size this large is inefficient use of bandwidth for packets that are carrying a small amount of data (ie. ACK packets). When small amounts of data are sent, the rest of the packet is padded. This provides no additional helpful information, but the larger size of the packet uses more bandwidth.

(c) If the signaling rate is reduced, then the minimum packet size also decreases. So, if compatibility is not an issue, then the signaling rate could be adjusted based on the size of the data that the host wants to transmit. When the data is small, the signaling rate is reduced so the packet size can be smaller.

P3. If a collision occurs with a packet using Manchester encoding and the clocks of the hosts colliding are not synchronized, then the result of the collision gives an encoding of data frames that is disorganized. The Manchester encoding of one packet is an xor of the clock with the NRZ encoding. For each clock cycle (which is one bit), there is either a low-to-high transition or a high-to-low transition. Because the length of the clock cycle and location of the transition depends on the clock rate, the combination (collision) of two packets from hosts that are not synchronized would give a resultant encoding that does not follow either host's clock cycle. This change would indicate that there was a collision before reading the CRC.

P4. Suppose there are 3 wireless nodes: A, B, and C. A and B are within range of each other, B and C are within range of each other, but A and C are out of range. To avoid collision with wireless transmission, each node checks if the medium is busy before transmitting its data. Say that A wants to send a message to B. A checks the medium and finds that it is not busy, so A transmits its data. However, C is also trying to transmit data to B. C also checks the medium, and because

A is outside of its transmission range, C finds it available so C transmits the data. There is then interference because both A and C are sending to B at the same time and there will be a collision because neither A or C was aware of the other.

P5. Collision detection is more complex in wireless networks because, as opposed to a wired network, a wireless network has nodes that do not receive transmissions from all other nodes and that cannot receive and transmit data at the same time. In Ethernet, nodes are able to determine if the line is busy because each node receives transmissions from every other node. With wireless, some nodes do not receive other nodes' transmissions, so they are unaware that the medium is busy.

P6. During a natural disaster, it is likely that base stations will be damaged by the conditions of the environment. If the base stations fail, then all communication between nodes is unavailable (mobile nodes on a wireless network communicate to their base station, then their base station forwards the message to the correct node). However, if a mesh topology is implemented, the mobile nodes stay intact during the disaster, and they are able to communicate to each other since damage to smaller devices is less likely than damage to a base station wired network.