

ECE 358

Problem set 5

Note:

The *efficiency* of a LAN is the fraction of time spent sending successful frames. The *access time* is the maximum amount of time a station has to wait to start transmitting. An *active* station is one that has data to send. The *latency* of a ring is the time required for a bit to travel all the way around the ring. For the token ring problems below, neglect the time required to emit or absorb a token.

Problem 2.

In an 802.11 wireless LAN using CSMA/CA, station S sends a data packet to station R (which is within range). Even if we assume that connectivity is symmetric (A can hear B if and only if B can hear A), and collisions are the only cause of errors, and RTS/CTS packets never collide with each other, it is still possible that R will fail to receive the data packet. Describe one way this might happen.

Problem 3.

- a) When we examined the format of an Ethernet frame we noted that a number of bits are not data bits. Determine the fraction of data bits in a frame as a function of the packet length. Even if no time were wasted because of collisions, the data rate of the network would be limited by this fraction of the transmission rate. Compute this fraction for a packet length of 100 bytes and 1500 bytes.
- b) The 200 computers in a research laboratory are attached to a 10Base-T Ethernet with an efficiency of 65 percent. The packets have 800 data bits. On the average, how many packets can each computer send every second?

Problems below were taken from Chapter 5 of an earlier version of the book.

R3. Suppose two nodes start to transmit at the same time a packet of length L over a broadcast channel of rate R . Denote the propagation delay between the two nodes as d_{prop} . Will there be a collision if $d_{\text{prop}} < L/R$? Why or why not.

R8. Suppose nodes A, B, and C each attach to the same broadcast LAN (through their adapters). If A sends thousands of IP datagrams to B with each encapsulating frame 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 C? How would your answers change if A sends frames with the MAC broadcast address?

R 13. In CSMA/CD, after the fifth collision, what is the probability that a node chooses $K = 4$? The result $K = 4$ corresponds to a delay of how many seconds on a 10 Mbps Ethernet?