

ECE 360 – Computer Networks

Assignment 4

1. Six stations, A through F, communicate using the MACA protocol. Is it possible that two transmissions take place simultaneously? Explain your answer.
2. A seven-story office building has 15 adjacent offices per floor. Each office contains a wall socket for a terminal in the front wall, so the sockets form a rectangular grid in the vertical plane, with a separation of 4 m between sockets, both horizontally and vertically. Assuming that it is feasible to run a straight cable between any pair of sockets, horizontally, vertically, or diagonally, how many meters of cable are needed to connect all sockets using:
 - A. a star configuration with a single router in the middle?
 - B. an 802.3 LAN?

For each configuration, what is the maximum distance between any two computers?

3. Two CSMA/CD stations are each trying to transmit long (multiframe) files. After each frame is sent, they contend for the channel, using the binary exponential backoff algorithm. What is the probability that the contention ends on round k , and what is the mean number of rounds per contention period?
4. Consider building a CSMA/CD network running at 1 Gbps over a 1-km cable with no repeaters. The signal speed in the cable is 200,000 km/sec. What is the minimum frame size?
5. An IP packet to be transmitted by Ethernet is 60 bytes long, including all its headers. If LLC is not in use, is padding needed in the Ethernet frame, and if so, how many bytes?
6. Suppose that an 11-Mbps 802.11b LAN is transmitting 64-byte frames back-to-back over a radio channel with a bit error rate of $10e-7$. How many frames per second will be damaged on average?
7. Give two reasons why networks might use an error-correcting code instead of error detection and retransmission.
8. Briefly, describe the difference between store-and-forward and cut-through switches.
9. Store-and-forward switches have an advantage over cut-through switches with respect to damaged frames. Explain what it is.
10. A 1-km-long, 10-Mbps CSMA/CD LAN (not 802.3) has a propagation speed of 200 m/sec. Repeaters are not allowed in this system. Data frames are 256 bits long, including 32 bits of header, checksum, and other overhead. The first bit slot after a successful transmission is reserved for the receiver to capture the channel in order to send a 32-bit acknowledgement frame. What is the effective data rate, excluding overhead, assuming that there are no collisions?