

# Homework

1. A group of  $N$  stations share a 56-kbps pure ALOHA channel. Each station outputs a 1000-bit frame on average once every 100 sec, even if the previous one has not yet been sent (e.g., the stations can buffer outgoing frames). What is the maximum value of  $N$ ?
2. Consider the delay of pure ALOHA versus slotted ALOHA at low load. Which one is less? Explain your answer.
3. Sixteen stations, numbered 1 through 16, are contending for the use of a shared channel by using the adaptive tree walk protocol. If all the stations whose addresses are prime numbers suddenly become ready at once, how many bit slots are needed to resolve the contention?

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4. Six stations, A through F, communicate using the MACA protocol. Is it possible for two transmissions to take place simultaneously? Explain your answer.

5. Consider building a CSMA/CD network running at 1Gbps 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?

6. Please show the differences between

- (a) The Ethernet CSMA/CD protocol and the 802.11 CSMA/CA protocol
- (b) The MACA protocol and the 802.11 CSMA/CA protocol

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7. An unscrupulous host, A, connected to an 802.3 (Ethernet) network biases their implementation of the binary exponential backoff algorithm so they always choose from  $\{0,1\}$  after a collision, in any situation.

Another host, B, is trying to send a frame at the same time as A. Assuming A and B collide exactly three times before one of their transmissions succeeds, what are the odds that B sends its frame before A (as opposed to A sending before B)?

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8. Consider the following wireless network, where the circles are showing transmission ranges, and the presence of a host (letter) in a particular circle indicates it can hear that transmitter. If hosts A and C are both trying to send to host B will they encounter the hidden or exposed station problems? Does the MACA protocol help in this situation?

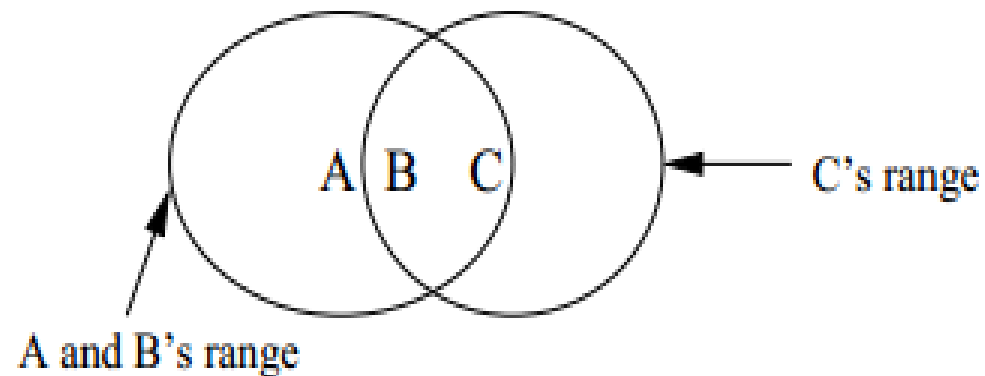


Figure 1: MACA Network showing transmission ranges for Question 8.

# Homework

9. Consider the extended LAN connected using bridges B1 and B2 in Fig. 4-41(b). Suppose the hash tables in the two bridges are empty. List all ports on which a packet will be forwarded for the following sequence of data transmissions:

- (a) A sends a packet to C.
- (b) E sends a packet to F.
- (c) F sends a packet to E.
- (d) G sends a packet to E.
- (e) D sends a packet to A.
- (f) B sends a packet to F.