Homework for Chapter 4

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?

   Solution:

   $$N \times \frac{1000}{100} \approx 0.184 \times 56 \times 10^3 \Rightarrow N \approx \frac{184 \times 56}{10} = 1030.4 \Rightarrow N = 1030.$$

2. A group of friends gets together to play highly interactive CPU- and network-intensive video games. The friends play together using a high-bandwidth wireless network. The wireless signal cannot propagate through walls, but the friends are all in the same room. In such a setup, would it be best to use nonpersistent CSMA or the token ring protocol? Please explain you answer.

   Solution:

   Token.

   For low fixed delay and high throughput.

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

   Solution:

   Yes. Six stations in a straight line.

4. Sketch the Manchester encoding on a classic Ethernet for the bit stream 0001110101.

   Solution:

   $$0001110101 \Rightarrow \texttt{LHLHLH HLHLHL LHHL LHHL}.$$

5. Give an example to show that the RTS/CTS in the 802.11 protocol is a little different than in the MACA protocol.

   Solution:

   MACA solves both hidden and exposed station problems.

   802.11 solves only hidden station problems.

6. Give two reasons why networks might use an error-correcting code instead of error detection and retransmission.

   Solution:

   For low quality channel like radio transmission.

   For real time transmission.

7. Consider the extended LAN connected using bridges $B1$ and $B2$ in Fig. 4-33(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.

Solution:

a. B1's port: 2, 3, 4; B2's port: 1, 2, 3.

b. B2's port: 1, 3, 4; B1's port: 1, 2, 3.

c. B2's port: no port; B1's port: no port.

d. B2's port: 2; B1's port: no port.

e. B2's port: 4; B1's port: 1.

f. B1's port: 1, 3, 4; B2's port: 2.

8. Store-and-forward switches have an advantage over cut-through switches with respect to damaged frames. Explain what it is.

   Solution:

   Store-and-forward switches don't forward damaged frames!

9. To make VLANs work, configuration tables are needed in the bridges. What if the VLANs of Fig. 4-39 used hubs rather than switches? Do the hubs need configuration tables, too? Why or why not?

   Solution:

   No.
   No need.

10. In Fig. 4-40, the switch in the legacy end domain on the right is a VLAN-aware switch. Would it be possible to use a legacy switch there? If so, how would that work? If not, why not?

    Solution:

    It would work.