Chapter 1

1. A factor in the delay of a store-and-forward packet-switching system is how long it takes to store and forward a packet through a switch. If switching time is 10 usec, is this likely to be a major factor in the response of a client-server system where the client is in New York and the server is in California? Assume the propagation speed in copper and fiber to be 2/3 the speed of light in vacuum.

distance between client and server is about 4000km.

propagation delay: $\frac{4000 \times 10^3}{2 \times 10^8} = 2 \times 10^{-2} s = 0.02 s$ ∴ propagation delay >> switching time.

2. Which of the OSI layers handles each of the following: ∴ It's not.

a. (a) Dividing the transmitted bit stream into frames.

b. (b)Determining which route through the subnet to use.

(a): the data link layer (Layer 2)

(b): the network layer (Layer 3)

3. A system has an n-layer protocol hierarchy. Applications generate messages of length M bytes. At each of the layers, an h-byte header is added. What fraction of the network bandwidth is filled with headers?

$$\text{fraction} = \frac{nh}{M+nh}$$

4. How long was a bit on the original 802.3 standard in meters? Use a transmission speed of 10 Mbps and assume the propagation speed in coax is 2/3 the speed of light in vacuum.

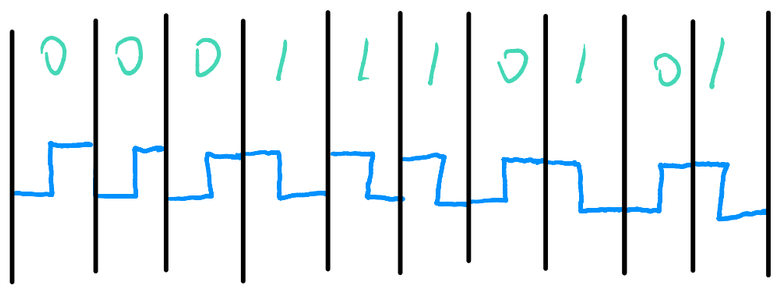
$\frac{1 \times 2 \times 10^8}{10 \times 10^6} = 20m$

Chapter 4

1. A group of N stations share 56-kbps pure ALOHA channel1. Each station outputs a 1000-bit frame on an average of 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?

one frame time $= \frac{1000}{56 \times 10^3} = \frac{1}{56}s$ $N_{max} = \frac{100}{1/56} = 5600$.

2. Sketch the Manchester encoding for the bit stream: 0001110101



3. Consider building a CSMA/CD network running at 1 Gbps over 1-km cable with no repeaters. The signal speed in the cable is 200,000 km/sec. What is the

minimum frame size?

$RTT = 2 \times \frac{1 \times 10^3}{2 \times 10^8} = 10^{-5}$ sec minimum frame size $= 1 \times 10^9 \times 10^{-5}$
$= 1 \times 10^4$ bit

4. 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?

60 + 18 = 78 bytes > 64 bytes ∴ No additinal padding is necessary.

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

Store-and-forward switches will check the frames for errors before forwarding it to the destination. It can drop frames that contain errors, to prevent the propagation of corrupted or damaged freames and reduce network congestion and bandwidth usage.