Chapter 6 Assignments

1. The Wireshark capture below shows a hex stream of an Ethernet frame generated by an application.

34c93d1de1e7f033e57acfed0800450000347bc740007d0645090a0006ca0a3e21ec01bb0dcd7e8204765
806bbc480120839838e0000020405b40103030201010402

Examine the frame and answer the following questions:

(a) What are the source and destination MAC addresses (in Hex)?
(b) What are the source and destination IP addresses (in dotted decimal)?
(c) What protocol type is the payload carried by IP packets?
(d) What is the source port number? How would you classify the source port?
(e) What is the destination port number? How would you classify the destination port?

2. You are hired to design a reliable byte-stream protocol that uses a sliding window (like TCP). This protocol will run over a 1-Gbps network. The RTT of the network is 100 ms, and the maximum segment lifetime is 30 seconds. How many bits would you include in the **AdvertisedWindow** and **SequenceNum** fields of your protocol header?

3. Consider Fig. 6-1. Assuming TCP Reno is the protocol experiencing the behavior shown above, answer the following questions. In all cases, you should provide a short discussion justifying your answer.

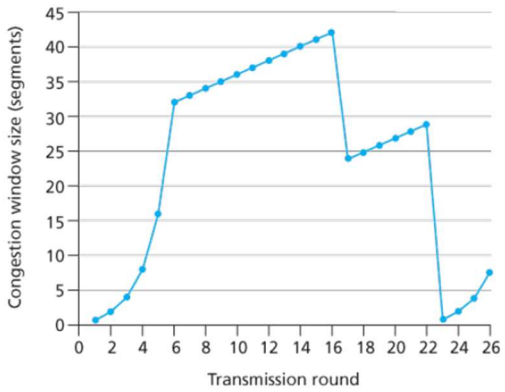

Fig. 6-1

(a) Identify the intervals of time when TCP slow start is operating.
(b) Identify the intervals of time when TCP congestion avoidance is operating.
(c) After the 16th transmission round, is segment loss detected by a triple duplicate ACK or by a timeout?
(d) After the 22nd transmission round, is segment loss detected by a triple duplicate ACK or by a timeout?
(e) What is the initial value of **ssthresh** at the first transmission round?
(f) What is the value of **ssthresh** at the 18th transmission round?
(g) What is the value of **ssthresh** at the 24th transmission round?

(h) During what transmission round is the 70th segment sent?
(i) Assuming a packet loss is detected after the 26th round by the receipt of a triple duplicate ACK, what will be the values of the congestion window size and of **ssthresh** ?
(j) Suppose TCP Tahoe is used (instead of TCP Reno), and assume that triple duplicate ACKs are received at the 16th round. What are the **ssthresh** and the congestion window size at the 19th round?
(k) Again suppose TCP Tahoe is used, and there is a timeout event at 22nd round. How many packets have been sent out from 17th round till 22nd round, inclusive.

4. Assume that TCP implements an extension that allows window sizes much larger than 64 KB. Suppose that you are using this extended TCP over a 1-Gbps link with a latency of 50 ms to transfer a 10-MB file, and the TCP receive window is 1 MB. If TCP sends 1-KB packets (assuming no congestion and no lost packets):
(a) How many RTTs does it take until slow start opens the send window to 1 MB?
(b) How many RTTs does it take to send the file?
(c) If the time to send the file is given by the number of required RTTs multiplied by the link latency, what is the effective throughput for the transfer? What percentage of the link bandwidth is utilized?