Transport Layer HW – Chapter 3

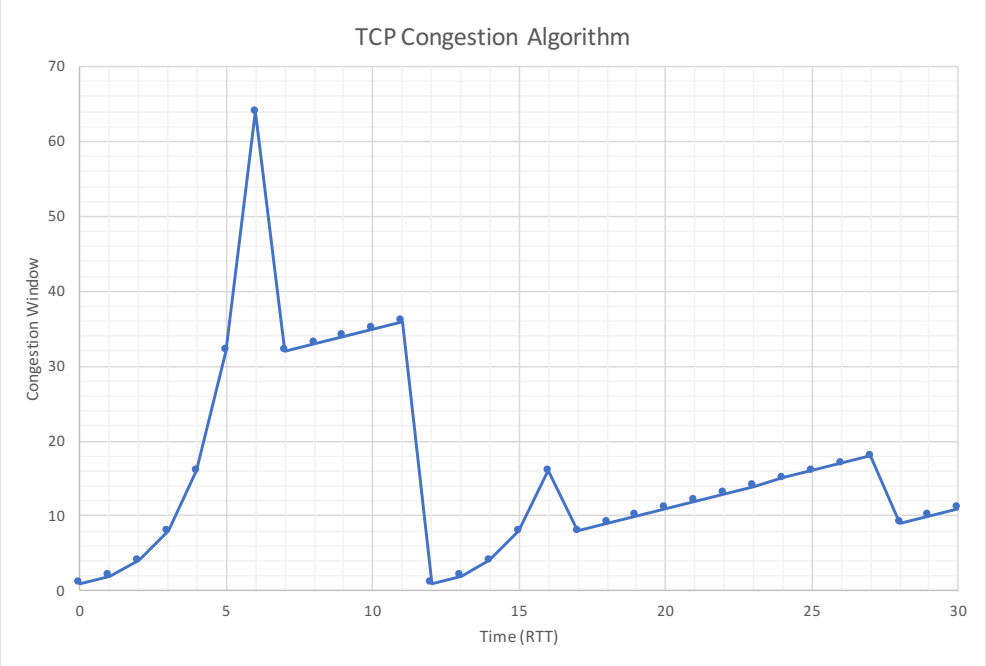
1) UDP and TCP use the 1s complement calculation for their checksums. Suppose you have the following three 8-bit bytes:

   01010111 01000110 01110110

   a. What is the 1s complement of the sum of these 8-bit bytes?
   b. What is the checksum for these three bytes?
      a. (Note that although UDP and TCP use 16-bit words in computing the checksum, for this problem you are being asked to consider 8-bit sums.)
   c. Show a 1 bit error that would be detected.
   d. Show a 2 bit error that would not be detected.
   e. Show all your work.

2) Hosts A and B are communicating over a TCP connection, and Host B has already received from A all bytes up through byte 126. Suppose Host A then sends two segments to Host B back-to-back. The first and second segments contain 80 and 40 bytes of data, respectively. In the first segment, the sequence number is 127, the source port number is 302, and the destination port number is 80. Host B sends an acknowledgment whenever it receives a segment from Host A.
   a. In the second segment sent from Host A to B, what are the sequence number, source port number, and destination port number?
   b. If the first segment arrives before the second segment, in the acknowledgment of the first arriving segment, what is the acknowledgment number, the source port number, and the destination port number?
   c. If the second segment arrives before the first segment, in the acknowledgment of the first arriving segment, what is the acknowledgment number?
   d. Suppose the two segments sent by A arrive in order at B. The first acknowledgment is lost and the second acknowledgment arrives after the first timeout interval. Draw a timing diagram, showing these segments and all other segments and acknowledgments sent. (Assume there is no additional packet loss.) For each segment in your figure, provide the sequence number and the number of bytes of data; for each acknowledgment that you add, provide the acknowledgment number.

3) Assuming TCP Reno is the protocol experiencing the behavior shown below, answer the following questions. Provide very brief statements justifying your answers.
   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. For each loss event, identify the time (number of RTT) the event occurred and the type of loss experiences.
   d. State the value of `cwnd` as the connection begins, at the moment of each loss event and for the RTT immediately following each loss event. Include the RTT number associated with each of your answers (perhaps a table will be a good way to answer this and part (e)).
   e. State the value of `ssthresh` as the connection begins and each time this variable value changes, along with the RTT at which the value changes.
   f. During what transmission round is the 70th segment sent?
   g. Suppose TCP Tahoe is used (instead of TCP Reno). What are the `ssthresh` and the `cwnd` size after each loss event (check the chapter for a quick explanation for the difference between Tahoe and Reno)?



Wireshark Lab

- TCP lab – with objective, what you did, and conclusion statement
  - Through question 10.
  - Playing around with question 14, for congestion, can be fun, but people have had mixed success in the past.
- Solutions will be posted on Moodle for reference