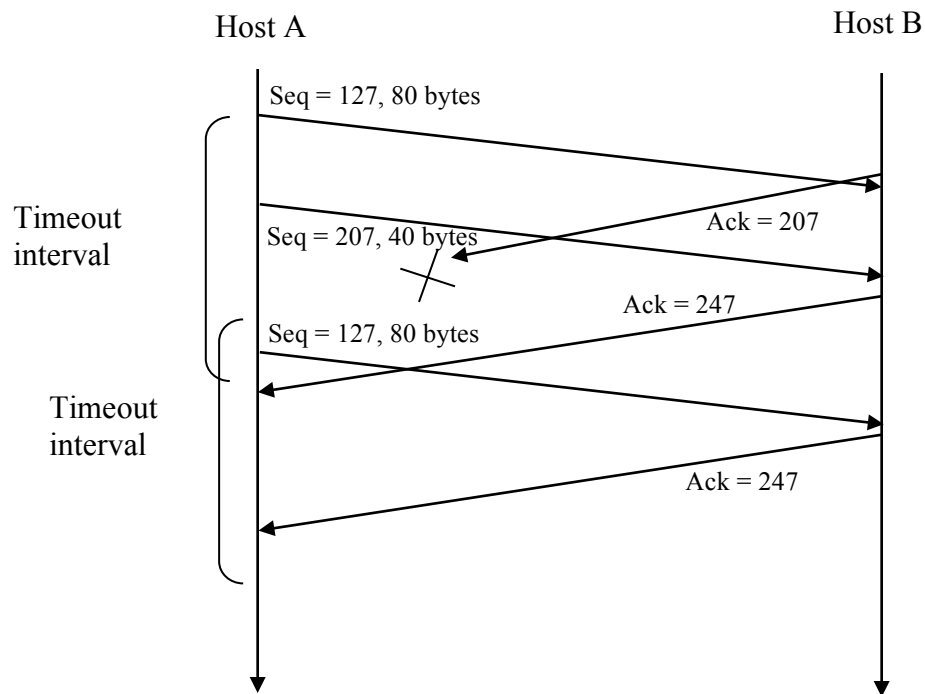


Transport Layer – Chapter 3

Problem 27

- a) In the second segment from Host A to B, the sequence number is 207, source port number is 302 and destination port number is 80.
- b) If the first segment arrives before the second, in the acknowledgement of the first arriving segment, the acknowledgement number is 207, the source port number is 80 and the destination port number is 302.
- c) If the second segment arrives before the first segment, in the acknowledgement of the first arriving segment, the acknowledgement number is 127, indicating that it is still waiting for bytes 127 and onwards.
- d)



Problem 40

- a) TCP slowstart is operating in the intervals [1,6] and [23,26]
- b) TCP congestion avoidance is operating in the intervals [6,16] and [17,22]
- c) After the 16th transmission round, packet loss occurs with a triple duplicate ACK.
 - a. If there was a timeout, the congestion window size would have dropped to 1.
- d) After the 22nd transmission round, segment loss is detected due to timeout, and hence the congestion window size is set to 1.
- e) The threshold is initially 32, since it is at this window size that slow start stops and congestion avoidance begins.
- f) The threshold is set to half the value of the congestion window when packet loss is detected. When loss is detected during transmission round 16, the congestion windows size is 42.
 - a. Hence the threshold is 21 during the 18th transmission round.
- g) The threshold is set to half the value of the congestion window when packet loss is detected.
 - a. When loss is detected during transmission round 22, the congestion windows size is 26.
 - b. Hence the threshold is 13 during the 24th transmission round.
- h) During the 1st transmission round, packet 1 is sent
 - a. Packet 2-3 are sent in the 2nd transmission round
 - b. Packets 4-7 are sent in the 3rd transmission round
 - c. Packets 8-15 are sent in the 4th transmission round
 - d. Packets 16-31 are sent in the 5th transmission round
 - e. Packets 32-63 are sent in the 6th transmission round
 - f. Packets 64 – 96 are sent in the 7th transmission round.
 - g. Packet 70 is sent in the 7th transmission round.
- i) The threshold will be set to half the current value of the congestion window (8) when the loss occurred and congestion window will be set to the new threshold value + 3 MSS (see bottom of page 275).
 - a. Thus the new values of the threshold and window will be 4 and 7 respectively.
- j) Originally, TCP cut CWND back to 1MSS for any loss event, then entering ‘slow start’ with the exponential growth (TCP Tahoe). If this version were to be used, then
 - a. For Round 17, $ssthresh = 0.5 * CWND = 42/2 = 21$; and CWND (with Tahoe) is set = 1. TCP enters ‘slow start’ (with exp. growth)
 - b. At Round 19, $CWND = 4$ (having grown exp. $1 : 2 : 4$); $ssthresh$ still = 21
- k) Again using TCP Tahoe, and assuming part (j) holds, *i.e.*, Tahoe was in place for the loss event at round 16 also (the question is perhaps unclear on this point), then with a timeout at the 22nd round, (with Tahoe):
 - a. Round 17, 1 packet
 - b. Round 18, 2 packets
 - c. Round 19, 4 packets
 - d. Round 20, 8 packets
 - e. Round 21, 16 packets
 - f. Round 22, 21 packets, since $ssthresh$ was reached

So, the total number of packets is 52.