

Worksheet 9

1. True or false? Consider congestion control in TCP. When the timer expires at the sender. The value of $ssthresh$ is set to one half of its previous value.
2. Consider sending a large file from one host to another over a TCP connection that has no loss.
 - a. Suppose TCP uses AIMD for its congestion control without slow start. Assuming $CongWin$ increases by 1 MSS every time an ACK is received and assuming approximately constant round-trip times, how long does it take for $CongWin$ to increase from 1 MSS to 5 MSS (assuming no loss events and constant RTT)?
 - b. What is the average throughput (in terms of MSS and RTT) for this connection up through time = 4 RTT?
3. Suppose that in TCP, the sender window is of size N , the base of the window is at sequence number x , and the sender has just sent a complete window's worth of segments. Let RTT be the sender-to-receiver-to-sender round-trip time, and let MSS be the segment size.
 - a. Is it possible that there are ACK segments in the receiver-to-sender channel for segments with sequence numbers lower than x ? Justify your answer.
 - b. Assuming no loss, what is the throughput (in packets/sec) of the sender-to-receiver connection?
 - c. Suppose TCP is in its congestion avoidance phase. Assuming no loss, what is the window size after the N segments are ACKed?
4. Suppose two TCP connections are present over some bottleneck link of rate R bps. Both connections have a huge file to send (in the same direction over the bottleneck link). The transmission of the file starts at the same time. What transmission rate would TCP like to give to each of the connections?