

TELE3118 Tutorial 5: Transport Layer

1. TCP error control and port #s

Host A and Host 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 acknowledgement of the first arriving segment, what is the acknowledgement number, the source port number and the destination port number?
- c) If the second segment arrives before the first segment, in the acknowledgement of the first *arriving* segment [i.e. the 2nd segment *sent*, containing 40 bytes], what is the acknowledgement number?
- d) Suppose the two segments sent by A arrive in order at B. The first acknowledgement is lost and the second acknowledgement arrives after the first time-out interval. Draw a timing diagram, showing these segments and all other segments and acknowledgements sent. Assume there is no additional packet loss. For each segment in your figure, provide the sequence number and the number of bytes; for each acknowledgement that you add, provide the acknowledgement number.

Kurose & Ross, Ch. 3, P27

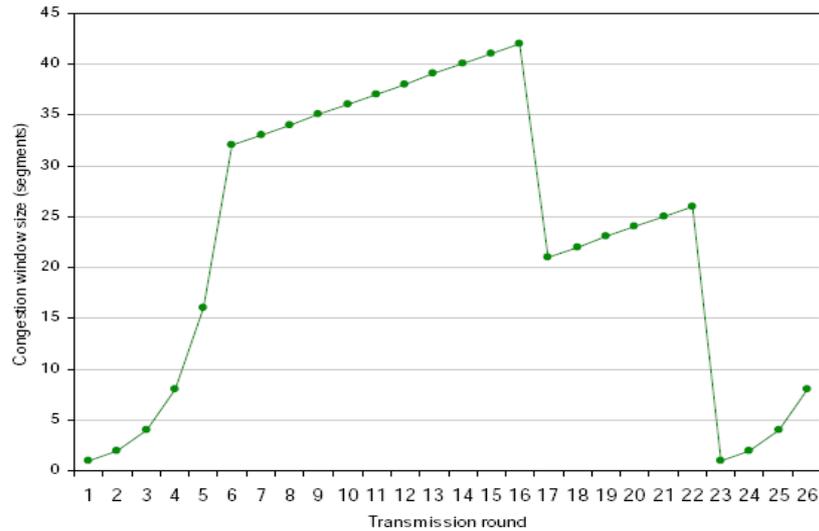
2. Window sizes

In a Usenet posting someone complained about a throughput of 120,000 bits/sec on a 256,000 bits/sec link with a 128-ms delay between the United States and Japan (47% utilization), and a throughput of 33,000 bits/sec when the link was routed over a satellite (13% utilization). What does the window size appear to be for both cases? (Assume a 500-ms delay for the satellite link.) How big should the window be for the satellite link?

Stevens, question 20.3 (p. 296)

3. TCP Congestion Control Modes

Consider the following plot of TCP window size as a function of time.



Assuming TCP Reno is the protocol experiencing the behaviour shown above, answer the following questions. In all cases, you should provide a short discussion justifying your answer.

- Identify the intervals of time when TCP slow start is operating.
- Identify the intervals of time when TCP congestion avoidance is operating.
- After the 16th transmission round, is segment loss detected by a triple duplicate ACK or by a timeout?
- After the 22nd transmission round, is segment loss detected by a triple duplicate ACK or by a timeout?
- What is the initial value of **ssthresh** at the first transmission round?
- What is the value of **ssthresh** at the 18th transmission round?
- What is the value of **ssthresh** at the 24th transmission round?
- During what transmission round is the 70th segment sent?
- 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**?