Computer Networks
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Homework 5

Problem 5.1

Solution:

a) Payload size: 1200

SEQ	ACK	F	WIN
1030	3848	ACK	4000

b) An application has consumed the data on the server side. This has caused the server side window to increase. The increase of the window size caused the server to send multiple acknowledgments that would reflect an increase in the window thus allowing the client to make use of it.

c) SACK is an acknowledgment that allows the system to say 'I only have up to packet "a", but I also have received packets "c" and "d" but I am missing packet "b"'. This allows there transmission only the packet that was not received. The way that SACK does this is by specifying the left and right Edges of data that has been received beyond the Seq number of the packet.

d) SACK should be used in segment 8.
The edges of the SACK would be:
Right edge = 4630
Left edge = 3430

e) Client side goes into TIME_WAIT. This is due to the process of having to close both sides of a TCP connection. In this case the client initiated the closing, sending a FIN, then received a ACK followed by a FIN, then sent an ACK back and goes to wait in case the ACK gets lost.

Problem 5.2

Solution:

a) According to the graph, 1300000 bytes have been transferred. The average data rate over the closed time interval [0.5, 12.5] can be calculated as:

$$average\ data\ rate = \frac{total\ amount\ transferred}{12.5-0.5}$$

$$\frac{1300000}{12} = 108,333p/s$$

b) minimum window: 30000
Maximum window: 300000

c) 6 segments have been lost and have not yet retransmitted successfully.

d) At the beginning of the TCP connection, a large number of TCP fragments are send from $t = 0.5tot = 1.5$. The sending data rate for the closed interval [0.5 : 1.5] is approx. 240000. However a lot seem to be lost then retransmitted from $t = 1.6$ to $t = 3.5$.

References:
http://www.serverframework.com/asynchronousevents/2011/01/time-wait-and-its-design-implica
html
https://networkengineering.stackexchange.com/questions/32312/what-makes-tcp-window-size-ke
http://packetbomb.com/understanding-the-tcptrace-time-sequence-graph-in-wireshark/
Questions discussed with Brian Sherif and Fezi Manana.