Computer Networks
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Homework 5

Problem 5.1

Solution:

a) The sequence number (SEQ) is 1030. The acknowledgment number (ACK) is 3848. The flags (F) is = ACK, and the receive window (WIN) is 4000. The segment carried 1200 bytes of data as payload.

b) The server sends almost 2 identical acknowledgments to inform the other half of the connection that data in the buffer has been consumed so the window size has now changed(that is also what happened as asked by the second part of the question).

c) The TCP extension to carry selective acknowledgments works by sending the received segment range in the duplicate acknowledgement. This is useful as it allows the other part of the communication to send only the missing segments and not all the segments after the segments that were lost. The two numbers carried in the extension option for each block indicate the Left and Right Edge numbers respectively of the received segments), and this is done to state explicitly the ranges of data that was received.

d) The server could have used selective acknowledgments in segment 8. Precisely, the ACK was used to show received packages, and the Left and Right Edge numbers are 3430 and 4630 respectively.

e) Yes, the client goes into the TIME_WAIT state. As seen in segments 14 and 15, the client start closing the communication by sending a FIN, then receives an ACK and FIN in response. The the last segment it sends the ACK back and goes in the TIME_WAIT state just in case ACK might get lost in the flight.

Problem 5.2

Solution:

Since the question does not ask for clarifications on why certain calculations go that way, I will only write the final results I got from my calculations.

a) The average data rate during the entire data transfer is $108333.\overline{3}$

b) The minimum and maximum receive window sizes are 30000 and 300000 bytes respectively.

c) A total of 6 segments were lost and not yet successfully retransmitted at t = 12.

d) At the beginning of the data transfer (the specified interval), initially a large number of TCP fragments gets transferred (t from .5 to 1.4), then many fragments get lost and retransitted (t from 1.6 to 3.3), and from t 3.3 and onwards it continues as normal TCP communication.