Dhruv Aggarwal
7163546
February 16, 2024

CS 176A: Homework 3

Part 1

1.
   a. Sequence Number
      i. Because TCP packets can be received in any order, the sequence number helps identify them and assemble the final packet in the correct order
   b. Acknowledgement Number
      i. Sent by the recipient in TCP to inform the sender of the bytes that are received.
   c. ACK Bit
      i. A flag that either validates or invalidates a given acknowledgement number. Tells the sender that the receiver has received data with 1, and 0 means no reception.
   d. Receiver Advertisted Window
      i. A mechanism that specifies how many bytes of data can be transmitted before acknowledgements are required. This prevents the sender from sending too much data in a short period of time
   e. Source Port Number
      i. Identifies the port that the sender uses to create the connection with the receiver. The port handles data multiplexing and demultiplexing.
2.
   a. FIN
   b. SYN-ACK
   c. SYN
   d. ACK
   e. RST
3. Transport layer multiplexing and demultiplexing refers to directing packets using the port fields of the TCP header. Multiplexing involves collecting data from multiple sources and transmitting it all over one connection, while demultipliexing involves receiving one stream of data and separating it to whichever processes should get specific information.
4. The UDP header field length is needed to check data integrity, determine the size of the datagram and to confirm proper port usage.
5.
   a. TCP slow start is between transmission rounds 1-6 and 23-26.
   b. TCP congestion avoidance is between rounds 6-15 and 17-22.
   c. Segment loss is due to triple duplicate ACK, because we can see the congestion window being cut in half before increasing again.
   d. Segment loss is due to timeout, as we have a slow start from 1 again afterwards
   e. Ssthresh is 32 as that is the maximum value we get to before incremental additive increase.
   f. At the 18th round, ssthresh is equal to half of the previous loss. Loss occurred at 42, so ssthresh will be 21.

g. At round 24, ssthresh is 12 because it is similarly half of the previous loss, which was this time 24.

h. If packet loss is detected, the ssthresh will be set to roughly 4, as the window was previously 8 and we cut in half. The congestion window was 4, but we add +1MSS for each RTT (there are 3) which means the window size is 7 in total.

Part 2: Wireshark

1. The IP address of the client is 192.168.86.68 and the port is 55639
2. The IP address of gaia.cs.umass.edu is 128.119.245.12 and the port number is 80.
3. The raw sequence number of this packet is 4236649187
4. The raw sequence number of the synack segment is 106896752. The value of the acknowledgement field is 4236649188 which si the next byte after the raw sequence number of the packet sent to gaia.cs.umass.edu. (4236649187 + 1)
5. The sequence number of the TCP segment containing POST is 4236649118.
6. The TCP packets sent at t = 0.025, 0.053, 0.082 and 0.1 seem to be in slow-start phase, because there seems to be roughly double the number of points at each of these timestamps.