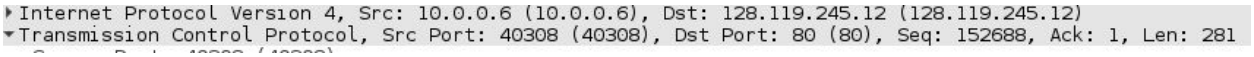
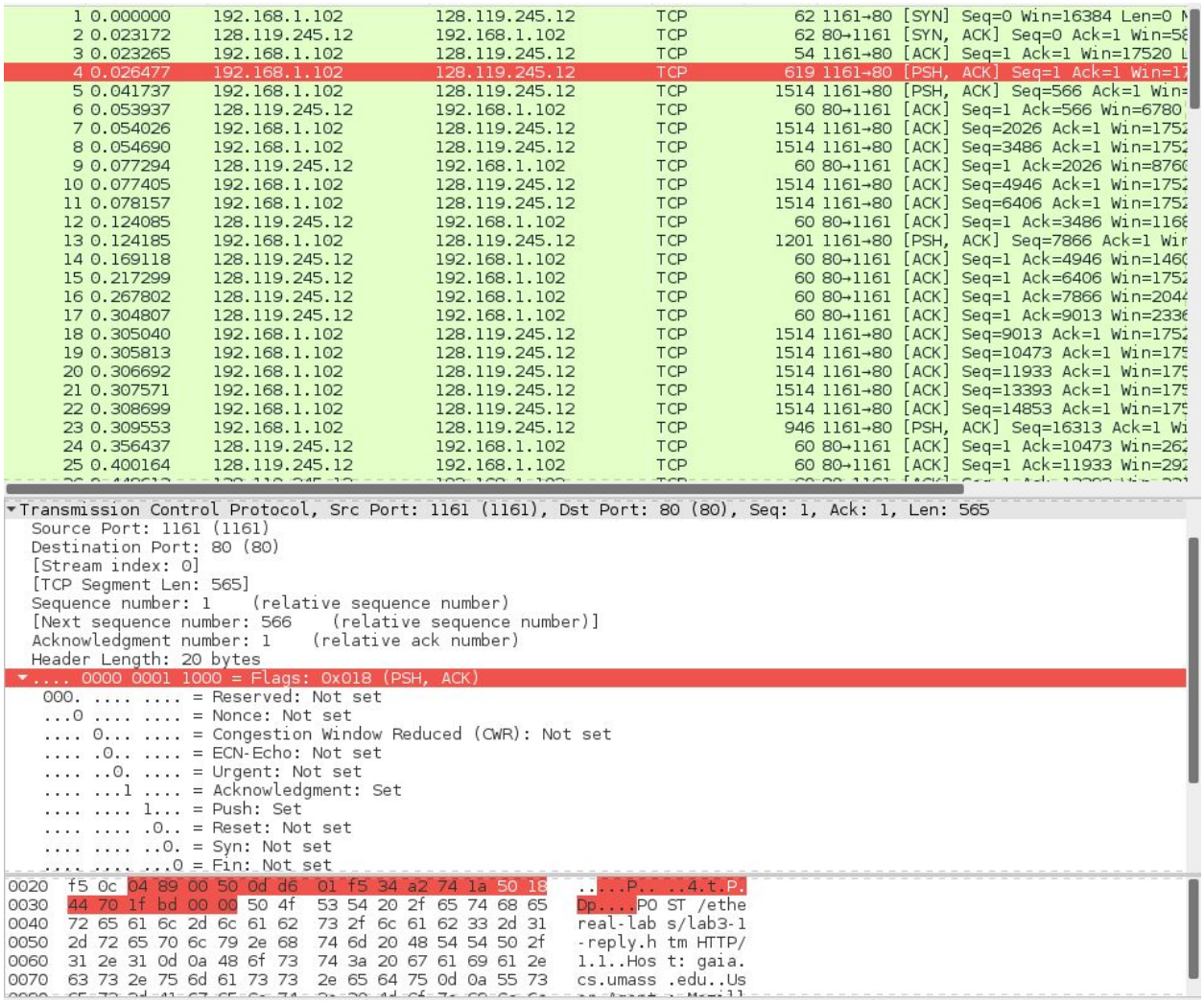
Kevin Stine
Lab 3 - TCP

1. What is the IP address and TCP port number used by the client computer?
    a. Source IP address is 192.168.1.102 and the TCP port number is 1161
2. What is the IP address of gaia.cs.umass.edu? On what port number is it sending and receiving TCP segments for this connection?
    a. The IP address of gaia.cs.umass.edu is 128.119.245.12 and is sending and receiving TCP segments on port 80
3. What is the IP address and TCP port number used by your client computer to transfer the file to gaia.cs.umass.edu?
    a. My client IP address is 10.0.0.6 and the TCP port number is 40308



4. What is the sequence number of the TCP SYN segment that is used to initiate the TCP connection between the client computer and gaia.cs.umass.edu? What is it in the segment that identifies the segment as a SYN segment?
    a. The SYN segment is …. 0000 0000 0010 = FLags: 0x002 (SYN)
    b. The 1 in the sequence is what identifies the SYN segment
5. What is the sequence number of the SYNACK segment sent by gaia.cs.umass.edu to the client computer in reply to the SYN? What is the value of the acknowledgement field in the SYNACK segment?
    a. The sequence is …. 0000 0001 0010 = Flags: 0x012 (SYN, ACK)
    b. The value of the acknowledgement field is set to 1
    c. The server adds 1 to the initial sequence number of SYN segment from the client computer which was initially zero, causing the the ACK number to be 1
    d. A segment is identified as a SYNACK segment if both the SYN flag and ACK flag in the segment are set to 1

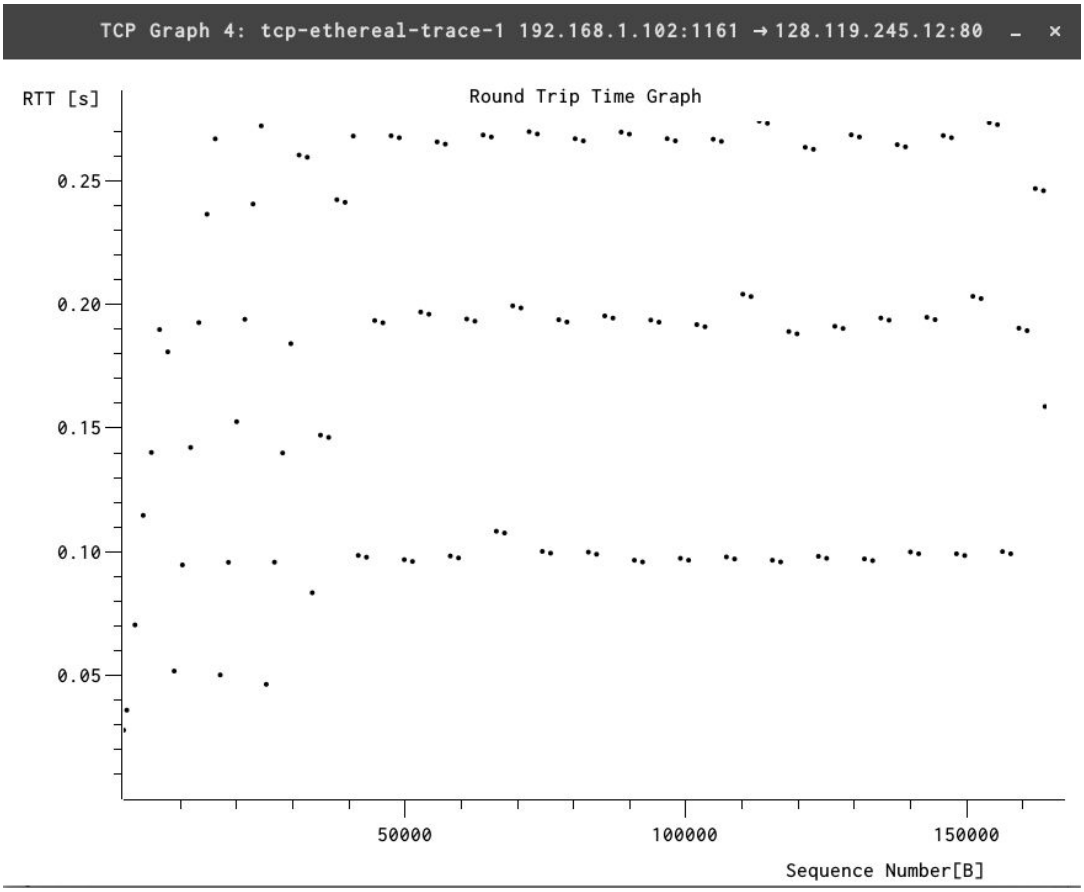
6. What is the sequence number of the TCP segment containing the HTTP POST command?



   a. The sequence number is set to 1 in this segment which contains the HTTP POST command

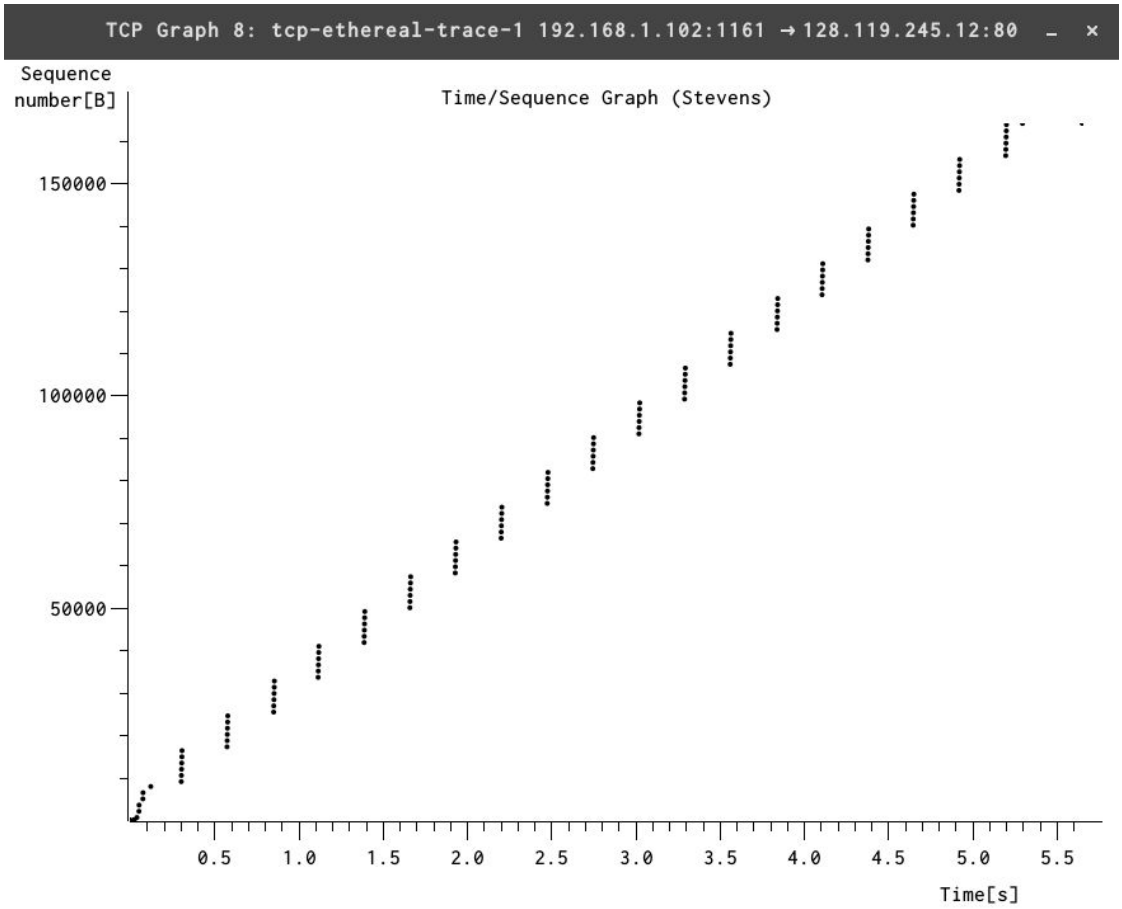
7. Consider the TCP segment containing the HTTP POST as the first segment in the TCP connection. What are the sequence numbers of the first six segments in the TCP Connection? At what time was each segment sent? When was the ACK for each segment received?
   a. The first six sequence numbers are: 1, 566, 1, 2026, 3486, 1

	Sent Time:	ACK Received Time:	RTT:
Segment 1:	.026477		.023265
Segment 2:	.041737		.023265
Segment 3:	.053937		.02746
Segment 4:	.054026		.023265
Segment 5:	.054690		.023265
Segment 6:	.077294		.035557



8. What is the length of each of the first six TCP segments?
    a. 619, 1514, 60, 1514, 1514, 60
9. What is the minimum amount of available buffer space advertised at the received for the entire trace? Does the lack of receiver buffer space ever throttle the sender?
    a. The minimum amount of buffer space is 5840 from the very first ACK
    b. The max buffer size is 60k bytes so it should never be throttled due to a lack of buffer space

10. Are there any retransmitted segments in the trace file? What did you check for in order to answer this question?
    a. No there are no retransmitted segments in the trace file. I checked the time sequence graph (stevens) and all the sequence numbers are increasing
11. How much data does the receiver typically acknowledge in an ACK? Can you identify cases where the receiver is ACKing every other received segment?
    a. The receiver typically acknowledges 1460 bytes and it looks like it ACKs every received segment
12. What is the throughput (bytes transferred per unit time) for the TCP connection? Explain how you calculated this value.
    a. The alice.txt is 152,138 bytes and the download time is 1.487253000 (First TCP segment) - 0.271257000 = 1.215996 seconds.
    b. 152,138/1.215996 = 125113.898401 bytes/second
13. Use the time sequence graph. Can you identify where TCP's slow start phase begins and ends, and where congestion avoidance takes over?



    a. It looks like the slow start of the TCP seems to begin around .15 seconds and ends around .3 seconds. Congestion avoidance takes over around .3 seconds because it cut down the amount being sent.