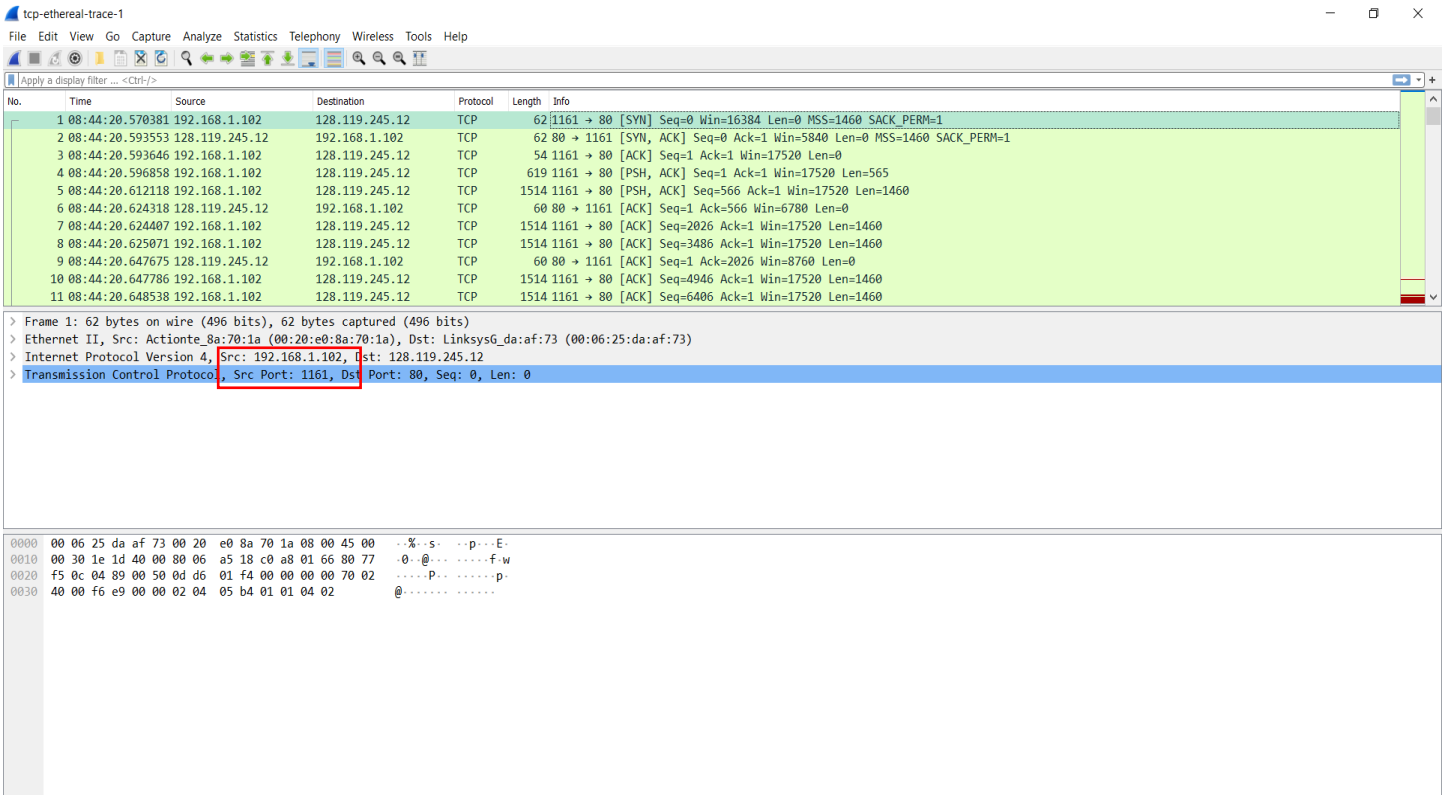
LAB 2

1. What is the IP address and TCP port number used by the client computer (source) that is transferring the file to gaia.cs.umass.edu? To answer this question, it's probably easiest to select an HTTP message and explore the details of the TCP packet used to carry this HTTP message, using the "details of the selected packet header window" (refer to Figure 2 in the "Getting Started with Wireshark" Lab if you're uncertain about the Wireshark windows.

   Solution 1:

   SRC IP – 192.168.1.102

   TCP Port Number – 1161

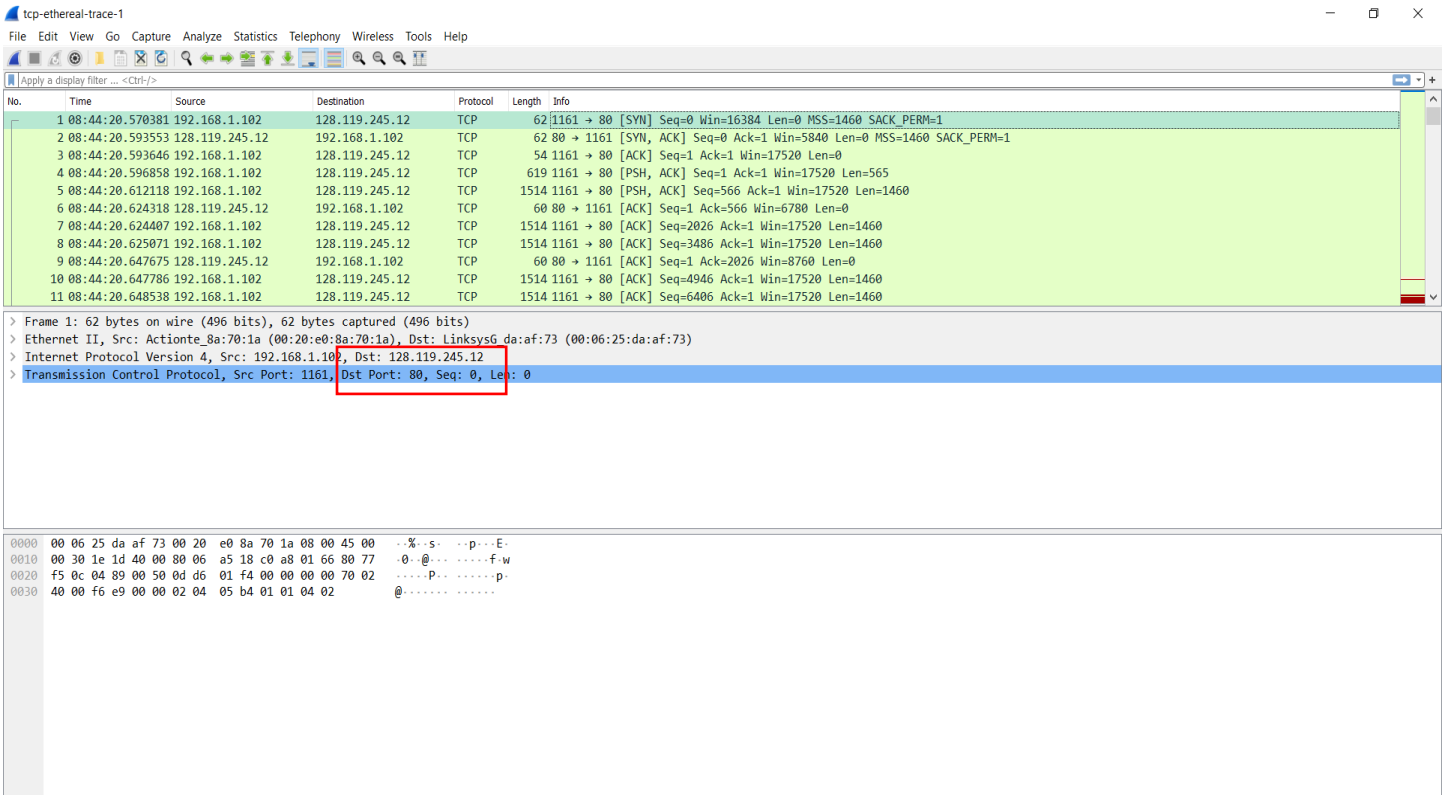


LAB 2

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?

   Solution 2:

   gaia.cs.umass.edu IP address – 128.119.245.12
   It is sending and receiving TCP segments on PORT – 80 (HTTP port)



LAB 2

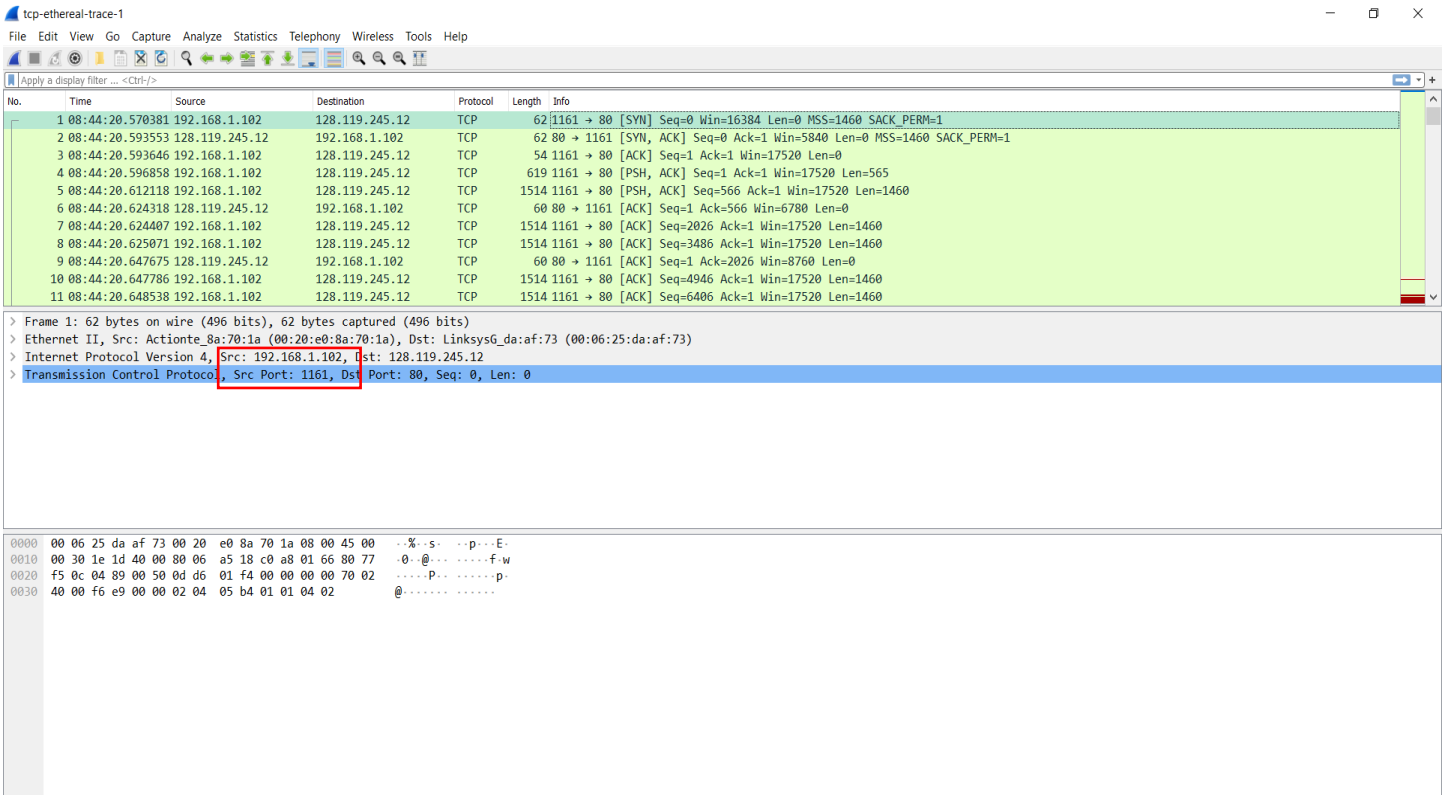
If you have been able to create your own trace, answer the following question:

3. What is the IP address and TCP port number used by your client computer (source) to transfer the file to gaia.cs.umass.edu?
   Solution 3:

No Trace provided in the material is used

SRC IP – 192.168.1.102

TCP Port Number – 1161

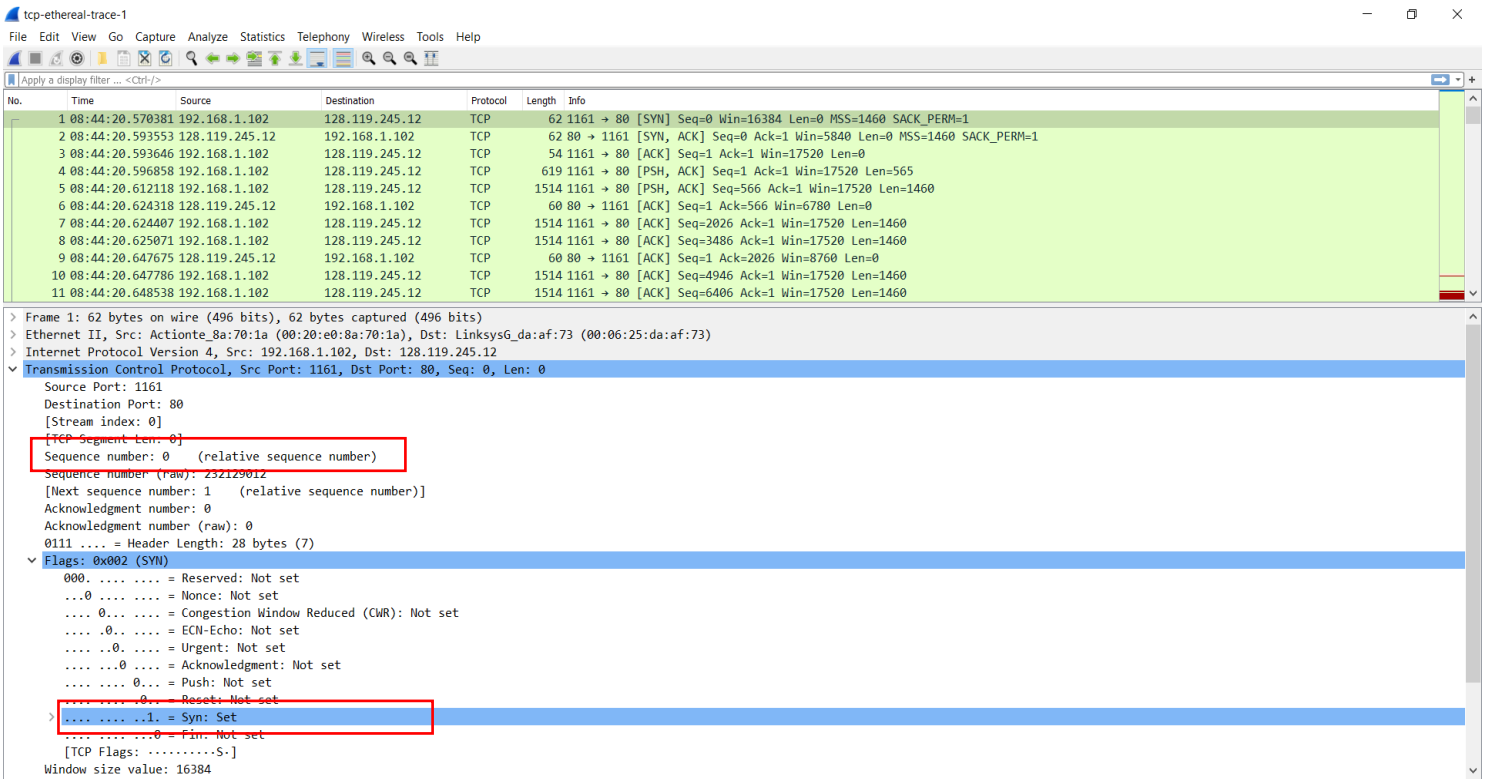


LAB 2

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?

Solution 4:

Sequence number of the TCP SYN segment – 0
SYN Flag is SET in Flags identifying this is a SYN segment



LAB 2

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? How did gaia.cs.umass.edu determine that value? What is it in the segment that identifies the segment as a SYNACK segment?

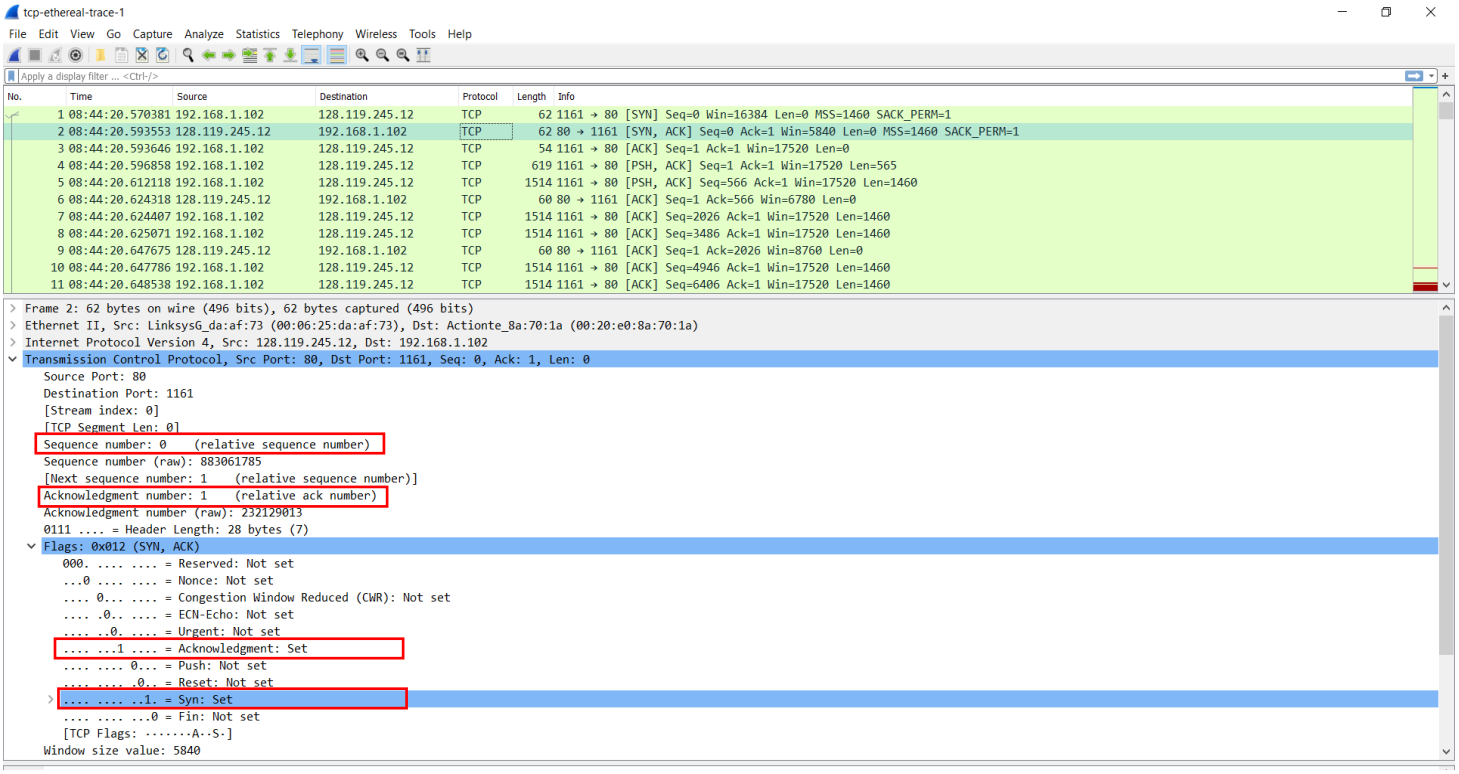
Solution 5:

Sequence number of SYNACK segment sent by gaia.cs.umass.edu to client computer in reply to SYN – 0

Acknowledgement field in the SYNACK segment – 1

gaia.cs.umass.edu determined this value by adding 1 to the initial sequence number i.e. 0 in SYN segment from client.

Both SYN & ACK are SET in the FLAGS indicating it is SYNACK segment.

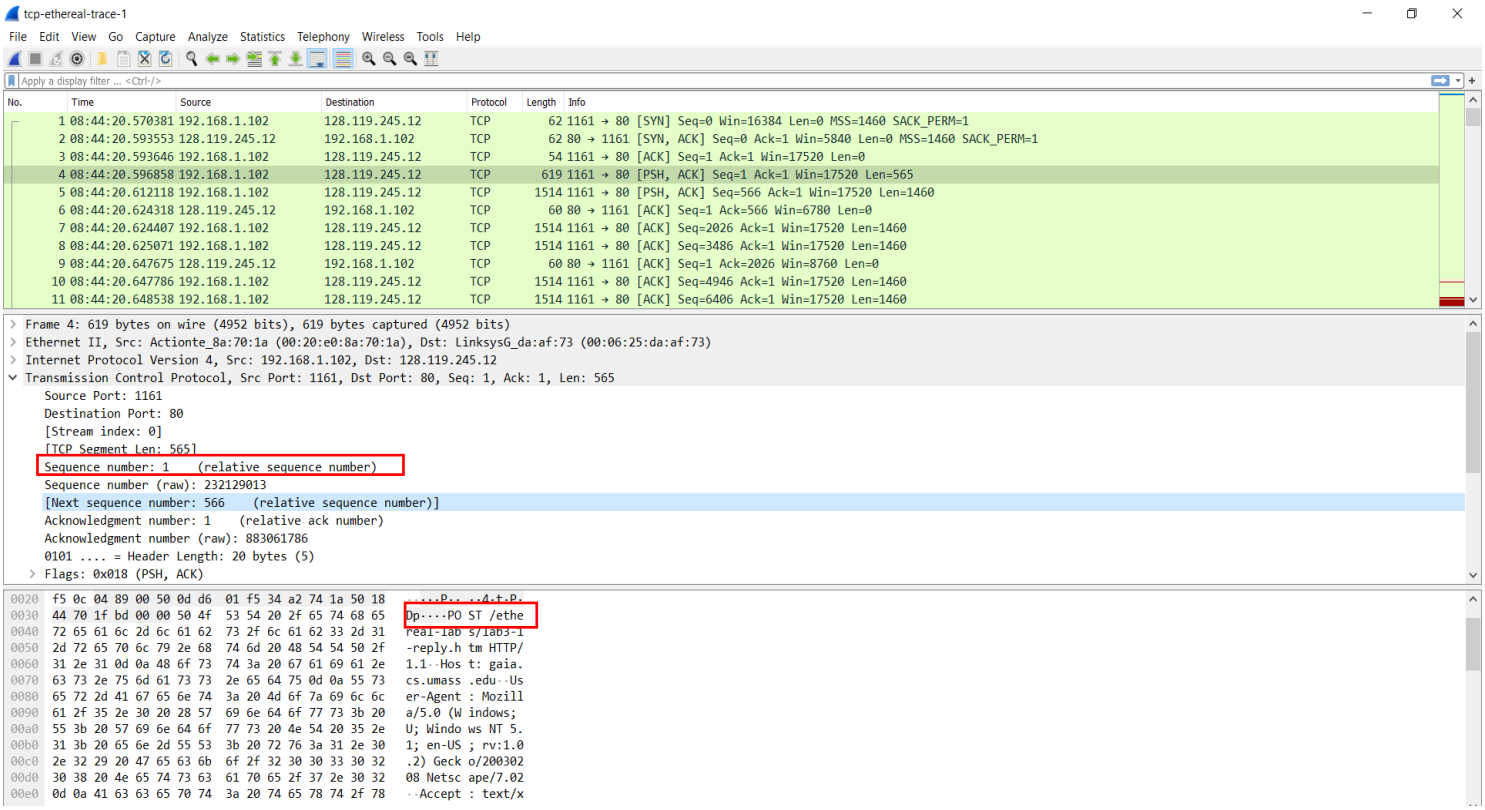


LAB 2

6. What is the sequence number of the TCP segment containing the HTTP POST command? Note that in order to find the POST command, you'll need to dig into the packet content field at the bottom of the Wireshark window, looking for a segment with a "POST" within its DATA field.

Solution 6 :

Sequence number of the TCP segment containing the HTTP POST command – 1



LAB 2

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 (including the segment containing the HTTP POST)? At what time was each segment sent? When was the ACK for each segment received? Given the difference between when each TCP segment was sent, and when its acknowledgement was received, what is the RTT value for each of the six segments? What is the EstimatedRTT value (see Section 3.5.3, page 242 in text) after the receipt of each ACK? Assume that the value of the EstimatedRTT is equal to the measured RTT for the first segment, and then is computed using the EstimatedRTT equation on page 242 for all subsequent segments. Note: Wireshark has a nice feature that allows you to plot the RTT for each of the TCP segments sent. Select a TCP segment in the "listing of captured packets" window that is being sent from the client to the gaia.cs.umass.edu server. Then select: Statistics->TCP Stream Graph>Round Trip Time Graph.

Solution 7:

1st Segment –

Sequence Number	Segment Sent Time	ACK Receive Time	RTT (seconds)	Estimated RTT (seconds)
1	**0.026477**	**0.053937**	**0.02746**	**0.02746**

EstimatedRTT = 0.875 * EstimatedRTT + 0.125 * SampleRTT

2nd Segment –

Sequence Number	Segment Sent Time	ACK Receive Time	RTT (seconds)	Estimated RTT (seconds)
566	**0.041737**	**0.077294**	**0.035557**	**0.028472125**

LAB 2

3rd Segment –

Sequence Number	Segment Sent Time	ACK Receive Time	RTT (seconds)	Estimated RTT (seconds)
2026	0.054026	0.124085	0.070059	0.03367049

4th Segment –

Sequence Number	Segment Sent Time	ACK Receive Time	RTT (seconds)	Estimated RTT (seconds)
3486	0.054690	0.169118	0.114428	0.04376518

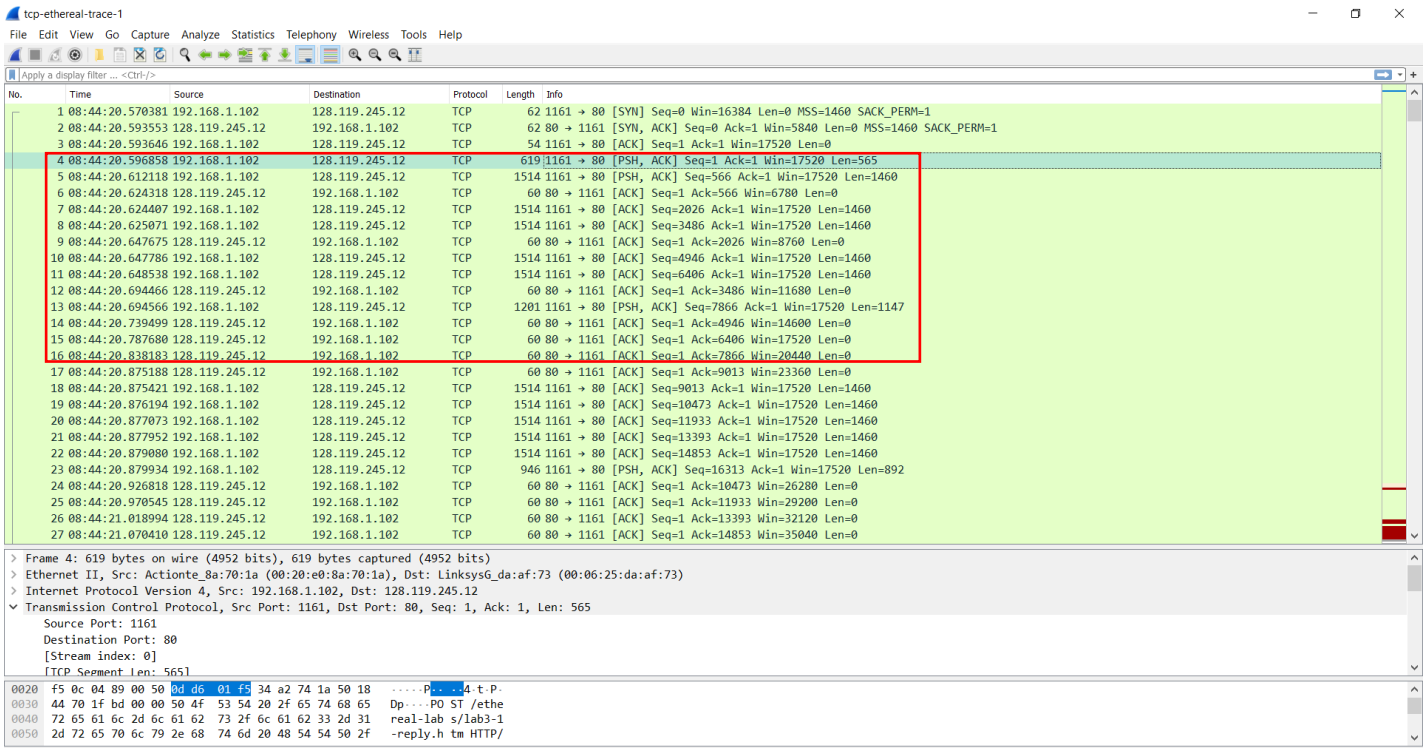
5th Segment –

Sequence Number	Segment Sent Time	ACK Receive Time	RTT (seconds)	Estimated RTT (seconds)
4946	0.077405	0.217299	0.139894	0.05

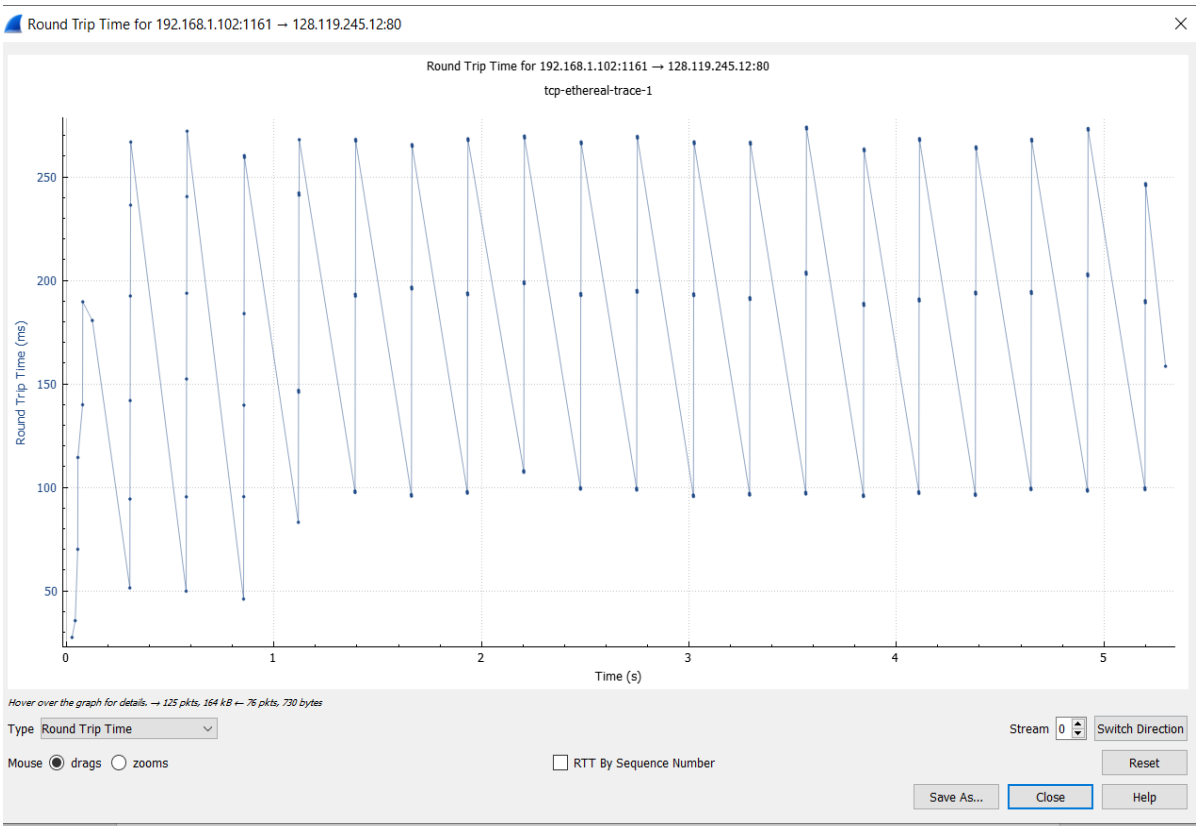
6th Segment –

Sequence Number	Segment Sent Time	ACK Receive Time	RTT (seconds)	Estimated RTT (seconds)
6406	0.078157	0.267802	0.18964	0.07

LAB 2



RTT PLOT -



LAB 2

8. What is the each of the first six TCP segments?

Solution 8 :

First Segment Length - 565 Bytes

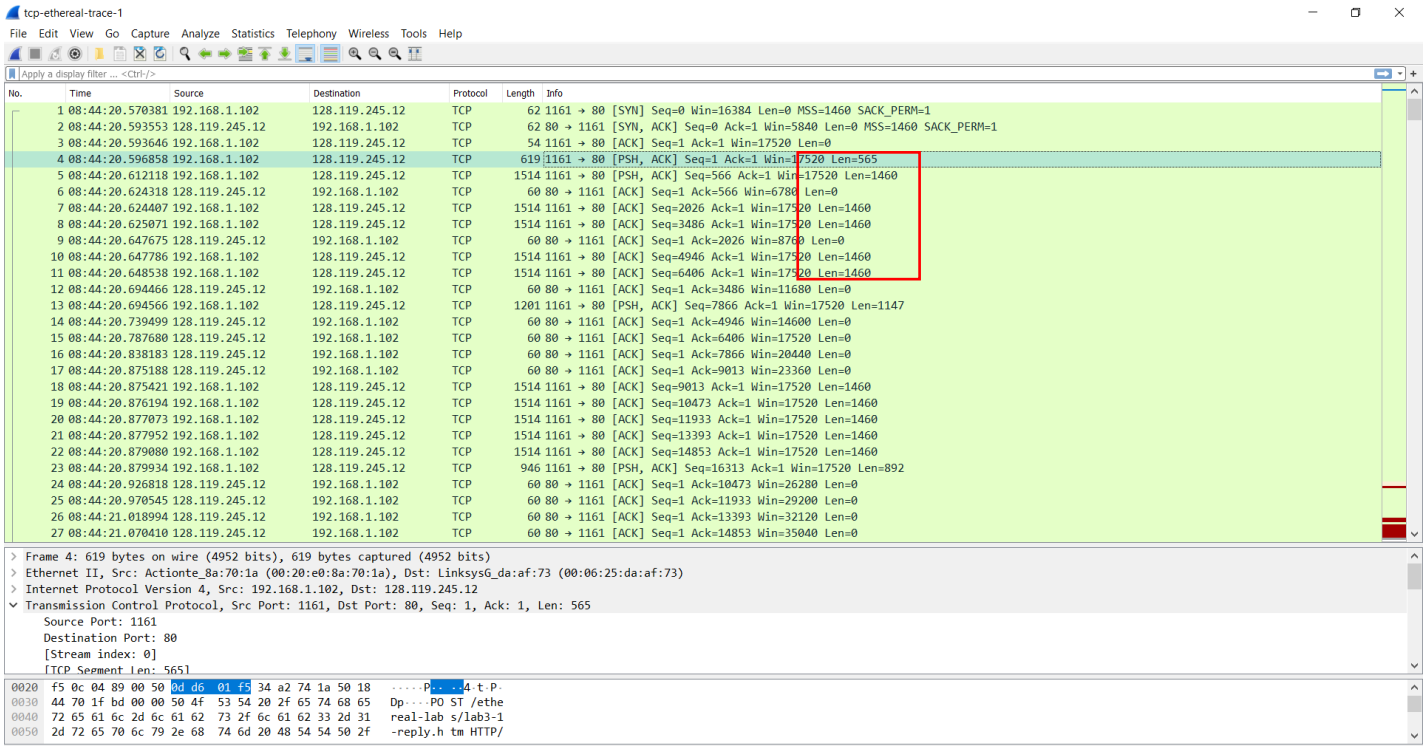
Second Segment Length - 1460 Bytes

Third Segment Length - 1460 Bytes

Fourth Segment Length - 1460 Bytes

Fifth Segment Length - 1460 Bytes

Sixth Segment Length - 1460 Bytes



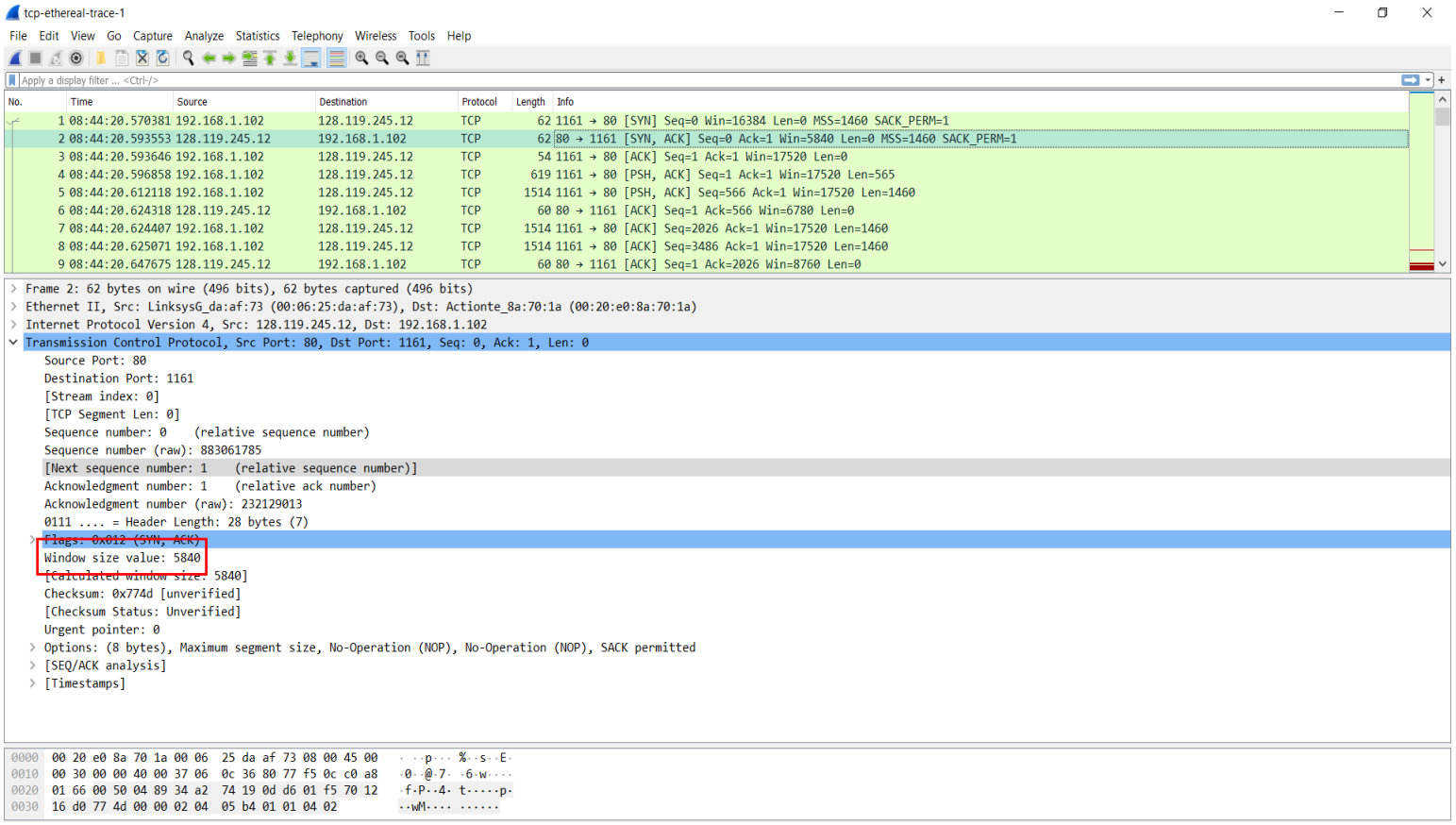
9. What is the minimum amount of available buffer space advertised at the received for the entire trace? Does the lack of receiver buffer space ever throttle the sender?

Solution 9 :

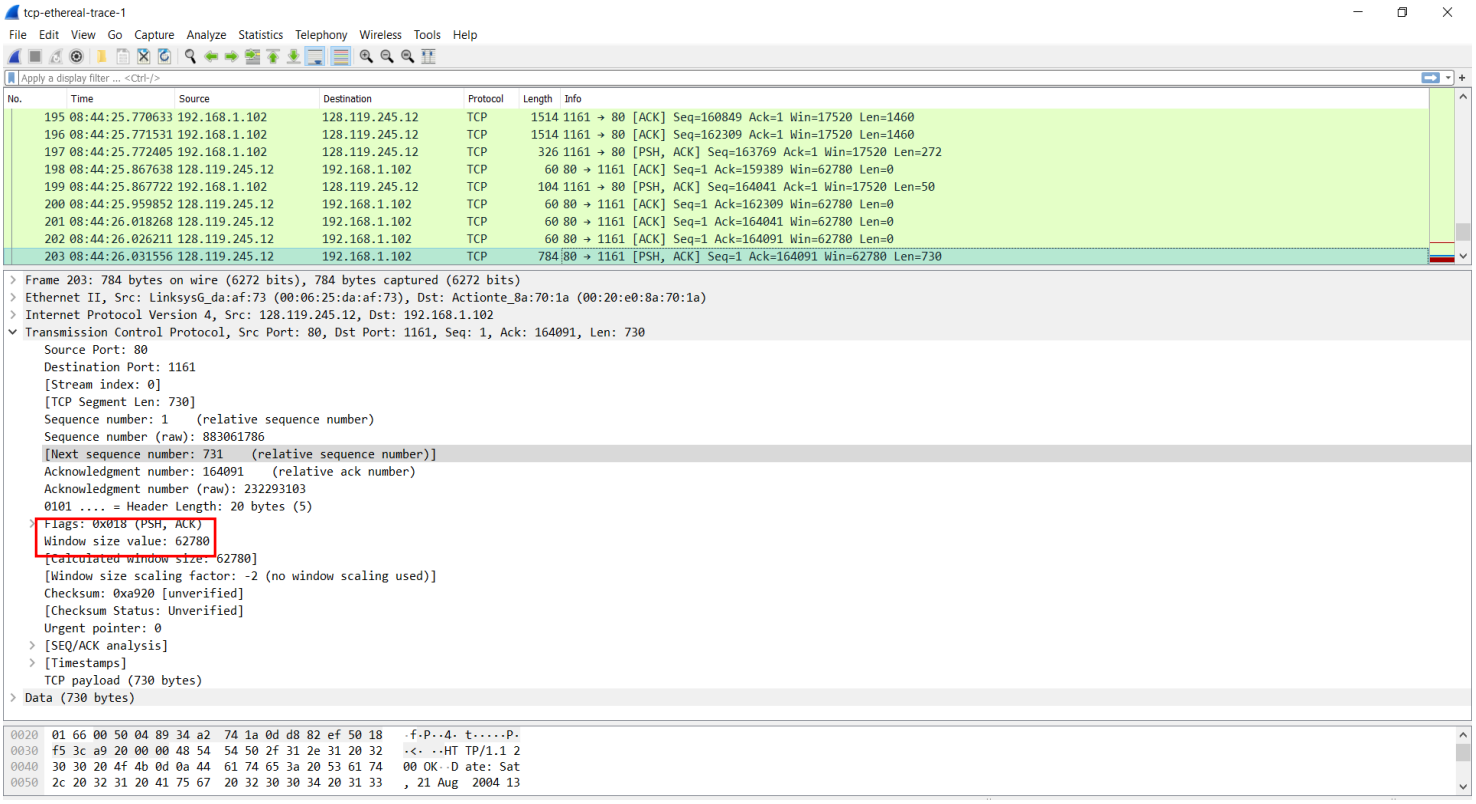
What is the minimum amount of available buffer space advertised at the received for the entire trace – 5840 bytes.

Maximum buffer space available – 62780 bytes

No, the sender never throttles due to lack of receiver buffer space therefore increases steadily.



LAB 2


tcp-ethereal-trace-1
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Apply a display filter ... <Ctrl-/>
No. Time Source Destination Protocol Length Info
195 08:44:25.770633 192.168.1.102 128.119.245.12 TCP 1514 1161 → 80 [ACK] Seq=160849 Ack=1 Win=17520 Len=1460
196 08:44:25.771531 192.168.1.102 128.119.245.12 TCP 1514 1161 → 80 [ACK] Seq=162309 Ack=1 Win=17520 Len=1460
197 08:44:25.772405 192.168.1.102 128.119.245.12 TCP 326 1161 → 80 [PSH, ACK] Seq=163769 Ack=1 Win=17520 Len=272
198 08:44:25.867638 128.119.245.12 192.168.1.102 TCP 60 80 → 1161 [ACK] Seq=1 Ack=159389 Win=62780 Len=0
199 08:44:25.867722 192.168.1.102 128.119.245.12 TCP 104 1161 → 80 [PSH, ACK] Seq=164041 Ack=1 Win=17520 Len=50
200 08:44:25.959852 128.119.245.12 192.168.1.102 TCP 60 80 → 1161 [ACK] Seq=1 Ack=162309 Win=62780 Len=0
201 08:44:26.018268 128.119.245.12 192.168.1.102 TCP 60 80 → 1161 [ACK] Seq=1 Ack=164041 Win=62780 Len=0
202 08:44:26.026211 128.119.245.12 192.168.1.102 TCP 60 80 → 1161 [ACK] Seq=1 Ack=164091 Win=62780 Len=0
203 08:44:26.031556 128.119.245.12 192.168.1.102 TCP 784 80 → 1161 [PSH, ACK] Seq=1 Ack=164091 Win=62780 Len=730
Frame 203: 784 bytes on wire (6272 bits), 784 bytes captured (6272 bits)
Ethernet II, Src: LinksysG_da:af:73 (00:06:25:da:af:73), Dst: Actionte_8a:70:1a (00:20:e0:8a:70:1a)
Internet Protocol Version 4, Src: 128.119.245.12, Dst: 192.168.1.102
Transmission Control Protocol, Src Port: 80, Dst Port: 1161, Seq: 1, Ack: 164091, Len: 730
Source Port: 80
Destination Port: 1161
[Stream index: 0]
[TCP Segment Len: 730]
Sequence number: 1 (relative sequence number)
Sequence number (raw): 883061786
[Next sequence number: 731 (relative sequence number)]
Acknowledgment number: 164091 (relative ack number)
Acknowledgment number (raw): 232293103
0101 .... = Header Length: 20 bytes (5)
Flags: 0x018 (PSH, ACK)
Window size value: 62780
[Calculated window size: 62780]
[Window size scaling factor: -2 (no window scaling used)]
Checksum: 0xa920 [unverified]
[Checksum Status: Unverified]
Urgent pointer: 0
[SEQ/ACK analysis]
[Timestamps]
TCP payload (730 bytes)
Data (730 bytes)
0020 01 66 00 50 04 89 34 a2 74 1a 0d d8 82 ef 50 18 ·f·P··4· t·····P·
0030 f5 3c a9 20 00 00 48 54 54 50 2f 31 2e 31 20 32 ·<· ··HT TP/1.1 2
0040 30 30 20 4f 4b 0d 0a 44 61 74 65 3a 20 53 61 74 00 OK··D ate: Sat
0050 2c 20 32 31 20 41 75 67 20 32 30 30 34 20 31 33 , 21 Aug 2004 13

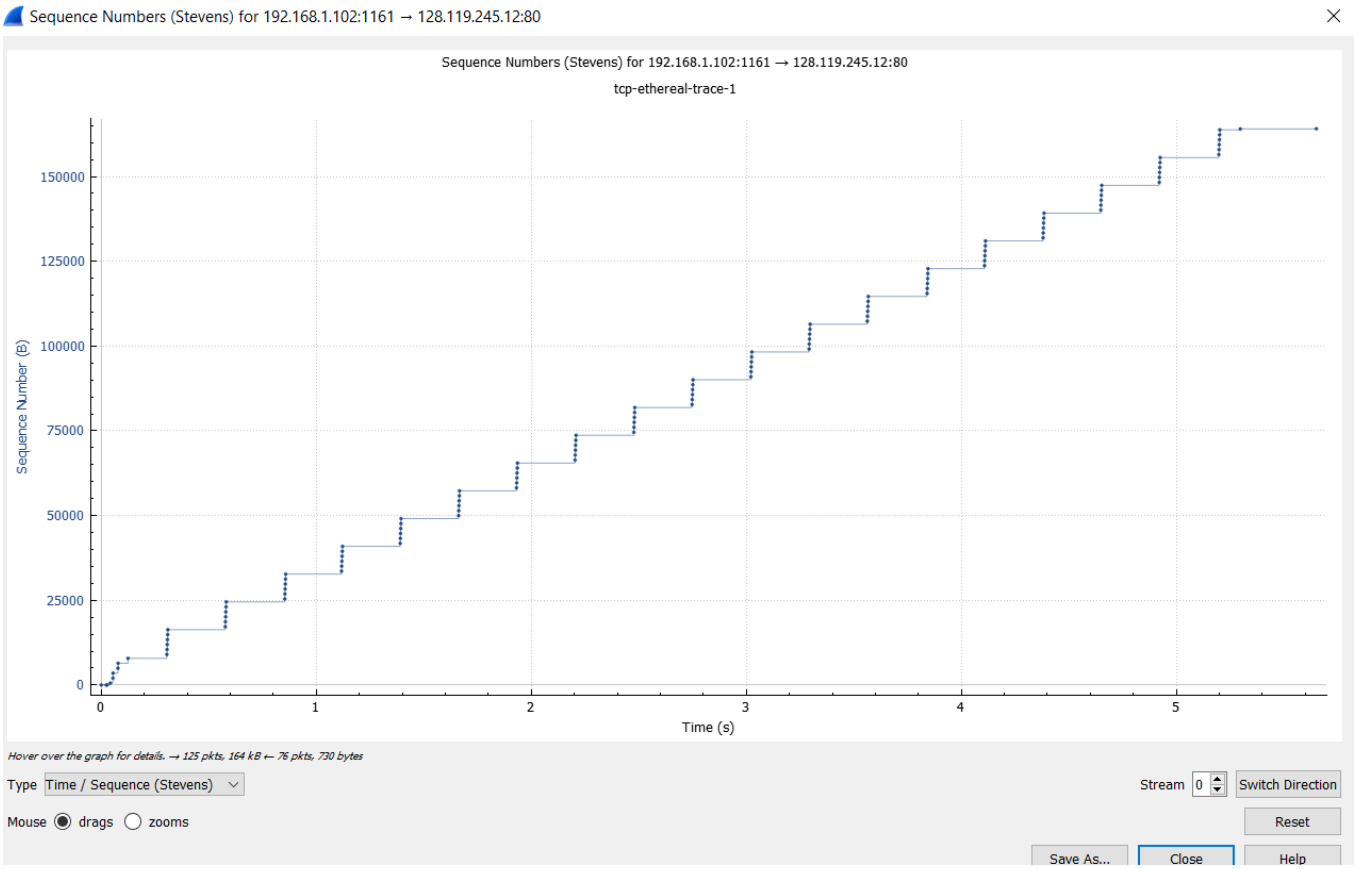
LAB 2

10 . Are there any retransmitted segments in the trace file? What did you check for (in the trace) in order to answer this question?

Solution 10:

No, there are No retransmitted segments in the trace files.

We can check this by analyzing the time vs sequence number graph. There is a linear or gradual increase in sequence number with respect to Time and there is not occurrence of retransmission of segments.



LAB 2

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 (see Table 3.2 on page 250 in the text).

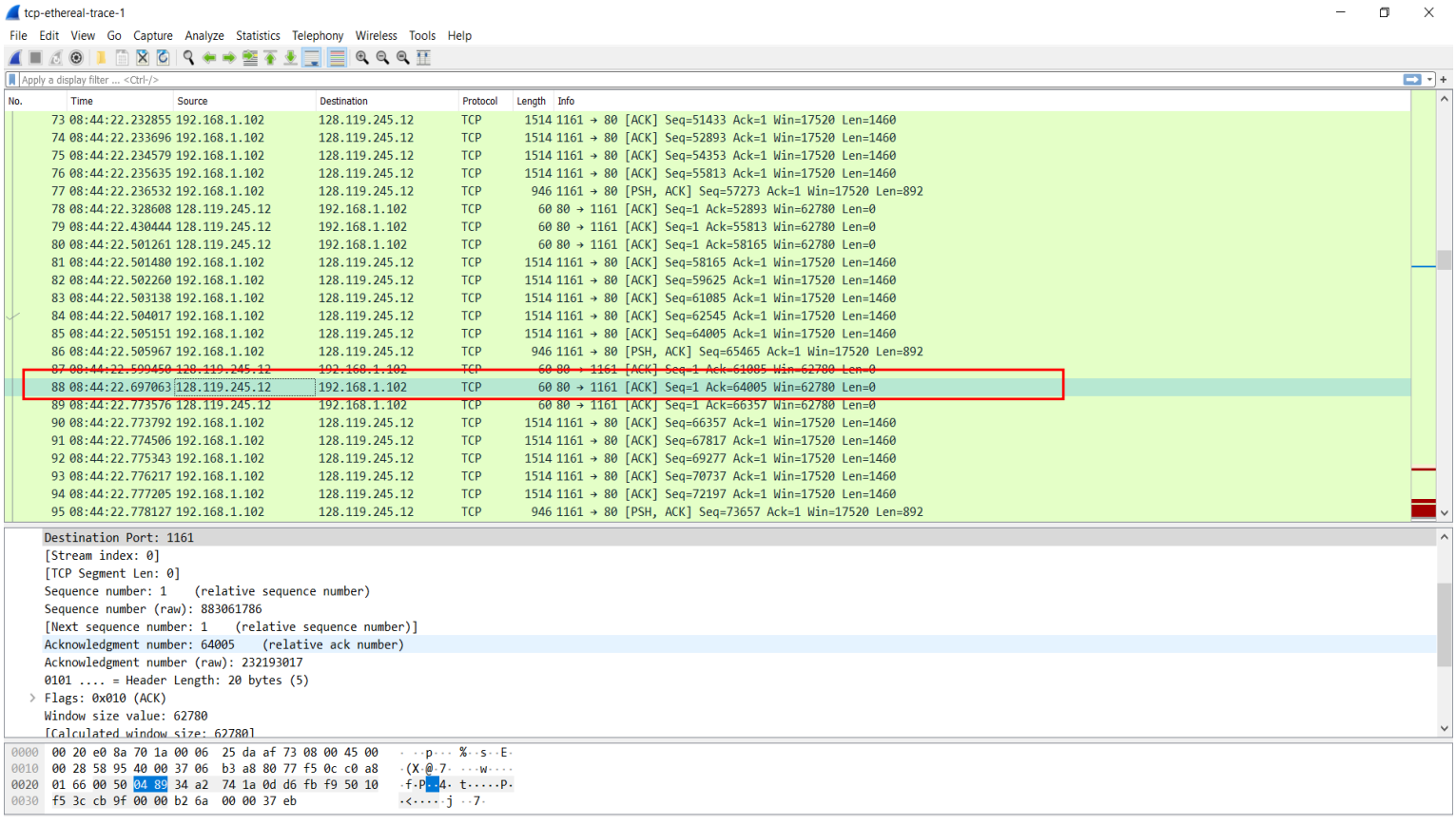
Solution 11:
The Amount of data the receiver typically acknowledge in an ACK would the difference between Two consecutive ACKs.

ACK 2 = 2026
ACK 3 = 3486

ACK3 – ACK2 = 3486 – 2026 = 1460 bytes of data

Can you identify cases where the receiver is ACKing every other received segment –

YES we can see the receiver ACKing every other received segment.
Taking an example of segment 88 which Acknowledges every other received segment.



12. What is the throughput (bytes transferred per unit time) for the TCP connection? Explain how you calculated this value.

Solution 12:

Last ACK = 164091

1st Sequence Number = 1

Total Amount of data =

(Acknowledge Sequence Number of Last ACK – 1st Sequence Number)

= (164091 – 1) = 164090 bytes

Last ACK Time = 5.455830

1st Segment Time = 0.026477

Total Transmission Time = (Last ACK Time – 1st Segment Time)

= (5.455830 - 0.026477) = 5.4294 seconds

Average Throughput = Ratio of total amount data and total transmission time.

= 164090/5.4294

= 30.222 KB/s

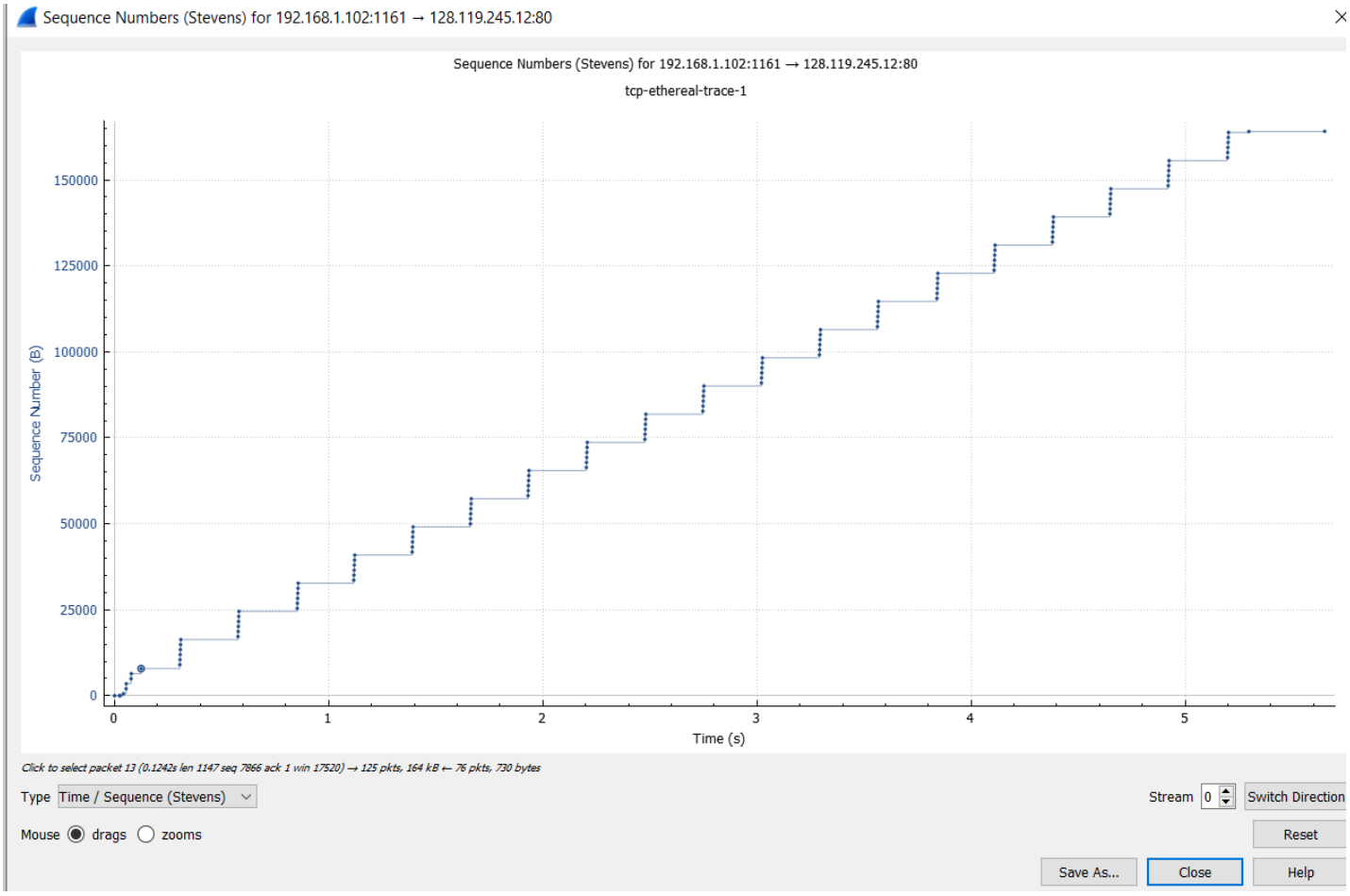
13. Use the Time-Sequence-Graph(Stevens) plotting tool to view the sequence number versus time plot of segments being sent from the client to the gaia.cs.umass.edu server. Can you identify where TCP's slowstart phase begins and ends, and where congestion avoidance takes over? Comment on ways in which the measured data differs from the idealized behavior of TCP that we've studied in the text

Solution 13:

Start Time = 0 Seconds

End Time = 0.1242 Seconds

After this congestion avoidance takes over. The measured data is only using a fraction of the window size instead of the idealized one third to a half.



14. Answer each of two questions above for the trace that you have gathered when you transferred a file from your computer to gaia.cs.umass.edu

Solution 14:

N.A. – ALL the Above Questions are Answered.