SHUBHAM SHANKAR
UTA ID :1001761068

COMPUTER NETWORK ORGANIZATION

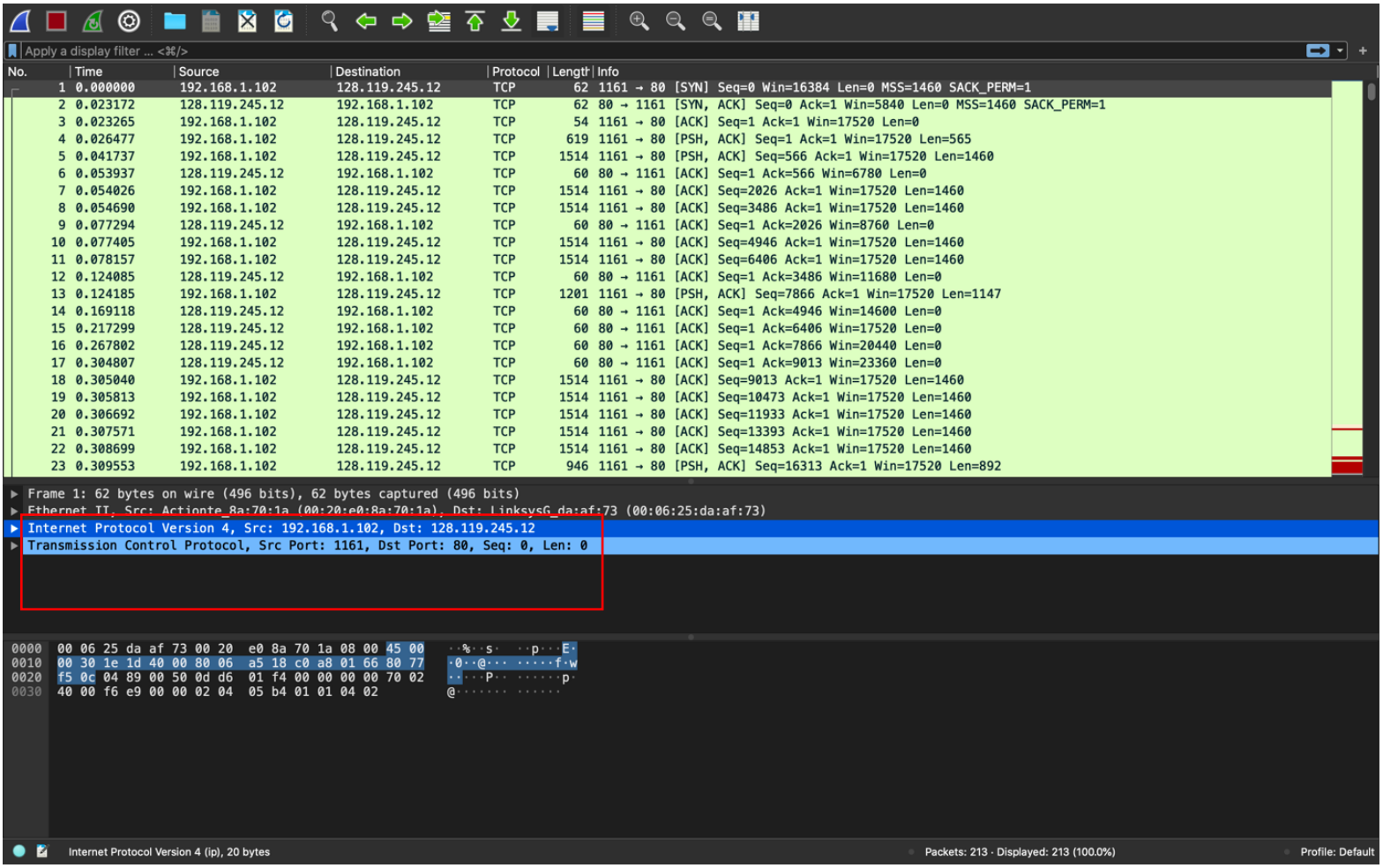
Lab 2

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.

Answer :

IP address used by the client computer: 192.168.1.102

TCP port number used by the client computer: 1161



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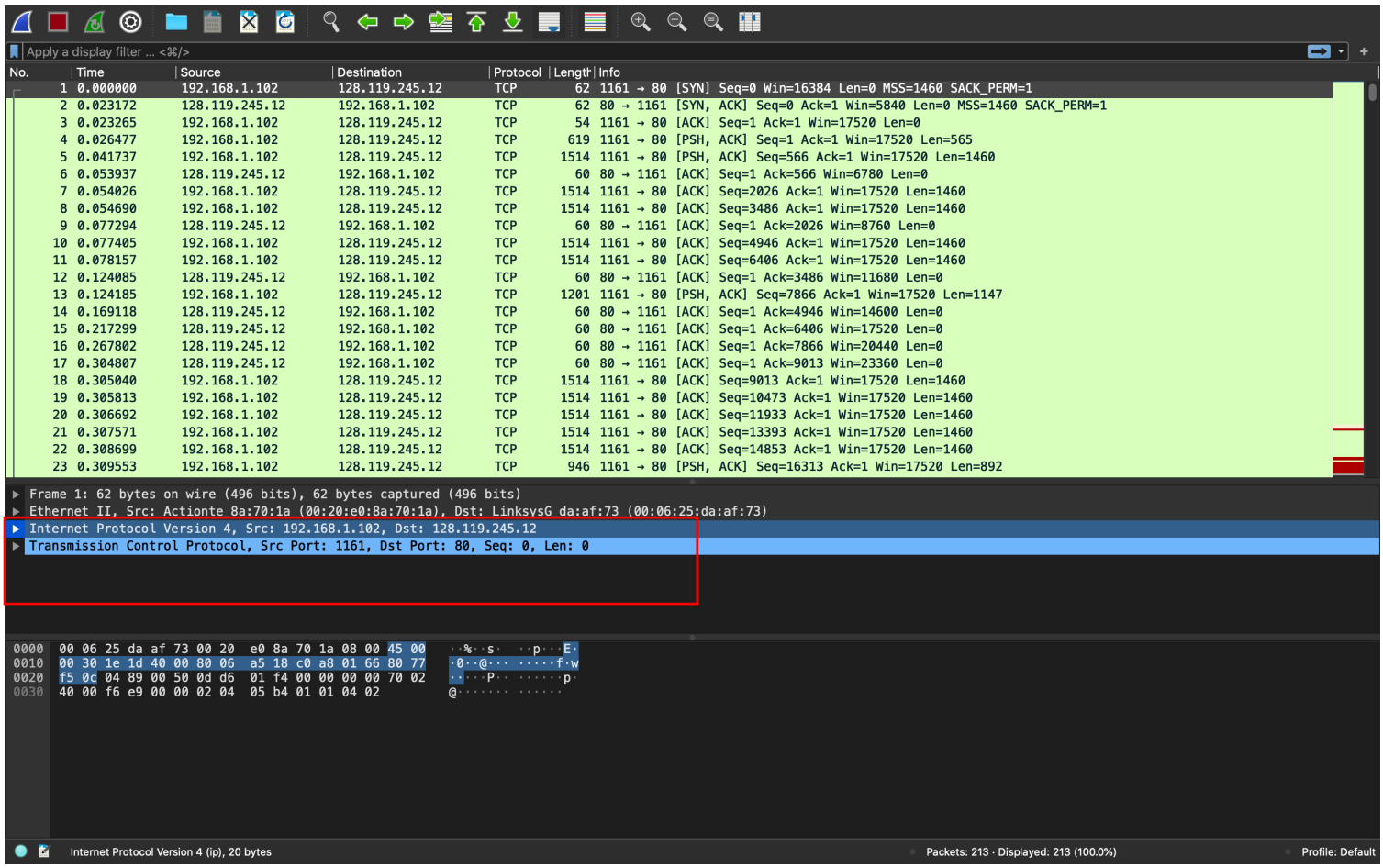
2. What is the IP address of gaia.cs.umass.edu? On what port number is it sending and receiving TCP segments for this connection?

Answer :

IP address of gaia.cs.umass.edu: 128.119.245.12

port number is: 80



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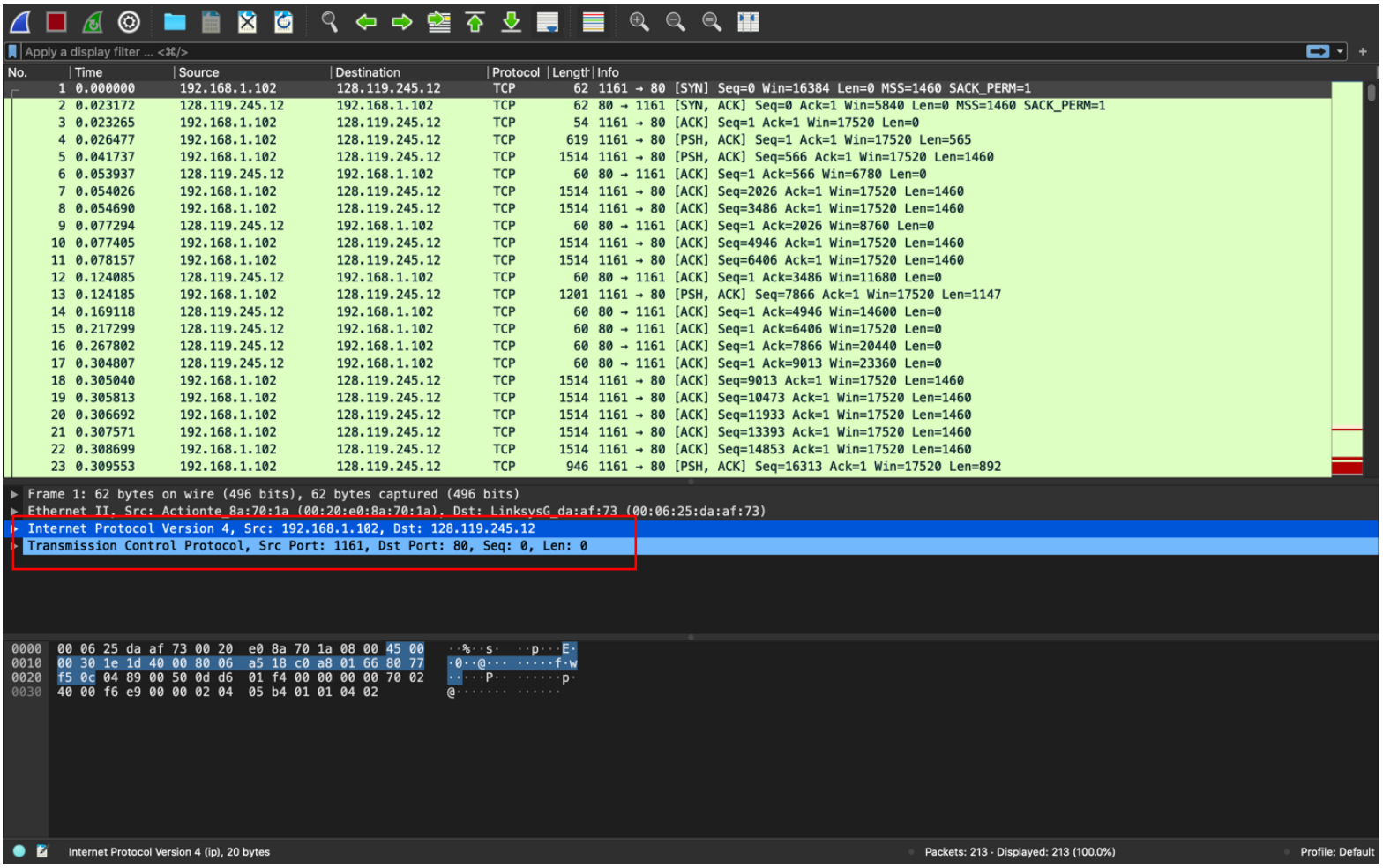
3. What is the IP address and TCP port number used by your client computer (source) to transfer the file to gaia.cs.umass.edu?

Answer : (tcp-ethereal-trace-1 packets used)

IP address used by the client computer: 192.168.1.102

TCP port number used by the client computer: 1161



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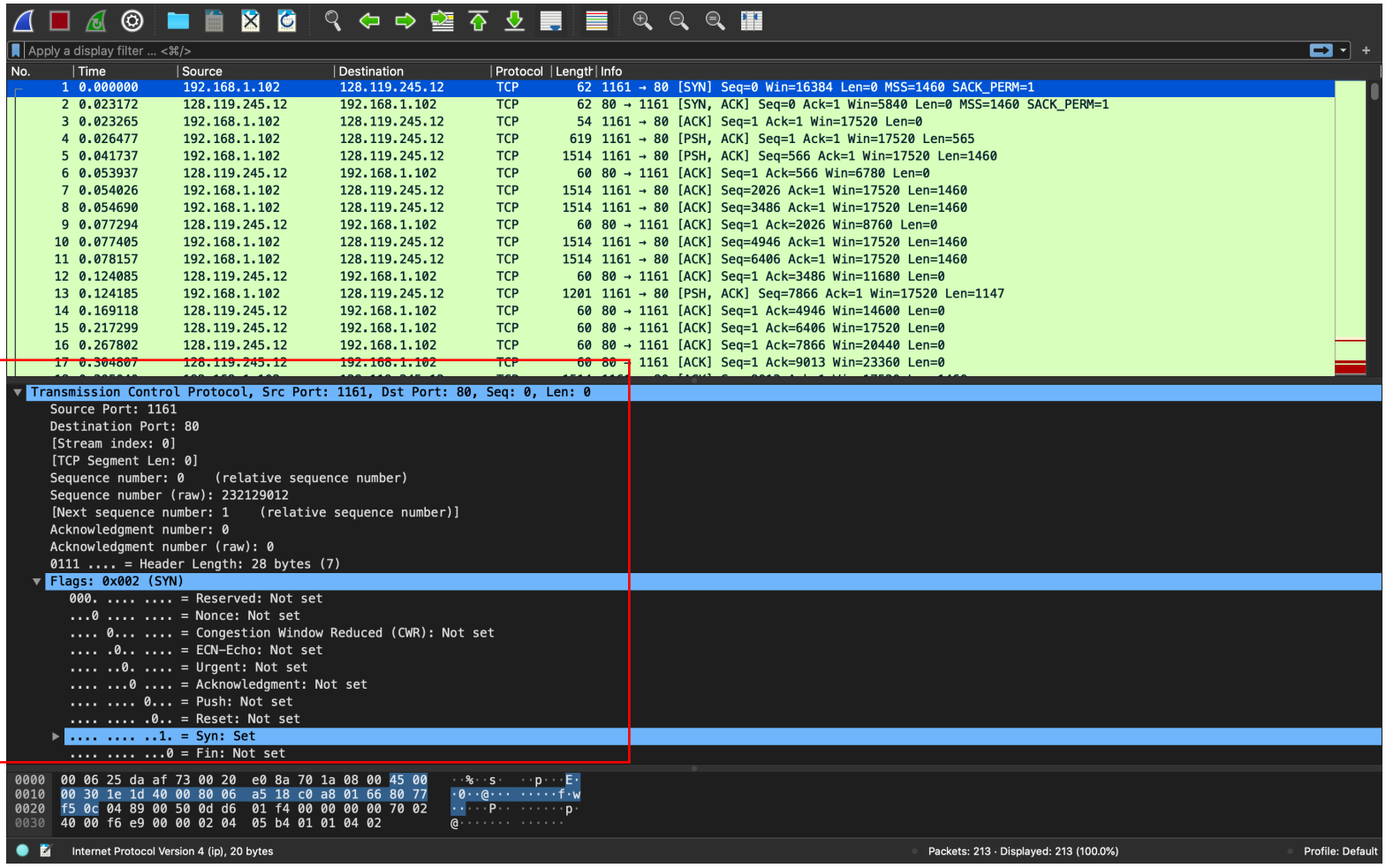
4. What is the sequence number of the TCP SYN segment that is used to initiate the TCP connection between the client computer and gaia.cs.umass.edu? What is it in the segment that identifies the segment as a SYN segment?

Answer :

Sequence number of the TCP SYN segment is 0.

In the Flags section, the SYN flag is set to 1, thus identifying the segment as a SYN Segment.



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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?

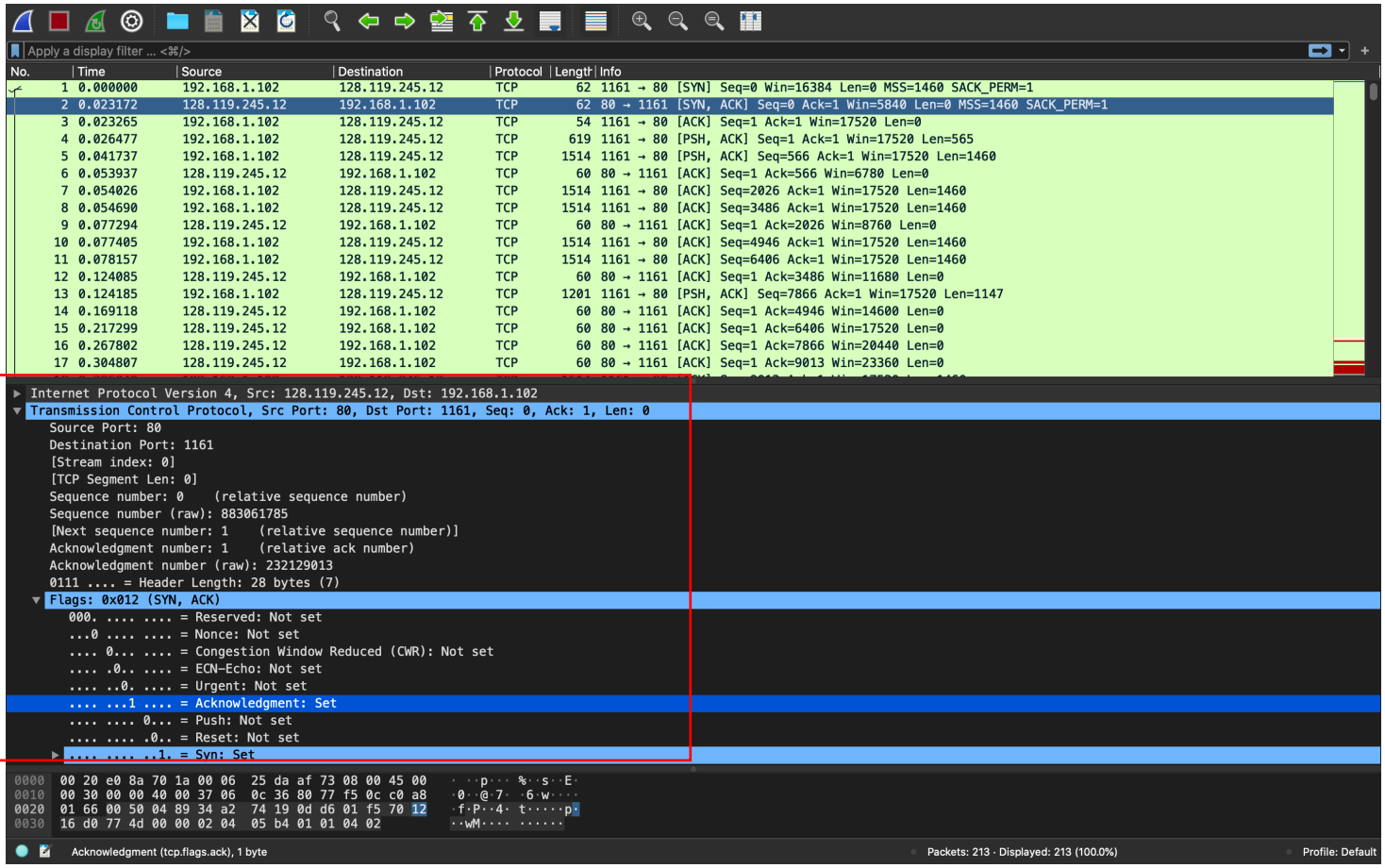
Answer :

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

The value of the Acknowledgement field in the SYNACK segment is 1.

The value is determined by the server of gaia.cs.umass.edu. The server adds one to the SYN message it received from the client.
(Here the Client sends a SYN Number 0. So the SYNACK segment is 1.)

Segment is identified as SYNACK segment when the flag section has SYN and ACK set to 1.



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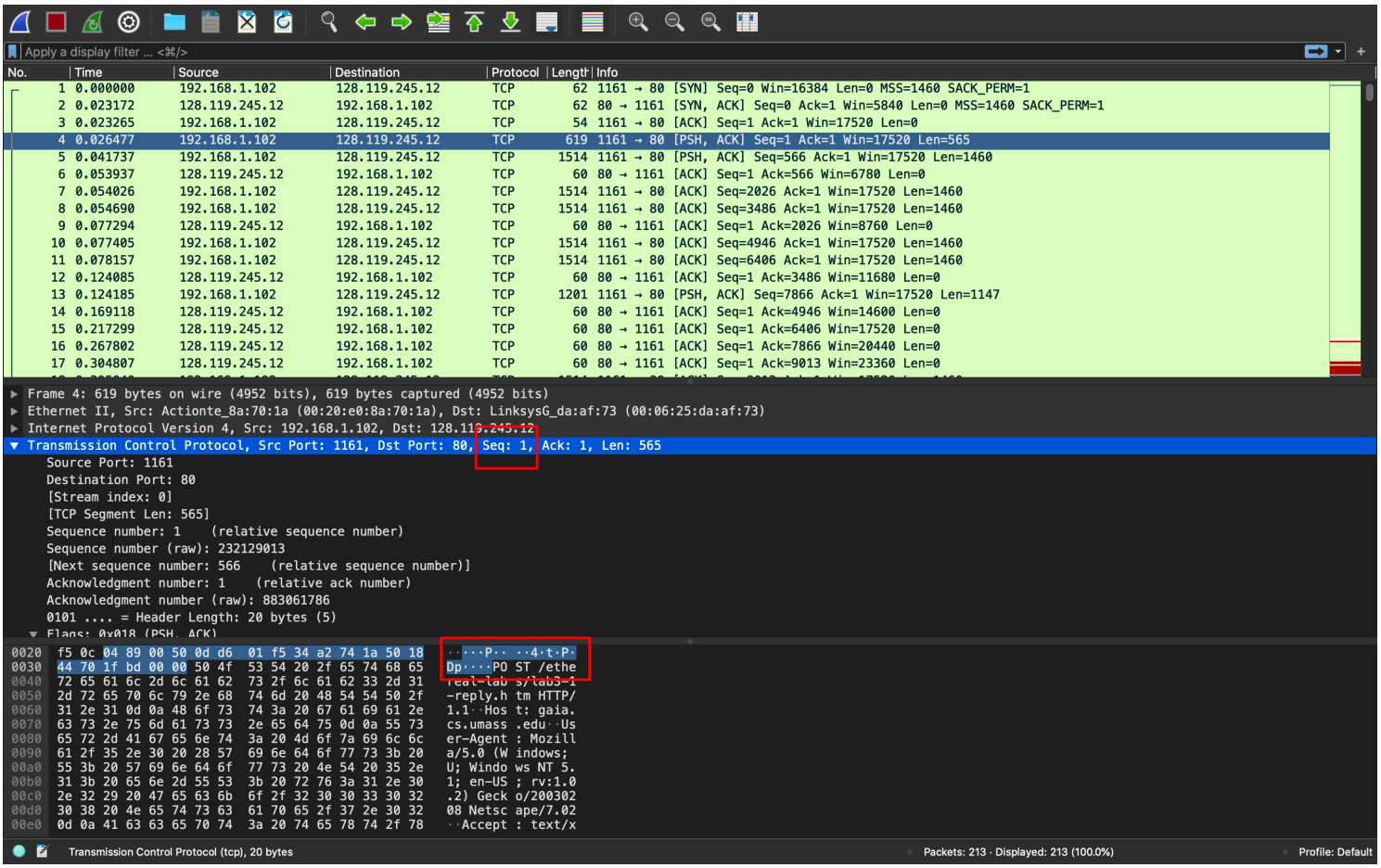
6. What is the sequence number of the TCP segment containing the HTTP POST command? Note that in order to find the POST command, you'll need to dig into the packet content field at the bottom of the Wireshark window, looking for a segment with a "POST" within its DATA field.

Answer :

The sequence number of the TCP segment containing the HTTP POST command is 1.



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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.*

Answer : The sequence numbers of the first six segments in the TCP connection are –

For First segment:
The sequence number is **1**
Segment Sent Time: 0.026477
ACK received at: 0.053937
RTT value: (0.053937 - 0.026477) = 0.02746 seconds.
Estimated RTT: 0.02746 seconds.

For Second segment:
The sequence number is **566**
Segment Sent Time: 0.041737
ACK received at: 0.077294
RTT value: (0.077294- 0.041737) = 0.035557 seconds.
Estimated RTT: (0.875 *Previous Seg ERTT + 0.125 * RTT)= 0.028472125 sec.

For Third segment:
The sequence number is **2026**
Segment Sent Time: 0.054026
ACK received at: 0.124085
RTT value: (0.124085- 0.054026) = 0.070059 seconds.
Estimated RTT: (0.875 *Previous Seg ERTT + 0.125 * RTT)= 0.03367049 sec.

For Fourth segment:
The sequence number is **3486**
Segment Sent Time: 0.054690
ACK received at: 0.169118

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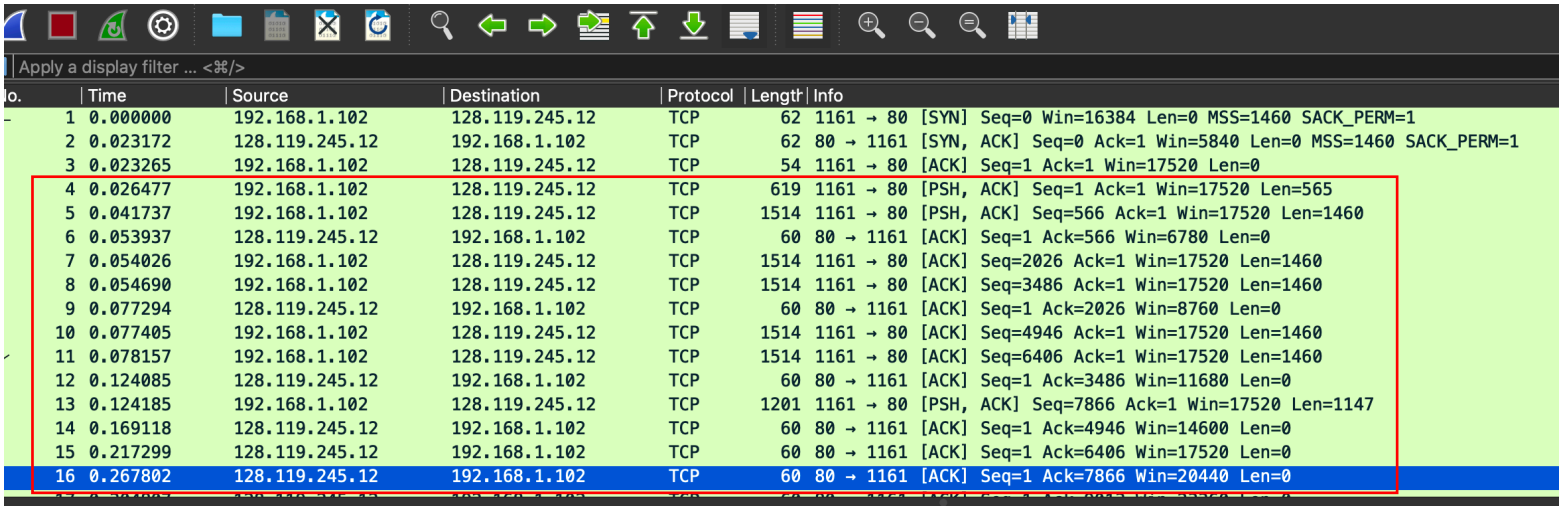
RTT value: (0.169118- 0.054690) = 0.114428 seconds.
Estimated RTT: (0.875 *Previous Seg ERTT + 0.125 * RTT)= 0.04376518 sec.

For Fifth segment:

The sequence number is **4946**
Segment Sent Time: 0.077405
ACK received at: 0.217299
RTT value: (0.217299- 0.077405) = 0.139894 seconds.
Estimated RTT: (0.875 * Previous Seg ERTT + 0.125 * RTT)= 0.05sec.

For Sixth segment:

The sequence number is **6406.**
Segment Sent Time: 0.078157
ACK received at: 0.267802
RTT value: (0.267802- 0.078157) = 0.18964 seconds.
Estimated RTT: (0.875 * Previous Seg ERTT + 0.125 * RTT) = 0.07 sec.



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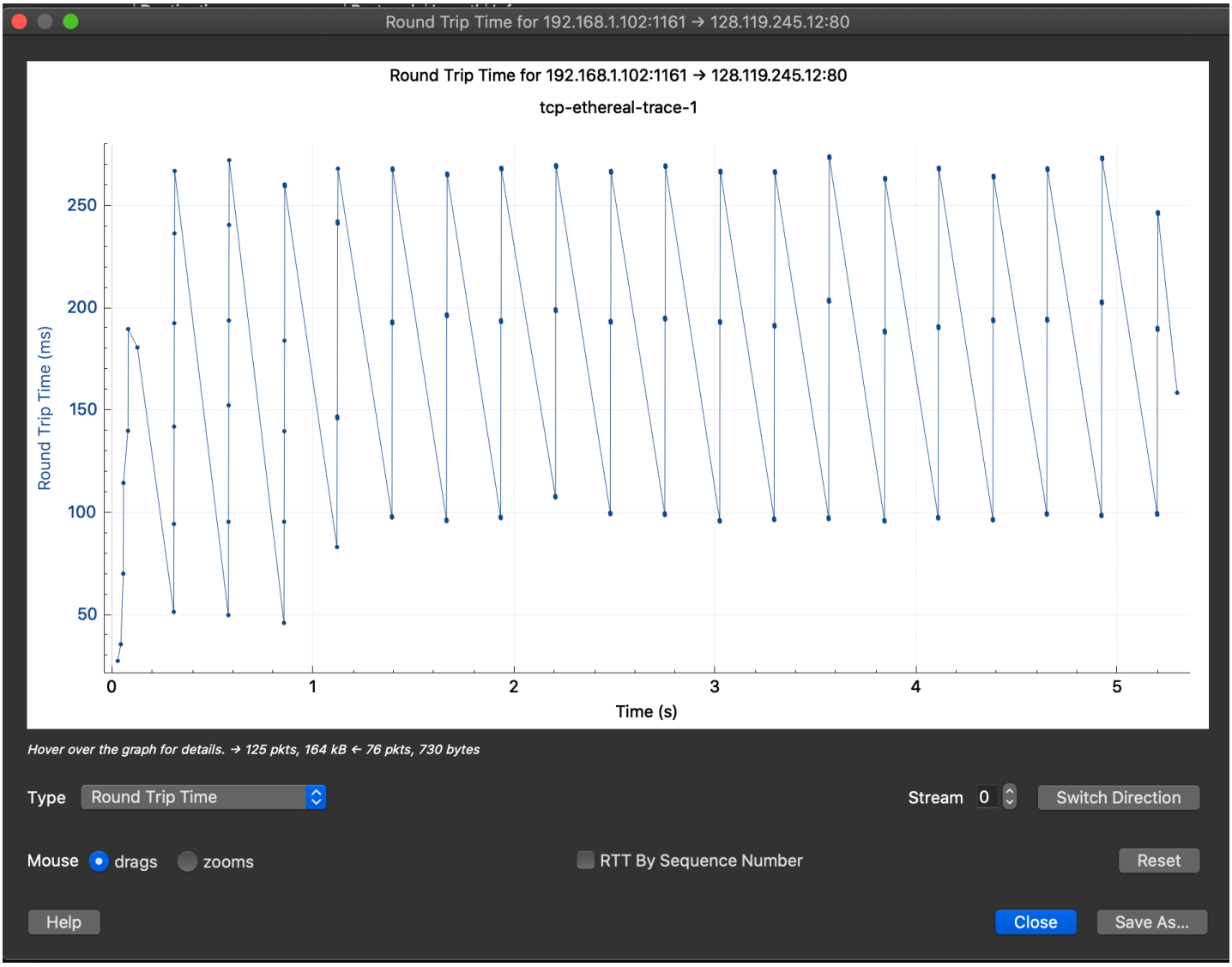
Graph that plot the RTT for each of the TCP segments sent.



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

Answer :

Length of first segment is : 565 Bytes

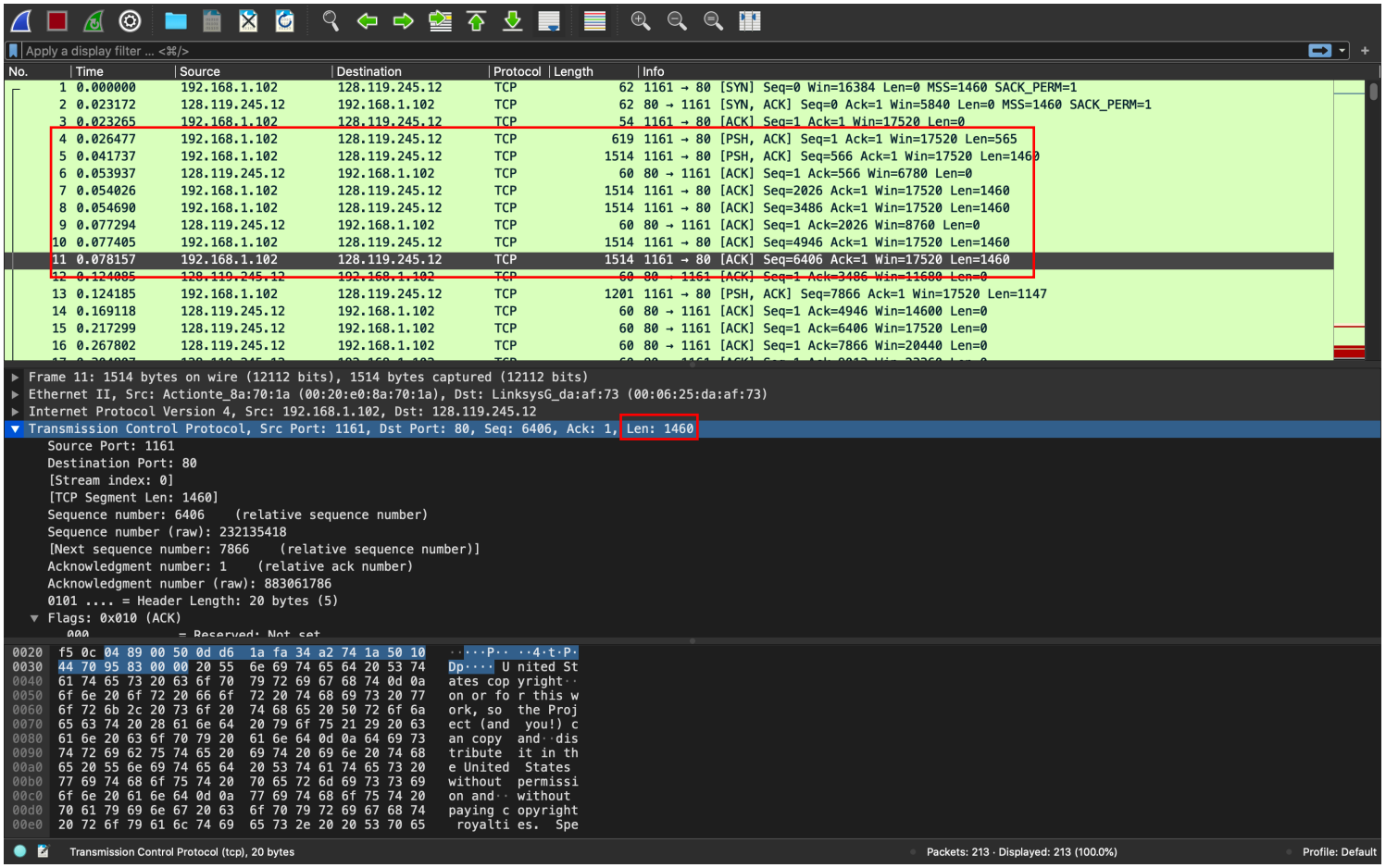
Length of second segment is : 1460 Bytes

Length of third segment is : 1460 Bytes

Length of fourth segment is : 1460 Bytes

Length of fifth segment is : 1460 Bytes

Length of sixth segment is : 1460 Bytes



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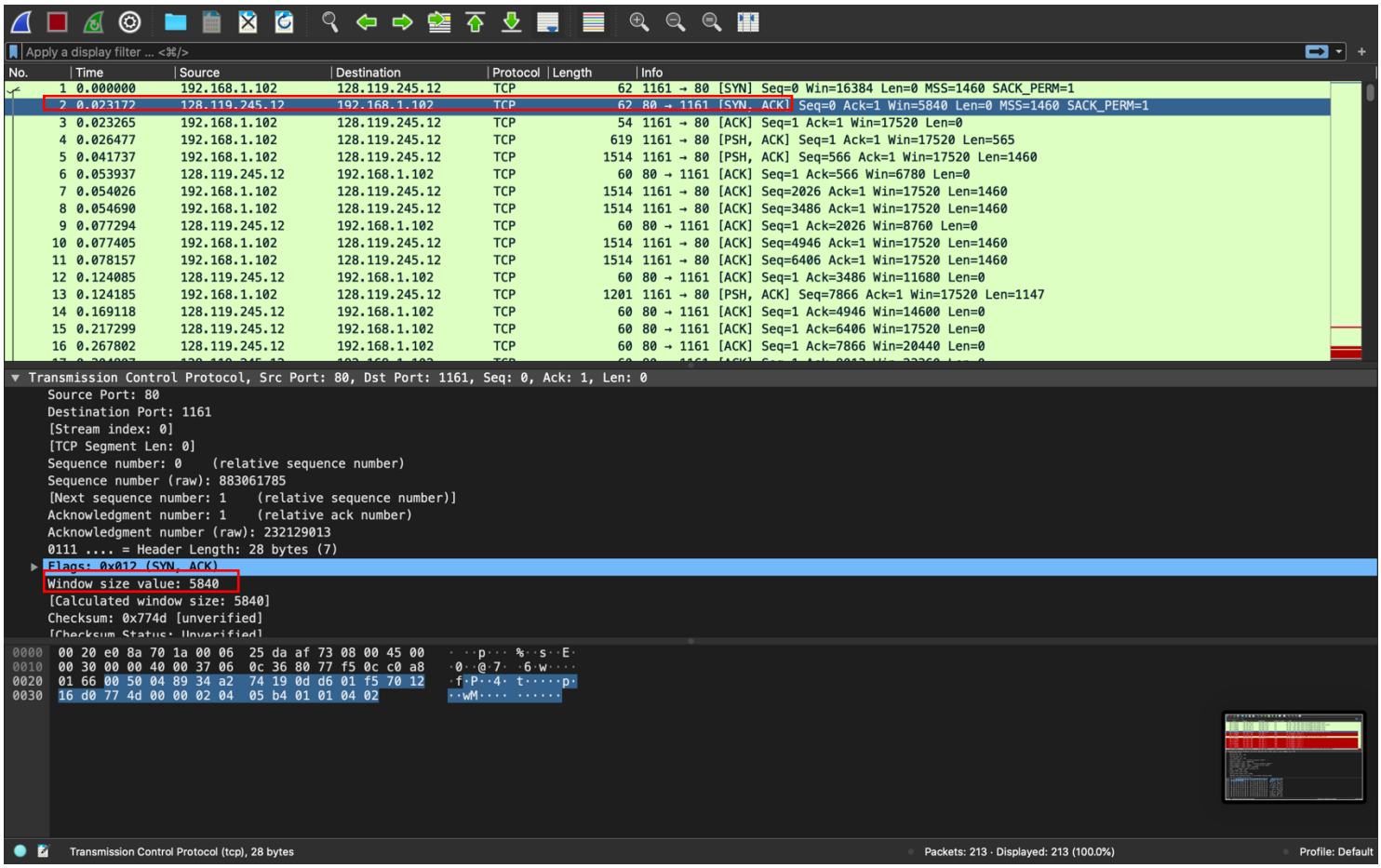
9. What is the minimum amount of available buffer space advertised at the received for the entire trace? Does the lack of receiver buffer space ever throttle the sender?

Answer : The minimum amount of available buffer space advertised at the received for the entire trace is 5840 bytes.

Receiver buffer space doesnot throttle because the maximum window size of the receiver is 62780 bytes.



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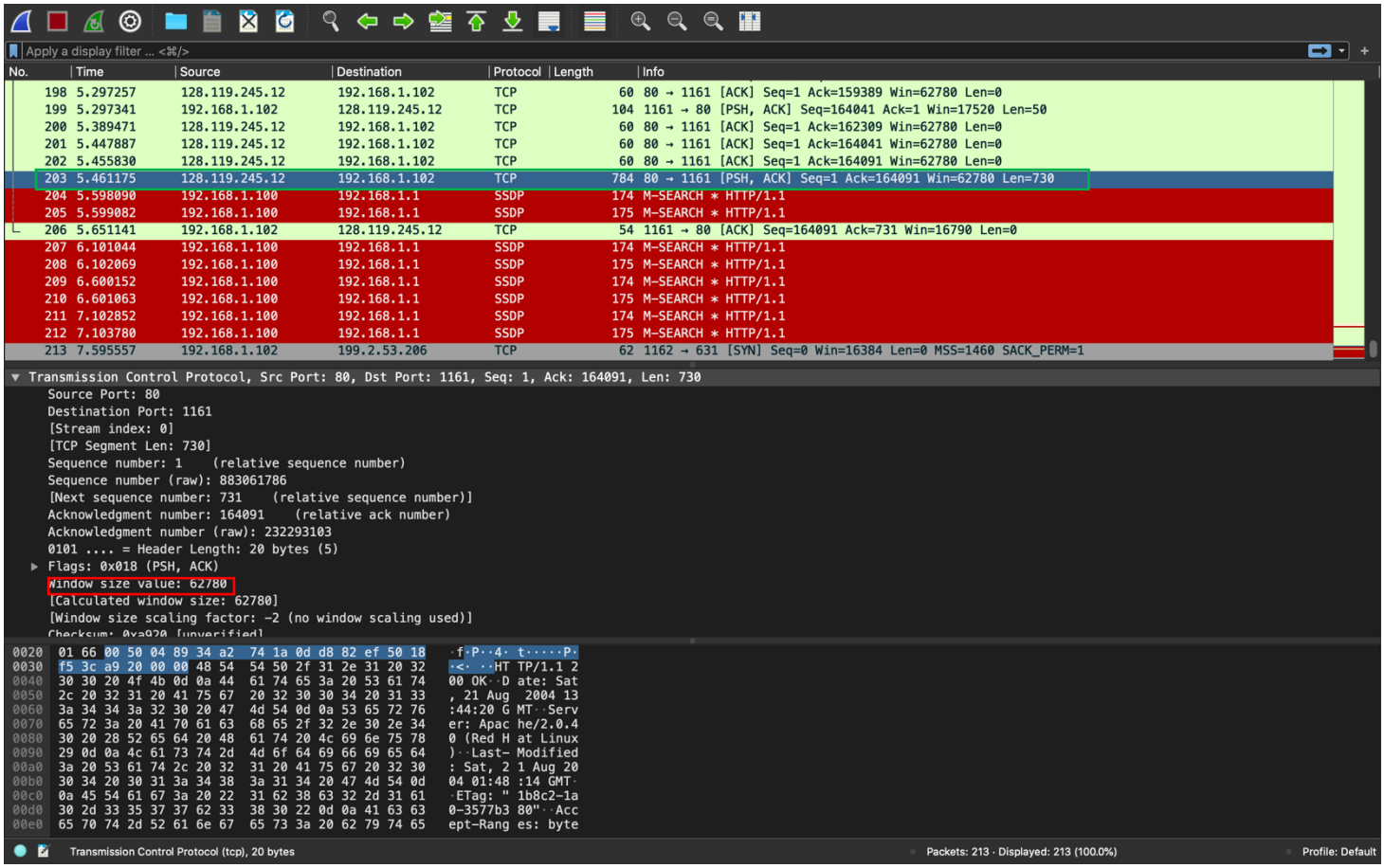

10. Are there any retransmitted segments in the trace file? What did you check for (in the trace) in order to answer this question?

Answer :

No, There are no retransmitted segment in the trace file. We can check this by looking at the Time – Sequence Graph. There is a increase in Sequence number with increase in time.

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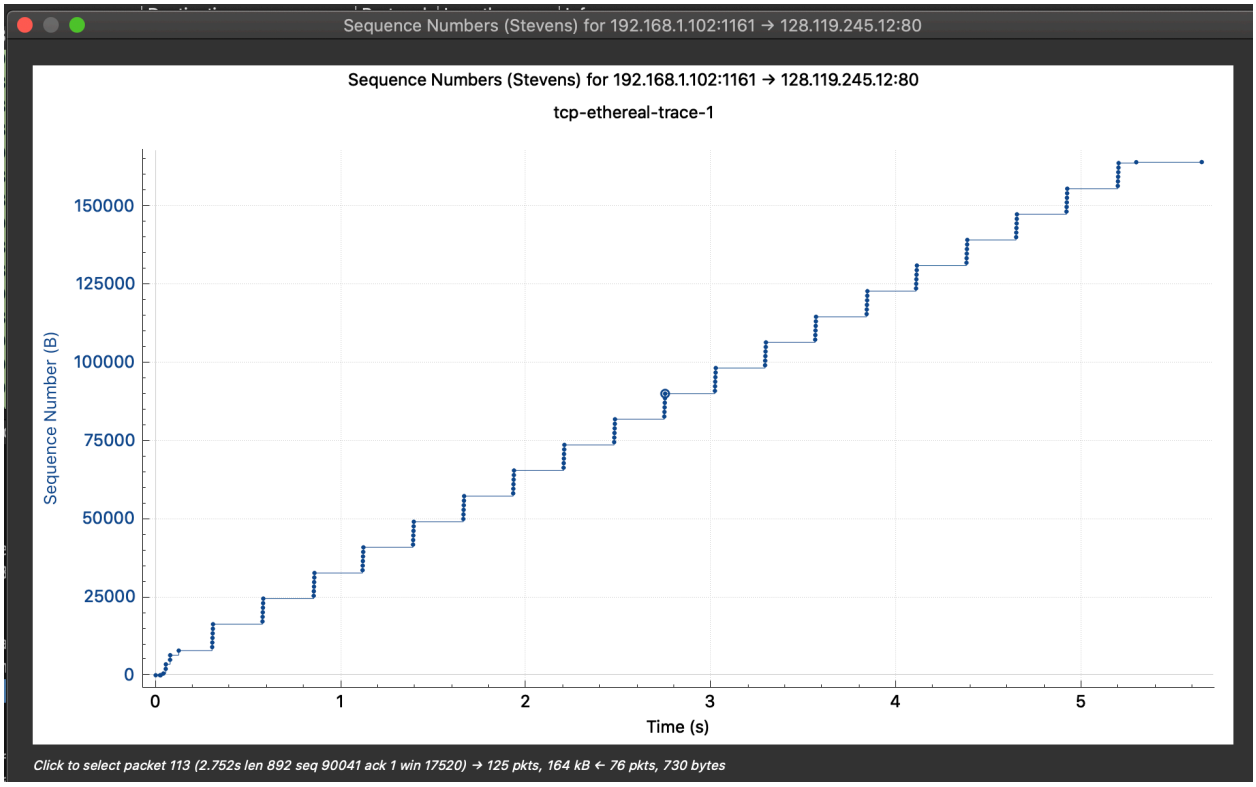

11. How much data does the receiver typically acknowledge in an ACK? Can you identify cases where the receiver is ACKing every other received segment (see Table 3.2 on page 250 in the text).

Answer :

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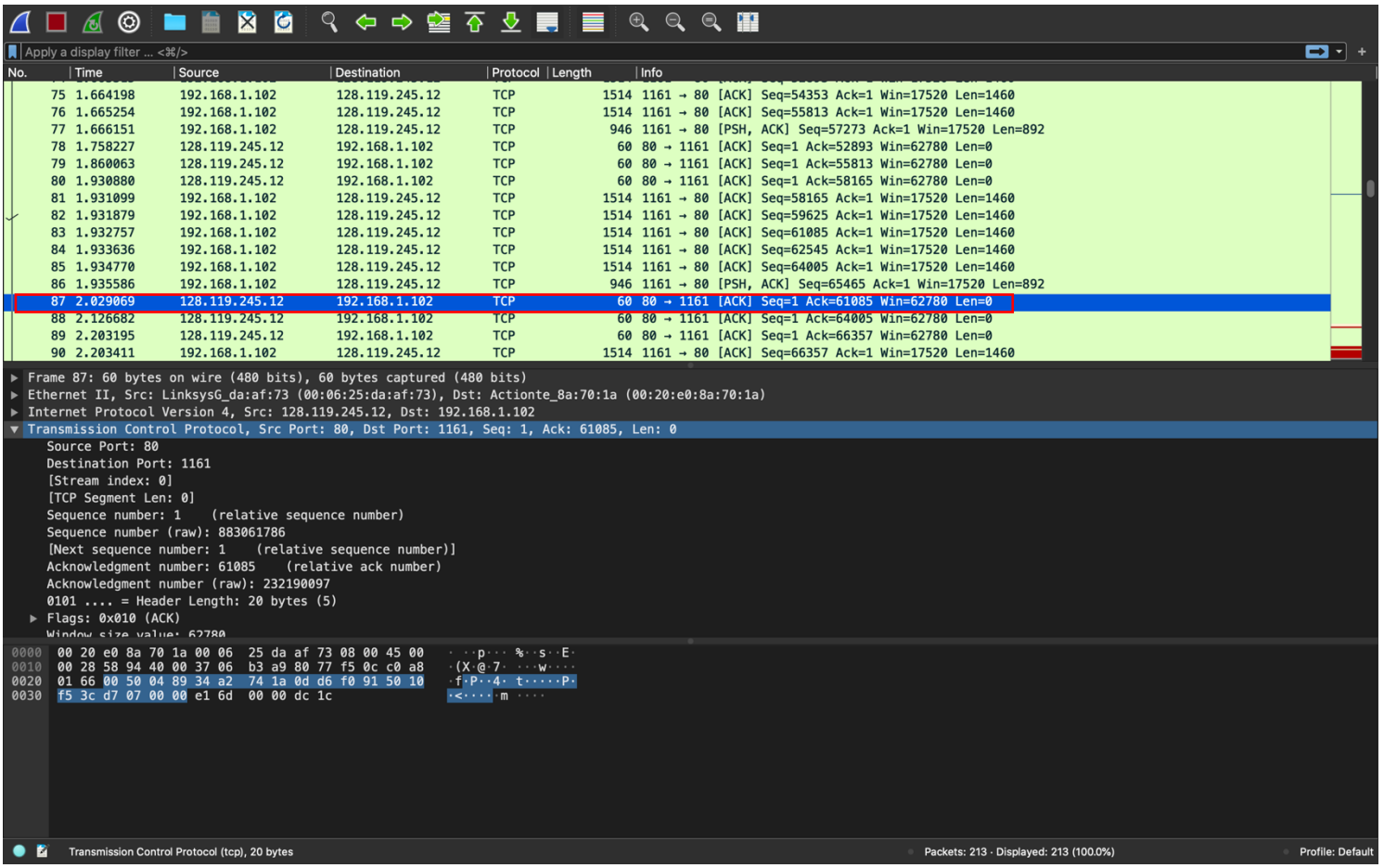
The difference between the acknowledged sequence numbers of two consecutive ACK indicates the data received by the server between these two ACK.

Eg : Ack 1 = 566 and ACK 2 = 2026 (From Packet Capture)

So the Acknowledged data is (Ack 2 – Ack 1) = 2026 – 566 = 1460 .

Yes, There are instances where the receiver is Acking every other received segment .

For eg : No: 87 acknowledges every other segments it received .



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12. What is the throughput (bytes transferred per unit time) for the TCP connection?

    Explain how you calculated this value.

Answer : The average throughput for this TCP connection is the ratio between the total amount data and the total transmission time.

Total Data Transmitted = Difference between the Acknowledge Sequence Number of last Ack and Sequence Number of first TCP segment (164091 – 1 = 164090)

Total Transmission Time = Difference between time instance of last ack and time instance of first segment (5.455830 - 0.026477 = 5.4294 seconds)

Average throughput = 164090/5.4294 = 30.222 KB/sec.

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.

Answer : Slow start begin from around 0 and ends at around 0.12sec and then 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.

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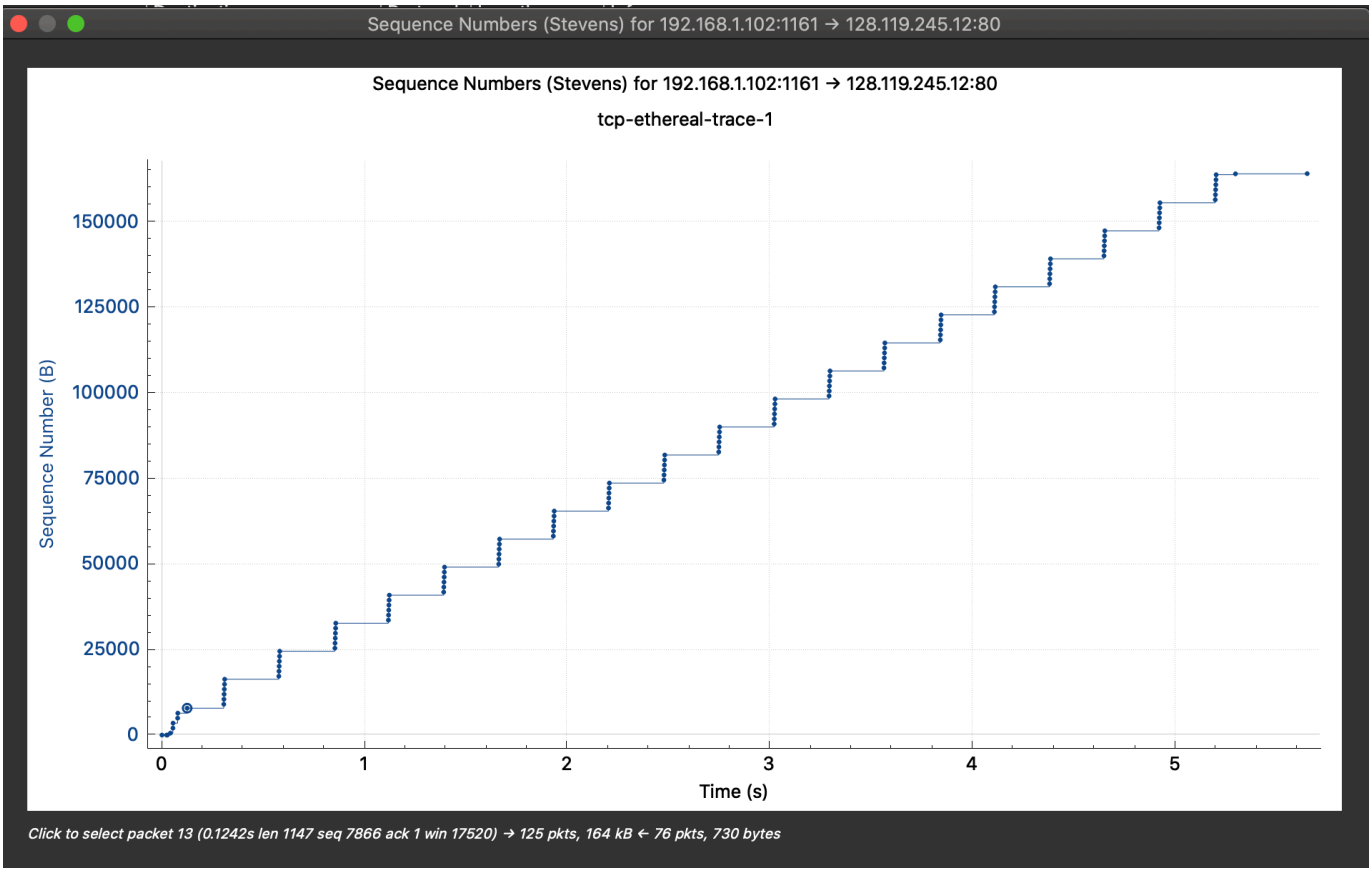

14. Answer each of two questions above for the trace that you have gathered when you transferred a file from your computer to gaia.cs.umass.edu .

    Answer : All the questions above have been answered.