Computer Network

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Date: 2022 / 11/ 23

Third Lab

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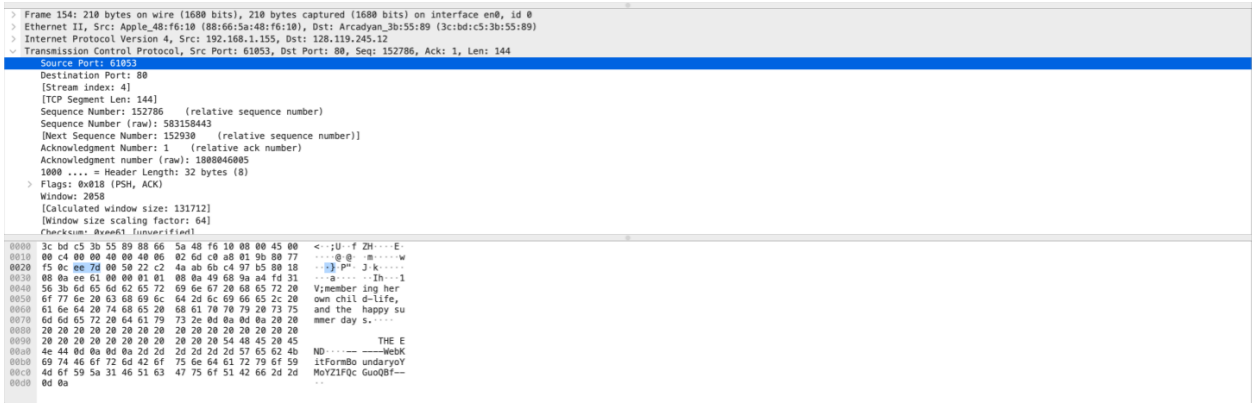
2. A first look at the captured trace

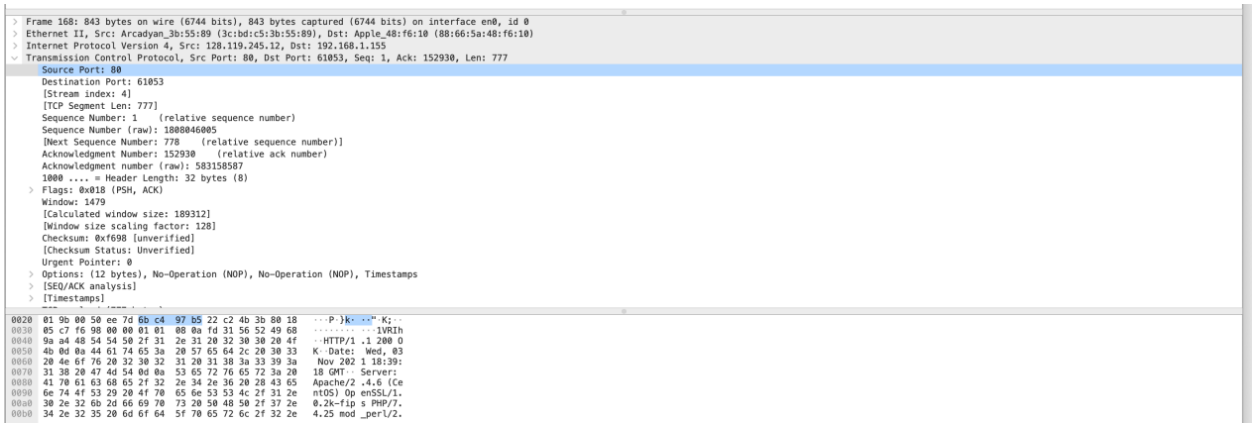
1. What is the IP address and TCP port number used by the client computer (source) that is transferring the alice.txt file to gaia.cs.umass.edu?



IP address used by the client's computer is : 192.168.242.1

***TCP port number* used by the client's computer is** : 61853

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?



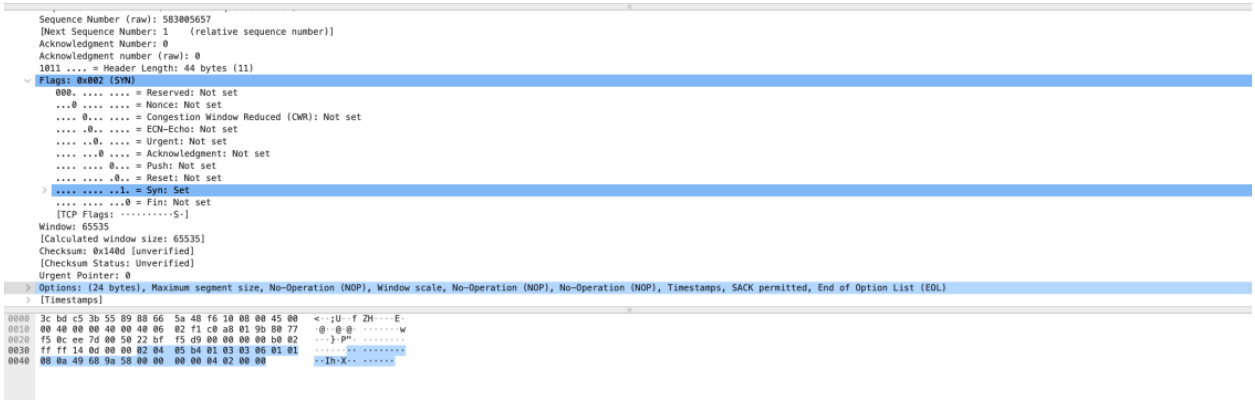
IP address of gaia.cs.umass.edu is : 128.119.245.12

TCP port number : 80

3. TCP Basics

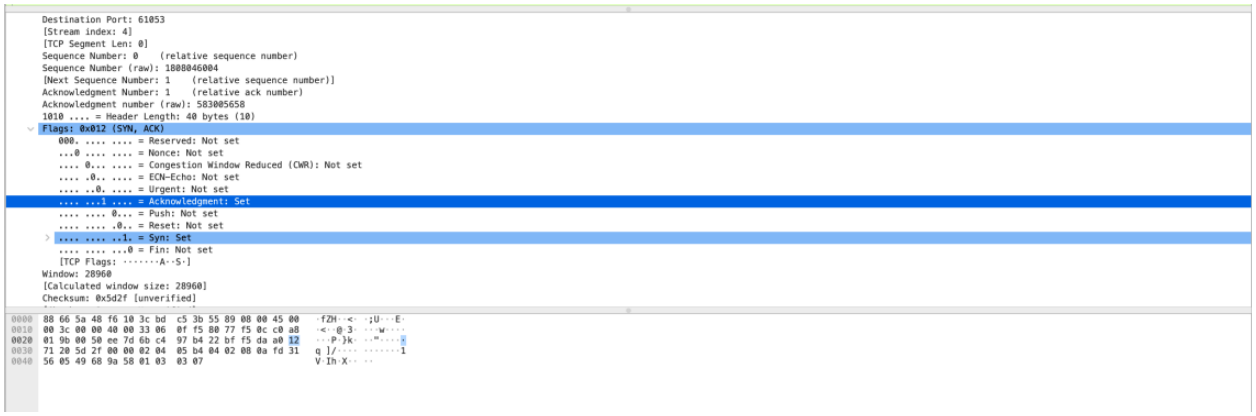
Answer the following questions for the TCP segments:

3. 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 this TCP segment that identifies the segment as a SYN segment? Will the TCP receiver in this session be able to use Selective Acknowledgments (allowing TCP to function a bit more like a “selective repeat” receiver, see section 3.4.5 in the text)?



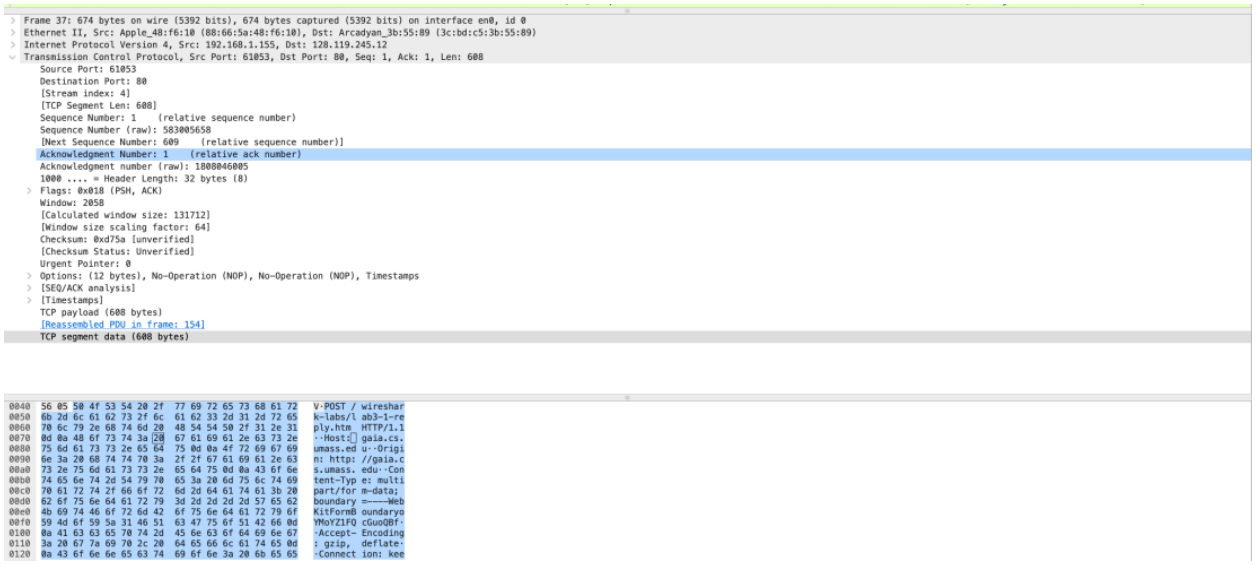
The sequence number of the TCP SYN segment used to establish a TCP connection between the client computer and gaia.cs.umass.edu is zero. The SYN flag is set to 1 in the Flags section, indicating that this is a SYN segment. Yes, the TCP receiver in this session will be able to use Selective Acknowledgments; we can see that SACK-permitted is present in the options section.

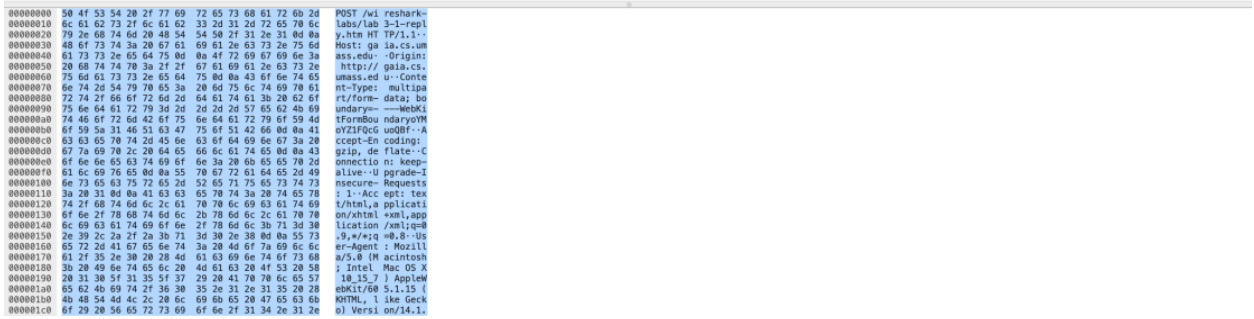
4. What is the sequence number of the SYNACK segment sent by gaia.cs.umass.edu to the client computer in reply to the SYN?
What is it in the segment that identifies the segment as a SYNACK segment? What is the value of the Acknowledgement field in the SYNACK segment? How did gaia.cs.umass.edu determine that value?



The sequence number of the SYNACK segment sent by gaia.cs.umass.edu in response to the SYN is 0. The SYN and Acknowledgement flags in the Flags section are both set to 1, indicating that this is a SYNACK segment. The Acknowledgement field in the SYNACK segment has a value of 1. The gaia.cs.umass.edu server adds 1 to the initial sequence number of the client computer's SYN segment. Because the client computer's initial sequence number for the SYN segment is 0, the value of the Acknowledgement field in the SYNACK segment is 1.

5. What is the sequence number of the TCP segment containing the header of the HTTP POST command? Note that in order to find the POST message header, you'll need to dig into the packet content field at the bottom of the Wireshark window, looking for a segment with the ASCII text "POST" within its DATA Field4,5 . How many bytes of data are contained in the payload (data) field of this TCP segment? Did all of the data in the transferred file alice.txt fit into this single Segment?

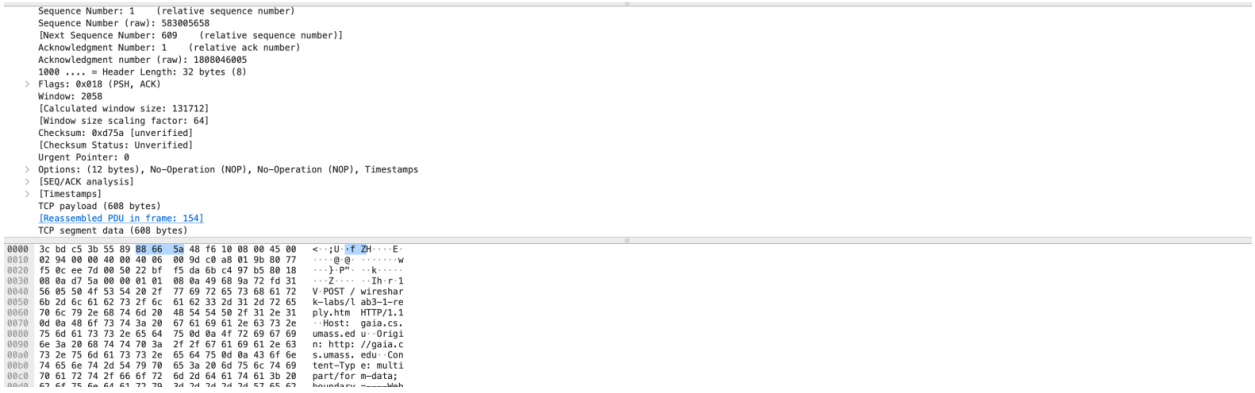




The sequence number of the TCP segment containing the HTTP header is 1. This TCP segment contains 608 bytes of data. No, the data was divided into 108 segments.

6. Consider the TCP segment containing the HTTP “POST” as the first segment in the data transfer part of the TCP connection.

• At what time was the first segment (the one containing the HTTP POST) in the data-transfer part of the TCP connection sent?



Answer: The first segment in the data-transfer part of the TCP connection was sent at 0.837022.

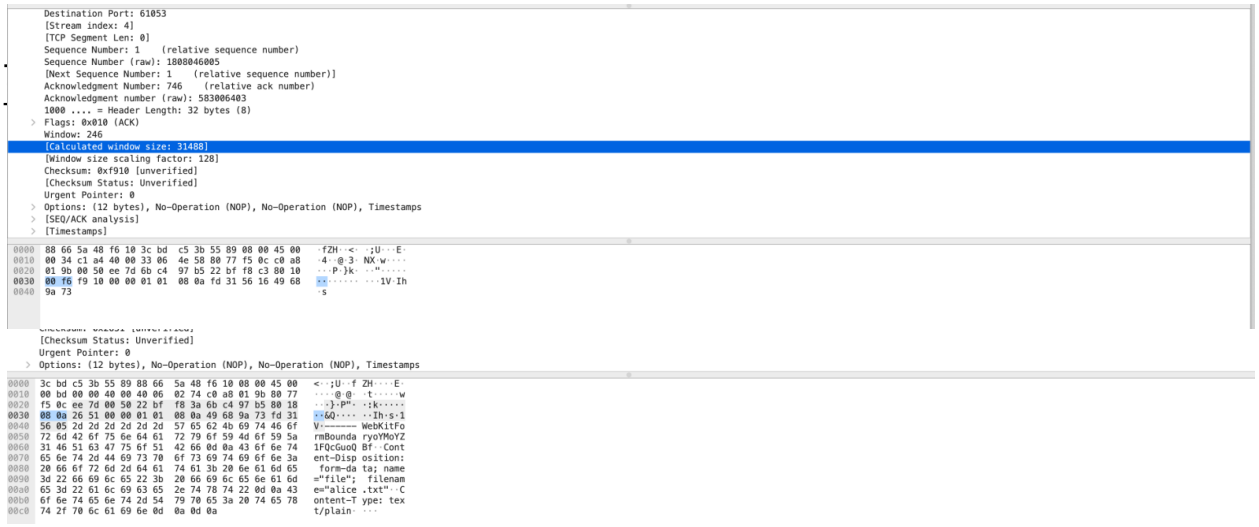
• At what time was the ACK for this first data-containing segment received?

Answer: The ACK for the first data-containing segment was received at 0.853552.

• What is the RTT for this first data-containing segment?

Answer: RTT = 0.853552 - 0.832022 = 0.02153 EstimatedRTT for first data-containing segment is: 0.02153 s

• What is the RTT value the second data-carrying TCP segment and its ACK?
• What is the EstimatedRTT value (see Section 3.5.3, in the text) after the ACK for the second data-carrying segment is received?



The first TCP segment is 608 bytes long, and the second TCP segment is 137 bytes long. Each of the following five TCP segments is 1448 bytes long.

8. What is the minimum amount of available buffer space advertised to the client by gaia.cs.umass.edu among these first four data-carrying TCP segments7 ?

Does the lack of receiver buffer space ever throttle the sender for these first four datacarrying segments?

Gaia.cs.umass.edu advertises 131712 Bytes of available buffer space among the first four data-carrying TCP segments to the client. For these first four data-carrying segments, the sender is never throttled due to a lack of receiver buffer space.

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

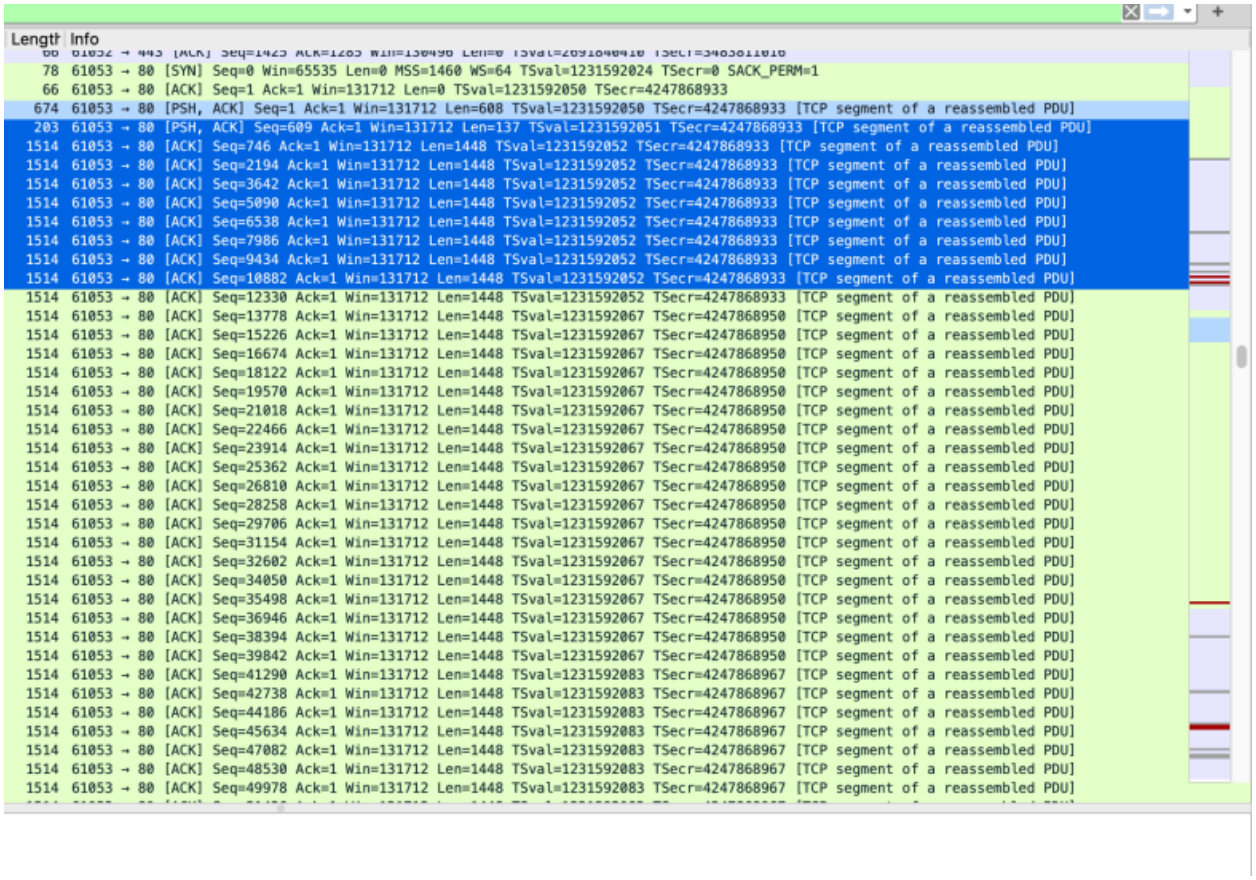
There are no retransmitted segments in the trace file. We can verify this by checking the sequence numbers of the TCP segments in the trace file. In the trace, all sequence numbers are increasing monotonically with respect to time. If there is a retransmitted segment, the sequence number of this retransmitted segment should be smaller than those of its neighboring segments and these retransmitted segments would be highlighted in black.

10. How much data does the receiver typically acknowledge in an ACK among the first ten data-carrying segments sent from the client to gaia.cs.umass.edu? Can you identify cases where the receiver is ACKing every other received segment (see Table 3.2 in the text) among these first ten data-carrying segments?

Acknowledgement	Acknowledged Sequence Number	Acknowledged Data
ACK 1	609	608
ACK 2	746	137
ACK 3	2194	1448
ACK 4	3642	1448
ACK 5	5090	1448
ACK 6	6538	1448
ACK 7	7986	1448
ACK 8	9434	1448
ACK 9	10882	1448
ACK 10	12330	1448

Among the first ten data-carrying segments sent from the client to gaia.cs.umass.edu, the receiver typically acknowledges 1448 bytes in an ACK. There are cases where the receiver is ACKing every other segment based on the amount of acknowledged data by each ACK. A segment of No. 80, for example, acknowledged data with 2920 bytes = 1460*2 bytes.

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



4. TCP congestion control in action

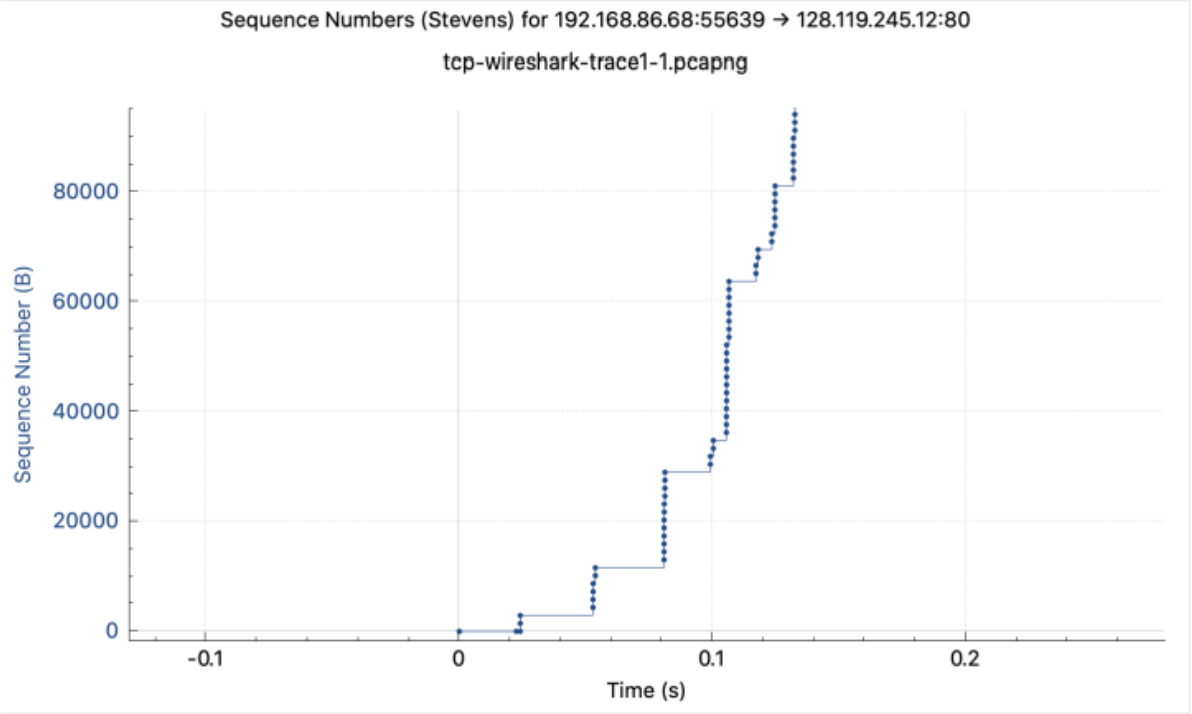
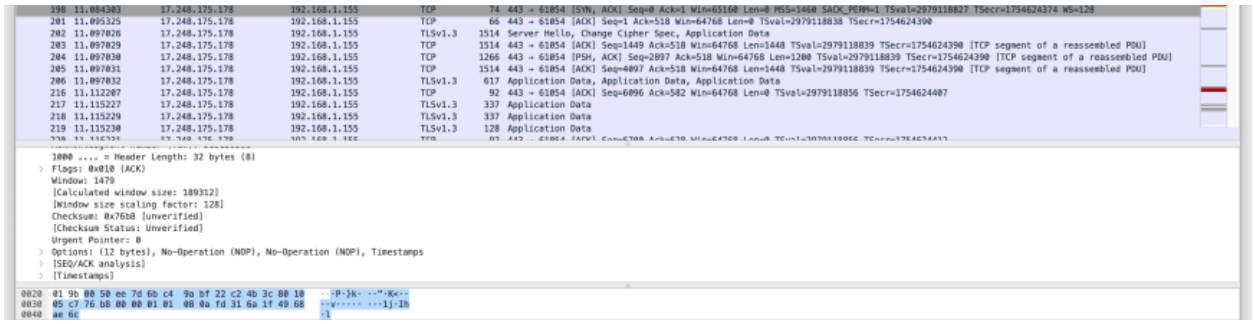


Figure 5: A sequence-number-versus-time plot (Stevens format) of TCP segments.

The alice.txt on the hard drive is 152,138 bytes, and the download time is 5.981633 (last ACK) - 0.837022. (first TCP segment) = 5.144611 seconds. Therefore, the throughput for the TCP connection is computed as 152,138/5.144611 = 29572.3039 bytes/second.



13. These “fleets” of segments appear to have some periodicity. What can you say about the period?

The slow begin of the TCP appears to begin at approximately 0.27 seconds and then ends at approximately zero.35 seconds. Congestion avoidance takes over at about 0.7 seconds because it reduce down the quantity being despatched Via staring at the plot, we will see that the gradual -begin segment handiest lasts for first 1-1.5 2d. Afterwards, it appears that evidently the TCP consultation is usually in congestion avoidance kingdom. In this situation, we do no longer examine the anticipated linear increase behaviour, i.e. the TCP transmit window does no longer grow linearly at some stage in this segment. In truth, it appears that the sender transmits packets in batches of 6. this does not seem to be caused by drift control for the reason that receiver marketed window is substantially large than five packets. The reason for this behaviour might be due to the truth that the HTTP server has enforced a fee-restrict of some kind.

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