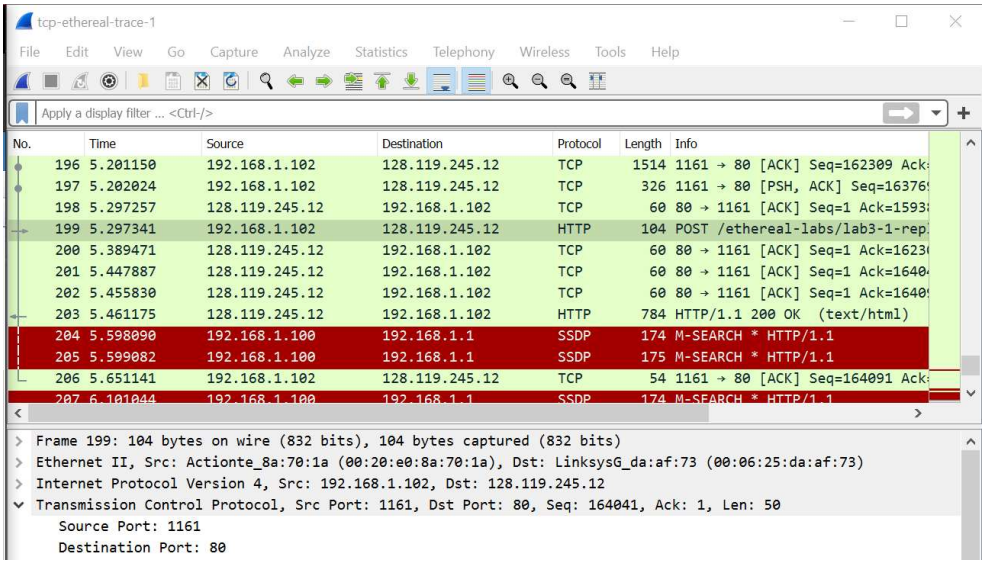
Jared Raiola - 903293358

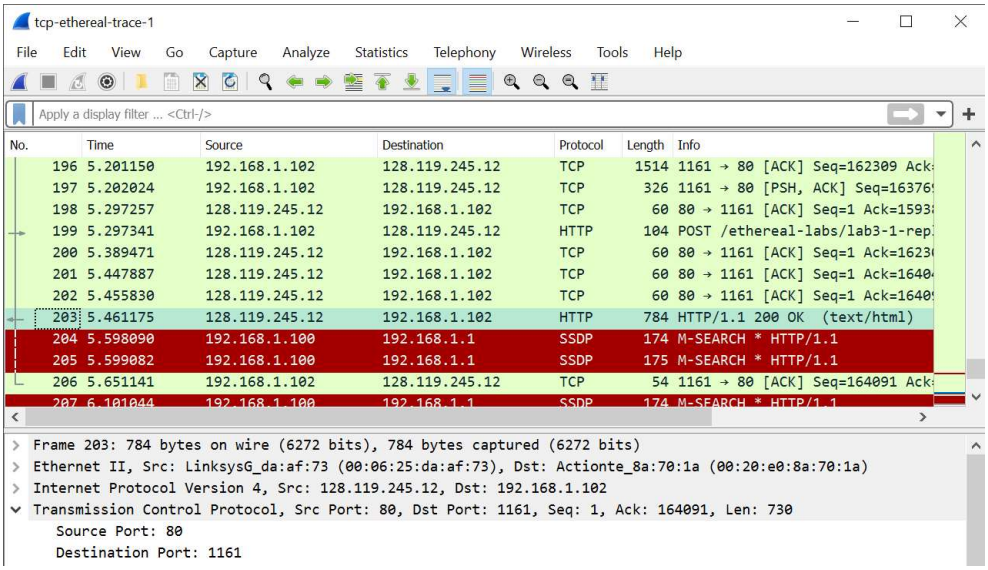
Homework 3

PART 1 - LAB

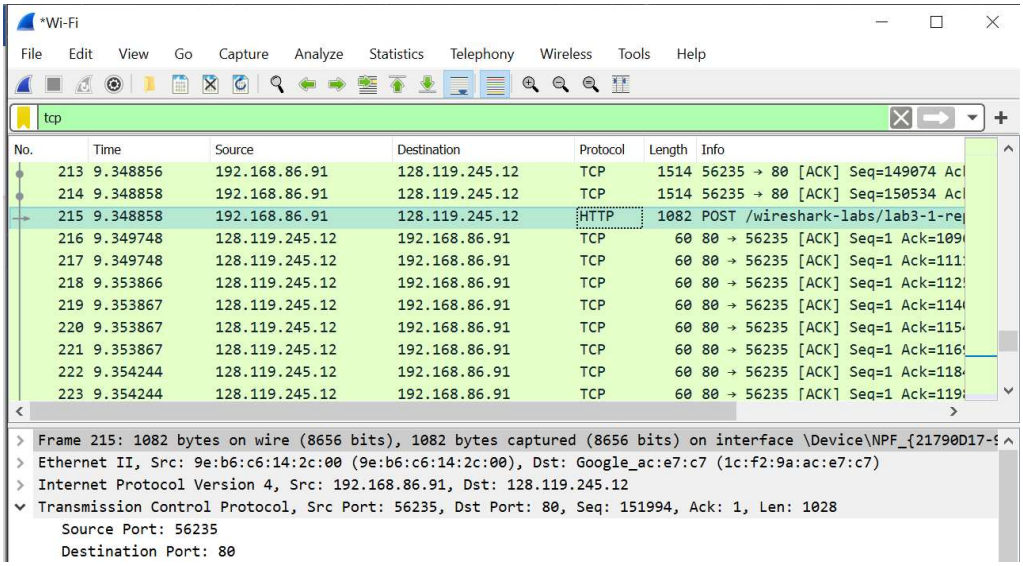
I am using the given trace for every question except question 3.

1. 

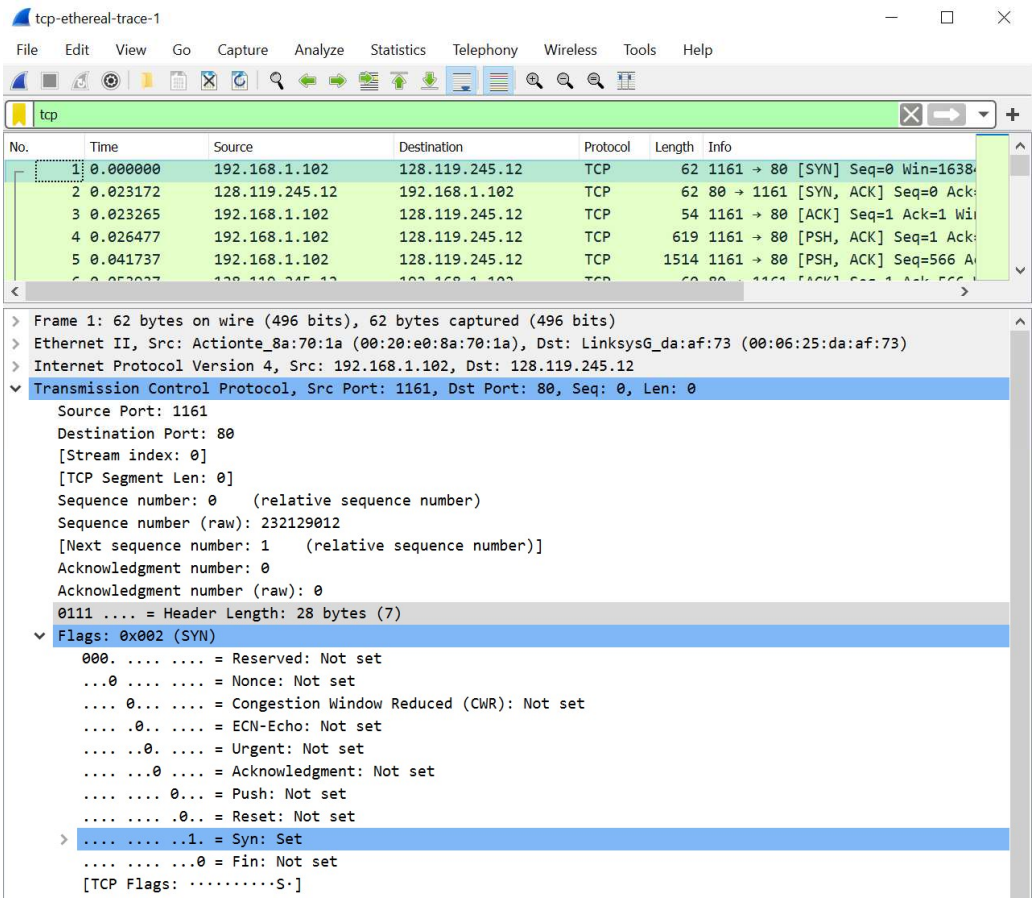
    a. Selecting HTTP at Frame 199 provides us with a client IP address of 192.168.1.102 and a TCP port number of 1161.

2. 

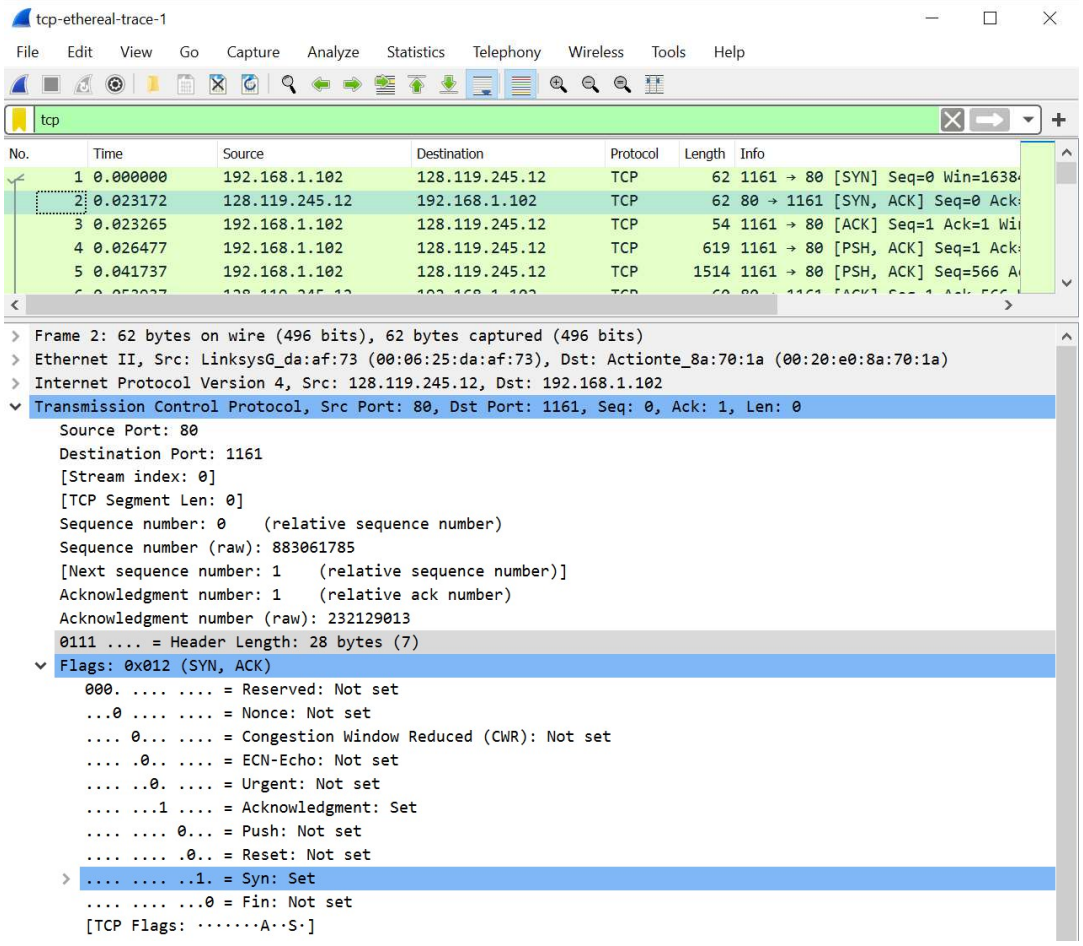
    a. The IP address of gaia.cs.umass.edu is 128.119.245.12 and the TCP port number is 80.

3. 

   a. The IP address of my computer is 192.168.86.91 and the TCP port number is 56235.

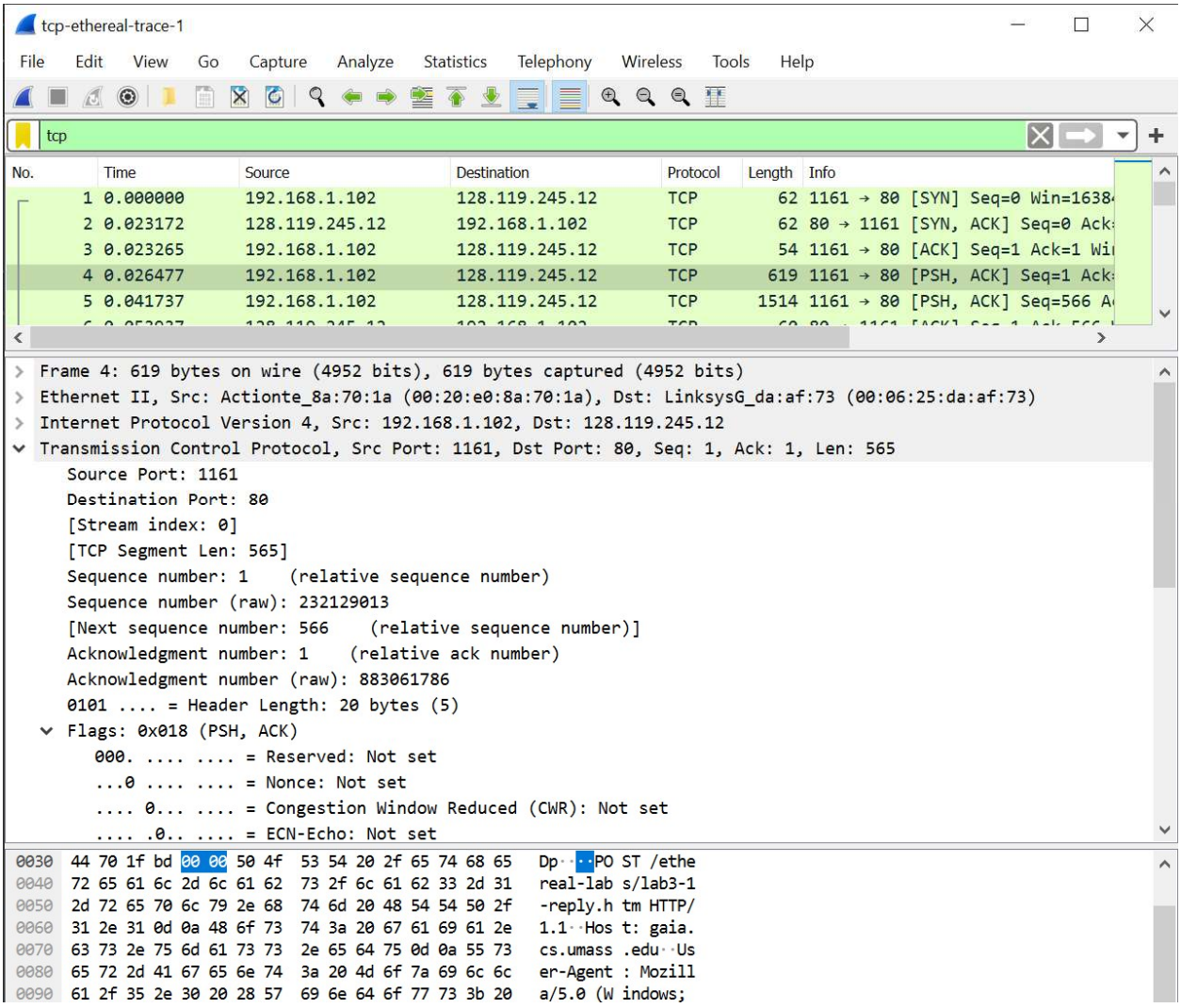
4. 

   a. The sequence number of the TCP SYN segment is 0. The SYN flag is set to 1, identifying it as a SYN segment.

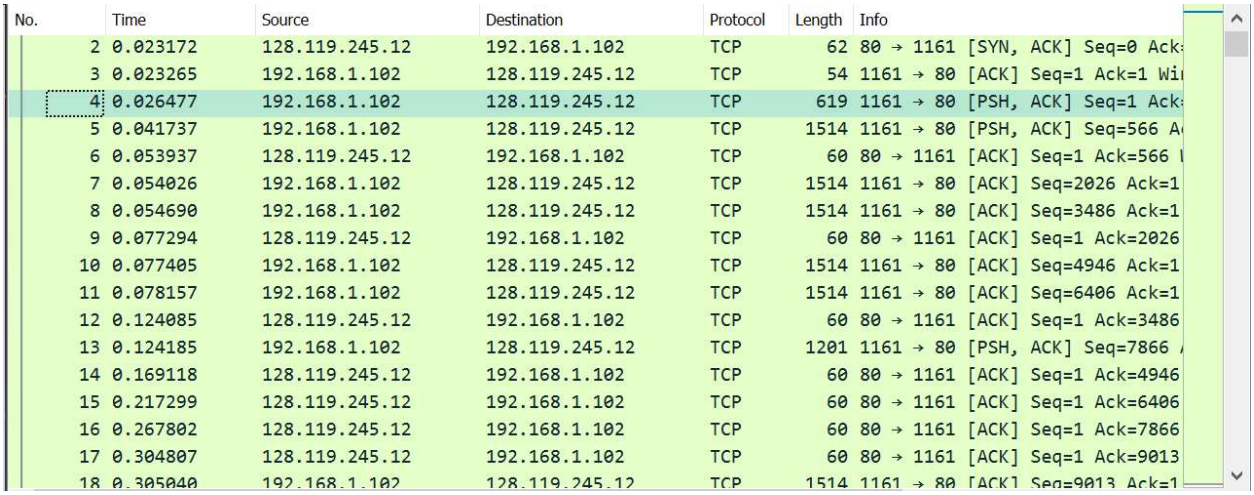


5.

a. The sequence number of the SNYACK segment is 0. The value of the Acknowledgement field is 1. This segment is identified as a SYNACK by the Acknowledgement and Syn flags both being set to 1.

6. 

a. The sequence number of segment 4 which contains the HTTP POST command is 1.

7. 

a. Segment Sequence Numbers:
    i. Segment 1: 1
    ii. Segment 2: 566

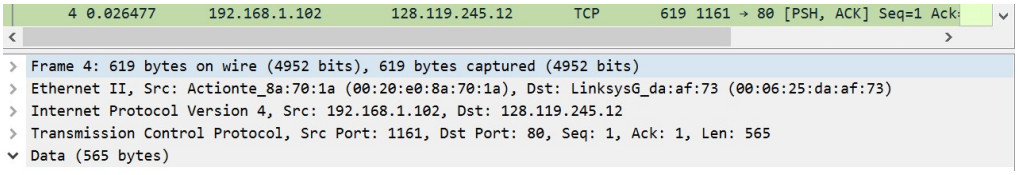
iii. Segment 3: 2026
iv. Segment 4: 3486
v. Segment 5: 4946
vi. Segment 6: 6406

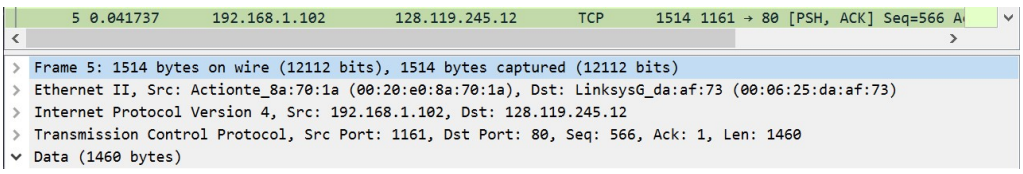
b. Sent Times in seconds
i. Segment 1: 0.026477
ii. Segment 2: 0.041737
iii. Segment 3: 0.053937
iv. Segment 4: 0.054026
v. Segment 5: 0.054690
vi. Segment 6: 0.077405

c. Ack Received Times in seconds
i. Segment 1: 0.053937
ii. Segment 2: 0.077294
iii. Segment 3: 0.124085
iv. Segment 4: 0.169118
v. Segment 5: 0.217229
vi. Segment 6: 0.267802

d. RTT in seconds
i. Segment 1: 0.02746
ii. Segment 2: 0.035557
iii. Segment 3: 0.070148
iv. Segment 4: 0.115092
v. Segment 5: 0.162539
vi. Segment 6: 0.190397

e. Estimated RTT in seconds
i. Segment 1: 0.02746
ii. Segment 2: 0.875 * 0.02746 + 0.125 * 0.035557 = 0.028472125
iii. Segment 3: 0.875 * 0.028472125 + 0.125 * 0.070148 = 0.03368160937
iv. Segment 4: 0.875 * 0.03368160937 + 0.125 * 0.115092 = 0.04385790819
v. Segment 5: 0.875 * 0.04385790819 + 0.125 * 0.162539 = 0.05869304466
vi. Segment 6: 0.875 * 0.05869304466 + 0.125 * 0.190397 = 0.07515603907

8. Length of TCP Segments in bytes
a. Segment 1: 565
i. 

b. Segment 2: 1460
i. 

c. Segment 3: 1460

d. Segment 4: 1460
e. Segment 5: 1460
f. Segment 6: 1460

1	0.000000	192.168.1.102	128.119.245.12	TCP	62 1161 → 80 [SYN] Seq=0 Win=1638
2	0.023172	128.119.245.12	192.168.1.102	TCP	62 80 → 1161 [SYN, ACK] Seq=0 Ack
3	0.023265	192.168.1.102	128.119.245.12	TCP	54 1161 → 80 [ACK] Seq=1 Ack=1 Wi
4	0.026477	192.168.1.102	128.119.245.12	TCP	619 1161 → 80 [PSH, ACK] Seq=1 Ack
5	0.041737	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [PSH, ACK] Seq=566 A
6	0.053937	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=1 Ack=566
7	0.054026	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=2026 Ack=1
8	0.054690	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=3486 Ack=1
9	0.077294	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=1 Ack=2026
10	0.077405	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=4946 Ack=1
11	0.078157	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=6406 Ack=1
12	0.124085	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=1 Ack=3486

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Sequence number: 0    (relative sequence number)
Sequence number (raw): 883061785
[Next sequence number: 1    (relative sequence number)]
Acknowledgment number: 1    (relative ack number)
Acknowledgment number (raw): 232129013
0111 .... = Header Length: 28 bytes (7)
Flags: 0x012 (SYN, ACK)
   000. .... .... = Reserved: Not set
   ...0 .... .... = Nonce: Not set
   .... 0... .... = Congestion Window Reduced (CWR): Not set
   .... .0.. .... = ECN-Echo: Not set
   .... ..0. .... = Urgent: Not set
   .... ...1 .... = Acknowledgment: Set
   .... .... 0... = Push: Not set
   .... .... .0.. = Reset: Not set
   .... .... ..1. = Syn: Set
   .... .... ...0 = Fin: Not set
   [TCP Flags: ·····A··S·]
Window size value: 5840
[Calculated window size: 5840]
Checksum: 0x774d [unverified]
[Checksum Status: Unverified]
Urgent pointer: 0
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9.
   a. The minimum amount of buffer space is 5840 bytes.
   b. The sender never gets throttled due to lack of receiver buffer space. It grows to 62780 bytes.
10. There are none. I checked for increasing sequence numbers in the Time-Sequence-Graph (Stevens).
11. The receiver typically acknowledges 1460 bytes in an ACK as most segments contain 1460 bytes of data. The only time the receiver seems to ACK every other received segment is before the POST segment is sent. It ACKS both the post segment in frame 4 and the segment in frame 3 together.
12. Average throughput is the total amount of data over the total transmission time.
    a. Total amount of data: last TCP segment sequence number acknowledges minus the first TCP segment sequence number.
        i. 164091 bytes – 1 byte = 164090 bytes
    b. Total transmission time: time of last ACK minus time the first TCP segment is sent
        i. 5.455830 s – 0.026477 s = 5.4294 seconds
    c. Average throughput = 164090 bytes / 5.4294 seconds = 30.2224924 kBps