Computer Networks

LAB 4a

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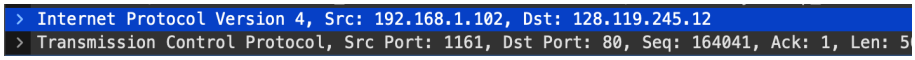
1. What is the IP address and TCP port number used by the client computer (source) that is transferring the file to `gaia.cs.umass.edu`?

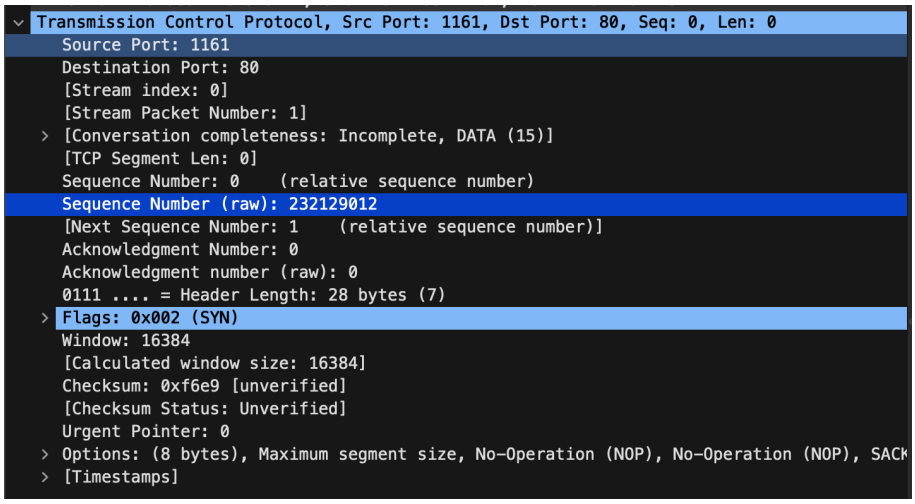


IP address: `192.168.1.102`, TCP port: `1161`

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?
   - IP address: `128.119.245.12`. Port number: `80`.

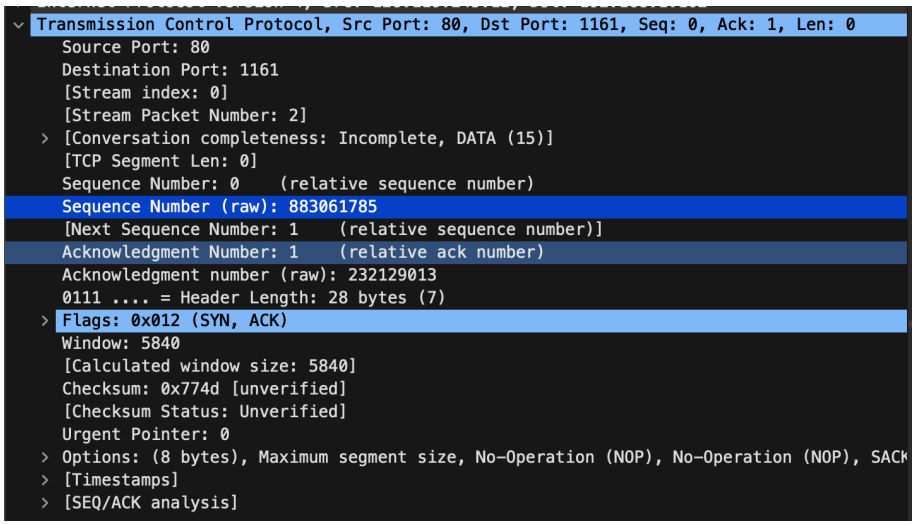
3. .

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?



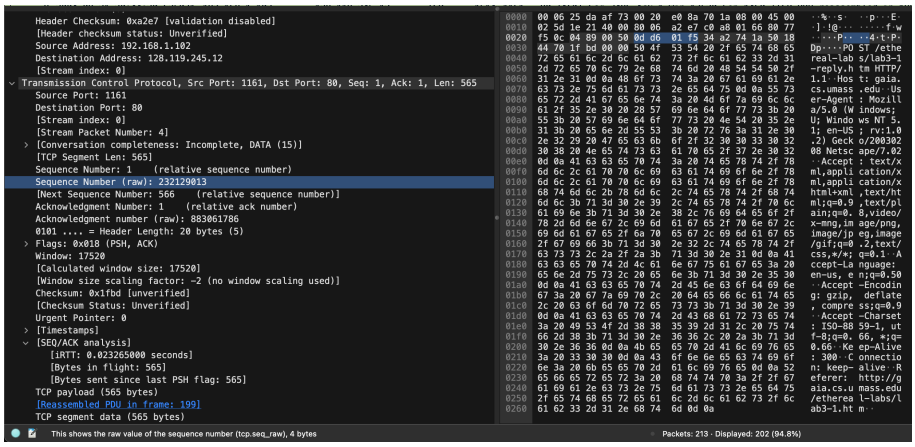
Sequence number: `232129012`, The identifier is the `Flags` field

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?



- Sequence number of the `SYNACK` segment: `883061785`
- Value of `Acknowledgement` field: `232129013`
- `gaia.cs.umass.edu` determine that value by taking the sequence number of client's TCP SYN and add `1`
- It is the `Flags` field that identifies the segment.

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.



Sequence number: `232129013`

7. 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 after the receipt of each ACK?

(a) 

Sequence number: `232129013`

- Sent at: 0.026477
- ACK received at: 0.053937
- RTT = 0.02749
- EstimatedRTT: 0.02749

(b) 

Sequence number: `232129578`

- Sent at: 0.041737
- ACK received at: 0.077294
- RTT = 0.035557
- EstimatedRTT: $0.8 \times 0.02749 + 0.125 \times 0.035557 = 0.026436625$

(c) 

Sequence number: `232131038`

- Sent at: 0.054026
- ACK received at: 0.124085
- RTT = 0.070059
- EstimatedRTT: $0.8 \times 0.026436625 + 0.125 \times 0.070059 = 0.029906675$

(d) 

Sequence number: `232132498`

- Sent at: 0.054690
- ACK received at: 0.169118
- RTT = 0.114428
- EstimatedRTT: $0.8 \times 0.029906675 + 0.125 \times 0.114428 = 0.03822884$

(e) 

Sequence number: `232133958`

- Sent at: 0.077405
- ACK received at: 0.217299
- RTT = 0.139894
- EstimatedRTT: $0.8 \times 0.029906675 + 0.125 \times 0.114428 = 0.03822884$

(f) 

Sequence number: `232135418`

- Sent at: 0.078157

- ACK received at: 0.267802
- RTT = 0.189645
- EstimatedRTT: $0.8 \times 0.03822884 + 0.125 \times 0.189645 = 0.054288697$

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

   - First segment: 565
   - Second segment to sixth segment: 1460.

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?

   - Minimum amount of available buffer space advertised is 6780 bytes. No, it does not.

10. 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.

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.

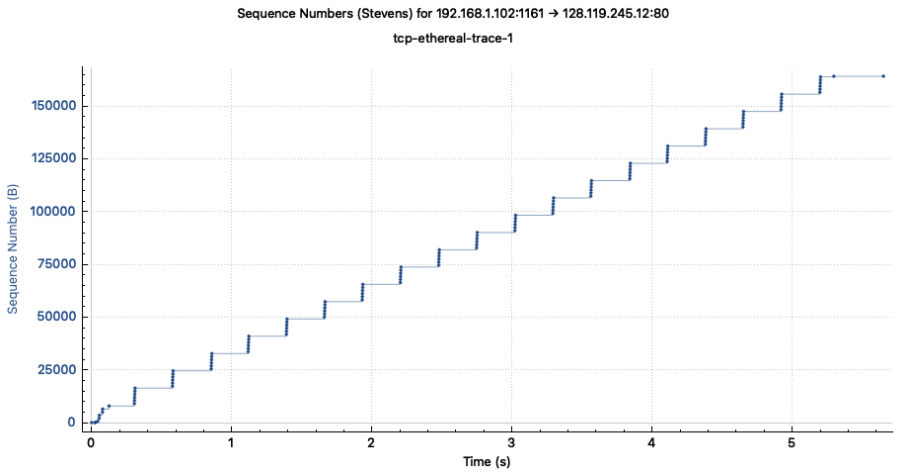
    - The receiver typically acknowledges 1460 bytes.

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

    - The throughput for the TCP connection:

      $$(565 + 1460 \times 100 + 1147 + 892 \times 18 + 272)/7.595557 = 21596.83615039687 \quad \text{bytes/second}$$

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.



The slow start phase typically starts at the beginning of the transmission.