Lab 4

Exercise 1:

Question 1 . What is the IP address of gaia.cs.umass.edu? On what port number is it sending and receiving TCP segments for this connection? 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?

Answer:

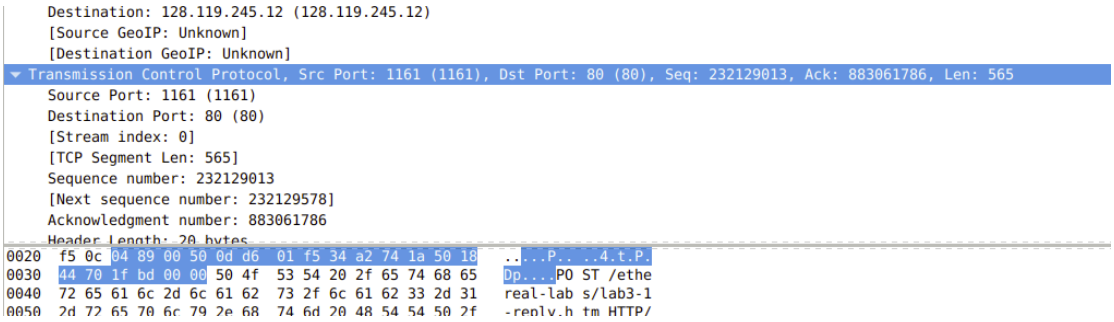
IP address of gaia.cs.umass.edu: 128.119.245.12
Port number: 80

IP address of client computer: 192.168.1.102
Port number: 1161

Question 2. 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:

Sequence number: 232129013

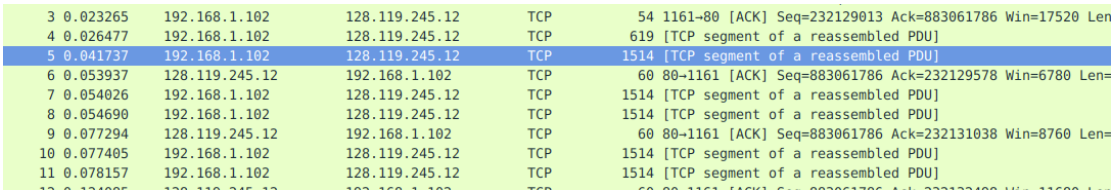


Question 3. Consider the TCP segment containing the HTTP POST as the first segment in the TCP connection. What are the sequence numbers of the first six segments in the TCP connection (including the segment containing the HTTP POST) sent from the client to the web server (Do not consider the ACKs received from the server as part of these six segments)? 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 relevant parts of Section 3.5 or lecture slides) after the receipt of each ACK? Assume that the initial value of EstimatedRTT is equal to the measured RTT (SampleRTT) for the first segment, and then is computed using the EstimatedRTT equation for all subsequent segments. Set alpha to 0.125.

Answer:

Segment number	Sequence number	Time of sent	Time ACK for each segment received	RTT value for segment	Estimated RTT value
1	232129013	0.026477	0.053937	0.02746	0.02746
2	232129578	0.041737	0.077294	0.035557	0.02847
3	232131038	0.054026	0.124085	0.070059	0.03367
4	232132498	0.054690	0.169118	0.114428	0.04377
5	232133958	0.077405	0.217299	0.139894	0.05578
6	232136878	0.078157	0.267802	0.189645	0.07251

Question 4. What is the length of each of the first six TCP segments?



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     3 0.023265    192.168.1.102     128.119.245.12    TCP      54 1161→80 [ACK] Seq=232129013 Ack=883061786 Win=17520 Len
     4 0.026477    192.168.1.102     128.119.245.12    TCP     619 [TCP segment of a reassembled PDU]
     5 0.041737    192.168.1.102     128.119.245.12    TCP    1514 [TCP segment of a reassembled PDU]
     6 0.053937    128.119.245.12    192.168.1.102     TCP      60 80→1161 [ACK] Seq=883061786 Ack=232129578 Win=6780 Len=
     7 0.054026    192.168.1.102     128.119.245.12    TCP    1514 [TCP segment of a reassembled PDU]
     8 0.054690    192.168.1.102     128.119.245.12    TCP    1514 [TCP segment of a reassembled PDU]
     9 0.077294    128.119.245.12    192.168.1.102     TCP      60 80→1161 [ACK] Seq=883061786 Ack=232131038 Win=8760 Len=
    10 0.077405    192.168.1.102     128.119.245.12    TCP    1514 [TCP segment of a reassembled PDU]
    11 0.078157    192.168.1.102     128.119.245.12    TCP    1514 [TCP segment of a reassembled PDU]
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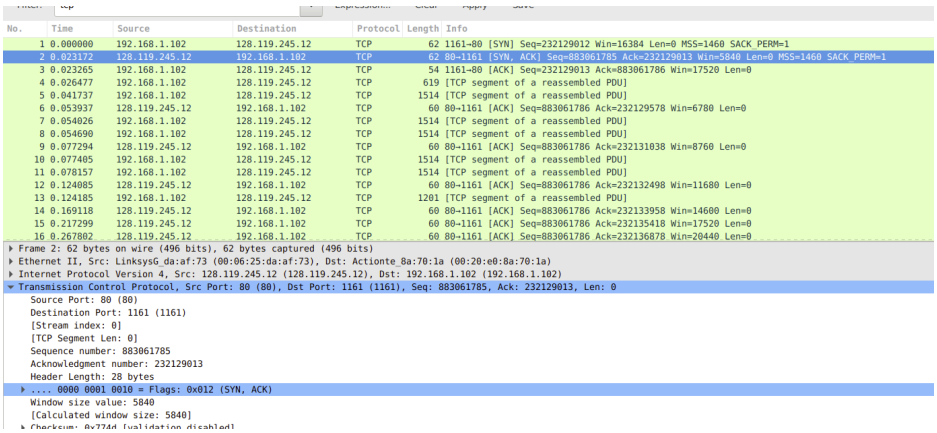
Segment 1: 619
Segment 2: 1514
Segment 3: 1514
Segment 4: 1514
Segment 5: 1514
Segment 6: 1514

Question 5. What is the minimum amount of available buffer space advertised at the receiver for the entire trace? Does the lack of receiver buffer space ever throttle the sender?

Answer:



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No.  Time      Source          Destination     Protocol Length Info
     1 0.000000  192.168.1.102   128.119.245.12  TCP        62 1161→80 [SYN] Seq=232129012 Win=16384 Len=0 MSS=1460 SACK_PERM=1
     2 0.023172  128.119.245.12  192.168.1.102   TCP        62 80→1161 [SYN, ACK] Seq=883061785 Ack=232129013 Win=5840 Len=0 MSS=1460 SACK_PERM=1
     3 0.023265  192.168.1.102   128.119.245.12  TCP        54 1161→80 [ACK] Seq=232129013 Ack=883061786 Win=17520 Len=0
     4 0.026477  192.168.1.102   128.119.245.12  TCP       619 [TCP segment of a reassembled PDU]
     5 0.041737  192.168.1.102   128.119.245.12  TCP      1514 [TCP segment of a reassembled PDU]
     6 0.053937  128.119.245.12  192.168.1.102   TCP        60 80→1161 [ACK] Seq=883061786 Ack=232129578 Win=6780 Len=0
     7 0.054026  192.168.1.102   128.119.245.12  TCP      1514 [TCP segment of a reassembled PDU]
     8 0.054690  192.168.1.102   128.119.245.12  TCP      1514 [TCP segment of a reassembled PDU]
     9 0.077294  128.119.245.12  192.168.1.102   TCP        60 80→1161 [ACK] Seq=883061786 Ack=232131038 Win=8760 Len=0
    10 0.077405  192.168.1.102   128.119.245.12  TCP      1514 [TCP segment of a reassembled PDU]
    11 0.078157  192.168.1.102   128.119.245.12  TCP      1514 [TCP segment of a reassembled PDU]
    12 0.124085  128.119.245.12  192.168.1.102   TCP        60 80→1161 [ACK] Seq=883061786 Ack=232132498 Win=11680 Len=0
    13 0.124185  192.168.1.102   128.119.245.12  TCP      1201 [TCP segment of a reassembled PDU]
    14 0.169118  128.119.245.12  192.168.1.102   TCP        60 80→1161 [ACK] Seq=883061786 Ack=232133958 Win=14600 Len=0
    15 0.217299  128.119.245.12  192.168.1.102   TCP        60 80→1161 [ACK] Seq=883061786 Ack=232135418 Win=17520 Len=0
    16 0.267802  128.119.245.12  192.168.1.102   TCP        60 80→1161 [ACK] Seq=883061786 Ack=232136878 Win=20440 Len=0
▸ Frame 2: 62 bytes on wire (496 bits), 62 bytes captured (496 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 (128.119.245.12), Dst: 192.168.1.102 (192.168.1.102)
▾ Transmission Control Protocol, Src Port: 80 (80), Dst Port: 1161 (1161), Seq: 883061785, Ack: 232129013, Len: 0
    Source Port: 80 (80)
    Destination Port: 1161 (1161)
    [Stream index: 0]
    [TCP Segment Len: 0]
    Sequence number: 883061785
    Acknowledgment number: 232129013
    Header Length: 28 bytes
  ▸ .... 0000 0001 0010 = Flags: 0x012 (SYN, ACK)
    Window size value: 5840
    [Calculated window size: 5840]
  ▸ Checksum: 0x774d [validation disabled]
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Minimum amount : 5840

The buffer space dose not throttle the sender, because the amount of buffer space always larger than the TCP segment length.

Question 6. Are there any retransmitted segments in the trace file? What did you check for (in the trace) in order to answer this question?

There is no retransmitted segment in the trace file.
To check for the same sequence number in the trace file, I sorted the trace file by sequence number in the wireshark.

Question 7. How much data does the receiver typically acknowledge in an ACK? Can you identify cases where the receiver is ACKing every other received segment (recall the discussion about delayed acks from the lecture notes or Section 3.5 of the text).

Answer:

18	0.305040	192.168.1.102	128.119.245.12	TCP	1514 [TCP segment of a reassembled PDU]
19	0.305813	192.168.1.102	128.119.245.12	TCP	1514 [TCP segment of a reassembled PDU]
20	0.306692	192.168.1.102	128.119.245.12	TCP	1514 [TCP segment of a reassembled PDU]
21	0.307571	192.168.1.102	128.119.245.12	TCP	1514 [TCP segment of a reassembled PDU]
22	0.308699	192.168.1.102	128.119.245.12	TCP	1514 [TCP segment of a reassembled PDU]
23	0.309553	192.168.1.102	128.119.245.12	TCP	946 [TCP segment of a reassembled PDU]
24	0.356437	128.119.245.12	192.168.1.102	TCP	60 80→1161 [ACK] Seq=883061786 Ack=232139485 Win=26280 Len=0
25	0.400164	128.119.245.12	192.168.1.102	TCP	60 80→1161 [ACK] Seq=883061786 Ack=232140945 Win=29200 Len=0
26	0.448613	128.119.245.12	192.168.1.102	TCP	60 80→1161 [ACK] Seq=883061786 Ack=232142405 Win=32120 Len=0
27	0.500029	128.119.245.12	192.168.1.102	TCP	60 80→1161 [ACK] Seq=883061786 Ack=232143865 Win=35040 Len=0
28	0.545052	128.119.245.12	192.168.1.102	TCP	60 80→1161 [ACK] Seq=883061786 Ack=232145325 Win=37960 Len=0
29	0.576417	128.119.245.12	192.168.1.102	TCP	60 80→1161 [ACK] Seq=883061786 Ack=232146217 Win=37960 Len=0

Receivers typically acknowledge 1460 bytes data.

When the increase in acknowledge number becomes double, the receiver is ACKing.

Question 8. What is the throughput (bytes transferred per unit time) for the TCP connection? Explain how you calculated this value.

Answer:
Total bytes: (202^{nd}) 232293103 – (4^{th})232129013 = 164090 bytes
Total time: (202^{nd}) 5.455830 – (4^{th})0.026477 = 5.429353 s
Througput = 30222.75 bytes/s

Exercise 2:

Question 1 . What is the sequence number of the TCP SYN segment that is used to initiate the TCP connection between the client computer and server?

Answer:
Sequence number: 2818463618

Question 2. What is the sequence number of the SYNACK segment sent by the server to the client computer in reply to the SYN? What is the value of the Acknowledgement field in the SYNACK segment? How did the server determine that value?

Answer:
Sequence number: 1247095790

Acknowledgement value: 2818463619

The server determined it by adding 1 value to the sequence number (2618463618+1)

Question 3 . What is the sequence number of the ACK segment sent by the client computer in response to the SYNACK?

Answer:
Sequence number: 2818463619

What is the value of the Acknowledgment field in this ACK segment? Does this segment contain any data?
Ack value: 1247095791

No data, because there is no change in the sequence number.

Question 4 . Who has done the active close? client or the server? how you have determined this? What type of closure has been performed? 3 Segment (FIN/FINACK/ACK), 4 Segment (FIN/ACK/FIN/ACK) or Simultaneous close?

Client has done the active close. The source IP address for the first FIN,ACK segment is 10.9.16.201

4 Segment closure

Question 5 . How many data bytes have been transferred from the client to the server and from the server to the client during the whole duration of the connection? What relationship does this have with the Initial Sequence Number and the final ACK received from the other side?

The total data bytes : 2818463653 – 2818463618 – 2 = 33 bytes
(FIN and SYN)
The relationship:
Total data bytes sent: final ACK – initial sequence number