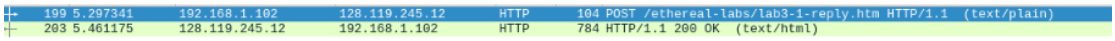
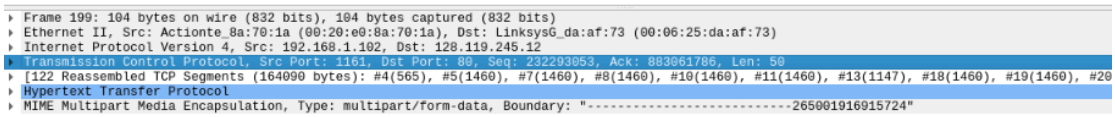
Exercise 1:

Q1

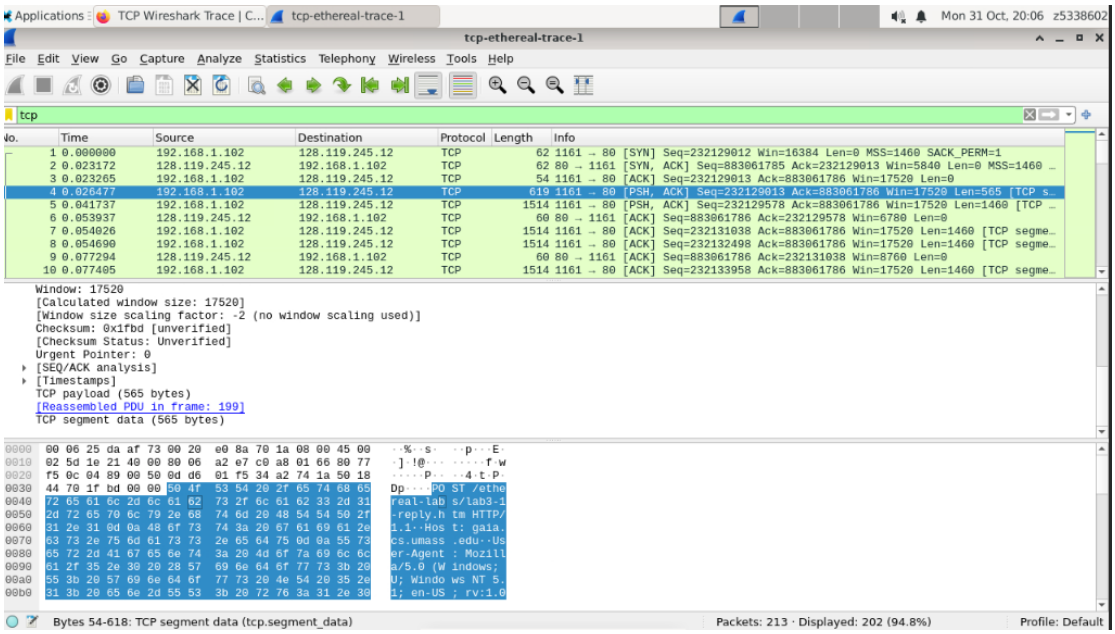




The IP address of ‘gaia.cs.umass.edu’ is 192.168.1.102. It sending and receiving TCP segments for this connection in the port number 80.

the IP address and TCP port numbers used by the client computer (source) that is transferring the file to gaia.cs.umass.edu is 192.168.1.102, 1161.

Q2



As the chart, the sequence number of the TCP segment containing the HTTP POST command is 232129013.

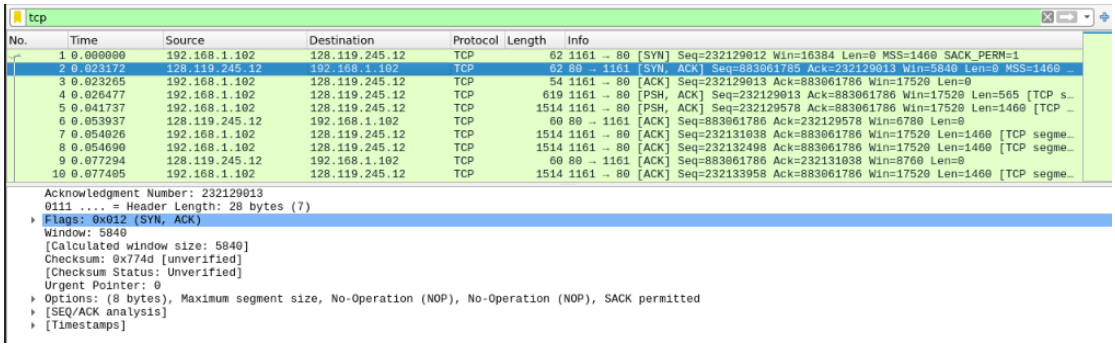
Q3

Seq. NO.	time sent	time ack	SampleRTT	Est. RTT	length
232129013	0.026477	0.053937	0.02746	0.02746	565
232129578	0.041737	0.077294	0.035557	0.02847213	1460
232136878	0.124185	0.169118	0.044933	0.03052973	1147
232145325	0.309553	0.356437	0.046884	0.03257402	892
232153517	0.581074	0.626496	0.045422	0.03418002	892
232161709	0.857683	0.899423	0.04174	0.03512501	892

Q4.

As the chart in the Q3 has e length of each of the first six TCP segments.

Q5.

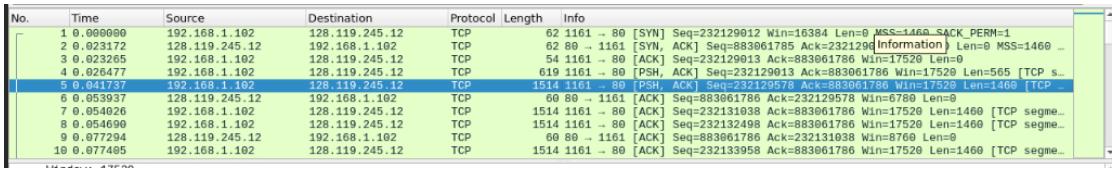


As the chart, the minimum amount of available buffer space advertised at the receiver for the entire trace is 5840. The lack of receiver buffer space will throttle the sender.

Q6.

Because the sequence numbers tend to increase, there are no retransmissions.

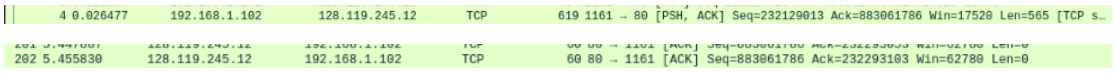
Q7.



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 …
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	1161 → 80 [PSH, ACK] Seq=232129013 Ack=883061786 Win=17520 Len=565 [TCP s…
5	0.041737	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [PSH, ACK] Seq=232129578 Ack=883061786 Win=17520 Len=1460 [TCP …
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	1161 → 80 [ACK] Seq=232131038 Ack=883061786 Win=17520 Len=1460 [TCP segme…
8	0.054690	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232132498 Ack=883061786 Win=17520 Len=1460 [TCP segme…
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	1161 → 80 [ACK] Seq=232133958 Ack=883061786 Win=17520 Len=1460 [TCP segme…

About 1460 bits data does the receiver typically acknowledge in an ACK.

Q8.



	4	0.026477	192.168.1.102	128.119.245.12	TCP	619 1161 → 80 [PSH, ACK] Seq=232129013 Ack=883061786 Win=17520 Len=565 [TCP s…
202	5.455830		128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=883061786 Ack=232293103 Win=62780 Len=0

The throughput=(232293103-232129013)/1000/(5.45583-0.026477)=30.223kbit/s

Exercise2

Q1.

No	Source IP	Destination IP	Protocol	Info
295	10.9.16.201	10.99.6.175	TCP	50045 > 5000 [SYN] Seq=2818463618 win=8192 MSS=1460

The sequence is 2818463618.

Q2.

296	10.99.6.175	10.9.16.201	TCP	5000 > 50045 [SYN, ACK] Seq=1247095790 Ack=2818463619 win=262144 MSS=1460

The reply sequence is 1247095790, the value of the Acknowledgement field in the SYNACK segment is 1460.

Q3.

297	10.9.16.201	10.99.6.175	TCP	50045 > 5000 [ACK] Seq=2818463619 Ack=1247095791 win=65535

the sequence number of the ACK segment sent by the client computer in response to the SYNACK is 2818463619. The value of the Acknowledgment field in this ACK segment is 1247095791. The segment contain 1 bit data.

Q4.

Both client and server done the active close since the connect close only need one (FIN,ACK/ACK), but it has two. So the client and server are close at the same time. This is a 4 Segment of Simultaneous close.

Q5.

There are (2818463652-2818463618)=34bit=4.25bytes data transferred from the client to the server and (1247095831-1247095790)=41bit=5.125bytes from the server to the client during the whole duration of the connection.

the final ACK received from the other side minus Initial Sequence Number can get the data during the transferred.