Computer Network Lab Assignment
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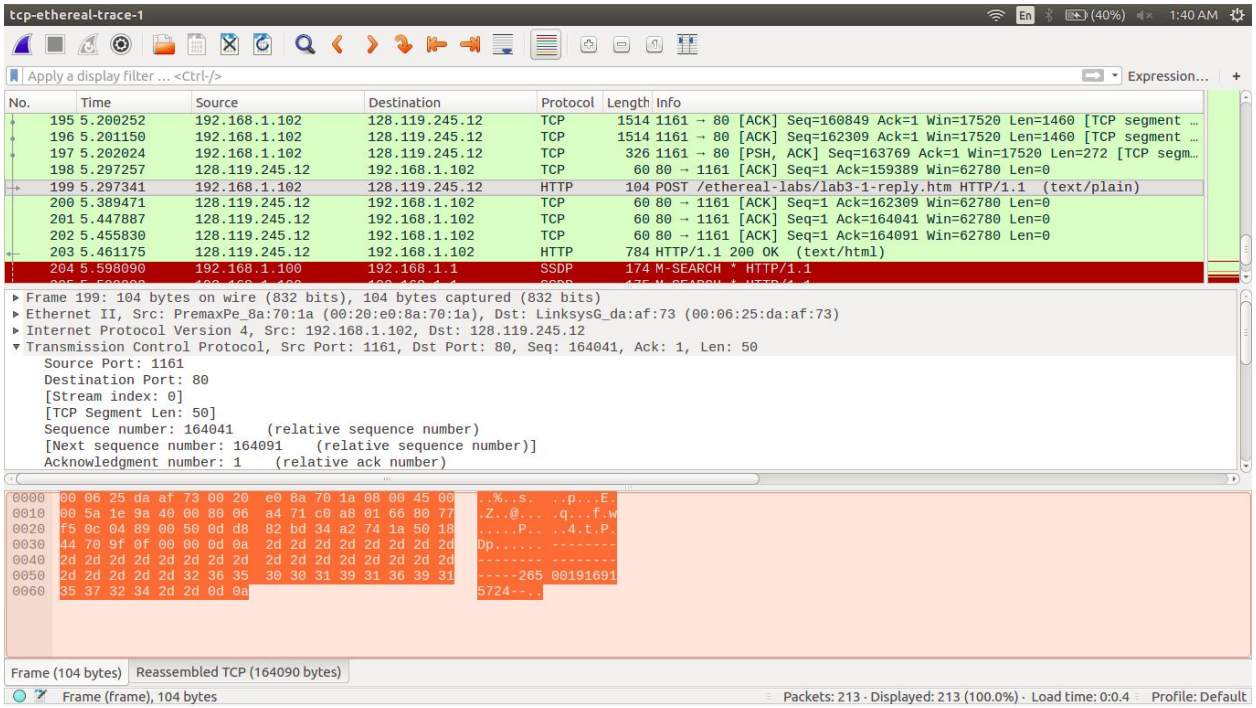
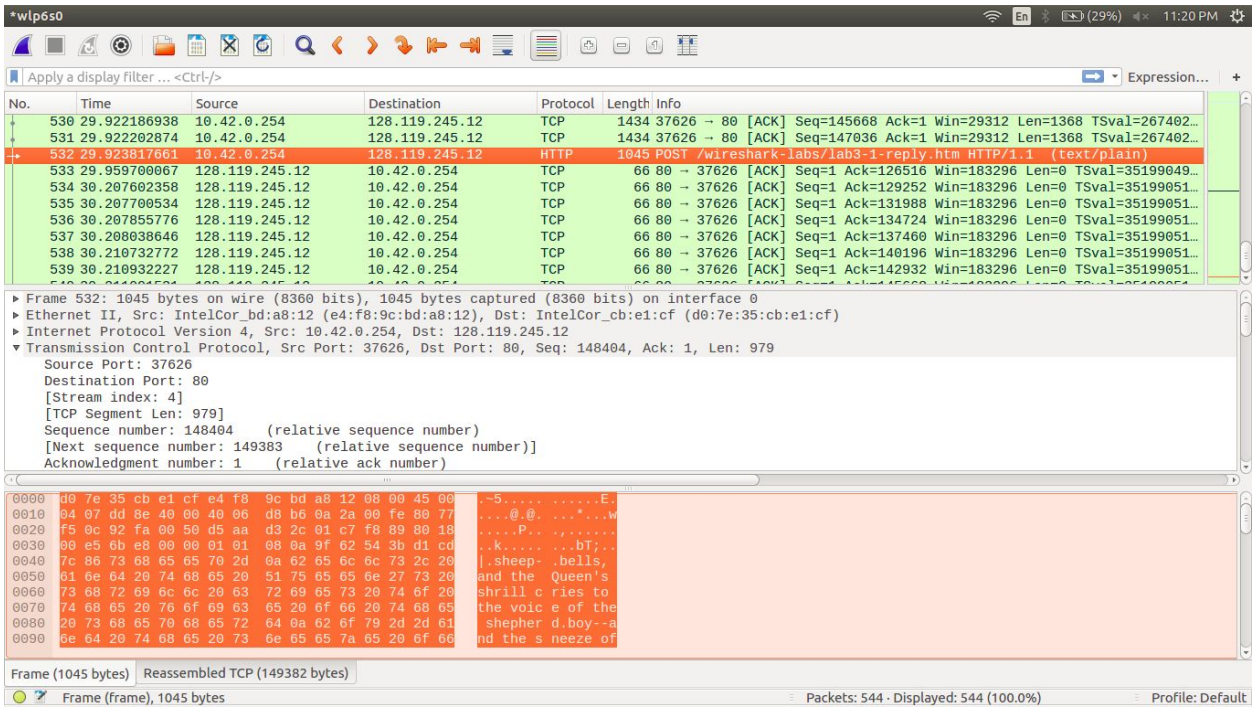
1.
What is the IP address and TCP port number used by the client computer (source) that is transferring the file to gaia.cs.umass.edu?
IP address: 192.168.1.102
TCP port number: 1161

2.
What is the IP address and port number used by gaia.cs.umass.edu to receive the file?
IP address: 128.119.245.12
TCP port number: 80

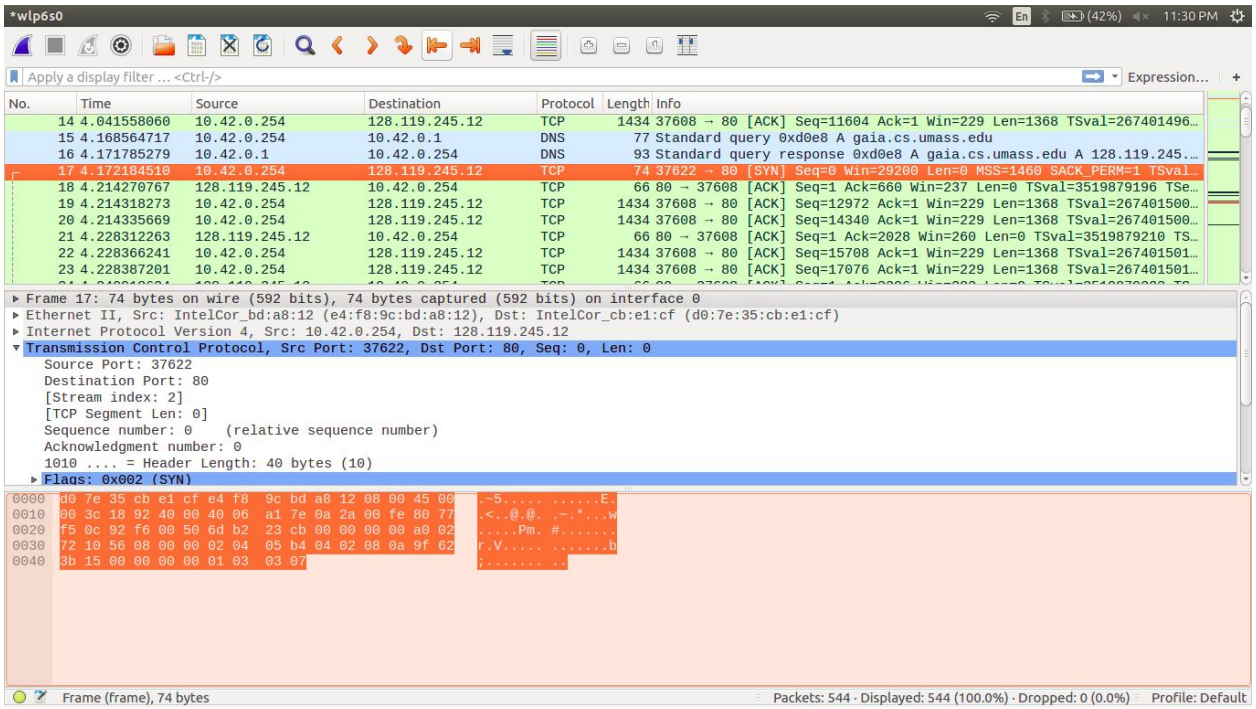


3.
What is the IP address and TCP port number used by your client computer (source) to transfer the file to gaia.cs.umass.edu?
IP address: 10.42.0.254
TCP port number: 37626



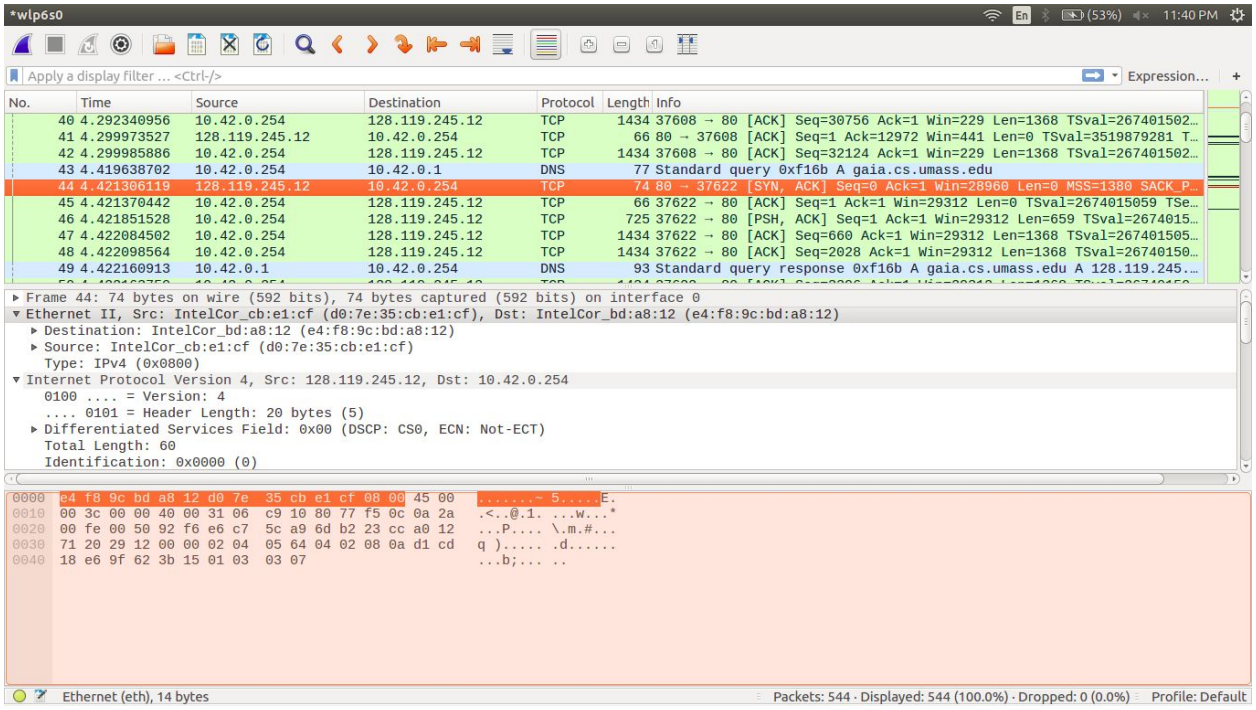
4.
What is the sequence number of the TCP SYN segment that is used to initiate the TCP connection between the client computer and gaia.cs.umass.edu? What is it in the segment that identifies the segment as a SYN segment?

ANS:
Seq number of the TCP SYN segment is used to initiate the TCP connection between the client computer and gaia.cs.umass.edu. The value is 0.
SYN flag is set to 1 => SYN segment.



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?

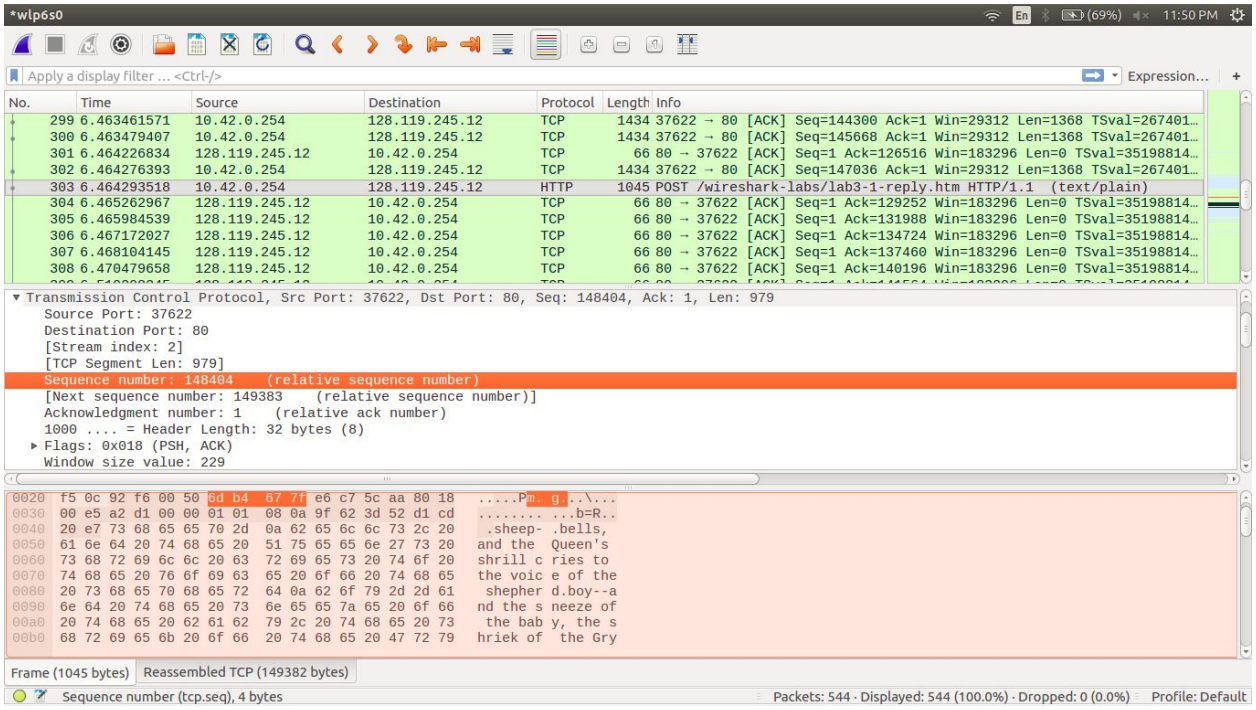
ANS:
Seq number of the SYNACK segment in reply to the SYN has the value of 0. ACKnowledgement field in the SYNACK segment is 1. ACKnowledgement field in the SYNACK segment is determined by adding 1 to the initial sequence number of SYN segment from the client computer.
The SYN flag and Acknowledgement flag in the segment are set to 1 => SYNACK segment.



6.

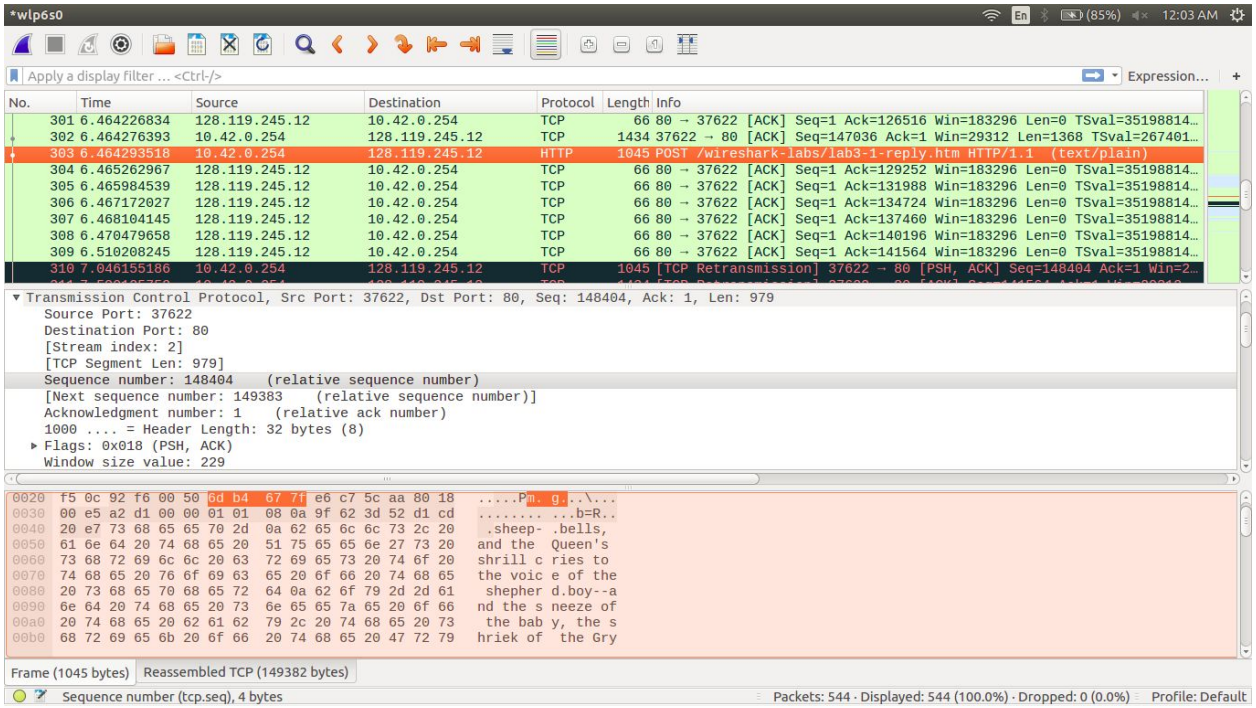
What is the sequence number of the TCP segment containing the HTTP POST command? Note that in order to find the POST command, you'll need to dig into the packet content field at the bottom of the Wireshark window, looking for a segment with a "POST" within its DATA field.

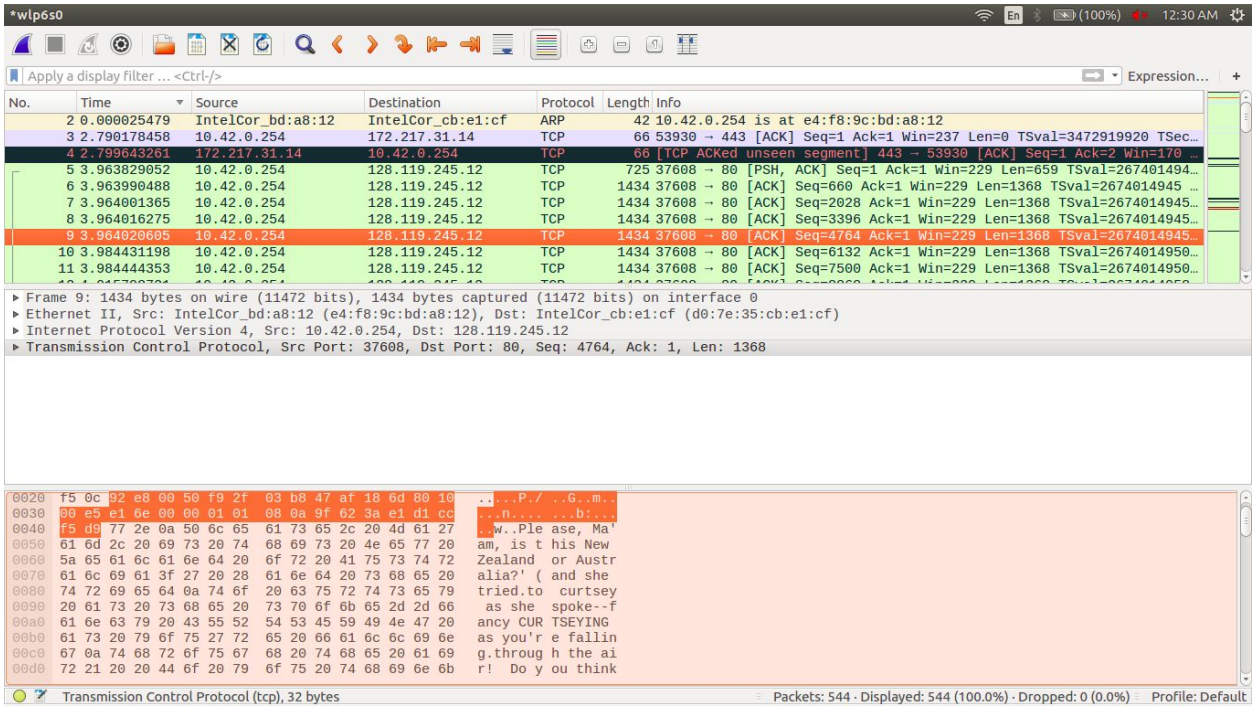
ANS:
In the TCP segment containing the HTTP POST command seq number of this segment has the value of 148404.

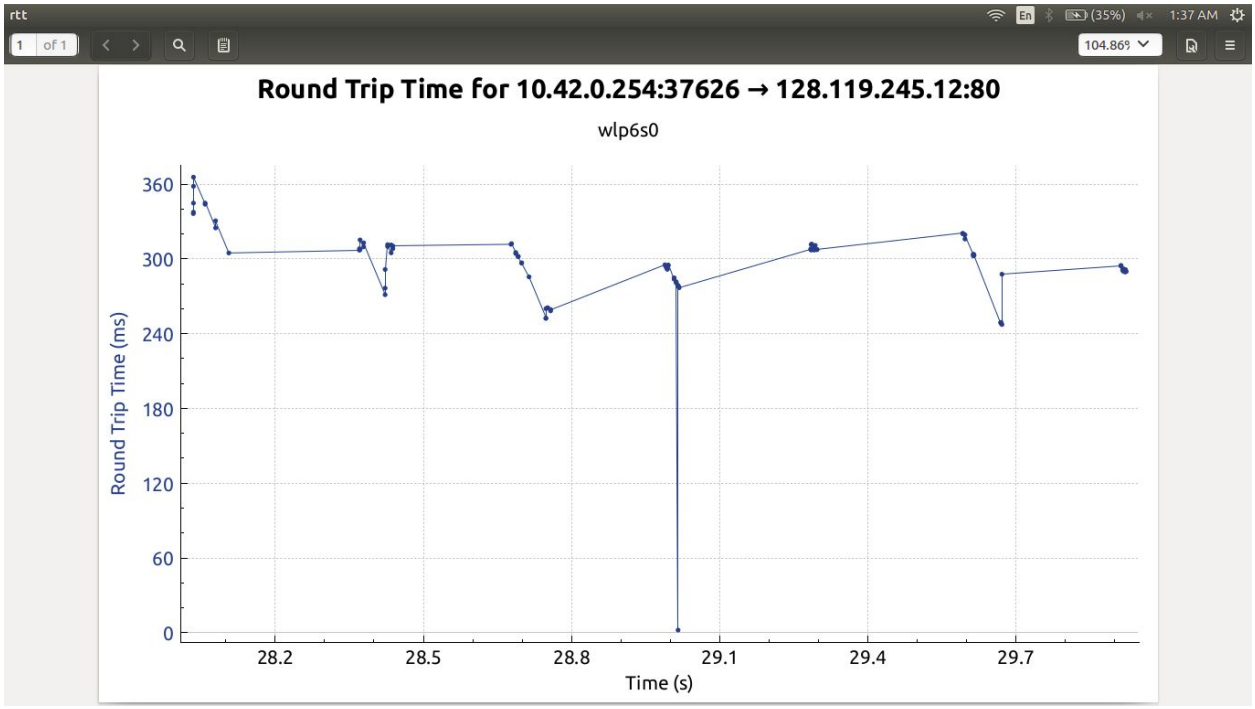


7.
Consider the TCP segment containing the HTTP POST as the first segment in the TCP connection. What are the sequence numbers of the first six segments in the TCP connection (including the segment containing the HTTP POST)? At what time was each segment sent? When was the ACK for each segment received? 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 page 249 in text) after the receipt of each ACK? Assume that the value of the EstimatedRTT is equal to the measured RTT for the first segment, and then is computed using the EstimatedRTT equation on page 249 for all subsequent segments. Note: Wireshark has a nice feature that allows you to plot the RTT for each of the TCP segments sent. Select a TCP segment in the “listing of captured packets” window that is being sent from the client to the gaia.cs.umass.edu server. Then select: Statistics->TCP Stream Graph- >Round Trip Time Graph.

ANS:
ACKs of seg 1,2,3,4,5,6 are :
Segment 1 sequence number: 129252
Segment 2 sequence number: 131988
Segment 3 sequence number: 134724
Segment 4 sequence number: 137460
Segment 5 sequence number: 140196
Segment 6 sequence number: 141564

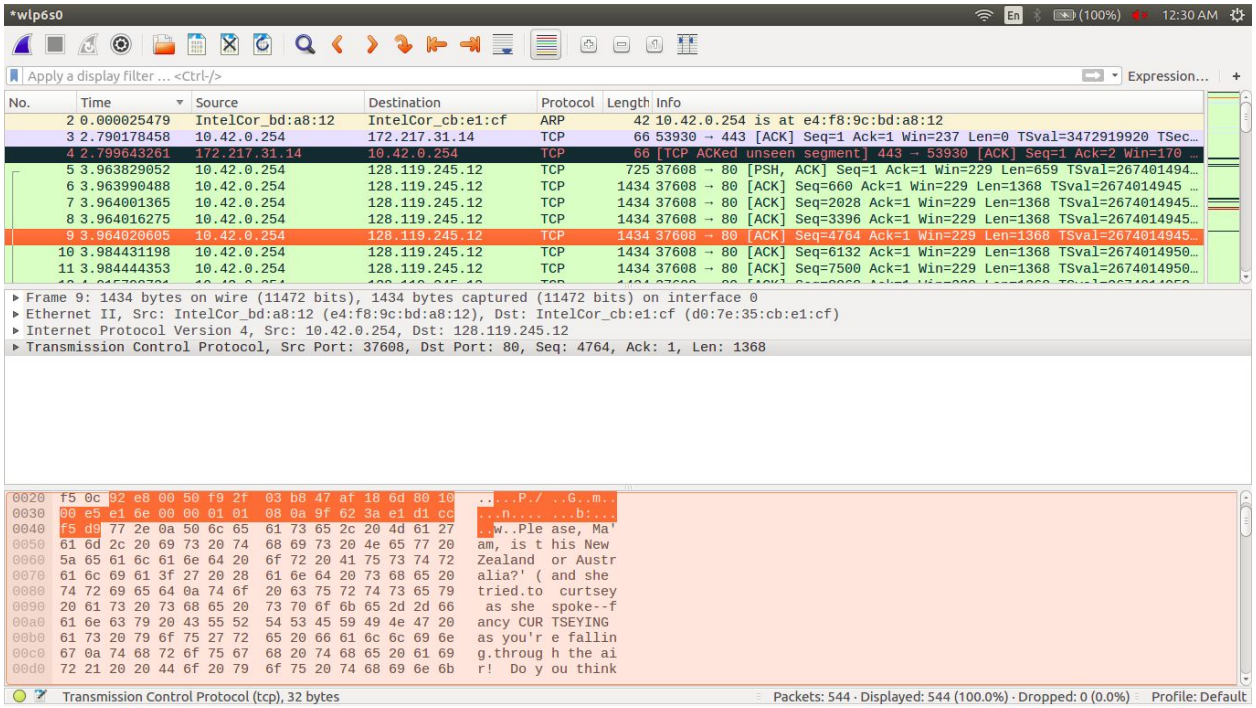

*wlp6s0
(85%) 12:03 AM
Apply a display filter … <Ctrl-/>
Expression…
No. Time Source Destination Protocol Length Info
301 6.464226834 128.119.245.12 10.42.0.254 TCP 66 80 → 37622 [ACK] Seq=1 Ack=126516 Win=183296 Len=0 TSval=35198814…
302 6.464276393 10.42.0.254 128.119.245.12 TCP 1434 37622 → 80 [ACK] Seq=147036 Ack=1 Win=29312 Len=1368 TSval=267401…
303 6.464293518 10.42.0.254 128.119.245.12 HTTP 1045 POST /wireshark-labs/lab3-1-reply.htm HTTP/1.1 (text/plain)
304 6.465262967 128.119.245.12 10.42.0.254 TCP 66 80 → 37622 [ACK] Seq=1 Ack=129252 Win=183296 Len=0 TSval=35198814…
305 6.465984539 128.119.245.12 10.42.0.254 TCP 66 80 → 37622 [ACK] Seq=1 Ack=131988 Win=183296 Len=0 TSval=35198814…
306 6.467172027 128.119.245.12 10.42.0.254 TCP 66 80 → 37622 [ACK] Seq=1 Ack=134724 Win=183296 Len=0 TSval=35198814…
307 6.468104145 128.119.245.12 10.42.0.254 TCP 66 80 → 37622 [ACK] Seq=1 Ack=137460 Win=183296 Len=0 TSval=35198814…
308 6.470479658 128.119.245.12 10.42.0.254 TCP 66 80 → 37622 [ACK] Seq=1 Ack=140196 Win=183296 Len=0 TSval=35198814…
309 6.510208245 128.119.245.12 10.42.0.254 TCP 66 80 → 37622 [ACK] Seq=1 Ack=141564 Win=183296 Len=0 TSval=35198814…
310 7.046155186 10.42.0.254 128.119.245.12 TCP 1045 [TCP Retransmission] 37622 → 80 [PSH, ACK] Seq=148404 Ack=1 Win=2…
Transmission Control Protocol, Src Port: 37622, Dst Port: 80, Seq: 148404, Ack: 1, Len: 979
Source Port: 37622
Destination Port: 80
[Stream index: 2]
[TCP Segment Len: 979]
Sequence number: 148404 (relative sequence number)
[Next sequence number: 149383 (relative sequence number)]
Acknowledgment number: 1 (relative ack number)
1000 .... = Header Length: 32 bytes (8)
Flags: 0x018 (PSH, ACK)
Window size value: 229
0020 f5 0c 92 f6 00 50 6d b4 67 7f e6 c7 5c aa 80 18 .....Pm. g...\...
0030 00 e5 a2 d1 00 00 01 01 08 0a 9f 62 3d 52 d1 cd ....b=R..
0040 20 e7 73 68 65 65 70 2d 0a 62 65 6c 6c 73 2c 20 .sheep- .bells,
0050 61 6e 64 20 74 68 65 20 51 75 65 65 6e 27 73 20 and the Queen's
0060 73 68 72 69 6c 6c 20 63 72 69 65 73 20 74 6f 20 shrill c ries to
0070 74 68 65 20 76 6f 69 63 65 20 6f 66 20 74 68 65 the voic e of the
0080 20 73 68 65 70 68 65 72 64 0a 62 6f 79 2d 2d 61 shepher d.boy--a
0090 6e 64 20 74 68 65 20 73 6e 65 65 7a 65 20 6f 66 nd the s neeze of
00a0 20 74 68 65 20 62 61 62 79 2c 20 74 68 65 20 73 the bab y, the s
00b0 68 72 69 65 6b 20 6f 66 20 74 68 65 20 47 72 79 hriek of the Gry
Frame (1045 bytes)
Reassembled TCP (149382 bytes)
Sequence number (tcp.seq), 4 bytes
Packets: 544 · Displayed: 544 (100.0%) · Dropped: 0 (0.0%)
Profile: Default


*wlp6s0
(100%) 12:30 AM
Apply a display filter … <Ctrl-/>
Expression…
No. Time Source Destination Protocol Length Info
2 0.000025479 IntelCor_bd:a8:12 IntelCor_cb:e1:cf ARP 42 10.42.0.254 is at e4:f8:9c:bd:a8:12
3 2.790178458 10.42.0.254 172.217.31.14 TCP 66 53930 → 443 [ACK] Seq=1 Ack=1 Win=237 Len=0 TSval=3472919920 TSec…
4 2.799643261 172.217.31.14 10.42.0.254 TCP 66 [TCP ACKed unseen segment] 443 → 53930 [ACK] Seq=1 Ack=2 Win=170 …
5 3.963829052 10.42.0.254 128.119.245.12 TCP 725 37608 → 80 [PSH, ACK] Seq=1 Ack=1 Win=229 Len=659 TSval=267401494…
6 3.963990488 10.42.0.254 128.119.245.12 TCP 1434 37608 → 80 [ACK] Seq=660 Ack=1 Win=229 Len=1368 TSval=2674014945 …
7 3.964001365 10.42.0.254 128.119.245.12 TCP 1434 37608 → 80 [ACK] Seq=2028 Ack=1 Win=229 Len=1368 TSval=2674014945…
8 3.964016275 10.42.0.254 128.119.245.12 TCP 1434 37608 → 80 [ACK] Seq=3396 Ack=1 Win=229 Len=1368 TSval=2674014945…
9 3.964020605 10.42.0.254 128.119.245.12 TCP 1434 37608 → 80 [ACK] Seq=4764 Ack=1 Win=229 Len=1368 TSval=2674014945…
10 3.984431198 10.42.0.254 128.119.245.12 TCP 1434 37608 → 80 [ACK] Seq=6132 Ack=1 Win=229 Len=1368 TSval=2674014950…
11 3.984444353 10.42.0.254 128.119.245.12 TCP 1434 37608 → 80 [ACK] Seq=7500 Ack=1 Win=229 Len=1368 TSval=2674014950…
Frame 9: 1434 bytes on wire (11472 bits), 1434 bytes captured (11472 bits) on interface 0
Ethernet II, Src: IntelCor_bd:a8:12 (e4:f8:9c:bd:a8:12), Dst: IntelCor_cb:e1:cf (d0:7e:35:cb:e1:cf)
Internet Protocol Version 4, Src: 10.42.0.254, Dst: 128.119.245.12
Transmission Control Protocol, Src Port: 37608, Dst Port: 80, Seq: 4764, Ack: 1, Len: 1368
0020 f5 0c 92 e8 00 50 f9 2f 03 b8 47 af 18 6d 80 10 .....P./ ..G..m..
0030 00 e5 e1 6e 00 00 01 01 08 0a 9f 62 3a e1 d1 cc ...n.... ...b:...
0040 f5 d9 77 2e 0a 50 6c 65 61 73 65 2c 20 4d 61 27 ..w..Ple ase, Ma'
0050 61 6d 2c 20 69 73 20 74 68 69 73 20 4e 65 77 20 am, is t his New
0060 5a 65 61 6c 61 6e 64 20 6f 72 20 41 75 73 74 72 Zealand or Austr
0070 61 6c 69 61 3f 27 20 28 61 6e 64 20 73 68 65 20 alia?' (and she
0080 74 72 69 65 64 0a 74 6f 20 63 75 72 74 73 65 79 tried.to curtsey
0090 20 61 73 20 73 68 65 20 73 70 6f 6b 65 2d 2d 66 as she spoke--f
00a0 61 6e 63 79 20 43 55 52 54 53 45 59 49 4e 47 20 ancy CUR TSEYING
00b0 61 73 20 79 6f 75 27 72 65 20 66 61 6c 6c 69 6e as you'r e fallin
00c0 67 0a 74 68 72 6f 75 67 68 20 74 68 65 20 61 69 g.throug h the ai
00d0 72 21 20 20 44 6f 20 79 6f 75 20 74 68 69 6e 6b r! Do y ou think
Transmission Control Protocol (tcp), 32 bytes
Packets: 544 · Displayed: 544 (100.0%) · Dropped: 0 (0.0%)
Profile: Default



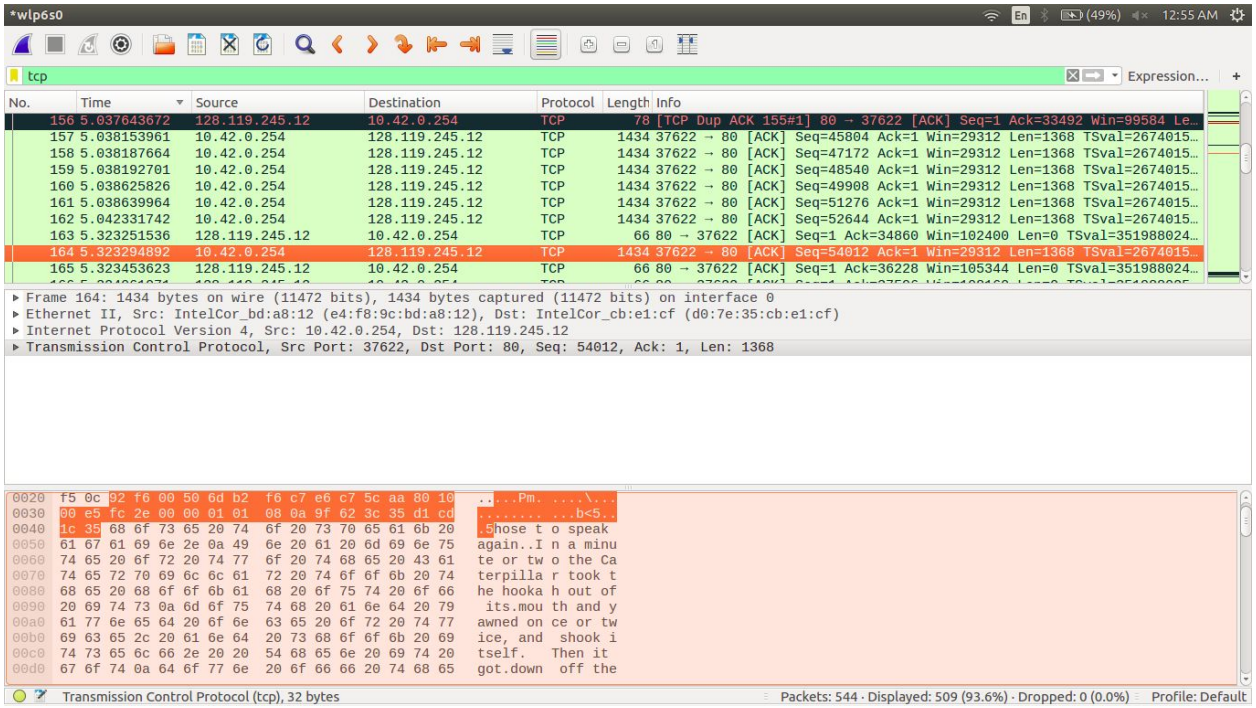
8. What is the length of each of the first six TCP segments?

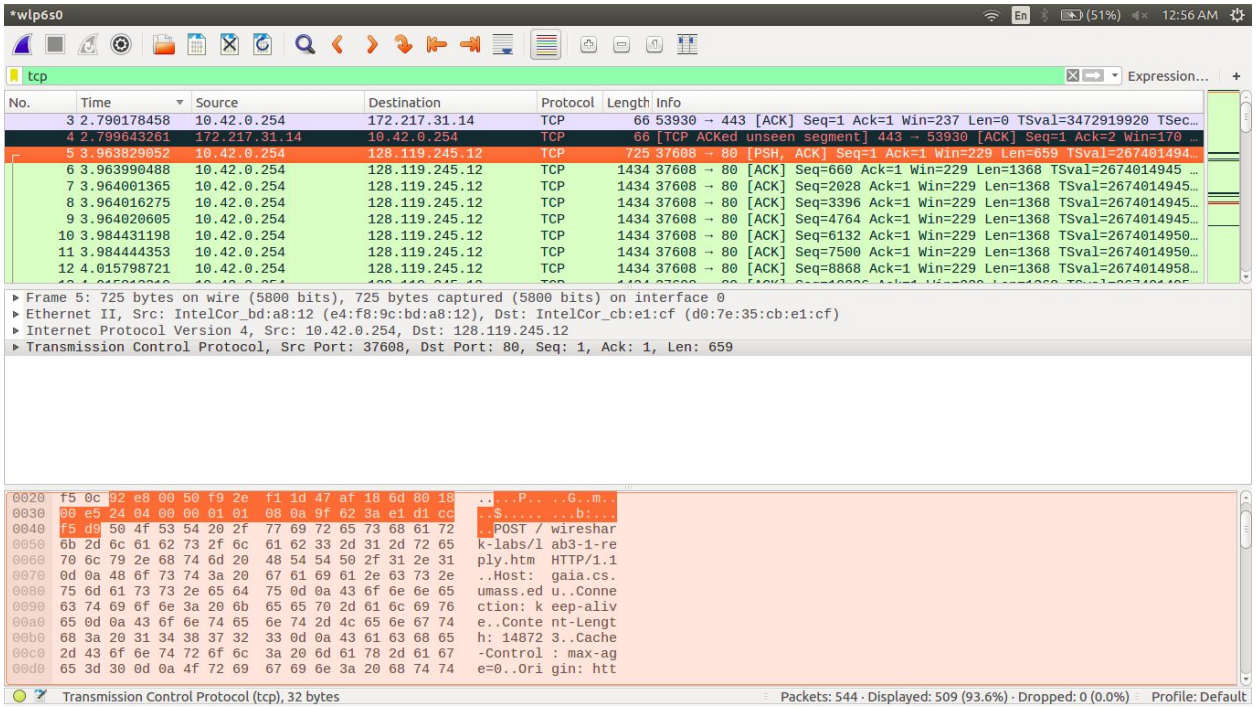
Length of the first TCP segment : 725 bytes
Length of each of the other five TCP segments: 1434 bytes (MSS)



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?

ANS:Max window size 29312.Min window size 229

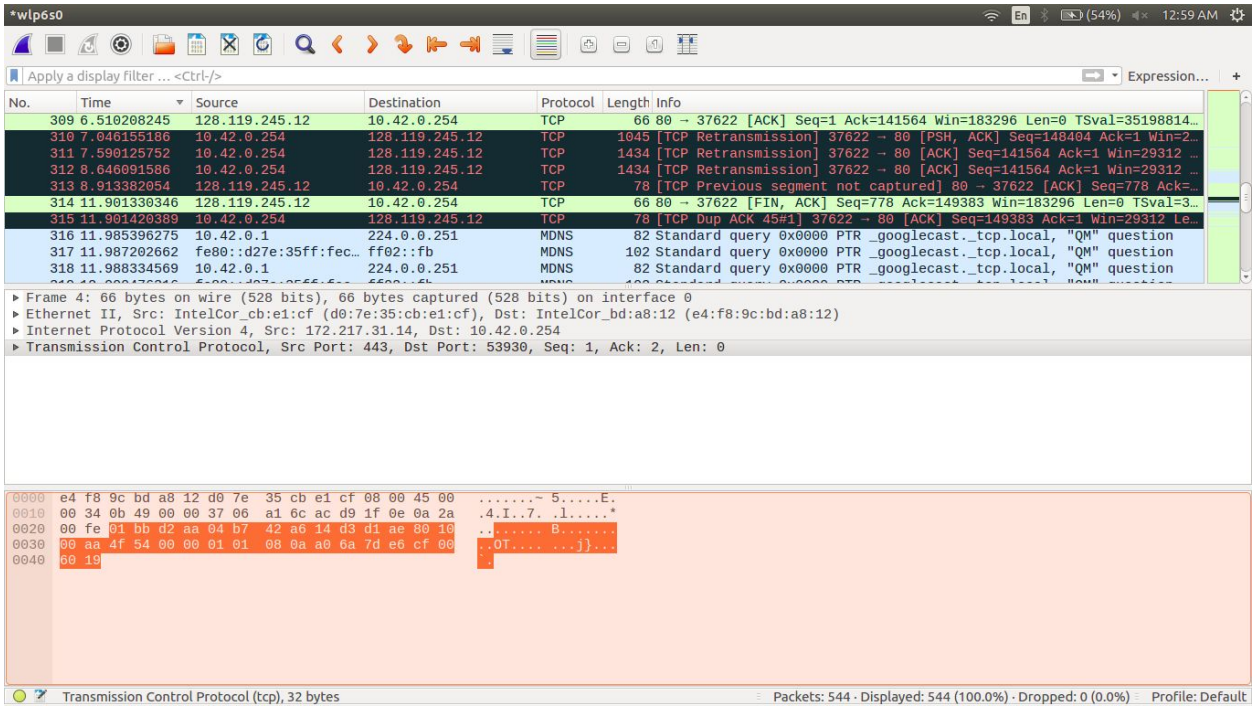


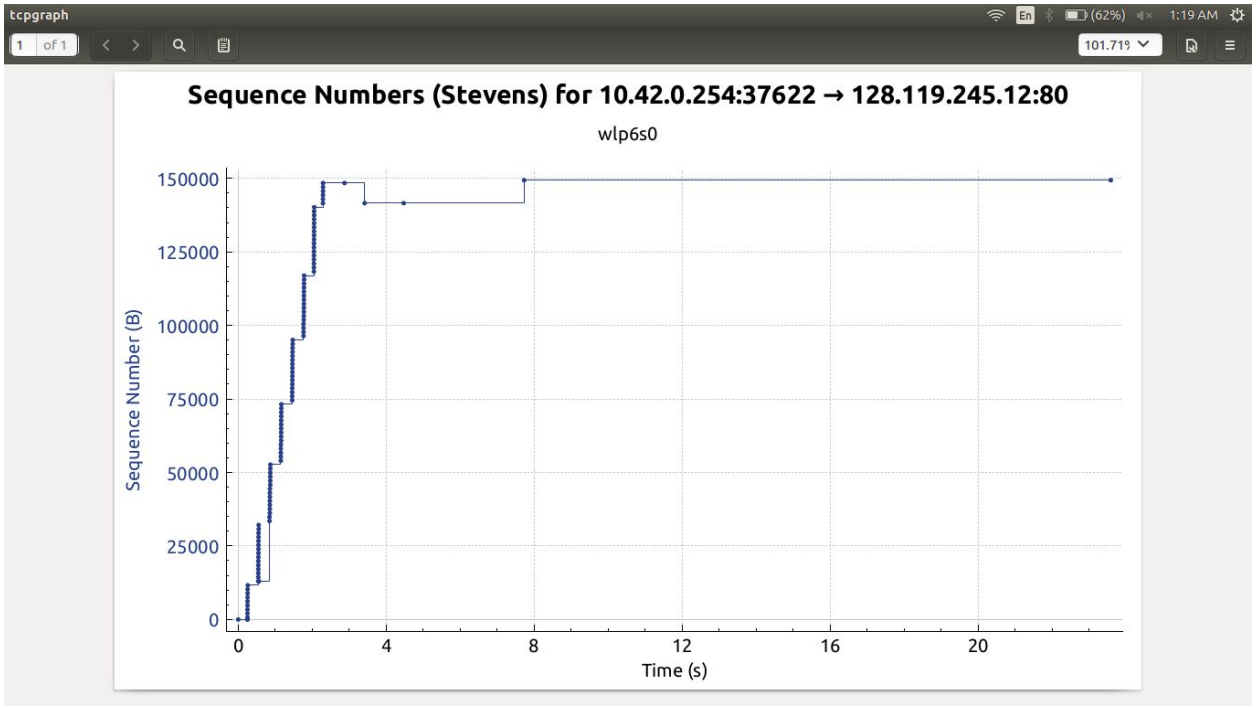


Yes the lack of buffer throttled in this case.

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 retransmitted segments in the trace file. We can verify this by seeing the following image.



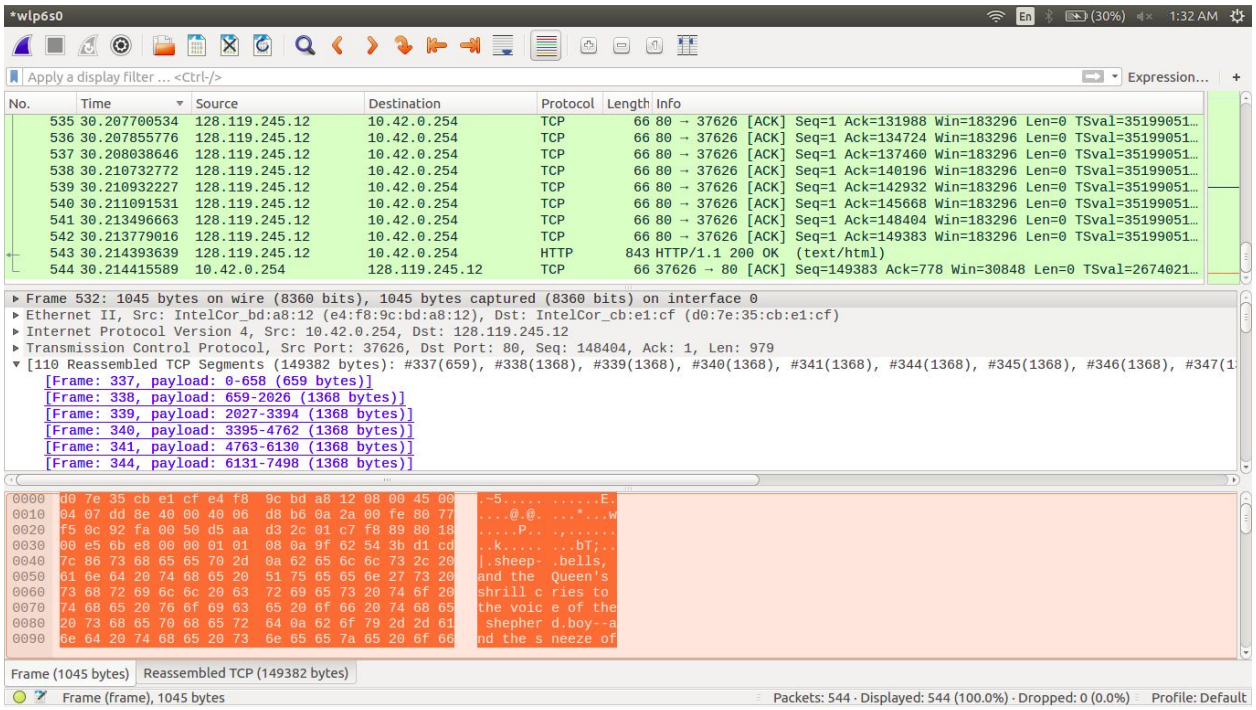


11.

How much data does the receiver typically acknowledge in an ACK? Can you identify cases where the receiver is ACKing every other received segment

ACK 1 sequence number: 129252 data : 1368

ACK 2 sequence number: 131988 data :2736
ACK 3 sequence number: 134724 data:2736
ACK 4 sequence number: 137460 data :2736
ACK 5 sequence number: 140196 data :2736
ACK 6 sequence number: 142932 data :2736
ACK 7 sequence number: 145668 data :2736
ACK 8 sequence number: 148404 data :2736
ACK 9 sequence number: 149383 data :979
ACK 10 sequence number: 152119 data :2736
ACK 11 sequence number: 154855 data :2736
ACK 12 sequence number: 157591 data :2736



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

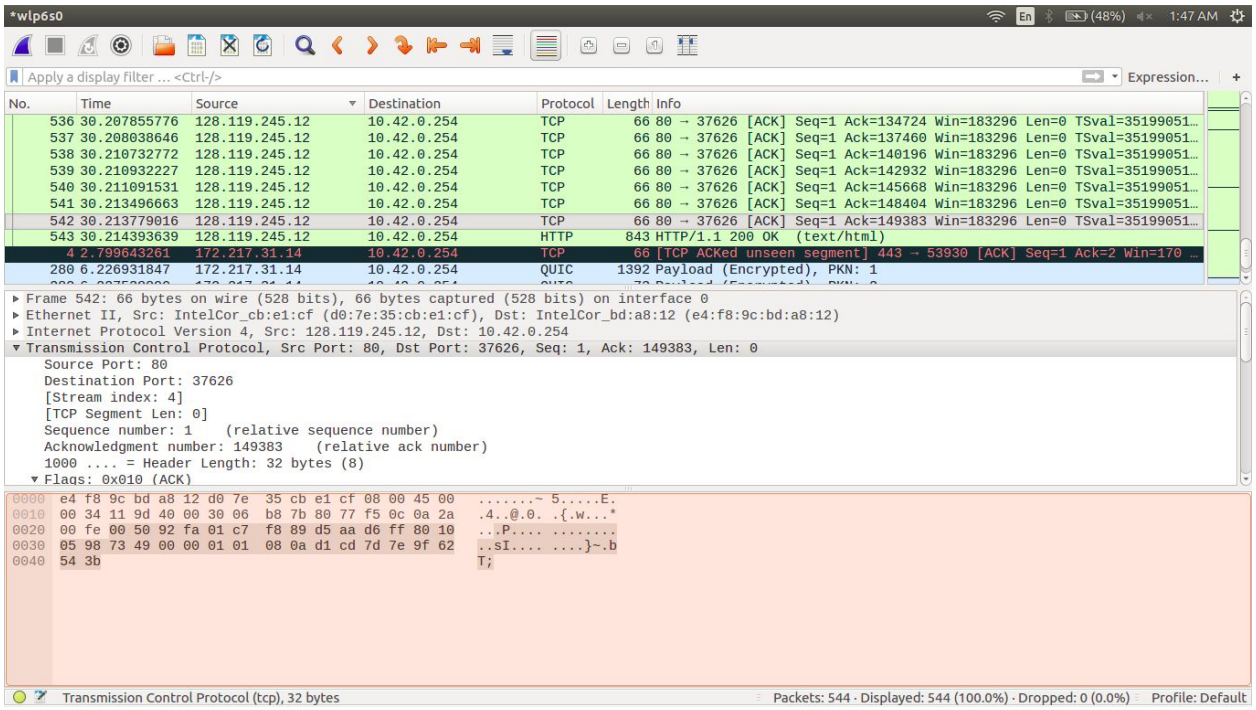
The total amount data transmitted can be computed by the difference
between the sequence number of the first TCP segment (1 of No. 4 segment)

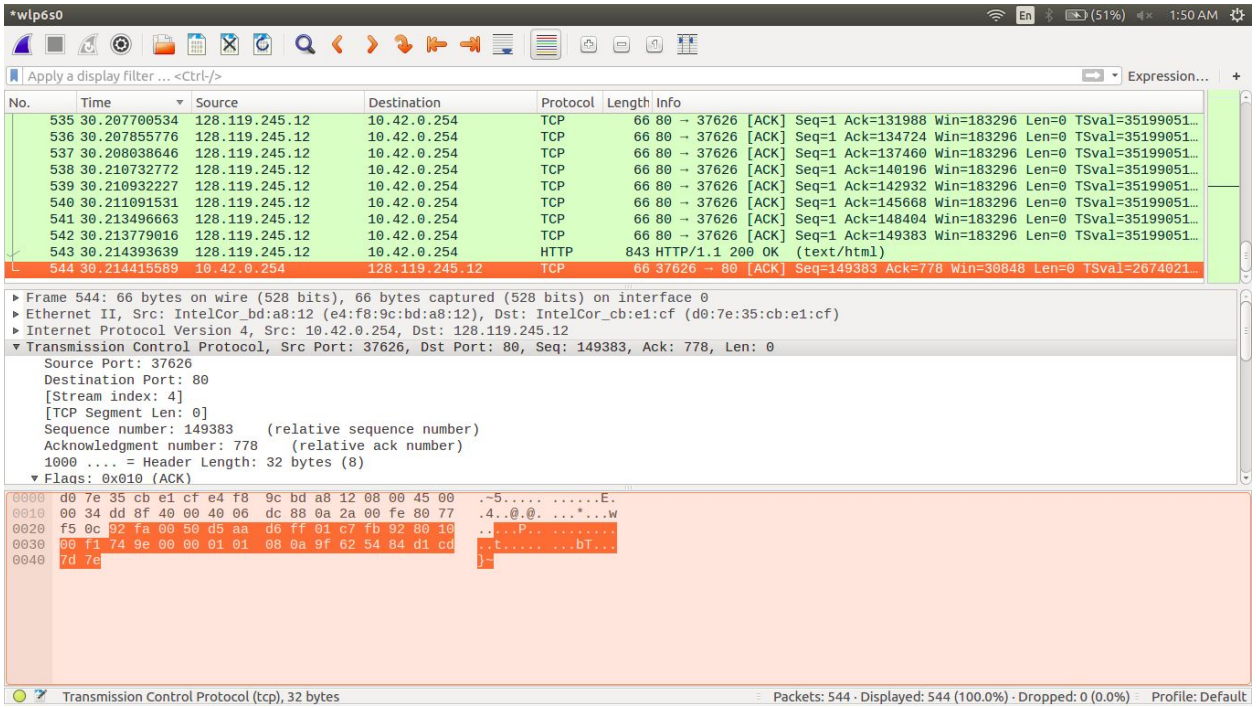
and the acknowledged sequence number of the last ACK (149383) diff =149382

The whole transmission time is the difference of the time instant of the first TCP segment (i.e., 2.790178458 for No.4 segment) and the time instant of the last ACK 30.214415589

Diff 30.214415589 - 2.790178458 = 27.424237131

149382/27.424237131=5447.0795044 bytes/sec = 5.31941357851293 KB/sec.




*wlp6s0
(51%) 1:50 AM
Apply a display filter … <Ctrl-/>
Expression…
No. Time Source Destination Protocol Length Info
535 30.207700534 128.119.245.12 10.42.0.254 TCP 66 80 → 37626 [ACK] Seq=1 Ack=131988 Win=183296 Len=0 TSval=35199051…
536 30.207855776 128.119.245.12 10.42.0.254 TCP 66 80 → 37626 [ACK] Seq=1 Ack=134724 Win=183296 Len=0 TSval=35199051…
537 30.208038646 128.119.245.12 10.42.0.254 TCP 66 80 → 37626 [ACK] Seq=1 Ack=137460 Win=183296 Len=0 TSval=35199051…
538 30.210732772 128.119.245.12 10.42.0.254 TCP 66 80 → 37626 [ACK] Seq=1 Ack=140196 Win=183296 Len=0 TSval=35199051…
539 30.210932227 128.119.245.12 10.42.0.254 TCP 66 80 → 37626 [ACK] Seq=1 Ack=142932 Win=183296 Len=0 TSval=35199051…
540 30.211091531 128.119.245.12 10.42.0.254 TCP 66 80 → 37626 [ACK] Seq=1 Ack=145668 Win=183296 Len=0 TSval=35199051…
541 30.213496663 128.119.245.12 10.42.0.254 TCP 66 80 → 37626 [ACK] Seq=1 Ack=148404 Win=183296 Len=0 TSval=35199051…
542 30.213779016 128.119.245.12 10.42.0.254 TCP 66 80 → 37626 [ACK] Seq=1 Ack=149383 Win=183296 Len=0 TSval=35199051…
543 30.214393639 128.119.245.12 10.42.0.254 HTTP 843 HTTP/1.1 200 OK (text/html)
544 30.214415589 10.42.0.254 128.119.245.12 TCP 66 37626 → 80 [ACK] Seq=149383 Ack=778 Win=30848 Len=0 TSval=2674021…
Frame 544: 66 bytes on wire (528 bits), 66 bytes captured (528 bits) on interface 0
Ethernet II, Src: IntelCor_bd:a8:12 (e4:f8:9c:bd:a8:12), Dst: IntelCor_cb:e1:cf (d0:7e:35:cb:e1:cf)
Internet Protocol Version 4, Src: 10.42.0.254, Dst: 128.119.245.12
Transmission Control Protocol, Src Port: 37626, Dst Port: 80, Seq: 149383, Ack: 778, Len: 0
Source Port: 37626
Destination Port: 80
[Stream index: 4]
[TCP Segment Len: 0]
Sequence number: 149383 (relative sequence number)
Acknowledgment number: 778 (relative ack number)
1000 .... = Header Length: 32 bytes (8)
Flags: 0x010 (ACK)
0000 d0 7e 35 cb e1 cf e4 f8 9c bd a8 12 08 00 45 00 .~5..... ......E.
0010 00 34 dd 8f 40 00 40 06 dc 88 0a 2a 00 fe 80 77 .4..@.@. ...*...w
0020 f5 0c 92 fa 00 50 d5 aa d6 ff 01 c7 fb 92 80 10 .....P.. ....
0030 00 f1 74 9e 00 00 01 01 08 0a 9f 62 54 84 d1 cd ..t..... ...bT...
0040 7d 7e }~
Transmission Control Protocol (tcp), 32 bytes
Packets: 544 · Displayed: 544 (100.0%) · Dropped: 0 (0.0%)
Profile: Default