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CSE4074 COMPUTER NETWORK
HW3 WIRESHARK TCP LAB SOLUTIONS

A First Look At The Captured Trace

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?

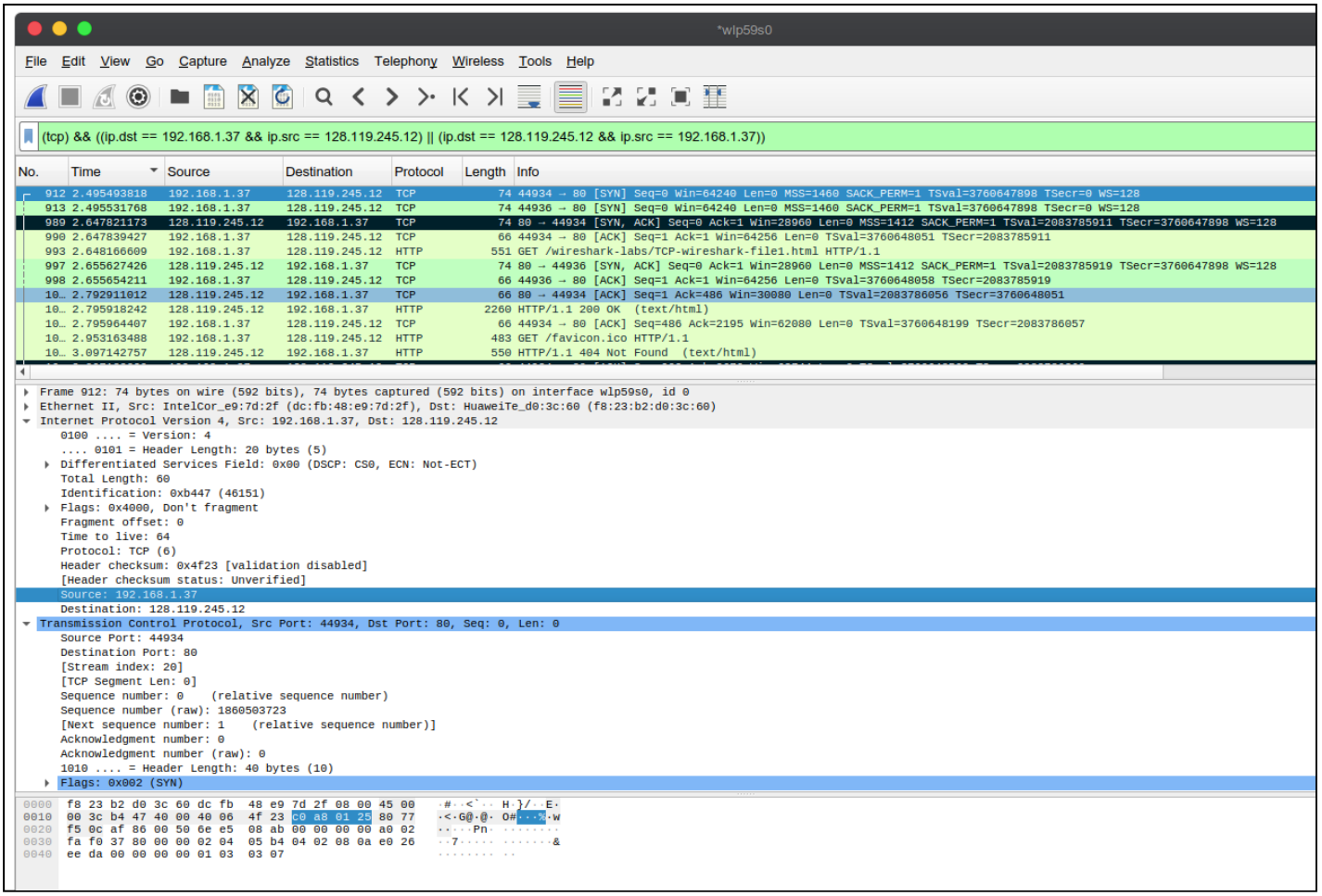
IP address: 192.168.1.37

TCP port number: 44934

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

TCP port number: 80



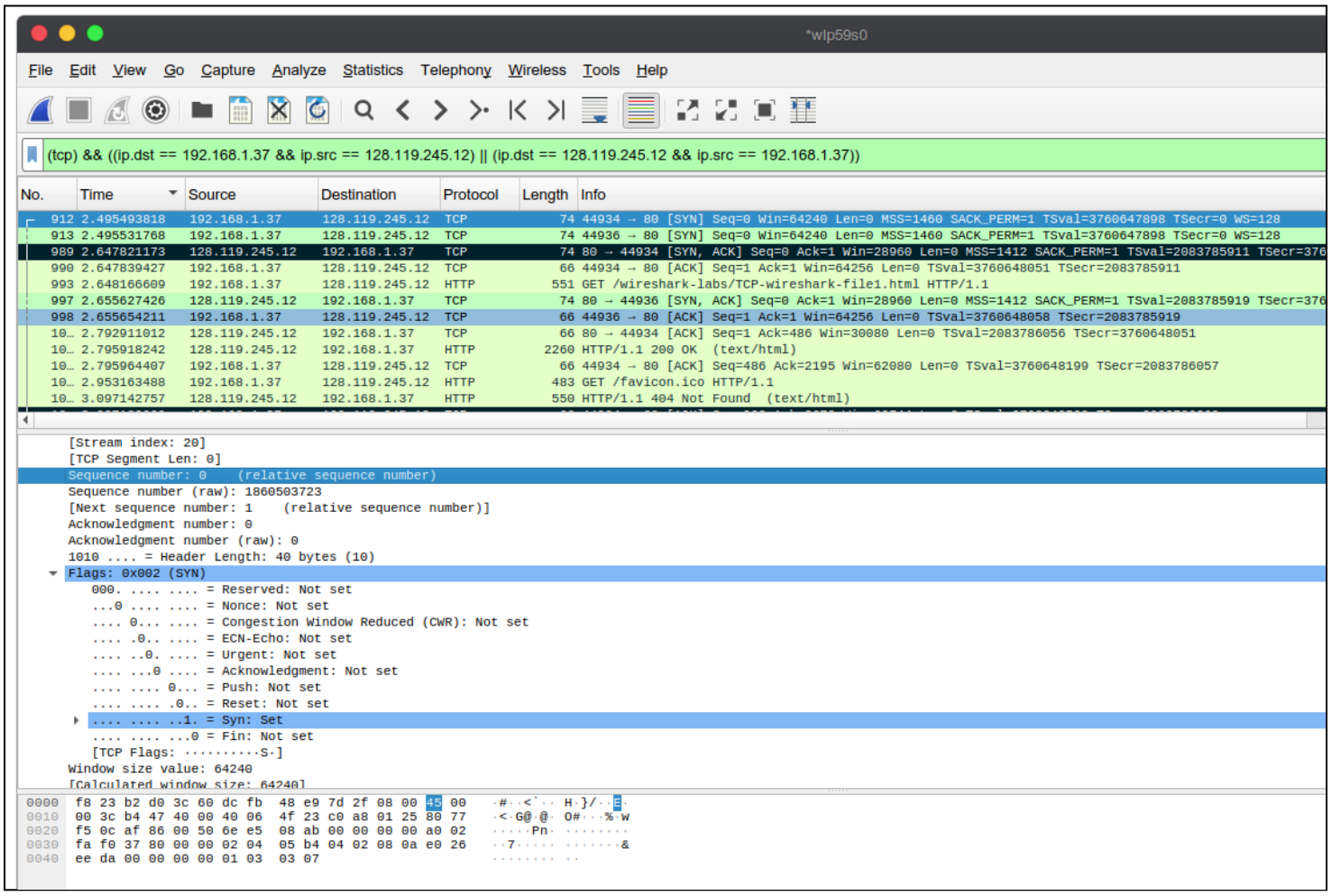
3. -

TCP Basics

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?

The sequence number is 0 (zero).

The SYN flag is set to 1 and it indicates that this segment is a SYN segment.



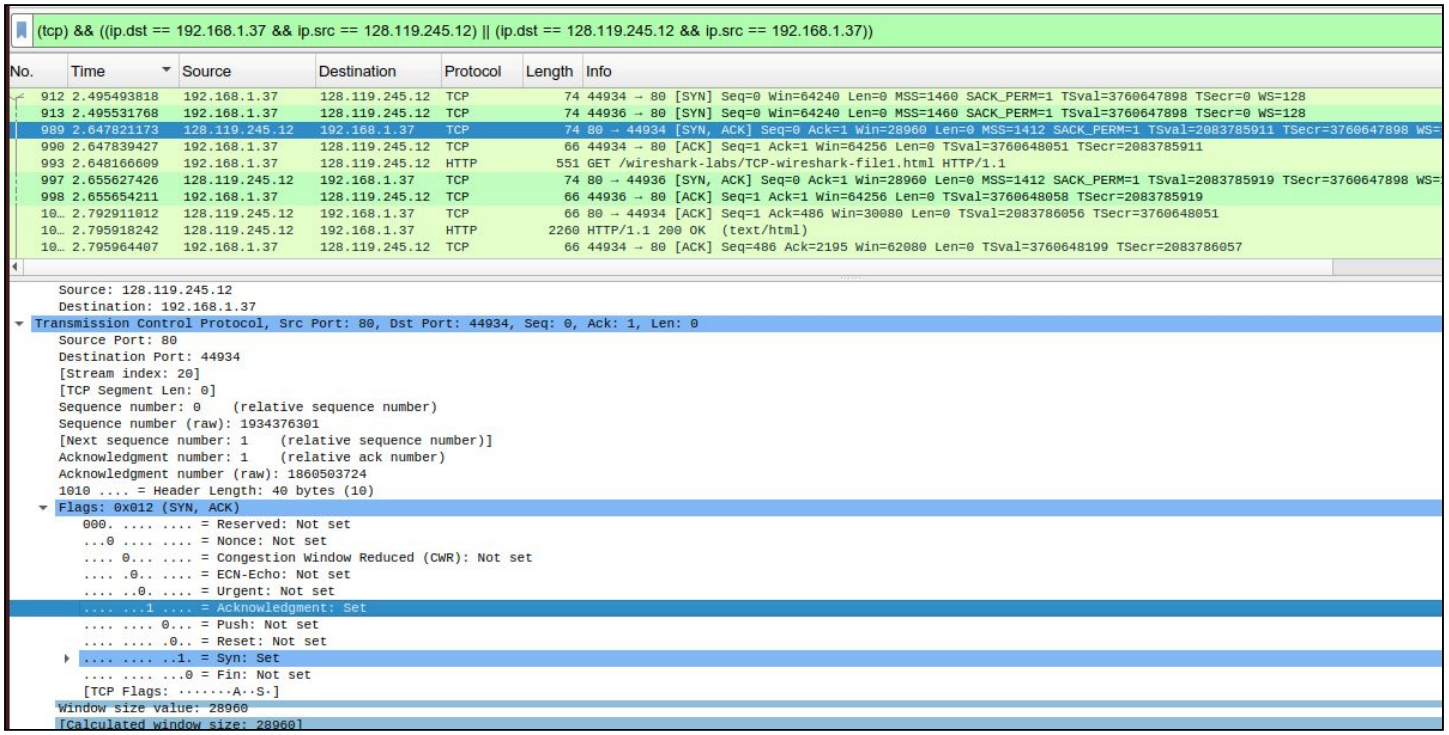
5. What is the sequence number of the SYNACK segment sent by gaia.cs.umass.edu to the client computer in reply to the SYN? What is the value of the Acknowledgement field in the SYNACK segment? How did gaia.cs.umass.edu determine that value? What is it in the segment that identifies the segment as a SYNACK segment?

Sequence number is 0 (zero).

Acknowledgement number is 1.

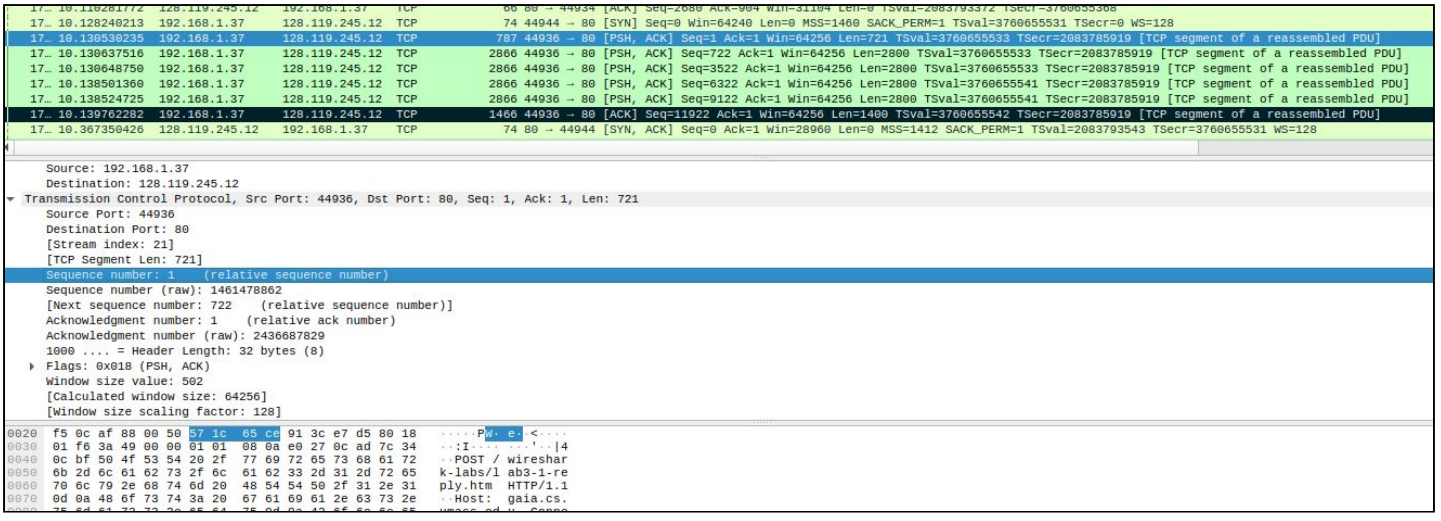
Acknowledgement field is determined by gaia.cs.umass.edu by adding 1 to the initial sequence number of SYN segment from the client.

A segment will be identified as a SYNACK segment if both SYN flag and Acknowledgement flag in the segment are set to 1.



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.

The sequence number of the TCP segment containing the HTTP Post command is 1.



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)?

1. sequence number:1
2. sequence number:11922
3. sequence number:21722
4. sequence number:39922
5. sequence number:49722
6. sequence number:91722

At what time was each segment sent?

1. segment:10.130530235
2. segment:10.139762282
3. segment:10.369526940
4. segment:10.373319231
5. segment:10.522738711
6. segment:10.637110418

When was the ACK for each segment received?

1. segment:10.367362319
2. segment:10.367362599
3. segment:10.367362699
4. segment:10.367362801
5. segment:10.367362901
6. segment:10.367362997

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?

1. RTT: 0.236832084
2. RTT: 0.227600317
3. RTT: 0.002164241
4. RTT: 0.00595643
5. RTT: 0.15537581
6. RTT: 0.269747421

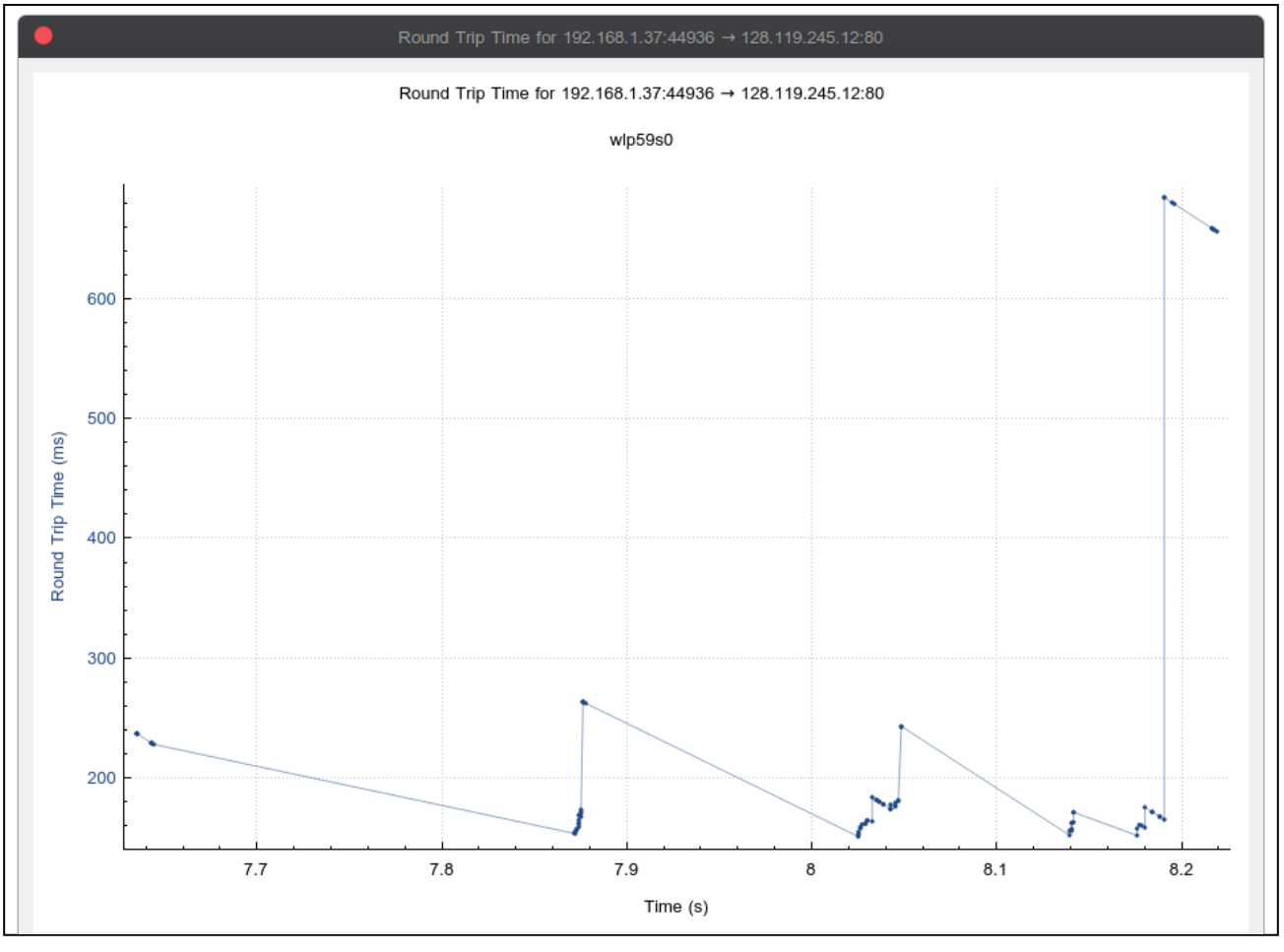
What is the EstimatedRTT value (see Section 3.5.3, page 242 in text) after the receipt of each ACK?

EstimatedRTT after the receipt of the ACK of segment 1: 0.236832084
EstimatedRTT after the receipt of the ACK of segment 2: 0.23567811312
EstimatedRTT after the receipt of the ACK of segment 3: 0.2064888791
EstimatedRTT after the receipt of the ACK of segment 4: 0.18142232296
EstimatedRTT after the receipt of the ACK of segment 5: 0.17816650884
EstimatedRTT after the receipt of the ACK of segment 6: 0.18961412286

(tcp) && ((ip.dst == 192.168.1.37 && ip.src == 128.119.245.12) || (ip.dst == 128.119.245.12 && ip.src == 192.168.1.37))

No.	Time	Source	Destination	Protocol	Length	Info
10…	2.795964407	192.168.1.37	128.119.245.12	TCP	66	44934 → 80 [ACK] Seq=486 Ack=2195 Win=62080 Len=0 TSval=3760648199 TSecr=2083786057
10…	2.953163488	192.168.1.37	128.119.245.12	HTTP	483	GET /favicon.ico HTTP/1.1
10…	3.097142757	128.119.245.12	192.168.1.37	HTTP	550	HTTP/1.1 404 Not Found (text/html)
10…	3.097183020	192.168.1.37	128.119.245.12	TCP	66	44934 → 80 [ACK] Seq=903 Ack=2679 Win=63744 Len=0 TSval=3760648500 TSecr=2083786360
16…	8.101346590	128.119.245.12	192.168.1.37	TCP	66	80 → 44934 [FIN, ACK] Seq=2679 Ack=903 Win=31104 Len=0 TSval=2083791365 TSecr=3760648500
16…	8.141735026	192.168.1.37	128.119.245.12	TCP	66	44934 → 80 [ACK] Seq=903 Ack=2680 Win=64128 Len=0 TSval=3760653544 TSecr=2083791365
16…	9.965624507	192.168.1.37	128.119.245.12	TCP	66	44934 → 80 [FIN, ACK] Seq=903 Ack=2680 Win=64128 Len=0 TSval=3760655368 TSecr=2083791365
17…	10.110281772	128.119.245.12	192.168.1.37	TCP	66	80 → 44934 [ACK] Seq=2680 Ack=904 Win=31104 Len=0 TSval=2083793372 TSecr=3760655368
17…	10.128240213	192.168.1.37	128.119.245.12	TCP	74	44944 → 80 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 SACK_PERM=1 TSval=3760655531 TSecr=0 WS=128
17…	10.130530235	192.168.1.37	128.119.245.12	TCP	787	44936 → 80 [PSH, ACK] Seq=1 Ack=1 Win=64256 Len=721 TSval=3760655533 TSecr=2083785919 [TCP segment of a reassembled PDU]
17…	10.130637516	192.168.1.37	128.119.245.12	TCP	2866	44936 → 80 [PSH, ACK] Seq=722 Ack=1 Win=64256 Len=2800 TSval=3760655533 TSecr=2083785919 [TCP segment of a reassembled PDU]
17…	10.130648750	192.168.1.37	128.119.245.12	TCP	2866	44936 → 80 [PSH, ACK] Seq=3522 Ack=1 Win=64256 Len=2800 TSval=3760655533 TSecr=2083785919 [TCP segment of a reassembled PDU]
17…	10.138501360	192.168.1.37	128.119.245.12	TCP	2866	44936 → 80 [PSH, ACK] Seq=6322 Ack=1 Win=64256 Len=2800 TSval=3760655541 TSecr=2083785919 [TCP segment of a reassembled PDU]
17…	10.138524725	192.168.1.37	128.119.245.12	TCP	2866	44936 → 80 [PSH, ACK] Seq=9122 Ack=1 Win=64256 Len=2800 TSval=3760655541 TSecr=2083785919 [TCP segment of a reassembled PDU]
17…	10.139762282	192.168.1.37	128.119.245.12	TCP	1466	44936 → 80 [ACK] Seq=11922 Ack=1 Win=64256 Len=1400 TSval=3760655542 TSecr=2083785919 [TCP segment of a reassembled PDU]
17…	10.367350426	128.119.245.12	192.168.1.37	TCP	74	80 → 44944 [SYN, ACK] Seq=0 Ack=1 Win=28960 Len=0 MSS=1412 SACK_PERM=1 TSval=2083793543 TSecr=3760655531 WS=128
18…	10.367362319	128.119.245.12	192.168.1.37	TCP	66	80 → 44936 [ACK] Seq=1 Ack=722 Win=30464 Len=0 TSval=2083793552 TSecr=3760655533
18…	10.367362599	128.119.245.12	192.168.1.37	TCP	66	80 → 44936 [ACK] Seq=1 Ack=2122 Win=33408 Len=0 TSval=2083793552 TSecr=3760655533
18…	10.367362699	128.119.245.12	192.168.1.37	TCP	66	80 → 44936 [ACK] Seq=1 Ack=3522 Win=36224 Len=0 TSval=2083793555 TSecr=3760655533
18…	10.367362801	128.119.245.12	192.168.1.37	TCP	66	80 → 44936 [ACK] Seq=1 Ack=4922 Win=39168 Len=0 TSval=2083793556 TSecr=3760655533
18…	10.367362901	128.119.245.12	192.168.1.37	TCP	66	80 → 44936 [ACK] Seq=1 Ack=6322 Win=42112 Len=0 TSval=2083793560 TSecr=3760655533
18…	10.367362997	128.119.245.12	192.168.1.37	TCP	66	80 → 44936 [ACK] Seq=1 Ack=7722 Win=44928 Len=0 TSval=2083793561 TSecr=3760655541
18…	10.367363099	128.119.245.12	192.168.1.37	TCP	66	80 → 44936 [ACK] Seq=1 Ack=9122 Win=47872 Len=0 TSval=2083793563 TSecr=3760655541
18…	10.367363193	128.119.245.12	192.168.1.37	TCP	66	80 → 44936 [ACK] Seq=1 Ack=10522 Win=50688 Len=0 TSval=2083793566 TSecr=3760655541
18…	10.367395114	192.168.1.37	128.119.245.12	TCP	2866	44936 → 80 [PSH, ACK] Seq=13322 Ack=1 Win=64256 Len=2800 TSval=3760655770 TSecr=2083793552 [TCP segment of a reassembled PDU]
18…	10.367423114	192.168.1.37	128.119.245.12	TCP	66	44944 → 80 [ACK] Seq=1 Ack=1 Win=64256 Len=0 TSval=3760655770 TSecr=2083793543
18…	10.367440480	192.168.1.37	128.119.245.12	TCP	2866	44936 → 80 [PSH, ACK] Seq=16122 Ack=1 Win=64256 Len=2800 TSval=3760655770 TSecr=2083793552 [TCP segment of a reassembled PDU]
18…	10.367489455	128.119.245.12	192.168.1.37	TCP	66	80 → 44936 [ACK] Seq=1 Ack=11922 Win=53632 Len=0 TSval=2083793567 TSecr=3760655541
18…	10.367489557	128.119.245.12	192.168.1.37	TCP	66	80 → 44936 [ACK] Seq=1 Ack=13322 Win=56576 Len=0 TSval=2083793569 TSecr=3760655542
18…	10.368392822	192.168.1.37	128.119.245.12	TCP	2866	44936 → 80 [PSH, ACK] Seq=18922 Ack=1 Win=64256 Len=2800 TSval=3760655771 TSecr=2083793569 [TCP segment of a reassembled PDU]
18…	10.369526940	192.168.1.37	128.119.245.12	TCP	1466	44936 → 80 [ACK] Seq=21722 Ack=1 Win=64256 Len=1400 TSval=3760655772 TSecr=2083793569 [TCP segment of a reassembled PDU]
18…	10.369551572	192.168.1.37	128.119.245.12	TCP	2866	44936 → 80 [PSH, ACK] Seq=23122 Ack=1 Win=64256 Len=2800 TSval=3760655772 TSecr=2083793569 [TCP segment of a reassembled PDU]
18…	10.369566455	192.168.1.37	128.119.245.12	TCP	2866	44936 → 80 [PSH, ACK] Seq=25922 Ack=1 Win=64256 Len=2800 TSval=3760655772 TSecr=2083793569 [TCP segment of a reassembled PDU]
18…	10.370769023	192.168.1.37	128.119.245.12	TCP	2866	44936 → 80 [PSH, ACK] Seq=28722 Ack=1 Win=64256 Len=2800 TSval=3760655773 TSecr=2083793569 [TCP segment of a reassembled PDU]
18…	10.370795545	192.168.1.37	128.119.245.12	TCP	2866	44936 → 80 [PSH, ACK] Seq=31522 Ack=1 Win=64256 Len=2800 TSval=3760655773 TSecr=2083793569 [TCP segment of a reassembled PDU]
18…	10.371825357	192.168.1.37	128.119.245.12	TCP	2866	44936 → 80 [PSH, ACK] Seq=34322 Ack=1 Win=64256 Len=2800 TSval=3760655774 TSecr=2083793569 [TCP segment of a reassembled PDU]
18…	10.371855038	192.168.1.37	128.119.245.12	TCP	2866	44936 → 80 [PSH, ACK] Seq=37122 Ack=1 Win=64256 Len=2800 TSval=3760655774 TSecr=2083793569 [TCP segment of a reassembled PDU]
18…	10.373319231	192.168.1.37	128.119.245.12	TCP	1466	44936 → 80 [ACK] Seq=39922 Ack=1 Win=64256 Len=1400 TSval=3760655776 TSecr=2083793569 [TCP segment of a reassembled PDU]
18…	10.520656952	128.119.245.12	192.168.1.37	TCP	66	80 → 44936 [ACK] Seq=1 Ack=14722 Win=59392 Len=0 TSval=2083793781 TSecr=3760655770
18…	10.520691850	192.168.1.37	128.119.245.12	TCP	2866	44936 → 80 [PSH, ACK] Seq=41322 Ack=1 Win=64256 Len=2800 TSval=3760655923 TSecr=2083793781 [TCP segment of a reassembled PDU]
18…	10.520848836	128.119.245.12	192.168.1.37	TCP	66	80 → 44936 [ACK] Seq=1 Ack=16122 Win=62336 Len=0 TSval=2083793783 TSecr=3760655770
18…	10.520874712	192.168.1.37	128.119.245.12	TCP	2866	44936 → 80 [PSH, ACK] Seq=44122 Ack=1 Win=64256 Len=2800 TSval=3760655924 TSecr=2083793783 [TCP segment of a reassembled PDU]
18…	10.521004303	128.119.245.12	192.168.1.37	TCP	66	80 → 44936 [ACK] Seq=1 Ack=17522 Win=65280 Len=0 TSval=2083793785 TSecr=3760655770
18…	10.521868863	192.168.1.37	128.119.245.12	TCP	2866	44936 → 80 [PSH, ACK] Seq=46922 Ack=1 Win=64256 Len=2800 TSval=3760655925 TSecr=2083793785 [TCP segment of a reassembled PDU]
18…	10.522100660	128.119.245.12	192.168.1.37	TCP	66	80 → 44936 [ACK] Seq=1 Ack=18922 Win=68096 Len=0 TSval=2083793787 TSecr=3760655770
18…	10.522738711	192.168.1.37	128.119.245.12	TCP	1466	44936 → 80 [ACK] Seq=49722 Ack=1 Win=64256 Len=1400 TSval=3760655925 TSecr=2083793787 [TCP segment of a reassembled PDU]
18…	10.524521700	128.119.245.12	192.168.1.37	TCP	66	80 → 44936 [ACK] Seq=1 Ack=20322 Win=71040 Len=0 TSval=2083793789 TSecr=3760655771
18…	10.524560721	192.168.1.37	128.119.245.12	TCP	2866	44936 → 80 [PSH, ACK] Seq=51122 Ack=1 Win=64256 Len=2800 TSval=3760655927 TSecr=2083793789 [TCP segment of a reassembled PDU]
18…	10.525496176	128.119.245.12	192.168.1.37	TCP	66	80 → 44936 [ACK] Seq=1 Ack=21722 Win=73856 Len=0 TSval=2083793791 TSecr=3760655771
18…	10.525536594	192.168.1.37	128.119.245.12	TCP	2866	44936 → 80 [PSH, ACK] Seq=53922 Ack=1 Win=64256 Len=2800 TSval=3760655928 TSecr=2083793791 [TCP segment of a reassembled PDU]
18…	10.528203241	128.119.245.12	192.168.1.37	TCP	66	80 → 44936 [ACK] Seq=1 Ack=23122 Win=76800 Len=0 TSval=2083793793 TSecr=3760655772

Sequence number: 1 (relative sequence number)



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

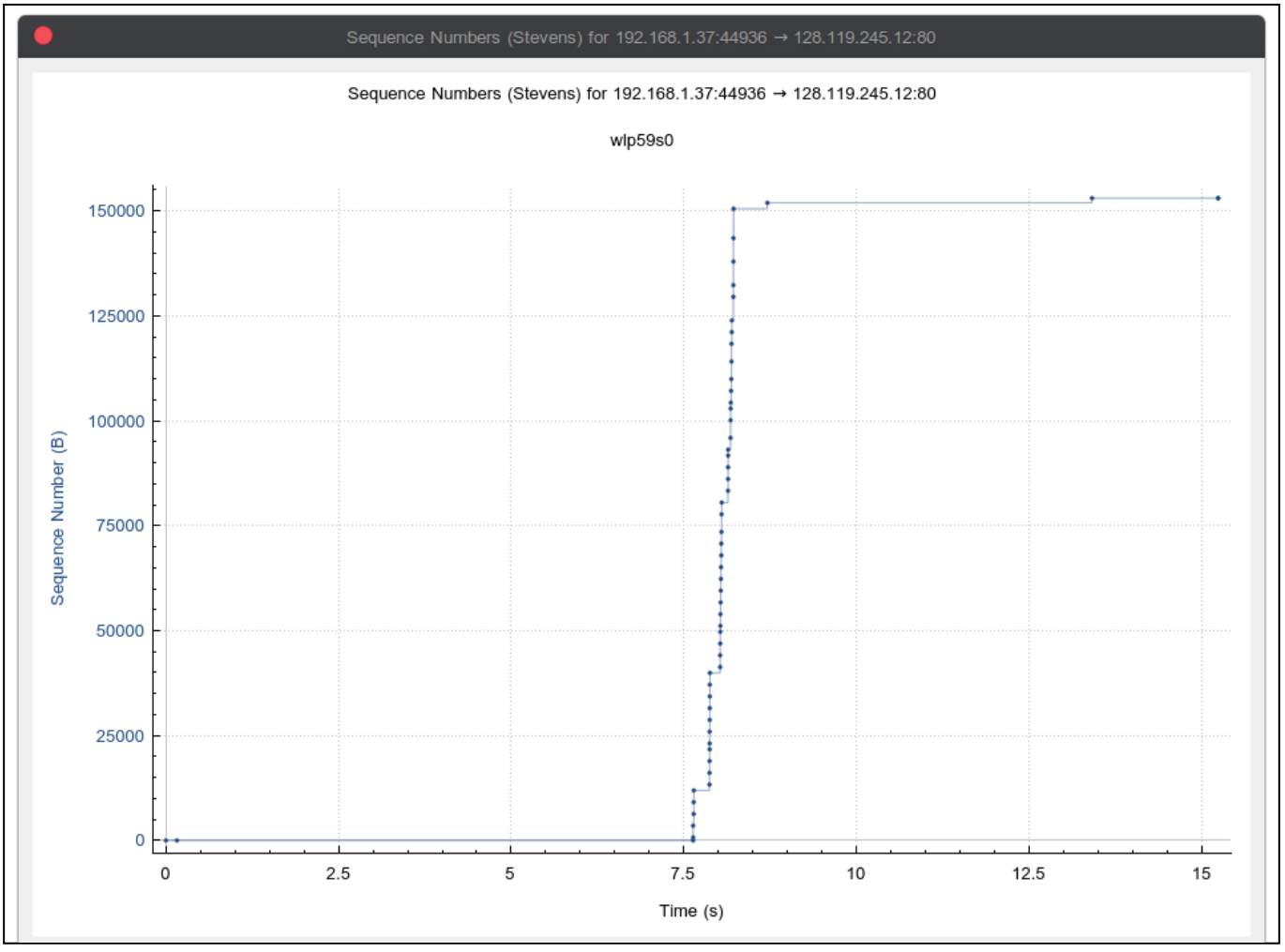
1. segment length: 1400
2. segment length: 1400
3. segment length: 1400
4. segment length: 1400
5. segment length: 1400
6. segment length: 1400

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?

1. segment length: 28960
2. segment length: 64256
3. segment length: 64256
4. segment length: 64256
5. segment length: 64256
6. segment length: 64256

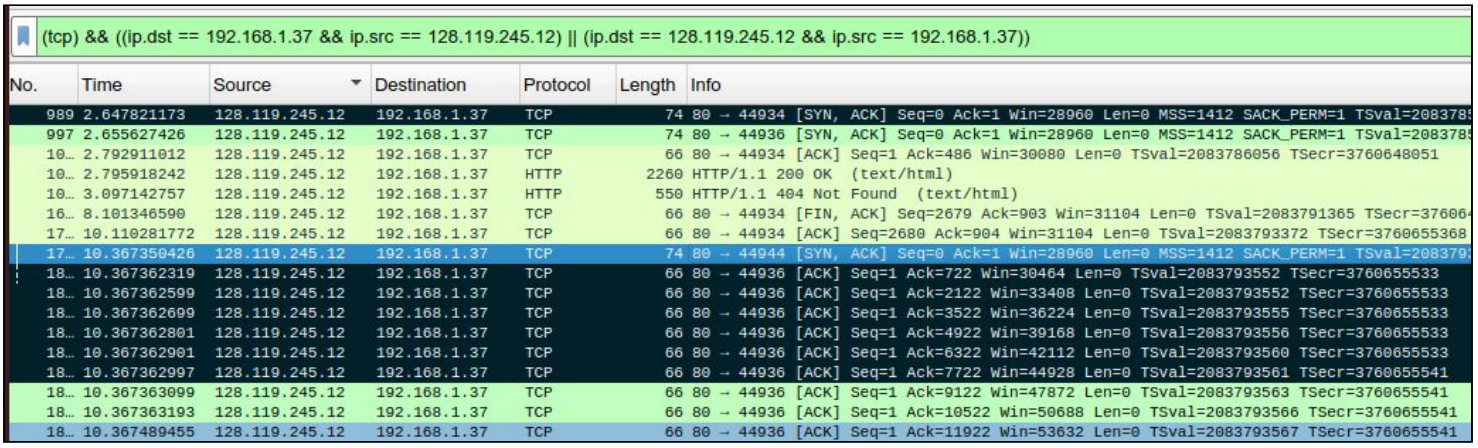
10. Are there any retransmitted segments in the trace file? What did you check for (in the trace) in order to answer this question?

There are no retransmitted segments in the trace file.
All sequence numbers from the source to the destination are increasing monotonically with respect to time.



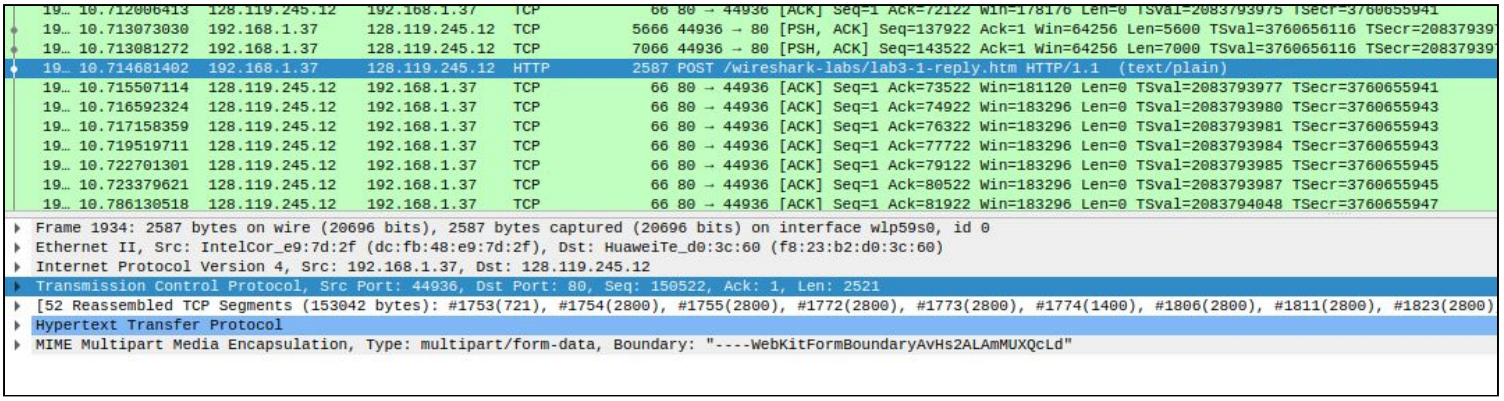
11. How much data does the receiver typically acknowledge in an ACK? Can you identify cases where the receiver is ACKing every other received segment.

We can see that the ACK numbers increase in the sequence of 722, 2122, 3522, 4922, 6322, 7722 and so on. The ACK numbers increases by 1400 each time, indicating that the receiver is acknowledging 1400 bytes.



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

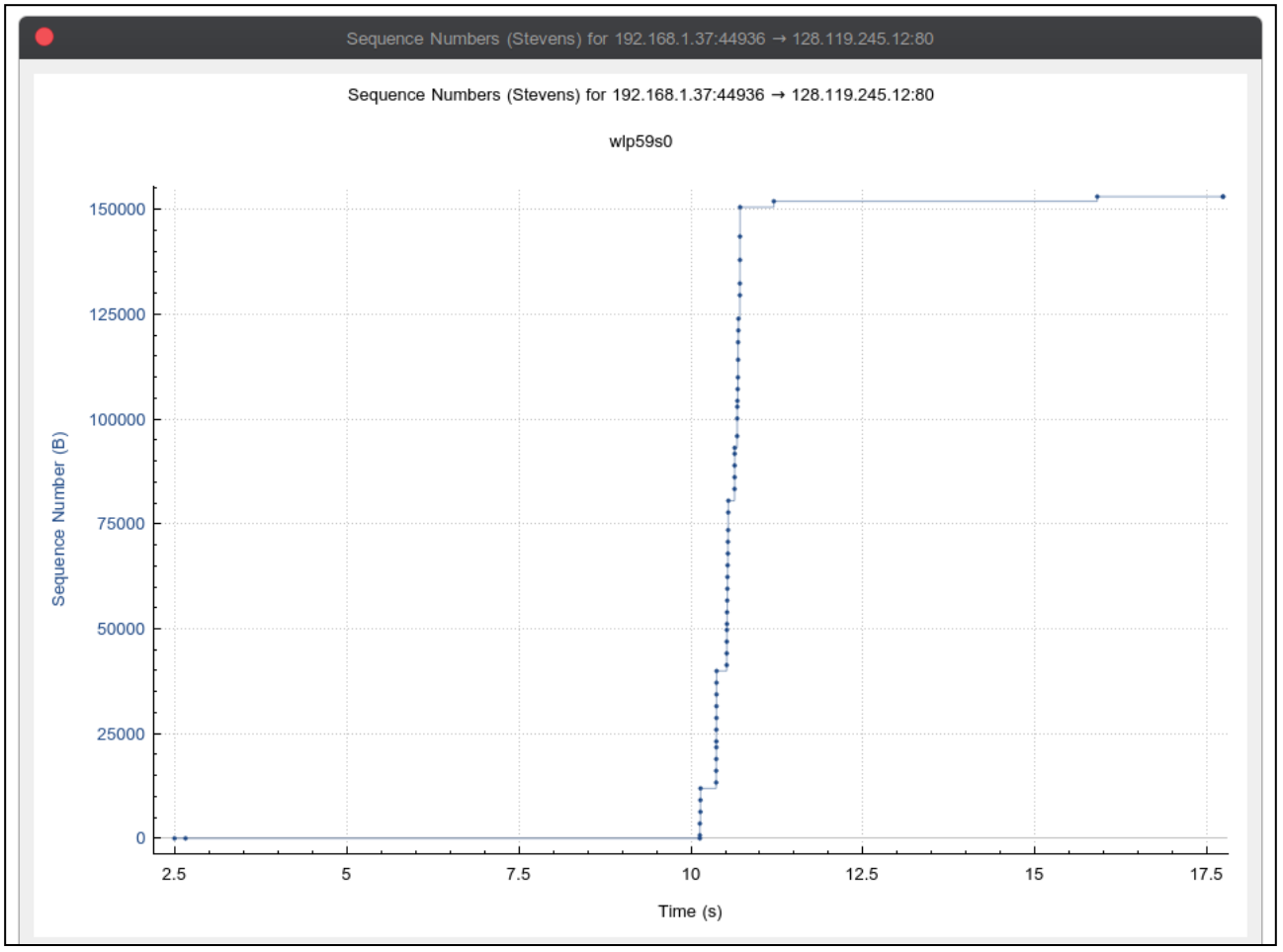
Throughput = Amount of data transmitted / time incurred
Amount of data transmitted = 150522
Time incurred = 10.714081402 - 10.307358420
Throughput = 37,008 KByte/sec

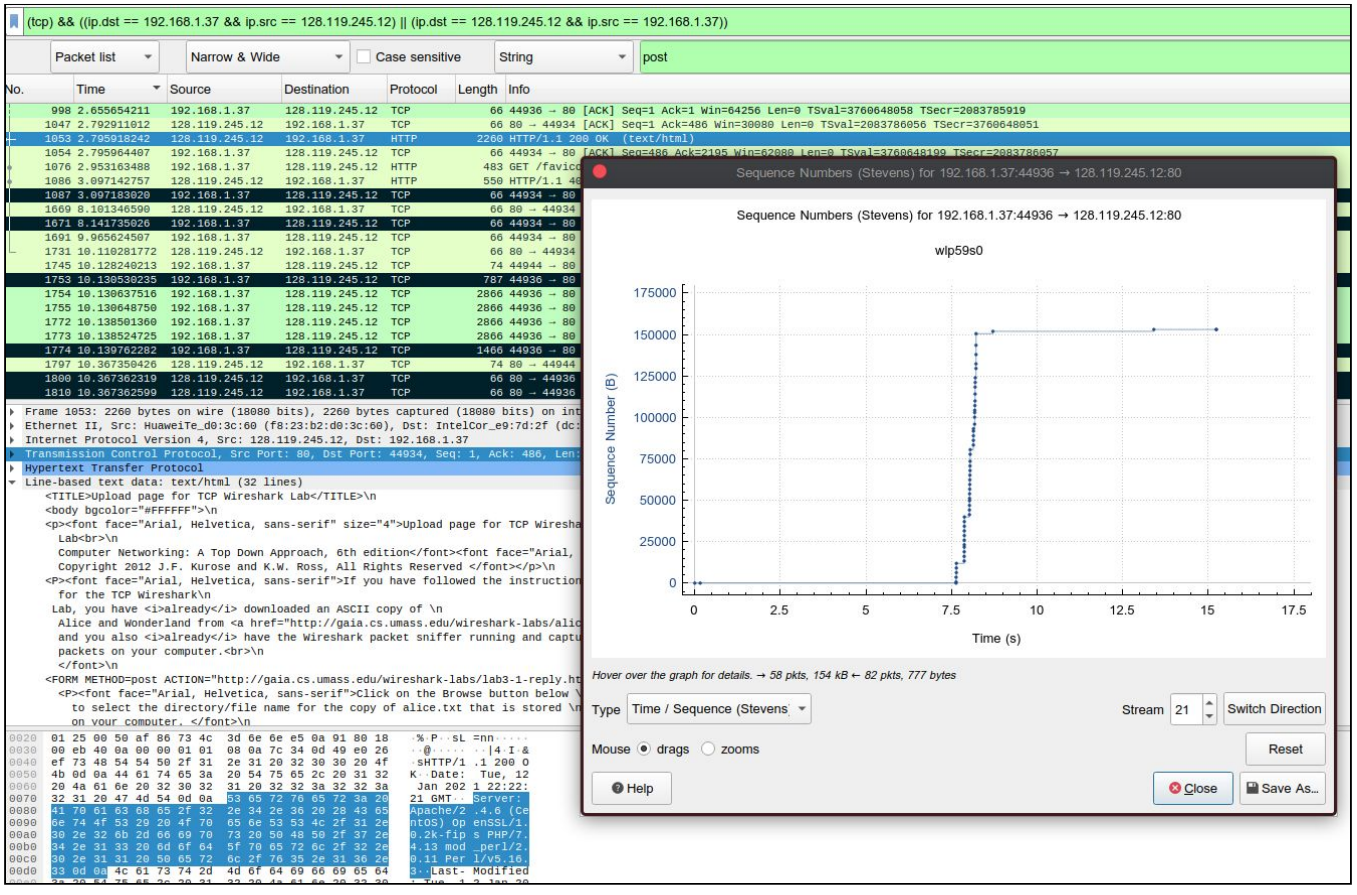


TCP Congestion Control In Action

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 slowstart begins at 2.6 sec and ends at 10.13 sec.
10.13-2.6 = 7.53 sec


Sequence Numbers (Stevens) for 192.168.1.37:44936 → 128.119.245.12:80
Sequence Numbers (Stevens) for 192.168.1.37:44936 → 128.119.245.12:80
wlp59s0
Sequence Number (B)
Time (s)
0
25000
50000
75000
100000
125000
150000
2.5
5
7.5
10
12.5
15
17.5


(tcp) && ((ip.dst == 192.168.1.37 && ip.src == 128.119.245.12) || (ip.dst == 128.119.245.12 && ip.src == 192.168.1.37))
Packet list
Narrow & Wide
Case sensitive
String
post
No. Time Source Destination Protocol Length Info
998 2.655654211 192.168.1.37 128.119.245.12 TCP 66 44936 → 80 [ACK] Seq=1 Ack=1 Win=64256 Len=0 TSval=3760648058 TSecr=2083785919
1047 2.792911012 128.119.245.12 192.168.1.37 TCP 66 80 → 44934 [ACK] Seq=1 Ack=486 Win=30080 Len=0 TSval=2083786056 TSecr=3760648051
1053 2.795918242 128.119.245.12 192.168.1.37 HTTP 2260 HTTP/1.1 200 OK (text/html)
1054 2.795964407 192.168.1.37 128.119.245.12 TCP 66 44934 → 80 [ACK] Seq=486 Ack=2195 Win=62080 Len=0 TSval=3760648199 TSecr=2083786057
1076 2.953163488 192.168.1.37 128.119.245.12 HTTP 483 GET /favicon
1086 3.097142757 128.119.245.12 192.168.1.37 HTTP 550 HTTP/1.1 40
1087 3.097183020 192.168.1.37 128.119.245.12 TCP 66 44934 → 80
1669 8.101346590 128.119.245.12 192.168.1.37 TCP 66 80 → 44934
1671 8.141735026 192.168.1.37 128.119.245.12 TCP 66 44934 → 80
1691 9.965624507 192.168.1.37 128.119.245.12 TCP 66 44934 → 80
1731 10.110281772 128.119.245.12 192.168.1.37 TCP 66 80 → 44934
1745 10.128240213 192.168.1.37 128.119.245.12 TCP 74 44944 → 80
1753 10.130530235 192.168.1.37 128.119.245.12 TCP 787 44936 → 80
1754 10.130637516 192.168.1.37 128.119.245.12 TCP 2866 44936 → 80
1755 10.130648750 192.168.1.37 128.119.245.12 TCP 2866 44936 → 80
1772 10.138501360 192.168.1.37 128.119.245.12 TCP 2866 44936 → 80
1773 10.138524725 192.168.1.37 128.119.245.12 TCP 2866 44936 → 80
1774 10.139762282 192.168.1.37 128.119.245.12 TCP 1466 44936 → 80
1797 10.367350426 128.119.245.12 192.168.1.37 TCP 74 80 → 44944
1800 10.367362319 128.119.245.12 192.168.1.37 TCP 66 80 → 44936
1810 10.367362599 128.119.245.12 192.168.1.37 TCP 66 80 → 44936
Frame 1053: 2260 bytes on wire (18080 bits), 2260 bytes captured (18080 bits) on int
Ethernet II, Src: HuaweiTe_d0:3c:60 (f8:23:b2:d0:3c:60), Dst: IntelCor_e9:7d:2f (dc:
Internet Protocol Version 4, Src: 128.119.245.12, Dst: 192.168.1.37
Transmission Control Protocol, Src Port: 80, Dst Port: 44934, Seq: 1, Ack: 486, Len:
Hypertext Transfer Protocol
Line-based text data: text/html (32 lines)
<TITLE>Upload page for TCP Wireshark Lab</TITLE>\n
<body bgcolor="#FFFFFF">\n
Upload page for TCP Wiresha
Lab
\n
Computer Networking: A Top Down Approach, 6th edition<font face="Arial,
Copyright 2012 J.F. Kurose and K.W. Ross, All Rights Reserved \n
<P>If you have followed the instructio
for the TCP Wireshark\n
Lab, you have already downloaded an ASCII copy of \n
Alice and Wonderland from <a href="http://gaia.cs.umass.edu/wireshark-labs/alic
and you also already have the Wireshark packet sniffer running and captu
packets on your computer.
\n
\n
<FORM METHOD=post ACTION="http://gaia.cs.umass.edu/wireshark-labs/lab3-1-reply.ht
<P>Click on the Browse button below \
to select the directory/file name for the copy of alice.txt that is stored \n
on your computer. \n
0020 01 25 00 50 af 86 73 4c 3d 6e 6e e5 0a 91 80 18 ·%·P··sL =nn·····
0030 00 eb 40 0a 00 00 01 01 08 0a 7c 34 0d 49 e0 26 ··@····· ··|4·I·&
0040 ef 73 48 54 54 50 2f 31 2e 31 20 32 30 30 20 4f ·sHTTP/1 .1 200 O
0050 4b 0d 0a 44 61 74 65 3a 20 54 75 65 2c 20 31 32 K··Date: Tue, 12
0060 20 4a 61 6e 20 32 30 32 31 20 32 32 3a 32 32 3a Jan 202 1 22:22:
0070 32 31 20 47 4d 54 0d 0a 53 65 72 76 65 72 3a 20 21 GMT·· Server:
0080 41 70 61 63 68 65 2f 32 2e 34 2e 36 20 28 43 65 Apache/2 .4.6 (Ce
0090 6e 74 4f 53 29 20 4f 70 65 6e 53 53 4c 2f 31 2e ntOS) Op enSSL/1.
00a0 30 2e 32 6b 2d 66 69 70 73 20 50 48 50 2f 37 2e 0.2k-fip s PHP/7.
00b0 34 2e 31 33 20 6d 6f 64 5f 70 65 72 6c 2f 32 2e 4.13 mod _perl/2.
00c0 30 2e 31 31 20 50 65 72 6c 2f 76 35 2e 31 36 2e 0.11 Per l/v5.16.
00d0 33 0d 0a 4c 61 73 74 2d 4d 6f 64 69 66 69 65 64 3··Last- Modified
Sequence Numbers (Stevens) for 192.168.1.37:44936 → 128.119.245.12:80
Sequence Numbers (Stevens) for 192.168.1.37:44936 → 128.119.245.12:80
wlp59s0
Sequence Number (B)
Time (s)
0
25000
50000
75000
100000
125000
150000
175000
2.5
5
7.5
10
12.5
15
17.5
Hover over the graph for details. → 58 pkts, 154 kB ← 82 pkts, 777 bytes
Type
Time / Sequence (Stevens
Stream
21
Switch Direction
Mouse
drags
zooms
Reset
Help
Close
Save As…