CMPT371 Project 2 Lab

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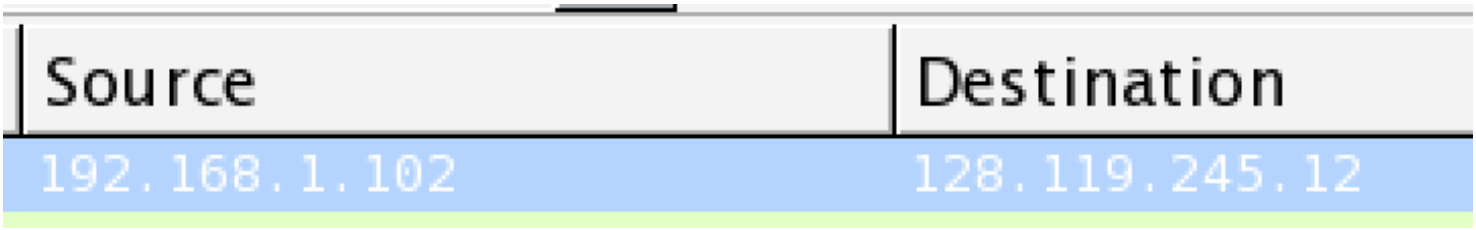
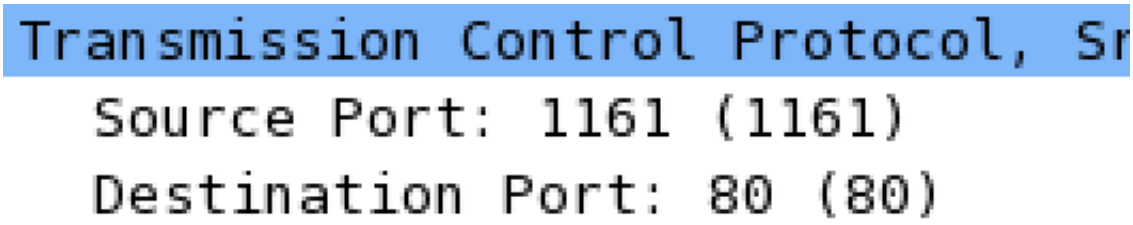
TCP

screen shot for q1 and q2.



screen shot for q1 and q2.



1.

IP address of client computer is 192.168.1.102. TCP port number is 1161.

2.

IP address of gaia.cs.umass.edu is 128.119.245.12. On port 80.

3.

8	2015-12-05 20:48:22.1275350	192.168.0.104	128.119.245.12	TCP
9	2015-12-05 20:48:22.1275830	192.168.0.104	128.119.245.12	TCP
10	2015-12-05 20:48:22.1275840	192.168.0.104	128.119.245.12	TCP
11	2015-12-05 20:48:22.2316600	128.119.245.12	192.168.0.104	TCP
12	2015-12-05 20:48:22.2317340	192.168.0.104	128.119.245.12	TCP
13	2015-12-05 20:48:22.2387160	128.119.245.12	192.168.0.104	TCP

```
Frame 8: 742 bytes on wire (5936 bits), 742 bytes captured (5936 bits) on interface 0
Ethernet II, Src: Apple_03:53:db (a0:99:9b:03:53:db), Dst: D-LinkIn_ac:23:a8 (b8:a3:86:ac:23:a
Internet Protocol Version 4, Src: 192.168.0.104 (192.168.0.104), Dst: 128.119.245.12 (128.119.
Transmission Control Protocol, Src Port: 56866 (56866), Dst Port: 80 (80), Seq: 1, Ack: 1, Len
  Source Port: 56866 (56866)
  Destination Port: 80 (80)
  [Stream index: 1]
  [TCP Segment Len: 676]
```

For my computer, IP address is 192.168.0.104 and port number is 56866.

4.

```
Source Port: 56866 (56866)
Destination Port: 80 (80)
[Stream index: 1]
[TCP Segment Len: 0]
Sequence number: 0    (relative sequence number)
Acknowledgment number: 0
Header Length: 44 bytes
```

The sequence number is 0.

```
.... 0000 0000 0010 = Flags: 0x002 (SYN)
    000. .... .... = Reserved: Not set
    ...0 .... .... = Nonce: Not set
    .... 0... .... = Congestion Window Reduced (CWR): Not set
    .... .0.. .... = ECN-Echo: Not set
    .... ..0. .... = Urgent: Not set
    .... ...0 .... = Acknowledgment: Not set
    .... .... 0... = Push: Not set
    .... .... .0.. = Reset: Not set
  ▷ .... .... ..1. = Syn: Set
    .... .... ...0 = Fin: Not set
```

The flag field of 0x002 identifies the segment to be SYN segment.

5.

```
Source Port: 80 (80)
Destination Port: 56866 (56866)
[Stream index: 1]
[TCP Segment Len: 0]
Sequence number: 0    (relative sequence number)
Acknowledgment number: 1    (relative ack number)
Header Length: 40 bytes
.... 0000 0001 0010 = Flags: 0x012 (SYN, ACK)
  000. .... .... = Reserved: Not set
  ...0 .... .... = Nonce: Not set
  .... 0... .... = Congestion Window Reduced (CWR): Not set
  .... .0.. .... = ECN-Echo: Not set
  .... ..0. .... = Urgent: Not set
  .... ...1 .... = Acknowledgment: Set
  .... .... 0... = Push: Not set
  .... .... .0.. = Reset: Not set
▷ .... .... ..1. = Syn: Set
  .... .... ...0 = Fin: Not set
Window size value: 14480
```

Sequence number is 0. The value of acknowledgement field is 1. The acknowledgement number is set to be sequence number + 1. The flag filed of 0x012 identifies the segment as a SYNACK.

6.

```
Source Port: 56866 (56866)
Destination Port: 80 (80)
[Stream index: 1]
[TCP Segment Len: 676]
Sequence number: 1    (relative sequence number)
[Next sequence number: 677    (relative sequence number)]
```

```
0  b8 a3 86 ac 23 a8 a0 99  9b 03 53 db 08 00 45 00   ....#... ..S...E.
0  02 d8 cf 42 40 00 40 06  32 49 c0 a8 00 68 80 77   ...B@.@. 2I...h.w
0  f5 0c de 22 00 50 39 d1  dc 24 f0 67 a2 b5 80 18   ..."·P9· ·$·g····
0  10 15 95 f3 00 00 01 01  08 0a 44 89 46 68 5a 8c   ........ ..D·FhZ·
0  26 81 50 4f 53 54 20 2f  77 69 72 65 73 68 61 72   &·POST / wireshar
0  6b 2d 6c 61 62 73 2f 6c  61 62 33 2d 31 2d 72 65   k-labs/l ab3-1-re
```

The sequence number of that is 1.

7.

No.	Time	Source	Destination	Protocol	Length	Info
8	2015-12-05 20:48:22.1275350	192.168.0.104	128.119.245.12	TCP	742	56866→80 [PSH, ACK] Seq=1 Ack=1 Win=1317
9	2015-12-05 20:48:22.1275830	192.168.0.104	128.119.245.12	TCP	1514	56866→80 [ACK] Seq=677 Ack=1 Win=131744
10	2015-12-05 20:48:22.1275840	192.168.0.104	128.119.245.12	TCP	1514	56866→80 [ACK] Seq=2125 Ack=1 Win=131744
11	2015-12-05 20:48:22.2316600	128.119.245.12	192.168.0.104	TCP	66	80→56866 [ACK] Seq=1 Ack=677 Win=15872 L
12	2015-12-05 20:48:22.2317340	192.168.0.104	128.119.245.12	TCP	1514	56866→80 [ACK] Seq=3573 Ack=1 Win=131744
13	2015-12-05 20:48:22.2387160	128.119.245.12	192.168.0.104	TCP	66	80→56866 [ACK] Seq=1 Ack=2125 Win=18816
14	2015-12-05 20:48:22.2388030	192.168.0.104	128.119.245.12	TCP	1514	56866→80 [ACK] Seq=5021 Ack=1 Win=131744
15	2015-12-05 20:48:22.2388040	192.168.0.104	128.119.245.12	TCP	1514	56866→80 [ACK] Seq=6469 Ack=1 Win=131744
16	2015-12-05 20:48:22.2493000	128.119.245.12	192.168.0.104	TCP	66	80→56866 [ACK] Seq=1 Ack=3573 Win=21632
17	2015-12-05 20:48:22.2493740	192.168.0.104	128.119.245.12	TCP	1514	56866→80 [ACK] Seq=7917 Ack=1 Win=131744
18	2015-12-05 20:48:22.2493750	192.168.0.104	128.119.245.12	TCP	1514	56866→80 [ACK] Seq=9365 Ack=1 Win=131744
19	2015-12-05 20:48:22.3459380	128.119.245.12	192.168.0.104	TCP	66	80→56866 [ACK] Seq=1 Ack=5021 Win=24576
20	2015-12-05 20:48:22.3460140	192.168.0.104	128.119.245.12	TCP	1514	56866→80 [ACK] Seq=10813 Ack=1 Win=13174
21	2015-12-05 20:48:22.3460160	192.168.0.104	128.119.245.12	TCP	1514	56866→80 [ACK] Seq=12261 Ack=1 Win=13174
22	2015-12-05 20:48:22.3503440	128.119.245.12	192.168.0.104	TCP	66	80→56866 [ACK] Seq=1 Ack=6469 Win=27520

The first six segments:

Sequence	time received	time ACK received	difference	RTT
1	20:48:22.1275350	20:48:22.2316600	0.1041250s	0.1041250s
677	20:48:22.1275830	20:48:22.2387160	0.1111330s	0.1111330s
2125	20:48:22.1275840	20:48:22.2493000	0.1217160s	0.1217160s
3573	20:48:22.2317340	20:48:22.3459380	0.1142040s	0.1142040s
5021	20:48:22.2388030	20:48:22.3503440	0.1115410s	0.1115410s
6469	20:48:22.2388040	20:48:22.3635840	0.1247800s	0.1247800s

ERTT1 = RTT1 = 0.1041250s

ERTT2 = (1-0.125)*ERTT1 + 0.125*RTT2 = 0.1050010s

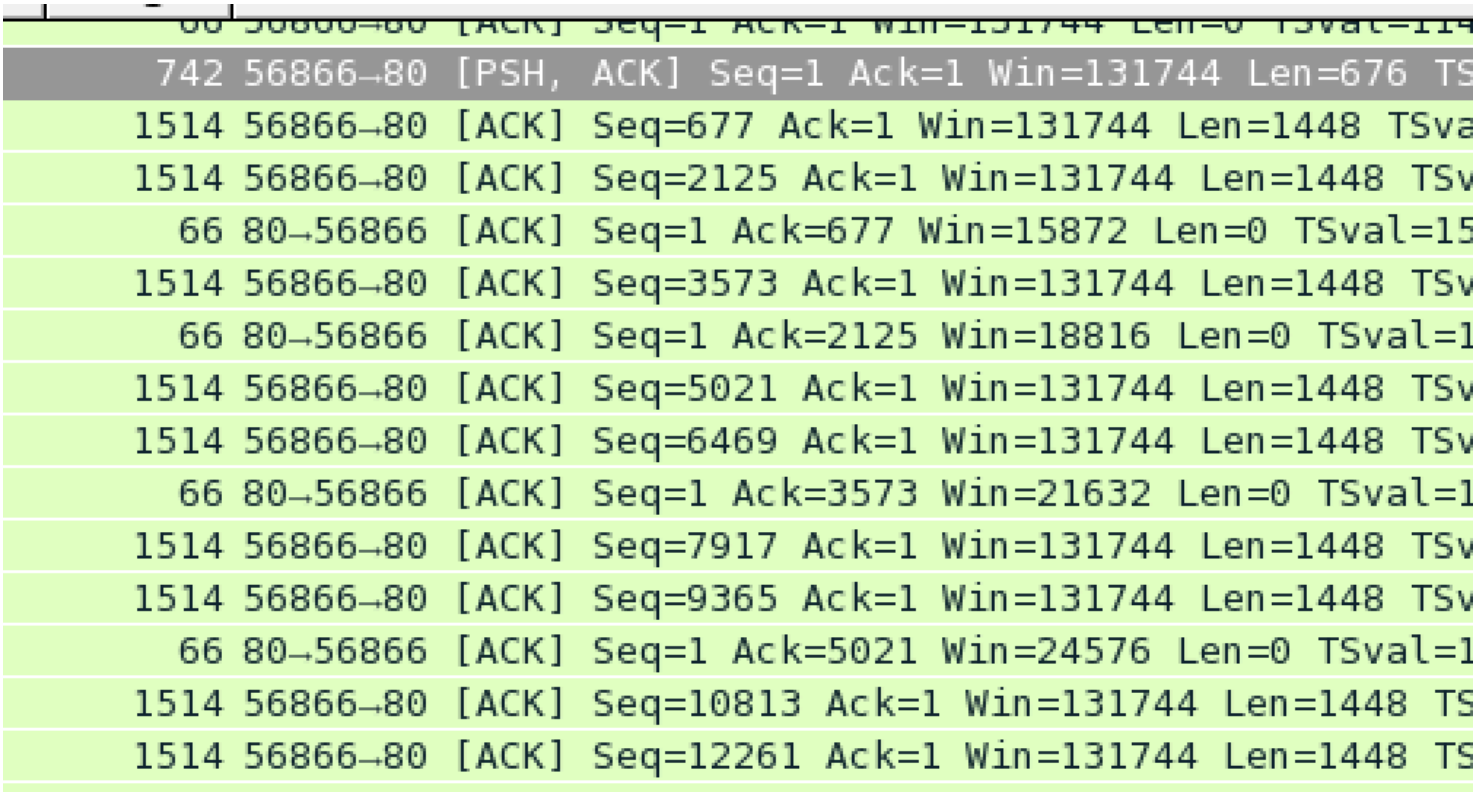
ERTT3 = (1-0.125)*ERTT2 + 0.125*RTT3 = 0.1070904s

ERTT4 = (1-0.125)*ERTT3 + 0.125*RTT4 = 0.1079796s

ERTT5 = (1-0.125)*ERTT4 + 0.125*RTT5 = 0.1084248s

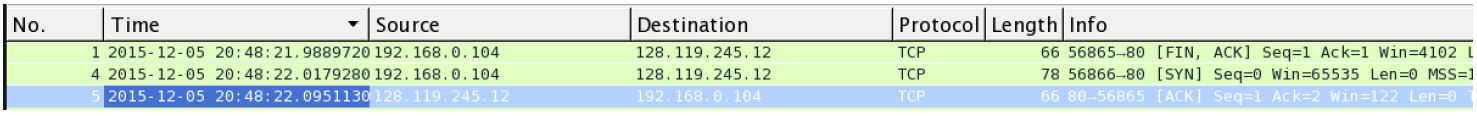
ERTT6 = (1-0.125)*ERTT5 + 0.125*RTT6 = 0.1104691s

8.

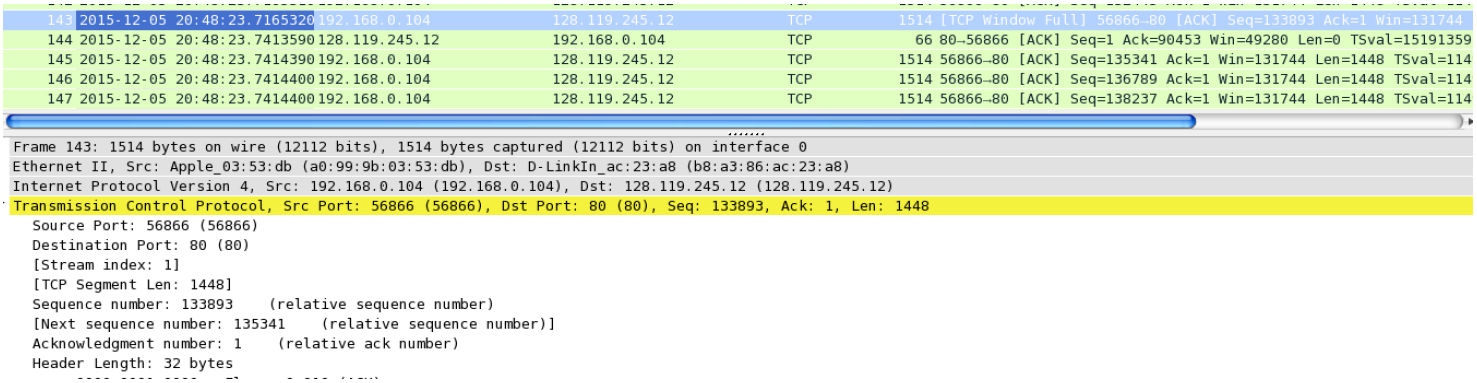


The lengths of first six segments are 676B, 1448B, 1448B, 1448B, 1448B, 1448B.

9.

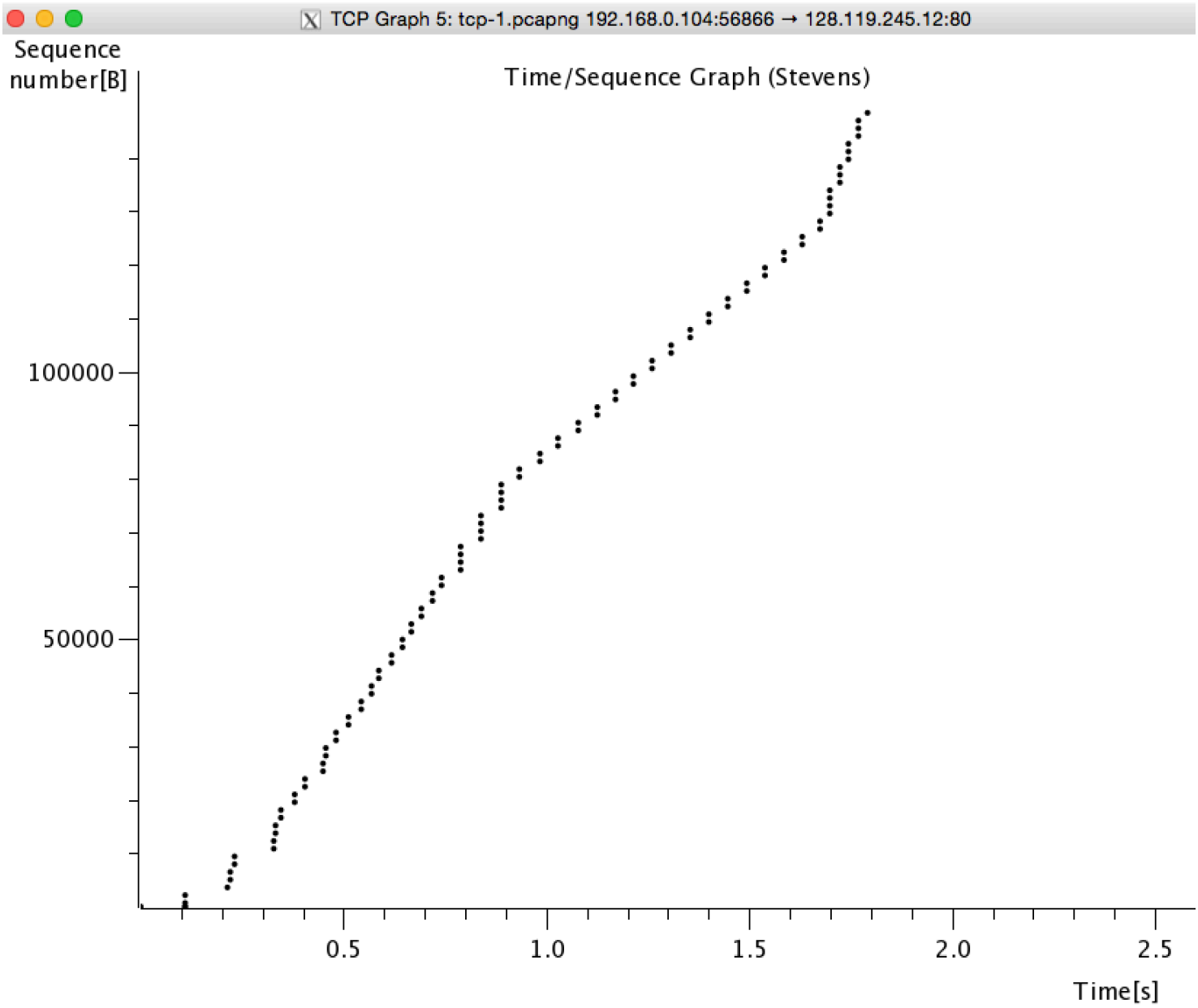


From the first segment from receiver, the minimum window size is 122.



Yes. There is once the sender encounters a situation where TCP window is full.

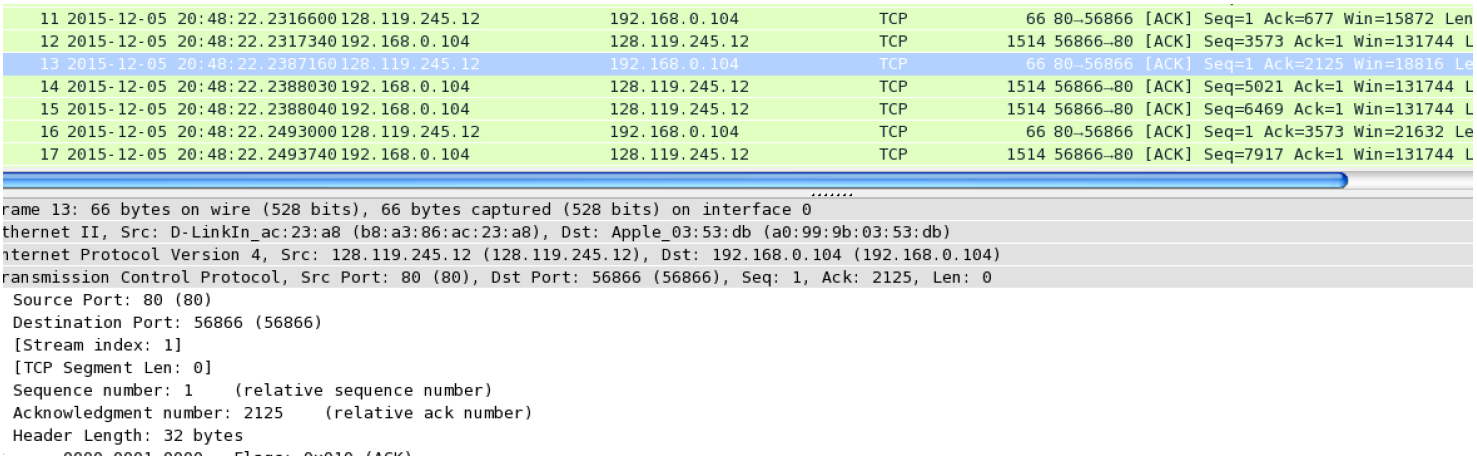
10.



From the chart we know that there is no retransmission.

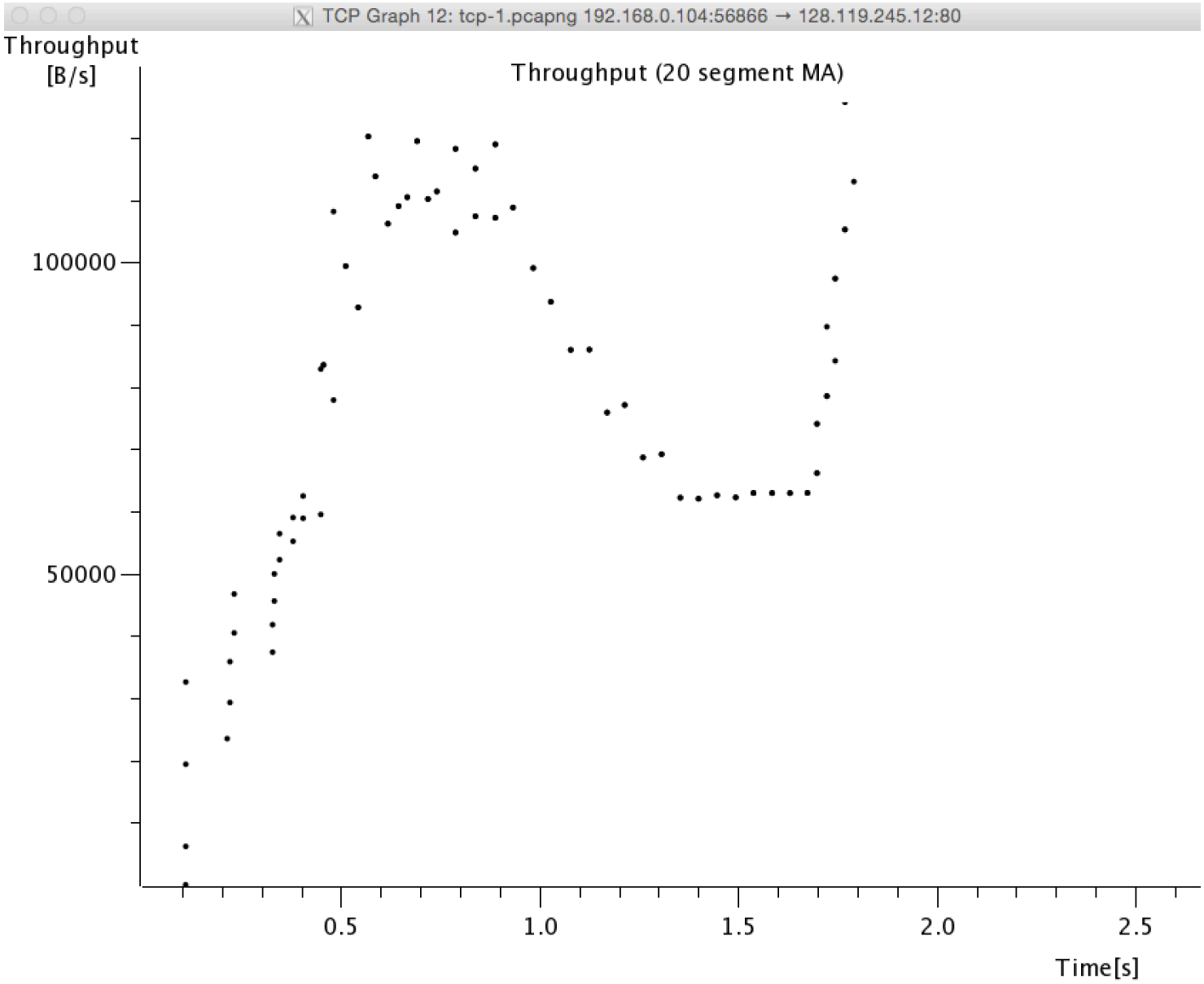
11.

Typically receiver acknowledges from sequence number it was waiting last time to the largest sequence number it receives this time.



Receiver is ACKing every other received segment.

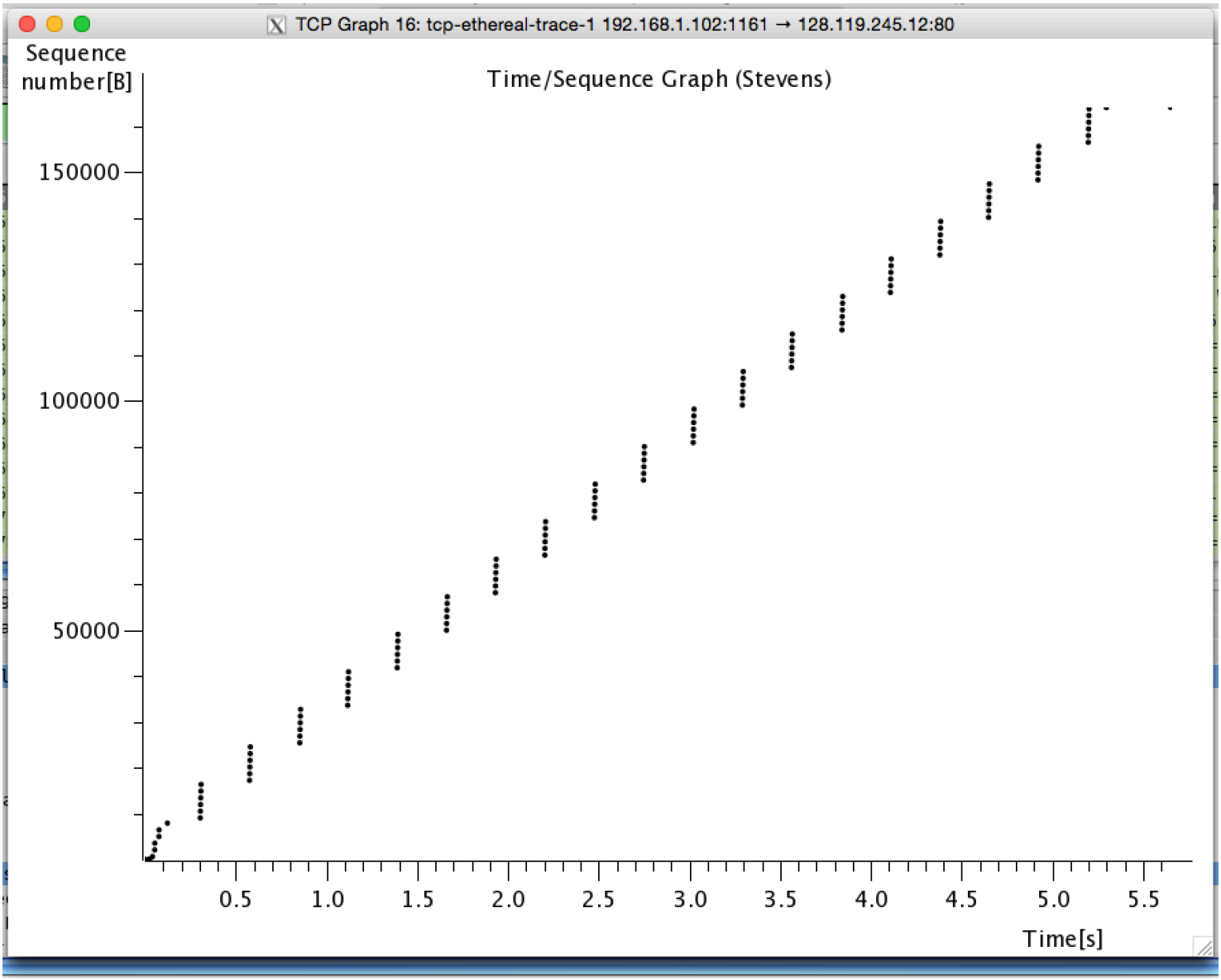
12.



This is the throughput graph generated by wireshark.

For the throughput of whole transmission section, total bytes transferred is 149414B. The whole process takes 3.2949020s. So throughput is 149414B/3.2949020s = 45347B/s.

13.

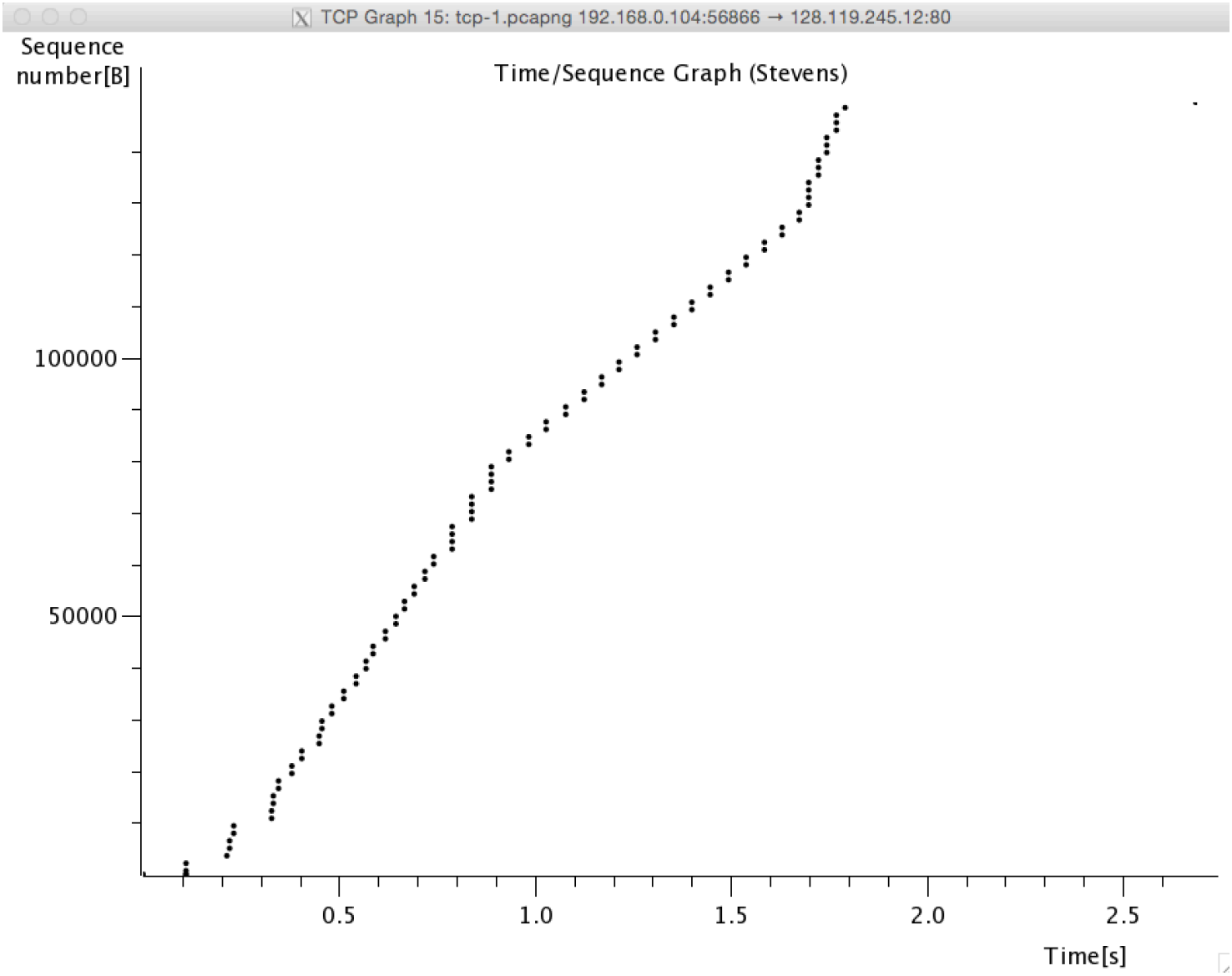


Slow start is at 0-0.1s.

Congestion avoidance happens at 0.1-0.2s.

After 0.3s the number of sequence grows steadily, which means the window size keeps the same. And there is no triple ACKs nor time out.

14.



Slow start is at 0.1-0.2s, 0.4-0.46s,0.78-0.82s,1.7-1.72s.

Congestion avoidance happens at 0.2-0.3s.

In most cases the number of sequence grows steadily, which means the window size keeps the same. There is no triple ACKs nor time out.