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Lab 2 CSCI 466

1. IP Address: 192.168.1.102 TCP Port: 1161
2. IP Address: 128.119.245.12 TCP Port: 80

Source	Destination	Protocol	Length	Info
128.119.245.12	192.168.1.102	TCP	60	80 → 1161

3. IP Address: 153.90.88.129 TCP Port: 58372

Source	Destination	Protocol	Length	Info
128.119.245.12	153.90.88.129	TCP	60	80 → 58372

4. Sequence Number = 0 A SYN bit in the flags section marks segment as a SYN segment.

```
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
```

5. Sequence Number = 0 Acknowledgment flag is set to a 1.

```
Acknowledgment number: 1    (relative ack number)
0111 .... = Header Length: 28 bytes (7)
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
```

6. Sequence Number = 1
7. Seq Numbers (Seq=…), Time Sent, and Time ACK received can all be found on the next image.
   RTT 2 = .0122(s)
   RTT 3 = .023268(s)
   RTT 4 = .069395(s)
   RTT 5 = .091713(s)
   RTT 6 = .139142(s)

No.	Time	Source	Destination	Protocol	Length	Info	
4	0.026477	192.168.1.102	128.119.245.12	TCP	619	1161 → 80 [PSH, ACK] Seq=1 Ack=1 Win=17520 Len=565	**1 (POST)**
5	0.041737	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [PSH, ACK] Seq=566 Ack=1 Win=17520 Len=1460	**2**
6	0.053937	128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACK] Seq=1 Ack=566 Win=6780 Len=0	**2 ACK**
7	0.054026	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=2026 Ack=1 Win=17520 Len=1460	**3**
8	0.054690	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=3486 Ack=1 Win=17520 Len=1460	**4**
9	0.077294	128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACK] Seq=1 Ack=2026 Win=8760 Len=0	**3 ACK**
10	0.077405	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=4946 Ack=1 Win=17520 Len=1460	**5**
11	0.078157	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=6406 Ack=1 Win=17520 Len=1460	**6**
12	0.124085	128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACK] Seq=1 Ack=3486 Win=11680 Len=0	**4 ACK**
13	0.124185	192.168.1.102	128.119.245.12	TCP	1201	1161 → 80 [PSH, ACK] Seq=7866 Ack=1 Win=17520 Len=1147	**7**
14	0.169118	128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACK] Seq=1 Ack=4946 Win=14600 Len=0	**5 ACK**
15	0.217299	128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACK] Seq=1 Ack=6406 Win=17520 Len=0	**6 ACK**

Estimated RTT1 = .875 * .0122 + .125 * .023268 = .013484(s)

Estimated RTT2 = .875 * .013484 + .125 * .069395 = .020473(s)

Estimated RTT3 = .875 * .020473 + .125 * .091713 = .029378(s)

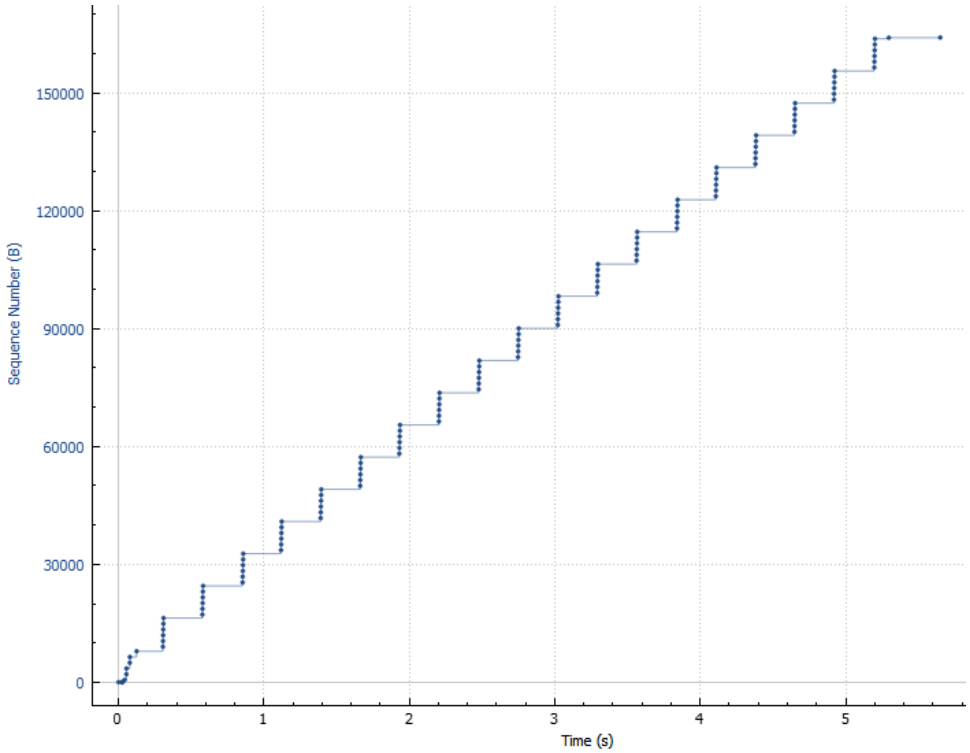
Estimated RTT final = .875 * .029378 + .125 * .139142 = **.043099(s)**

8. 1 = 565
   2 = 1460
   3 = 1460
   4 =1460
   5 =1460
   6 =1460
9. Min available buffer = 6780. It is not throttled as there is still room in buffer for more data.
10. No retransmitted segments. There are no duplicate sequence numbers.
11. There is ACKing every other segment as seen below.

54	1.118133	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=35049 Ack=1 Win=17520 Len=1460
55	1.119029	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=36509 Ack=1 Win=17520 Len=1460
56	1.119858	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=37969 Ack=1 Win=17520 Len=1460
57	1.120902	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=39429 Ack=1 Win=17520 Len=1460
58	1.121891	192.168.1.102	128.119.245.12	TCP	946	1161 → 80 [PSH, ACK] Seq=40889 Ack=1 Win=17520 Len=892
59	1.200421	128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACK] Seq=1 Ack=35049 Win=62780 Len=0
60	1.265026	128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACK] Seq=1 Ack=37969 Win=62780 Len=0
61	1.362074	128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACK] Seq=1 Ack=40889 Win=62780 Len=0

12. The amount of ACKed data is equal to the length of the segments. Typically, 1460 bytes as in Question 8.

13. Slow start appears to start about .03 seconds and ends about .06 seconds where congestion control creates this stepping graph.



14. Slow start begins at .05 seconds and ends at .16 seconds where congestion control begins to limit segment send rate.