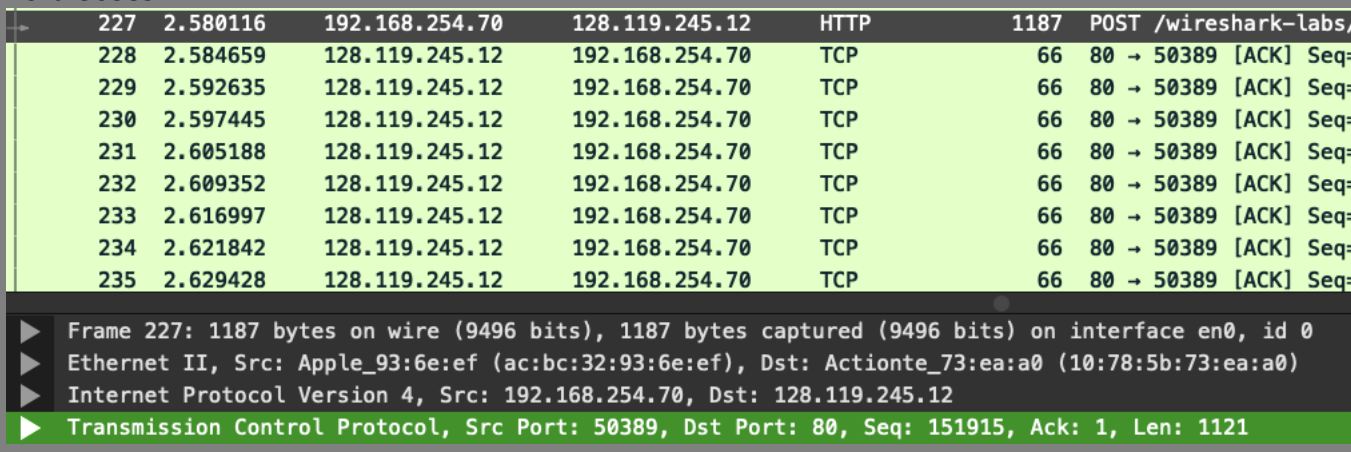
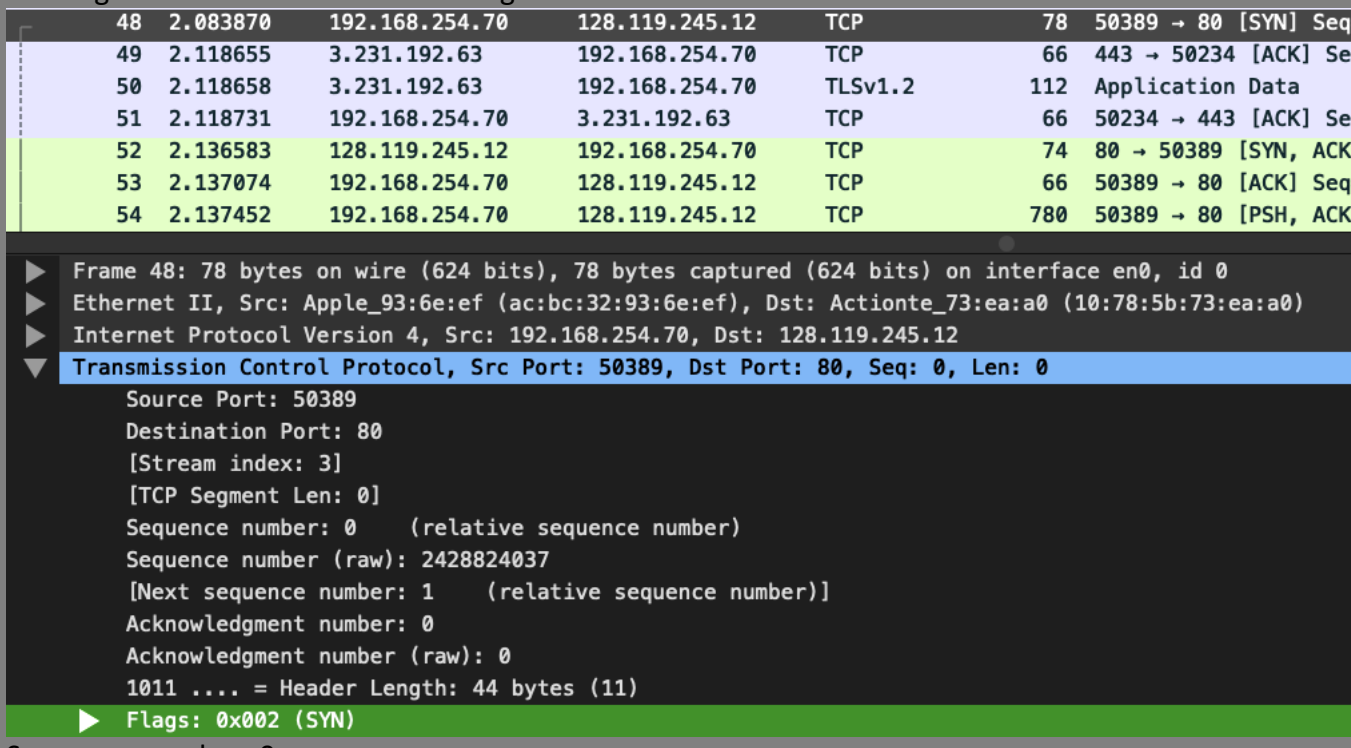
1. Address: 192.168.254.70
   Port: 50389



2. Address: 128.119.245.12
   Port: 80
3. Address: 192.168.254.70
   Port: 50389
4. Sequence number: 0
   The flag 0x002 identifies it as a SYN segment



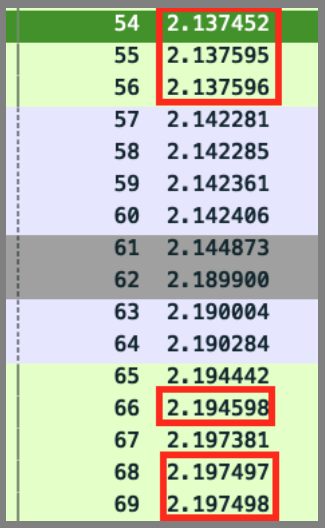
5. Sequence number: 0
   Acknowledgement: 1
   If the sequence number is 0, then the ack value is 1 and vice versa
   The flag identifies it

```
    52  2.136583    128.119.245.12    192.168.254.70    TCP      74  80 → 50389 [SYN, ACK
    53  2.137074    192.168.254.70    128.119.245.12    TCP      66  50389 → 80 [ACK] Seq
    54  2.137452    192.168.254.70    128.119.245.12    TCP     780  50389 → 80 [PSH, ACK

▶ Frame 52: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface en0, id 0
▶ Ethernet II, Src: Actionte_73:ea:a0 (10:78:5b:73:ea:a0), Dst: Apple_93:6e:ef (ac:bc:32:93:6e:ef)
▶ Internet Protocol Version 4, Src: 128.119.245.12, Dst: 192.168.254.70
▼ Transmission Control Protocol, Src Port: 80, Dst Port: 50389, Seq: 0, Ack: 1, Len: 0
    Source Port: 80
    Destination Port: 50389
    [Stream index: 3]
    [TCP Segment Len: 0]
    Sequence number: 0    (relative sequence number)
    Sequence number (raw): 3256207309
    [Next sequence number: 1    (relative sequence number)]
    Acknowledgment number: 1    (relative ack number)
    Acknowledgment number (raw): 2428824038
    1010 .... = Header Length: 40 bytes (10)
  ▶ Flags: 0x012 (SYN, ACK)
```

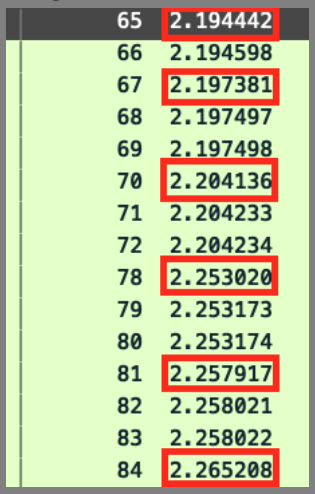
6. Sequence number: 1

```
    54  2.137452    192.168.254.70    128.119.245.12    TCP     780  50389 → 80 [PSH, ACK]
    55  2.137595    192.168.254.70    128.119.245.12    TCP    1506  50389 → 80 [ACK] Seq=7
    56  2.137596    192.168.254.70    128.119.245.12    TCP    1506  50389 → 80 [ACK] Seq=2

▶ Frame 54: 780 bytes on wire (6240 bits), 780 bytes captured (6240 bits) on interface en0, id 0
▶ Ethernet II, Src: Apple_93:6e:ef (ac:bc:32:93:6e:ef), Dst: Actionte_73:ea:a0 (10:78:5b:73:ea:a0)
▶ Internet Protocol Version 4, Src: 192.168.254.70, Dst: 128.119.245.12
▼ Transmission Control Protocol, Src Port: 50389, Dst Port: 80, Seq: 1, Ack: 1, Len: 714
    Source Port: 50389
    Destination Port: 80
    [Stream index: 3]
    [TCP Segment Len: 714]
    Sequence number: 1    (relative sequence number)
    Sequence number (raw): 2428824038
    [Next sequence number: 715    (relative sequence number)]
    Acknowledgment number: 1    (relative ack number)
    Acknowledgment number (raw): 3256207310
    1000 .... = Header Length: 32 bytes (8)
  ▶ Flags: 0x018 (PSH, ACK)
    Window size value: 2070
    [Calculated window size: 132480]
    [Window size scaling factor: 64]
    Checksum: 0x3219 [unverified]
    [Checksum Status: Unverified]
    Urgent pointer: 0
  ▶ Options: (12 bytes), No-Operation (NOP), No-Operation (NOP), Timestamps
  ▶ [SEQ/ACK analysis]
  ▶ [Timestamps]
    TCP payload (714 bytes)
▼ Data (714 bytes)
    Data: 504f5354202f77697265736861726b2d6c6162732f6c6162…
    [Length: 714]

0040  d2 d7 50 4f 53 54 20 2f  77 69 72 65 73 68 61 72   ··POST / wireshar
```

7. Segments: 54, 55, 56, 66, 68, 69
   Sequence numbers: 1, 715, 2155, 3595, 5035, 6475
   Looked at each packets current and next sequence numbers until I had 6 of them connected
   Time:



   Ack received sequence number: 65, 67, 70, 78 , 81, 84
   Time:



   Difference:
   a. 0.05699
   b. 0.059786
   c. 0.06654
   d. 0.058422
   e. 0.06042
   f. 0.06771

   EstimatedRTT
   0.875*EstimatedRTT+0.125*SampleRTT
   a. 0.05699
   b. 0.0573395

c. 0.0584895625
d. 0.05848111719
e. 0.05872347754
f. 0.05984679285

8.

54	2.137452	192.168.254.70	128.119.245.12	TCP	780	50389 → 80 [PSH, ACK]
55	2.137595	192.168.254.70	128.119.245.12	TCP	1506	50389 → 80 [ACK] Seq=
56	2.137596	192.168.254.70	128.119.245.12	TCP	1506	50389 → 80 [ACK] Seq=
65	2.194442	128.119.245.12	192.168.254.70	TCP	66	80 → 50389 [ACK] Seq=
66	2.194598	192.168.254.70	128.119.245.12	TCP	1506	50389 → 80 [ACK] Seq=
67	2.197381	128.119.245.12	192.168.254.70	TCP	66	80 → 50389 [ACK] Seq=
68	2.197497	192.168.254.70	128.119.245.12	TCP	1506	50389 → 80 [ACK] Seq=
69	2.197498	192.168.254.70	128.119.245.12	TCP	1506	50389 → 80 [ACK] Seq=

9. 132480
No, the window size grows large early on negating any throttling

54	2.137452	192.168.254.70	128.119.245.12	TCP	780	50389 → 80 [PSH, ACK]
55	2.137595	192.168.254.70	128.119.245.12	TCP	1506	50389 → 80 [ACK] Seq=
56	2.137596	192.168.254.70	128.119.245.12	TCP	1506	50389 → 80 [ACK] Seq=

```
▶ Frame 54: 780 bytes on wire (6240 bits), 780 bytes captured (6240 bits) on interface en0, id 0
▶ Ethernet II, Src: Apple_93:6e:ef (ac:bc:32:93:6e:ef), Dst: Actionte_73:ea:a0 (10:78:5b:73:ea:a0)
▶ Internet Protocol Version 4, Src: 192.168.254.70, Dst: 128.119.245.12
▼ Transmission Control Protocol, Src Port: 50389, Dst Port: 80, Seq: 1, Ack: 1, Len: 714
    Source Port: 50389
    Destination Port: 80
    [Stream index: 3]
    [TCP Segment Len: 714]
    Sequence number: 1    (relative sequence number)
    Sequence number (raw): 2428824038
    [Next sequence number: 715    (relative sequence number)]
    Acknowledgment number: 1    (relative ack number)
    Acknowledgment number (raw): 3256207310
    1000 .... = Header Length: 32 bytes (8)
  ▶ Flags: 0x018 (PSH, ACK)
    Window size value: 2070
    [Calculated window size: 132480]
```

10. No, checked duplicate sequence numbers
11. Ack received sequence number: 65, 67, 70, 78 , 81, 84
Sequence numbers: 715, 2155, 3595, 5035, 6475, 7915
Acked data: 715, 1440, 1440, 1440, 1440, 1440 therefore typically 1440
None identified, traversed the entire trace twice and never encountered a packet acking more than 1440 bytes
12. Data:
Lack ack = 153036
First ack = 0
Last – First = 153036 bytes

Time:
Last ack = 2.911572

First ack = 2.194442
Last - First = 0.71713 s

153036 / 0.71713 = 213,400.6386568684 bytes/s

13. Begins around .052 s
    Ends around .054 s
    Congestion avoidance starts around .12 s
    The segments being sent are not sent in an increasing linear manner. Growth rate is surprisingly decreasing.