

Marc Soda  
Lab 5

1: 192.168.86.68:55639

2: 128.119.245.12:80

153	0.147682	192.168.86.68	128.119.245.12	HTTP	1451 POST /wireshark-labs/lab3-1-reply
179	0.192625	128.119.245.12	192.168.86.68	HTTP	843 HTTP/1.1 200 OK (text/html)

▶ Frame 153: 1451 bytes on wire (11608 bits), 1451 bytes captured (11608 bits) on interface en0, id 0

▶ Ethernet II, Src: Apple\_98:d9:27 (78:4f:43:98:d9:27), Dst: Google\_89:0e:c8 (3c:28:6d:89:0e:c8)

▶ Internet Protocol Version 4, Src: 192.168.86.68, Dst: 128.119.245.12

▼ Transmission Control Protocol, Src Port: 55639, Dst Port: 80, Seq: 152041, Ack: 1, Len: 1385

Source Port: 55639

Destination Port: 80

[Stream index: 0]

[Conversation completeness: Incomplete, DATA (15)]

[TCP Segment Len: 1385]

Sequence Number: 152041 (relative sequence number)

Sequence Number (raw): 4236881228

[Next Sequence Number: 153426 (relative sequence number)]

Acknowledgment Number: 1 (relative ack number)

Acknowledgment Number (raw): 1968969753

1AAA = Header Length: 32 bytes (8)

3: Seq number: 0

The SYN flag being set to 1 is what identifies the segment as a SYN segment

The TCP receiver will be able to use Selective Acknowledgments. SACK permitted option is enabled

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	192.168.86.68	128.119.245.12	TCP	76	55639 → 80 [SYN] Seq=0 Win=0 Len=0 MSS=1460 WS=64 TSval=725607509 TSecr=0 SACK_PERM=1
2	0.022414	128.119.245.12	192.168.86.68	TCP	74	80 → 55639 [SYN, ACK] Seq=0 Ack=1 Win=28960 Len=0 MSS=1460 SACK_PERM=1 TSval=3913851370 TSecr=725607509 WS=128
3	0.022505	192.168.86.68	128.119.245.12	TCP	66	55639 → 80 [ACK] Seq=1 Ack=1 Win=131712 Len=0 TSval=725607531 TSecr=3913851370
4	0.024047	192.168.86.68	128.119.245.12	TCP	1514	55639 → 80 [ACK] Seq=1 Ack=1 Win=131712 Len=1448 TSval=725607532 TSecr=3913851370 [TCP segment of a reassembled PDU]
5	0.024048	192.168.86.68	128.119.245.12	TCP	1514	55639 → 80 [ACK] Seq=1449 Ack=1 Win=131712 Len=1448 TSval=725607532 TSecr=3913851370 [TCP segment of a reassembled PDU]
6	0.024049	192.168.86.68	128.119.245.12	TCP	1514	55639 → 80 [ACK] Seq=2897 Ack=1 Win=131712 Len=1448 TSval=725607532 TSecr=3913851370 [TCP segment of a reassembled PDU]
7	0.052071	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=1449 Win=31872 Len=0 TSval=3913851399 TSecr=725607532
8	0.052076	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=2897 Win=31872 Len=0 TSval=3913851400 TSecr=725607532
9	0.052774	192.168.86.68	128.119.245.12	TCP	1514	55639 → 80 [ACK] Seq=4345 Ack=1 Win=131712 Len=1448 TSval=725607560 TSecr=3913851399 [TCP segment of a reassembled PDU]
10	0.052775	192.168.86.68	128.119.245.12	TCP	1514	55639 → 80 [ACK] Seq=5793 Ack=1 Win=131712 Len=1448 TSval=725607560 TSecr=3913851399 [TCP segment of a reassembled PDU]
11	0.052854	192.168.86.68	128.119.245.12	TCP	1514	55639 → 80 [ACK] Seq=7241 Ack=1 Win=131712 Len=1448 TSval=725607560 TSecr=3913851400 [TCP segment of a reassembled PDU]
12	0.052855	192.168.86.68	128.119.245.12	TCP	1514	55639 → 80 [ACK] Seq=8689 Ack=1 Win=131712 Len=1448 TSval=725607560 TSecr=3913851400 [TCP segment of a reassembled PDU]

Source Port: 55639

Destination Port: 80

[Stream index: 0]

[Conversation completeness: Incomplete, DATA (15)]

[TCP Segment Len: 0]

Sequence Number: 0 (relative sequence number)

Sequence Number (raw): 4236649187

[Next Sequence Number: 1 (relative sequence number)]

Acknowledgment Number: 0 (relative sequence number)

Acknowledgment Number (raw): 0

1011 ... = Header Length: 44 bytes (11)

▼ 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

▼ Sequence flags: SYN set

...0 ... = FIN: Not set

[TCP Flags: .....S.]

Window: 65535

[Calculated window size: 65535]

Checksum: 0x0000 (unverified)

[Checksum Status: Unverified]

Urgent Pointer: 0

▼ Options: (24 bytes), Maximum segment size, No-Operation (NOP), Window scale, No-Operation (NOP), No-Operation (NOP), Timestamps, SACK permitted, End of Option List (EOL)

▶ TCP Option - Maximum segment size: 1460 bytes

▶ TCP Option - No-Operation (NOP)

▶ TCP Option - Window scale: 6 (multiply by 64)

▶ TCP Option - No-Operation (NOP)

▶ TCP Option - No-Operation (NOP)

▶ TCP Option - Timestamps: TSval 725607509, TSecr 0

▶ TCP Option - SACK permitted

▶ TCP Option - End of Option List (EOL)

▶ [Timestamps]

0000 3c 28 6d 89 0e c8 78 4f 43 98 d9 27 88 00 45 00 <[...x0 C...E...>

SYN and ACK flags are set  
Value of ACK is 1

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23 0.0.0.0.80      192.168.86.68    128.119.245.12   TCP           1514 55639 - 80 [ACK] Seq=1737
24 0.0.0.0.80      192.168.86.68    128.119.245.12   TCP           1514 55639 - 80 [ACK] Seq=1882
25 0.0.0.0.80      192.168.86.68    128.119.245.12   TCP           1514 55639 - 80 [ACK] Seq=1882
Transmission Control Protocol, Src Port: 80, Dst Port: 55639, Seq: 0, Ack: 1, Len: 0
Source Port: 80
Destination Port: 55639
[Stream index: 0]
[Conversation completeness: Incomplete, DATA (15)]
[TCP Segment Len: 0]
Sequence Number: 0 (relative sequence number)
Sequence Number (raw): 1068969752
[Next Sequence Number: 1 (relative sequence number)]
Acknowledgment Number: 1 (relative ack number)
Acknowledgment number (raw): 4236649188
1010 ..... = Header Length: 40 bytes (10)
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
[TCP Flags: .....A..S.]
Window: 28960
[Calculated window size: 28960]
0000 7f 4f 43 98 d9 27 3c 28 6d 89 0e c8 08 00 45 00 x0C'<(' m---E-
0010 00 3c 00 00 40 00 34 06 ba 4b 80 77 f5 9c 0c a8 <- . 4- K w ---

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1448 Bytes  
It did not all fit

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3 0.0225065      192.168.86.68      128.119.245.12      TCP      66 55639 → 80 [ACK] Seq=1 Ack=1448
3 0.0225065      192.168.86.68      128.119.245.12      TCP      1514 55639 → 80 [ACK] Seq=1 Ack=1448
6 0.024048      192.168.86.68      128.119.245.12      TCP      1514 55639 → 80 [ACK] Seq=1449 Ack=1448
6 0.024049      192.168.86.68      128.119.245.12      TCP      1514 55639 → 80 [ACK] Seq=2897 Ack=1448
7 0.052671      128.119.245.12      192.168.86.68      TCP      66 80 → 55639 [ACK] Seq=1 Ack=1448
8 0.052676      128.119.245.12      192.168.86.68      TCP      66 80 → 55639 [ACK] Seq=1 Ack=2897
9 0.052774      192.168.86.68      128.119.245.12      TCP      1514 55639 → 80 [ACK] Seq=4345 Ack=1448
10 0.052775      192.168.86.68      128.119.245.12      TCP      1514 55639 → 80 [ACK] Seq=5793 Ack=1448
11 0.052854      192.168.86.68      128.119.245.12      TCP      1514 55639 → 80 [ACK] Seq=7241 Ack=1448
12 0.052855      192.168.86.68      128.119.245.12      TCP      1514 55639 → 80 [ACK] Seq=8689 Ack=1448
13 0.053026      128.119.245.12      192.168.86.68      TCP      66 80 → 55639 [ACK] Seq=1 Ack=4345
14 0.053710      192.168.86.68      128.119.245.12      TCP      1514 55639 → 80 [ACK] Seq=10137 Ack=1448
15 0.053711      192.168.86.68      128.119.245.12      TCP      1514 55639 → 80 [ACK] Seq=11585 Ack=1448
16 0.080768      128.119.245.12      192.168.86.68      TCP      66 80 → 55639 [ACK] Seq=1 Ack=5793
17 0.080771      128.119.245.12      192.168.86.68      TCP      66 80 → 55639 [ACK] Seq=1 Ack=7241
18 0.080772      128.119.245.12      192.168.86.68      TCP      66 80 → 55639 [ACK] Seq=1 Ack=8689
19 0.080772      128.119.245.12      192.168.86.68      TCP      66 80 → 55639 [ACK] Seq=1 Ack=10137
20 0.080845      192.168.86.68      128.119.245.12      TCP      1514 55639 → 80 [ACK] Seq=13033 Ack=1448
21 0.080846      192.168.86.68      128.119.245.12      TCP      1514 55639 → 80 [ACK] Seq=14481 Ack=1448
22 0.080847      192.168.86.68      128.119.245.12      TCP      1514 55639 → 80 [ACK] Seq=15929 Ack=1448
23 0.080848      192.168.86.68      128.119.245.12      TCP      1514 55639 → 80 [ACK] Seq=17377 Ack=1448
24 0.080850      192.168.86.68      128.119.245.12      TCP      1514 55639 → 80 [ACK] Seq=18825 Ack=1448
25 0.080850      192.168.86.68      128.119.245.12      TCP      1514 55639 → 80 [ACK] Seq=20273 Ack=1448

Frame 4: 1514 bytes on wire (12112 bits), 1514 bytes captured (12112 bits) on interface en0, id 0
Ethernet II, Src: Apple, 98:09:27:78:4f:43:98:d9:27, Dst: Google, 89:0e:c8:3c:28:6d:89:0e:c8
Internet Protocol Version 4, Src: 192.168.86.68, Dst: 128.119.245.12
Transmission Control Protocol, Src Port: 55639, Dst Port: 80, Seq: 1, Ack: 1, Len: 1448
Source Port: 55639
Destination Port: 80
[Stream Index: 0]
[Conversation completeness: Incomplete, DATA (15)]
[TCP Segment Len: 1448]
Sequence Number: 1 (relative sequence number)
Sequence Number (raw): 4236649188
[Next Sequence Number: 1449 (relative sequence number)]
Acknowledgment Number: 1 (relative ack number)
Acknowledgment Number (raw): 1068969753
1000 .... = Header Length: 32 bytes (8)
Flags: 0x010 (ACK)
Window: 2858
[Calculated window size: 131712]
Window size scaling factor: 64
Checksum: 0xbd21 [unverified]
[Checksum Status: Unverified]
Urgent Pointer: 0
Options: (12 bytes), No-Operation (NOP), No-Operation (NOP), Timestamps
[Timestamps]
[SEQ/ACK analysis]
TCP navload (1448 bytes)
a1 ea 50 4f 53 54 20 2f 7f 68 72 65 73 68 61 72 ..POST / wireless
0050 72 65 61 62 73 2f 0c 61 62 32 20 31 2d 72 65 ..r/ab31-re
0060 20 6c 70 2a 68 73 5d 28 8d 54 50 2f 2d 72 3f ..l\abtn_HUP(1;4

```

6: .024047  
 .052671  
 .052671 - .024047 = .028624  
 .052676 - .024048 = .028628  
 .0875 \* .028624 + .125 \* .028624 = .0060826

Seq. No.	Source IP	Destination IP	Protocol	Length	Window	Flags	Sequence Number	Destination Port	Source Port	Notes
2	0.022414	128.119.245.12	TCP	74	80	SYN, ACK	Seq=0 Ack=1 Win=28960 Len=0 MSS=1460 SACK PERM=1 TSval=3913851370 TSecr=725607509 WS=128			
3	0.022505	192.168.86.68	TCP	66	80	ACK	Seq=1 Ack=1 Win=131712 Len=0 TSval=725607531 TSecr=3913851370			
4	0.024047	192.168.86.68	TCP	1514	55639	ACK	Seq=1 Ack=1 Win=131712 Len=1448 TSval=725607532 TSecr=3913851370 [TCP segment of a reassembled PDU]			
5	0.024048	192.168.86.68	TCP	1514	55639	ACK	Seq=1449 Ack=1 Win=131712 Len=1448 TSval=725607532 TSecr=3913851370 [TCP segment of a reassembled PDU]			
6	0.024049	192.168.86.68	TCP	1514	55639	ACK	Seq=2897 Ack=1 Win=131712 Len=1448 TSval=725607532 TSecr=3913851370 [TCP segment of a reassembled PDU]			
7	0.052671	128.119.245.12	TCP	66	80	ACK	Seq=1 Ack=1449 Win=31872 Len=0 TSval=3913851399 TSecr=725607532			
8	0.052676	128.119.245.12	TCP	66	80	ACK	Seq=1 Ack=2897 Win=34816 Len=0 TSval=3913851400 TSecr=725607532			
9	0.052774	192.168.86.68	TCP	1514	55639	ACK	Seq=4345 Ack=1 Win=131712 Len=1448 TSval=725607560 TSecr=3913851399 [TCP segment of a reassembled PDU]			
10	0.052775	192.168.86.68	TCP	1514	55639	ACK	Seq=5793 Ack=1 Win=131712 Len=1448 TSval=725607560 TSecr=3913851399 [TCP segment of a reassembled PDU]			
11	0.052854	192.168.86.68	TCP	1514	55639	ACK	Seq=7241 Ack=1 Win=131712 Len=1448 TSval=725607560 TSecr=3913851400 [TCP segment of a reassembled PDU]			
12	0.052855	192.168.86.68	TCP	1514	55639	ACK	Seq=8689 Ack=1 Win=131712 Len=1448 TSval=725607560 TSecr=3913851400 [TCP segment of a reassembled PDU]			
13	0.053626	128.119.245.12	TCP	66	80	ACK	Seq=1 Ack=4345 Win=3768 Len=0 TSval=3913851400 TSecr=725607532			
14	0.053710	192.168.86.68	TCP	1514	55639	ACK	Seq=19137 Ack=1 Win=131712 Len=1448 TSval=725607560 TSecr=3913851400 [TCP segment of a reassembled PDU]			
15	0.053711	192.168.86.68	TCP	1514	55639	ACK	Seq=15885 Ack=1 Win=131712 Len=1448 TSval=725607560 TSecr=3913851400 [TCP segment of a reassembled PDU]			
16	0.080768	128.119.245.12	TCP	66	80	ACK	Seq=1 Ack=5793 Win=40076 Len=0 TSval=3913851421 TSecr=725607560			
17	0.080771	128.119.245.12	TCP	66	80	ACK	Seq=1 Ack=7241 Win=43529 Len=0 TSval=3913851422 TSecr=725607560			
18	0.080772	128.119.245.12	TCP	66	80	ACK	Seq=1 Ack=8689 Win=46326 Len=0 TSval=3913851422 TSecr=725607560			
19	0.080772	128.119.245.12	TCP	66	80	ACK	Seq=1 Ack=19137 Win=49280 Len=0 TSval=3913851422 TSecr=725607560			
20	0.080845	192.168.86.68	TCP	1514	55639	ACK	Seq=13033 Ack=1 Win=131712 Len=1448 TSval=725607588 TSecr=3913851421 [TCP segment of a reassembled PDU]			
21	0.080846	192.168.86.68	TCP	1514	55639	ACK	Seq=14481 Ack=1 Win=131712 Len=1448 TSval=725607588 TSecr=3913851421 [TCP segment of a reassembled PDU]			

- 7: 1448 bytes  
 8: 131712  
 Sender is not throttled  
 Found in screenshot for Q5  
 9: No. Verified by analyzing sequence numbers. Since the sequence numbers never go down over time, there were no retransmissions.  
 10: Receiver typically acknowledges 1448 bytes.  
 There are cases where the receiver is ACKing every other segment.  
 See screenshot for Q6  
 11: I am not sure