

Wireshark Lab: TCP

Questions:

Using the packet trace given in the lab after question 3

Preliminary:

Applications Upload page for TCP Eth... *eth0 18:40 root

*eth0

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tcp

| No. | Time | Source | Destination | Protocol | Length | Info |
|-----|-------------|----------------|----------------|----------|--------|---|
| 1 | 0.000000000 | 10.0.2.15 | 72.21.91.29 | TCP | 54 | 54096 → 80 [ACK] Seq=1 Ack=1 Win=35460 Len=0 |
| 2 | 0.000243429 | 10.0.2.15 | 72.21.91.29 | TCP | 54 | 54098 → 80 [ACK] Seq=1 Ack=1 Win=35460 Len=0 |
| 3 | 0.000714496 | 72.21.91.29 | 10.0.2.15 | TCP | 60 | [TCP ACKed unseen segment] 80 → 54096 [ACK] Seq=1 Ack=2 Win=65535 Len=0 |
| 4 | 0.000736892 | 72.21.91.29 | 10.0.2.15 | TCP | 60 | [TCP ACKed unseen segment] 80 → 54098 [ACK] Seq=1 Ack=2 Win=65535 Len=0 |
| 5 | 0.255918561 | 10.0.2.15 | 72.21.91.29 | TCP | 54 | 54112 → 80 [ACK] Seq=1 Ack=1 Win=30732 Len=0 |
| 6 | 0.256131723 | 72.21.91.29 | 10.0.2.15 | TCP | 60 | [TCP ACKed unseen segment] 80 → 54112 [ACK] Seq=1 Ack=2 Win=65535 Len=0 |
| 7 | 1.157779619 | 10.0.2.15 | 128.119.245.12 | TCP | 54 | 43450 → 80 [FIN, ACK] Seq=1 Ack=1 Win=29200 Len=0 |
| 8 | 1.157976685 | 128.119.245.12 | 10.0.2.15 | TCP | 60 | 80 → 43450 [ACK] Seq=1 Ack=2 Win=65535 Len=0 |
| 9 | 1.160747204 | 128.119.245.12 | 10.0.2.15 | TCP | 60 | 80 → 43450 [ACK] Seq=1 Ack=2 Win=65535 Len=0 |

Internet Protocol Version 4, Src: 10.0.2.15, Dst: 72.21.91.29

Transmission Control Protocol, Src Port: 54096, Dst Port: 80, Seq: 1, Ack: 1, Len: 0

Source Port: 54096

Destination Port: 80

[Stream index: 0]

[TCP Segment Len: 0]

Sequence number: 1 (relative sequence number)

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

Acknowledgment number: 1 (relative ack number)

0101 ... = Header Length: 20 bytes (5)

Flags: 0x010 (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
- ...0 = Syn: Not set
- ...0 = Fin: Not set

[TCP Flags:A....]

Window size value: 35460

[Calculated window size: 35460]

[Window size scaling factor: -1 (unknown)]

Checksum: 0xaf5b [unverified]

[Checksum Status: Unverified]

Urgent pointer: 0

[Timestamps]

[Time since first frame in this TCP stream: 0.000000000 seconds]

0000 52 54 00 12 35 02 08 00 27 28 14 3a 08 00 45 00 RT: 5... '(:::E

0010 00 28 8c ed 40 00 40 06 fe a1 0a 00 02 0f 48 15 :(: @ @H

0020 5b 1d d3 50 00 50 7c bd b4 d8 01 c1 44 51 50 10 [..P]..DQP

0030 8a 84 af 5b 00 00[..

Transmission Control Protocol: Protocol

Packets: 158 · Displayed: 158 (100.0%) · Dropped: 0 (0.0%) Profile: Default

1. Source is 192.168.1.102, TCP port number is 1161
2. Destination is 128.119.245.12, TCP port number is 80

The image shows a Wireshark packet capture analysis of a network trace. The top pane displays a list of captured packets. Packet 199 is highlighted, showing an HTTP POST request from 192.168.1.102 to 128.119.245.12 on port 80. The bottom pane shows the detailed view of this packet, including the Ethernet II header, Internet Protocol Version 4 header, and Transmission Control Protocol (TCP) header. The TCP header details are expanded, showing the source port (1161), destination port (80), sequence number (164041), and acknowledgment number (1). The packet payload is also visible, showing the HTTP POST request body.

| No. | Time | Source | Destination | Protocol | Length | Info |
|-----|----------|----------------|----------------|----------|--------|--|
| 196 | 5.201150 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=162309 Ack=1 Win=17520 Len=1460 [TCP segment of a reassembled PDU] |
| 197 | 5.202024 | 192.168.1.102 | 128.119.245.12 | TCP | 326 | 1161 → 80 [PSH, ACK] Seq=163769 Ack=1 Win=17520 Len=272 [TCP segment of a reassembled PDU] |
| 198 | 5.297257 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=159389 Win=62780 Len=0 |
| 199 | 5.297341 | 192.168.1.102 | 128.119.245.12 | HTTP | 104 | POST /etherbase-labs/lab3-1-reply.htm HTTP/1.1 (text/plain) |
| 200 | 5.389471 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=162309 Win=62780 Len=0 |
| 201 | 5.447887 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=164041 Win=62780 Len=0 |
| 202 | 5.455830 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=164091 Win=62780 Len=0 |
| 203 | 5.461175 | 128.119.245.12 | 192.168.1.102 | HTTP | 784 | HTTP/1.1 200 OK (text/html) |
| 204 | 5.598090 | 192.168.1.100 | 192.168.1.1 | SSDP | 174 | M-SEARCH * HTTP/1.1 |
| 205 | 5.599082 | 192.168.1.100 | 192.168.1.1 | SSDP | 175 | M-SEARCH * HTTP/1.1 |
| 206 | 5.651141 | 192.168.1.102 | 128.119.245.12 | TCP | 54 | 1161 → 80 [ACK] Seq=164091 Ack=731 Win=16790 Len=0 |
| 207 | 6.101044 | 192.168.1.100 | 192.168.1.1 | SSDP | 174 | M-SEARCH * HTTP/1.1 |
| 208 | 6.102069 | 192.168.1.100 | 192.168.1.1 | SSDP | 175 | M-SEARCH * HTTP/1.1 |
| 209 | 6.600152 | 192.168.1.100 | 192.168.1.1 | SSDP | 174 | M-SEARCH * HTTP/1.1 |
| 210 | 6.601063 | 192.168.1.100 | 192.168.1.1 | SSDP | 175 | M-SEARCH * HTTP/1.1 |

Frame 199: 104 bytes on wire (832 bits), 104 bytes captured (832 bits) on interface 0
Ethernet II, Src: Actionte_8a:70:1a (00:20:e0:8a:70:1a), Dst: LinksysG_da:af:73 (00:06:25:da:af:73)
Internet Protocol Version 4, Src: 192.168.1.102, Dst: 128.119.245.12
Transmission Control Protocol, Src Port: 1161, Dst Port: 80, Seq: 164041, Ack: 1, Len: 50
Destination Port: 80
[Stream index: 0]
[TCP Segment Len: 50]
Sequence number: 164041 (relative sequence number)
[Next sequence number: 164091 (relative sequence number)]
Acknowledgment number: 1 (relative ack number)
0101 ... = Header Length: 20 bytes (5)
Flags: 0x018 (PSH, ACK)
Window size value: 17520
[Calculated window size: 17520]
[Window size scaling factor: -2 (no window scaling used)]
Checksum: 0x9f0f [unverified]
[Checksum Status: Unverified]
Urgent pointer: 0
[SEQ/ACK analysis]
[Timestamps]
TCP payload (50 bytes)
TCP segment data (50 bytes)

0020 f5 0c 34 89 00 50 0d d8 82 bd 34 a2 74 1a 50 18 ...P...4.t.P
0030 44 70 9f 0f 00 00 0d 0a 2d 2d 2d 2d 2d 2d 2d 2d Up.....

Frame (104 bytes) Reassembled TCP (164090 bytes)

Transmission Control Protocol (tcp), 20 bytes

Packets: 213 · Displayed: 213 (100.0%) Profile: Default

3. Source is 10.0.2.15, TCP port number is 54524

Destination is 128.119.245.12, TCP port number is 443

Applications [tcp-ethereal-trace-1] tcp lab prelim.pcapng Downloads - File Manager 19:04 root

tcp lab prelim.pcapng

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| No. | Time | Source | Destination | Protocol | Length | Info |
|-----|-------------|----------------|----------------|----------|--------|--|
| 144 | 1.842394398 | 128.119.245.12 | 10.0.2.15 | TCP | 60 | 80 → 43452 [ACK] Seq=1 Ack=144541 Win=52560 Len=0 |
| 145 | 1.842395831 | 128.119.245.12 | 10.0.2.15 | TCP | 60 | 80 → 43452 [ACK] Seq=1 Ack=146001 Win=51100 Len=0 |
| 146 | 1.842397229 | 128.119.245.12 | 10.0.2.15 | TCP | 60 | 80 → 43452 [ACK] Seq=1 Ack=147461 Win=49640 Len=0 |
| 147 | 1.842398617 | 128.119.245.12 | 10.0.2.15 | TCP | 60 | 80 → 43452 [ACK] Seq=1 Ack=148921 Win=48180 Len=0 |
| 148 | 1.842400416 | 128.119.245.12 | 10.0.2.15 | TCP | 60 | 80 → 43452 [ACK] Seq=1 Ack=149323 Win=47778 Len=0 |
| 149 | 2.047927128 | 10.0.2.15 | 54.230.34.59 | TCP | 54 | 54524 → 443 [ACK] Seq=1 Ack=1 Win=65320 Len=0 |
| 150 | 2.048108741 | 54.230.34.59 | 10.0.2.15 | TCP | 60 | [TCP ACKed unseen segment] 443 → 54524 [ACK] Seq=1 Ack=2 Win=65535 Len=0 |
| 151 | 2.289107743 | 128.119.245.12 | 10.0.2.15 | TCP | 60 | [TCP Window Update] 80 → 43452 [ACK] Seq=1 Ack=149323 Win=65535 Len=0 |
| 152 | 2.472201310 | 128.119.245.12 | 10.0.2.15 | HTTP | 831 | HTTP/1.1 200 OK (text/html) |
| 153 | 2.472229898 | 10.0.2.15 | 128.119.245.12 | TCP | 54 | 43452 → 80 [ACK] Seq=149323 Ack=778 Win=30303 Len=0 |
| 154 | 6.656020609 | 10.0.2.15 | 172.217.9.174 | TCP | 54 | 60834 → 80 [ACK] Seq=1 Ack=1 Win=30315 Len=0 |
| 155 | 6.656061146 | 172.217.9.174 | 10.0.2.15 | TCP | 60 | [TCP ACKed unseen segment] 80 → 60834 [ACK] Seq=1 Ack=2 Win=65535 Len=0 |
| 156 | 7.485199931 | 128.119.245.12 | 10.0.2.15 | TCP | 60 | 80 → 43452 [FIN, ACK] Seq=778 Ack=149323 Win=65535 Len=0 |
| 157 | 7.485510513 | 10.0.2.15 | 128.119.245.12 | TCP | 54 | 43452 → 80 [FIN, ACK] Seq=149323 Ack=779 Win=30303 Len=0 |
| 158 | 7.486505880 | 128.119.245.12 | 10.0.2.15 | TCP | 60 | 80 → 43452 [ACK] Seq=779 Ack=149324 Win=65535 Len=0 |

Frame 149: 54 bytes on wire (432 bits), 54 bytes captured (432 bits) on interface 0
Ethernet II, Src: PcsCompu_28:14:3a (08:00:27:28:14:3a), Dst: RealtekU_12:35:02 (52:54:00:12:35:02)
Internet Protocol Version 4, Src: 10.0.2.15, Dst: 54.230.34.59
Transmission Control Protocol, Src Port: 54524, Dst Port: 443, Seq: 1, Ack: 1, Len: 0
Source Port: 54524
Destination Port: 443
[Stream index: 5]
[TCP Segment Len: 0]
Sequence number: 1 (relative sequence number)
[Next sequence number: 1 (relative sequence number)]
Acknowledgment number: 1 (relative ack number)
0101 = Header Length: 20 bytes (5)
Flags: 0x010 (ACK)
Window size value: 65320
[Calculated window size: 65320]
[Window size scaling factor: -1 (unknown)]
Checksum: 0x654a [unverified]
[Checksum Status: Unverified]
Urgent pointer: 0
[Timestamps]

0000 52 54 00 12 35 02 08 00 27 28 14 3a 08 00 45 00 RT...5... '(:...E.
0010 00 28 38 4b 40 00 40 06 9d 55 0a 00 02 0f 36 e6 .(8K@-@-U...6.
0020 22 3b d4 fc 01 bb ea af 7a 3d 02 1f 6e 3b 50 10 " ;.....z=...n;P.
0030 ff 28 65 4a 00 00 .(eJ...

tcp lab prelim.pcapng Packets: 158 · Displayed: 158 (100.0%) Profile: Default

4. The sequence number of the TCP SYN segment is 0. The SYN flag is set to one, which is an indication of a SYN segment.

The image shows a Wireshark packet capture analysis of a TCP SYN segment. The top pane displays a list of packets, with the first packet (No. 1) selected. The middle pane shows the details of this packet, and the bottom pane shows the raw packet data in hexadecimal and ASCII.

Packet List:

| No. | Time | Source | Destination | Protocol | Length | Info |
|-----|----------|----------------|----------------|----------|--------|--|
| 1 | 0.000000 | 192.168.1.102 | 128.119.245.12 | TCP | 62 | 1161 → 80 [SYN] Seq=0 Win=16384 Len=0 MSS=1460 SACK_PERM=1 |
| 2 | 0.023172 | 128.119.245.12 | 192.168.1.102 | TCP | 62 | 80 → 1161 [SYN, ACK] Seq=0 Ack=1 Win=5840 Len=0 MSS=1460 SACK_PERM=1 |
| 3 | 0.023265 | 192.168.1.102 | 128.119.245.12 | TCP | 54 | 1161 → 80 [ACK] Seq=1 Ack=1 Win=17520 Len=0 |
| 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 |
| 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 |
| 6 | 0.053937 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=566 Win=6780 Len=0 |
| 7 | 0.054926 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=2026 Ack=1 Win=17520 Len=1460 |

Packet Details:

- Frame 1: 62 bytes on wire (496 bits), 62 bytes captured (496 bits)
- Ethernet II, Src: Actionte_8a:70:1a (00:20:e0:8a:70:1a), Dst: LinksysG_da:af:73 (00:06:25:da:af:73)
- Internet Protocol Version 4, Src: 192.168.1.102, Dst: 128.119.245.12
- Transmission Control Protocol, Src Port: 1161, Dst Port: 80, Seq: 0, Len: 0
 - Source Port: 1161
 - Destination Port: 80
 - [Stream index: 0]
 - [TCP Segment Len: 0]
 - Sequence number: 0 (relative sequence number)
 - [Next sequence number: 0 (relative sequence number)]
 - Acknowledgment number: 0
 - 0111 = Header Length: 28 bytes (7)
 - 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
 - [TCP Flags:S.]
 - Window size value: 16384
 - [Calculated window size: 16384]
 - Checksum: 0xf6e9 [unverified]
 - [Checksum Status: Unverified]
 - Urgent pointer: 0
 - Options: (8 bytes), Maximum segment size, No-Operation (NOP), No-Operation (NOP), SACK permitted
 - [Timestamps]

Raw Packet Data:

```
0000 00 06 25 da af 73 00 20 e0 8a 70 1a 08 00 45 00  ..-%.s. .p..E.
0010 00 30 1e 1d 40 00 00 06 a5 18 c0 a8 01 66 80 77  .0..@... ..fSw
0020 f5 08 04 89 00 50 0d d6 01 f4 00 00 00 00 70 02  .P...P.....p
0030 40 00 f6 e9 00 00 02 04 05 b4 01 01 04 02      @.....
```

Flags (12 bits) (tcp.flags), 2 bytes

Packets: 213 · Displayed: 213 (100.0%)

Profile: Default

5.

- The sequence number is sent to the client in reply to the SYN is 0.
- The value of the ACK field in the SYNACK segment is 1.
- This value is determined by the destination machine by adding 1 to the sequence from the client machine.
- The SYN and Acknowledgment flag identify the segment as a SYNACK segment as they are both set to 1.

The screenshot displays the Wireshark interface with a packet capture of a TCP SYNACK segment. The packet list shows a SYNACK segment from 192.168.1.102 to 128.119.245.12, sequence number 0, and acknowledgment number 1. The packet details pane shows the TCP header with the SYN flag set and the acknowledgment number 1. The packet bytes pane shows the raw data of the packet.

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tcp-ethereal-trace-1

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| No. | Time | Source | Destination | Protocol | Length | Info |
|-----|----------|----------------|----------------|----------|--------|--|
| 1 | 0.000000 | 192.168.1.102 | 128.119.245.12 | TCP | 62 | 1161 → 80 [SYN] Seq=0 Win=16384 Len=0 MSS=1460 SACK_PERM=1 |
| 2 | 0.023172 | 128.119.245.12 | 192.168.1.102 | TCP | 62 | 80 → 1161 [SYN, ACK] Seq=0 Ack=1 Win=5840 Len=0 MSS=1460 SACK_PERM=1 |
| 3 | 0.023265 | 192.168.1.102 | 128.119.245.12 | TCP | 54 | 1161 → 80 [ACK] Seq=1 Ack=1 Win=17520 Len=0 |
| 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 |
| 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 |
| 6 | 0.053937 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=566 Win=6780 Len=0 |
| 7 | 0.054026 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=2026 Ack=1 Win=17520 Len=1460 |

Frame 2: 62 bytes on wire (496 bits), 62 bytes captured (496 bits)

Ethernet II, Src: LinksysG_da:af:73 (00:06:25:da:af:73), Dst: Actionte_8a:70:1a (00:20:e0:8a:70:1a)

Internet Protocol Version 4, Src: 128.119.245.12, Dst: 192.168.1.102

Transmission Control Protocol, Src Port: 80, Dst Port: 1161, Seq: 0, Ack: 1, Len: 0

Source Port: 80

Destination Port: 1161

[Stream index: 0]

[TCP Segment Len: 0]

Sequence number: 0 (relative sequence number)

[Next sequence number: 0 (relative sequence number)]

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

[TCP Flags:A..S.]

Window size value: 5840

[Calculated window size: 5840]

Checksum: 0x774d [unverified]

[Checksum Status: Unverified]

Urgent pointer: 0

Options: (8 bytes), Maximum segment size, No-Operation (NOP), No-Operation (NOP), SACK permitted

[SEQ/ACK analysis]

0000 00 20 e0 8a 70 1a 00 06 25 da af 73 08 00 45 00 ...p...%..s..E..

0010 00 30 00 00 40 00 37 06 0c 36 00 77 f5 0c c0 a8 ..@..7..6w...

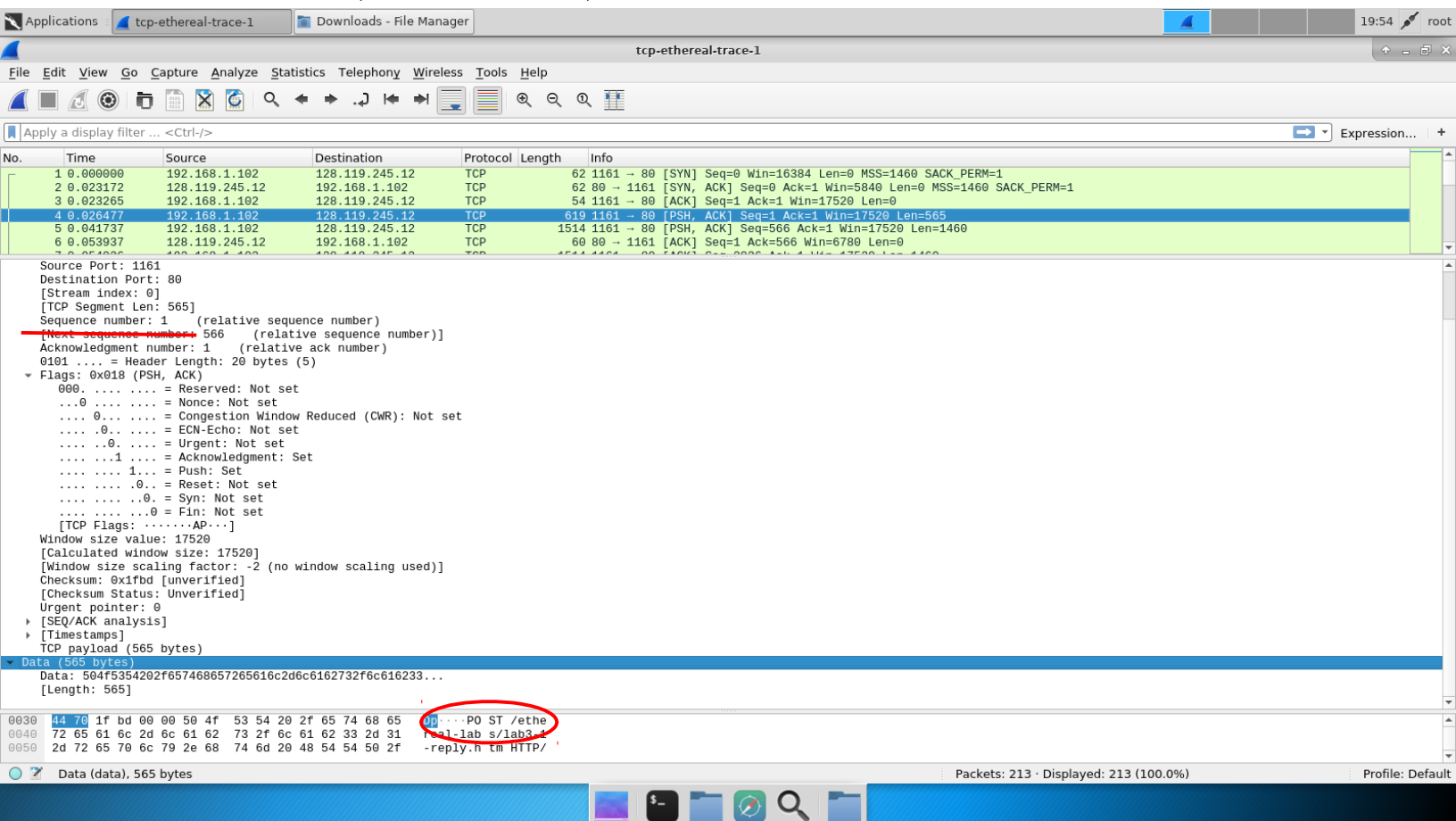
0020 01 06 00 50 04 00 34 a2 74 19 0d d6 01 f5 70 12 ..f.P..4..t....p..

0030 16 d0 77 4d 00 00 02 04 05 b4 01 01 04 02 ...WM.....

Flags (12 bits) (tcp.flags), 2 bytes

Packets: 213 · Displayed: 213 (100.0%) Profile: Default

6. The sequence number of the HTTP POST command has a value of 1. POST appears in the data field (in the screenshot).



7. A, B, C, D:

| # | Segment | Sequence Number | Sent | ACK | RTT(ACK-Sent) |
|----|---------|-----------------|--------|-------|---------------|
| 4 | 1 | 1 | 0.026 | 0.053 | 0.027 |
| 5 | 2 | 566 | 0.041 | 0.077 | 0.036 |
| 7 | 3 | 2026 | 0.054 | 0.124 | 0.070 |
| 8 | 4 | 3486 | 0.0546 | 0.169 | 0.114 |
| 10 | 5 | 4946 | 0.077 | 0.217 | 0.140 |
| 11 | 6 | 6406 | 0.078 | 0.267 | 0.189 |

Estimated RTT's for each segment:

The text gives the following equation: $EstRTT = (1-\alpha) * EstRTT + \alpha * SampleRTT$ where $\alpha = 0.125$

| Segment | Estimated RTT |
|---------|---------------|
| 1 | 0.027 |
| 2 | 0.028 |
| 3 | 0.033 |
| 4 | 0.044 |
| 5 | 0.055 |
| 6 | 0.073 |

tcp-ethereal-trace-1

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| No. | Time | Source | Destination | Protocol | Length | Info |
|-----|----------|----------------|----------------|----------|--------|--|
| 1 | 0.000000 | 192.168.1.102 | 128.119.245.12 | TCP | 62 | 1161 → 80 [SYN] Seq=0 Win=16384 Len=0 MSS=1460 SACK_PERM=1 |
| 2 | 0.023172 | 128.119.245.12 | 192.168.1.102 | TCP | 62 | 80 → 1161 [SYN, ACK] Seq=0 Ack=1 Win=5840 Len=0 MSS=1460 SACK_PERM=1 |
| 3 | 0.023265 | 192.168.1.102 | 128.119.245.12 | TCP | 54 | 1161 → 80 [ACK] Seq=1 Ack=1 Win=17520 Len=0 |
| 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 |
| 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 |
| 6 | 0.053937 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=566 Win=6780 Len=0 |
| 7 | 0.054026 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=2026 Ack=1 Win=17520 Len=1460 |
| 8 | 0.054690 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=3486 Ack=1 Win=17520 Len=1460 |
| 9 | 0.077294 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=2026 Win=8760 Len=0 |
| 10 | 0.077405 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=4946 Ack=1 Win=17520 Len=1460 |
| 11 | 0.078157 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=6406 Ack=1 Win=17520 Len=1460 |
| 12 | 0.124085 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=3486 Win=11680 Len=0 |

Acknowledgment number: 566 (relative ack number)
 0101 = Header Length: 20 bytes (5)
 Flags: 0x010 (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
0... = Syn: Not set
0... = Fin: Not set
 [TCP Flags:A....]
 Window size value: 6780
 [Calculated window size: 6780]
 [Window size scaling factor: -2 (no window scaling used)]
 Checksum: 0x9e30 [unverified]
 [Checksum Status: Unverified]
 Urgent pointer: 0
 [SEQ/ACK analysis]
 [This is an ACK to the segment in frame: 4]
 [The RTT to ACK the segment was: 0.027400000 seconds]
 [RTT: 0.023265000 seconds]
 [Timestamps]
 [Time since first frame in this TCP stream: 0.053937000 seconds]
 [Time since previous frame in this TCP stream: 0.012200000 seconds]

0010 00 28 58 72 40 00 37 06 b3 cb 80 77 f5 0c c0 a8 .(Xr@-7. ...w...
 0020 01 66 00 50 04 89 34 a2 74 1a 0d d6 04 2a 50 10 .f.P..4. t....*P.
 0030 1a 7c 9e 30 00 00 da 12 00 00 47 a5 .!..0....G.

8. The length of each of the first six segments:

| Segment | Length |
|---------|--------|
| 1 | 565 |
| 2 | 1460 |
| 3 | 1460 |
| 4 | 1460 |
| 5 | 1460 |
| 6 | 1460 |

| No. | Time | Source | Destination | Protocol | Length | Info |
|-----|----------|----------------|----------------|----------|--------|--|
| 1 | 0.000000 | 192.168.1.102 | 128.119.245.12 | TCP | 62 | 1161 → 80 [SYN] Seq=0 Win=16384 Len=0 MSS=1460 SACK_PERM=1 |
| 2 | 0.023172 | 128.119.245.12 | 192.168.1.102 | TCP | 62 | 80 → 1161 [SYN, ACK] Seq=0 Ack=1 Win=5840 Len=0 MSS=1460 SACK_PERM=1 |
| 3 | 0.023265 | 192.168.1.102 | 128.119.245.12 | TCP | 54 | 1161 → 80 [ACK] Seq=1 Ack=1 Win=17520 Len=0 |
| 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 |
| 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 |
| 6 | 0.053937 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=566 Win=6780 Len=0 |
| 7 | 0.054026 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=2026 Ack=1 Win=17520 Len=1460 |
| 8 | 0.054690 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=3486 Ack=1 Win=17520 Len=1460 |
| 9 | 0.077294 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=2026 Win=8760 Len=0 |
| 10 | 0.077405 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=4946 Ack=1 Win=17520 Len=1460 |
| 11 | 0.078157 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=6406 Ack=1 Win=17520 Len=1460 |
| 12 | 0.124085 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=3486 Win=11680 Len=0 |

```

...0 .... = Nonce: Not set
... 0... = Congestion Window Reduced (CWR): Not set
... .0... = ECN-Echo: Not set
... ..0... = Urgent: Not set
... ...1... = Acknowledgment: Set
... ....1... = Push: Set
... .....0... = Reset: Not set
... .....0... = Syn: Not set
... .....0... = Fin: Not set
[TCP Flags: .....AP...]

```

Window size value: 17520

[Calculated window size: 17520]

[Window size scaling factor: -2 (no window scaling used)]

Checksum: 0x1fbd [unverified]

[Checksum Status: Unverified]

Urgent pointer: 0

▼ [SEQ/ACK analysis]

[iRTT: 0.023265000 seconds]

[Bytes in flight: 565]

[Bytes sent since last PSH flag: 565]

▼ [Timestamps]

[Time since first frame in this TCP stream: 0.026477000 seconds]

[Time since previous frame in this TCP stream: 0.003212000 seconds]

TCP payload (565 bytes)

▼ Data (565 bytes)

Data: 504f5354202f657468657265616c2d6c6162732f6c616233...

[Length: 565]

```

0030 44 70 1f bd 00 00 50 4f 53 54 20 2f 65 74 68 65  Dp....P0 ST /ethe
0040 72 65 61 6c 2d 6c 61 62 73 2f 6c 61 62 33 2d 31  real-lab s/lab3-1
0050 2d 72 65 70 6c 79 2e 68 74 6d 20 48 54 54 50 2f  -reply.h tm HTTP/

```

The window size scaling factor (-1 when unknown, -2 when no scaling is used) (tcp.window_size_scalefactor), 2 bytes

Packets: 213 · Displa

Length of the last five in question is 1460.

| No. | Time | Source | Destination | Protocol | Length | Info |
|-----|----------|----------------|----------------|----------|--------|--|
| 1 | 0.000000 | 192.168.1.102 | 128.119.245.12 | TCP | 62 | 1161 → 80 [SYN] Seq=0 Win=16384 Len=0 MSS=1460 SACK_PERM=1 |
| 2 | 0.023172 | 128.119.245.12 | 192.168.1.102 | TCP | 62 | 80 → 1161 [SYN, ACK] Seq=0 Ack=1 Win=5840 Len=0 MSS=1460 SACK_PERM=1 |
| 3 | 0.023265 | 192.168.1.102 | 128.119.245.12 | TCP | 54 | 1161 → 80 [ACK] Seq=1 Ack=1 Win=17520 Len=0 |
| 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 |
| 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 |
| 6 | 0.053937 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=566 Win=6780 Len=0 |
| 7 | 0.054026 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=2026 Ack=1 Win=17520 Len=1460 |
| 8 | 0.054690 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=3486 Ack=1 Win=17520 Len=1460 |
| 9 | 0.077294 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=2026 Win=8760 Len=0 |
| 10 | 0.077405 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=4946 Ack=1 Win=17520 Len=1460 |
| 11 | 0.078157 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=6406 Ack=1 Win=17520 Len=1460 |
| 12 | 0.124085 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=3486 Win=11680 Len=0 |

```

...0 .... = Nonce: Not set
....0.... = Congestion Window Reduced (CWR): Not set
....0.... = ECN-Echo: Not set
....0.... = Urgent: Not set
....1.... = Acknowledgment: Set
....1.... = Push: Set
....0.... = Reset: Not set
....0.... = Syn: Not set
....0.... = Fin: Not set
[TCP Flags: .....AP...]

```

```
Window size value: 17520
[Calculated window size: 17520]
```

```
[Window size scaling factor: -2 (no window scaling used)]
```

Checksum: 0x3be5 [unverified]

[Checksum Status: Unverified]

Urgent pointer: 0
5650/ACK analysis

```
EQ/ACK analysis]
[iRTT: 0.023265000 seconds]
```

```
[Bytes in flight: 2025]
```

```
[Bytes sent since last PSH flag: 1460]
```

▼ [Timestamps]

```
[Time since first frame in this TCP stream: 0.041737000 seconds]
```

```
[Time since previous frame in this TCP stream: 0.015260000 seconds]
```

TCP payload (1460 bytes)
 ... (1460 bytes)

Data: 426f6e74656e742d5470706552a206d756c7469706172742f

```
Data: 436f6e74
[Length: 1460]
```

```
0030 44 70 3b e5 00 00 43 6f 6e 74 65 6e 74 2d 54 79 dp;...Content-Ty
0040 70 65 3a 20 6d 75 6c 74 69 70 61 72 74 2f 66 6f pe: multipart/fo
0050 72 6d 2d 64 61 74 61 3b 20 62 6f 75 6e 64 61 72 rm-data; boundar
```

The window size scaling factor (-1 when unknown, -2 when no scaling is used) (tcp.window_size_scalefactor), 2 bytes

9. In the acknowledgment to the first SYN, the min buffer space is given in the Win specification, it is 5840 bytes.

tcp-ethereal-trace-1

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/>

| No. | Time | Source | Destination | Protocol | Length | Info |
|-----|----------|----------------|----------------|----------|--------|--|
| 1 | 0.000000 | 192.168.1.102 | 128.119.245.12 | TCP | 62 | 1161 → 80 [SYN] Seq=0 Win=16384 Len=0 MSS=1460 SACK_PERM=1 |
| 2 | 0.023172 | 128.119.245.12 | 192.168.1.102 | TCP | 62 | 80 → 1161 [SYN, ACK] Seq=0 Ack=1 Win=5840 Len=0 MSS=1460 SACK_PERM=1 |
| 3 | 0.023265 | 192.168.1.102 | 128.119.245.12 | TCP | 54 | 1161 → 80 [ACK] Seq=1 Ack=1 Win=17520 Len=0 |
| 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 |
| 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 |
| 6 | 0.053937 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=566 Win=6780 Len=0 |
| 7 | 0.054026 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=2026 Ack=1 Win=17520 Len=1460 |
| 8 | 0.054690 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=3486 Ack=1 Win=17520 Len=1460 |
| 9 | 0.077294 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=2026 Win=8760 Len=0 |
| 10 | 0.077405 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=4946 Ack=1 Win=17520 Len=1460 |
| 11 | 0.078157 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=6406 Ack=1 Win=17520 Len=1460 |
| 12 | 0.124085 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=3486 Win=11680 Len=0 |

Acknowledgment number: 1 (relative ack number)
0111 = Header Length: 28 bytes (7)
Flags: 0x012 (SYN, ACK)
...0 = Reserved: Not set
...0 = Nonce: Not set
....0... = Congestion Window Reduced (CWR): Not set
....0... = ECN-Echo: Not set
....0... = Urgent: Not set
....01 = Acknowledgment: Set
....0... = Push: Not set
....0... = Reset: Not set
....01 = Syn: Set
....0... = Fin: Not set
[TCP Flags:A..S.]
Window size value: 5840
[Calculated window size: 5840]
Checksum: 0x774d [unverified]
[Checksum Status: Unverified]
Urgent pointer: 0
Options: (8 bytes), Maximum segment size, No-Operation (NOP), No-Operation (NOP), SACK permitted
[SEQ/ACK analysis]
[This is an ACK to the segment in frame: 1]
[The RTT to ACK the segment was: 0.023172000 seconds]
[RTT: 0.023265000 seconds]
[Timestamps]
[Time since first frame in this TCP stream: 0.023172000 seconds]
[Time since previous frame in this TCP stream: 0.023172000 seconds]

0010 00 30 00 00 40 00 37 06 0c 36 80 77 f5 0c c0 a8 :0..@.7..6.w...
0020 01 66 00 50 04 89 34 a2 74 19 0d d6 01 f5 70 12 :f.P..4. t....p
0030 16 d0 77 4d 00 00 02 04 05 b4 01 01 04 02 :..wM....

Congestion Window Reduced (CWR) (tcp.flags.cwr), 1 byte

Packets: 213 · Displayed:

9b. The sender does not appear to be throttled as the value reaches 62780 bytes.

| No. | Time | Source | Destination | Protocol | Length | Info |
|-----|----------|----------------|----------------|----------|--------|--|
| 31 | 0.577385 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=18665 Ack=1 Win=17520 Len=1460 |
| 32 | 0.578329 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=20125 Ack=1 Win=17520 Len=1460 |
| 33 | 0.579195 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=21585 Ack=1 Win=17520 Len=1460 |
| 34 | 0.580149 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=23045 Ack=1 Win=17520 Len=1460 |
| 35 | 0.581074 | 192.168.1.102 | 128.119.245.12 | TCP | 946 | 1161 → 80 [PSH, ACK] Seq=24505 Ack=1 Win=17520 Len=892 |
| 36 | 0.626496 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=18665 Win=40880 Len=0 |
| 37 | 0.672796 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=20125 Win=43800 Len=0 |
| 38 | 0.730684 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=21585 Win=46720 Len=0 |
| 39 | 0.772990 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=23045 Win=49640 Len=0 |
| 40 | 0.820622 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=24505 Win=52560 Len=0 |
| 41 | 0.853186 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=25397 Win=52560 Len=0 |
| 42 | 0.853405 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=25397 Ack=1 Win=17520 Len=1460 |
| 43 | 0.854076 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=26857 Ack=1 Win=17520 Len=1460 |
| 44 | 0.855036 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=28317 Ack=1 Win=17520 Len=1460 |
| 45 | 0.855878 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=29777 Ack=1 Win=17520 Len=1460 |
| 46 | 0.856802 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=31237 Ack=1 Win=17520 Len=1460 |
| 47 | 0.857683 | 192.168.1.102 | 128.119.245.12 | TCP | 946 | 1161 → 80 [PSH, ACK] Seq=32697 Ack=1 Win=17520 Len=892 |
| 48 | 0.899423 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=26857 Win=55480 Len=0 |
| 49 | 0.949545 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=28317 Win=58400 Len=0 |
| 50 | 0.994715 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=29777 Win=61320 Len=0 |
| 51 | 1.039820 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=31237 Win=62780 Len=0 |
| 52 | 1.117097 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=33589 Win=62780 Len=0 |
| 53 | 1.117333 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=33589 Ack=1 Win=17520 Len=1460 |
| 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 |
| 62 | 1.389886 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=41781 Win=62780 Len=0 |
| 63 | 1.390110 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=41781 Ack=1 Win=17520 Len=1460 |
| 64 | 1.390824 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=43241 Ack=1 Win=17520 Len=1460 |
| 65 | 1.391683 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=44701 Ack=1 Win=17520 Len=1460 |
| 66 | 1.392594 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=46161 Ack=1 Win=17520 Len=1460 |

Acknowledgment number: 1 (relative ack number)

0101 = Header Length: 20 bytes (5)

Flags: 0x010 (ACK)

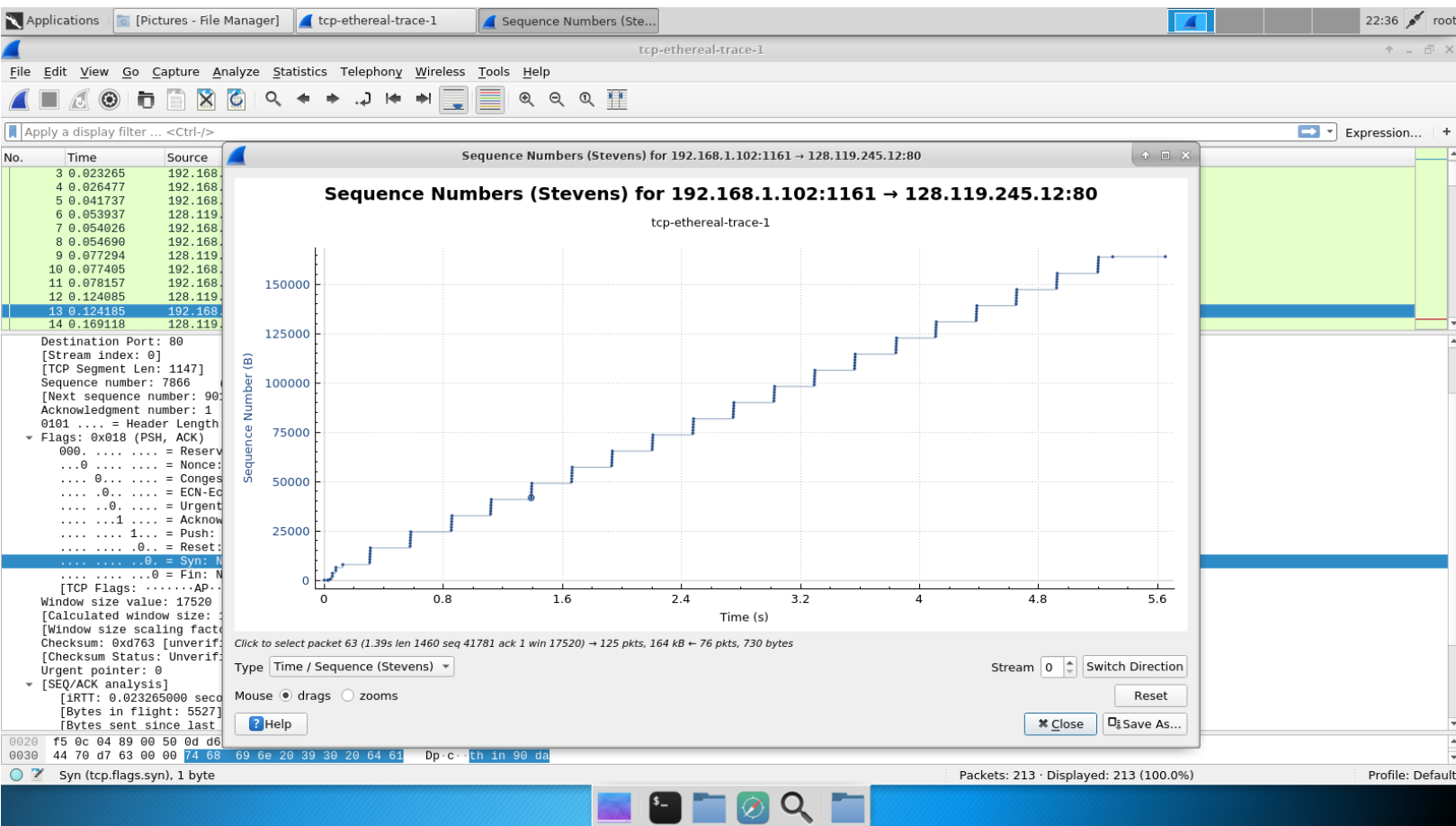
000. = Reserved: Not set

0. = Window: Not set

0020 f5 0c 04 89 00 50 0d d6 ea dd 34 a2 74 1a 50 10P...4.t.P

0030 44 70 13 50 00 00 3f 20 20 41 6c 69 63 65 20 6c Dp.P..? Alice 1

10. Re-transmitted segments show in the time/sequence graph as a lesser sequence number in respect to its previous and next segment. Because each sequence number increases and does not repeat itself, there are no segments which are re-transmitted.



11.

A pattern emerges that 1460 bytes is the typical and most frequent size of data that is acknowledged, however it can vary.

| | | | | | | | | |
|----|----------|----------------|----------------|-----|------|-----------|------------|------------------------------------|
| 3 | 0.023265 | 192.168.1.102 | 128.119.245.12 | TCP | 54 | 1161 → 80 | [ACK] | Seq=1 Ack=1 Win=17520 Len=0 |
| 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 |
| 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 |
| 6 | 0.053937 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 | [ACK] | Seq=1 Ack=566 Win=6780 Len=0 |
| 7 | 0.054026 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 | [ACK] | Seq=2026 Ack=1 Win=17520 Len=1460 |
| 8 | 0.054690 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 | [ACK] | Seq=3486 Ack=1 Win=17520 Len=1460 |
| 9 | 0.077294 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 | [ACK] | Seq=1 Ack=2026 Win=8760 Len=0 |
| 10 | 0.077405 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 | [ACK] | Seq=4946 Ack=1 Win=17520 Len=1460 |
| 11 | 0.078157 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 | [ACK] | Seq=6406 Ack=1 Win=17520 Len=1460 |
| 12 | 0.124885 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 | [ACK] | Seq=1 Ack=3486 Win=11680 Len=0 |
| 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 |
| 14 | 0.169118 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 | [ACK] | Seq=1 Ack=4946 Win=14600 Len=0 |
| 15 | 0.217299 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 | [ACK] | Seq=1 Ack=6406 Win=17520 Len=0 |
| 16 | 0.267802 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 | [ACK] | Seq=1 Ack=7866 Win=20440 Len=0 |
| 17 | 0.304807 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 | [ACK] | Seq=1 Ack=9013 Win=23360 Len=0 |
| 18 | 0.305040 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 | [ACK] | Seq=9013 Ack=1 Win=17520 Len=1460 |
| 19 | 0.305813 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 | [ACK] | Seq=10473 Ack=1 Win=17520 Len=1460 |
| 20 | 0.306692 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 | [ACK] | Seq=11933 Ack=1 Win=17520 Len=1460 |
| 21 | 0.307571 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 | [ACK] | Seq=13393 Ack=1 Win=17520 Len=1460 |
| 22 | 0.308699 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 | [ACK] | Seq=14853 Ack=1 Win=17520 Len=1460 |
| 23 | 0.309553 | 192.168.1.102 | 128.119.245.12 | TCP | 946 | 1161 → 80 | [PSH, ACK] | Seq=16313 Ack=1 Win=17520 Len=892 |
| 24 | 0.356437 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 | [ACK] | Seq=1 Ack=10473 Win=26280 Len=0 |
| 25 | 0.400164 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 | [ACK] | Seq=1 Ack=11933 Win=29200 Len=0 |
| 26 | 0.448613 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 | [ACK] | Seq=1 Ack=13393 Win=32120 Len=0 |
| 27 | 0.500029 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 | [ACK] | Seq=1 Ack=14853 Win=35040 Len=0 |
| 28 | 0.545052 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 | [ACK] | Seq=1 Ack=16313 Win=37960 Len=0 |
| 29 | 0.576417 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 | [ACK] | Seq=1 Ack=17205 Win=37960 Len=0 |
| 30 | 0.576671 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 | [ACK] | Seq=17205 Ack=1 Win=17520 Len=1460 |
| 31 | 0.577385 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 | [ACK] | Seq=18665 Ack=1 Win=17520 Len=1460 |
| 32 | 0.578329 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 | [ACK] | Seq=20125 Ack=1 Win=17520 Len=1460 |
| 33 | 0.579195 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 | [ACK] | Seq=21585 Ack=1 Win=17520 Len=1460 |
| 34 | 0.580149 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 | [ACK] | Seq=23045 Ack=1 Win=17520 Len=1460 |
| 35 | 0.581074 | 192.168.1.102 | 128.119.245.12 | TCP | 946 | 1161 → 80 | [PSH, ACK] | Seq=24505 Ack=1 Win=17520 Len=892 |
| 36 | 0.626496 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 | [ACK] | Seq=1 Ack=18665 Win=40880 Len=0 |
| 37 | 0.672796 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 | [ACK] | Seq=1 Ack=20125 Win=43800 Len=0 |
| 38 | 0.730684 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 | [ACK] | Seq=1 Ack=21585 Win=46720 Len=0 |
| 39 | 0.772990 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 | [ACK] | Seq=1 Ack=23045 Win=49640 Len=0 |
| 40 | 0.820622 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 | [ACK] | Seq=1 Ack=24505 Win=52560 Len=0 |
| 41 | 0.853186 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 | [ACK] | Seq=1 Ack=25397 Win=52560 Len=0 |
| 42 | 0.853405 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 | [ACK] | Seq=25397 Ack=1 Win=17520 Len=1460 |
| 43 | 0.854976 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 | [ACK] | Seq=26857 Ack=1 Win=17520 Len=1460 |

0000 00 20 e0 8a 70 1a 00 06 25 da af 73 08 00 45 00 . . . p . . . % . . s . E .

0010 00 28 58 74 40 00 37 06 b3 c9 80 77 f5 0c c0 a8 . (Xt @ . 7 w

Internet Protocol Version 4 (ip), 20 bytes

Packets: 213

11b. Yes, there are several cases where the receiver is ACKing every other received segment. One such example is number 179 acknowledged 2920 bytes. (1460+1460)

| No. | Time | Source | Destination | Protocol | Length | Info |
|-----|----------|----------------|----------------|----------|--------|---|
| 160 | 4.300300 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=129541 Win=62780 Len=0 |
| 161 | 4.379826 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=131893 Win=62780 Len=0 |
| 162 | 4.380034 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=131893 Ack=1 Win=17520 Len=1460 |
| 163 | 4.380741 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=133353 Ack=1 Win=17520 Len=1460 |
| 164 | 4.381618 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=134813 Ack=1 Win=17520 Len=1460 |
| 165 | 4.382478 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=136273 Ack=1 Win=17520 Len=1460 |
| 166 | 4.383659 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=137733 Ack=1 Win=17520 Len=1460 |
| 167 | 4.384548 | 192.168.1.102 | 128.119.245.12 | TCP | 946 | 1161 → 80 [PSH, ACK] Seq=139193 Ack=1 Win=17520 Len=892 |
| 168 | 4.476833 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=134813 Win=62780 Len=0 |
| 169 | 4.575928 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=137733 Win=62780 Len=0 |
| 170 | 4.648167 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=140085 Win=62780 Len=0 |
| 171 | 4.648386 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=140085 Ack=1 Win=17520 Len=1460 |
| 172 | 4.649100 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=141545 Ack=1 Win=17520 Len=1460 |
| 173 | 4.649993 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=143005 Ack=1 Win=17520 Len=1460 |
| 174 | 4.650926 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=144465 Ack=1 Win=17520 Len=1460 |
| 175 | 4.651858 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=145925 Ack=1 Win=17520 Len=1460 |
| 176 | 4.652735 | 192.168.1.102 | 128.119.245.12 | TCP | 946 | 1161 → 80 [PSH, ACK] Seq=147385 Ack=1 Win=17520 Len=892 |
| 177 | 4.747988 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=143005 Win=62780 Len=0 |
| 178 | 4.844598 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=145925 Win=62780 Len=0 |
| 179 | 4.920051 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=148277 Win=62780 Len=0 |
| 180 | 4.920310 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=148277 Ack=1 Win=17520 Len=1460 |
| 181 | 4.921025 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=149737 Ack=1 Win=17520 Len=1460 |
| 182 | 4.921916 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=151197 Ack=1 Win=17520 Len=1460 |
| 183 | 4.922820 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=152657 Ack=1 Win=17520 Len=1460 |
| 184 | 4.923863 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=154117 Ack=1 Win=17520 Len=1460 |
| 185 | 4.924667 | 192.168.1.102 | 128.119.245.12 | TCP | 946 | 1161 → 80 [PSH, ACK] Seq=155577 Ack=1 Win=17520 Len=892 |

▶ Frame 179: 60 bytes on wire (480 bits), 60 bytes captured (480 bits)
 ▶ Ethernet II, Src: LinksysG_da:af:73 (00:06:25:da:af:73), Dst: Actionte_8a:70:1a (00:20:e0:8a:70:1a)
 ▶ Internet Protocol Version 4, Src: 128.119.245.12, Dst: 192.168.1.102
 ▼ Transmission Control Protocol, Src Port: 80, Dst Port: 1161, Seq: 1, Ack: 148277, Len: 0
 Source Port: 80
 Destination Port: 1161
 [Stream index: 0]
 [TCP Segment Len: 0]
 Sequence number: 1 (relative sequence number)
 [Next sequence number: 1 (relative sequence number)]
 Acknowledgment number: 148277 (relative ack number)
 0101 = Header Length: 20 bytes (5)
 ▼ Flags: 0x010 (ACK)
 000. = Reserved: Not set
 0. = Nonce: Not set

| | | |
|------|---|---------------------|
| 0020 | 01 66 00 50 04 89 34 a2 74 1a 0d d8 45 29 50 10 | ..f.P...4. t...E)P. |
| 0030 | f5 3c 82 6e 00 00 bd db 00 00 c2 0d | ..<.n... .. |

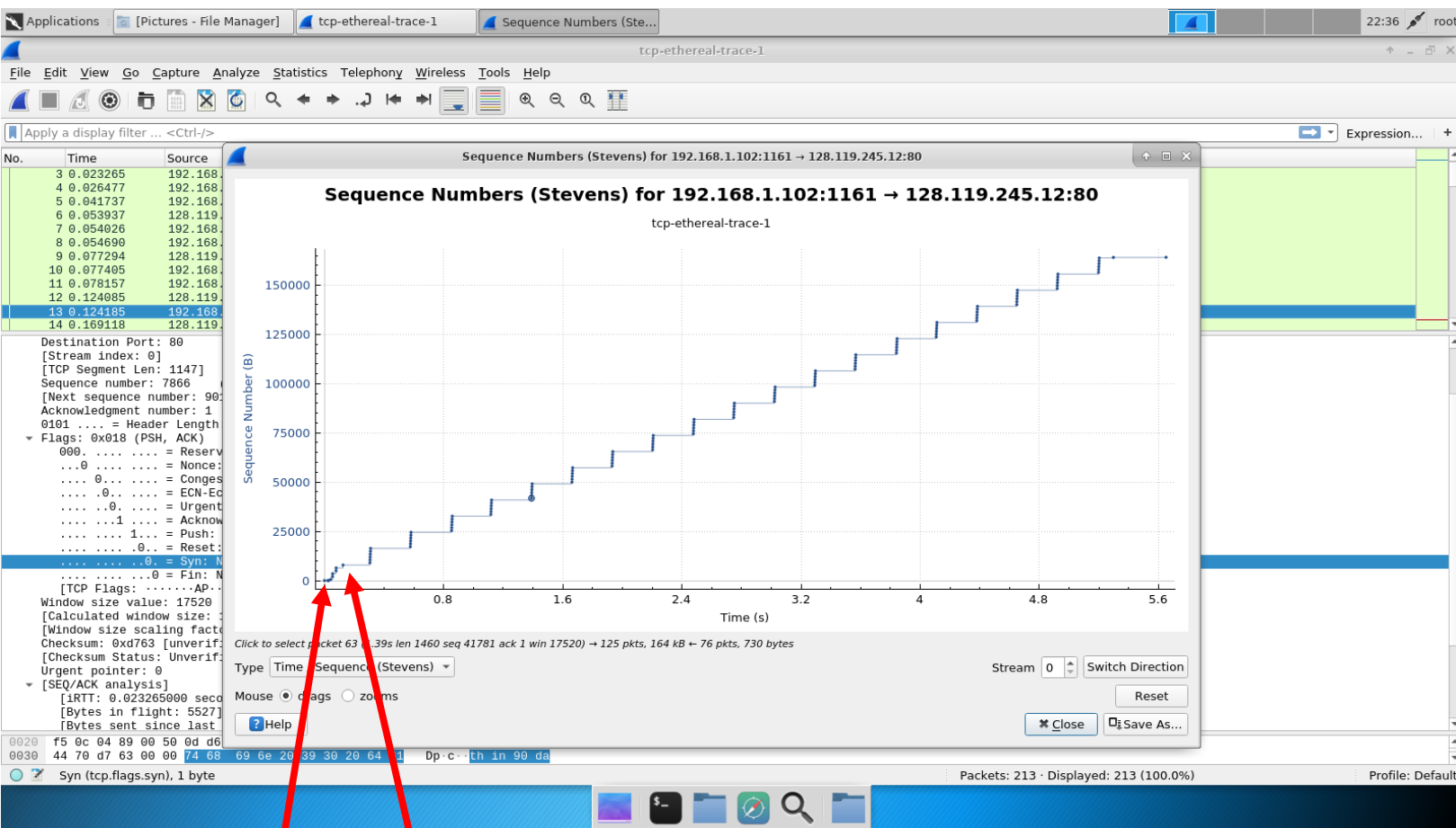
12. Throughput = total data/total time

The last acknowledgment has number 164091. The total time from the first acknowledgment at 0.0264 seconds to the last at 5.455 is 5.4286 seconds, therefore the throughput is 164091 bytes/5.4286 seconds = 30227.13 bytes per second.

| No. | Time | Source | Destination | Protocol | Length | Info |
|--|-------------|----------------|-------------------------|-------------------|--------|---|
| 193 | 5.198388 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=157929 Ack=1 Win=17520 Len=1460 |
| 194 | 5.199275 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=159389 Ack=1 Win=17520 Len=1460 |
| 195 | 5.200252 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=160849 Ack=1 Win=17520 Len=1460 |
| 196 | 5.201150 | 192.168.1.102 | 128.119.245.12 | TCP | 1514 | 1161 → 80 [ACK] Seq=162309 Ack=1 Win=17520 Len=1460 |
| 197 | 5.202024 | 192.168.1.102 | 128.119.245.12 | TCP | 326 | 1161 → 80 [PSH, ACK] Seq=163769 Ack=1 Win=17520 Len=272 |
| 198 | 5.297257 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=159389 Win=62780 Len=0 |
| 199 | 5.297341 | 192.168.1.102 | 128.119.245.12 | TCP | 104 | 1161 → 80 [PSH, ACK] Seq=164041 Ack=1 Win=17520 Len=50 |
| 200 | 5.389471 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=162309 Win=62780 Len=0 |
| 201 | 5.447887 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=164041 Win=62780 Len=0 |
| 202 | 5.455830 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=164091 Win=62780 Len=0 |
| 203 | 5.455830 | 128.119.245.12 | 192.168.1.102 | TCP | 60 | 80 → 1161 [ACK] Seq=1 Ack=164091 Win=62780 Len=0 |
| 204 | 5.598090 | 192.168.1.100 | 192.168.1.1 | SSDP | 174 | M-SEARCH * HTTP/1.1 |
| 205 | 5.599082 | 192.168.1.100 | 192.168.1.1 | SSDP | 175 | M-SEARCH * HTTP/1.1 |
| 206 | 5.651141 | 192.168.1.102 | 128.119.245.12 | TCP | 54 | 1161 → 80 [ACK] Seq=164091 Ack=731 Win=16790 Len=0 |
| 207 | 6.101044 | 192.168.1.100 | 192.168.1.1 | SSDP | 174 | M-SEARCH * HTTP/1.1 |
| 208 | 6.102069 | 192.168.1.100 | 192.168.1.1 | SSDP | 175 | M-SEARCH * HTTP/1.1 |
| 209 | 6.600152 | 192.168.1.100 | 192.168.1.1 | SSDP | 174 | M-SEARCH * HTTP/1.1 |
| 210 | 6.601063 | 192.168.1.100 | 192.168.1.1 | SSDP | 175 | M-SEARCH * HTTP/1.1 |
| 211 | 7.102852 | 192.168.1.100 | 192.168.1.1 | SSDP | 174 | M-SEARCH * HTTP/1.1 |
| Source Port: 80 | | | | | | |
| Destination Port: 1161 | | | | | | |
| [Stream index: 0] | | | | | | |
| [TCP Segment Len: 0] | | | | | | |
| Sequence number: 1 (relative sequence number) | | | | | | |
| [Next sequence number: 1 (relative sequence number)] | | | | | | |
| Acknowledgment number: 164091 (relative ack number) | | | | | | |
| 0101 = Header Length: 20 bytes (5) | | | | | | |
| ▼ Flags: 0x010 (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 | | | | | | |
|0. = Syn: Not set | | | | | | |
|0 = Fin: Not set | | | | | | |
| [TCP Flags:A....] | | | | | | |
| Window size value: 62780 | | | | | | |
| [Calculated window size: 62780] | | | | | | |
| 0020 | 01 66 00 50 | 04 89 34 a2 | 74 1a 0d d8 82 ef 50 10 | .f.P...4. t....P. | | |
| 0030 | f5 3c 44 a8 | 00 00 e5 e7 | 00 00 07 fb | .<D.... | | |

13.

Slowstart begins at 0 and congestion avoidance begins around .1 seconds.



Start

Congestion Avoidance takes over