

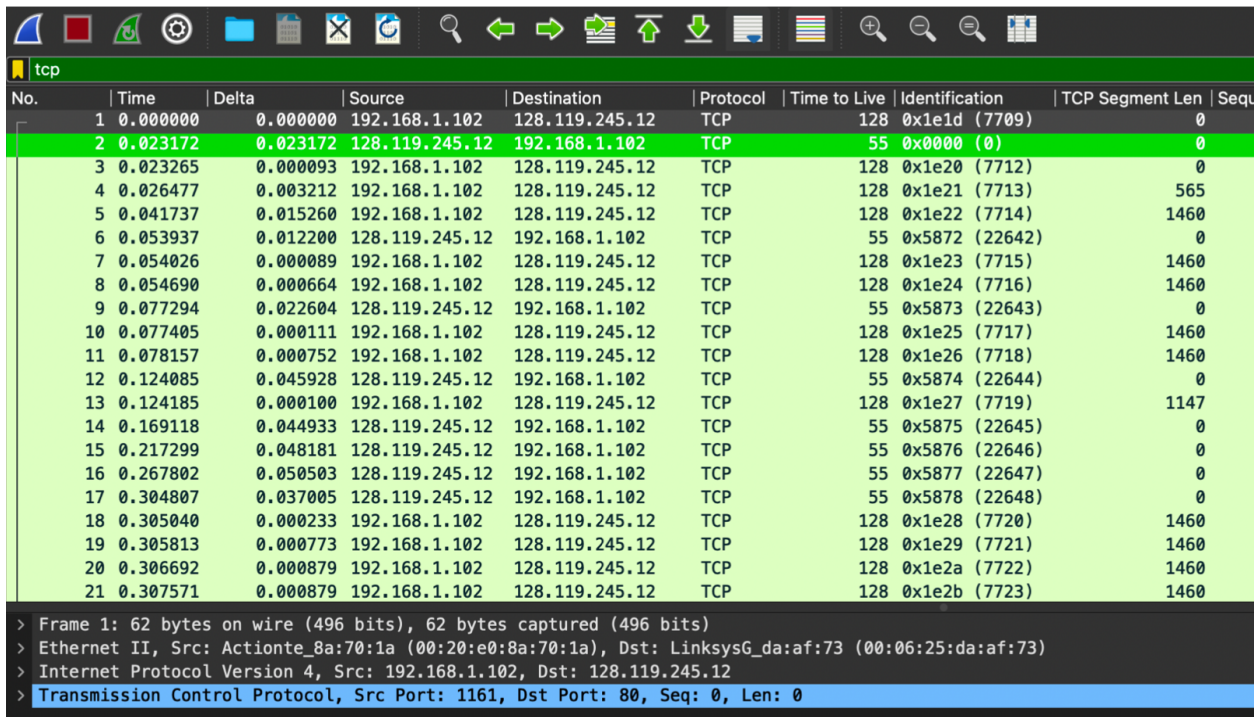
NEHAL JHAJHARIA (U20CS093)

COMPUTER NETWORKS

ASSIGNMENT 05

TCP

1)



| No. | Time | Delta | Source | Destination | Protocol | Time to Live | Identification | TCP Segment Len | Seq |
|-----|----------|----------|----------------|----------------|----------|--------------|----------------|-----------------|-----|
| 1 | 0.000000 | 0.000000 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 0x1e1d (7709) | 0 | |
| 2 | 0.023172 | 0.023172 | 128.119.245.12 | 192.168.1.102 | TCP | 55 | 0x0000 (0) | 0 | |
| 3 | 0.023265 | 0.000093 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 0x1e20 (7712) | 0 | |
| 4 | 0.026477 | 0.003212 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 0x1e21 (7713) | 565 | |
| 5 | 0.041737 | 0.015260 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 0x1e22 (7714) | 1460 | |
| 6 | 0.053937 | 0.012200 | 128.119.245.12 | 192.168.1.102 | TCP | 55 | 0x5872 (22642) | 0 | |
| 7 | 0.054026 | 0.000089 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 0x1e23 (7715) | 1460 | |
| 8 | 0.054690 | 0.000664 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 0x1e24 (7716) | 1460 | |
| 9 | 0.077294 | 0.022604 | 128.119.245.12 | 192.168.1.102 | TCP | 55 | 0x5873 (22643) | 0 | |
| 10 | 0.077405 | 0.000111 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 0x1e25 (7717) | 1460 | |
| 11 | 0.078157 | 0.000752 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 0x1e26 (7718) | 1460 | |
| 12 | 0.124085 | 0.045928 | 128.119.245.12 | 192.168.1.102 | TCP | 55 | 0x5874 (22644) | 0 | |
| 13 | 0.124185 | 0.000100 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 0x1e27 (7719) | 1147 | |
| 14 | 0.169118 | 0.044933 | 128.119.245.12 | 192.168.1.102 | TCP | 55 | 0x5875 (22645) | 0 | |
| 15 | 0.217299 | 0.048181 | 128.119.245.12 | 192.168.1.102 | TCP | 55 | 0x5876 (22646) | 0 | |
| 16 | 0.267802 | 0.050503 | 128.119.245.12 | 192.168.1.102 | TCP | 55 | 0x5877 (22647) | 0 | |
| 17 | 0.304807 | 0.037005 | 128.119.245.12 | 192.168.1.102 | TCP | 55 | 0x5878 (22648) | 0 | |
| 18 | 0.305040 | 0.000233 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 0x1e28 (7720) | 1460 | |
| 19 | 0.305813 | 0.000773 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 0x1e29 (7721) | 1460 | |
| 20 | 0.306692 | 0.000879 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 0x1e2a (7722) | 1460 | |
| 21 | 0.307571 | 0.000879 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 0x1e2b (7723) | 1460 | |

> 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

2) Packet no: 199

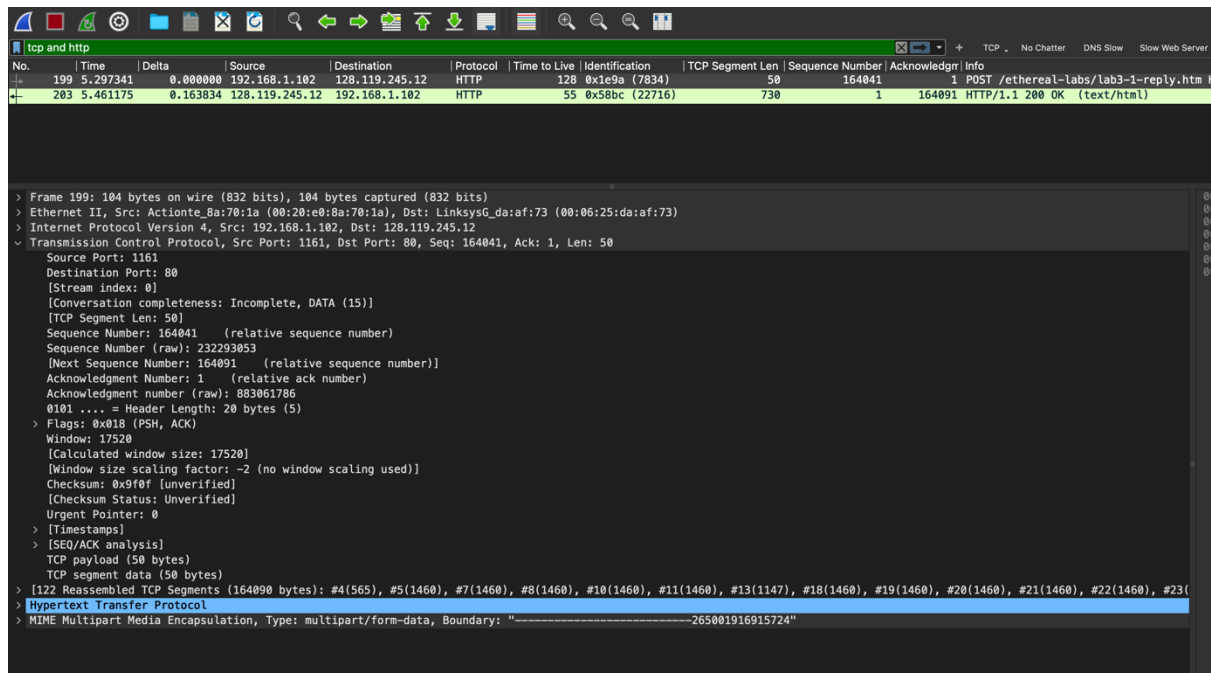
3) First packet is 199 Last packet is: 203

4) Client IP address: Client Port No. :

192.168.1.102

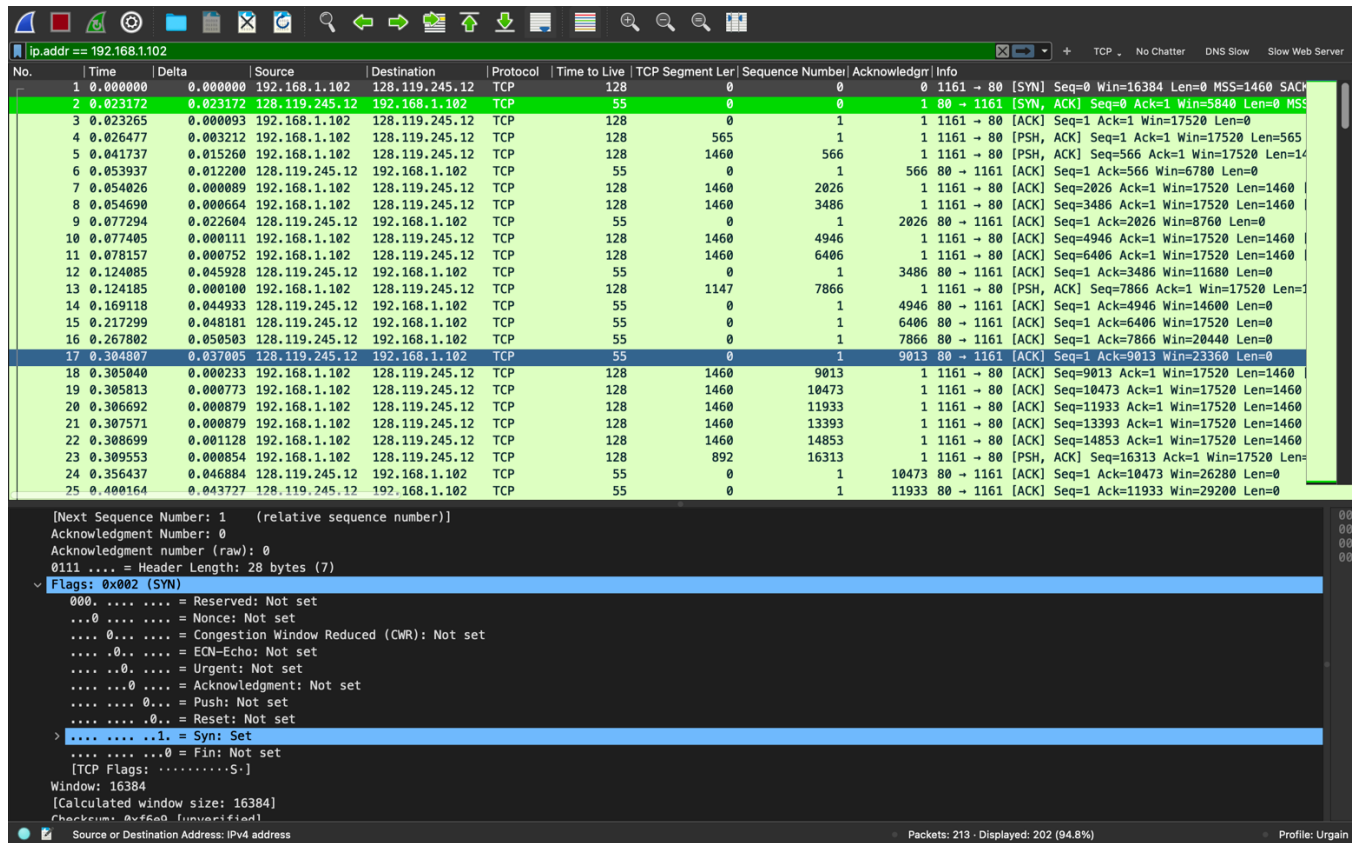
1161

5) IP address of gaia.cs.umass.edu: 128.119.245.12 Post No: 80



6) Sequence No. : 0

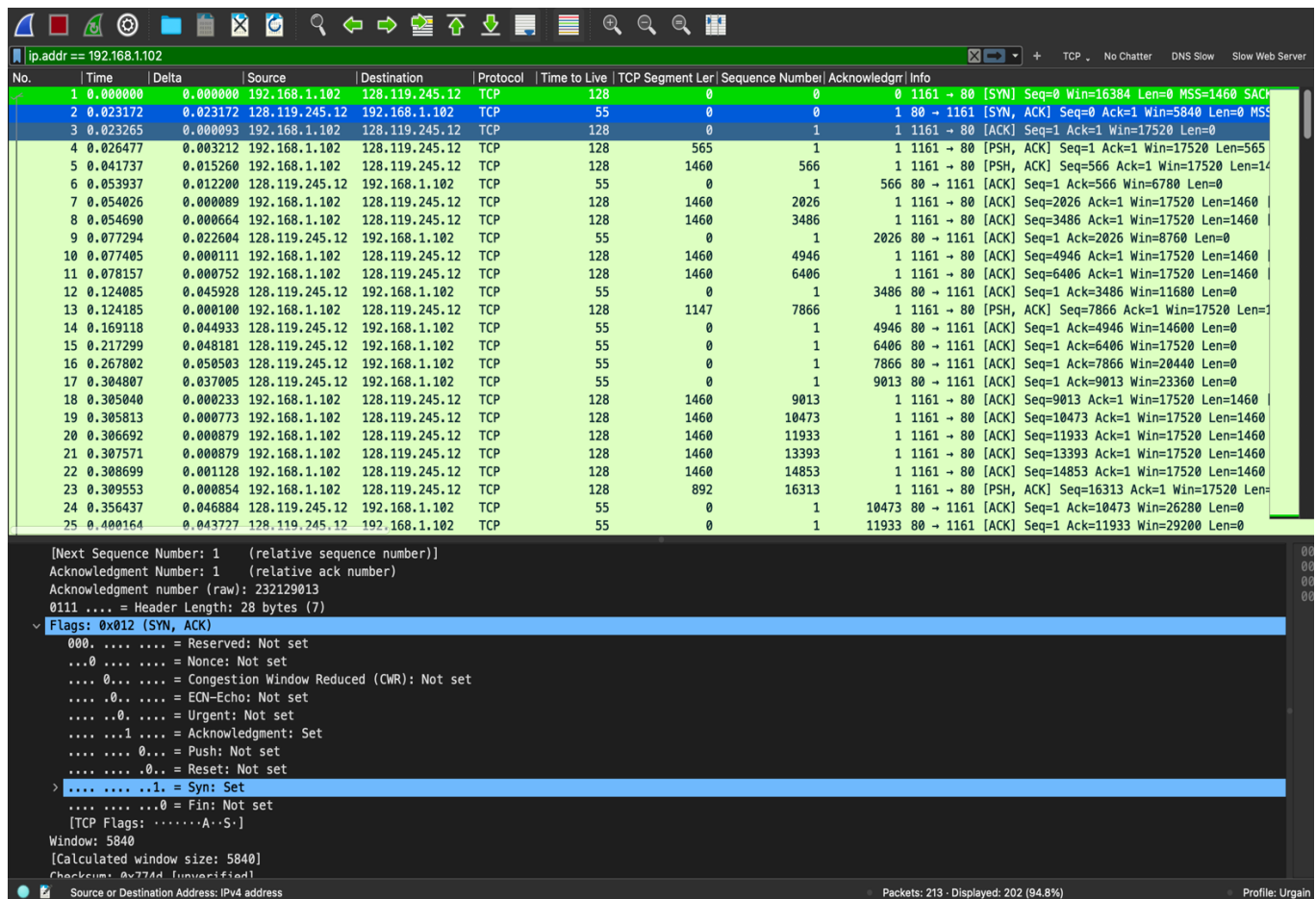
The flags in the TCP packets shows that SYN flag is set.



7) Acknowledgement no is: 1
Sequence no is: 0

gaia.cs.umass.edu determines the ack no by adding 1 to client's sequence number.

SYN as well as ACK flags are set in the packet that identify it as a syn/ack packet.

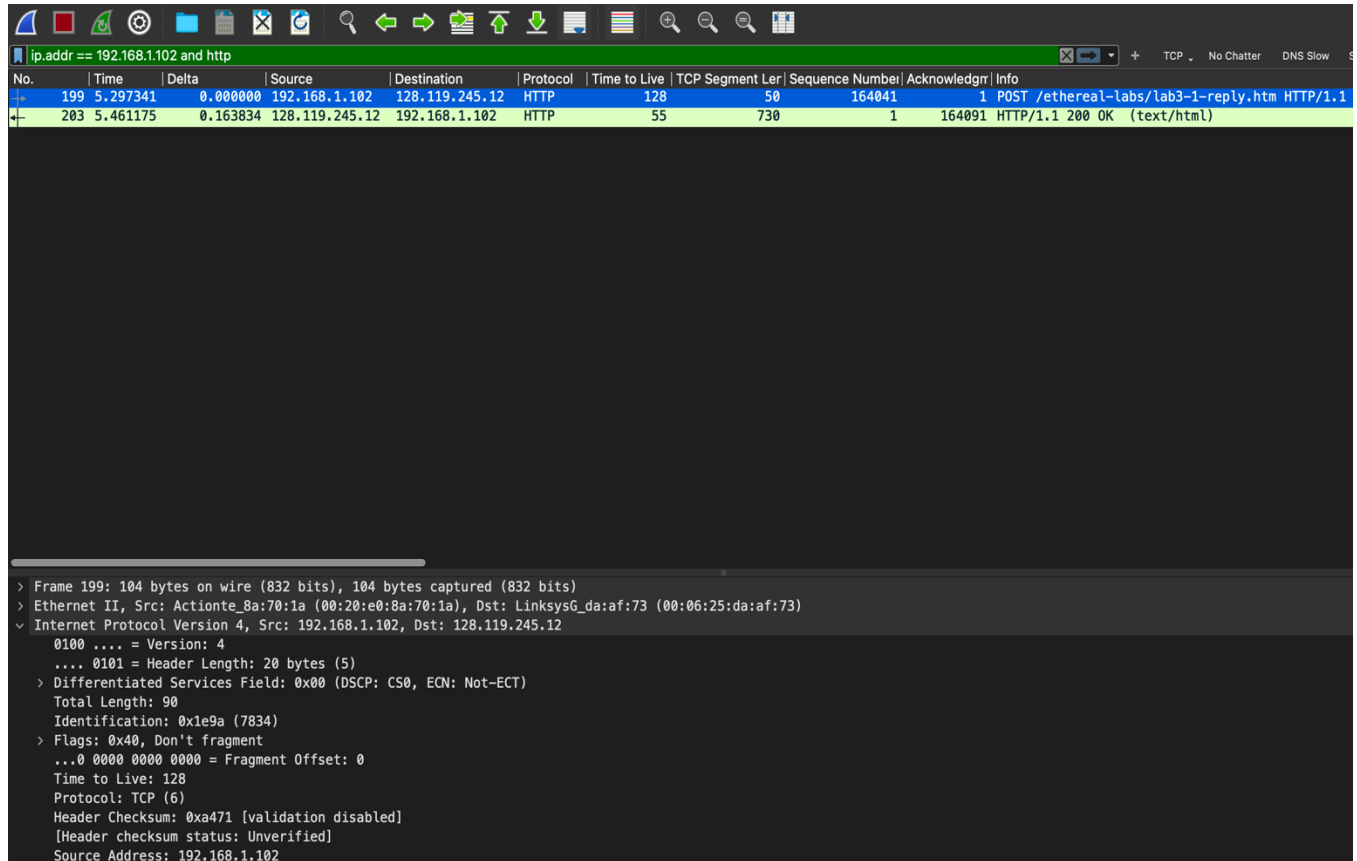


| No. | Time | Delta | Source | Destination | Protocol | Time to Live | TCP Segment Len | Sequence Number | Acknowledgment | Info |
|-----|----------|----------|----------------|----------------|----------|--------------|-----------------|-----------------|----------------|--|
| 1 | 0.000000 | 0.000000 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 0 | 0 | 0 | 1161 → 80 [SYN] Seq=0 Win=16384 Len=0 MSS=1460 SACK |
| 2 | 0.023172 | 0.023172 | 128.119.245.12 | 192.168.1.102 | TCP | 55 | 0 | 0 | 1 | 80 → 1161 [SYN, ACK] Seq=0 Ack=1 Win=5840 Len=0 MSS |
| 3 | 0.023265 | 0.000093 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 0 | 1 | 1 | 1161 → 80 [ACK] Seq=1 Ack=1 Win=17520 Len=0 |
| 4 | 0.026477 | 0.003212 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 565 | 1 | 1 | 1161 → 80 [PSH, ACK] Seq=1 Ack=1 Win=17520 Len=565 |
| 5 | 0.041737 | 0.015260 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 1460 | 566 | 1 | 1161 → 80 [PSH, ACK] Seq=566 Ack=1 Win=17520 Len=1460 |
| 6 | 0.053937 | 0.012200 | 128.119.245.12 | 192.168.1.102 | TCP | 55 | 0 | 1 | 566 | 80 → 1161 [ACK] Seq=1 Ack=566 Win=6780 Len=0 |
| 7 | 0.054026 | 0.000089 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 1460 | 2026 | 1 | 1161 → 80 [ACK] Seq=2026 Ack=1 Win=17520 Len=1460 |
| 8 | 0.054690 | 0.000664 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 1460 | 3486 | 1 | 1161 → 80 [ACK] Seq=3486 Ack=1 Win=17520 Len=1460 |
| 9 | 0.077294 | 0.022604 | 128.119.245.12 | 192.168.1.102 | TCP | 55 | 0 | 1 | 2026 | 80 → 1161 [ACK] Seq=1 Ack=2026 Win=8760 Len=0 |
| 10 | 0.077405 | 0.000111 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 1460 | 4946 | 1 | 1161 → 80 [ACK] Seq=4946 Ack=1 Win=17520 Len=1460 |
| 11 | 0.078157 | 0.000752 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 1460 | 6406 | 1 | 1161 → 80 [ACK] Seq=6406 Ack=1 Win=17520 Len=1460 |
| 12 | 0.124085 | 0.045928 | 128.119.245.12 | 192.168.1.102 | TCP | 55 | 0 | 1 | 3486 | 80 → 1161 [ACK] Seq=1 Ack=3486 Win=11680 Len=0 |
| 13 | 0.124185 | 0.000100 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 1147 | 7866 | 1 | 1161 → 80 [PSH, ACK] Seq=7866 Ack=1 Win=17520 Len=1147 |
| 14 | 0.169118 | 0.044933 | 128.119.245.12 | 192.168.1.102 | TCP | 55 | 0 | 1 | 4946 | 80 → 1161 [ACK] Seq=1 Ack=4946 Win=14600 Len=0 |
| 15 | 0.217299 | 0.048181 | 128.119.245.12 | 192.168.1.102 | TCP | 55 | 0 | 1 | 6406 | 80 → 1161 [ACK] Seq=1 Ack=6406 Win=17520 Len=0 |
| 16 | 0.267802 | 0.050503 | 128.119.245.12 | 192.168.1.102 | TCP | 55 | 0 | 1 | 7866 | 80 → 1161 [ACK] Seq=1 Ack=7866 Win=20440 Len=0 |
| 17 | 0.304807 | 0.037005 | 128.119.245.12 | 192.168.1.102 | TCP | 55 | 0 | 1 | 9013 | 80 → 1161 [ACK] Seq=1 Ack=9013 Win=23360 Len=0 |
| 18 | 0.305040 | 0.000233 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 1460 | 9013 | 1 | 1161 → 80 [ACK] Seq=9013 Ack=1 Win=17520 Len=1460 |
| 19 | 0.305813 | 0.000773 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 1460 | 10473 | 1 | 1161 → 80 [ACK] Seq=10473 Ack=1 Win=17520 Len=1460 |
| 20 | 0.306692 | 0.000879 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 1460 | 11933 | 1 | 1161 → 80 [ACK] Seq=11933 Ack=1 Win=17520 Len=1460 |
| 21 | 0.307571 | 0.000879 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 1460 | 13393 | 1 | 1161 → 80 [ACK] Seq=13393 Ack=1 Win=17520 Len=1460 |
| 22 | 0.308699 | 0.001128 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 1460 | 14853 | 1 | 1161 → 80 [ACK] Seq=14853 Ack=1 Win=17520 Len=1460 |
| 23 | 0.309553 | 0.000854 | 192.168.1.102 | 128.119.245.12 | TCP | 128 | 892 | 16313 | 1 | 1161 → 80 [PSH, ACK] Seq=16313 Ack=1 Win=17520 Len=892 |
| 24 | 0.356437 | 0.046884 | 128.119.245.12 | 192.168.1.102 | TCP | 55 | 0 | 1 | 10473 | 80 → 1161 [ACK] Seq=1 Ack=10473 Win=26280 Len=0 |
| 25 | 0.400164 | 0.043727 | 128.119.245.12 | 192.168.1.102 | TCP | 55 | 0 | 1 | 11933 | 80 → 1161 [ACK] Seq=1 Ack=11933 Win=29200 Len=0 |

[Next Sequence Number: 1 (relative sequence number)]
Acknowledgment Number: 1 (relative ack number)
Acknowledgment number (raw): 232129013
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: 5840
[Calculated window size: 5840]
Checksum: 0x774d [unverified]

Source or Destination Address: IPv4 address Packets: 213 · Displayed: 202 (94.8%) Profile: Urgain

8) Sequence no of HTTP post command: 164041

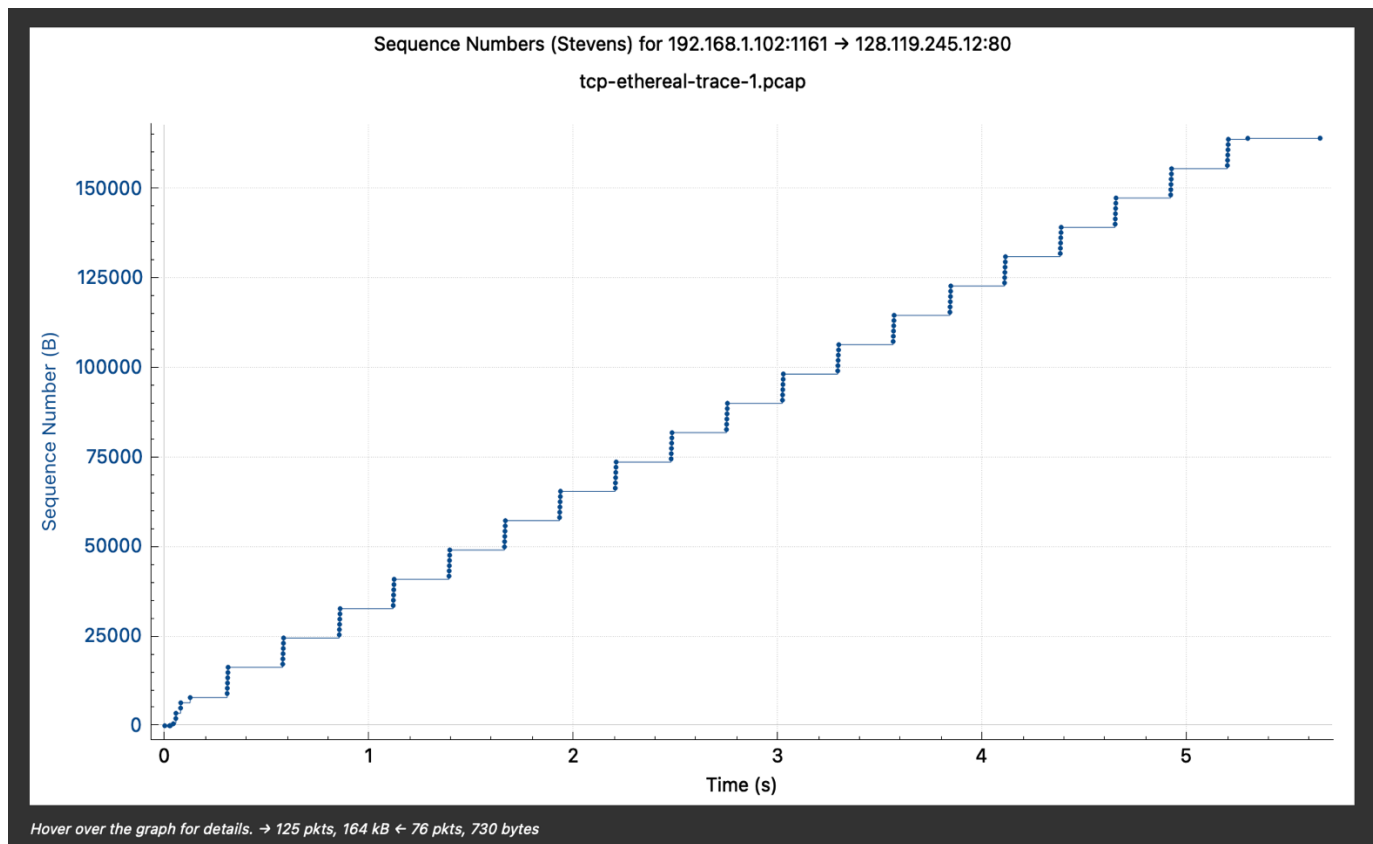


The image shows a Wireshark packet capture interface. The top pane displays a list of captured packets. Packet 199 is highlighted, showing an HTTP POST request from 192.168.1.102 to 128.119.245.12 with sequence number 164041. The bottom pane shows the detailed view of this packet, including Ethernet II, Internet Protocol Version 4, and TCP segments.

| No. | Time | Delta | Source | Destination | Protocol | Time to Live | TCP Segment Len | Sequence Number | Acknowledgr | Info |
|-----|----------|----------|----------------|----------------|----------|--------------|-----------------|-----------------|-------------|---|
| 199 | 5.297341 | 0.000000 | 192.168.1.102 | 128.119.245.12 | HTTP | 128 | 50 | 164041 | 1 | POST /ethereal-labs/lab3-1-reply.htm HTTP/1.1 |
| 203 | 5.461175 | 0.163834 | 128.119.245.12 | 192.168.1.102 | HTTP | 55 | 730 | 1 | 164091 | HTTP/1.1 200 OK (text/html) |


```
> Frame 199: 104 bytes on wire (832 bits), 104 bytes captured (832 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
  0100 .... = Version: 4
  .... 0101 = Header Length: 20 bytes (5)
  > Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
    Total Length: 90
    Identification: 0x1e9a (7834)
  > Flags: 0x40, Don't fragment
    ...0 0000 0000 0000 = Fragment Offset: 0
    Time to Live: 128
    Protocol: TCP (6)
    Header Checksum: 0xa471 [validation disabled]
    [Header checksum status: Unverified]
    Source Address: 192.168.1.102
```

9)



Here, each dot represents a TCP segment sent, plotting the sequence number of the segment versus the time at which it was sent. Note that a set of dots stacked above each other represents a series of packets that were sent back-to-back by the sender.

UDP

1) There are 4 fields in UDP header.

Those are:

Source Port

Destination Port

Length

Checksum

Apply a display filter ... <%%/>

| No. | Time | Delta | Source | Destination | Protocol | Time to Live | TCP Segment Len | Sequence Number | Acknowledgmr | Info |
|-----|----------|----------|----------------|----------------|----------|--------------|-----------------|-----------------|--------------|----------------------|
| 1 | 0.000000 | 0.000000 | 192.168.1.101 | 68.87.71.226 | DNS | 128 | | | | Standard query 0x000 |
| 2 | 0.012481 | 0.012481 | 68.87.71.226 | 192.168.1.101 | DNS | 50 | | | | Standard query respo |
| 3 | 0.014232 | 0.001751 | 192.168.1.101 | 68.87.71.226 | DNS | 128 | | | | Standard query 0x000 |
| 4 | 0.042641 | 0.028409 | 68.87.71.226 | 192.168.1.101 | DNS | 50 | | | | Standard query respo |
| 5 | 0.044178 | 0.001537 | 192.168.1.101 | 68.87.71.226 | DNS | 128 | | | | Standard query 0x000 |
| 6 | 0.058934 | 0.014756 | 68.87.71.226 | 192.168.1.101 | DNS | 50 | | | | Standard query respo |
| 7 | 0.060268 | 0.001334 | 192.168.1.101 | 68.87.71.226 | DNS | 128 | | | | Standard query 0x000 |
| 8 | 0.074984 | 0.014716 | 68.87.71.226 | 192.168.1.101 | DNS | 50 | | | | Standard query respo |
| 9 | 2.874248 | 2.799264 | 128.119.245.93 | 192.168.1.101 | TLSv1 | 49 | 69 | 1 | 1 | Application Data |
| 10 | 2.886418 | 0.012170 | 192.168.1.101 | 128.119.245.93 | TLSv1 | 128 | 37 | 1 | 70 | Application Data |

> Frame 3: 91 bytes on wire (728 bits), 91 bytes captured (728 bits)

> Ethernet II, Src: Dell_4f:36:23 (00:08:74:4f:36:23), Dst: Cisco-Li_f4:eb:a8 (00:16:b6:f4:eb:a8)

> Internet Protocol Version 4, Src: 192.168.1.101, Dst: 68.87.71.226

▼ User Datagram Protocol, Src Port: 4373, Dst Port: 53

Source Port: 4373

Destination Port: 53

Length: 57

Checksum: 0x8085 [unverified]

[Checksum Status: Unverified]

[Stream index: 1]

▼ [Timestamps]

[Time since first frame: 0.000000000 seconds]

[Time since previous frame: 0.000000000 seconds]


UDP payload (49 bytes)

> Domain Name System (query)

- 2) By consulting the displayed information in Wireshark's packet content field, we found the following sizes:

| <u>Field Name</u> | <u>Size (bytes)</u> |
|-------------------|---------------------|
| Source Port | 2 |
| Destination Port | 2 |
| Length | 2 |
| Checksum | 2 |

```
> Frame 3: 91 bytes on wire (728 bits), 91 bytes captured (728 bits)
> Ethernet II, Src: Dell_4f:36:23 (00:08:74:4f:36:23), Dst: Cisco-Li_f4:eb:a8 (00:16:b6:f4:eb:a8)
> Internet Protocol Version 4, Src: 192.168.1.101, Dst: 68.87.71.226
< User Datagram Protocol, Src Port: 4373, Dst Port: 53
  Source Port: 4373
  Destination Port: 53
  Length: 57
  Checksum: 0x8085 [unverified]
  [Checksum Status: Unverified]
  [Stream index: 1]
  > [Timestamps]
  UDP payload (49 bytes)
> Domain Name System (query)
```

 Payload (udp.payload), 49 bytes

- 3) The length field specifies the number of bytes in the UDP segment plus header data.
In my selected packet, UDP payload is 49 bytes.
- 4) A UDP datagram is carried in a single IP packet and is hence limited to a maximum payload of 65,507 bytes for IPv4 and 65,527 bytes for IPv6.
- 5) Largest possible source port number is 65535.

6) Protocol Number for UDP is 17.

In hexadecimal, it is: 0x11.

7) The source port of the UDP packet sent by the host is the same as the destination port of the reply packet, and conversely the destination port of the UDP packet sent by the host is the same as the source port of the reply packet.

```
> Frame 1: 85 bytes on wire (680 bits), 85 bytes captured (680 bits)
> Ethernet II, Src: Dell_4f:36:23 (00:08:74:4f:36:23), Dst: Cisco-Li_f4:eb:a8 (00:16:b6:f4:eb:a8)
> Internet Protocol Version 4, Src: 192.168.1.101, Dst: 68.87.71.226
< User Datagram Protocol, Src Port: 4372, Dst Port: 53
  Source Port: 4372
  Destination Port: 53
  Length: 51
  Checksum: 0x77d4 [unverified]
  [Checksum Status: Unverified]
  [Stream index: 0]
  > [Timestamps]
  UDP payload (43 bytes)
> Domain Name System (query)
```

```
> Frame 2: 137 bytes on wire (1096 bits), 137 bytes captured (1096 bits)
> Ethernet II, Src: Cisco-Li_f4:eb:a8 (00:16:b6:f4:eb:a8), Dst: Dell_4f:36:23 (00:08:74:4f:36:23)
> Internet Protocol Version 4, Src: 68.87.71.226, Dst: 192.168.1.101
< User Datagram Protocol, Src Port: 53, Dst Port: 4372
  Source Port: 53
  Destination Port: 4372
  Length: 103
  Checksum: 0xc73c [unverified]
  [Checksum Status: Unverified]
  [Stream index: 0]
  > [Timestamps]
  UDP payload (95 bytes)
> Domain Name System (response)
```