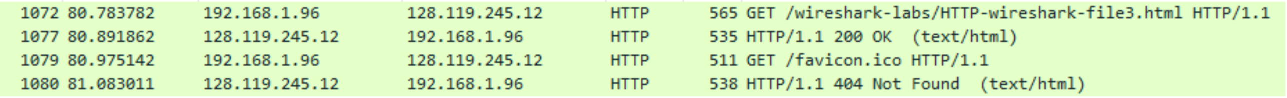
# Task 1

a)

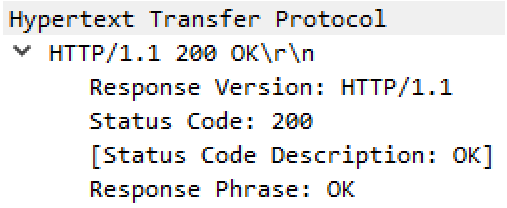


```
1072 80.783782   192.168.1.96     128.119.245.12   HTTP   565 GET /wireshark-labs/HTTP-wireshark-file3.html HTTP/1.1
1077 80.891862   128.119.245.12   192.168.1.96     HTTP   535 HTTP/1.1 200 OK  (text/html)
1079 80.975142   192.168.1.96     128.119.245.12   HTTP   511 GET /favicon.ico HTTP/1.1
1080 81.083011   128.119.245.12   192.168.1.96     HTTP   538 HTTP/1.1 404 Not Found  (text/html)
```

The browser has sent one GET request excluding the favicon request.

b)

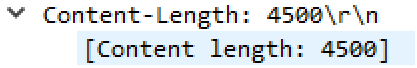
The second packet contains the response. The status code and phrase can be found in the top of the HTTP header.



```
Hypertext Transfer Protocol
  HTTP/1.1 200 OK\r\n
      Response Version: HTTP/1.1
      Status Code: 200
      [Status Code Description: OK]
      Response Phrase: OK
```

c)

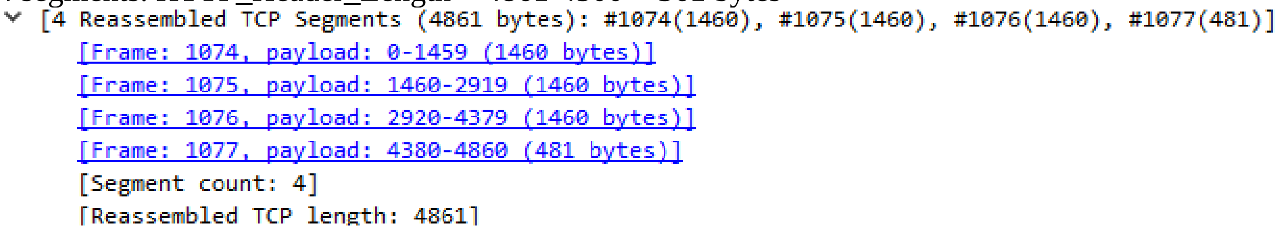
4500 bytes



```
  Content-Length: 4500\r\n
      [Content length: 4500]
```

d)

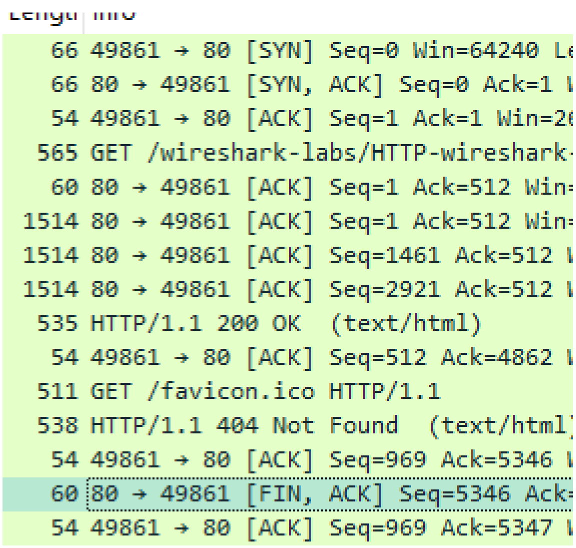
4 segments. HTTP_Header_Length = 4861-4500 = 361 bytes



```
  [4 Reassembled TCP Segments (4861 bytes): #1074(1460), #1075(1460), #1076(1460), #1077(481)]
      [Frame: 1074, payload: 0-1459 (1460 bytes)]
      [Frame: 1075, payload: 1460-2919 (1460 bytes)]
      [Frame: 1076, payload: 2920-4379 (1460 bytes)]
      [Frame: 1077, payload: 4380-4860 (481 bytes)]
      [Segment count: 4]
      [Reassembled TCP length: 4861]
```

## Task 2

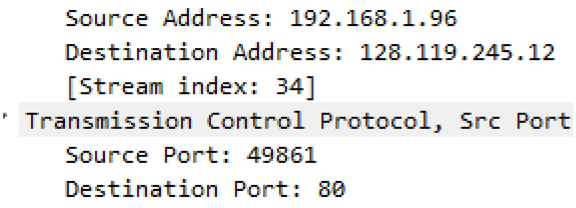
a)



```
Length Info
    66 49861 → 80 [SYN] Seq=0 Win=64240 Le
    66 80 → 49861 [SYN, ACK] Seq=0 Ack=1 W
    54 49861 → 80 [ACK] Seq=1 Ack=1 Win=26
   565 GET /wireshark-labs/HTTP-wireshark-
    60 80 → 49861 [ACK] Seq=1 Ack=512 Win=
  1514 80 → 49861 [ACK] Seq=1 Ack=512 Win=
  1514 80 → 49861 [ACK] Seq=1461 Ack=512 W
  1514 80 → 49861 [ACK] Seq=2921 Ack=512 W
   535 HTTP/1.1 200 OK  (text/html)
    54 49861 → 80 [ACK] Seq=512 Ack=4862 W
   511 GET /favicon.ico HTTP/1.1
   538 HTTP/1.1 404 Not Found  (text/html)
    54 49861 → 80 [ACK] Seq=969 Ack=5346 W
    60 80 → 49861 [FIN, ACK] Seq=5346 Ack=
    54 49861 → 80 [ACK] Seq=969 Ack=5347 W
```

The same connection was used since the finish flag terminating the connection was used once and that was after the favicon request putting it inside the persistent connection.

b)

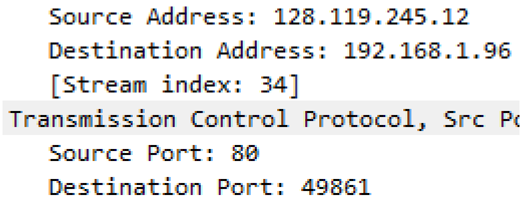


```
    Source Address: 192.168.1.96
    Destination Address: 128.119.245.12
    [Stream index: 34]
 Transmission Control Protocol, Src Port
    Source Port: 49861
    Destination Port: 80
```

Source IP is 192.168.1.96

Source Port is 49861

c)

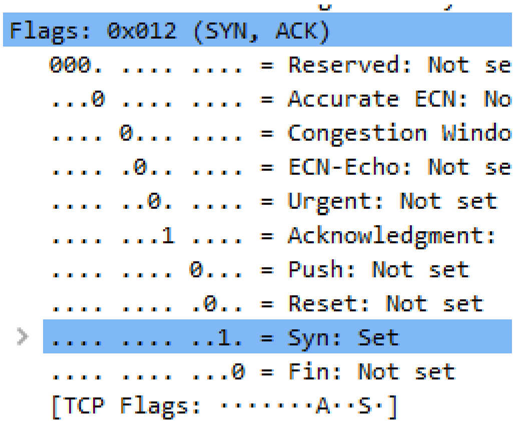


```
    Source Address: 128.119.245.12
    Destination Address: 192.168.1.96
    [Stream index: 34]
 Transmission Control Protocol, Src Po
    Source Port: 80
    Destination Port: 49861
```

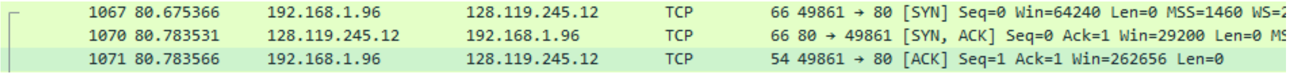
Source IP is 128.119.145.12

Source Port is 80

d)



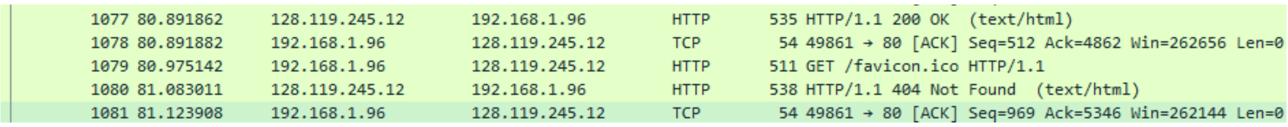
```
Flags: 0x012 (SYN, ACK)
    000. .... .... = Reserved: Not se
    ...0 .... .... = Accurate ECN: No
    .... 0... .... = Congestion Windo
    .... .0.. .... = ECN-Echo: Not se
    .... ..0. .... = Urgent: Not set
    .... ...1 .... = Acknowledgment:
    .... .... 0... = Push: Not set
    .... .... .0.. = Reset: Not set
  > .... .... ..1. = Syn: Set
    .... .... ...0 = Fin: Not set
    [TCP Flags: ·······A··S·]
```



```
1067 80.675366   192.168.1.96     128.119.245.12   TCP    66 49861 → 80 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=2
1070 80.783531   128.119.245.12   192.168.1.96     TCP    66 80 → 49861 [SYN, ACK] Seq=0 Ack=1 Win=29200 Len=0 MS
1071 80.783566   192.168.1.96     128.119.245.12   TCP    54 49861 → 80 [ACK] Seq=1 Ack=1 Win=262656 Len=0
```

3 segments. Header flags for initiating connection SYN : SYN,ACK : ACK.

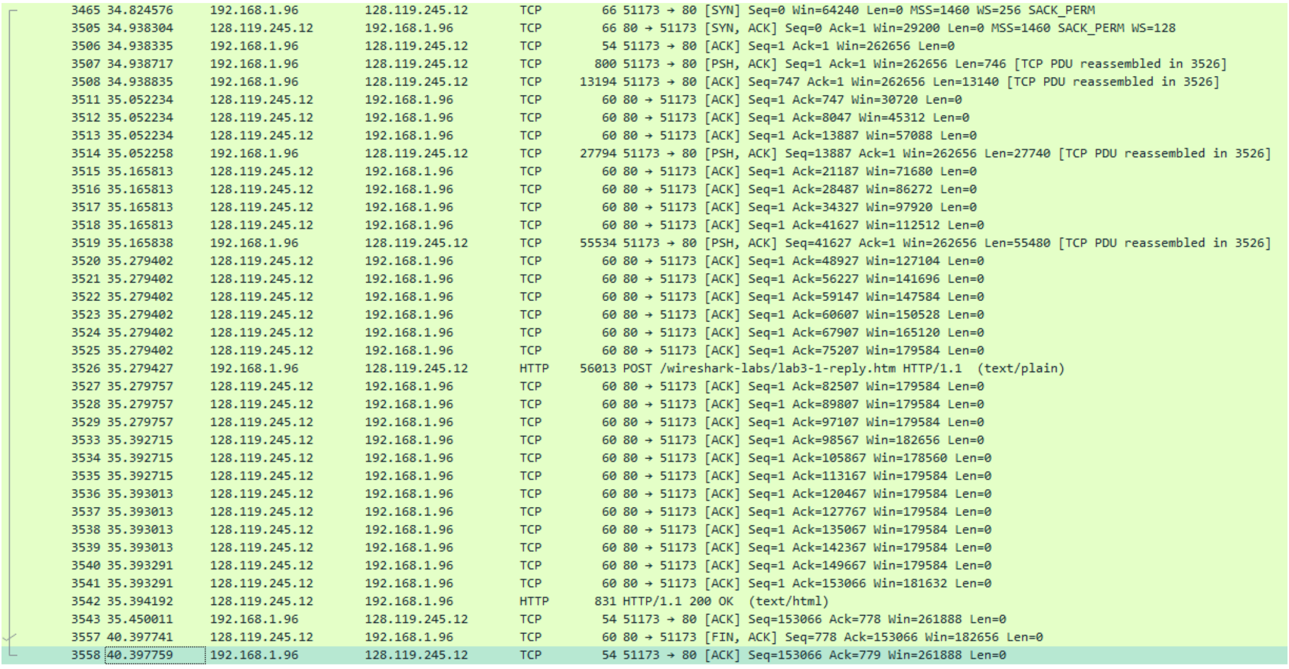
e)



```
1077 80.891862   128.119.245.12   192.168.1.96     HTTP   535 HTTP/1.1 200 OK  (text/html)
1078 80.891882   192.168.1.96     128.119.245.12   TCP     54 49861 → 80 [ACK] Seq=512 Ack=4862 Win=262656 Len=0
1079 80.975142   192.168.1.96     128.119.245.12   HTTP   511 GET /favicon.ico HTTP/1.1
1080 81.083011   128.119.245.12   192.168.1.96     HTTP   538 HTTP/1.1 404 Not Found  (text/html)
1081 81.123908   192.168.1.96     128.119.245.12   TCP     54 49861 → 80 [ACK] Seq=969 Ack=5346 Win=262144 Len=0
```

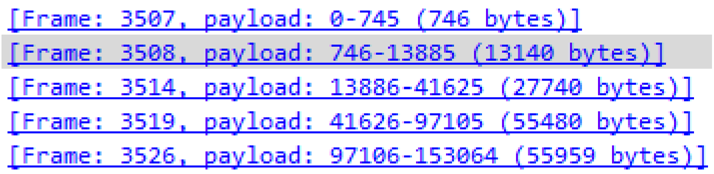
The ACK to the server for receiveing the webpage and the ACK for recieving the response for the nonexistence of favicon.

# Task 3



```
3465 34.824576   192.168.1.96     128.119.245.12   TCP      66 51173 → 80 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=256 SACK_PERM
3505 34.938304   128.119.245.12   192.168.1.96     TCP      66 80 → 51173 [SYN, ACK] Seq=0 Ack=1 Win=29200 Len=0 MSS=1460 SACK_PERM WS=128
3506 34.938335   192.168.1.96     128.119.245.12   TCP      54 51173 → 80 [ACK] Seq=1 Ack=1 Win=262656 Len=0
3507 34.938717   192.168.1.96     128.119.245.12   TCP     800 51173 → 80 [PSH, ACK] Seq=1 Ack=1 Win=262656 Len=746 [TCP PDU reassembled in 3526]
3508 34.938835   192.168.1.96     128.119.245.12   TCP   13194 51173 → 80 [ACK] Seq=747 Ack=1 Win=262656 Len=13140 [TCP PDU reassembled in 3526]
3511 35.052234   128.119.245.12   192.168.1.96     TCP      60 80 → 51173 [ACK] Seq=1 Ack=747 Win=30720 Len=0
3512 35.052234   128.119.245.12   192.168.1.96     TCP      60 80 → 51173 [ACK] Seq=1 Ack=8047 Win=45312 Len=0
3513 35.052234   128.119.245.12   192.168.1.96     TCP      60 80 → 51173 [ACK] Seq=1 Ack=13887 Win=57088 Len=0
3514 35.052258   192.168.1.96     128.119.245.12   TCP   27794 51173 → 80 [PSH, ACK] Seq=13887 Ack=1 Win=262656 Len=27740 [TCP PDU reassembled in 3526]
3515 35.165813   128.119.245.12   192.168.1.96     TCP      60 80 → 51173 [ACK] Seq=1 Ack=21187 Win=71680 Len=0
3516 35.165813   128.119.245.12   192.168.1.96     TCP      60 80 → 51173 [ACK] Seq=1 Ack=28487 Win=86272 Len=0
3517 35.165813   128.119.245.12   192.168.1.96     TCP      60 80 → 51173 [ACK] Seq=1 Ack=34327 Win=97920 Len=0
3518 35.165813   128.119.245.12   192.168.1.96     TCP      60 80 → 51173 [ACK] Seq=1 Ack=41627 Win=112512 Len=0
3519 35.165838   192.168.1.96     128.119.245.12   TCP   55534 51173 → 80 [PSH, ACK] Seq=41627 Ack=1 Win=262656 Len=55480 [TCP PDU reassembled in 3526]
3520 35.279402   128.119.245.12   192.168.1.96     TCP      60 80 → 51173 [ACK] Seq=1 Ack=48927 Win=127104 Len=0
3521 35.279402   128.119.245.12   192.168.1.96     TCP      60 80 → 51173 [ACK] Seq=1 Ack=56227 Win=141696 Len=0
3522 35.279402   128.119.245.12   192.168.1.96     TCP      60 80 → 51173 [ACK] Seq=1 Ack=59147 Win=147584 Len=0
3523 35.279402   128.119.245.12   192.168.1.96     TCP      60 80 → 51173 [ACK] Seq=1 Ack=60607 Win=150528 Len=0
3524 35.279402   128.119.245.12   192.168.1.96     TCP      60 80 → 51173 [ACK] Seq=1 Ack=67907 Win=165120 Len=0
3525 35.279402   128.119.245.12   192.168.1.96     TCP      60 80 → 51173 [ACK] Seq=1 Ack=75207 Win=179584 Len=0
3526 35.279427   192.168.1.96     128.119.245.12   HTTP  56013 POST /wireshark-labs/lab3-1-reply.htm HTTP/1.1  (text/plain)
3527 35.279757   128.119.245.12   192.168.1.96     TCP      60 80 → 51173 [ACK] Seq=1 Ack=82507 Win=179584 Len=0
3528 35.279757   128.119.245.12   192.168.1.96     TCP      60 80 → 51173 [ACK] Seq=1 Ack=89807 Win=179584 Len=0
3529 35.279757   128.119.245.12   192.168.1.96     TCP      60 80 → 51173 [ACK] Seq=1 Ack=97107 Win=179584 Len=0
3533 35.392715   128.119.245.12   192.168.1.96     TCP      60 80 → 51173 [ACK] Seq=1 Ack=98567 Win=182656 Len=0
3534 35.392715   128.119.245.12   192.168.1.96     TCP      60 80 → 51173 [ACK] Seq=1 Ack=105867 Win=178560 Len=0
3535 35.392715   128.119.245.12   192.168.1.96     TCP      60 80 → 51173 [ACK] Seq=1 Ack=113167 Win=179584 Len=0
3536 35.393013   128.119.245.12   192.168.1.96     TCP      60 80 → 51173 [ACK] Seq=1 Ack=120467 Win=179584 Len=0
3537 35.393013   128.119.245.12   192.168.1.96     TCP      60 80 → 51173 [ACK] Seq=1 Ack=127767 Win=179584 Len=0
3538 35.393013   128.119.245.12   192.168.1.96     TCP      60 80 → 51173 [ACK] Seq=1 Ack=135067 Win=179584 Len=0
3539 35.393013   128.119.245.12   192.168.1.96     TCP      60 80 → 51173 [ACK] Seq=1 Ack=142367 Win=179584 Len=0
3540 35.393291   128.119.245.12   192.168.1.96     TCP      60 80 → 51173 [ACK] Seq=1 Ack=149667 Win=179584 Len=0
3541 35.393291   128.119.245.12   192.168.1.96     TCP      60 80 → 51173 [ACK] Seq=1 Ack=153066 Win=181632 Len=0
3542 35.394192   128.119.245.12   192.168.1.96     HTTP    831 HTTP/1.1 200 OK  (text/html)
3543 35.450011   192.168.1.96     128.119.245.12   TCP      54 51173 → 80 [ACK] Seq=153066 Ack=778 Win=261888 Len=0
3557 40.397741   128.119.245.12   192.168.1.96     TCP      60 80 → 51173 [FIN, ACK] Seq=778 Ack=153066 Win=182656 Len=0
3558 40.397759   192.168.1.96     128.119.245.12   TCP      54 51173 → 80 [ACK] Seq=153066 Ack=779 Win=261888 Len=0
```

a)

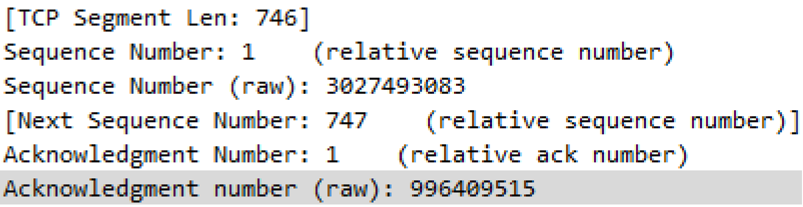


```
[Frame: 3507, payload: 0-745 (746 bytes)]
[Frame: 3508, payload: 746-13885 (13140 bytes)]
[Frame: 3514, payload: 13886-41625 (27740 bytes)]
[Frame: 3519, payload: 41626-97105 (55480 bytes)]
[Frame: 3526, payload: 97106-153064 (55959 bytes)]
```

It increases with each packet. But the last two packets indicated the link handled packets with a payload of little over 55 000 bytes.

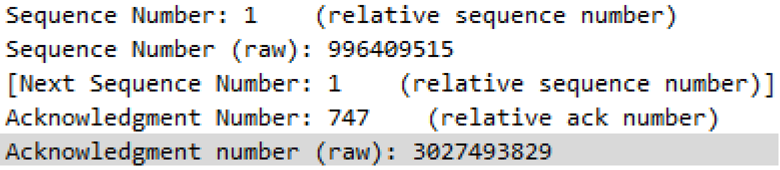
b)

The value of the Acknowledgement number of a packet is the sequence number + the length of the tcp packet it's acknowleding.



```
[TCP Segment Len: 746]
Sequence Number: 1    (relative sequence number)
Sequence Number (raw): 3027493083
[Next Sequence Number: 747    (relative sequence number)]
Acknowledgment Number: 1    (relative ack number)
Acknowledgment number (raw): 996409515
```

Sent PDU.



```
Sequence Number: 1    (relative sequence number)
Sequence Number (raw): 996409515
[Next Sequence Number: 1    (relative sequence number)]
Acknowledgment Number: 747    (relative ack number)
Acknowledgment number (raw): 3027493829
```

ACK. It uses the previous packets acknowledgement as sequence number (996409515). Sequence number of the PSH is 3 027 493 083. ACK number of the ack packet is 3 027 493 829. The difference between the Ack number and the previous sequence number is 746 just like the length of the tcp PSH packet.

Last ack number  3027646148. Last Ack – First sequence number = 153 065 bytes.

c)

First packet 746

Second 5800

All in the middle 7300.

Last 3399.

d)

There is only 2 closing packets captured in this instance 1 initiation from the server and one ACK from my computer. This was sent 5 seconds after the last HTTP. ( There was expected to be 4 packets to close but repeated capturing confirmed that we only captured 2).

## Task 4

a)

| No | Seq. Number | Payload Length | Time sent | Time ACKed | RTT | Estimated RTT |
|---|---|---|---|---|---|---|
| 4 | 1 | 565 | 0,03 | 0,05 | 0,03 | 0,03 |
| 5 | 566 | 1460 | 0,04 | 0,08 | 0,04 | 0,03 |
| 7 | 2026 | 1460 | 0,05 | 0,12 | 0,07 | 0,03367048 |
| 8 | 3486 | 1460 | 0,05 | 0,17 | 0,11 | 0,04376517 |
| 10 | 4946 | 1460 | 0,08 | 0,22 | 0,14 | 0,05578128 |
| 11 | 6406 | 1460 | 0,08 | 0,27 | 0,19 | 0,07251424 |