

Lab04

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1.

IP address of gaia.cs.umass.edu : 128.119.245.12

```
TRANSMISSION CONTROL PROTOCOL, SRC PORT: 1161, DST PORT: 80, S
Source Port: 1161
Destination Port: 80
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Source port: 1161

Destination port: 80

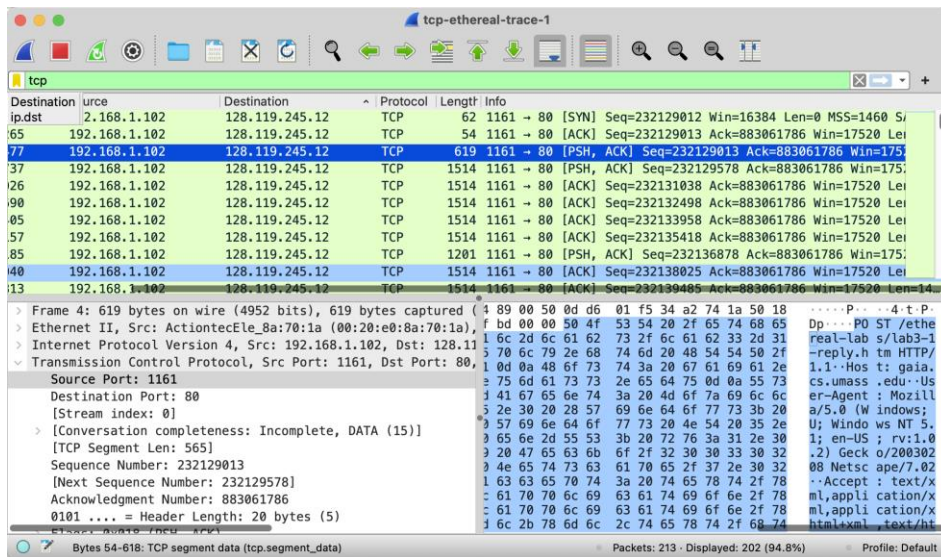
Client: 192.168.1.102

TCP port from client:1161

2.

sequence number of the TCP segment:232129013

```
77 192.168.1.102 128.119.245.12 TCP 619 1161 → 80 [PSH, ACK] Seq=232129013 Ack=883061786 Win=175
```



3.

From First segment to last:

Seq: 232129012

Seq: 232129013

Seq: 232129013

Seq: 232129578

Seq: 232131038

Seq: 232132498

tcp

Destination ip.dst	Time	Source	Destination	Protocol	Length	Info
1 0.000000	192.168.1.102	128.119.245.12	TCP	62	1161 → 80 [SYN] Seq=232129012 Win=16384 Len=0 MSS=1460 SACK_PERM	
3 0.023265	192.168.1.102	128.119.245.12	TCP	54	1161 → 80 [ACK] Seq=232129013 Ack=883061786 Win=17520 Len=0	
4 0.026477	192.168.1.102	128.119.245.12	TCP	619	1161 → 80 [PSH, ACK] Seq=232129013 Ack=883061786 Win=17520 Len=565 [TCP segment of a reassembled PDU]	
5 0.041737	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [PSH, ACK] Seq=232129578 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]	
7 0.054026	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232131038 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]	
8 0.054690	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232132498 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]	
10 0.077405	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232133958 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]	
11 0.078157	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232135418 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]	
13 0.124185	192.168.1.102	128.119.245.12	TCP	1201	1161 → 80 [PSH, ACK] Seq=232136878 Ack=883061786 Win=17520 Len=1147 [TCP segment of a reassembled PDU]	
18 0.305040	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232138025 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]	
19 0.305813	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232139485 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]	
20 0.306692	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232140945 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]	
21 0.307571	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232142405 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]	
22 0.308699	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232143865 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]	
23 0.309553	192.168.1.102	128.119.245.12	TCP	946	1161 → 80 [PSH, ACK] Seq=232145325 Ack=883061786 Win=17520 Len=892 [TCP segment of a reassembled PDU]	
30 0.576671	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232146217 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]	
31 0.577385	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232147677 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]	
32 0.578329	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232149137 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]	
33 0.579195	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232150597 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]	
34 0.580149	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232152057 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]	

Conversation completeness: Incomplete, DATA (15)

[TCP Segment Len: 1460]

Sequence Number: 232132498

[Next Sequence Number: 232133958]

Acknowledgment Number: 883061786

0101 = Header Length: 20 bytes (5)

Flags: 0x010 (ACK)

Window: 17520

[Calculated window size: 17520]

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

Checksum: 0xdd01 [unverified]

[Checksum Status: Unverified]

Urgent Pointer: 0

[Timestamps]

[Time since first frame in this TCP stream: 0.054690000 seconds]

[Time since previous frame in this TCP stream: 0.000664000 seconds]

[SEQ/ACK analysis]

[RTT: 0.023265000 seconds]

[Bytes in flight: 4380]

[Bytes sent since last PSH flag: 2920]

TCP payload (1460 bytes)

[Reassembled PDU in frame: 199]

TCP segment data (1460 bytes)

A data segment used in reassembly of a lower-level protocol (tcp.segment_data), 1460 bytes

Packets: 213 · Displayed: 202 (94.8%)

tcp-ethereal-trace-1

Source ip.src	Time	Source	Destination	Protocol	Length	Info
1 0.000000	192.168.1.102	128.119.245.12	TCP	62	1161 → 80 [SYN] Seq=232129012 Win=16384 Len=0 MSS=1460 SACK_PERM	
3 0.023265	192.168.1.102	128.119.245.12	TCP	54	1161 → 80 [ACK] Seq=232129013 Ack=883061786 Win=17520 Len=0	
4 0.026477	192.168.1.102	128.119.245.12	TCP	619	1161 → 80 [PSH, ACK] Seq=232129013 Ack=883061786 Win=17520 Len=565 [TCP segment of a reassembled PDU]	
5 0.041737	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [PSH, ACK] Seq=232129578 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]	
7 0.054026	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232131038 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]	
8 0.054690	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232132498 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]	
10 0.077405	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232133958 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]	
11 0.078157	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232135418 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]	
13 0.124185	192.168.1.102	128.119.245.12	TCP	1201	1161 → 80 [PSH, ACK] Seq=232136878 Ack=883061786 Win=17520 Len=1147 [TCP segment of a reassembled PDU]	
18 0.305040	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232138025 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]	
19 0.305813	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232139485 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]	

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

Checksum: 0xdd01 [unverified]

[Checksum Status: Unverified]

Urgent Pointer: 0

[Timestamps]

[Time since first frame in this TCP stream: 0.054690000 seconds]

[Time since previous frame in this TCP stream: 0.000664000 seconds]

[SEQ/ACK analysis]

[RTT: 0.023265000 seconds]

[Bytes in flight: 4380]

[Bytes sent since last PSH flag: 2920]

TCP payload (1460 bytes)

[Reassembled PDU in frame: 199]

TCP segment data (1460 bytes)

Time relative to first frame in this TCP stream (tcp.time_relative)

Packets: 213 · Displayed: 202 (94.8%)

$$\text{EstimatedRTT} = (1 - \alpha) * \text{EstimatedRTT} + \alpha * \text{SampleRTT}$$

We can observe this from timestamp:

Segment 1:

Seq: 232129012

✓ [Timestamps]

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

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

RTT: 0.02326500

EstimatedRTT = 0.023265s

> [Conversation completeness: Incomplete, DATA (15)]

[TCP Segment Len: 0]

Sequence Number: 232129012

Segment 2:

Seq: 232129013

✓ [Timestamps]

[Time since first frame in this TCP stream: 0.023265000 seconds]

[Time since previous frame in this TCP stream: 0.000093000 seconds]

RTT: next sent – this sent = 0.003212

EstimatedRTT=(1-0.125)×0.023265+0.125×0.003212 =0.020760875

[Conversation completeness: Incomplete]

[TCP Segment Len: 0]

Sequence Number: 232129013

Segment 3:

Seq: 232129013

✓ [Timestamps]

✓ [Timestamps]

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

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

RTT:0.015626

EstimatedRTT=0.020119015625

[Conversation completeness: Incomplete,
[TCP Segment Len: 565]
Sequence Number: 232129013

Segment 4:

Seq: 232129578

urgent pointer: 0
✓ [Timestamps]
[Time since first frame in this TCP stream: 0.041737000 seconds]
[Time since previous frame in this TCP stream: 0.015260000 seconds]
[SST/ACK analysis]

RTT: 0.012289s

EstimatedRTT=0.0191402626953125

> [Conversation completeness: Incomplete
[TCP Segment Len: 1460]
Sequence Number: 232129578

Segment 5:

Seq: 232131038

✓ [Timestamps]
[Time since first frame in this TCP stream: 0.054026000 seconds]
[Time since previous frame in this TCP stream: 0.000089000 seconds]
[SST/ACK analysis]

RTT: 0.000664s

EstimatedRTT=0.01683122998046875

[Conversation completeness: Incomplete
[TCP Segment Len: 1460]
Sequence Number: 232131038

Segment 6:

Seq: 232132498

urgent pointer: 0
✓ [Timestamps]
[Time since first frame in this TCP stream: 0.054690000 seconds]
[Time since previous frame in this TCP stream: 0.000664000 seconds]
✓ [SST/ACK analysis]

RTT: $0.077405 - 0.05469 = 0.022715s$

EstimatedRTT=0.017568301982421874

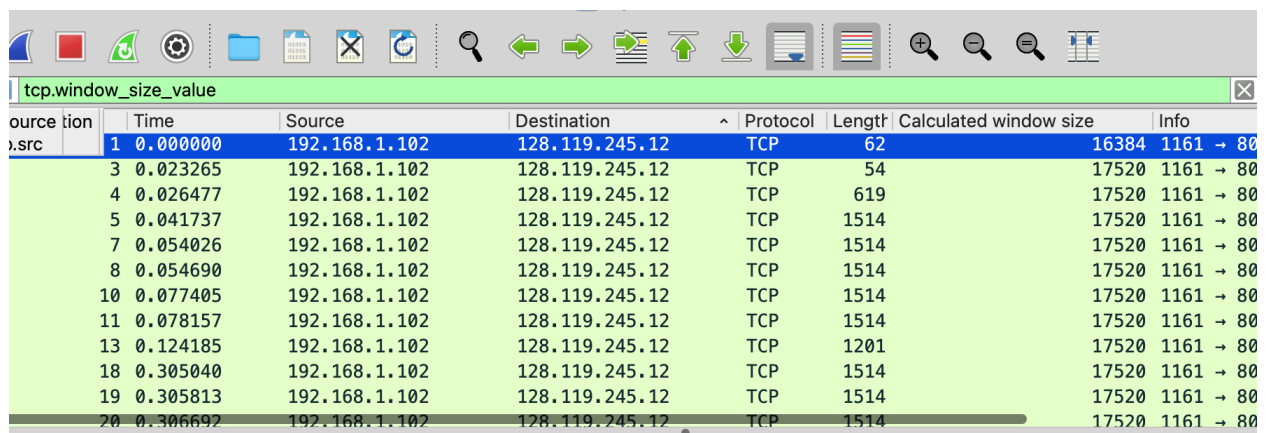
[Conversation completeness: Incomplete

[TCP Segment Len: 1460]

Sequence Number: 232132498

[Next Sequence Number: 232133050]

4.

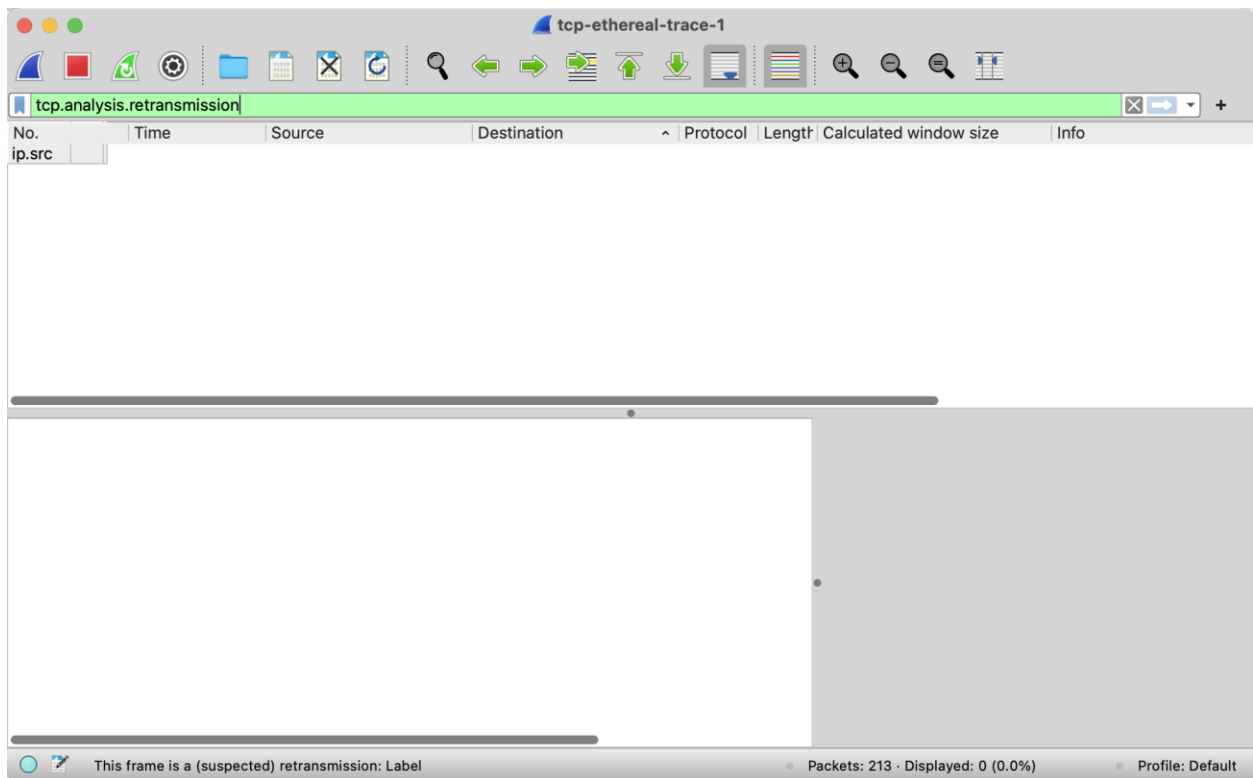


Source	Time	Source	Destination	Protocol	Length	Calculated window size	Info
192.168.1.102	0.000000	192.168.1.102	128.119.245.12	TCP	62	16384	1161 → 80
192.168.1.102	0.023265	192.168.1.102	128.119.245.12	TCP	54	17520	1161 → 80
192.168.1.102	0.026477	192.168.1.102	128.119.245.12	TCP	619	17520	1161 → 80
192.168.1.102	0.041737	192.168.1.102	128.119.245.12	TCP	1514	17520	1161 → 80
192.168.1.102	0.054026	192.168.1.102	128.119.245.12	TCP	1514	17520	1161 → 80
192.168.1.102	0.054690	192.168.1.102	128.119.245.12	TCP	1514	17520	1161 → 80
192.168.1.102	0.077405	192.168.1.102	128.119.245.12	TCP	1514	17520	1161 → 80
192.168.1.102	0.078157	192.168.1.102	128.119.245.12	TCP	1514	17520	1161 → 80
192.168.1.102	0.124185	192.168.1.102	128.119.245.12	TCP	1201	17520	1161 → 80
192.168.1.102	0.305040	192.168.1.102	128.119.245.12	TCP	1514	17520	1161 → 80
192.168.1.102	0.305813	192.168.1.102	128.119.245.12	TCP	1514	17520	1161 → 80
192.168.1.102	0.306692	192.168.1.102	128.119.245.12	TCP	1514	17520	1161 → 80

Minimum: 16384

There is no window size down to 0 which mean it doesn't lack of receiver buffer space .

5.

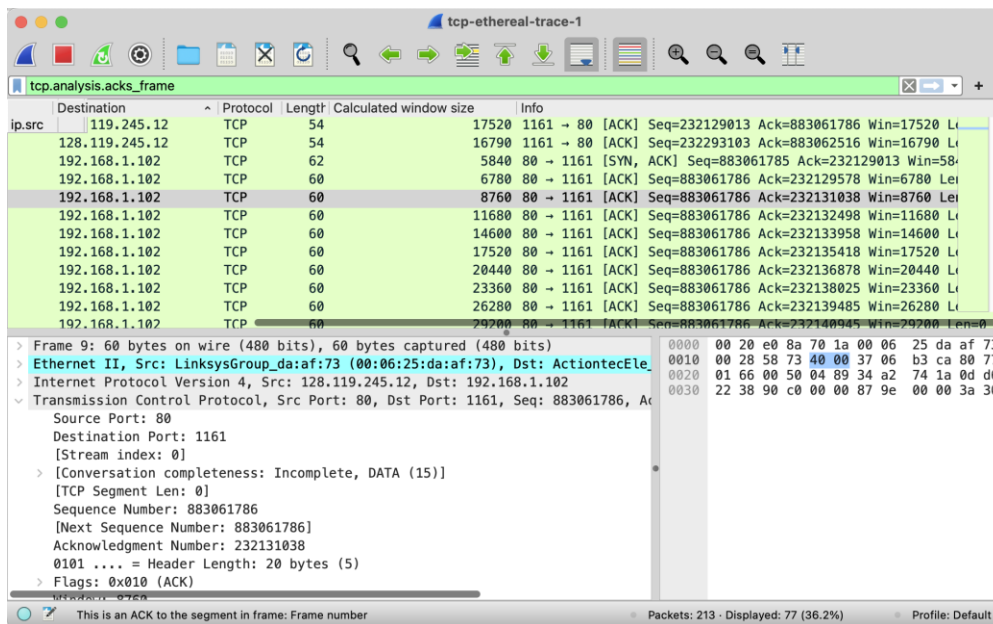


No , there is no retransmission segments

6.

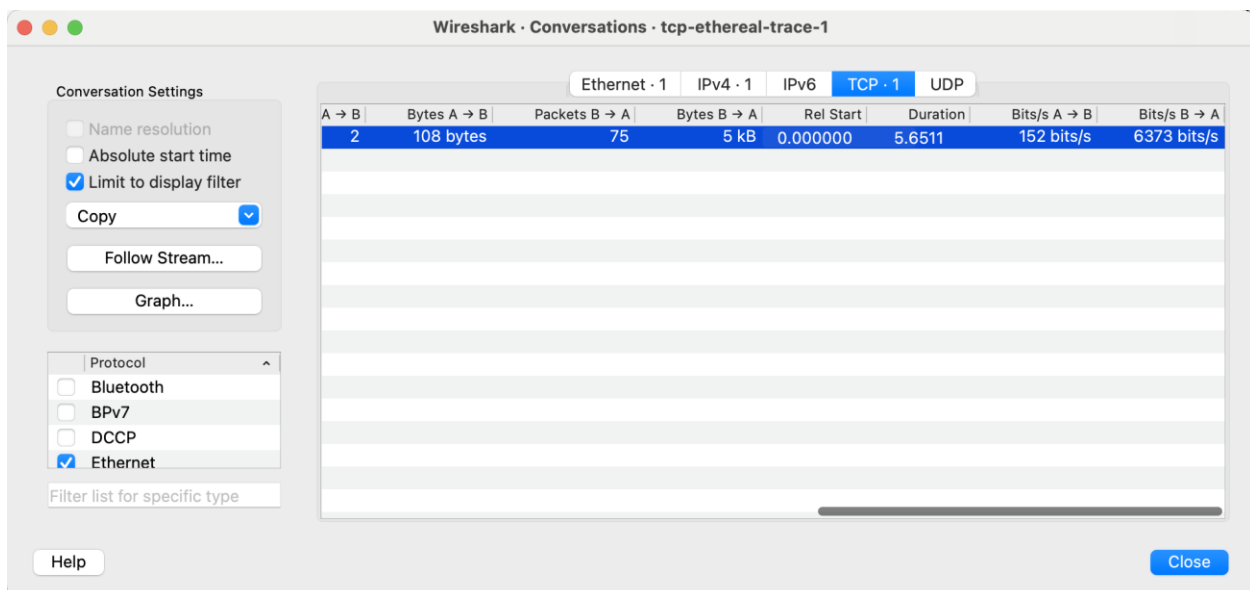
Normally: $\text{Ack}=2321314518 - \text{Ack}=2321313958 = 560$

The amount of data confirmed between other acks is too large, which I can think of as delayed ACK. The diagram below:



7.

Throughput = Total bytes transferred/connection duration



Question 2:

1. SYN seq:2818463618
2. SYNACK:1247095790. ACK:2818463619, server expect to send next seq number will be ack
3. Seq: 2818463619 ACK: 247095791 there is no data.
4. (1) Active close: The server (2) send a first FIN. (3) 4-segment closure (FIN/ACK/FIN/ACK)
5.
 1. **Data transferred from client to server:** $2818463652 - 2818463618 = 34$ bytes
 2. Data transferred from server to client: $1247095831 - 1247095790 = 41$ bytes