

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	192.168.61.14	192.168.61.16	TCP	74	43300 → 5001 [SYN] Seq=0
2	0.100811489	192.168.61.16	192.168.61.14	TCP	74	5001 → 43300 [SYN, ACK]
3	0.100839726	192.168.61.14	192.168.61.16	TCP	66	43300 → 5001 [ACK] Seq=...
4	0.101199511	192.168.61.14	192.168.61.16	TCP	2962	43300 → 5001 [PSH, ACK]
5	0.101211130	192.168.61.14	192.168.61.16	TCP	2962	43300 → 5001 [PSH, ACK]
6	0.101951425	192.168.61.14	192.168.61.16	TCP	2962	43300 → 5001 [PSH, ACK]
7	0.104376845	192.168.61.14	192.168.61.16	TCP	2962	43300 → 5001 [PSH, ACK]
8	0.106806524	192.168.61.14	192.168.61.16	TCP	2962	43300 → 5001 [PSH, ACK]
9	0.201743417	192.168.61.16	192.168.61.14	TCP	66	5001 → 43300 [ACK] Seq=...
10	0.201743651	192.168.61.16	192.168.61.14	TCP	66	5001 → 43300 [ACK] Seq=...
11	0.201797133	192.168.61.14	192.168.61.16	TCP	2962	43300 → 5001 [PSH, ACK]
12	0.201810068	192.168.61.14	192.168.61.16	TCP	2962	43300 → 5001 [PSH, ACK]
13	0.202228103	192.168.61.16	192.168.61.14	TCP	66	5001 → 43300 [ACK] Seq=...
14	0.202519187	192.168.61.14	192.168.61.16	TCP	2962	43300 → 5001 [PSH, ACK]
15	0.204976357	192.168.61.14	192.168.61.16	TCP	2962	43300 → 5001 [PSH, ACK]

> Frame 1: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface enp6s0, id 0  
 > Ethernet II, Src: ASUSTekC\_ed:80:7c: (04:5d:64:ed:80:7c), Dst: HP\_ed:48:df (b0:22:7a:ed:48:df)  
 > Internet Protocol Version 4, Src: 192.168.61.14, Dst: 192.168.61.16  
 > Transmission Control Protocol, Src Port: 43300, Dst Port: 5001, Seq: 0, Len: 0

1. 192.168.61.14 (43300)

2. 192.168.61.16 (5001)

[TCP Segment Len: 0]

Sequence Number: 0 (relative sequence number)

Sequence Number (raw): 903558035

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

Acknowledgment Number: 0

Acknowledgment number (raw): 0

1010 .... = Header Length: 40 bytes (10)

> Flags: 0x002 (SYN)

Window: 64240

3. 0 (raw: 903558035), Flags

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

Acknowledgment Number: 1 (relative ack number)

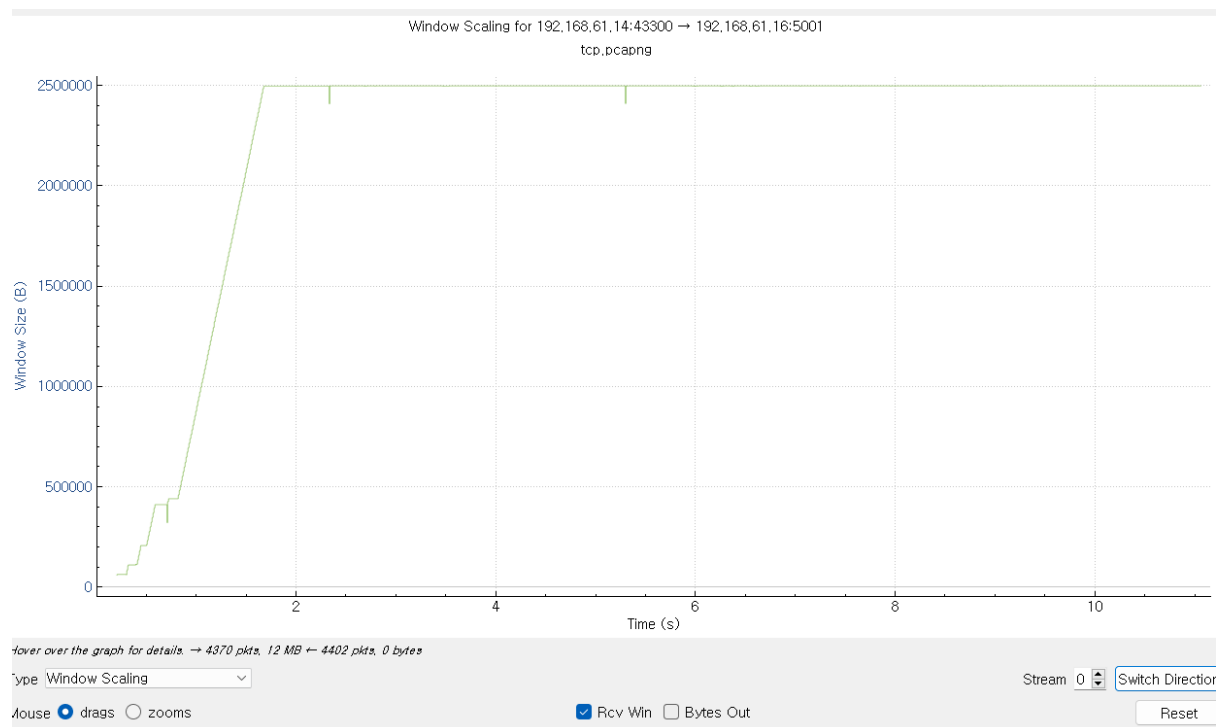
Acknowledgment number (raw): 903558036

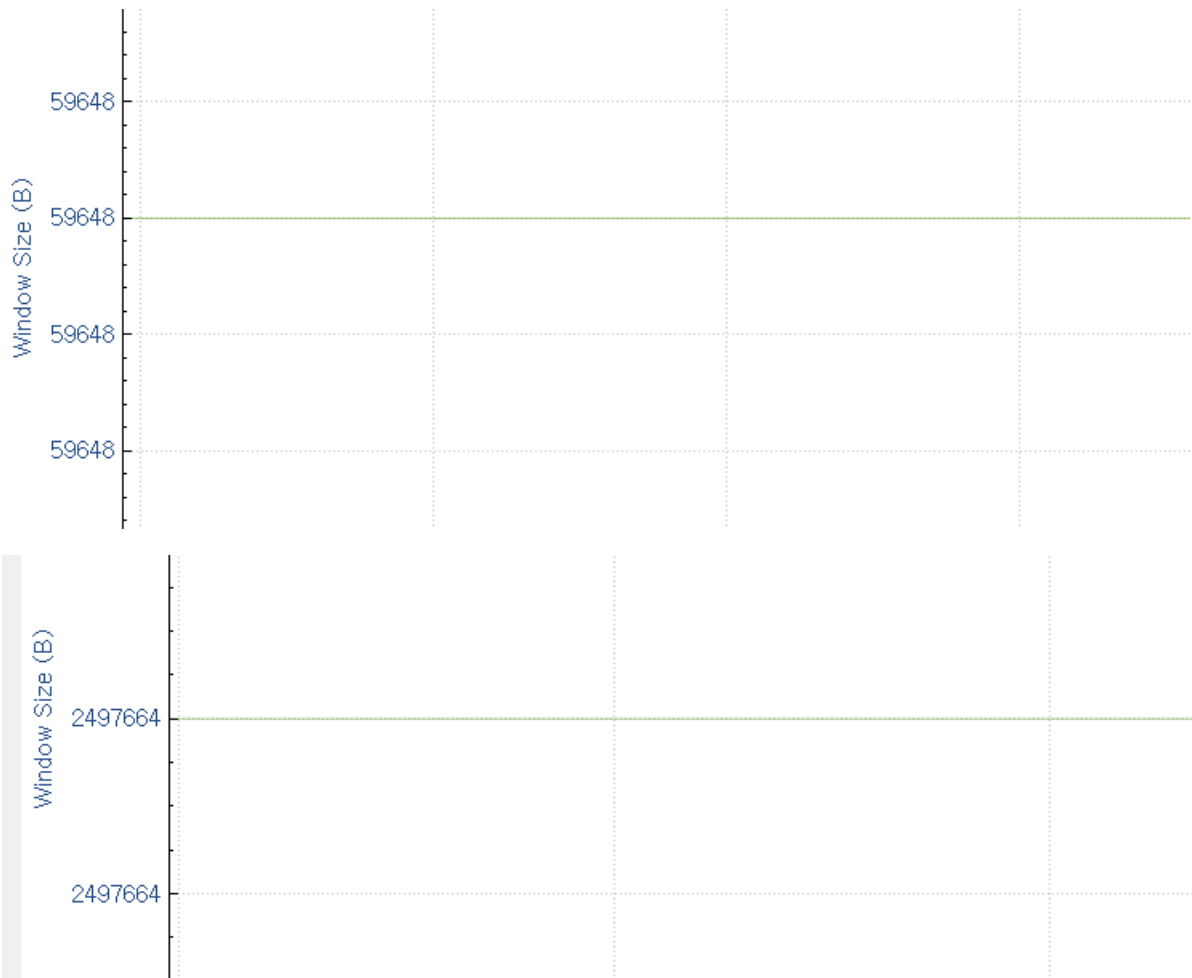
```

Sequence Number: 0 (relative sequence number)
Sequence Number (raw): 2067760045
[Next Sequence Number: 1 (relative sequence number)]
Acknowledgment Number: 1 (relative ack number)
Acknowledgment number (raw): 903558036
1010 .... = Header Length: 40 bytes (10)
> Flags: 0x012 (SYN, ACK)
Header: 05400
1010 .... = Header Length: 40 bytes (10)
✓ Flags: 0x012 (SYN, ACK)
 000. .... = Reserved: Not set
 ...0 .... = Accurate ECN: Not set
 .... 0... = Congestion Window Reduced: 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

```

4. 0 (raw: 2067760045), the value is 1, determine it as (seq number + 1). We can identify the segment by Acknowledgement filed in Flags.





5. maximum: 2497664 B

Minimum: 59648 B

Window size scaling factor means the factor by which the window size should be multiplied. This scaling factor allows TCP to adapt to varying network conditions and efficiently utilize available bandwidth, particularly in high-speed and high-latency networks.

tcp.analysis.retransmission						
No.	Time	Source	Destination	Protocol	Length	Info
220	0.609248057	192.168.61.14	192.168.61.16	TCP	2962	[TCP Fast Retra
1921	2.232311824	192.168.61.14	192.168.61.16	TCP	2962	[TCP Fast Retra
4359	5.198891922	192.168.61.14	192.168.61.16	TCP	1514	[TCP Fast Retra

6. 3 segments.

#### [TCP Analysis Flags]

- ▼ [Expert Info (Note/Sequence): This frame is a (suspected) fast retransmission]
  - [This frame is a (suspected) fast retransmission]
  - [Severity level: Note]
  - [Group: Sequence]
- ▼ [Expert Info (Note/Sequence): This frame is a (suspected) retransmission]
  - [This frame is a (suspected) retransmission]
  - [Severity level: Note]
  - [Group: Sequence]

7. the packets retransmitted were a (suspected) fast retransmission.



Acknowledgment Number: 1 (relative ack number)

Acknowledgment number (raw): 2067760046

1000 .... = Header Length: 32 bytes (8)

> Flags: 0x018 (PSH, ACK)

Window: 502

[Calculated window size: 64256]

[Window size scaling factor: 128]

Checksum: 0x06e6 [unverified]

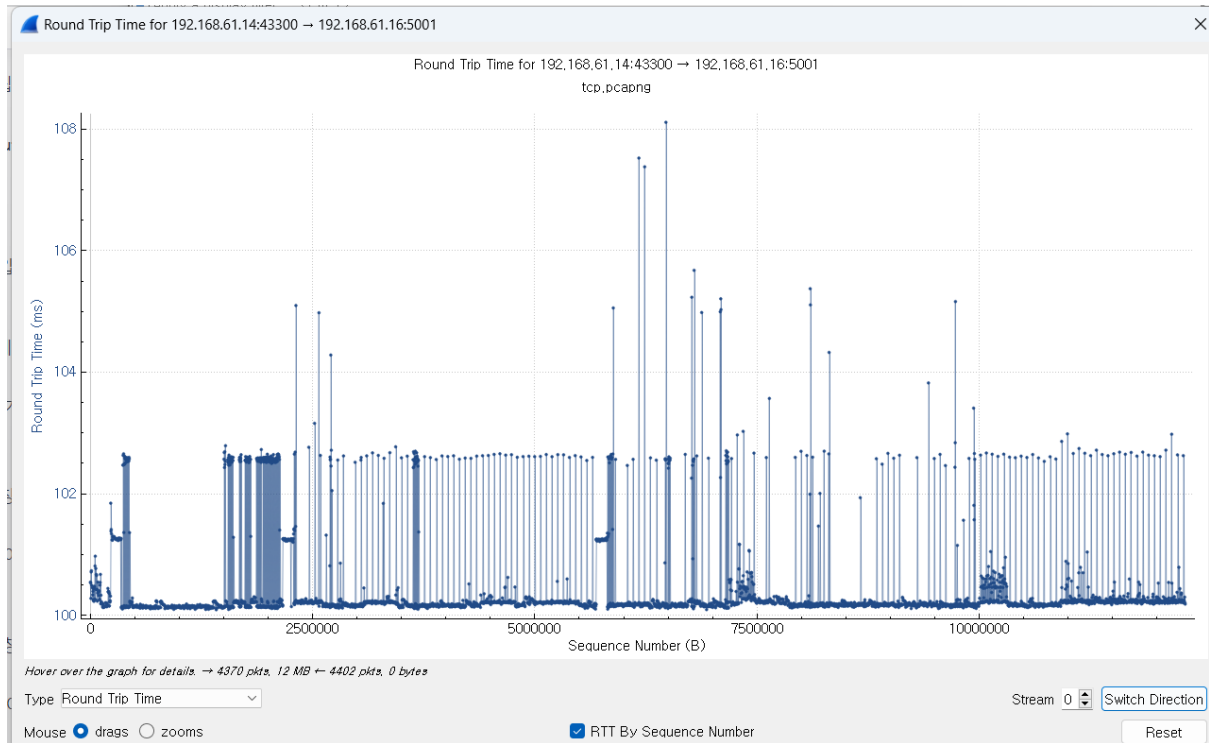
[Checksum Status: Unverified]

Urgent Pointer: 0

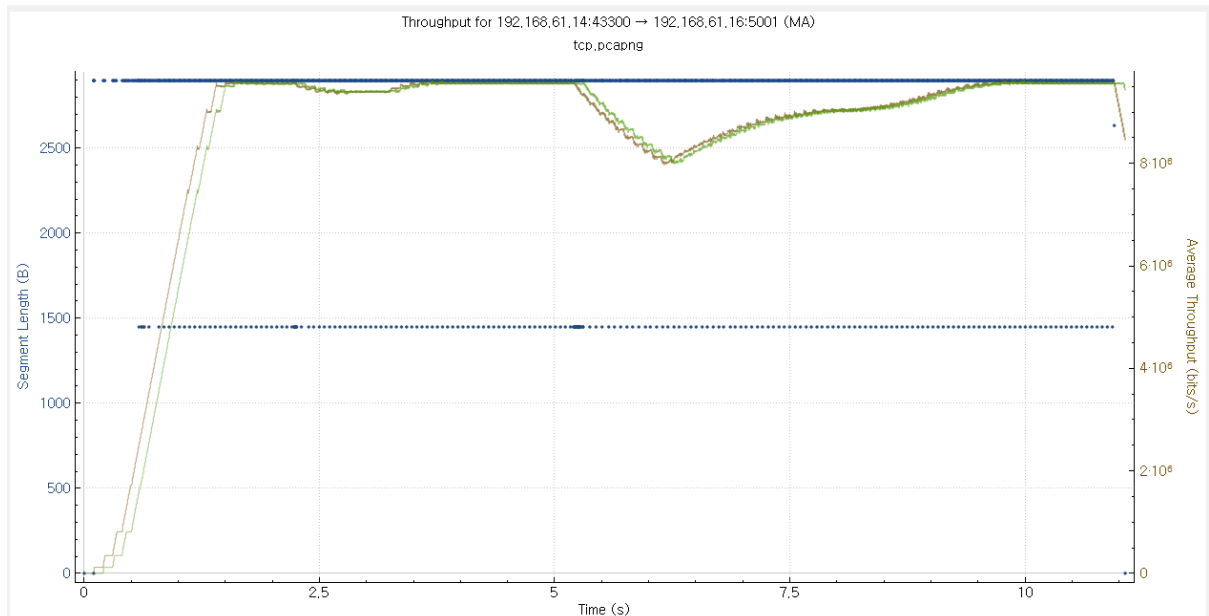
8. TCP's slow start from points I draw circle in green. Initial window size of it is 64256.

## Statistics

Measurement	Captured	Displayed	Marked
Packets	8772	8772 (100.0%)	—
Time span, s	11.065	11.065	—
Average pps	792.8	792.8	—
Average packet size, B	1471	1471	—
Bytes	12901476	12901476 (100.0%)	0
Average bytes/s	1165 k	1165 k	—
Average bits/s	9327 k	9327 k	—



9. average throughput is 1165K (bytes/s). we can show RTT like above.



No.	Time	Source	Destination	Protocol	Length	Info
4414	5.259034093	192.168.61.14	192.168.61.16	TCP	2962	43300 → 5001 [PSH, ACK] Seq=5867297 Ack=1 Wi
4415	5.261393382	192.168.61.16	192.168.61.14	TCP	78	[TCP Dup ACK 4349#32] 5001 → 43300 [ACK] Seq
4416	5.261439803	192.168.61.14	192.168.61.16	TCP	1514	43300 → 5001 [ACK] Seq=5870193 Ack=1 Win=642
4417	5.263825297	192.168.61.16	192.168.61.14	TCP	78	[TCP Dup ACK 4349#33] 5001 → 43300 [ACK] Seq
4418	5.263873853	192.168.61.14	192.168.61.16	TCP	1514	43300 → 5001 [ACK] Seq=5871641 Ack=1 Win=642
4419	5.266223681	192.168.61.16	192.168.61.14	TCP	78	[TCP Dup ACK 4349#34] 5001 → 43300 [ACK] Seq
4420	5.266270760	192.168.61.14	192.168.61.16	TCP	2962	43300 → 5001 [PSH, ACK] Seq=5873089 Ack=1 Wi
4421	5.268641087	192.168.61.16	192.168.61.14	TCP	78	[TCP Dup ACK 4349#35] 5001 → 43300 [ACK] Seq
4422	5.268688294	192.168.61.14	192.168.61.16	TCP	1514	43300 → 5001 [ACK] Seq=5875985 Ack=1 Win=642
4423	5.269878047	192.168.61.16	192.168.61.14	TCP	78	[TCP Dup ACK 4349#36] 5001 → 43300 [ACK] Seq
4424	5.269927896	192.168.61.14	192.168.61.16	TCP	1514	43300 → 5001 [ACK] Seq=5877433 Ack=1 Win=642
4425	5.272278265	192.168.61.16	192.168.61.14	TCP	78	[TCP Dup ACK 4349#37] 5001 → 43300 [ACK] Seq
4426	5.272325550	192.168.61.14	192.168.61.16	TCP	1514	43300 → 5001 [ACK] Seq=5878881 Ack=1 Win=642
4427	5.274735345	192.168.61.16	192.168.61.14	TCP	78	[TCP Dup ACK 4349#38] 5001 → 43300 [ACK] Seq
4428	5.274783021	192.168.61.14	192.168.61.16	TCP	2962	43300 → 5001 [PSH, ACK] Seq=5880329 Ack=1 Wi
4429	5.277135658	192.168.61.16	192.168.61.14	TCP	78	[TCP Dup ACK 4349#39] 5001 → 43300 [ACK] Seq
4430	5.277183015	192.168.61.14	192.168.61.16	TCP	1514	43300 → 5001 [ACK] Seq=5883225 Ack=1 Win=642
4431	5.279544112	192.168.61.16	192.168.61.14	TCP	78	[TCP Dup ACK 4349#40] 5001 → 43300 [ACK] Seq
4432	5.282012251	192.168.61.16	192.168.61.14	TCP	78	[TCP Dup ACK 4349#41] 5001 → 43300 [ACK] Seq
4433	5.282059681	192.168.61.14	192.168.61.16	TCP	2962	43300 → 5001 [PSH, ACK] Seq=5884673 Ack=1 Wi
4434	5.284465172	192.168.61.16	192.168.61.14	TCP	78	[TCP Dup ACK 4349#42] 5001 → 43300 [ACK] Seq
4435	5.284511955	192.168.61.14	192.168.61.16	TCP	2962	43300 → 5001 [PSH, ACK] Seq=5887569 Ack=1 Wi
4436	5.286883367	192.168.61.16	192.168.61.14	TCP	78	[TCP Dup ACK 4349#43] 5001 → 43300 [ACK] Seq
4437	5.286931097	192.168.61.14	192.168.61.16	TCP	2962	43300 → 5001 [PSH, ACK] Seq=5890465 Ack=1 Wi
4438	5.289221123	192.168.61.16	192.168.61.14	TCP	78	[TCP Dup ACK 4349#44] 5001 → 43300 [ACK] Seq
4439	5.289267926	192.168.61.14	192.168.61.16	TCP	2962	43300 → 5001 [PSH, ACK] Seq=5893361 Ack=1 Wi
4440	5.291732943	192.168.61.16	192.168.61.14	TCP	78	[TCP Dup ACK 4349#45] 5001 → 43300 [ACK] Seq

10. in the decrement point middle of the graph, there were many duplicated ACKs. It occurs retransmissions and makes throughput less at that time.