Computer Network experiment III

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Question 1 The IP and port of the client computer

| 2 0.023172 | 128.119.245.12 | 192.168.1.102 | TCP | 62 80 → 1161 | |
| 3 0.023265 | 192.168.1.102 | 128.119.245.12 | TCP | 54 1161 → 80 | |

IP 192.168.1.102

Port 1161

Question 2 The IP address and TCP port used server computer

IP address is 128.119.254.12

Port is 80

| 121 4.391452 | 114.214.229.191 | 128.119.245.12 | HTTP | 1993 POST /wiresha |
| 123 4.410590 | 128.119.245.12 | 114.214.229.191 | TCP | 60 80 → 57032 [A |

Question 3 IP and port of client

| 120 4.391324 | 128.119.245.12 | 114.214.229.191 | TCP | 60 80 → 57032 [ACK] Seq=1 Ack=127731 Win=180608 Len=0 |
| 121 4.391452 | 114.214.229.191 | 128.119.245.12 | HTTP | 1993 POST /wireshark-labs/lab3-1-reply.htm HTTP/1.1 (text/plain) |

IP address 114.214.229.191

Port 57032

Question4

```
[Stream index: 0]
[TCP Segment Len: 0]
Sequence Number: 0    (relative sequence number)
Sequence Number (raw): 232129012
[Next Sequence Number: 1    (relative sequence number)]
Acknowledgment Number: 0
Acknowledgment number (raw): 0
0111 .... = Header Length: 28 bytes (7)
Flags: 0x002 (SYN)
Window: 16384
[Calculated window size: 16384]
Checksum: 0xf6e9 [unverified]
[Checksum Status: Unverified]
```

Initial sequence number is 0 and it sets the SYN tag bit 1'b1 to indicate the TCP segment is made to build the connection

Question 5

```
✓ 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)
     Sequence Number (raw): 883061785
     [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)
     Window: 5840
```

- sequence of SYN ack segment is 0
- Acknowledge number is 1
- set the flag SYN to 1 to indicate it is the ACK SYN segment

Question 6

```
Destination Port: 80
[Stream index: 0]
[TCP Segment Len: 565]
Sequence Number: 1     (relative sequence number)
Sequence Number (raw): 232129013
[Next Sequence Number: 566     (relative sequence number)]
Acknowledgment Number: 1     (relative ack number)
Acknowledgment number (raw): 883061786
0101       = Header Length: 20 bytes (5)
```

```
000  00 06 25 da af 73 00 20  e0 8a 70 1a 08 00 45 00    ··%··s·  ··p···E·
010  02 5d 1e 21 40 00 80 06  a2 e7 c0 a8 01 66 80 77    ·]·!@···  ·····f·w
020  f5 0c 04 89 00 50 0d d6  01 f5 34 a2 74 1a 50 18    ·····P··  ··4·t·P·
030  44 70 1f bd 00 00 50 4f  53 54 20 2f 65 74 68 65    Dp····PO ST /ethe
040  72 65 61 6c 2d 6c 61 62  73 2f 6c 61 62 33 2d 31    real-lab s/lab3-1
050  2d 72 65 70 6c 79 2e 68  74 6d 20 48 54 54 50 2f    -reply.h tm HTTP/
060  31 2e 31 0d 0a 48 6f 73  74 3a 20 67 61 69 61 2e    1.1··Hos t: gaia.
```

We can find the TCP segment contain POST command has the sequence number 1

Question 7

first

```
Destination Port: 80
[Stream index: 0]
[TCP Segment Len: 565]
Sequence Number: 1     (relative sequence number)
Sequence Number (raw): 232129013
[Next Sequence Number: 566     (relative sequence number)]
Acknowledgment Number: 1     (relative ack number)
Acknowledgment number (raw): 883061786
0101       = Header Length: 20 bytes (5)
```

```
000  00 06 25 da af 73 00 20  e0 8a 70 1a 08 00 45 00    ··%··s·  ··p···E·
010  02 5d 1e 21 40 00 80 06  a2 e7 c0 a8 01 66 80 77    ·]·!@···  ·····f·w
020  f5 0c 04 89 00 50 0d d6  01 f5 34 a2 74 1a 50 18    ·····P··  ··4·t·P·
030  44 70 1f bd 00 00 50 4f  53 54 20 2f 65 74 68 65    Dp····PO ST /ethe
040  72 65 61 6c 2d 6c 61 62  73 2f 6c 61 62 33 2d 31    real-lab s/lab3-1
050  2d 72 65 70 6c 79 2e 68  74 6d 20 48 54 54 50 2f    -reply.h tm HTTP/
060  31 2e 31 0d 0a 48 6f 73  74 3a 20 67 61 69 61 2e    1.1··Hos t: gaia.
```

The sequence number is 1

second

```
    Source Port: 1161
    Destination Port: 80
    [Stream index: 0]
    [TCP Segment Len: 1460]
    Sequence Number: 566     (relative sequence number)
    Sequence Number (raw): 232129578
    [Next Sequence Number: 2026     (relative sequence number)]
    Acknowledgment Number: 1     (relative ack number)
    Acknowledgment number (raw): 883061786
    0101         = Header Length: 20 bytes (5)
```

The sequence number is 266

Third

```
    Source Port: 1161
    Destination Port: 80
    [Stream index: 0]
    [TCP Segment Len: 1460]
    Sequence Number: 2026     (relative sequence number)
    Sequence Number (raw): 232131038
    [Next Sequence Number: 3486     (relative sequence number)]
    Acknowledgment Number: 1     (relative ack number)
    Acknowledgment number (raw): 883061786
    0101         = Header Length: 20 bytes (5)
```

The sequence number is 2026

4th

```
    Source Port: 1161
    Destination Port: 80
    [Stream index: 0]
    [TCP Segment Len: 1460]
    Sequence Number: 3486     (relative sequence number)
    Sequence Number (raw): 232132498
    [Next Sequence Number: 4946     (relative sequence number)]
    Acknowledgment Number: 1     (relative ack number)
    Acknowledgment number (raw): 883061786
    0101         = Header Length: 20 bytes (5)
```

3486

5th

```
Transmission Control Protocol, Src Port: 1161, Dst Port: 80, Seq: 4946, Ack: 1, Len: 1460
    Source Port: 1161
    Destination Port: 80
    [Stream index: 0]
    [TCP Segment Len: 1460]
    Sequence Number: 4946     (relative sequence number)
    Sequence Number (raw): 232133958
    [Next Sequence Number: 6406     (relative sequence number)]
    Acknowledgment Number: 1     (relative ack number)
    Acknowledgment number (raw): 883061786
    0101         = Header Length: 20 bytes (5)
```

4946

6th

```
Transmission Control Protocol, Src Port: 1161, Dst Port: 80, Seq: 6406, Ack: 1, Len: 1460
    Source Port: 1161
    Destination Port: 80
    [Stream index: 0]
    [TCP Segment Len: 1460]
    Sequence Number: 6406     (relative sequence number)
    Sequence Number (raw): 232135418
    [Next Sequence Number: 7866     (relative sequence number)]
    Acknowledgment Number: 1     (relative ack number)
    Acknowledgment number (raw): 883061786
    0101         = Header Length: 20 bytes (5)
```

6406

$$EstimatedRTT = \alpha \times Last_E stimatedRTT + (1 - \alpha) \times SampleRTT$$

$\alpha = 0.875$

sequence of segment	sequence number	send time	Ack time	RTT	Estiamted RTT	TCP segment length
1	1	0.026	0.0539	0.027	0.027	565
2	566	0.041	0.0772	0.0355	0.0028	1460
3	2026	0.054	0.124	0.07	0.033	1460
4	3486	0.054	0.169	0.114	0.043	1460
5	4946	0.077	0.217	0.139	0.055	1460
6	6406	0.078	0.267	0.189	0.072	1460

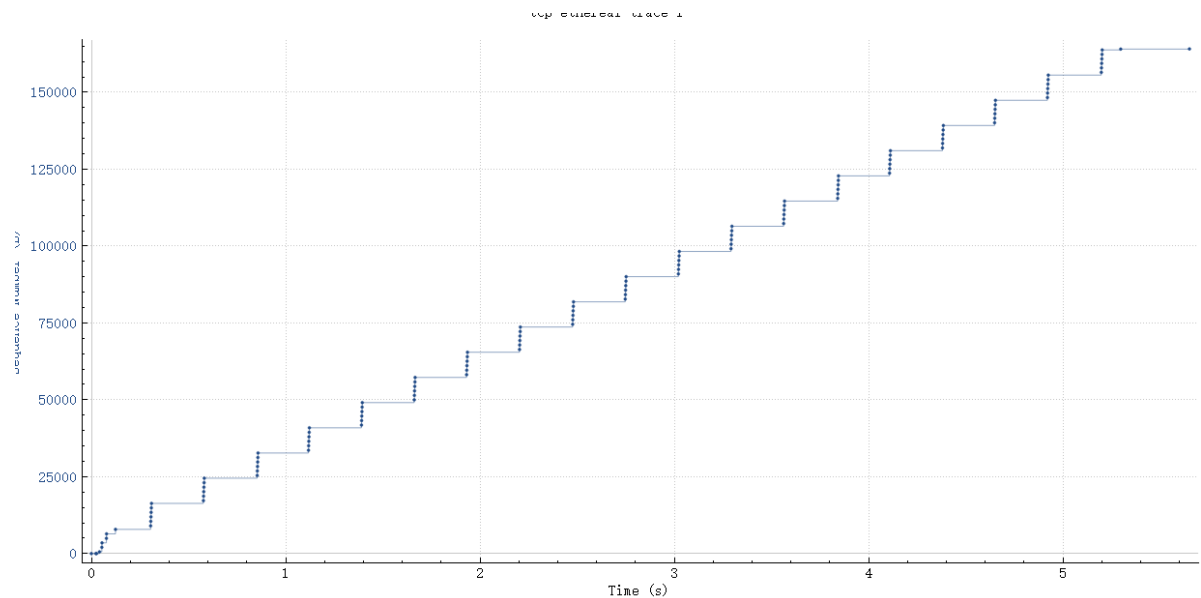# Question 8

See the table above

Question 9


```
  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 [TCP segment of a reassembled P
  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 [TCP segment of a reassemble
  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 [TCP segment of a reassembled PD
  8 0.054690    192.168.1.102    128.119.245.12    TCP    1514 1161 → 80 [ACK] Seq=3486 Ack=1 Win=17520 Len=1460 [TCP segment of a reassembled PD
  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 [TCP segment of a reassembled PD
 11 0.078157    192.168.1.102    128.119.245.12    TCP    1514 1161 → 80 [ACK] Seq=6406 Ack=1 Win=17520 Len=1460 [TCP segment of a reassembled PD
 12 0.124085    128.119.245.12   192.168.1.102     TCP    60 80 → 1161 [ACK] Seq=1 Ack=3486 Win=11680 Len=0
```

```
    [Stream index: 0]
    [TCP Segment Len: 0]
    Sequence Number: 0    (relative sequence number)
    Sequence Number (raw): 883061785
    [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)
    Window: 5840
```

Windows size is 5840

Question 10

There is no retransmitted segment in the trace and we can find this through no duplicated segment number when we check the segment number of different segment shown in the Wireshark

Question 11

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
199 5.297341	192.168.1.102	128.119.245.12	HTTP	104 POST /ethereal-labs/lab3-1-reply.htm HTTP/1.1 (text/plain)
206 5.651141	192.168.1.102	128.119.245.12	TCP	54 1161 → 80 [ACK] Seq=164091 Ack=731 Win=16790 Len=0
213 7.595557	192.168.1.102	199.2.53.206	TCP	62 1162 → 631 [SYN] Seq=0 Win=16384 Len=0 MSS=1460 SACK_PERM=1
187 5.104175	Intel_52:2b:23	Broadcast	ARP	42 Who has 192.168.1.1? Tell 192.168.1.100
188 5.105060	LinksysG_da:af:73	Intel_52:2b:23	ARP	42 192.168.1.1 is at 00:06:25:da:af:73

```
TCP segment data (50 bytes)
[122 Reassembled TCP Segments (164090 bytes): #4(565), #5(1460), #7(1460), #8(1460), #10(1460), #11(1460), #13(1147), #18(1460), #19(1460), #20(1460), #21(1460), #
   [Frame: 4, payload: 0-564 (565 bytes)]
   [Frame: 5, payload: 565-2024 (1460 bytes)]
   [Frame: 7, payload: 2025-3484 (1460 bytes)]
   [Frame: 8, payload: 3485-4944 (1460 bytes)]
   [Frame: 10, payload: 4945-6404 (1460 bytes)]
   [Frame: 11, payload: 6405-7864 (1460 bytes)]
   [Frame: 13, payload: 7865-9011 (1147 bytes)]
   [Frame: 18, payload: 9012-10471 (1460 bytes)]
   [Frame: 19, payload: 10472-11931 (1460 bytes)]
```
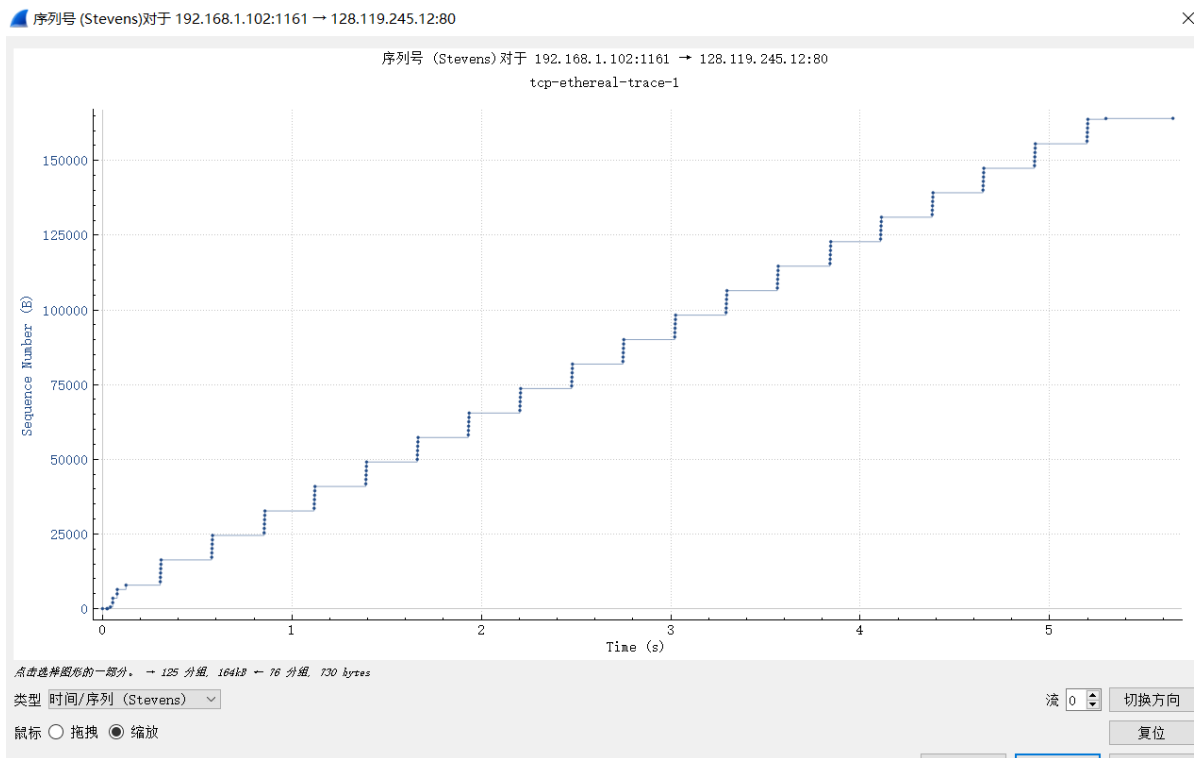
122segments

Question 12

Total=164090 Bytes in 5.29s

Throughput=31019 Bytes/s

Question 13

From this Graph ,we can find the process of slow start. The basic principle of TCP behavior is that TCP sender wants to send more data and when it gets ACK which means the requirement of sending more data through Network will not cause congestion in the whole Network. But when TCP sender miss the ACK segment or detect a Timeout issue, the sender will decrease the data it sends through Network.

Question 14

This is time analyze between my computer to the host computer and we can find the process of slow start

The initial sequence number is very low and the sequence number sent by the sender will be doubled between some time. This is how the network incease the utility of the network from the start point

You can also find the throughout - time Graph to indicate the view
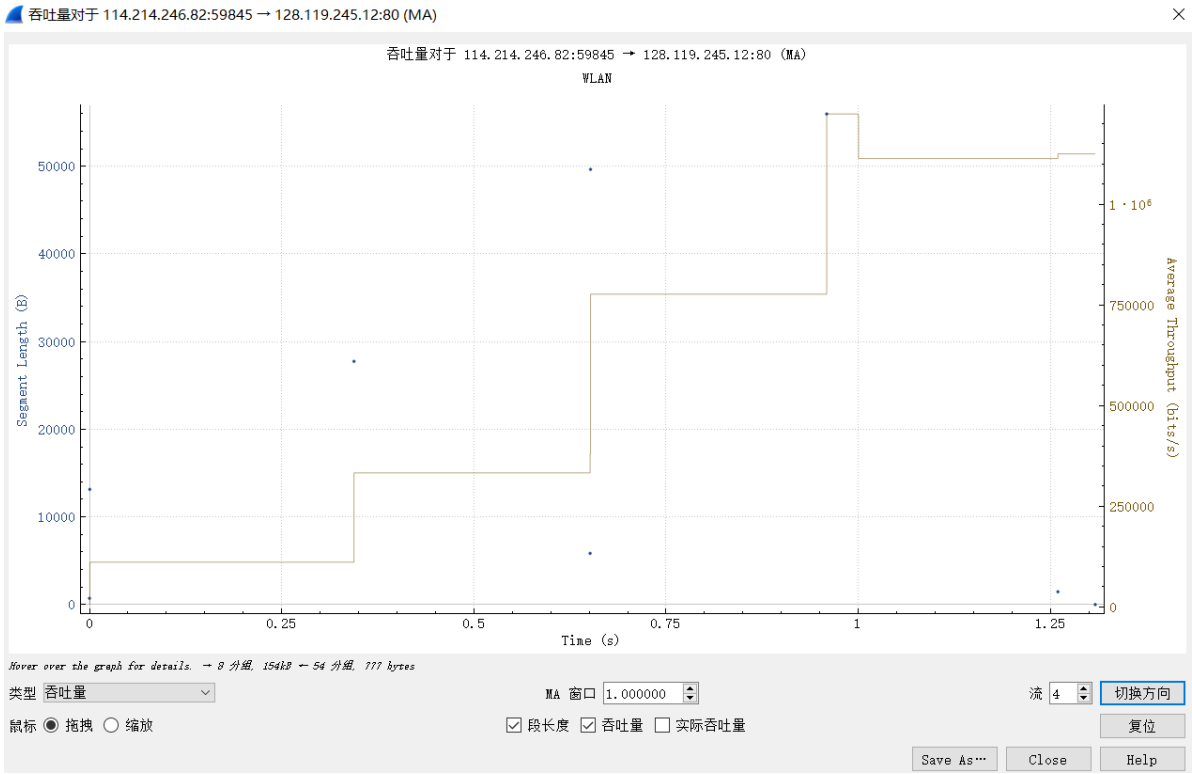
The throughout doubled after certain time period