COMP9331 LAB 04

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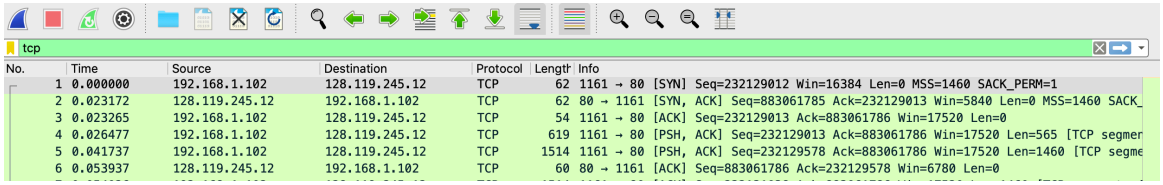
Exercise 1: Understanding TCP using Wireshark

Question 1



- The IP address of gaia.cs.umass.edu is `128.119.245.12`
- The port number of gaia.cs.umass.edu is `80`
- The client computer IP address is `192.168.1.102`
- The client computer IP port number is `1161`

Question 2

```
▶ Frame 4: 619 bytes on wire (4952 bits), 619 bytes captured (4952 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: 232129013, Ack: 883061786, Len: 565
    Source Port: 1161
    Destination Port: 80
    [Stream index: 0]
    [TCP Segment Len: 565]
    Sequence Number: 232129013
    [Next Sequence Number: 232129578]
    Acknowledgment Number: 883061786
    0101 .... = Header Length: 20 bytes (5)
  ▶ Flags: 0x018 (PSH, ACK)
    Window: 17520
    [Calculated window size: 17520]
    [Window size scaling factor: -2 (no window scaling used)]
    Checksum: 0x1fbd [unverified]
```

```
0020  f5 0c 04 89 00 50 0d d6  01 f5 34 a2 74 1a 50 18   ·····P·· ··4·t·P·
0030  44 70 1f bd 00 00 50 4f  53 54 20 2f 65 74 68 65   Dp····PO ST /ethe
0040  72 65 61 6c 2d 6c 61 62  73 2f 6c 61 62 33 2d 31   real-lab s/lab3-1
0050  2d 72 65 70 6c 79 2e 68  74 6d 20 48 54 54 50 2f   -reply.h tm HTTP/
0060  31 2e 31 0d 0a 48 6f 73  74 3a 20 67 61 69 61 2e   1.1··Hos t: gaia.
0070  63 73 2e 75 6d 61 73 73  2e 65 64 75 0d 0a 55 73   cs.umass .edu··Us
```

- The sequence number of the TCP segment containing the HTTP POST command is `232129013`

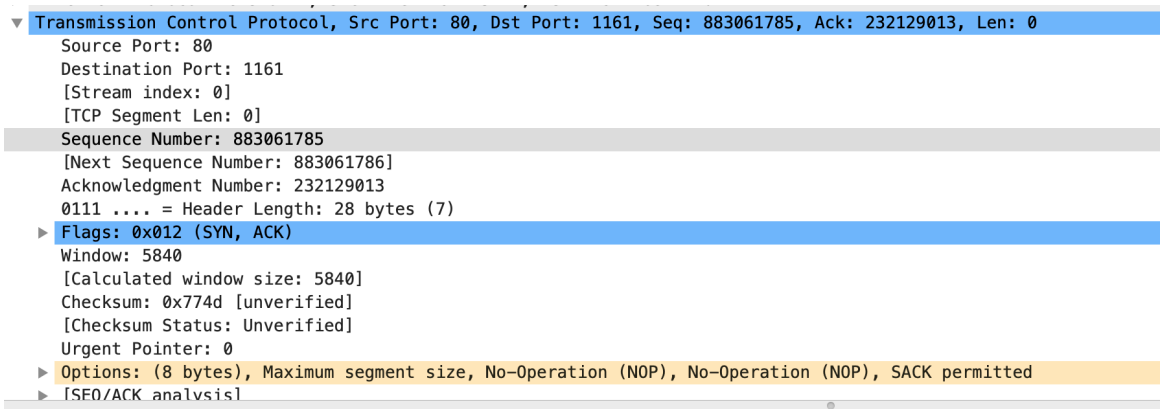
Question 3

Sequence Number	Send Time	ACK	RTT	EstimatedRtt
232129013	0.026477	0.053937	0.027460	0.027460
232129578	0.041737	0.077294	0.035557	0.028472
232131038	0.054026	0.124085	0.070059	0.033670
232132498	0.054690	0.169118	0.114428	0.043765
232133958	0.077405	0.217299	0.139894	0.055781
232135418	0.078157	0.267802	0.189645	0.072514

Question 4

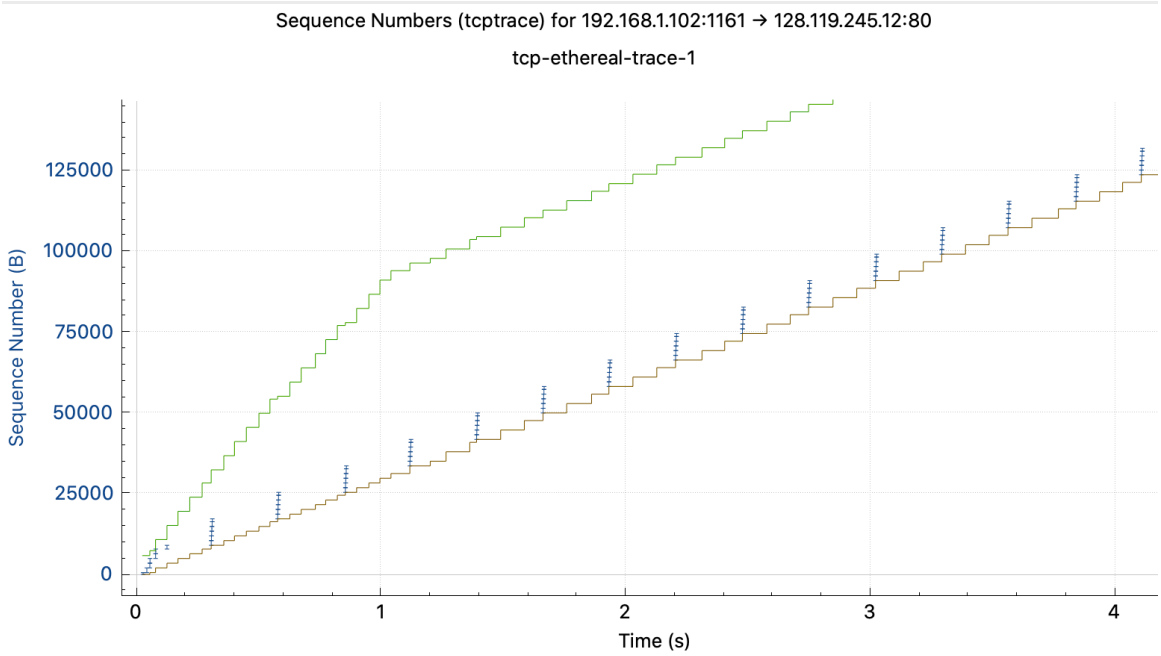
Sequence Number	Length
232129013	565
232129578	1460
232131038	1460
232132498	1460
232133958	1460
232135418	1460

Question 5



- The minimum amount of available buffer space is 5840 bytes.
- No, there is not flow control. The window size always more than 1460 bytes.

Question 6



- There is increasing line. Therefore, there is not any retransmitted segments in the trace file.
- I check the TCP stream graph -> Time sequence (tcptrace)

Question 7

17	0.304807	128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACK] Seq=883061786
18	0.305040	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232138025
19	0.305813	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232139485
20	0.306692	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232140945
21	0.307571	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232142405
22	0.308699	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232143865
23	0.309553	192.168.1.102	128.119.245.12	TCP	946	1161 → 80 [PSH, ACK] Seq=2321
24	0.356437	128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACK] Seq=883061786
25	0.400164	128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACK] Seq=883061786
26	0.448613	128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACK] Seq=883061786
27	0.500029	128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACK] Seq=883061786
28	0.545052	128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACK] Seq=883061786
29	0.576417	128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACK] Seq=883061786

```
▶ Frame 18: 1514 bytes on wire (12112 bits), 1514 bytes captured (12112 bits)
▶ Ethernet II, Src: Actionte_8a:70:1a (00:20:e0:8a:70:1a), Dst: LinksysG_da:af:73 (00:06:25:da:af:7
▶ Internet Protocol Version 4, Src: 192.168.1.102, Dst: 128.119.245.12
▼ Transmission Control Protocol, Src Port: 1161, Dst Port: 80, Seq: 232138025, Ack: 883061786, Len:
    Source Port: 1161
    Destination Port: 80
    [Stream index: 0]
    [TCP Segment Len: 1460]
    Sequence Number: 232138025
    [Next Sequence Number: 232139485]
    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: 0xe628 [unverified]
```

- The receiver typically acknowledge in an ACK is 1460

No.	acknowledged sequence number	acknowledged data
18	232138025	1460
19	232139485	1460
20	232140945	1460
21	232142405	1460
22	232143865	1460

Question 8

$$Throughput = \frac{totalData}{time} = \frac{(lastACK - firstSeq)}{time} = \frac{(232293103 - 232129013)}{5.455803 - 0.026477} = 30222.904 byte/s$$

Exercise 2: TCP Connection Management

Question 1

The sequence number is `2818463618`

Question 2

- The sequence number of the SYNACK segment is `2818463619`
- The value of the Acknowledgement field in the SYNACK segment is `1247095790`
- Server will send $ackNum = seqNum + 1$ to determine it have received the data.

Question 3

- The sequence number is 2818463619
- The value of the acknowledgement field is the ACK number 1247095791.
- There is no data contains.

Question 4

- Both client and server done the active close.
- No.304 Seq == No.305 ACK
- Simultaneous close

Question 5

- Client -> Server: $Data = lastAck - firstSeq - (SYN + FIN) = 33\ bytes$
- Server -> Client: $Data = lastAck - firstSeq - (SYN + FIN) = 40\ bytes$
- Relationship is: $Data = lastAck - firstSeq - (SYN + FIN)$