COMP3331 WK04 LAB REPORT

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Exercise 1:

Question1:

No.	Time	^	Source	Destination	Protocol	Length	Info
1	0.000000		192.168.1.102	128.119.245.12	TCP	62	1161 → 80 [SYN

```
▼ Transmission Control Protocol, Src Port: 1161, Dst Port: 80, Seq: 232129012, Len: 0
    Source Port: 1161
    Destination Port: 80
    [Stream index: 0]
    [TCP Segment Len: 0]
    Sequence number: 232129012
    [Next sequence number: 232129012]
```

For gais.cs.umass.edu (Dst)

IP address: 128.119.245.12

Port number: 80

For client computer (Source)

IP address: 192.168.1.102

Port number: 1161

Question2:

3	0.023265	192.168.1.102	128.119.245.12	TCP	54	1161 → 80 [ACI
4	0.026477	192.168.1.102	128.119.245.12	TCP	619	1161 → 80 [PSI
5	0.041737	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [PSI
6	0.053937	128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACI
7	0.054026	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACI
8	0.054690	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACI
9	0.077294	128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACI
10	0.077405	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq

```
▶ Frame 4: 619 bytes on wire (4952 bits), 619 bytes captured (4952 bits)
0000  00 06 25 da af 73 00 20  e0 8a 70 1a 08 00 45 00   ··%··s·  ··p···E·
0010  02 5d 1e 21 40 00 80 06  a2 e7 c0 a8 01 66 80 77   ·]·!@···  ·····f·w
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
0080  65 72 2d 41 67 65 6e 74  3a 20 4d 6f 7a 69 6c 6c   er-Agent  : Mozill
```

⦿ 📝   Frame (frame), 619 bytes   ⦿ Packets: 213 · Displayed: 202 (94.8%) ⦿ Profile: Default

Segment #4 contains the POST command; the sequence number is 232129013

Question3:

The first six segments in the TCP connection (start from #4) are 4, 5, 7,8,10,11.

Sequence numbers for them are:

Segment 1: 232129013

Segment 2: 232129578

Segment 3: 232131038

Segment 4: 232132498

Segment 5: 232133958

Segment 6: 232135418

Segment	Sent time (seconds)	ACK received(seconds)	RTT (seconds)
1	0.026477	0.053937	0.02746
2	0.041737	0.077294	0.035557
3	0.054026	0.124085	0.070059
4	0.054690	0.169118	0.11443
5	0.077405	0.217299	0.13989
6	0.078157	0.267802	0.18964

EstimatedRTT = $(1 - \alpha)$ * EstimatedRTT + α * sampleRTT = 0.875 * EstimatedRTT + 0.125 * sampleRTT

α = 0.125

Segment 1: assume that the initial value of EstimatedRTT = sampleRTT, 1 * sampleRTT = 0.02746s

Segment 2: 0.875 * 0.02746 + 0.125 * 0.035557 = 0.0285s

Segment 3: 0.875 * 0.0285 + 0.125 * 0.070059 = 0.0337s

Segment 4: 0.875 * 0.0337 + 0.125 * 0.11443 = 0.0438s

Segment 5: 0.875 * 0.0438 + 0.125 * 0.13989 = 0.0558s

Segment 6: 0.875 * 0.0558 + 0.125 * 0.18964 = 0.0725s
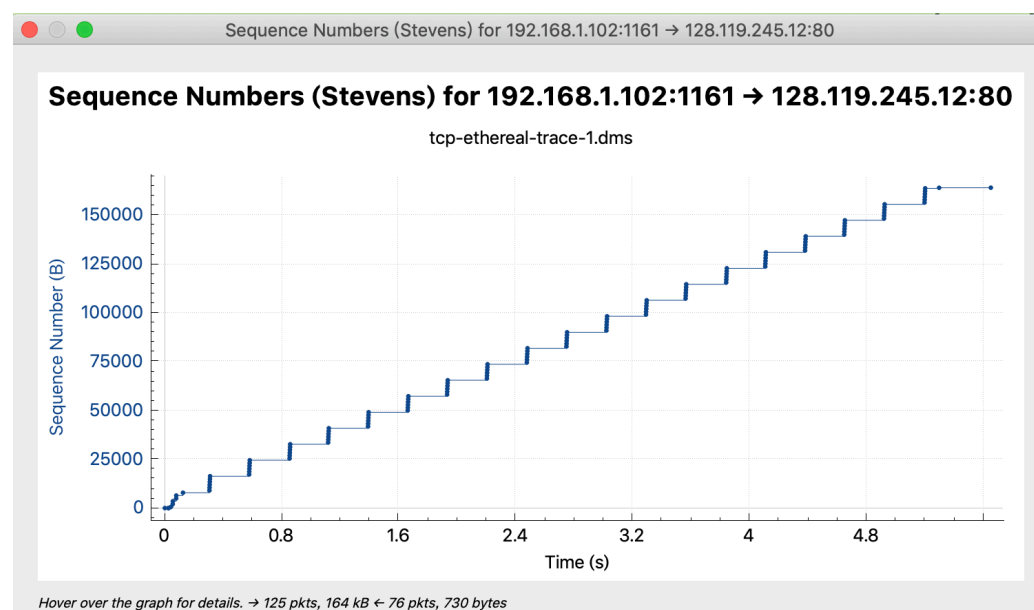
Question 4:

First segment is 565 bytes, other five segments are 1460 bytes.

Question 5:

Window size value: 5840

The minimum amount of buffer space advertised at the receiver for the entire trace is 5840 bytes and this value will gradually increase. The lack of receiver buffer space doesn't throttle the sender.

Question 6:

There doesn't have retransmission in the trace file, because the sequence numbers of the TCP

segments are continuously increasing respect to time (shown in the graph), if there has a retransmission segment, the sequence number of that segment will smaller than its neighbouring segment.

Question 7:

99 2.476801	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=232203561 Ack=883061786 Win=17520 Len=1460 [TCP segme
100 2.477515	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=232205021 Ack=883061786 Win=17520 Len=1460 [TCP segme
101 2.478415	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=232206481 Ack=883061786 Win=17520 Len=1460 [TCP segme
102 2.479341	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=232207941 Ack=883061786 Win=17520 Len=1460 [TCP segme
103 2.480356	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=232209401 Ack=883061786 Win=17520 Len=1460 [TCP segme
104 2.481218	192.168.1.102	128.119.245.12	TCP	946 1161 → 80 [PSH, ACK] Seq=232210861 Ack=883061786 Win=17520 Len=892 [TCP s
105 2.576633	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=883061786 Ack=232206481 Win=62780 Len=0
106 2.672045	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=883061786 Ack=232209401 Win=62780 Len=0

The data received by the server is the difference between the acknowledged sequence numbers of two consecutive ACK, and typically the data should be 1460 bytes. However, we can find that for segment #106, the ACK number 232209401 is acknowledging two segments with sequence number 232206481 and 232207941, this is due to TCP uses delayed acknowledgment, several ACK responses may be combined together into a single response.

Question8:

Total data transmitted = acknowledgement seq number of last seg – seq number of 1st segment

= 232293103 – 232129013 = 164090 bytes

Transmission time = 5.455830s (last ACK) – 0.026477s (first TCP segment) = 5.4294 seconds

The throughput for the TCP = 164090bytes/5.4294s = 30.222 bps

Exercise 2:

Question1:
Seq = 2818463618

Question2:
Seq = 1247095790, ACK = 2818463619, this value is the ISN plus 1.

Question3:
Seq = 2818463619, ACK = 1247095791, it doesn't contain any data.

Question4:
The client and server are both close the connection, which means this is a simultaneous close. This can be determined by checking the sequence numbers and ACK numbers in the FIN segments, their ACK numbers haven't increased by 1, thus both of them they sent the close information.

Question5:
Client ISN = 2818463618, last ACK number = 2818463653
Data sent from the client = 2818463653 – 2818463618 – 1 (for SYN) – 1(for FIN) = 32 bytes
Server ISN = 1247095790, last ACK number = 1247095832
Data sent from the server = 1247095832 – 1247095790 - 2 = 40 bytes