LAB 5 TCP

1. What is the IP address and TCP port number used by the client computer (source) that is transferring the file to gaia.cs.umass.edu? To answer this question, it's probably easiest to select an HTTP message and explore the details of the TCP packet used to carry this HTTP message, using the "details of the selected packet header window" (refer to Figure 2 in the "Getting Started with Wireshark" Lab if you're uncertain about the Wireshark windows.

192.168.1.102 port 1161

```
Frame 1: 62 bytes on wire (496 bits), 62 bytes captured (496 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: 0, Len: 0
```

2. What is the IP address of gaia.cs.umass.edu? On what port number is it sending and receiving TCP segments for this connection?

128.119.245.12 port 80

	Time	Source	Destination	Protocol	Length	Info
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

3. What is the IP address and TCP port number used by your client computer (source) to transfer the file to gaia.cs.umass.edu?

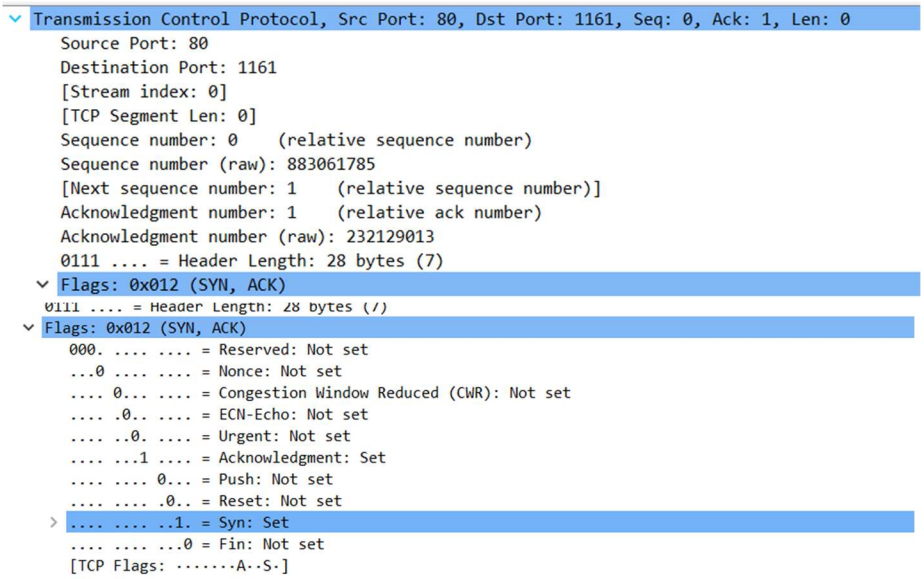
อันนี้ใช้ไฟล์ของ lab ครับ

4. What is the sequence number of the TCP SYN segment that is used to initiate the TCP connection between the client computer and gaia.cs.umass.edu? What is it in the segment that identifies the segment as a SYN segment?

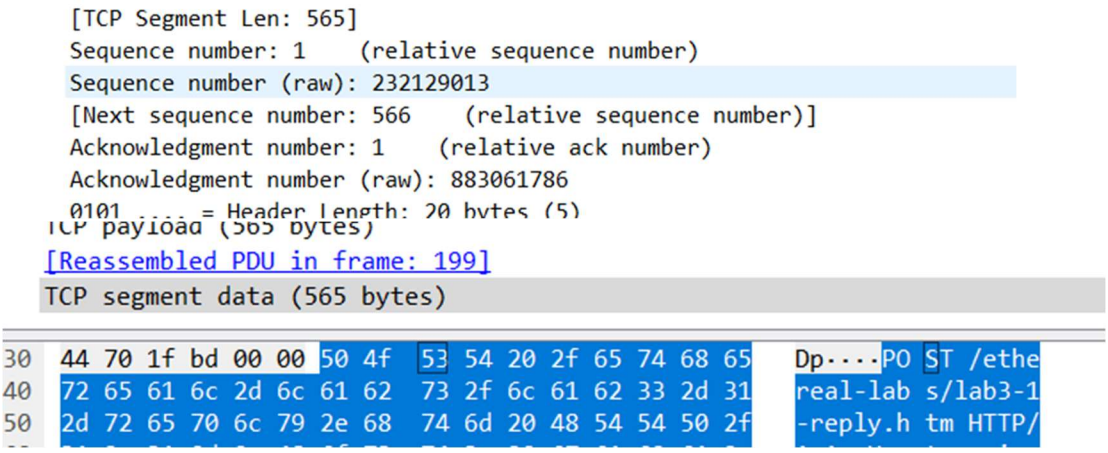
```
Flags: 0x002 (SYN)
    000. .... .... = Reserved: Not set
    ...0 .... .... = Nonce: Not set
    .... 0... .... = Congestion Window Reduced (CWR): Not set
    .... .0.. .... = ECN-Echo: Not set
    .... ..0. .... = Urgent: Not set
    .... ...0 .... = Acknowledgment: Not set
    .... .... 0... = Push: Not set
    .... .... .0.. = Reset: Not set
  > .... .... ..1. = Syn: Set
    .... .... ...0 = Fin: Not set
    [TCP Flags: ··········S·]
```

5. What is the sequence number of the SYNACK segment sent by gaia.cs.umass.edu to the client computer in reply to the SYN? What is the value of the Acknowledgement field in the SYNACK segment? How did

gaia.cs.umass.edu determine that value? What is it in the segment that identifies the segment as a SYNACK segment?



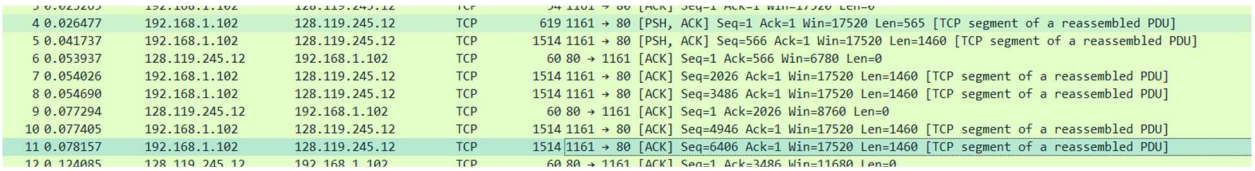
6. What is the sequence number of the TCP segment containing the HTTP POST command? Note that in order to find the POST command, you'll need to dig into the packet content field at the bottom of the Wireshark window, looking for a segment with a "POST" within its DATA field.



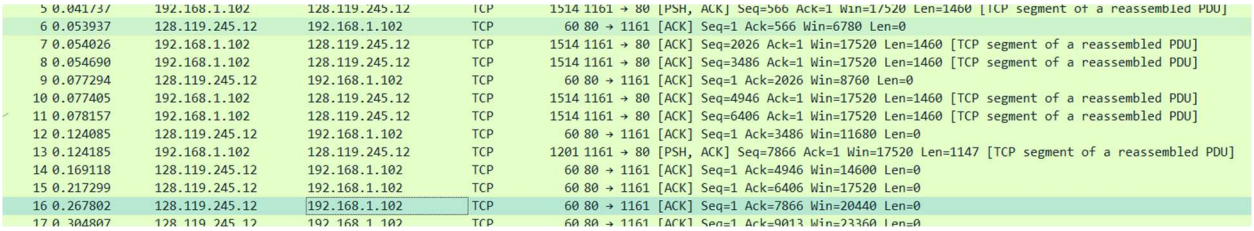
7. Consider the TCP segment containing the HTTP POST as the first segment in the TCP connection. What are the sequence numbers of the first six segments in the TCP connection (including the segment containing the HTTP POST)? At what time was each segment sent? When was the ACK for each segment received? Given the difference between when each TCP segment was sent, and when its acknowledgement was received, what is the RTT value for each of the six segments? What is the EstimatedRTT value (see Section 3.5.3, page 242 in text) after the receipt of each ACK? Assume that the value of the EstimatedRTT is equal to

the measured RTT for the first segment, and then is computed using the EstimatedRTT equation on page 242 for all subsequent segments. Note: Wireshark has a nice feature that allows you to plot the RTT for each of the TCP segments sent. Select a TCP segment in the “listing of captured packets” window that is being sent from the client to the gaia.cs.umass.edu server. Then select: Statistics->TCP Stream Graph- >Round Trip Time Graph.

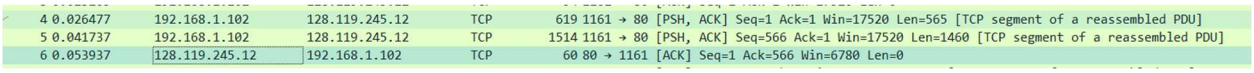
เซคเมนต์ที่ 1-6 คือ 4, 5, 7, 8, 10, 11



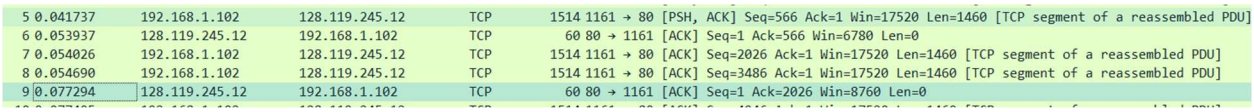
ack ของมันคือ 6, 9, 12, 14, 15, 16 ตามลำดับกับด้านบน



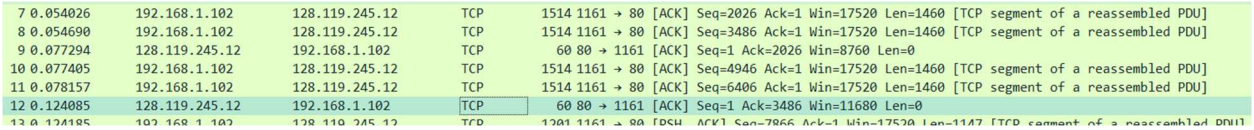
คู่แรก 4, 6 ใช้เวลา = 0.02746 s



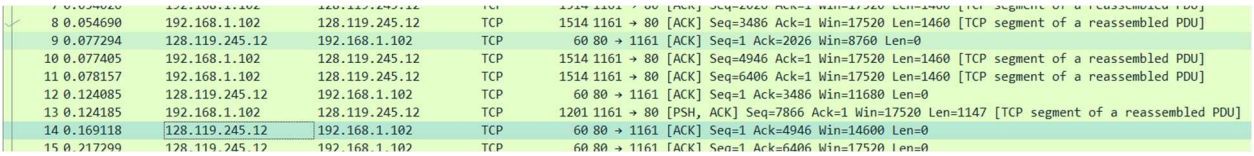
คู่ 5, 9 ใช้เวลา = 0.035557



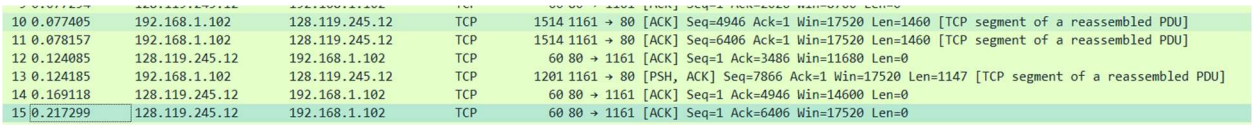
คู่ 7, 12 ใช้เวลา = 0.070059



คู่ 8, 14 ใช้เวลา = 0.114428

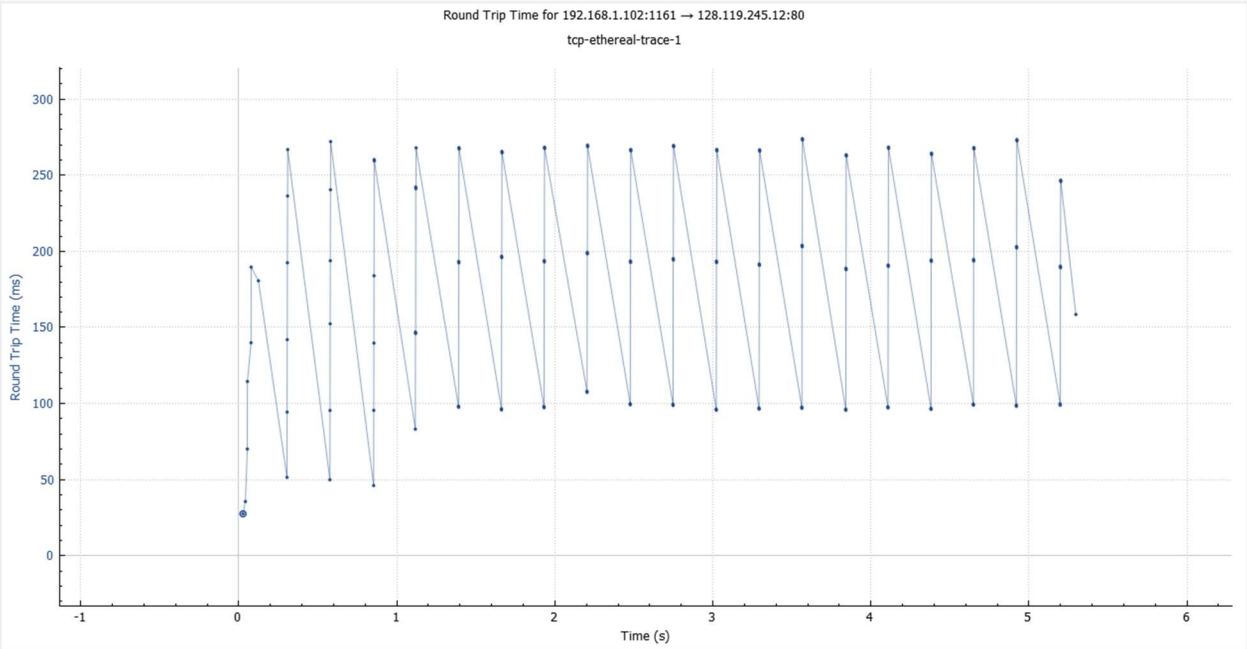


คู่ 10, 15 ใช้เวลา = 0.139894



คู่ 11, 16 ใช้เวลา = 0.189645

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 PDU]
12	0.124085	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=1 Ack=3486 Win=11680 Len=0
13	0.124185	192.168.1.102	128.119.245.12	TCP	1201 1161 → 80 [PSH, ACK] Seq=7866 Ack=1 Win=17520 Len=1147 [TCP segment of a reassembled PI
14	0.169118	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=1 Ack=4946 Win=14600 Len=0
15	0.217299	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=1 Ack=6406 Win=17520 Len=0
16	0.267802	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=1 Ack=7866 Win=20440 Len=0



8. What is the length of each of the first six TCP segments?

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 PDU]
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 reassembled PDU]
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 PDU]
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 PDU]
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 PDU]
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 PDU]

เซคเมนต์ที่ 1-6 คือ 4, 5, 7, 8, 10, 11 >> 565, 1460, 1460, 1460, 1460, 1460

```
Len=0
17520 Len=565 [TCP se
n=17520 Len=1460 [TCP
0 Len=0
520 Len=1460 [TCP seg
520 Len=1460 [TCP seg
60 Len=0
520 Len=1460 [TCP seg
520 Len=1460 [TCP seg
680 Len=0
```

9. What is the minimum amount of available buffer space advertised at the received for the entire trace? Does the lack of receiver buffer space ever throttle the sender?

จาก ack แรกที่ส่งกลับมา

```
> Flags: 0x010 (ACK)
  Window size value: 6780
  [Calculated window size: 6780]
```

10. Are there any retransmitted segments in the trace file? What did you check for (in the trace) in order to answer this question?

ไม่มีการ retransmitted เนื่องจาก sequence number เพิ่มขึ้นเรื่อยๆ เมื่อดูในไฟล์

11. How much data does the receiver typically acknowledge in an ACK? Can you identify cases where the receiver is ACKing every other received segment (see Table 3.2 on page 250 in the text).

ขนาด 1460 bytes

12. What is the throughput (bytes transferred per unit time) for the TCP connection? Explain how you calculated this value.

ขนาดของไฟล์ text = 148 KB (151,552 bytes) ใช้เวลาทั้งหมดคือ ตั้งแต่การส่งครั้งแรกจนรับ ack ครั้งสุดท้าย = 0.267802 - 0.026477 = 0.241325 >> throughput = 151552 ÷ 0.241325 = 627,999.5856210505

13. Use the Time-Sequence-Graph(Stevens) plotting tool to view the sequence number versus time plot of segments being sent from the client to the gaia.cs.umass.edu server. Can you identify where TCP's slowstart phase begins and ends, and where congestion avoidance takes over? Comment on ways in which the measured data differs from the idealized behavior of TCP that we've studied in the text.

ก็คือช่วงที่ seq number นั้นไม่ยอมเพิ่มขึ้น