

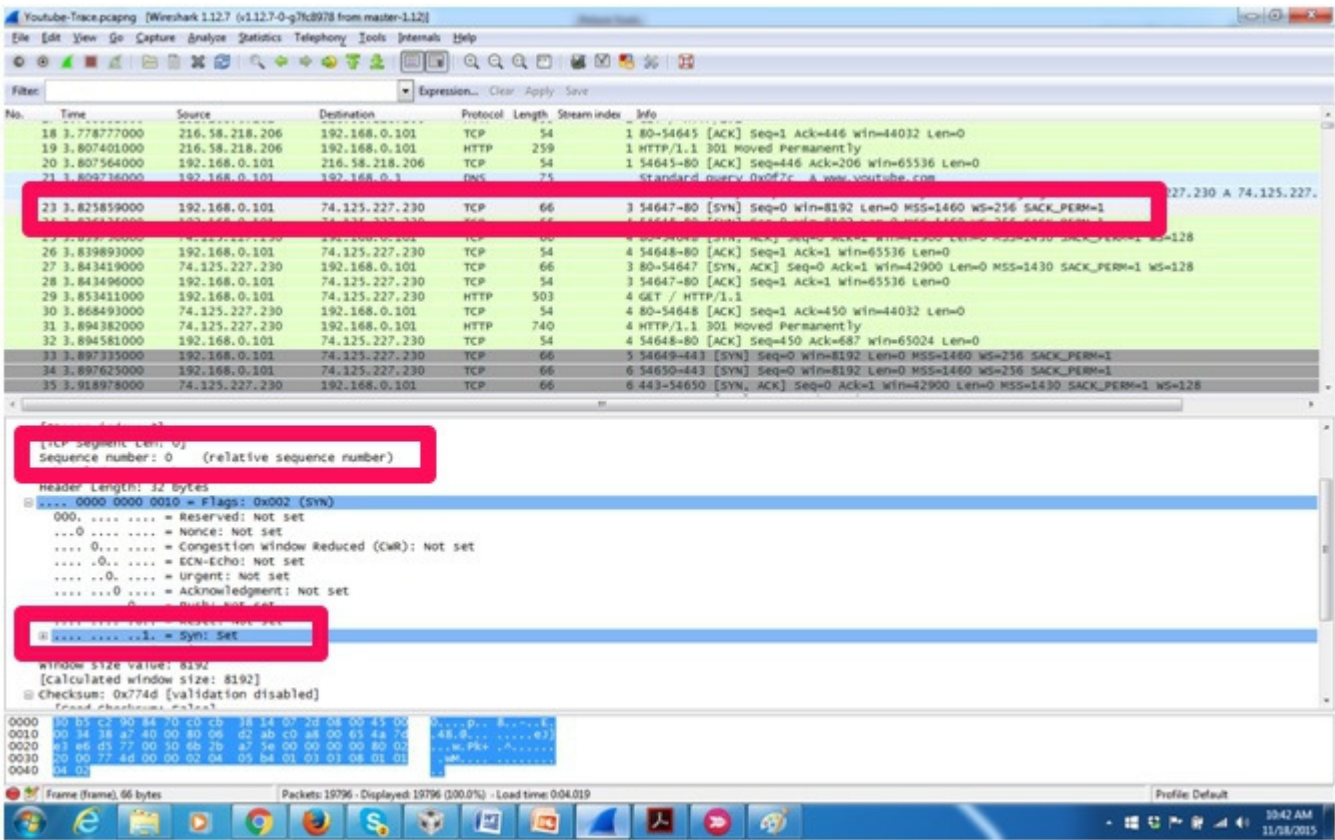
Client TCP port number:54419



Problem set-2

1.What is the sequence number of the TCP SYN segment that is used to initiate the TCP connection between the client computer and youtube.com?

SYN segment Initiation Relative Sequence Number: 0



2.What is it in the segment that identifies the segment as a SYN segment?

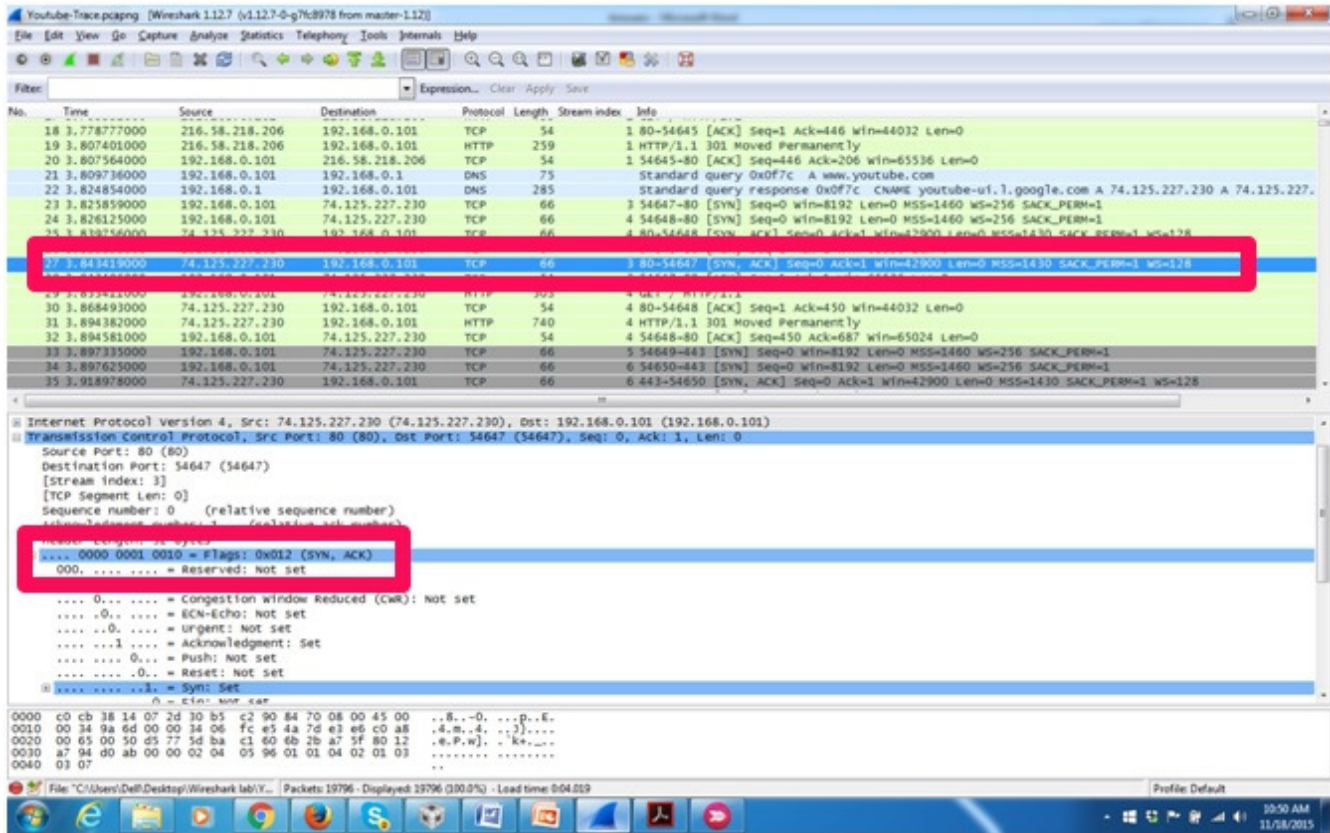
SYN flag is set (=1) in the segment (Flags 0X02 (SYN)) ---screenshot above

3.What is the sequence number of the SYNACK segment sent by youtube.com to the client computer in reply to the SYN? What is the value of the Acknowledgement field in the SYNACK segment?

The SYN ACK relative sequence number from youtube.com is 0

The value of Acknowledgment is 1(relative acknowledgement number)

(Screenshot below)



4.How did youtube.com determine that value? What is it in the segment that identifies the segment as a SYNACK segment? From the sequence 0 it received for SYN, the acknowledgement was set to 1(0+1).

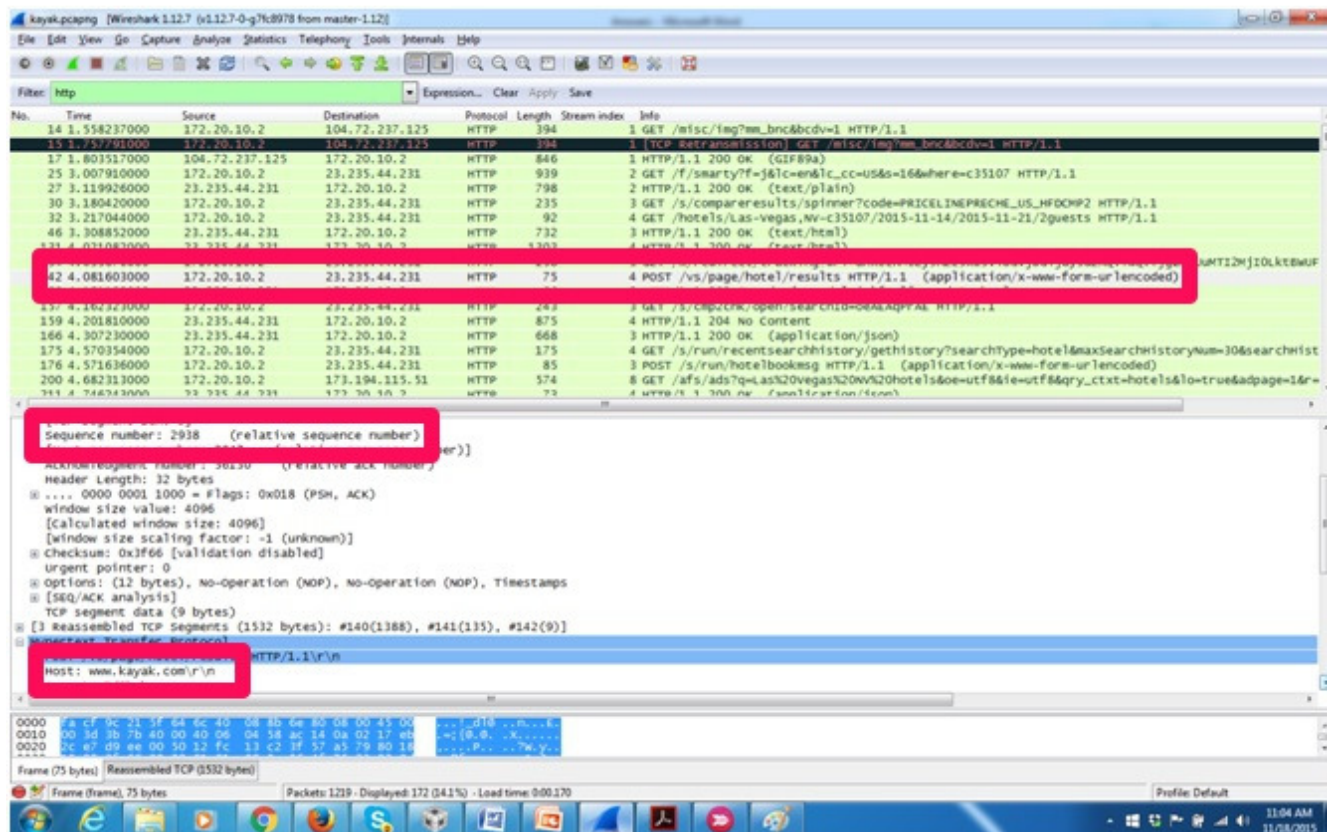
The SYN & ACK flags are set indicating it is a SYN ACK.

Both SYN flag =1& ACK flag=1

Problem Set-3

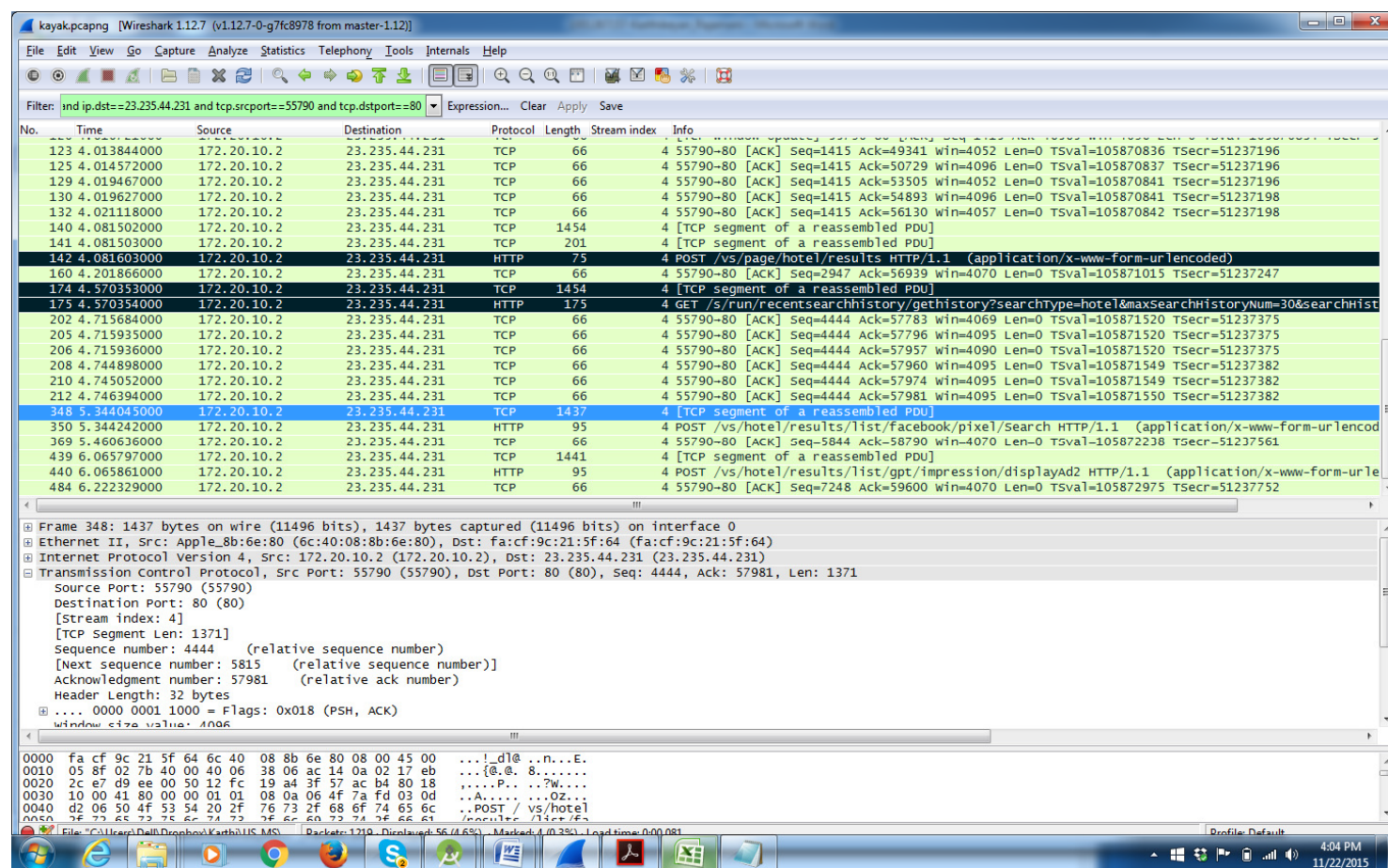
1.What is the sequence number of the TCP segment containing the HTTP POST command?

Kayak.com-Relative sequence number:2938



2. Consider the TCP segment containing the HTTP POST as the first segment in the TCP connection. What are the sequence numbers of the first four 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 four segments? What is the EstimatedRTT value (see Section 3.5.3, page 239 in text) after the receipt of each ACK? Assume that the value of the EstimatedRTT is equal to the measured RTT for the _rst segment, and then is computed using the EstimatedRTT equation on page 239 for all subsequent segments

Filter=ip.src==172.20.10.2 and ip.dst==23.235.44.231 and tcp.srcport==55790 and tcp.dstport==80



Segment no	Wireshark Trace no	Rel.Seq. no	Time sent	Next exp seq no	Ack Wireshark Tr no	Ack Recd Time	Sampled RTT	Estimated RTT
1st segment- HTTP Post	142	1	4.081603	2947	146	4.135716	0.05411300	0.05411300000000
2nd segment	174	2947	4.570353	4335	186	4.646868	0.07651500	0.05691325000000
3rd segment	175	4335	4.570354	4444	188	4.649796	0.07944200	0.059729343750000
4th segment	348	4444	5.344045	5815	356	5.393234	0.04918900	0.058411800781250

Formula: $\text{EstimatedRTT} = (1-x) * \text{EstimatedRTT} + x * \text{Sample RTT}$ ---- (X=0.125)

1st Segment- $\text{EstimatedRTT} = \text{SampleRTT} = 0.05411300$

2nd Segment- $= (1-0.125) * 0.05411300 + 0.125 * 0.07651500 = 0.05691325000000$

3rd segment $= (1-0.125) * 0.05691325000000 + 0.125 * 0.07944200 = 0.059729343750000$

4th segment $= (1-0.125) * 0.059729343750000 + 0.125 * 0.04918900 = 0.058411800781250$

3.What is the length of each of the first four TCP segments?

Segment	Wireshark Trace no	Segment Length
1st segment-HTTP Post	142	9
2nd segment	174	1388
3rd segment	175	109
4th segment	348	1371

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

The minimum buffer size window is 66 in no 35. The study of the trace indicates that the sender is not throttled.

Wireshark 1.12.7 (v1.12.7-0-g7fc8978 from master-1.12.7)

Filter: ip.src==23.235.44.231 and ip.dst==172.20.10.2

Expression... Clear Apply Save

No.	Time	Source	Destination	Protocol	Length	Stream index	Info
23	3.005770000	23.235.44.231	172.20.10.2	TCP	74	2	80->55805 [SYN, ACK] Seq=0 Ack=1 win=28960 Len=0 MSS=1400 SACK_PERM=1 TSval=335022886 TSecr=1
26	3.054021000	23.235.44.231	172.20.10.2	TCP	66	2	80->55805 [ACK] Seq=1 Ack=874 win=30720 Len=0 TSval=335022898 TSecr=105869850
27	3.119926000	23.235.44.231	172.20.10.2	HTTP	798	2	HTTP/1.1 200 OK (text/plain)
33	3.228780000	23.235.44.231	172.20.10.2	TCP	66	3	80->55789 [ACK] Seq=1 Ack=1389 win=74 Len=0 TSval=917517717 TSecr=105870021
34	3.228892000	23.235.44.231	172.20.10.2	TCP	66	3	80->55789 [ACK] Seq=1 Ack=1557 TSval=917517717 TSecr=105870021
35	3.268771000	23.235.44.231	172.20.10.2	TCP	66	4	80->55790 [ACK] Seq=1 Ack=1411 win=66 Len=0 TSval=51237014 TSecr=105870057
36	3.269065000	23.235.44.231	172.20.10.2	TCP	66	4	80->55790 [ACK] Seq=1 Ack=1411 win=66 Len=0 TSval=51237014 TSecr=105870057
37	3.299588000	23.235.44.231	172.20.10.2	TCP	903	3	[TCP segment of a reassembled PDU]
39	3.299815000	23.235.44.231	172.20.10.2	TCP	69	3	[TCP segment of a reassembled PDU]
41	3.301657000	23.235.44.231	172.20.10.2	TCP	1454	3	[TCP segment of a reassembled PDU]
42	3.303287000	23.235.44.231	172.20.10.2	TCP	1454	3	[TCP segment of a reassembled PDU]
44	3.304210000	23.235.44.231	172.20.10.2	TCP	935	3	[TCP segment of a reassembled PDU]
46	3.308852000	23.235.44.231	172.20.10.2	HTTP	732	3	HTTP/1.1 200 OK (text/html)
49	3.905058000	23.235.44.231	172.20.10.2	TCP	933	4	[TCP segment of a reassembled PDU]
51	3.929141000	23.235.44.231	172.20.10.2	TCP	86	4	[TCP segment of a reassembled PDU]
53	3.929392000	23.235.44.231	172.20.10.2	TCP	1454	4	[TCP segment of a reassembled PDU]
54	3.929396000	23.235.44.231	172.20.10.2	TCP	1266	4	[TCP segment of a reassembled PDU]
56	3.931055000	23.235.44.231	172.20.10.2	TCP	1334	4	[TCP segment of a reassembled PDU]
57	3.931067000	23.235.44.231	172.20.10.2	TCP	71	4	[TCP segment of a reassembled PDU]

Frame 35: 66 bytes on wire (528 bits), 66 bytes captured (528 bits) on interface 0

Ethernet II, Src: fa:cf:9c:21:5f:64 (fa:cf:9c:21:5f:64), Dst: Apple_8b:6e:80 (6c:40:08:8b:6e:80)

Internet Protocol Version 4, Src: 23.235.44.231 (23.235.44.231), Dst: 172.20.10.2 (172.20.10.2)

Transmission Control Protocol, Src Port: 80 (80), Dst Port: 55790 (55790), Seq: 1, Ack: 1389, Len: 0

Source Port: 80 (80)

Destination Port: 55790 (55790)

[Stream index: 4]

[TCP Segment Len: 0]

Sequence number: 1 (relative sequence number)

Acknowledgment number: 1389 (relative ack number)

Header Length: 32 bytes

... 0000 0001 0000 = Flags: 0x010 (ACK)

Window size value: 66

[Calculated window size: 66]

[Window size scaling factor: -1 (unknown)]

Checksum: 0x2a38 [validation disabled]

0000 6c 40 08 8b 6e 80 fa cf 9c 21 5f 64 08 00 45 00 T...n...!...d...E..

0010 00 34 04 9e 00 00 35 06 86 3e 17 eb 2c e7 ac 14 .4...5...>.....

0020 0a 02 00 50 d9 ee 3f 56 ca 38 12 fc 0d b5 80 10 ...P...7V...8.....

0030 00 42 2a 38 00 00 01 01 08 0a 03 0d 00 96 06 4f .8*B.....0

0040 72 e9 F..

File: C:\Users\ DELL\Dropbox\Karthi\US_MS... Packets: 1219 - Displayed: 116 (9.5%) - Load time: 0:00.062

Profile: Default

4:40 PM 11/20/2015

5. Are there any retransmitted segments in the trace file? What did you check for (in the trace) in order to answer this question? There are retransmissions in the trace file. They have the same sequence numbers. The TCP Retransmission black lines in the trace mark the retransmitted segments.

Wireshark 1.12.7 (v1.12.7-0-g7fc8978 from master-1.12.7)

Filter: Expression... Clear Apply Save

No.	Time	Source	Destination	Protocol	Length	Stream index	Info
1	0.000000000	173.194.115.90	172.20.10.2	TLSv1.2	129	0	Application Data
2	0.000077000	172.20.10.2	173.194.115.90	TCP	66	0	55720->443 [ACK] Seq=1 Ack=64 win=4094 Len=0 TSval=105866854 TSecr=1853611394
3	0.000649000	172.20.10.2	173.194.115.90	TCP	66	0	55720->443 [FIN, ACK] Seq=1 Ack=64 win=4096 Len=0 TSval=105866854 TSecr=1853611394
4	0.025860000	173.194.115.90	172.20.10.2	TCP	66	0	443->55720 [FIN, ACK] Seq=64 Ack=1 win=375 Len=0 TSval=1853611394 TSecr=105627111
5	0.025860000	173.194.115.90	172.20.10.2	TCP	66	0	443->55720 [FIN, ACK] Seq=64 Ack=1 win=375 Len=0 TSval=1853611490 TSecr=105627111
6	0.025943000	172.20.10.2	173.194.115.90	TCP	66	0	TCP Retransmission] 55720->443 [FIN, ACK] Seq=1 Ack=65 win=4096 Len=0 TSval=105866879 TSecr=105627111
7	0.025944000	172.20.10.2	173.194.115.90	TCP	66	0	TCP Retransmission] 55720->443 [FIN, ACK] Seq=1 Ack=65 win=4096 Len=0 TSval=105866879 TSecr=105627111
8	0.059891000	173.194.115.90	172.20.10.2	TLSv1.2	129	0	Application Data
9	0.059976000	172.20.10.2	173.194.115.90	TCP	78	0	[TCP Retransmission] 55720->443 [FIN, ACK] Seq=1 Ack=65 win=4096 Len=0 TSval=105866913 TSecr=105627111
10	0.100838000	173.194.115.90	172.20.10.2	TCP	66	0	443->55720 [ACK] Seq=65 Ack=2 win=375 Len=0 TSval=1853611822 TSecr=105866854
11	0.101031000	173.194.115.90	172.20.10.2	TCP	66	0	[TCP Dup ACK 10#1] 443->55720 [ACK] Seq=65 Ack=2 win=375 Len=0 TSval=1853611822 TSecr=105866854
12	0.101056000	172.20.10.2	173.194.115.90	TCP	66	0	[TCP Dup ACK 6#1] 55720->443 [ACK] Seq=2 Ack=65 win=4096 Len=0 TSval=105866953 TSecr=185361182
13	0.104917000	173.194.115.90	172.20.10.2	TCP	66	0	[TCP Dup ACK 10#2] 443->55720 [ACK] Seq=65 Ack=2 win=375 Len=0 TSval=1853611829 TSecr=105866854
14	1.558237000	172.20.10.2	104.72.237.125	HTTP	394	1	1 GET /misc/img/mm_bnc&bcdv=1 HTTP/1.1
15	1.757910000	104.72.237.125	172.20.10.2	HTTP	394	1	1 [TCP Retransmission] GET /misc/img/mm_bnc&bcdv=1 HTTP/1.1
16	1.781231000	104.72.237.125	172.20.10.2	TCP	66	1	1 80->55795 [ACK] Seq=1 Ack=329 win=1063 Len=0 TSval=3414685785 TSecr=105868406
17	1.803517000	104.72.237.125	172.20.10.2	HTTP	846	1	1 HTTP/1.1 200 OK (GIF89a)
18	1.803607000	172.20.10.2	104.72.237.125	TCP	66	1	1 55795->80 [ACK] Seq=329 Ack=781 win=4071 Len=0 TSval=105868650 TSecr=3414685821
19	1.814209000	104.72.237.125	172.20.10.2	TCP	78	1	1 [TCP Dup ACK 16#1] 80->55795 [ACK] Seq=781 Ack=329 win=1063 Len=0 TSval=3414685833 TSecr=105868406
20	2.901343000	172.20.10.2	172.20.10.1	DNS	85	2	Standard query 0x9c88 A mathid-origin.mathtag.com
21	2.913690000	172.20.10.2	23.235.44.231	TCP	78	2	2 55805->80 [SYN] Seq=0 win=65535 Len=0 MSS=1460 WS=32 TSval=105869757 TSecr=0 SACK_PERM=1
22	3.004363000	172.20.10.1	172.20.10.2	DNS	117	2	Standard query response 0x9c88 A 74.121.139.80 A 74.121.142.217
23	3.005770000	23.235.44.231	172.20.10.2	TCP	74	2	2 80->55805 [SYN, ACK] Seq=0 Ack=1 win=28960 Len=0 MSS=1400 SACK_PERM=1 TSval=335022886 TSecr=1
24	3.005770000	23.235.44.231	172.20.10.2	TCP	66	2	2 80->55805 [ACK] Seq=1 Ack=1 win=131840 Len=0 TSval=105869849 TSecr=335022886

Frame 6: 66 bytes on wire (528 bits), 66 bytes captured (528 bits) on interface 0
 Ethernet II, Src: Apple8b:6e:80 (6c:40:08:8b:6e:80), Dst: fa:cf:9c:21:5f:64 (fa:cf:9c:21:5f:64)
 Internet Protocol Version 4, Src: 172.20.10.2 (172.20.10.2), Dst: 173.194.115.90 (173.194.115.90)
 Transmission Control Protocol, Src Port: 55720 (55720), Dst Port: 443 (443), Seq: 1, Ack: 65, Len: 0
 Source Port: 55720 (55720)
 Destination Port: 443 (443)
 [Stream index: 0]
 [TCP Segment Len: 0]
 Sequence number: 1 (relative sequence number)
 Acknowledgment number: 65 (relative ack number)
 Header Length: 32 bytes

0000 fa cf 9c 21 5f 64 6c 40 08 8b 6e 80 08 00 45 00 ...!dl@...n...E.
 0010 00 34 52 53 40 00 00 06 11 3e ac 14 0a 02 4d c2 ...4RSB.0...>.....
 0020 73 5a d9 a8 01 bb ae 13 2c e8 9c cd c8 90 11 52s.....
 0030 10 00 a6 fd 00 00 01 01 08 0a 06 4f 66 7f 6e 7b:.....Of.n
 0040 dd 82 ..

6.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 247 in the text).

The difference between successive Ack-numbers gives a measure of the data sent to server. The data from the first seven Acknowledgements are listed below.

Wireshark 1.12.7 (v1.12.7-0-g7fc8978 from master-1.12.7)

Filter: ip.src==172.20.10.2 and ip.dst==23.235.44.231 Expression... Clear Apply Save

No.	Time	Source	Destination	Protocol	Length	Stream index	Info
21	2.913690000	172.20.10.2	23.235.44.231	TCP	78	2	2 55805->80 [SYN] Seq=0 win=65535 Len=0 MSS=1460 WS=32 TSval=105869757 TSecr=0 SACK_PERM=1
24	3.005845000	172.20.10.2	23.235.44.231	TCP	66	2	2 55805->80 [ACK] Seq=1 Ack=1 Win=131840 Len=0 TSval=105869849 TSecr=335022886
25	3.007910000	172.20.10.2	23.235.44.231	HTTP	939	2	2 GET /f/smarty?f=j&l=c=en&l=cc=US&s=16&where=c35107 HTTP/1.1
28	3.120003000	172.20.10.2	23.235.44.231	TCP	66	2	2 55805->80 [ACK] Seq=874 Ack=733 Win=131104 Len=0 TSval=105869961 TSecr=335022912
29	3.180418000	172.20.10.2	23.235.44.231	TCP	1454	3	3 [TCP segment of a reassembled PDU]
30	3.180420000	172.20.10.2	23.235.44.231	HTTP	235	3	3 GET /s/compareresults/spinner?code=PRICELINEPRECHE_US_HFDCMP2 HTTP/1.1
31	3.217042000	172.20.10.2	23.235.44.231	TCP	1454	4	4 [TCP segment of a reassembled PDU]
32	3.217044000	172.20.10.2	23.235.44.231	HTTP	92	4	4 GET /hotels/Las-Vegas,NV-c35107/2015-11-14/2015-11-21/2guests HTTP/1.1
38	3.299682000	172.20.10.2	23.235.44.231	TCP	66	3	3 55789->80 [ACK] Seq=1558 Ack=838 win=4069 Len=0 TSval=105870137 TSecr=917517734
40	3.299683000	172.20.10.2	23.235.44.231	TCP	66	3	3 55789->80 [ACK] Seq=1558 Ack=841 win=4069 Len=0 TSval=105870137 TSecr=917517734
43	3.303370000	172.20.10.2	23.235.44.231	TCP	66	3	3 55789->80 [ACK] Seq=1558 Ack=3617 win=4052 Len=0 TSval=105870140 TSecr=917517734
45	3.304259000	172.20.10.2	23.235.44.231	TCP	66	3	3 55789->80 [ACK] Seq=1558 Ack=4486 win=4068 Len=0 TSval=105870140 TSecr=917517734
47	3.308917000	172.20.10.2	23.235.44.231	TCP	66	3	3 55789->80 [ACK] Seq=1558 Ack=5152 win=4075 Len=0 TSval=105870145 TSecr=917517734
50	3.905098000	172.20.10.2	23.235.44.231	TCP	66	4	4 55790->80 [ACK] Seq=1415 Ack=868 win=4068 Len=0 TSval=105870737 TSecr=51237137
52	3.929207000	172.20.10.2	23.235.44.231	TCP	66	4	4 55790->80 [ACK] Seq=1415 Ack=888 win=4095 Len=0 TSval=105870761 TSecr=51237137
55	3.929458000	172.20.10.2	23.235.44.231	TCP	66	4	4 55790->80 [ACK] Seq=1415 Ack=3476 win=4015 Len=0 TSval=105870761 TSecr=51237137
63	3.931158000	172.20.10.2	23.235.44.231	TCP	66	4	4 55790->80 [ACK] Seq=1415 Ack=4744 win=4056 Len=0 TSval=105870762 TSecr=51237137
64	3.931159000	172.20.10.2	23.235.44.231	TCP	66	4	4 55790->80 [ACK] Seq=1415 Ack=4749 win=4056 Len=0 TSval=105870762 TSecr=51237137
65	3.931160000	172.20.10.2	23.235.44.231	TCP	66	4	4 55790->80 [ACK] Seq=1415 Ack=5039 win=4047 Len=0 TSval=105870762 TSecr=51237137
66	3.931161000	172.20.10.2	23.235.44.231	TCP	66	4	4 55790->80 [ACK] Seq=1415 Ack=5041 win=4047 Len=0 TSval=105870762 TSecr=51237137
67	3.931198000	172.20.10.2	23.235.44.231	TCP	66	4	4 55790->80 [ACK] Seq=1415 Ack=5046 win=4046 Len=0 TSval=105870762 TSecr=51237137
68	3.931199000	172.20.10.2	23.235.44.231	TCP	66	4	4 55790->80 [ACK] Seq=1415 Ack=6077 win=4014 Len=0 TSval=105870762 TSecr=51237137
69	3.931274000	172.20.10.2	23.235.44.231	TCP	66	4	4 55790->80 [ACK] Seq=1415 Ack=7465 win=4096 Len=0 TSval=105870762 TSecr=51237157

Frame 47: 66 bytes on wire (528 bits), 66 bytes captured (528 bits) on interface 0
 Ethernet II, Src: Apple8b:6e:80 (6c:40:08:8b:6e:80), Dst: fa:cf:9c:21:5f:64 (fa:cf:9c:21:5f:64)
 Internet Protocol Version 4, Src: 172.20.10.2 (172.20.10.2), Dst: 23.235.44.231 (23.235.44.231)
 Transmission Control Protocol, Src Port: 55789 (55789), Dst Port: 80 (80), Seq: 1558, Ack: 5152, Len: 0
 Source Port: 55789 (55789)
 Destination Port: 80 (80)
 [Stream index: 3]
 [TCP Segment Len: 0]
 Sequence number: 1558 (relative sequence number)
 Acknowledgment number: 5152 (relative ack number)
 Header Length: 32 bytes

0000 fa cf 9c 21 5f 64 6c 40 08 8b 6e 80 08 00 45 00 ...!dl@...n...E.
 0010 00 34 76 16 40 00 00 06 c9 c5 ac 14 0a 02 17 eb ...4v.@.
 0020 2c e7 d9 ed 00 50 07 0f e5 cb 1d c0 09 7f 80 10P.P
 0030 0f eb de 49 00 00 01 01 08 0a 06 4f 73 41 36 b0I.....OSAE.
 0040 35 a6 5.

Wireshark Trace no	ACK No	Ack Data
24	1	
28	733	732
38	838	105
40	841	3
43	3617	2776
45	4486	869
47	5152	666

Yes, in segment #73, the reciver ACKing ACK=10241 which is for Segment #71 & 72. The receiver is sending cumulative acknowledgement. There are several cases from then onwards.

Wireshark 1.12.7 (v1.12.7-0-g7fc8978 from master-1.12)

Filter: ip.addr==23.235.44.231

No.	Time	Source	Destination	Protocol	Length	Stream index	Info
60	3.931068000	23.235.44.231	172.20.10.2	TCP	71	4	[TCP segment of a reassembled PDU]
61	3.931070000	23.235.44.231	172.20.10.2	TCP	1097	4	[TCP segment of a reassembled PDU]
62	3.931072000	23.235.44.231	172.20.10.2	TCP	1454	4	[TCP segment of a reassembled PDU]
63	3.931158000	172.20.10.2	23.235.44.231	TCP	66	4	55790->80 [ACK] Seq=1415 Ack=4744 win=4056 Len=0 TSval=105870762 TSecr=51237137
64	3.931159000	172.20.10.2	23.235.44.231	TCP	66	4	55790->80 [ACK] Seq=1415 Ack=4749 win=4056 Len=0 TSval=105870762 TSecr=51237137
65	3.931160000	172.20.10.2	23.235.44.231	TCP	66	4	55790->80 [ACK] Seq=1415 Ack=5039 win=4047 Len=0 TSval=105870762 TSecr=51237137
66	3.931161000	172.20.10.2	23.235.44.231	TCP	66	4	55790->80 [ACK] Seq=1415 Ack=5041 win=4047 Len=0 TSval=105870762 TSecr=51237137
67	3.931198000	172.20.10.2	23.235.44.231	TCP	66	4	55790->80 [ACK] Seq=1415 Ack=5046 win=4046 Len=0 TSval=105870762 TSecr=51237137
68	3.931199000	172.20.10.2	23.235.44.231	TCP	66	4	55790->80 [ACK] Seq=1415 Ack=6077 win=4014 Len=0 TSval=105870762 TSecr=51237137
69	3.931274000	172.20.10.2	23.235.44.231	TCP	66	4	55790->80 [ACK] Seq=1415 Ack=7465 win=4096 Len=0 TSval=105870762 TSecr=51237157
71	3.965478000	23.235.44.231	172.20.10.2	TCP	1454	4	[TCP segment of a reassembled PDU]
72	3.968455000	23.235.44.231	172.20.10.2	TCP	1454	4	[TCP segment of a reassembled PDU]
73	3.968508000	172.20.10.2	23.235.44.231	TCP	66	4	55790->80 [ACK] Seq=1415 Ack=10241 win=4052 Len=0 TSval=105870799 TSecr=51237186
74	3.970547000	23.235.44.231	172.20.10.2	TCP	1454	4	[TCP segment of a reassembled PDU]
75	3.970739000	172.20.10.2	23.235.44.231	TCP	66	4	55790->80 [ACK] Seq=1415 Ack=11629 win=4096 Len=0 TSval=105870801 TSecr=51237186
76	3.973258000	23.235.44.231	172.20.10.2	TCP	1454	4	[TCP segment of a reassembled PDU]
77	3.974127000	23.235.44.231	172.20.10.2	TCP	1454	4	[TCP segment of a reassembled PDU]
78	3.974188000	172.20.10.2	23.235.44.231	TCP	66	4	55790->80 [ACK] Seq=1415 Ack=14405 win=4052 Len=0 TSval=105870803 TSecr=51237188
79	3.975265000	23.235.44.231	172.20.10.2	TCP	1454	4	[TCP segment of a reassembled PDU]
80	3.975458000	172.20.10.2	23.235.44.231	TCP	66	4	55790->80 [ACK] Seq=1415 Ack=15793 win=4096 Len=0 TSval=105870804 TSecr=51237188
81	3.976164000	23.235.44.231	172.20.10.2	TCP	1454	4	[TCP segment of a reassembled PDU]
82	3.976539000	23.235.44.231	172.20.10.2	TCP	1454	4	[TCP segment of a reassembled PDU]
83	3.976589000	172.20.10.2	23.235.44.231	TCP	66	4	55790->80 [ACK] Seq=1415 Ack=18569 win=4052 Len=0 TSval=105870805 TSecr=51237188

Frame 78: 66 bytes on wire (528 bits), 66 bytes captured (528 bits) on interface 0

Ethernet II, Src: Apple_8b:6e:80 (6c:40:08:8b:6e:80), Dst: fa:cf:9c:21:5f:64 (fa:cf:9c:21:5f:64)

Internet Protocol Version 4, Src: 172.20.10.2 (172.20.10.2), Dst: 23.235.44.231 (23.235.44.231)

Transmission Control Protocol, Src Port: 55790 (55790), Dst Port: 80 (80), Seq: 1415, Ack: 14405, Len: 0

Source Port: 55790 (55790)

Destination Port: 80 (80)

[Stream index: 4]

[TCP Segment Len: 0]

Sequence number: 1415 (relative sequence number)

Acknowledgment number: 14405 (relative ack number)

Header Length: 32 bytes

.... 0000 0001 0000 = Flags: 0x010 (ACK)

Window size value: 4052

[calculated window size: 4052]

0000 fa cf 9c 21 5f 64 6c 40 08 8b 6e 80 08 00 45 00 ...!_d!@ .n...E.

0010 00 34 0f fb 40 00 40 06 2f e1 ac 14 0a 02 17 eb .4..@.@. /.....

0020 2c e7 d9 ee 00 50 12 fc 0d cf 3f 57 02 7c 80 10P. ...?w...|.

0030 0f d4 de af 00 00 01 01 08 0a 06 4f 75 d3 03 0dOu... ..

0040 d1 44 ..D

File: "C:\Users\Delhi\Dropbox\Karthi\US_MS\... Packets: 1219 - Displayed: 222 (18.2%) - Marked: 3 (0.2%) - Load time: 0:00:056 Profile: Default

7. What is the throughput (bytes transferred per unit time) for the TCP connection?

Throughput=4130.998997Bytes/Sec

8. Explain how you calculated this value.

The first segment Wireshark trace # 25 Time =3.007910000 Segment sequence number=1

The last acknowledged sequence number of the current session #447 Time=6.116117000 Segment sequence number =12870

Total transmission time=6.116117000 -3.007910000 =3.108207 seconds

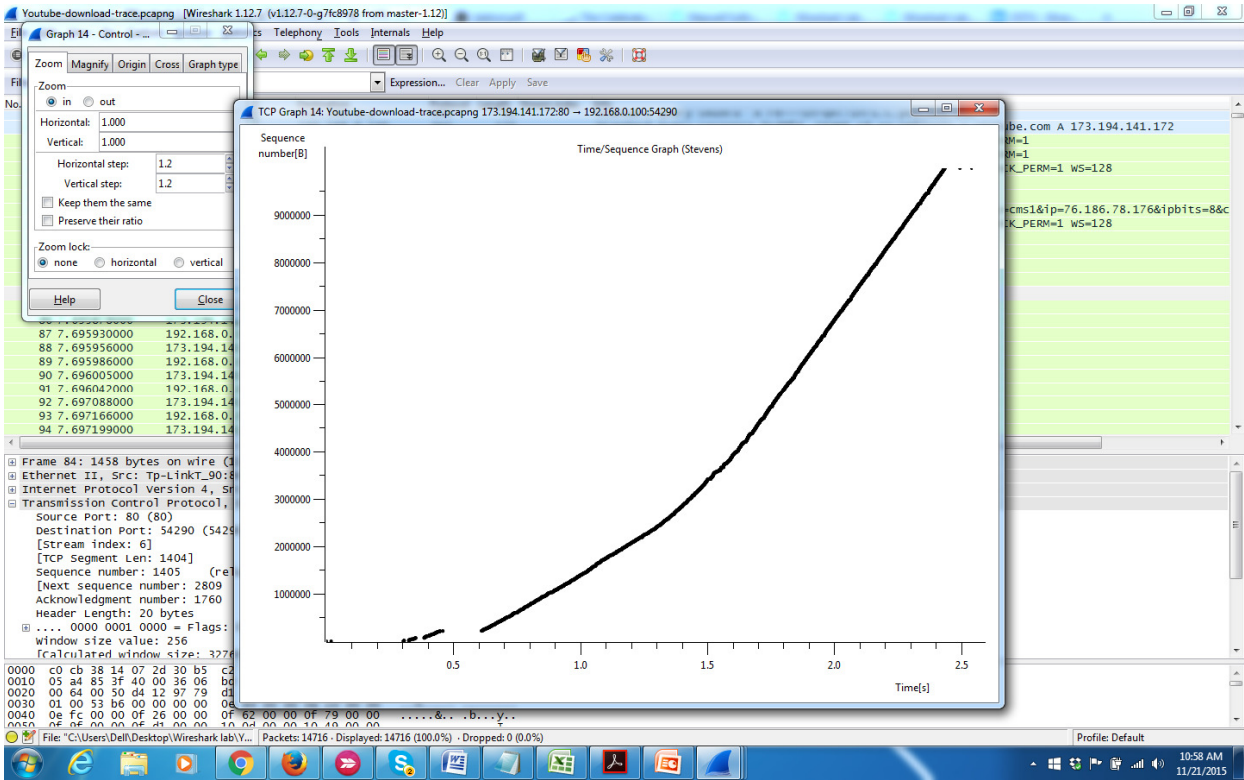
Last byte no-447- sack no=12841

Total no of bytes=12870-1=12869 Bytes

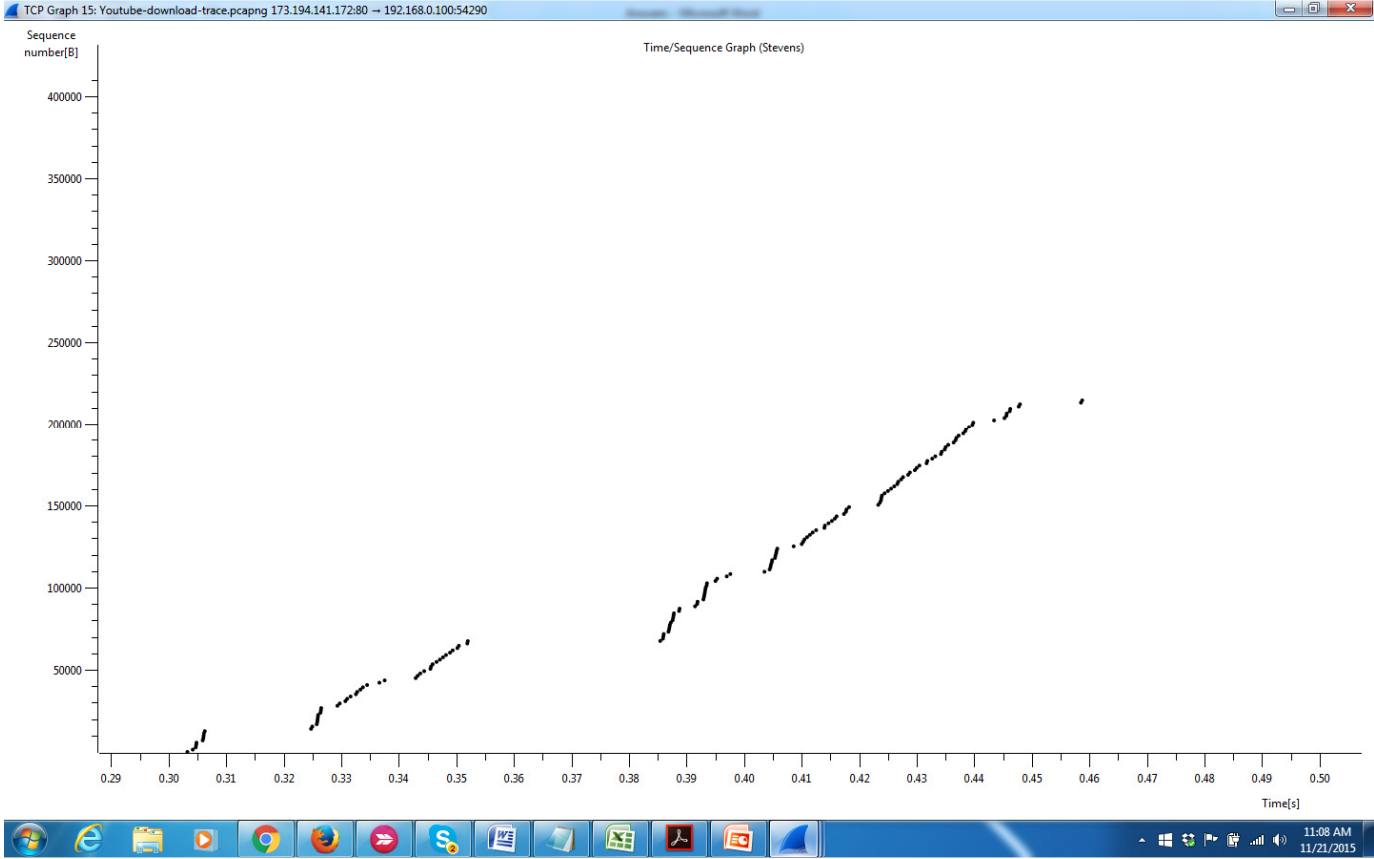
Throughput=12869/3.108207=4140.329Bytes/Sec

Problem Set-4

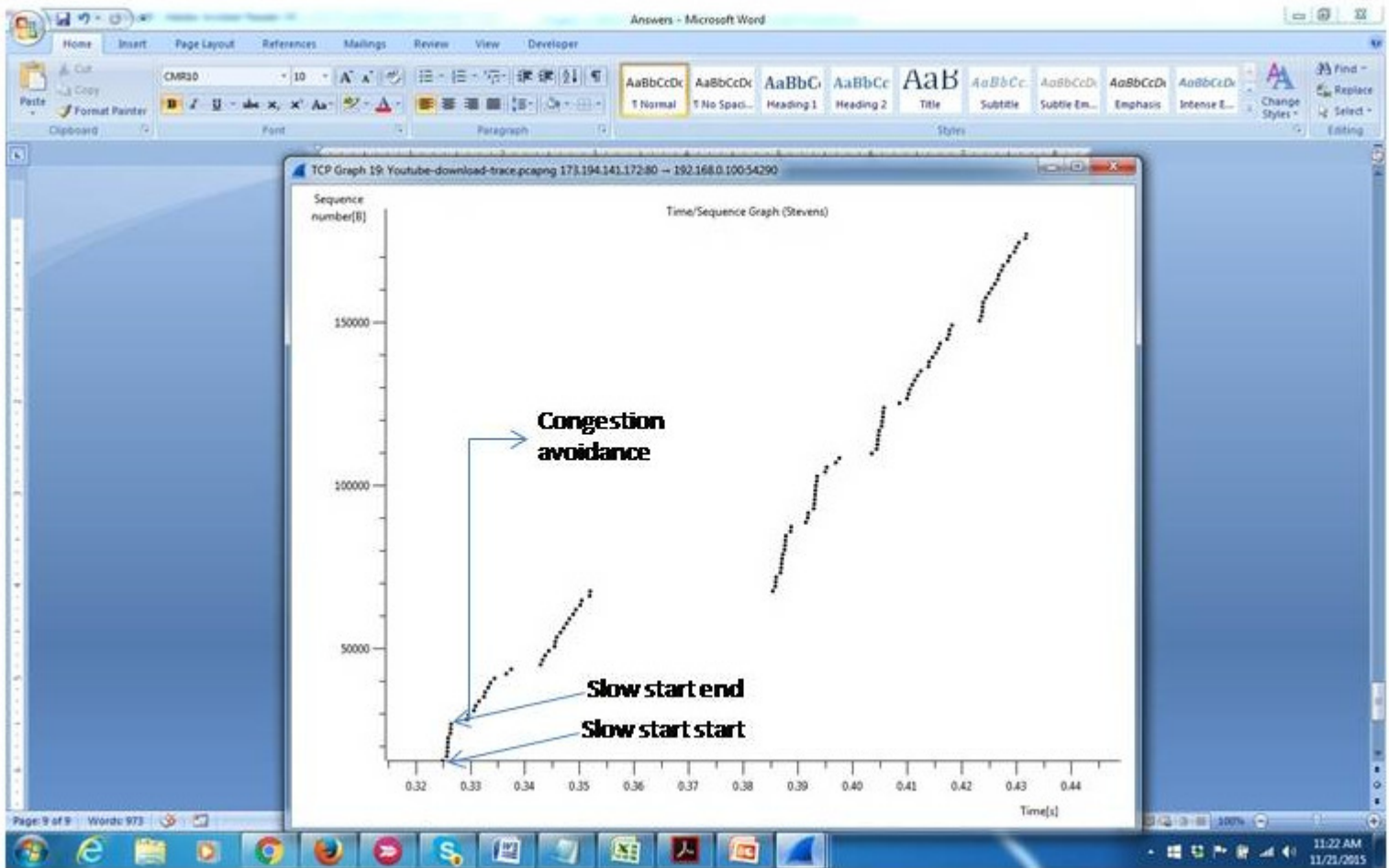
1. Use the Time-Sequence-Graph(Stevens) plotting tool to view the sequence number versus time plot of segments being sent from youtube.com to your computer. Can you identify where TCP's slow-start phase begins and ends, and where congestion avoidance takes over? Highlight these areas . Comment on ways in which the measured data differs from the idealized behavior of TCP that we've studied in the text.



Segment #354



Zoomed portions of the graph.



Further zoomed portions of the graph.

Slow start seems to start at 0.325 Seconds and ends at 0.328 approximately.

Congestion avoidance seems to start from 0.329 seconds as the data volume is cut down.

The text book plots a perfect exponential growth for slow start but the trace graph indicates the slow start is uneven. The congestion avoidance graph in the book indicates a gradual increase after sstresh but the trace graph congestion avoidance is uneven.

2. Answer each of two questions above for the trace that you have gathered when you transferred a file from your computer from youtube.com.