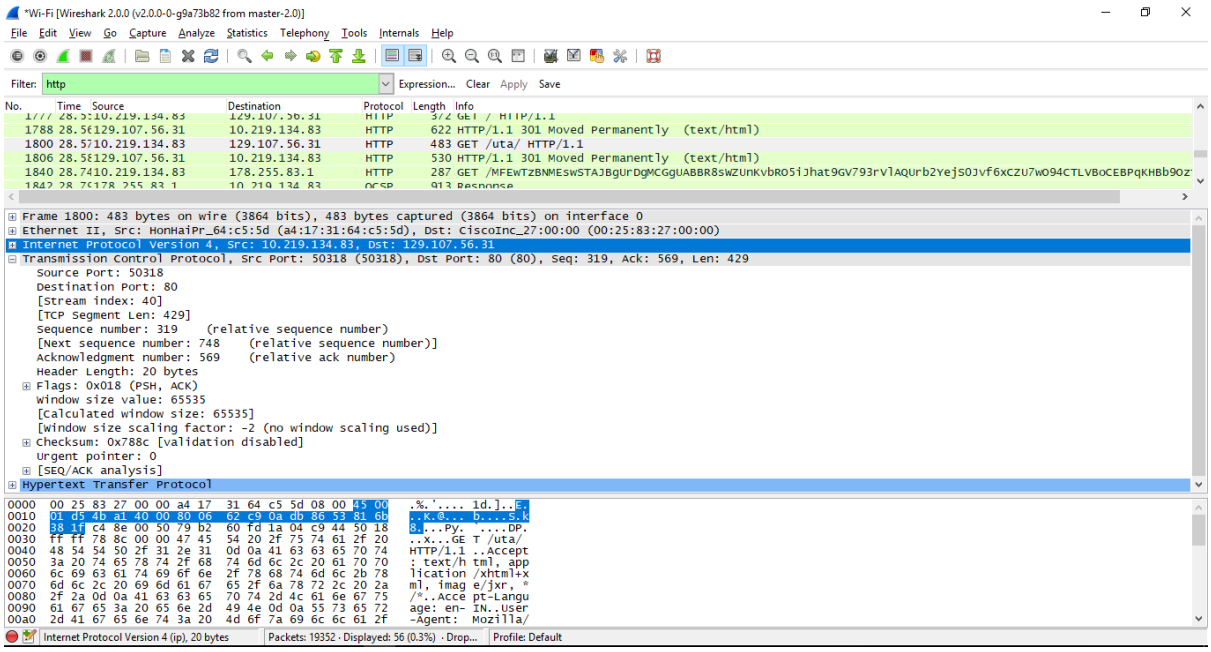
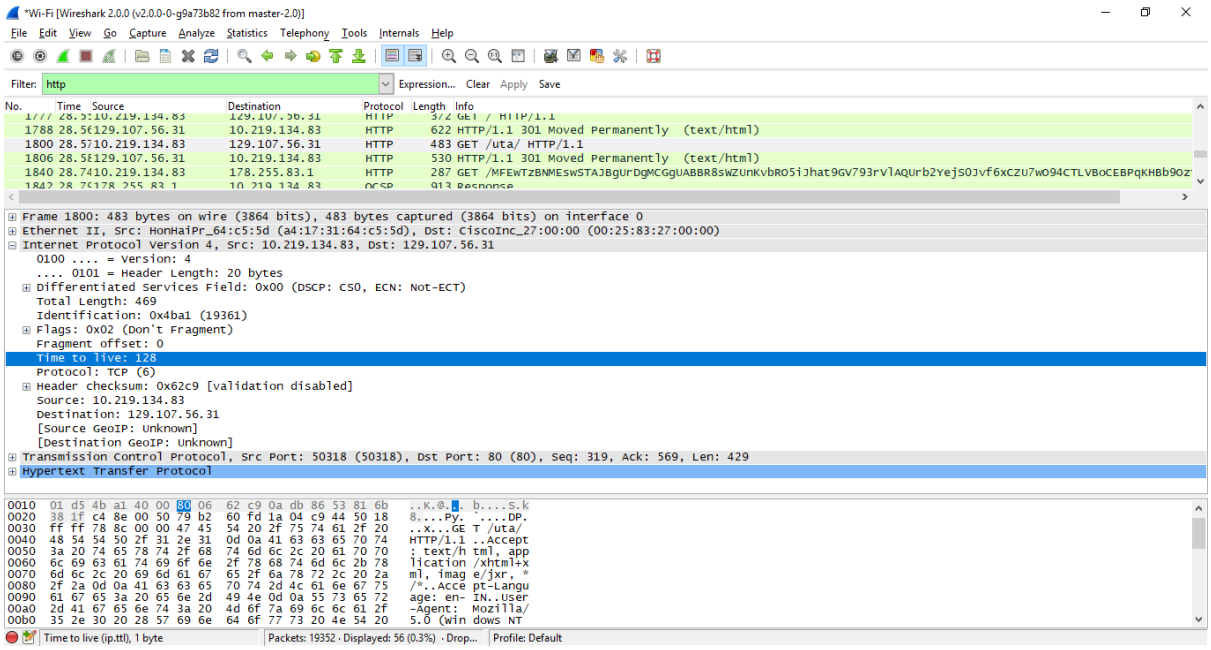
## Section 1: HTTP over TCP

## Problem Set 1:

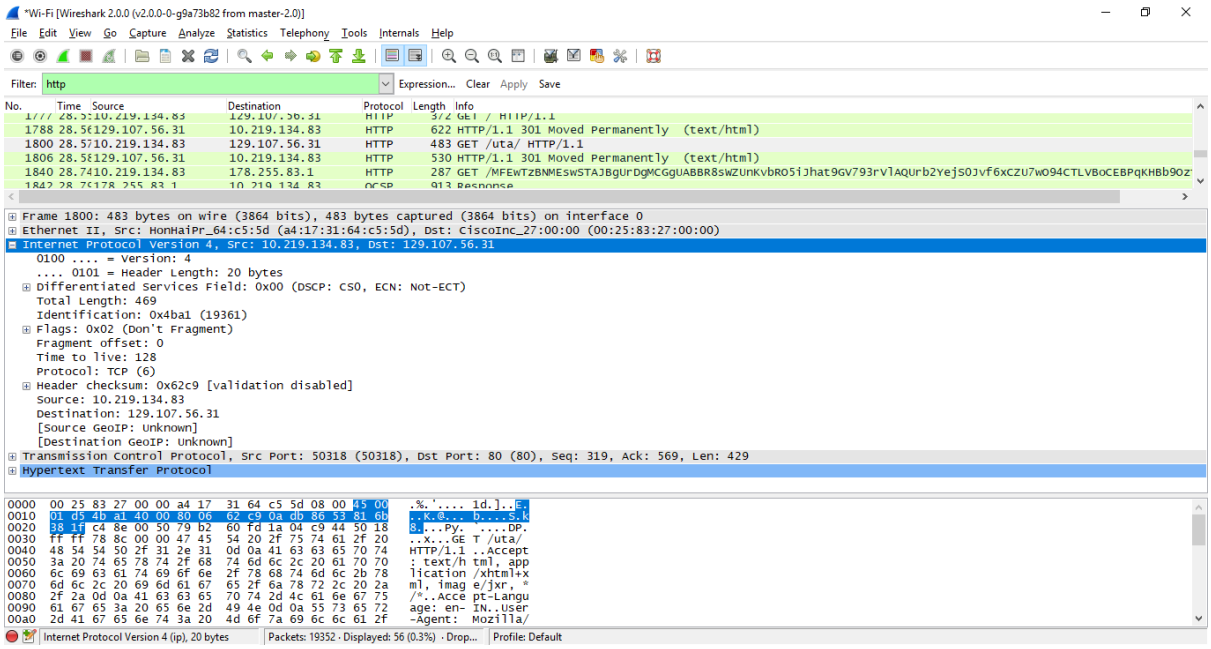
1. Source Ip Address and Port is 10.219.134.82 : 50318



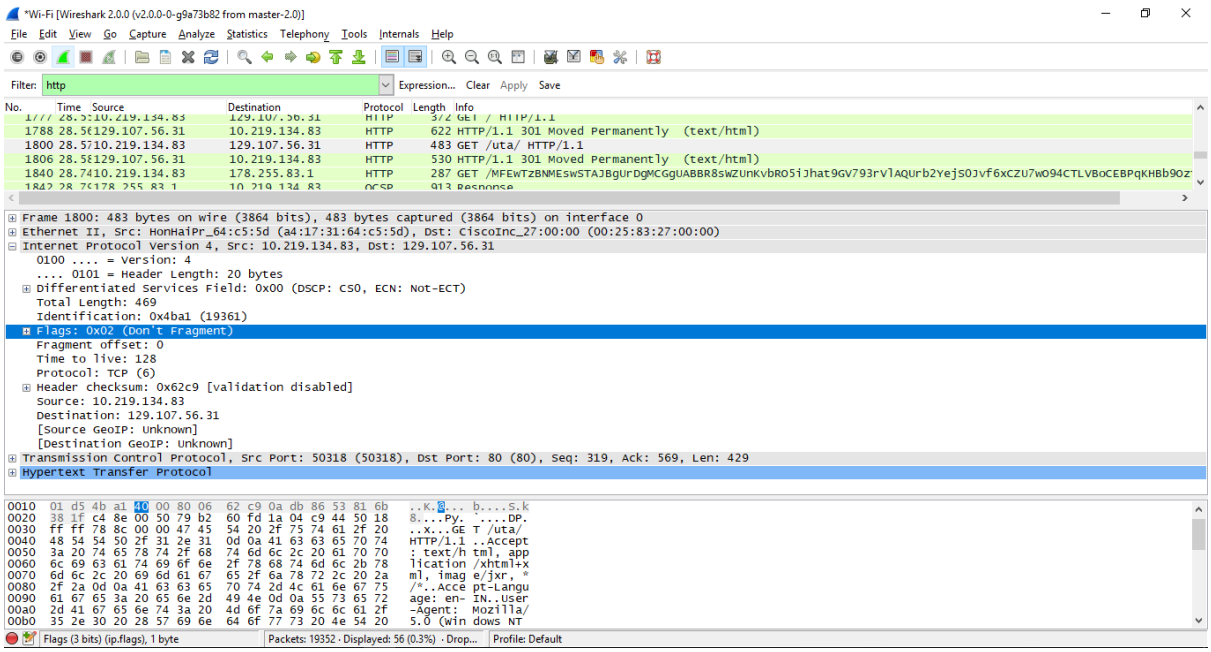

2. TTL Value used in Communication is 128



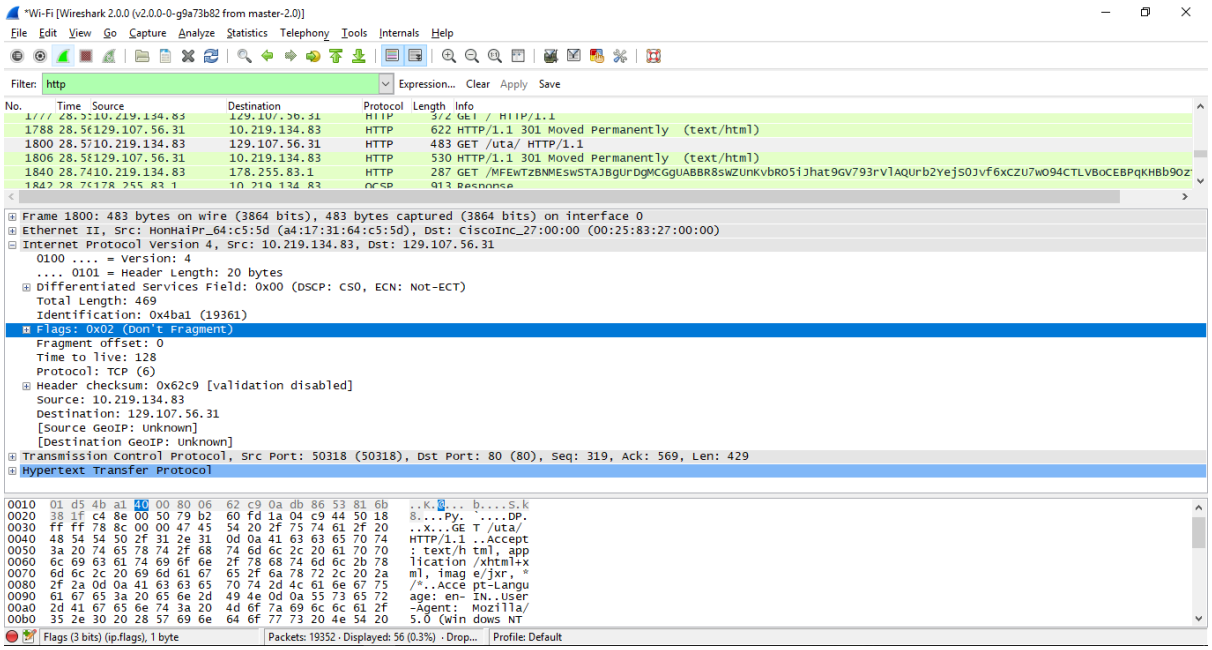
3. IPV4 is used During Communication.



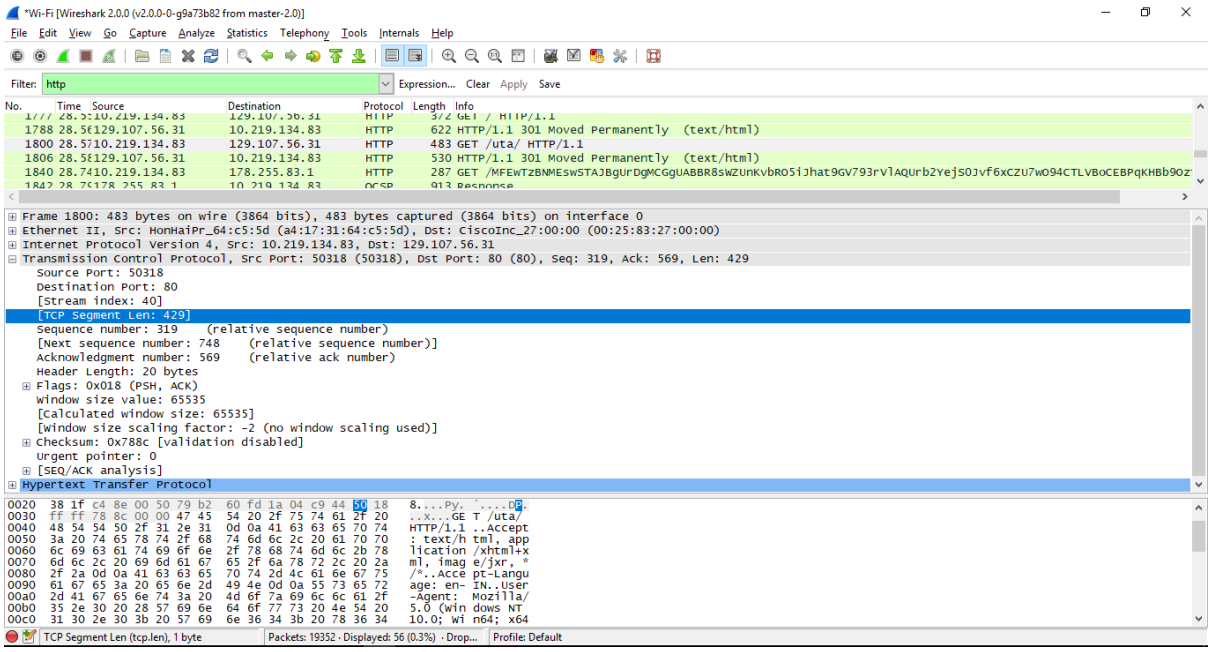

4. No Contain in the Option Field



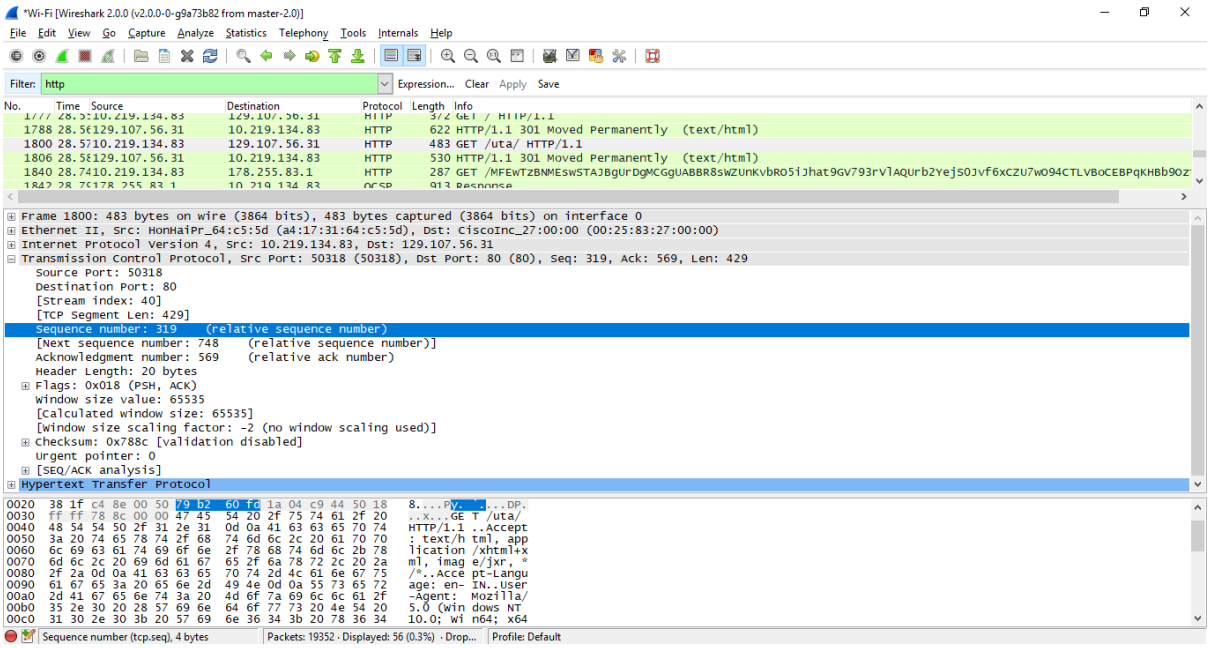
## 5. Packet Fragmented (Don't Fragment)



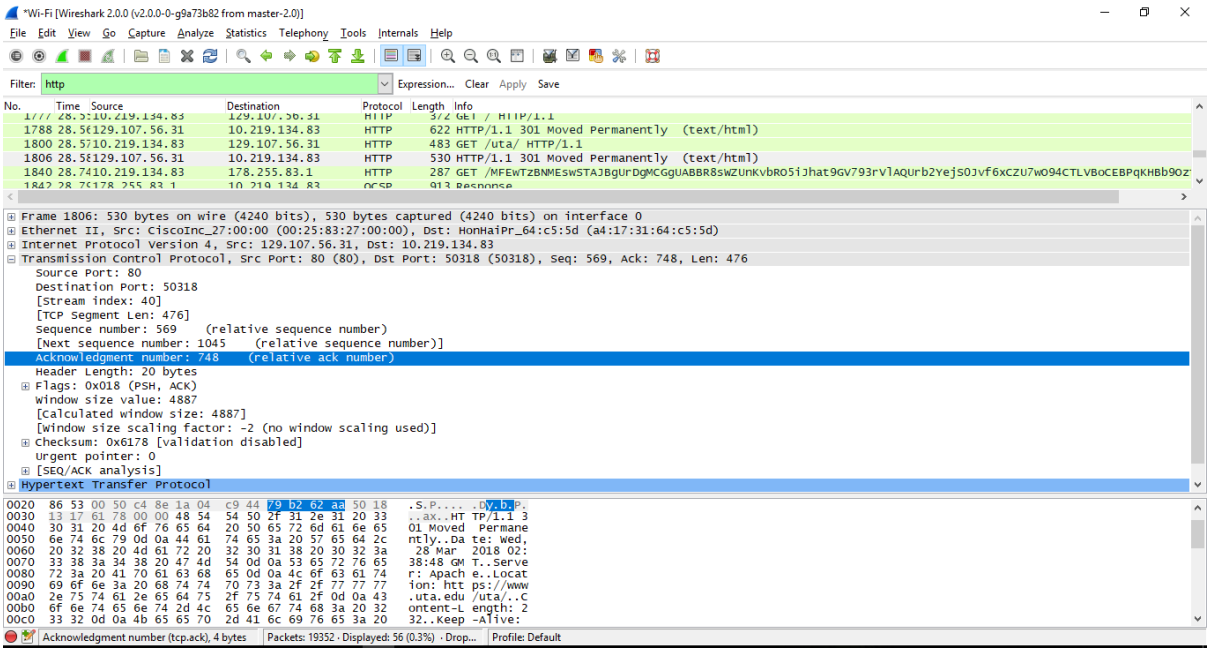

## 6. TCP Segment Length: 429



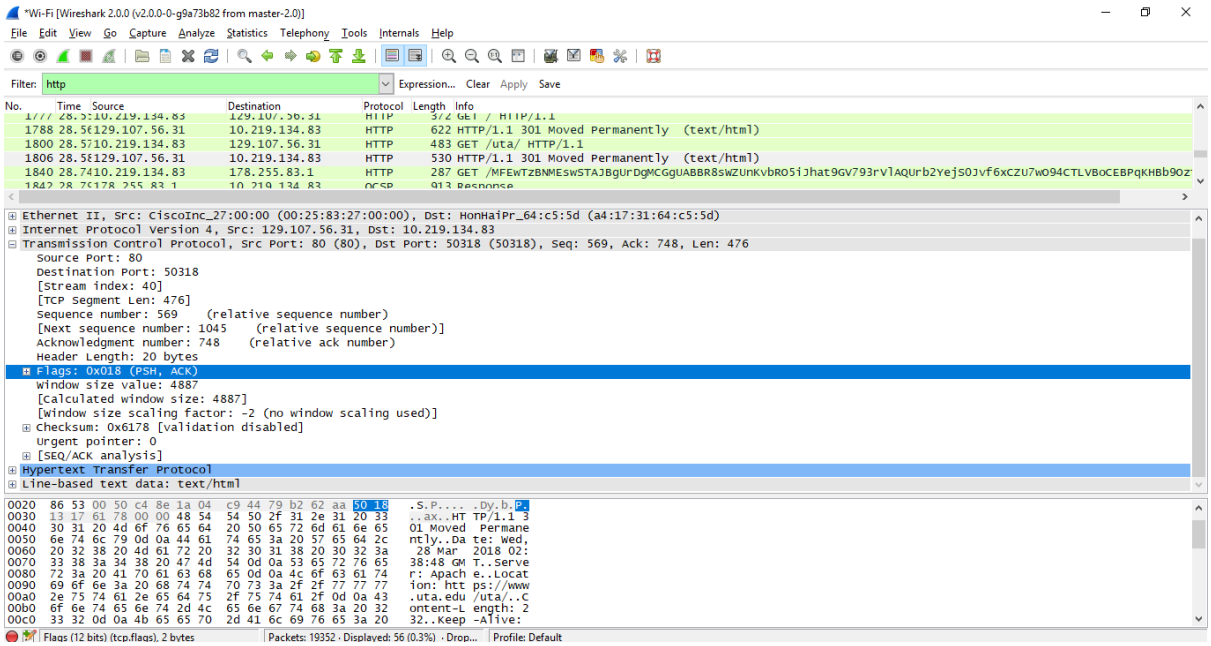
## 7. Sequence Number of TCP Segment is 319



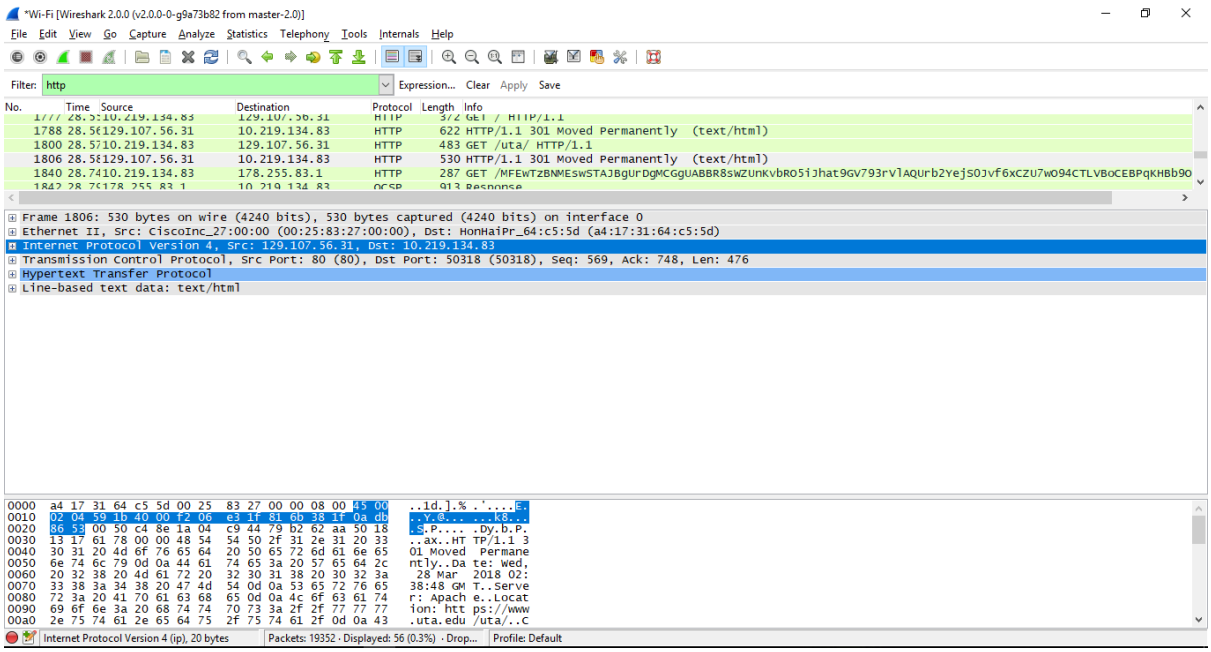

## 8. Acknowledgment Number = Tcp segment Length + sequence Number = 748



9. PSH flag is used in this packet capture



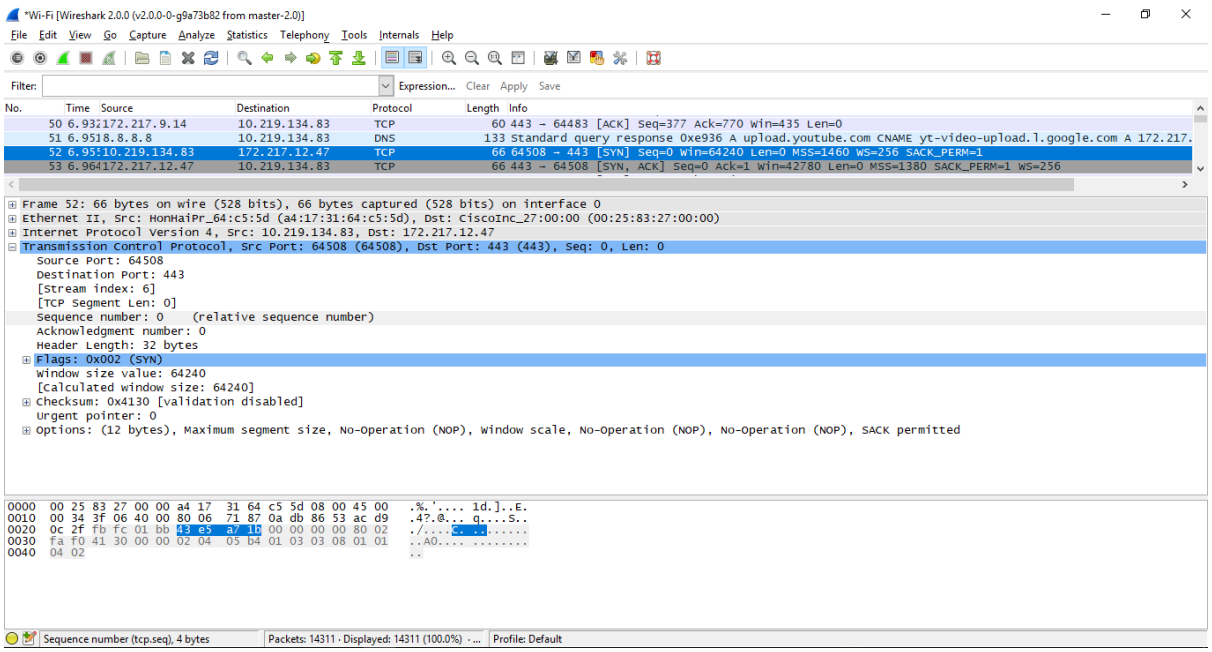

10. IP address of UTA.edu = 129.107.56.31 Sending Port No= 80 Receiving Port No. = 50318



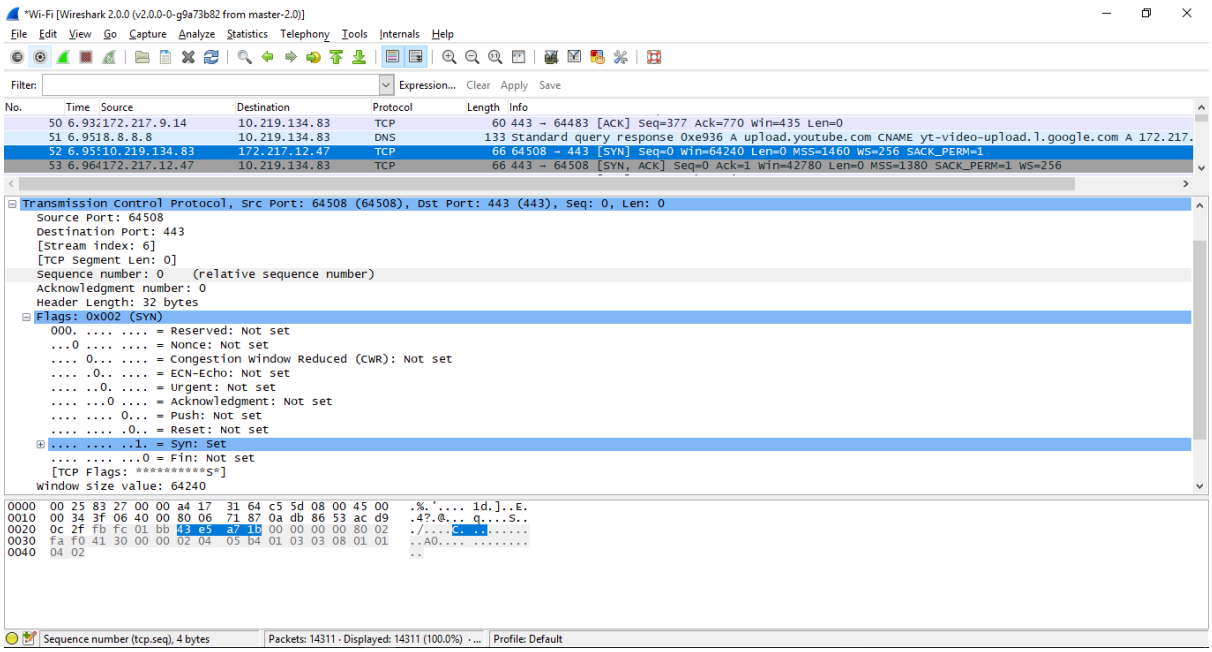
## Section 2: Analysing the Connection Parameters in TCP

## Problem Set 2:

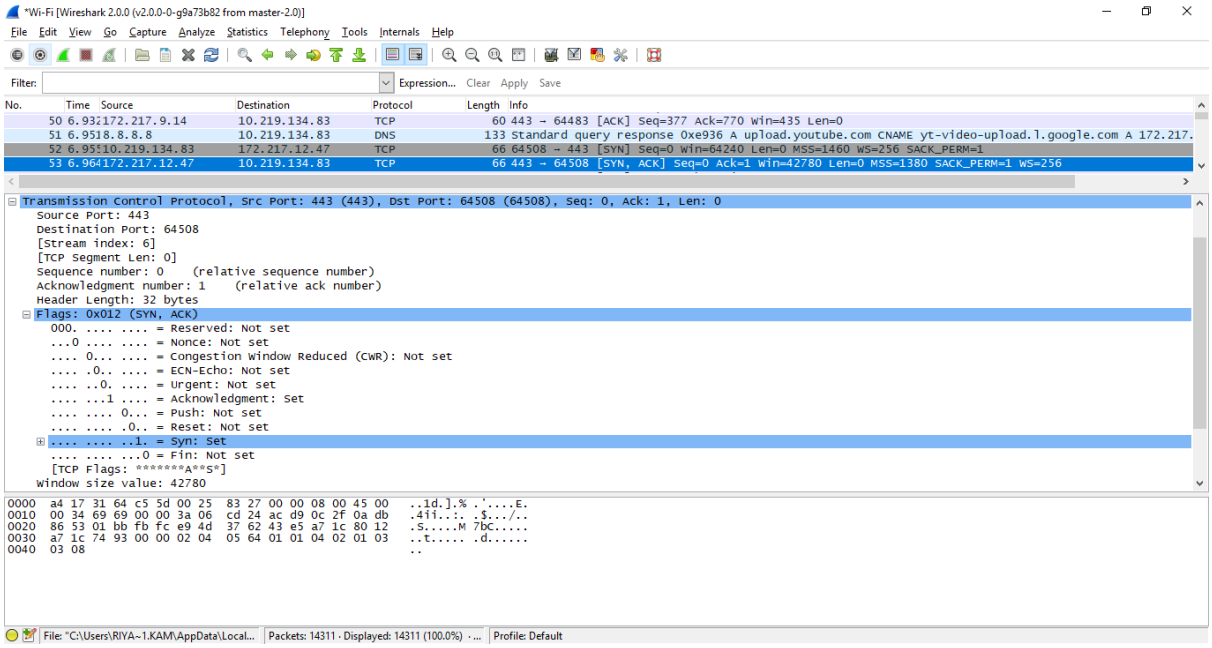
1. Sequence number of the TCP SYN segment is used to initiate the TCP connection between the client computer and youtube.com is trace to 0. The Aboslute Squence number is 43 e5 a7 1b c…



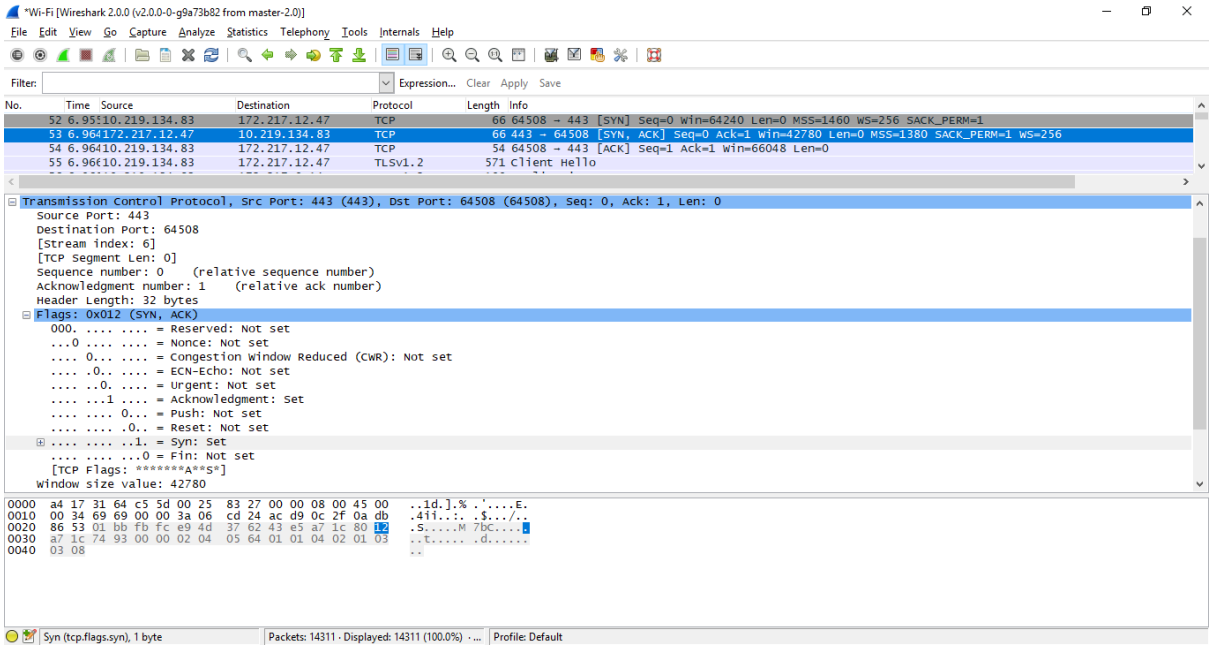

2. The SYN flag is set to 1 and it indicates that this segment is a SYN segment.



3. Sequence number of the SYNACK segment from youtube.com to the client computer in reply to the SYN has the value of 0 in this trace. The value of the Acknowledgement field in the SYNACK segment is 1.



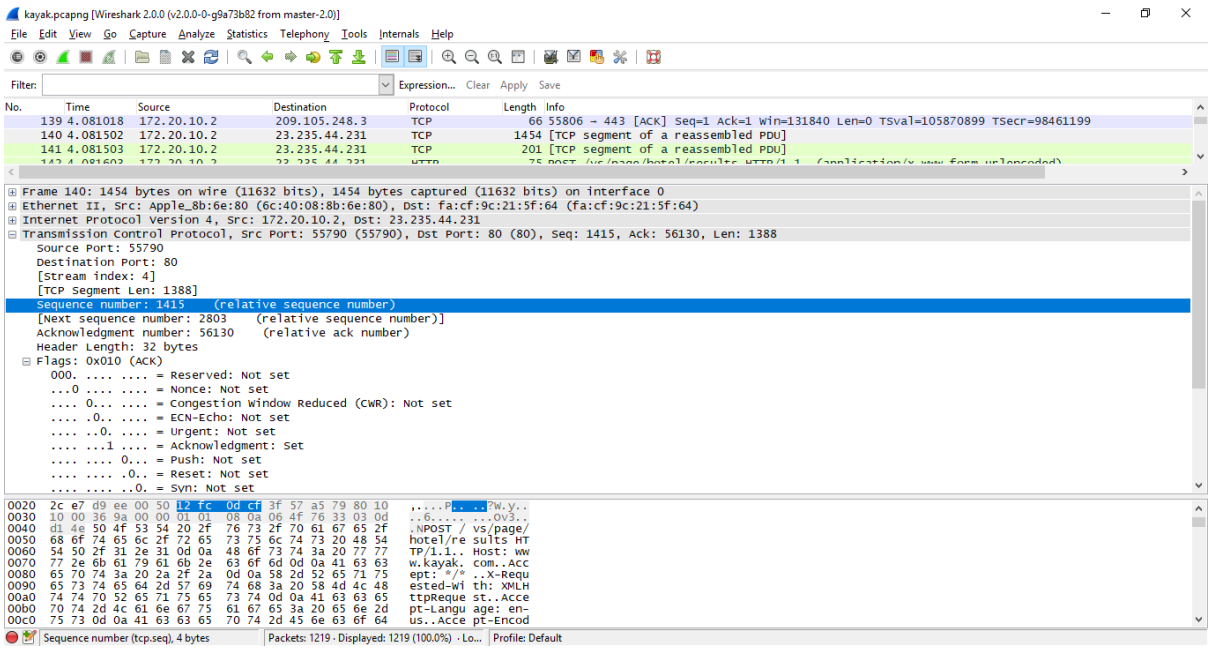

4. The value of the Acknowledgement field ( i.e. Acknowledgement number =1) in the SYNACK segment is determined by youtube.com by adding 1 to the initial sequence number of SYN segment(i.e. Sequence number =0) from the client computer. The SYN flag and Acknowledgement flag in the segment are set to 1 and they indicate that this segment is a SYNACK segment.



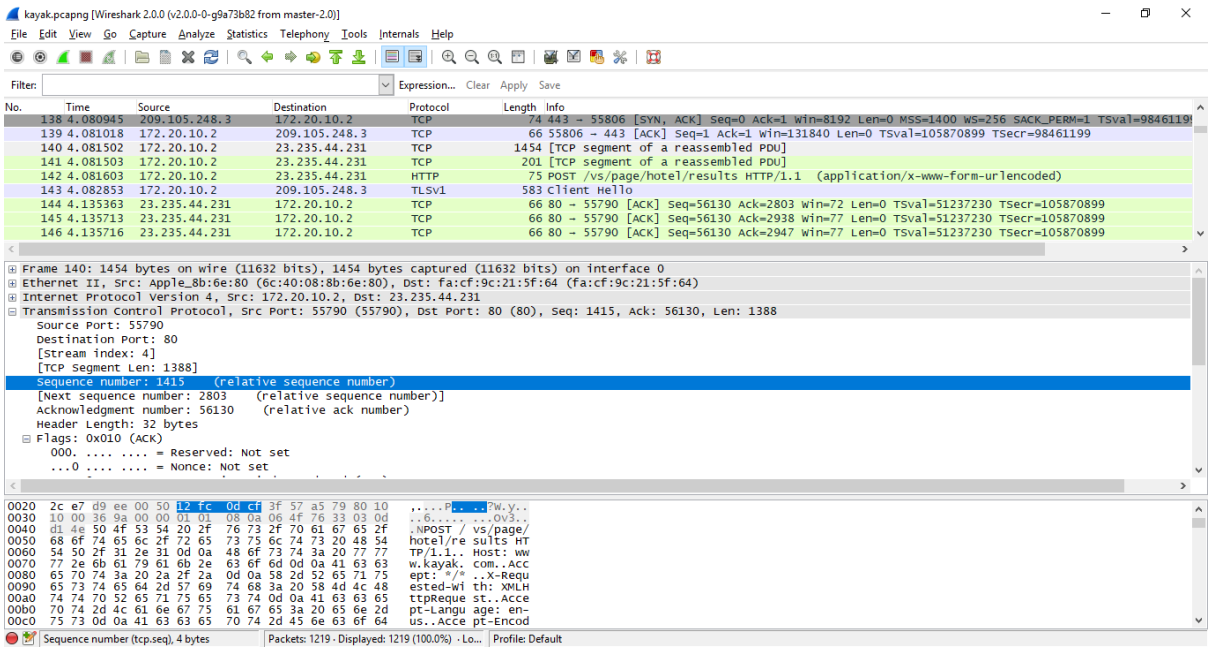
## Section 3: Analysis of the trace provided

Problem Set 3:

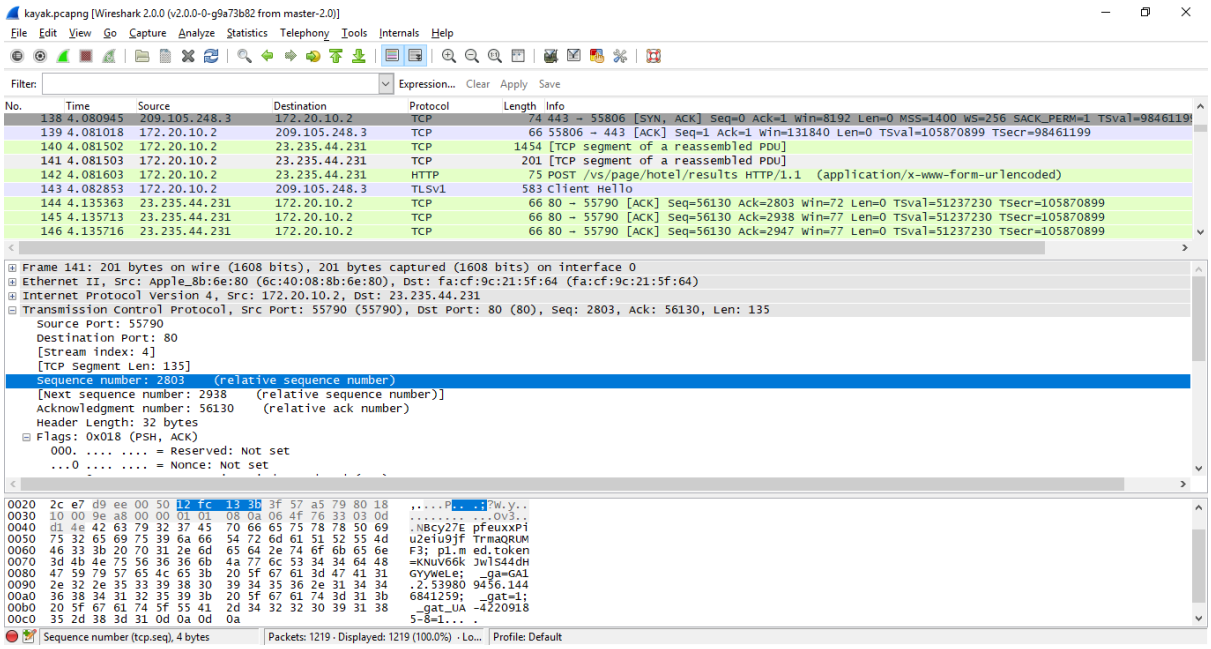
**1.** Sequence Number is 1415



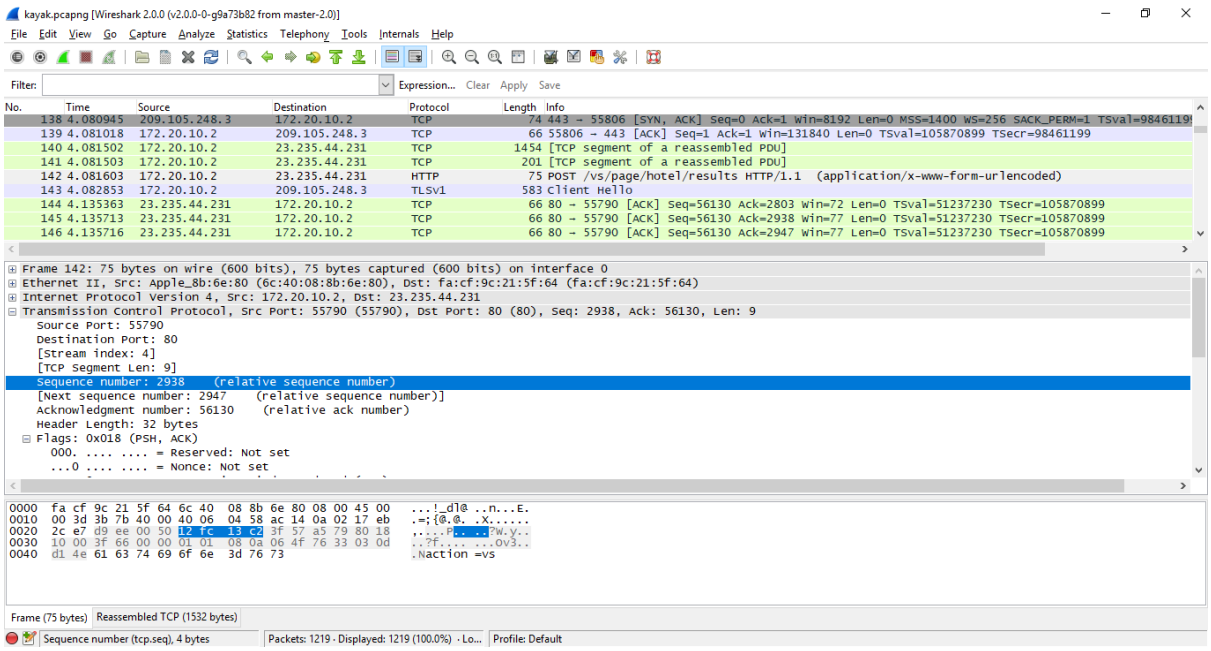

**2.** i. Segment 1: Sequence Number = 1415



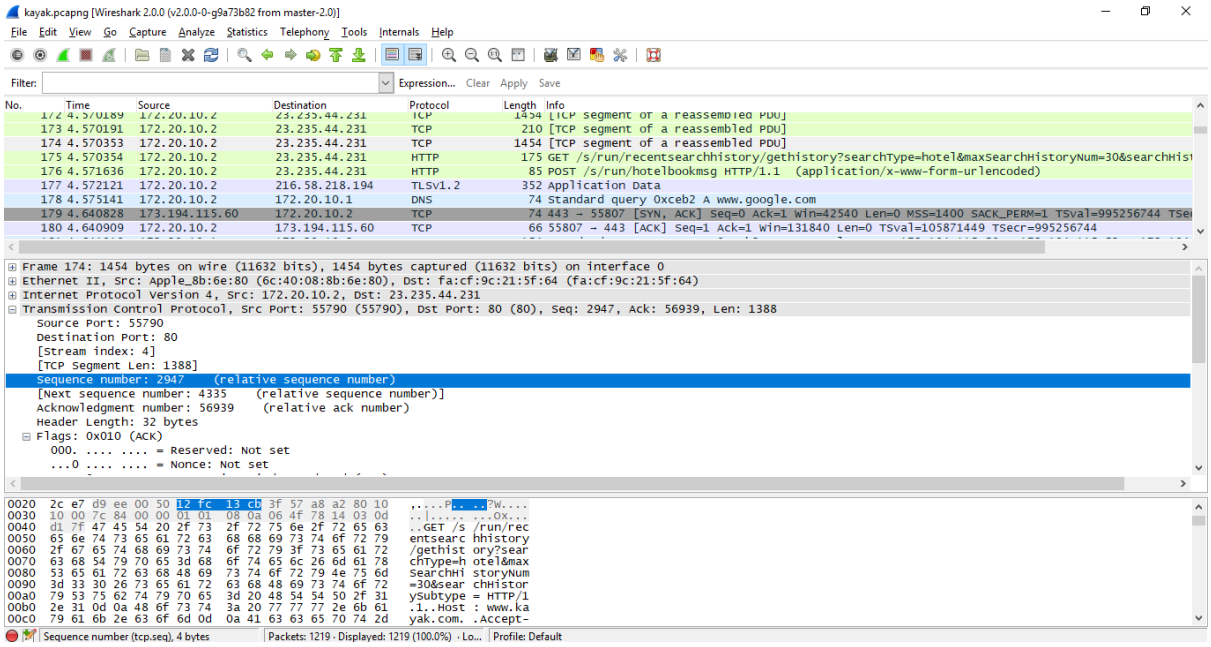
## Segment 2: Sequence Number = 2803



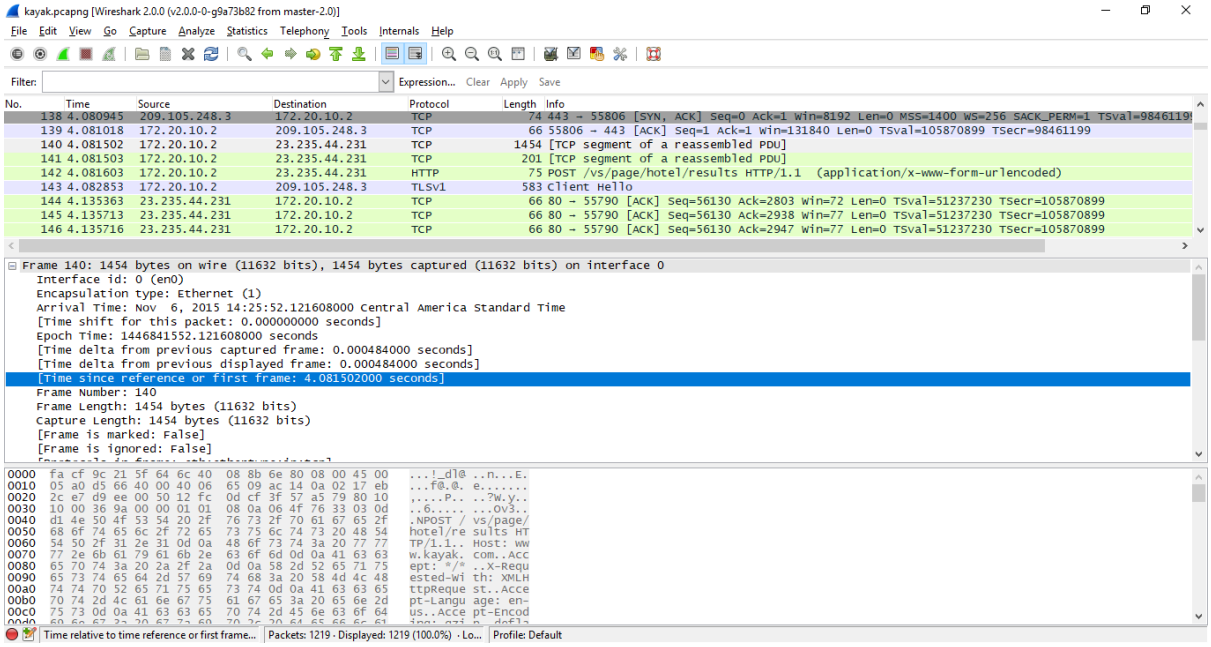

## Segment 3: Sequence Number = 2938

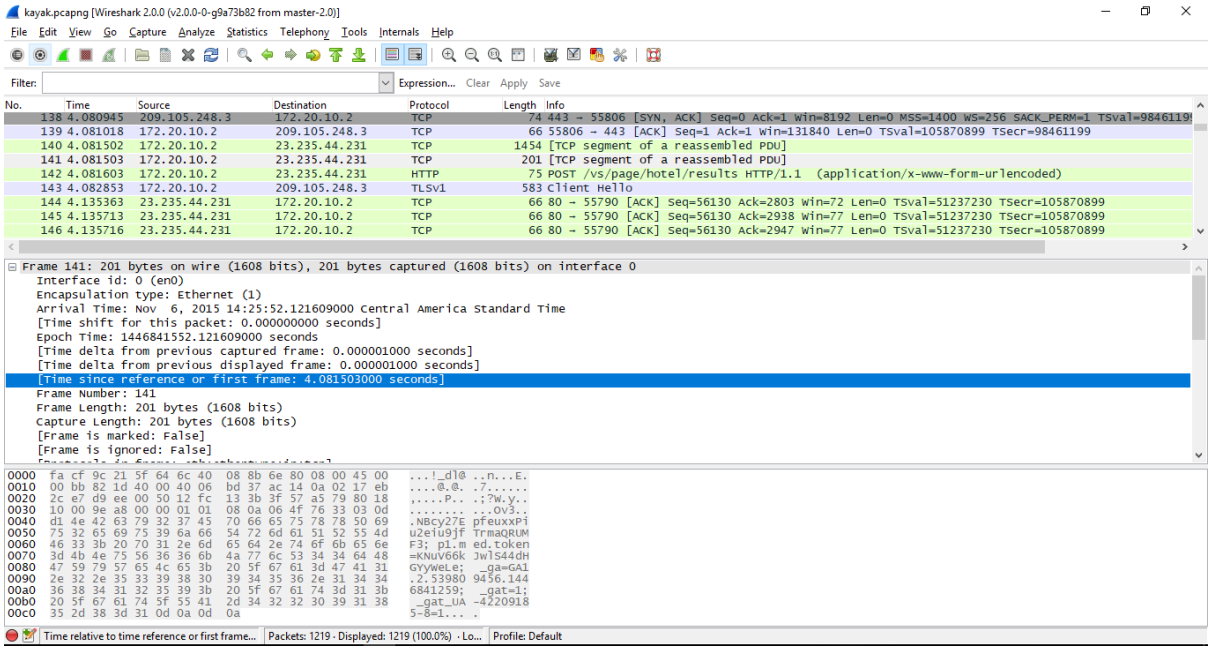


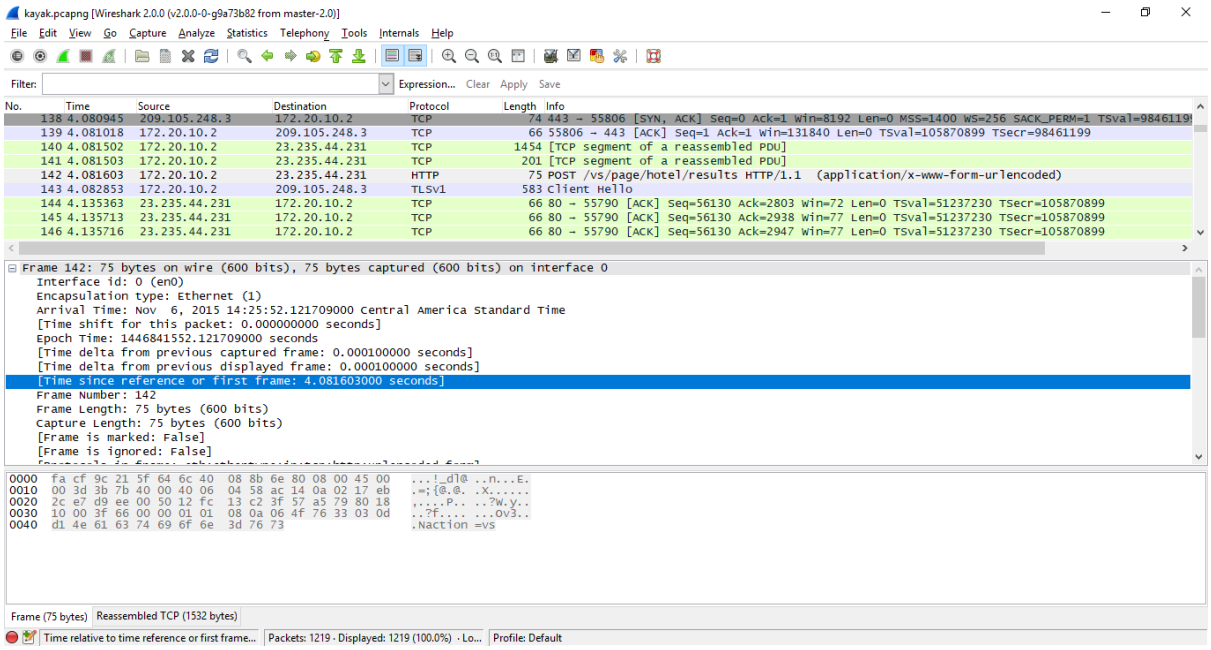
## Segment 4: Sequence Number = 2947

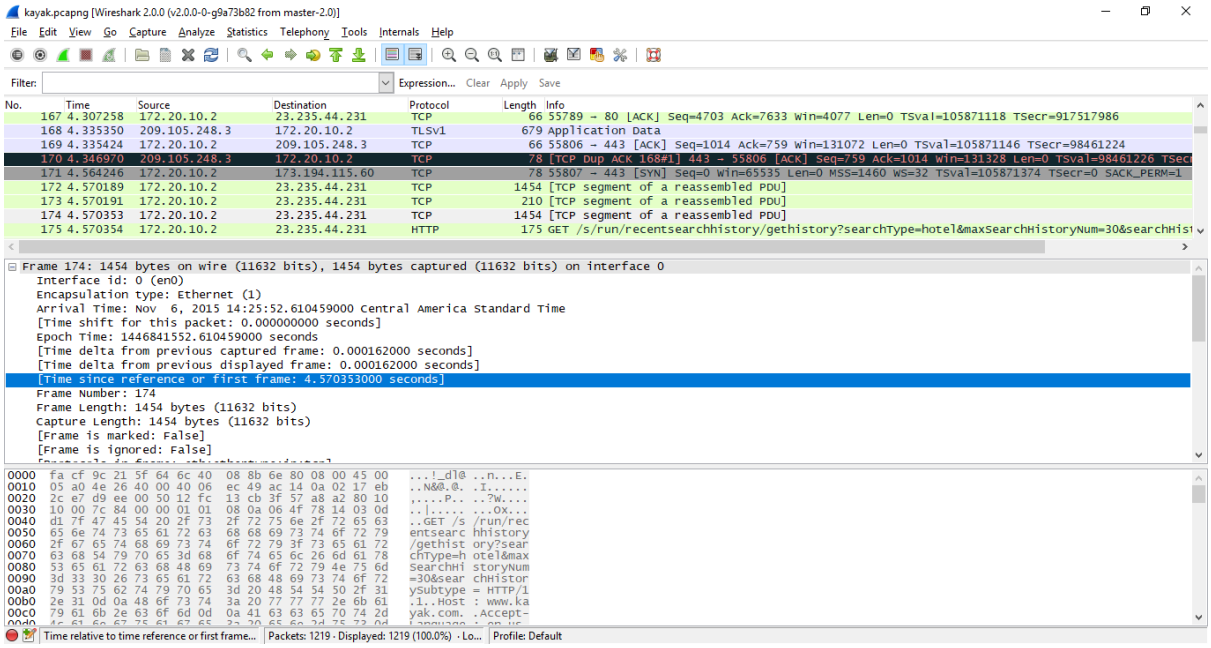



ii.




kayak.pcapng [Wireshark 2.0.0 (v2.0.0-0-g9a73b82 from master-2.0)]
File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help
Filter: Expression... Clear Apply Save
No. Time Source Destination Protocol Length Info
138 4.080945 209.105.248.3 172.20.10.2 TCP 74 443 → 55806 [SYN, ACK] Seq=0 Ack=1 Win=8192 Len=0 MSS=1400 WS=256 SACK_PERM=1 TSval=98461191
139 4.081018 172.20.10.2 209.105.248.3 TCP 66 55806 → 443 [ACK] Seq=1 Ack=1 Win=131840 Len=0 TSval=105870899 TSecr=98461199
140 4.081502 172.20.10.2 23.235.44.231 TCP 1454 [TCP segment of a reassembled PDU]
141 4.081503 172.20.10.2 23.235.44.231 TCP 201 [TCP segment of a reassembled PDU]
142 4.081603 172.20.10.2 23.235.44.231 HTTP 75 POST /vs/page/hotel/results HTTP/1.1 (application/x-www-form-urlencoded)
143 4.082853 172.20.10.2 209.105.248.3 TLSv1 583 Client Hello
144 4.135363 23.235.44.231 172.20.10.2 TCP 66 80 → 55790 [ACK] Seq=56130 Ack=2803 Win=72 Len=0 TSval=51237230 TSecr=105870899
145 4.135713 23.235.44.231 172.20.10.2 TCP 66 80 → 55790 [ACK] Seq=56130 Ack=2938 Win=77 Len=0 TSval=51237230 TSecr=105870899
146 4.135716 23.235.44.231 172.20.10.2 TCP 66 80 → 55790 [ACK] Seq=56130 Ack=2947 Win=77 Len=0 TSval=51237230 TSecr=105870899
Frame 141: 201 bytes on wire (1608 bits), 201 bytes captured (1608 bits) on interface 0
Interface id: 0 (en0)
Encapsulation type: Ethernet (1)
Arrival Time: Nov 6, 2015 14:25:52.121609000 Central America Standard Time
[Time shift for this packet: 0.000000000 seconds]
Epoch Time: 1446841552.121609000 seconds
[Time delta from previous captured frame: 0.000001000 seconds]
[Time delta from previous displayed frame: 0.000001000 seconds]
[Time since reference or first frame: 4.081503000 seconds]
Frame Number: 141
Frame Length: 201 bytes (1608 bits)
Capture Length: 201 bytes (1608 bits)
[Frame is marked: False]
[Frame is ignored: False]
0000 fa cf 9c 21 5f 64 6c 40 08 8b 6e 80 08 00 45 00 ...!_dl@ ..n...E.
0010 00 bb 82 1d 40 00 40 06 bd 37 ac 14 0a 02 17 eb ....@.@. .7......
0020 2c e7 d9 ee 00 50 12 fc 13 3b 3f 57 a5 79 80 18 ,....P.. .;?W.y..
0030 10 00 9e a8 00 00 01 01 08 0a 06 4f 76 33 03 0d ........ ...Ov3..
0040 d1 4e 42 63 79 32 37 45 7O 66 65 75 78 78 50 69 .NBcy27E pfeuxxPi
0050 75 32 65 69 75 39 6a 66 54 72 6d 61 51 52 55 4d u2eiu9jf TrmaQRUM
0060 46 33 3b 20 70 31 2e 6d 65 64 2e 74 6f 6b 65 6e F3; p1.m ed.token
0070 3d 4b 4e 75 56 36 36 6b 4a 77 6c 53 34 34 64 48 =KNuV66k JwlS44dH
0080 47 59 79 57 65 4c 65 3b 20 5f 67 61 3d 47 41 31 GYyWeLe; _ga=GA1
0090 2e 32 2e 35 33 39 38 30 39 34 35 36 2e 31 34 34 .2.53980 9456.144
00a0 36 38 34 31 32 35 39 3b 20 5f 67 61 74 3d 31 3b 6841259; _gat=1;
00b0 20 5f 67 61 74 5f 55 41 2d 34 32 32 30 39 31 38 _gat_UA -4220918
00c0 35 2d 38 3d 31 0d 0a 0d 0a 5-8=1... .
Time relative to time reference or first frame... Packets: 1219 · Displayed: 1219 (100.0%) · Lo... Profile: Default

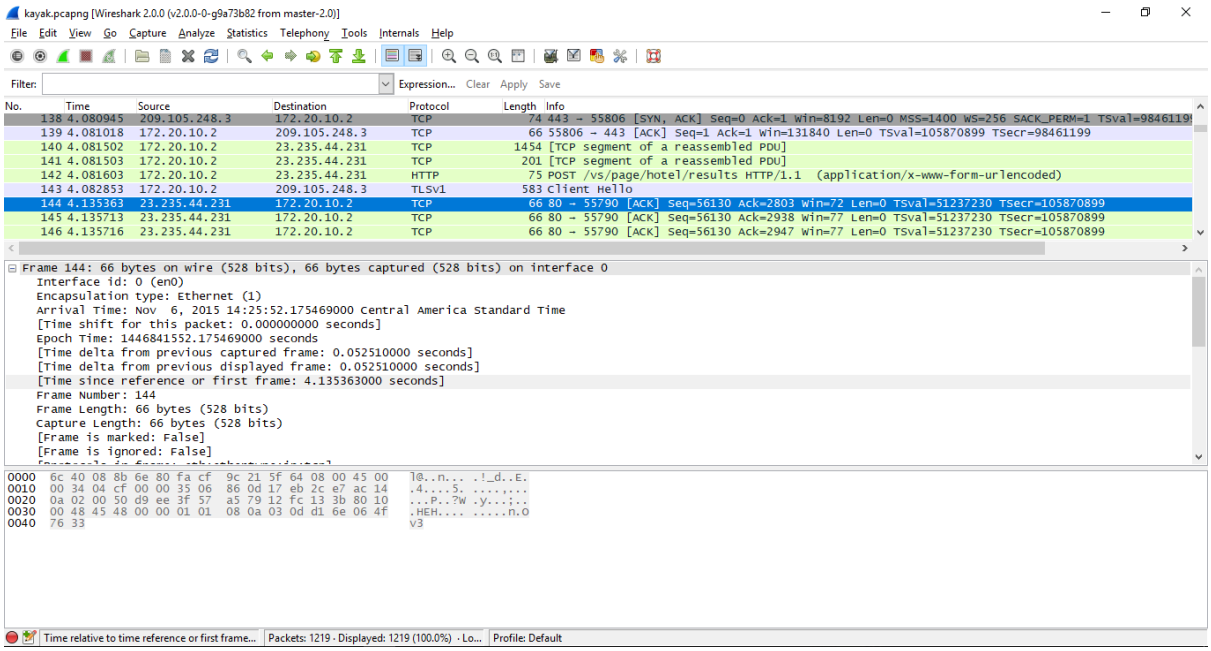

kayak.pcapng [Wireshark 2.0.0 (v2.0.0-0-g9a73b82 from master-2.0)]
File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help
Filter: Expression... Clear Apply Save
No. Time Source Destination Protocol Length Info
138 4.080945 209.105.248.3 172.20.10.2 TCP 74 443 → 55806 [SYN, ACK] Seq=0 Ack=1 Win=8192 Len=0 MSS=1400 WS=256 SACK_PERM=1 TSval=98461191
139 4.081018 172.20.10.2 209.105.248.3 TCP 66 55806 → 443 [ACK] Seq=1 Ack=1 Win=131840 Len=0 TSval=105870899 TSecr=98461199
140 4.081502 172.20.10.2 23.235.44.231 TCP 1454 [TCP segment of a reassembled PDU]
141 4.081503 172.20.10.2 23.235.44.231 TCP 201 [TCP segment of a reassembled PDU]
142 4.081603 172.20.10.2 23.235.44.231 HTTP 75 POST /vs/page/hotel/results HTTP/1.1 (application/x-www-form-urlencoded)
143 4.082853 172.20.10.2 209.105.248.3 TLSv1 583 Client Hello
144 4.135363 23.235.44.231 172.20.10.2 TCP 66 80 → 55790 [ACK] Seq=56130 Ack=2803 Win=72 Len=0 TSval=51237230 TSecr=105870899
145 4.135713 23.235.44.231 172.20.10.2 TCP 66 80 → 55790 [ACK] Seq=56130 Ack=2938 Win=77 Len=0 TSval=51237230 TSecr=105870899
146 4.135716 23.235.44.231 172.20.10.2 TCP 66 80 → 55790 [ACK] Seq=56130 Ack=2947 Win=77 Len=0 TSval=51237230 TSecr=105870899
Frame 142: 75 bytes on wire (600 bits), 75 bytes captured (600 bits) on interface 0
Interface id: 0 (en0)
Encapsulation type: Ethernet (1)
Arrival Time: Nov 6, 2015 14:25:52.121709000 Central America Standard Time
[Time shift for this packet: 0.000000000 seconds]
Epoch Time: 1446841552.121709000 seconds
[Time delta from previous captured frame: 0.000100000 seconds]
[Time delta from previous displayed frame: 0.000100000 seconds]
[Time since reference or first frame: 4.081603000 seconds]
Frame Number: 142
Frame Length: 75 bytes (600 bits)
Capture Length: 75 bytes (600 bits)
[Frame is marked: False]
[Frame is ignored: False]
0000 fa cf 9c 21 5f 64 6c 40 08 8b 6e 80 08 00 45 00 ...!_dl@ ..n...E.
0010 00 3d 3b 7b 40 00 40 06 04 58 ac 14 0a 02 17 eb .=;{@.@. .X......
0020 2c e7 d9 ee 00 50 12 fc 13 c2 3f 57 a5 79 80 18 ,....P.. ..?W.y..
0030 10 00 3f 66 00 00 01 01 08 0a 06 4f 76 33 03 0d ..?f.... ...Ov3..
0040 d1 4e 61 63 74 69 6f 6e 3d 76 73 .Naction =vs
Frame (75 bytes) Reassembled TCP (1532 bytes)
Time relative to time reference or first frame... Packets: 1219 · Displayed: 1219 (100.0%) · Lo... Profile: Default




From the above observations in the screenshot, below is the details for the Segment Sent Time:

| | Segment 1 | Segment 2 | Segment 3 | Segment 4 |
|---|---|---|---|---|
| Segment Sent Time | 4.081502000 sec | 4.081503000 sec | 4.081603000 sec | 4.570353000 sec |

iii.




*Above screenshot shows the received time for the 1st Segment only

| | Segment 1 | Segment 2 | Segment 3 | Segment 4 |
|---|---|---|---|---|
| Segment Received Time | 4.135363000 sec | 4.135713000 sec | 4.135716000 sec | 4.646868000 sec |

iv. RTT value for the segments are mentioned below:

| | Segment 1 | Segment 2 | Segment 3 | Segment 4 |
|---|---|---|---|---|
| RTT | 0.053861 sec | 0.05421 sec | 0.054113 sec | 0.076515 sec |

- **Estimated RTT = 0.875 * Estimated RTT + 0.125 * Sample RTT**

For Segment 1:

Estimated RTT = RTT for the first segment = 0.053861 sec (Will be used in segment 2)

For Segment 2:

Estimated RTT = 0.875 * 0.053861 + 0.125 * 0.05421 = 0.05390 sec (Will be used in segment 3)

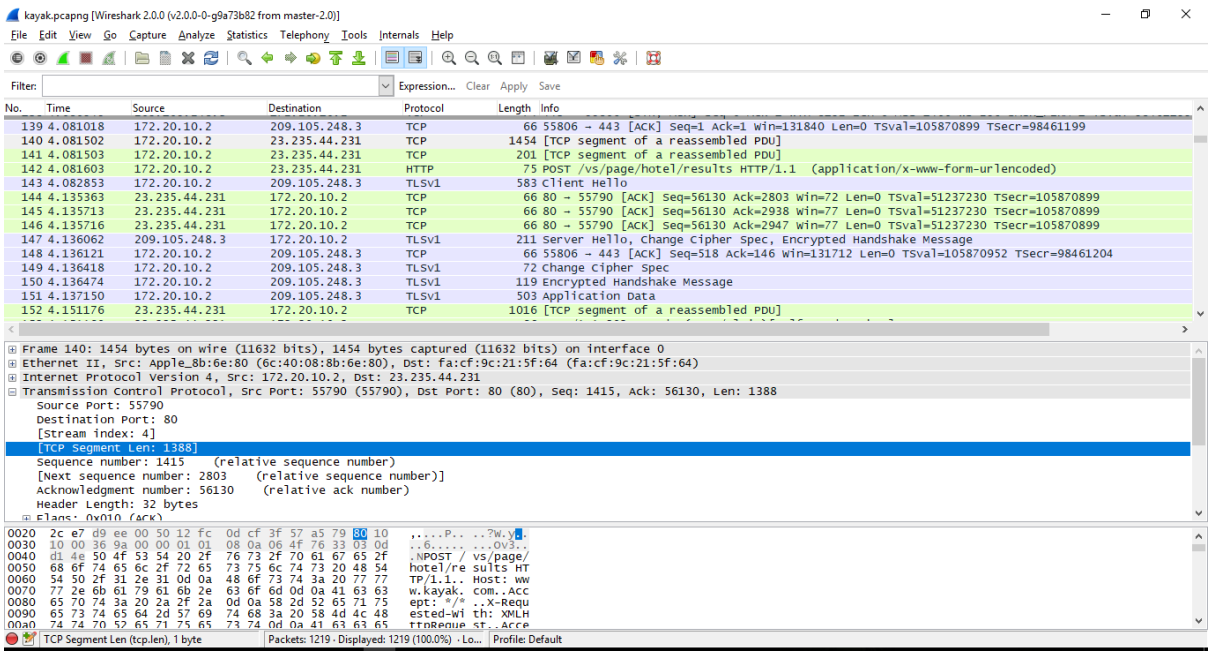
For Segment 3:

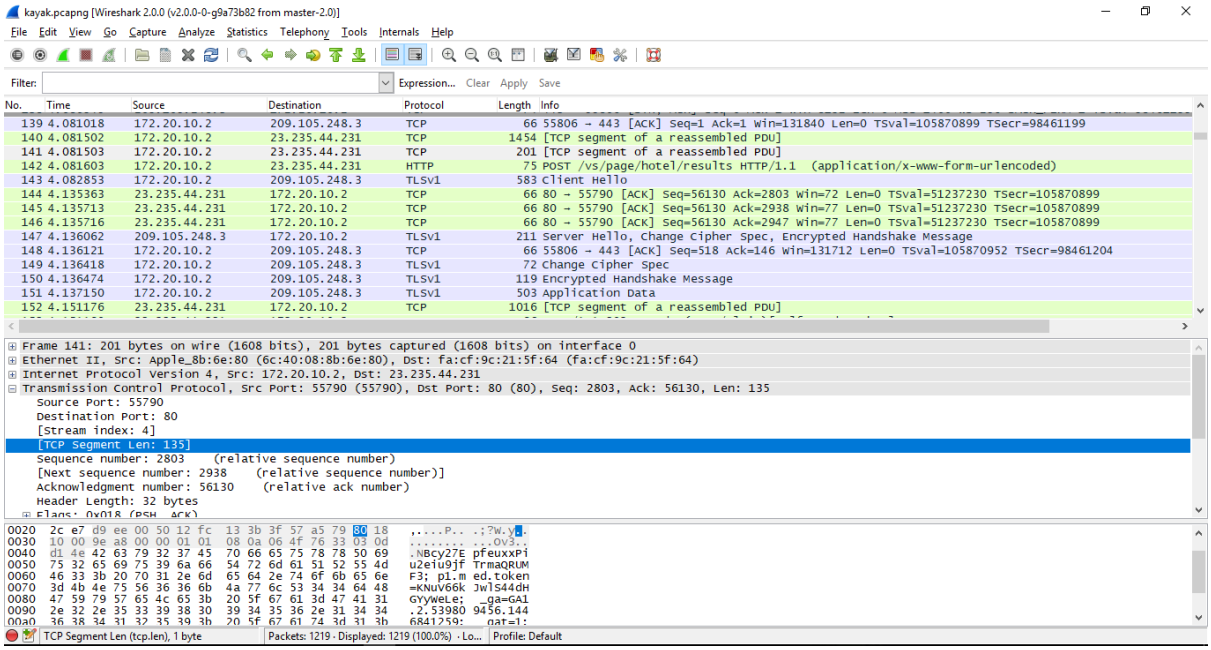
Estimated RTT = 0.875 * 0.05390 + 0.125 * 0.054113 = 0.05393 sec (Will be used in segment 4)

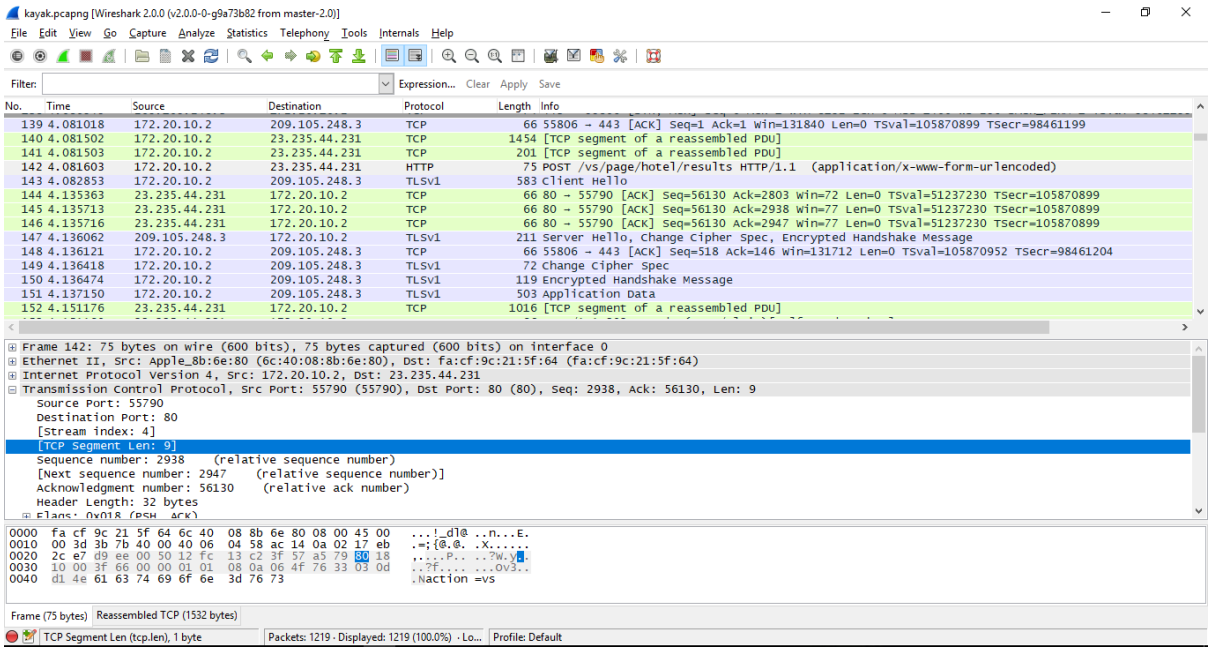
For Segment 4:

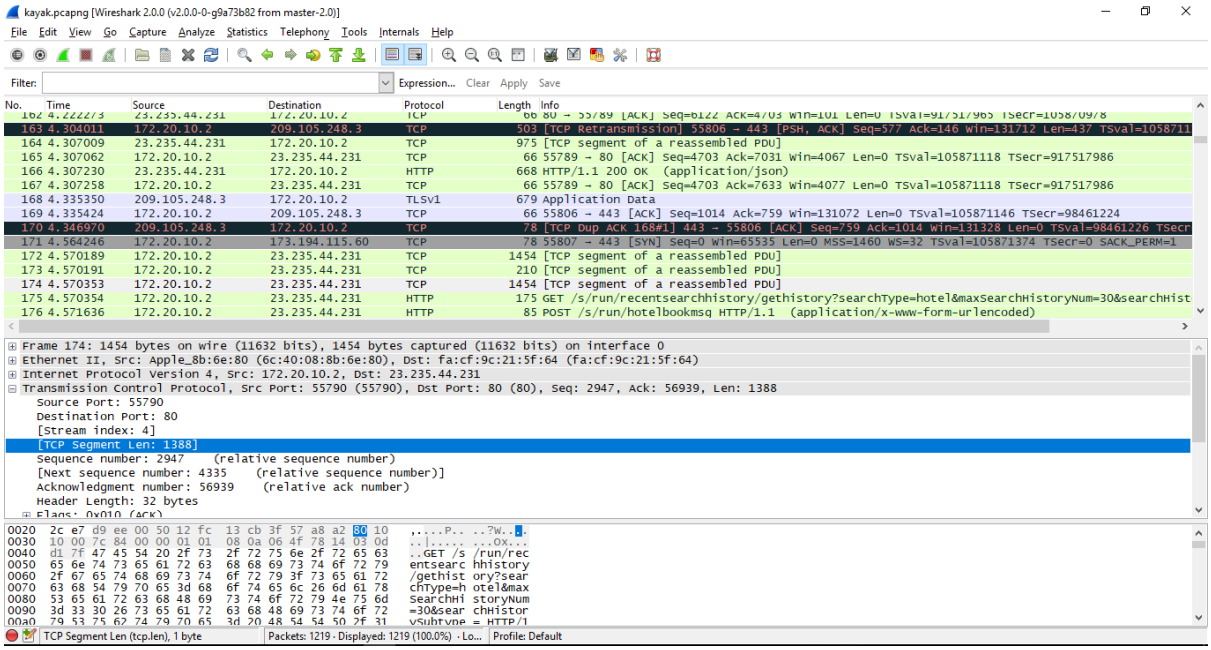
Estimated RTT = 0.875 * 0.05390 + 0.125 * 0.054113 = 0.05393 sec (Will be used in next segment

**3.** For Length of Segments:




kayak.pcapng [Wireshark 2.0.0 (v2.0.0-0-g9a73b82 from master-2.0)]
File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help
Filter: Expression... Clear Apply Save
No. Time Source Destination Protocol Length Info
139 4.081018 172.20.10.2 209.105.248.3 TCP 66 55806 → 443 [ACK] Seq=1 Ack=1 Win=131840 Len=0 TSval=105870899 TSecr=98461199
140 4.081502 172.20.10.2 23.235.44.231 TCP 1454 [TCP segment of a reassembled PDU]
141 4.081503 172.20.10.2 23.235.44.231 TCP 201 [TCP segment of a reassembled PDU]
142 4.081603 172.20.10.2 23.235.44.231 HTTP 75 POST /vs/page/hotel/results HTTP/1.1 (application/x-www-form-urlencoded)
143 4.082853 172.20.10.2 209.105.248.3 TLSv1 583 Client Hello
144 4.135363 23.235.44.231 172.20.10.2 TCP 66 80 → 55790 [ACK] Seq=56130 Ack=2803 Win=72 Len=0 TSval=51237230 TSecr=105870899
145 4.135713 23.235.44.231 172.20.10.2 TCP 66 80 → 55790 [ACK] Seq=56130 Ack=2938 Win=77 Len=0 TSval=51237230 TSecr=105870899
146 4.135716 23.235.44.231 172.20.10.2 TCP 66 80 → 55790 [ACK] Seq=56130 Ack=2947 Win=77 Len=0 TSval=51237230 TSecr=105870899
147 4.136062 209.105.248.3 172.20.10.2 TLSv1 211 Server Hello, Change Cipher Spec, Encrypted Handshake Message
148 4.136121 172.20.10.2 209.105.248.3 TCP 66 55806 → 443 [ACK] Seq=518 Ack=146 Win=131712 Len=0 TSval=105870952 TSecr=98461204
149 4.136418 172.20.10.2 209.105.248.3 TLSv1 72 Change Cipher Spec
150 4.136474 172.20.10.2 209.105.248.3 TLSv1 119 Encrypted Handshake Message
151 4.137150 172.20.10.2 209.105.248.3 TLSv1 503 Application Data
152 4.151176 23.235.44.231 172.20.10.2 TCP 1016 [TCP segment of a reassembled PDU]
Frame 141: 201 bytes on wire (1608 bits), 201 bytes captured (1608 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, Dst: 23.235.44.231
Transmission Control Protocol, Src Port: 55790 (55790), Dst Port: 80 (80), Seq: 2803, Ack: 56130, Len: 135
Source Port: 55790
Destination Port: 80
[Stream index: 4]
[TCP Segment Len: 135]
Sequence number: 2803 (relative sequence number)
[Next sequence number: 2938 (relative sequence number)]
Acknowledgment number: 56130 (relative ack number)
Header Length: 32 bytes
Flags: 0x018 (PSH, ACK)
0020 2c e7 d9 ee 00 50 12 fc 13 3b 3f 57 a5 79 80 18 ,....P.. .;?W.y..
0030 10 00 9e a8 00 00 01 01 08 0a 06 4f 76 33 03 0d ........ ...Ov3..
0040 d1 4e 42 63 79 32 37 45 70 66 65 75 78 78 50 69 .NBcy27E pfeuxxPi
0050 75 32 65 69 75 39 6a 66 54 72 6d 61 51 52 55 4d u2eiu9jf TrmaQRUM
0060 46 33 3b 20 70 31 2e 6d 65 64 2e 74 6f 6b 65 6e F3; p1.m ed.token
0070 3d 4b 4e 75 56 36 36 6b 4a 77 6c 53 34 34 64 48 =KNuV66k JwlS44dH
0080 47 59 79 57 65 4c 65 3b 20 5f 67 61 3d 47 41 31 GYyWeLe; _ga=GA1
0090 2e 32 2e 35 33 39 38 30 39 34 35 36 2e 31 34 34 .2.53980 9456.144
00a0 36 38 34 31 32 35 39 3b 20 5f 67 61 74 3d 31 3b 6841259; _gat=1;
TCP Segment Len (tcp.len), 1 byte
Packets: 1219 · Displayed: 1219 (100.0%) · Lo...
Profile: Default

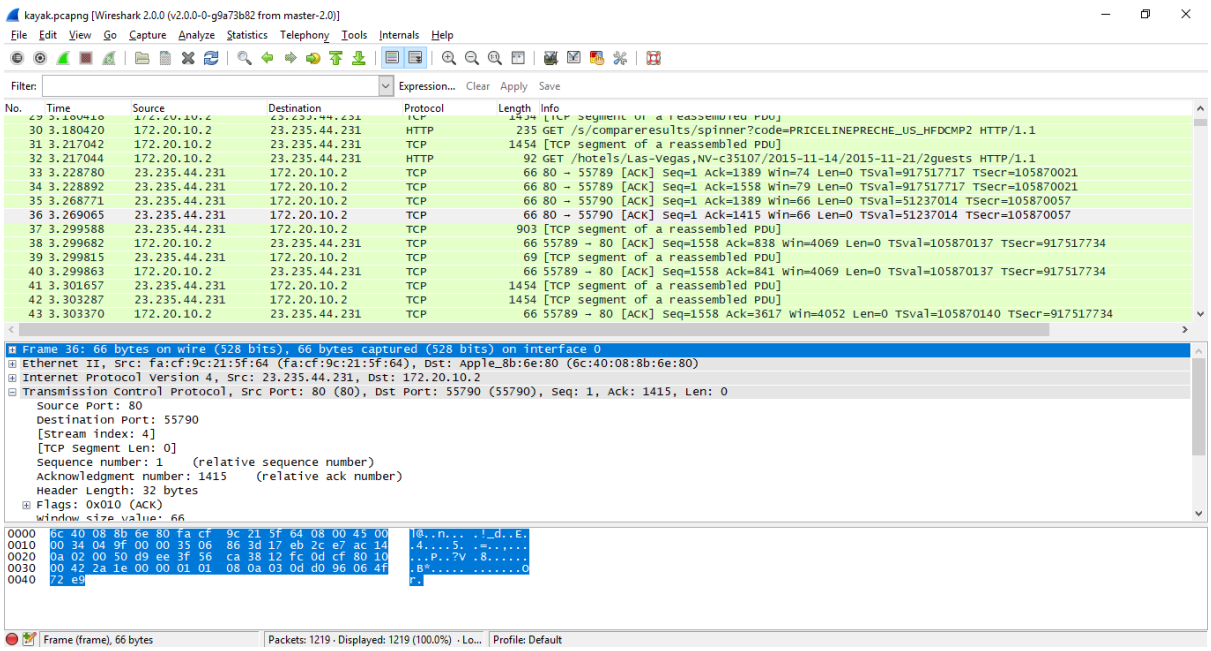

kayak.pcapng [Wireshark 2.0.0 (v2.0.0-0-g9a73b82 from master-2.0)]
File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help
Filter: Expression... Clear Apply Save
No. Time Source Destination Protocol Length Info
139 4.081018 172.20.10.2 209.105.248.3 TCP 66 55806 → 443 [ACK] Seq=1 Ack=1 Win=131840 Len=0 TSval=105870899 TSecr=98461199
140 4.081502 172.20.10.2 23.235.44.231 TCP 1454 [TCP segment of a reassembled PDU]
141 4.081503 172.20.10.2 23.235.44.231 TCP 201 [TCP segment of a reassembled PDU]
142 4.081603 172.20.10.2 23.235.44.231 HTTP 75 POST /vs/page/hotel/results HTTP/1.1 (application/x-www-form-urlencoded)
143 4.082853 172.20.10.2 209.105.248.3 TLSv1 583 Client Hello
144 4.135363 23.235.44.231 172.20.10.2 TCP 66 80 → 55790 [ACK] Seq=56130 Ack=2803 Win=72 Len=0 TSval=51237230 TSecr=105870899
145 4.135713 23.235.44.231 172.20.10.2 TCP 66 80 → 55790 [ACK] Seq=56130 Ack=2938 Win=77 Len=0 TSval=51237230 TSecr=105870899
146 4.135716 23.235.44.231 172.20.10.2 TCP 66 80 → 55790 [ACK] Seq=56130 Ack=2947 Win=77 Len=0 TSval=51237230 TSecr=105870899
147 4.136062 209.105.248.3 172.20.10.2 TLSv1 211 Server Hello, Change Cipher Spec, Encrypted Handshake Message
148 4.136121 172.20.10.2 209.105.248.3 TCP 66 55806 → 443 [ACK] Seq=518 Ack=146 Win=131712 Len=0 TSval=105870952 TSecr=98461204
149 4.136418 172.20.10.2 209.105.248.3 TLSv1 72 Change Cipher Spec
150 4.136474 172.20.10.2 209.105.248.3 TLSv1 119 Encrypted Handshake Message
151 4.137150 172.20.10.2 209.105.248.3 TLSv1 503 Application Data
152 4.151176 23.235.44.231 172.20.10.2 TCP 1016 [TCP segment of a reassembled PDU]
Frame 142: 75 bytes on wire (600 bits), 75 bytes captured (600 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, Dst: 23.235.44.231
Transmission Control Protocol, Src Port: 55790 (55790), Dst Port: 80 (80), Seq: 2938, Ack: 56130, Len: 9
Source Port: 55790
Destination Port: 80
[Stream index: 4]
[TCP Segment Len: 9]
Sequence number: 2938 (relative sequence number)
[Next sequence number: 2947 (relative sequence number)]
Acknowledgment number: 56130 (relative ack number)
Header Length: 32 bytes
Flags: 0x018 (PSH, ACK)
0000 fa cf 9c 21 5f 64 6c 40 08 8b 6e 80 08 00 45 00 ...!_dl@ ..n...E.
0010 00 3d 3b 7b 40 00 40 06 04 58 ac 14 0a 02 17 eb .=;{@.@. .X......
0020 2c e7 d9 ee 00 50 12 fc 13 c2 3f 57 a5 79 80 18 ,....P.. ..?W.y..
0030 10 00 3f 66 00 00 01 01 08 0a 06 4f 76 33 03 0d ..?f.... ...Ov3..
0040 d1 4e 61 63 74 69 6f 6e 3d 76 73 .Naction =vs
Frame (75 bytes) Reassembled TCP (1532 bytes)
TCP Segment Len (tcp.len), 1 byte
Packets: 1219 · Displayed: 1219 (100.0%) · Lo...
Profile: Default




From the above screenshots for the 4 Segments, we can infer the length of the segments

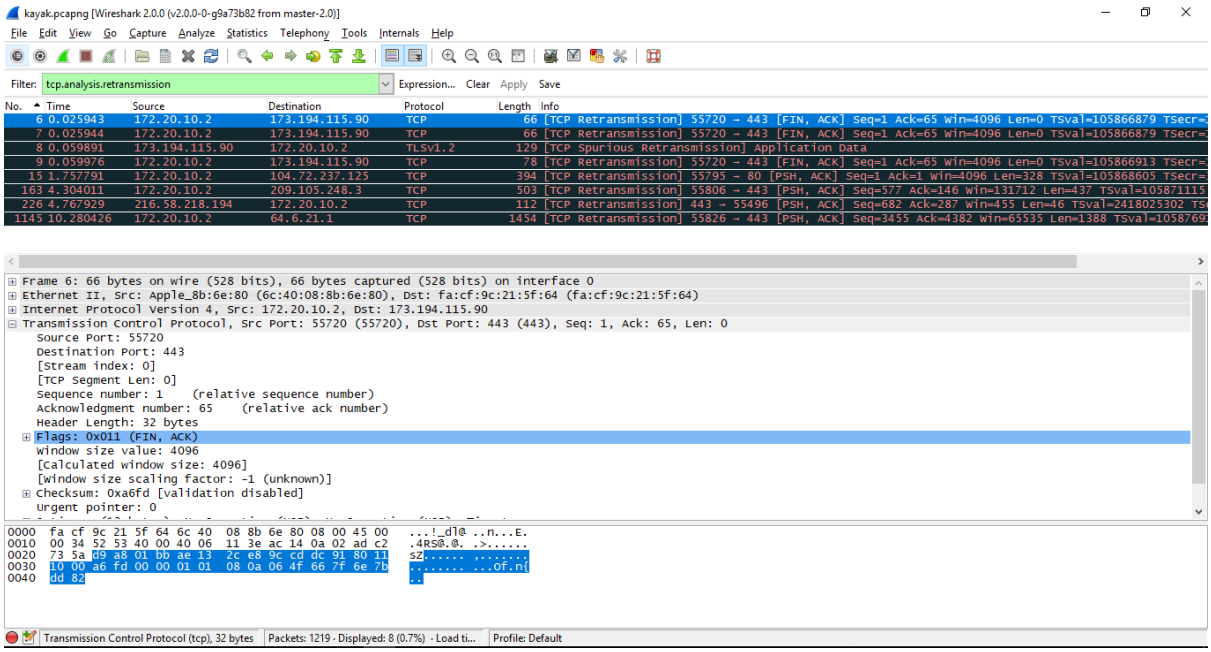
Length of Segment 1: 1388
Length of Segment 2: 135
Length of Segment 3: 9
Length of Segment 4: 1388

**4.** Minimum amount of available buffer space advertised at the receiver: 66

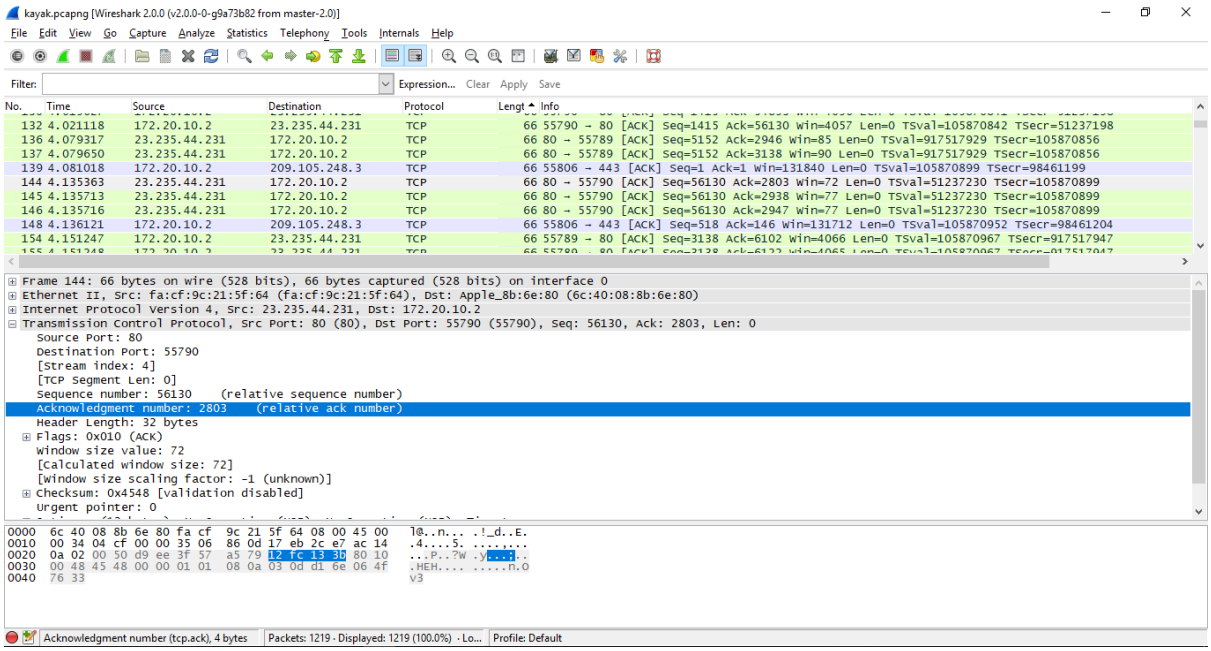


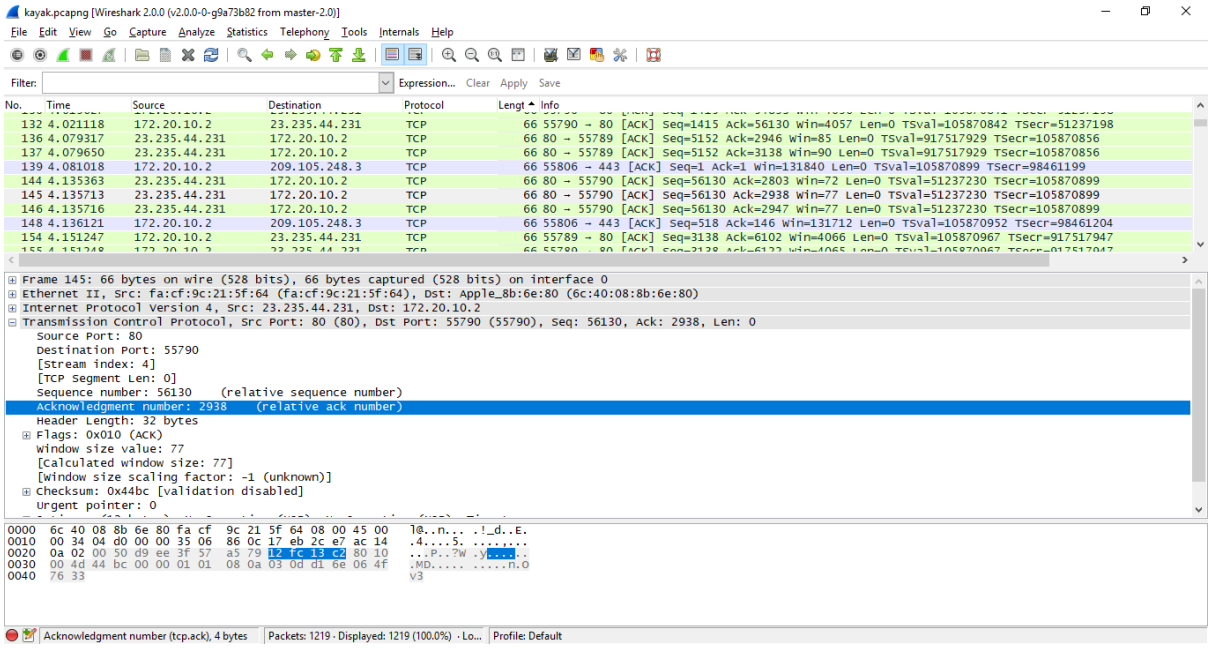

**5.** No, lack of the receiver buffer space doesn't throttle the sender.

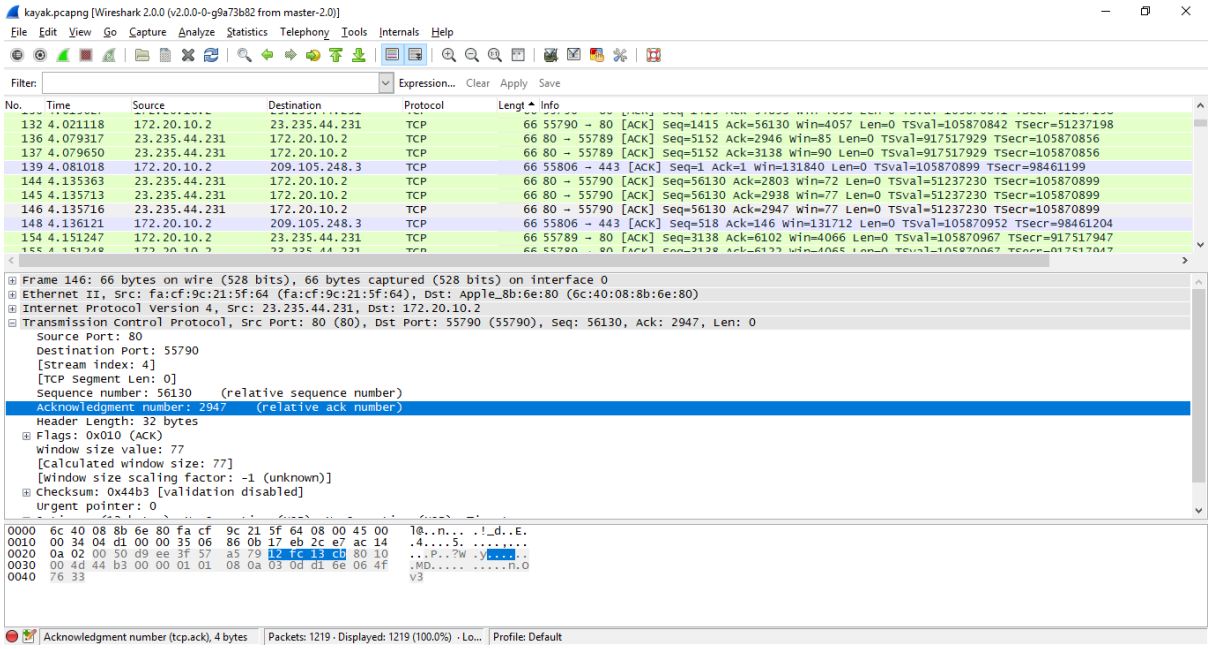
**6.** Yes, there are 8 retransmitted segments in the trace file. For checking the same, we can apply the filter “tcp.analysis.retransmission” as shown below in the screenshot.

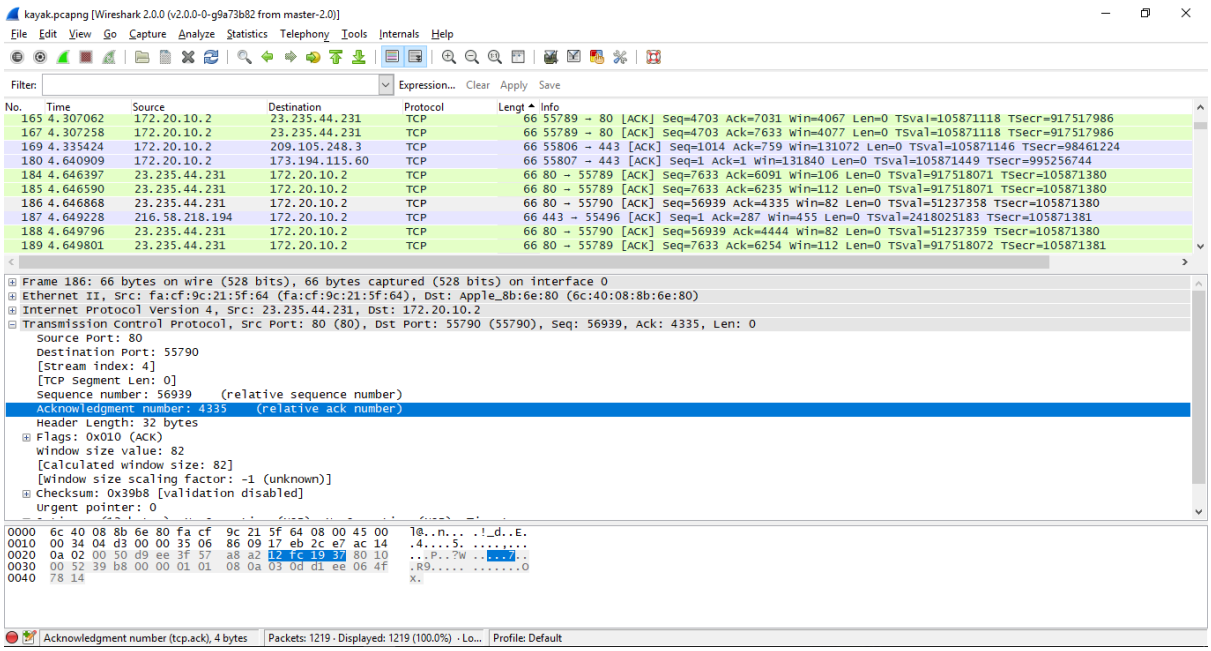



**7.** For each of the four packets, in order, the data that is acknowledged is: 0,135,9 and 1388. (Subtracting ACK field of 2nd packet from the ACK of the first packet)




kayak.pcapng [Wireshark 2.0.0 (v2.0.0-0-g9a73b82 from master-2.0)]
File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help
Filter: Expression... Clear Apply Save
No. Time Source Destination Protocol Lengt Info
132 4.021118 172.20.10.2 23.235.44.231 TCP 66 55790 → 80 [ACK] Seq=1415 Ack=56130 Win=4057 Len=0 TSval=105870842 TSecr=51237198
136 4.079317 23.235.44.231 172.20.10.2 TCP 66 80 → 55789 [ACK] Seq=5152 Ack=2946 Win=85 Len=0 TSval=917517929 TSecr=105870856
137 4.079650 23.235.44.231 172.20.10.2 TCP 66 80 → 55789 [ACK] Seq=5152 Ack=3138 Win=90 Len=0 TSval=917517929 TSecr=105870856
139 4.081018 172.20.10.2 209.105.248.3 TCP 66 55806 → 443 [ACK] Seq=1 Ack=1 Win=131840 Len=0 TSval=105870899 TSecr=98461199
144 4.135363 23.235.44.231 172.20.10.2 TCP 66 80 → 55790 [ACK] Seq=56130 Ack=2803 Win=72 Len=0 TSval=51237230 TSecr=105870899
145 4.135713 23.235.44.231 172.20.10.2 TCP 66 80 → 55790 [ACK] Seq=56130 Ack=2938 Win=77 Len=0 TSval=51237230 TSecr=105870899
146 4.135716 23.235.44.231 172.20.10.2 TCP 66 80 → 55790 [ACK] Seq=56130 Ack=2947 Win=77 Len=0 TSval=51237230 TSecr=105870899
148 4.136121 172.20.10.2 209.105.248.3 TCP 66 55806 → 443 [ACK] Seq=518 Ack=146 Win=131712 Len=0 TSval=105870952 TSecr=98461204
154 4.151247 172.20.10.2 23.235.44.231 TCP 66 55789 → 80 [ACK] Seq=3138 Ack=6102 Win=4066 Len=0 TSval=105870967 TSecr=917517947
Frame 145: 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, Dst: 172.20.10.2
Transmission Control Protocol, Src Port: 80 (80), Dst Port: 55790 (55790), Seq: 56130, Ack: 2938, Len: 0
Source Port: 80
Destination Port: 55790
[Stream index: 4]
[TCP Segment Len: 0]
Sequence number: 56130 (relative sequence number)
Acknowledgment number: 2938 (relative ack number)
Header Length: 32 bytes
Flags: 0x010 (ACK)
Window size value: 77
[Calculated window size: 77]
[window size scaling factor: -1 (unknown)]
Checksum: 0x44bc [validation disabled]
Urgent pointer: 0
0000 6c 40 08 8b 6e 80 fa cf 9c 21 5f 64 08 00 45 00 l@..n.... .!_d..E.
0010 00 34 04 d0 00 00 35 06 86 0c 17 eb 2c e7 ac 14 .4....5. ....,...
0020 0a 02 00 50 d9 ee 3f 57 a5 79 b2 fc 13 c2 80 10 ...P..?W .y......
0030 00 4d 44 bc 00 00 01 01 08 0a 03 0d d1 6e 06 4f .MD..... .....n.O
0040 76 33 v3
Acknowledgment number (tcp.ack), 4 bytes
Packets: 1219 · Displayed: 1219 (100.0%) · Lo...
Profile: Default


kayak.pcapng [Wireshark 2.0.0 (v2.0.0-0-g9a73b82 from master-2.0)]
File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help
Filter: Expression... Clear Apply Save
No. Time Source Destination Protocol Lengt Info
132 4.021118 172.20.10.2 23.235.44.231 TCP 66 55790 → 80 [ACK] Seq=1415 Ack=56130 Win=4057 Len=0 TSval=105870842 TSecr=51237198
136 4.079317 23.235.44.231 172.20.10.2 TCP 66 80 → 55789 [ACK] Seq=5152 Ack=2946 Win=85 Len=0 TSval=917517929 TSecr=105870856
137 4.079650 23.235.44.231 172.20.10.2 TCP 66 80 → 55789 [ACK] Seq=5152 Ack=3138 Win=90 Len=0 TSval=917517929 TSecr=105870856
139 4.081018 172.20.10.2 209.105.248.3 TCP 66 55806 → 443 [ACK] Seq=1 Ack=1 Win=131840 Len=0 TSval=105870899 TSecr=98461199
144 4.135363 23.235.44.231 172.20.10.2 TCP 66 80 → 55790 [ACK] Seq=56130 Ack=2803 Win=72 Len=0 TSval=51237230 TSecr=105870899
145 4.135713 23.235.44.231 172.20.10.2 TCP 66 80 → 55790 [ACK] Seq=56130 Ack=2938 Win=77 Len=0 TSval=51237230 TSecr=105870899
146 4.135716 23.235.44.231 172.20.10.2 TCP 66 80 → 55790 [ACK] Seq=56130 Ack=2947 Win=77 Len=0 TSval=51237230 TSecr=105870899
148 4.136121 172.20.10.2 209.105.248.3 TCP 66 55806 → 443 [ACK] Seq=518 Ack=146 Win=131712 Len=0 TSval=105870952 TSecr=98461204
154 4.151247 172.20.10.2 23.235.44.231 TCP 66 55789 → 80 [ACK] Seq=3138 Ack=6102 Win=4066 Len=0 TSval=105870967 TSecr=917517947
Frame 146: 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, Dst: 172.20.10.2
Transmission Control Protocol, Src Port: 80 (80), Dst Port: 55790 (55790), Seq: 56130, Ack: 2947, Len: 0
Source Port: 80
Destination Port: 55790
[Stream index: 4]
[TCP Segment Len: 0]
Sequence number: 56130 (relative sequence number)
Acknowledgment number: 2947 (relative ack number)
Header Length: 32 bytes
Flags: 0x010 (ACK)
Window size value: 77
[Calculated window size: 77]
[window size scaling factor: -1 (unknown)]
Checksum: 0x44b3 [validation disabled]
Urgent pointer: 0
0000 6c 40 08 8b 6e 80 fa cf 9c 21 5f 64 08 00 45 00 l@..n.... .!_d..E.
0010 00 34 04 d1 00 00 35 06 86 0b 17 eb 2c e7 ac 14 .4....5. ....,...
0020 0a 02 00 50 d9 ee 3f 57 a5 79 b2 fc 13 c3 80 10 ...P..?W .y......
0030 00 4d 44 b3 00 00 01 01 08 0a 03 0d d1 6e 06 4f .MD..... .....n.O
0040 76 33 v3
Acknowledgment number (tcp.ack), 4 bytes
Packets: 1219 · Displayed: 1219 (100.0%) · Lo...
Profile: Default




**8.** Throughput = (Amount of Data Transmitted/Time Incurred)

= (2920) / (0.565366)

= 5,164.795 Kb/sec

**9.** Amount of Data Transmitted can be calculated by subtracting sequence number of the first byte being sent (Packet 140) from the ACK of the last packet (Packet 186)

i.e. 4335 - 1415= 2920.

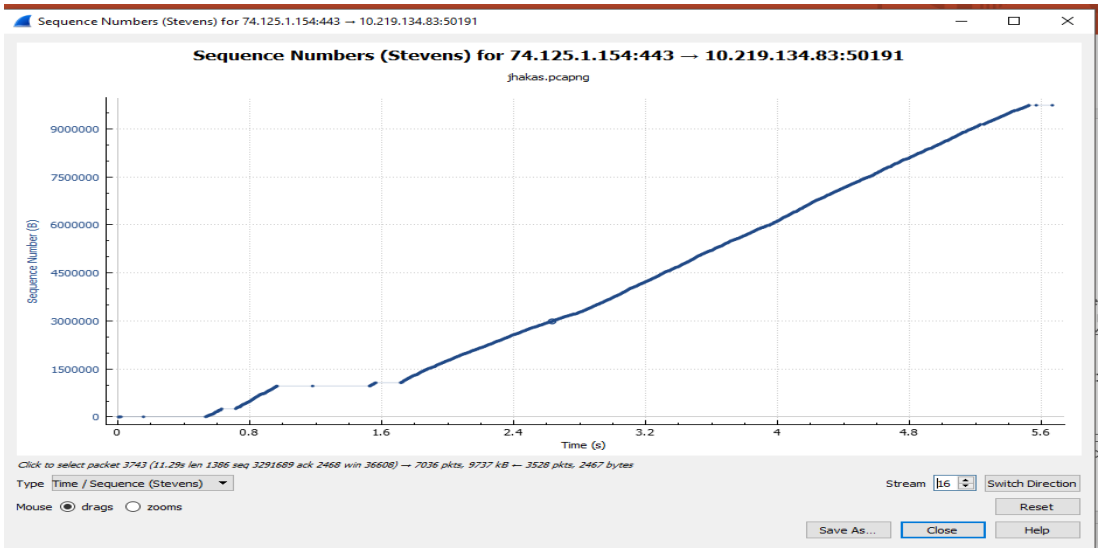
Time Incurred can be calculated by subtracting the time of the first byte that was sent from the time of the last acknowledgement.

i.e. 4.646868 - 4.081502= 0.565366

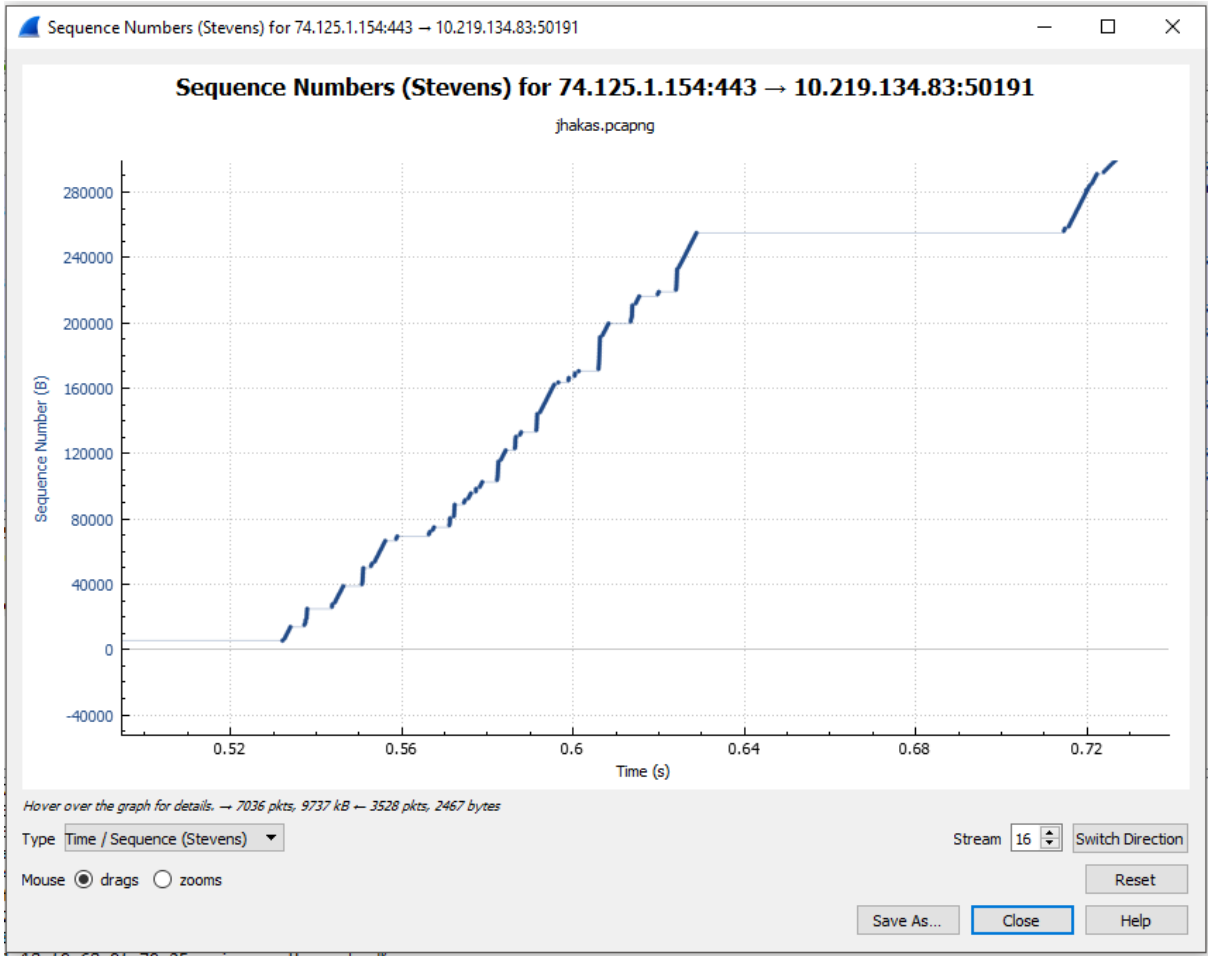
## Section 4: TCP congestion control in action

## Problem Set 4:

**1.** Slow Start is 0.01 to 0.075



2. Congestion avoidance is 0.523




3. Comments on the ways in which the measured data differs from the idealized behavior of TCP that we've studied in the text can be stated as the idealized behavior of TCP depicts that it is one of the best protocol that can handle internet application using congestion control and slow start mechanism. A huge traffic in the network can congest the network and hence TCP should follow some algorithms like AIDM. This technique is applied so as to drop the size of the window and avoid congestion. There can be various problems like retransmission, time delay or loss mostly based on the application to implement it. Slow start also delays the of application start in some cases.