

CSCE 5580 COMPUTER NETWORKING

Lab Wireshark TCP

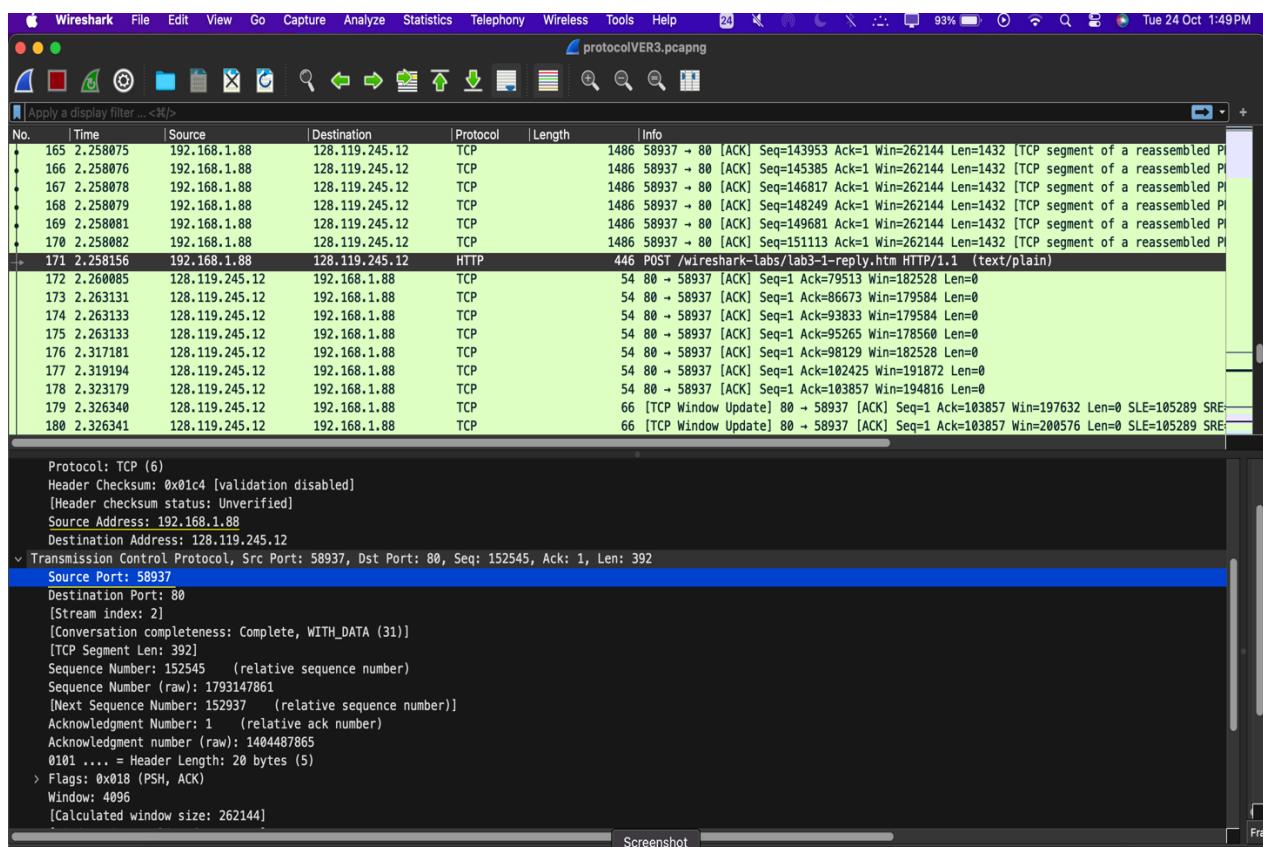
Ganesh Gundekarla

11700551

Question 01

IP address of the source is (aka the client one) : **Source Address: 192.168.1.88**

TCP source port of the client computer is : **Source Port: 58937**



Question : 2

Destination Address: **128.119.245.12**

Destination Port: **80**

No.	Time	Source	Destination	Protocol	Length	Info
165	2.258075	192.168.1.88	128.119.245.12	TCP	1486	58937 → 80 [ACK] Seq=143953 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled P
166	2.258076	192.168.1.88	128.119.245.12	TCP	1486	58937 → 80 [ACK] Seq=145385 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled P
167	2.258078	192.168.1.88	128.119.245.12	TCP	1486	58937 → 80 [ACK] Seq=146817 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled P
168	2.258079	192.168.1.88	128.119.245.12	TCP	1486	58937 → 80 [ACK] Seq=148249 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled P
169	2.258081	192.168.1.88	128.119.245.12	TCP	1486	58937 → 80 [ACK] Seq=149681 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled P
170	2.258082	192.168.1.88	128.119.245.12	TCP	1486	58937 → 80 [ACK] Seq=151113 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled P
171	2.258156	192.168.1.88	128.119.245.12	HTTP	446	POST /wireshark-labs/lab3-1-reply.htm HTTP/1.1 (text/plain)
172	2.260085	128.119.245.12	192.168.1.88	TCP	54	80 → 58937 [ACK] Seq=1 Ack=79513 Win=182528 Len=0
173	2.263131	128.119.245.12	192.168.1.88	TCP	54	80 → 58937 [ACK] Seq=1 Ack=86673 Win=179584 Len=0
174	2.263133	128.119.245.12	192.168.1.88	TCP	54	80 → 58937 [ACK] Seq=1 Ack=93833 Win=179584 Len=0
175	2.263133	128.119.245.12	192.168.1.88	TCP	54	80 → 58937 [ACK] Seq=1 Ack=95265 Win=178560 Len=0
176	2.317181	128.119.245.12	192.168.1.88	TCP	54	80 → 58937 [ACK] Seq=1 Ack=98129 Win=182528 Len=0
177	2.319194	128.119.245.12	192.168.1.88	TCP	54	80 → 58937 [ACK] Seq=1 Ack=102425 Win=191872 Len=0
178	2.323179	128.119.245.12	192.168.1.88	TCP	54	80 → 58937 [ACK] Seq=1 Ack=103857 Win=194816 Len=0
179	2.326340	128.119.245.12	192.168.1.88	TCP	66	[TCP Window Update] 80 → 58937 [ACK] Seq=1 Ack=103857 Win=197632 Len=0 SLE=105289 SRE=
180	2.326341	128.119.245.12	192.168.1.88	TCP	66	[TCP Window Update] 80 → 58937 [ACK] Seq=1 Ack=103857 Win=200576 Len=0 SLE=105289 SRE=

Protocol: TCP (6)
Header Checksum: 0x01c4 [validation disabled]
[Header checksum status: Unverified]
Source Address: 192.168.1.88
Destination Address: 128.119.245.12
▼ Transmission Control Protocol, Src Port: 58937, Dst Port: 80, Seq: 152545, Ack: 1, Len: 392
Source Port: 58937
Destination Port: 80
[Stream index: 2]
[Conversation completeness: Complete, WITH_DATA (31)]
[TCP Segment Len: 392]
Sequence Number: 152545 (relative sequence number)
Sequence Number (raw): 1793147861
[Next Sequence Number: 152937 (relative sequence number)]
Acknowledgment Number: 1 (relative ack number)
Acknowledgment number (raw): 1404487865
0101 = Header Length: 20 bytes (5)
> Flags: 0x018 (PSH, ACK)
Window: 4096
[Calculated window size: 262144]

Question : 3

I was able to create my own trace and solutions for all questions

My IP address source is : Source Address: 192.168.1.88

sending on port no : Source Port: 58937

Destination address : Destination Address: 128.119.245.12

Receiver side port no : Destination Port: 80

No.	Time	Source	Destination	Protocol	Length	Info
165	2.258075	192.168.1.88	128.119.245.12	TCP	1486	58937 → 80 [ACK] Seq=143953 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled P
166	2.258076	192.168.1.88	128.119.245.12	TCP	1486	58937 → 80 [ACK] Seq=145385 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled P
167	2.258078	192.168.1.88	128.119.245.12	TCP	1486	58937 → 80 [ACK] Seq=146817 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled P
168	2.258079	192.168.1.88	128.119.245.12	TCP	1486	58937 → 80 [ACK] Seq=148249 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled P
169	2.258081	192.168.1.88	128.119.245.12	TCP	1486	58937 → 80 [ACK] Seq=149681 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled P
170	2.258082	192.168.1.88	128.119.245.12	TCP	1486	58937 → 80 [ACK] Seq=151113 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled P
171	2.258156	192.168.1.88	128.119.245.12	HTTP	446	POST /wireshark-labs/lab3-1-reply.htm HTTP/1.1 (text/plain)
172	2.260085	128.119.245.12	192.168.1.88	TCP	54	80 → 58937 [ACK] Seq=1 Ack=79513 Win=182528 Len=0
173	2.263131	128.119.245.12	192.168.1.88	TCP	54	80 → 58937 [ACK] Seq=1 Ack=86673 Win=179584 Len=0
174	2.263133	128.119.245.12	192.168.1.88	TCP	54	80 → 58937 [ACK] Seq=1 Ack=93833 Win=179584 Len=0
175	2.263133	128.119.245.12	192.168.1.88	TCP	54	80 → 58937 [ACK] Seq=1 Ack=95265 Win=178560 Len=0
176	2.317181	128.119.245.12	192.168.1.88	TCP	54	80 → 58937 [ACK] Seq=1 Ack=98129 Win=182528 Len=0
177	2.319194	128.119.245.12	192.168.1.88	TCP	54	80 → 58937 [ACK] Seq=1 Ack=102425 Win=191872 Len=0
178	2.323179	128.119.245.12	192.168.1.88	TCP	54	80 → 58937 [ACK] Seq=1 Ack=103857 Win=194816 Len=0
179	2.326340	128.119.245.12	192.168.1.88	TCP	66	[TCP Window Update] 80 → 58937 [ACK] Seq=1 Ack=103857 Win=197632 Len=0 SLE=105289 SRE=
180	2.326341	128.119.245.12	192.168.1.88	TCP	66	[TCP Window Update] 80 → 58937 [ACK] Seq=1 Ack=103857 Win=200576 Len=0 SLE=105289 SRE=

Protocol: TCP (6)
Header Checksum: 0x01c4 [validation disabled]
[Header checksum status: Unverified]
Source Address: 192.168.1.88
Destination Address: 128.119.245.12
▼ Transmission Control Protocol, Src Port: 58937, Dst Port: 80, Seq: 152545, Ack: 1, Len: 392
Source Port: 58937
Destination Port: 80
[Stream index: 2]
[Conversation completeness: Complete, WITH_DATA (31)]
[TCP Segment Len: 392]
Sequence Number: 152545 (relative sequence number)
Sequence Number (raw): 1793147861
[Next Sequence Number: 152937 (relative sequence number)]
Acknowledgment Number: 1 (relative ack number)
Acknowledgment number (raw): 1404487865
0101 = Header Length: 20 bytes (5)
> Flags: 0x018 (PSH, ACK)
Window: 4096
[Calculated window size: 262144]

Screenshot

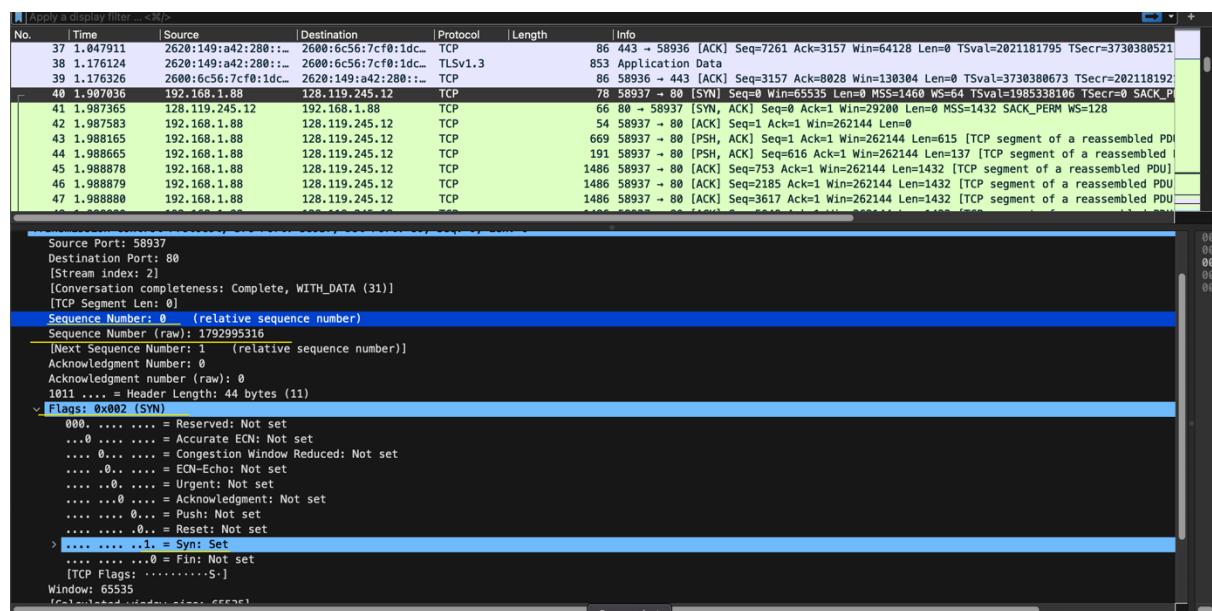
Question: 04

Here the frame num: 40 initiates the connection with the client computer and the gaia.cs.umass.edu , so that is set up with a seq number with 0

Sequence Number : 0 (relative sequence number) , Sequence Number (raw):

1792995316

Flags: 0x002 (SYN) identifies the segment as SYN segment and you can see in the below picture only the Syn: Set is turned on.



Question-5:

SynAck is arriving from port 80(destination) to client's computer.

1. Sequence Number(relative one) = 0 Sequence Number (raw): 1404487864
2. Acknowledgment Number: 1 (relative ack number), Acknowledgment number (raw): 1792995317
3. Basically determined by the [initial seq number +1]
4. Identified using the Flags
5. Flags: 0x012 (SYN, ACK) , this indicates that the flag is set to SYNACK and these are turned on in the flags section .
6. Acknowledgement : Set
7. Syn : Set

No.	Time	Source	Destination	Protocol	Length	Info
38	1.176124	2620:149:a42:280:..	2600:6c56:7cf0:1dc..	TLSv1.3	853	Application Data
39	1.176326	2600:6c56:7cf0:1dc..	2620:149:a42:280:..	TCP	86	58936 -> 443 [ACK] Seq=3157 Ack=8028 Win=130304 Len=0 TSval=3730380673 TSecr=202118192
40	1.987836	192.168.1.88	128.119.245.12	TCP	78	58937 -> 80 [SYN] Seq=0 Win=65535 Len=0 MSS=1460 WS=64 TSval=1985338106 TSecr=0 SACK_P
41	1.987365	128.119.245.12	192.168.1.88	TCP	66	80 -> 58937 [SYN, ACK] Seq=0 Ack=1 Win=29200 Len=0 MSS=1432 SACK_PERM WS=128
42	1.987583	192.168.1.88	128.119.245.12	TCP	54	58937 -> 80 [ACK] Seq=1 Ack=1 Win=262144 Len=0
43	1.988165	192.168.1.88	128.119.245.12	TCP	669	58937 -> 80 [PSH, ACK] Seq=1 Ack=1 Win=262144 Len=15 [TCP segment of a reassembled PDU]
44	1.988665	192.168.1.88	128.119.245.12	TCP	191	58937 -> 80 [PSH, ACK] Seq=616 Ack=1 Win=262144 Len=137 [TCP segment of a reassembled PDU]
45	1.988878	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=753 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
46	1.988879	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=2185 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
47	1.988880	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=3617 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
48	1.988880	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=5049 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
49	1.988881	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=6481 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
50	1.988882	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=7913 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
51	1.988882	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=9345 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
						1486 58937 -> 80 [ACK] Seq=9345 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]

Destination Port: 58937
[Stream index: 2]
[Conversation completeness: Complete, WITH_DATA (31)]
[TCP Segment Len: 0]
Sequence Number: 0 (relative sequence number)
Sequence Number (raw): 1404487864
[Next Sequence Number: 1 (relative sequence number)]
Acknowledgment Number: 1 (relative ack number)
Acknowledgment number (raw): 1792995317
1000 = Header Length: 32 bytes (8)
Flags: 0x012 (SYN, ACK)
000. = Reserved: Not set
....0. = Accurate ECN: Not set
....0. = Congestion Window Reduced: Not set
....0. = ECN-Echo: Not set
....0. = Urgent: Not set
....1.... = Acknowledgment: Set
....0... = Push: Not set
....0....0.... = Reset: Not set
>....0....1.... = Syn: Set
....0....0....0.... = Fin: Not set
[TCP Flags:A-S-]
Window: 29200

Question : 6

Sequence number of the TCP segment containing the HTTP Post command is

Sequence Number: 1 (relative sequence number); Sequence Number (raw): 1792995317

In the below screenshot we can see the “post” in its data field.

No.	Time	Source	Destination	Protocol	Length	Info
38	1.176124	2620:149:a42:280:..	2600:6c56:7cf0:1dc..	TLSv1.3	853	Application Data
39	1.176326	2600:6c56:7cf0:1dc..	2620:149:a42:280:..	TCP	86	58936 -> 443 [ACK] Seq=3157 Ack=8028 Win=130304 Len=0 TSval=3730380673 TSecr=202118192
40	1.987836	192.168.1.88	128.119.245.12	TCP	78	58937 -> 80 [SYN] Seq=0 Win=65535 Len=0 MSS=1460 WS=64 TSval=1985338106 TSecr=0 SACK_P
41	1.987365	128.119.245.12	192.168.1.88	TCP	66	80 -> 58937 [SYN, ACK] Seq=0 Ack=1 Win=29200 Len=0 MSS=1432 SACK_PERM WS=128
42	1.987583	192.168.1.88	128.119.245.12	TCP	54	58937 -> 80 [ACK] Seq=1 Ack=1 Win=262144 Len=0
43	1.988165	192.168.1.88	128.119.245.12	TCP	669	58937 -> 80 [PSH, ACK] Seq=1 Ack=1 Win=262144 Len=15 [TCP segment of a reassembled PDU]
44	1.988665	192.168.1.88	128.119.245.12	TCP	191	58937 -> 80 [PSH, ACK] Seq=616 Ack=1 Win=262144 Len=137 [TCP segment of a reassembled PDU]
45	1.988878	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=753 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
46	1.988879	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=2185 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
47	1.988880	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=3617 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
48	1.988880	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=5049 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
49	1.988881	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=6481 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
50	1.988882	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=7913 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
51	1.988882	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=9345 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
						1486 58937 -> 80 [ACK] Seq=9345 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]

Destination Port: 80
[Stream index: 2]
[Conversation completeness: Complete, WITH_DATA (31)]
[TCP Segment Len: 615]
Sequence Number: 1 (relative sequence number)
Sequence Number (raw): 1792995317
[Next Sequence Number: 616 (relative sequence number)]
Acknowledgment Number: 1 (relative ack number)
Acknowledgment number (raw): 1404487865
0101 = Header Length: 20 bytes (5)
Flags: 0x018 (PSH, ACK)
000. = Reserved: Not set
....0. = Accurate ECN: Not set
....0. = Congestion Window Reduced: Not set
....0. = ECN-Echo: Not set
....0. = Urgent: Not set
....1.... = Acknowledgment: Set
....0... = Push: Set
....0....0.... = Reset: Not set
....0....0.... = Syn: Not set
....0....0.... = Fin: Not set
[TCP Flags:AP...]

0020 f5 0c e6 39 00 50 6a de ef f5 p3 b6 c8 b9 50 18 ...-9 Pj...-S...P-
0030 10 00 7b 13 00 50 4f 53 54 20 2f 77 69 72 65 ...{... PO ST /wire
0040 73 68 61 72 6b 2d 61 62 73 2f 61 62 33 2d shark-lab0s/lab3-
0050 32 d7 72 65 70 6c 71 62 68 74 6d 20 48 54 54 50 1-reply.htm HTTP
0060 2f 31 2e 0d 0a 48 61 73 74 3a 20 68 74 70 3d 2f 67 61 1.1. no site.gala
0070 2e 63 73 69 66 3a 20 68 74 70 3d 2f 67 61 69 61 .cs.umas.s.edu-0
0080 72 69 67 69 66 3a 20 68 74 70 3d 2f 67 61 rigin: http://ga
0090 69 61 2e 63 73 75 6d 71 63 72 2d 65 64 75 80 0a 4f ia.cs.ums.ass.edu-
0100 09 43 6f 66 63 74 66 6e 74 20 67 65 3d 60 6d Content-type: m
0110 75 64 34 69 74 66 6e 74 20 67 65 3d 60 6d ultilite/1.0 form-da
0120 24 61 3b 20 62 65 75 6c 64 61 72 79 3d 2d 2d 64 1.1. boun da
0130 2d 57 65 62 68 69 74 46 67 62 64 6f 75 66 64 WebKit/53.1.1.0
0140 61 72 79 6b 53 33 38 76 67 5a 6a 63 34 53 32 41 aryS38V gZj4c52A
0150 4f 42 46 0d 0a 41 63 63 65 78 74 2d 45 6e 63 6f OBF-Acc-ept-Enco
0160 64 69 66 57 3a 20 67 7a 69 78 2c 20 64 65 66 6c ding: gz ip, defl
0170 61 74 65 0d 0a 43 6f 6e 66 63 74 69 6f 6e 3a ate: Con nection:
0180 6d 6c 3b 2d 5d 3d 3e 39 2c 2a 2b 3b 71 3d 30 m; q=0.9, */*; q=0 keep-alive: Upg
0190 2d 6b 65 65 70 2d 61 6c 69 76 65 0d 0a 55 70 67 rade-Ins ecure-Re
0200 4d 6f 65 66 6c 61 2f 35 2e 20 28 4d 61 63 65 70 quest: 1.-Accp
0210 29 66 74 6f 73 68 3b 20 49 6e 74 65 6c 20 4d 61 intosh: Intel Ma
0220 28 4f 53 20 58 20 31 30 5f 31 35 5f 37 29 20 c 05 X 1 0_15_7)

Question : 7

The first ACK sent by the server to the client computer is in frame no 41

The 'maximum segment size' in the first ACK by the "server" is 1432 bytes.

No.	Time	Source	Destination	Protocol	Length	Info
38	1.176124	2620:149:a42:280:..	2600:6c56:7cf0:1dc..	TLSv1.3	853	Application Data
39	1.176326	2600:6c56:7cf0:1dc..	2620:149:a42:280:..	TCP	86	58936 -> 443 [ACK] Seq=3157 Ack=8028 Win=130304 Len=0 TSval=3730380673 TSecr=202118192
40	1.987836	192.168.1.88	128.119.245.12	TCP	78	58937 -> 80 [SYN] Seq=0 Win=65535 Len=0 MSS=1460 WS=64 TSval=1985338106 TSecr=0 SACK_P
41	1.987365	128.119.245.12	192.168.1.88	TCP	66	80 -> 58937 [SYN, ACK] Seq=0 Ack=1 Win=29280 Len=0 MSS=1432 SACK_PERM WS=128
42	1.987583	192.168.1.88	128.119.245.12	TCP	54	58937 -> 80 [ACK] Seq=1 Ack=1 Win=262144 Len=0
43	1.988165	192.168.1.88	128.119.245.12	TCP	669	58937 -> 80 [PSH, ACK] Seq=1 Ack=1 Win=262144 Len=615 [TCP segment of a reassembled PDU]
44	1.988665	192.168.1.88	128.119.245.12	TCP	191	58937 -> 80 [PSH, ACK] Seq=616 Ack=1 Win=262144 Len=137 [TCP segment of a reassembled PDU]
45	1.988878	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=753 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
46	1.988879	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=2185 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
47	1.988880	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=3617 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
48	1.988880	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=5049 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
49	1.988881	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=6481 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
50	1.988882	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=7913 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
51	1.988882	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=9345 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]

Question : 8

Frame no 41

Round trip time for the ACK received by the server is

[The RTT to ACK the segment was: 0.080329000 seconds]						
No.	Time	Source	Destination	Protocol	Length	Info
38	1.176124	2620:149:a42:280:..	2600:6c56:7cf0:1dc..	TLSv1.3	853	Application Data
39	1.176326	2600:6c56:7cf0:1dc..	2620:149:a42:280:..	TCP	86	58936 -> 443 [ACK] Seq=3157 Ack=8028 Win=130304 Len=0 TSval=3730380673 TSecr=202118192
40	1.987836	192.168.1.88	128.119.245.12	TCP	78	58937 -> 80 [SYN] Seq=0 Win=65535 Len=0 MSS=1460 WS=64 TSval=1985338106 TSecr=0 SACK_P
41	1.987365	128.119.245.12	192.168.1.88	TCP	66	80 -> 58937 [SYN, ACK] Seq=0 Ack=1 Win=29280 Len=0 MSS=1432 SACK_PERM WS=128
42	1.987583	192.168.1.88	128.119.245.12	TCP	54	58937 -> 80 [ACK] Seq=1 Ack=1 Win=262144 Len=0
43	1.988165	192.168.1.88	128.119.245.12	TCP	669	58937 -> 80 [PSH, ACK] Seq=1 Ack=1 Win=262144 Len=615 [TCP segment of a reassembled PDU]
44	1.988665	192.168.1.88	128.119.245.12	TCP	191	58937 -> 80 [PSH, ACK] Seq=616 Ack=1 Win=262144 Len=137 [TCP segment of a reassembled PDU]
45	1.988878	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=753 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
46	1.988879	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=2185 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
47	1.988880	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=3617 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
48	1.988880	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=5049 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
49	1.988881	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=6481 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
50	1.988882	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=7913 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
51	1.988882	192.168.1.88	128.119.245.12	TCP	1486	58937 -> 80 [ACK] Seq=9345 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]

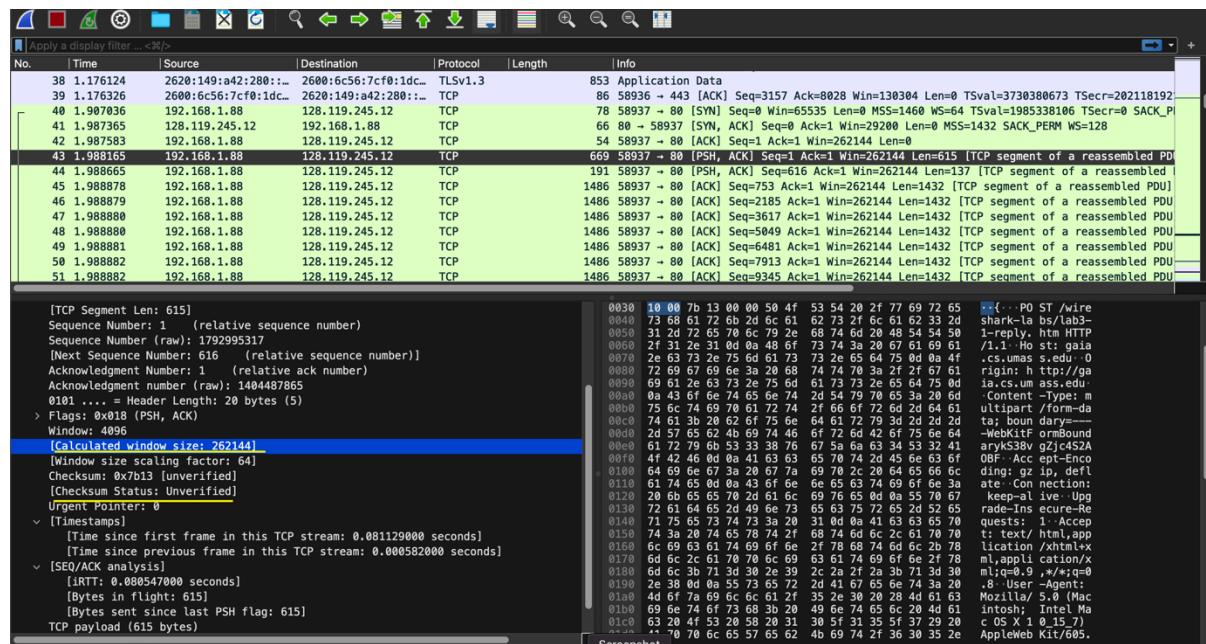
[Conversation completeness: Complete, WITH_DATA (31)]
[TCP Segment Len: 0]
Sequence Number: 0 (relative sequence number)
Sequence Number (raw): 1404487864
[Next Sequence Number: 1 (relative sequence number)]
Acknowledgment Number: 1 (relative ack number)
Acknowledgment number (raw): 1792995317
1000 = Header Length: 32 bytes (8)
Flags: 0x012 (SYN, ACK)
Window: 29280
[Calculated window size: 29280]
Checksum: 0x67bb [unverified]
[Checksum Status: Unverified]
Urgent Pointer: 0
Options: [12 bytes], Maximum segment size, No-Operation (NOP), No-Operation (NOP), [Timestamps]
[Time since first frame in this TCP stream: 0.080329000 seconds]
[Time since previous frame in this TCP stream: 0.080329000 seconds]
▼ [SEQ/ACK analysis]
[This is an ACK to the segment in frame: 40]
[The RTT to ACK the segment was: 0.080329000 seconds]
[RTT: 0.080547000 seconds]

Question : 9

Frame no 43 is the first packet that is being sent here in my case reason is that we see the PSH in the info and the data field contains POST and since the packets(http) are carried over tcp .

[Calculated window size: 262144]

[Checksum Status: Unverified]



Question 10 :

Yes , in many frames we can see the push flag that is being set to 1 .

Significance of PUSH flag:

- Enables for more efficient data transfer and a much more efficient communication.
- It is highly required for the applications that require real time data delivery or a connection that deals with the low-latency communication.
- The general aim behind the push flag is that it is used to tell the sender is sending the data receiver without any further ado and there will be no buffer filling in this scenario.
- This flag means that the data is directly ‘pushed’ to the received one’s application layer immediately.

- There could be two case where we could consider here
- First case : Whether the first HTTP first packet push flag is set here
- Second case : Any random HTTP packet’s push flag is set or not

First case :

No.	Time	Source	Destination	Protocol	Length	Info
36	1.024333	2600:6c56:7cf0:1dc...	2620:149:a42:280:..	TLSV1.3	768	Application Data, Application Data
37	1.047911	2620:149:a42:280:..	2600:6c56:7cf0:1dc...	TCP	86	443 - 58932 [ACK] Seq=7261 Ack=3157 Win=64128 Len=0 TSval=2021181795 TSecr=3730380521
38	1.176124	2620:149:a42:280:..	2600:6c56:7cf0:1dc...	TLSV1.3	853	Application Data
39	1.176326	2600:6c56:7cf0:1dc...	2620:149:a42:280:..	TCP	86	58932 - 443 [ACK] Seq=3157 Ack=8028 Win=130304 Len=0 TSval=3730380673 TSecr=202118192
40	1.987836	192.168.1.88	128.119.245.12	TCP	78	58937 - 88 [SYN] Seq=0 Win=65535 Len=0 MSS=1460 WS=64 TSval=1985338106 TSecr=0 SACK_P
41	1.987365	128.119.245.12	192.168.1.88	TCP	66	88 - 58937 [SYN, ACK] Seq=0 Ack=1 Win=29200 Len=0 MSS=1432 SACK_PERM WS=128
42	1.987583	192.168.1.88	128.119.245.12	TCP	54	58937 - 88 [ACK] Seq=1 Ack=1 Win=262144 Len=0
43	1.988165	192.168.1.88	128.119.245.12	TCP	669	58937 - 88 [PSH, ACK] Seq=1 Ack=1 Win=262144 Len=615 [TCP segment of a reassembled PDU]
44	1.988665	192.168.1.88	128.119.245.12	TCP	191	58937 - 88 [PSH, ACK] Seq=616 Ack=1 Win=262144 Len=137 [TCP segment of a reassembled PDU]
45	1.988878	192.168.1.88	128.119.245.12	TCP	1486	58937 - 88 [ACK] Seq=753 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
46	1.988879	192.168.1.88	128.119.245.12	TCP	1486	58937 - 88 [ACK] Seq=2185 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
47	1.988880	192.168.1.88	128.119.245.12	TCP	1486	58937 - 88 [ACK] Seq=3617 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
48	1.988880	192.168.1.88	128.119.245.12	TCP	1486	58937 - 88 [ACK] Seq=5049 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
49	1.988881	192.168.1.88	128.119.245.12	TCP	1486	58937 - 88 [ACK] Seq=6481 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]

Sequence Number (raw): 1792995317
[Next Sequence Number: 616 (relative sequence number)]
Acknowledgment Number: 1 (relative ack number)
Acknowledgment number (raw): 1404487865
0101 = Header Length: 20 bytes (5)
Flags: 0x018 (PSH, ACK)
000.... = Reserved: Not set
00.... = Accurate ECN: Not set
0.... = Congestion Window Reduced: Not set
0.... = Urgent: Not set
0.... = Acknowledgment: Set
.....1.... = Push: Set
.....0.... = Reset: Not set
.....0.... = Syn: Not set
.....0.... = Fin: Not set
[TCP Flags:AP...]
Window: 4096
[Calculated window size: 262144]
[Window size scaling factor: 64]
Checksum: 0x7b13 [unverified]
[Checksum Status: Unverified]

```

0020 f5 0c e6 39 00 50 6a d0 ef f5 53 b6 c8 b9 50 18 ...9 Pj .S ..P.  

0030 10 00 3a 53 00 6f 64 68 65 72 20 6c 74 74 ...S ot her litt  

0040 64 65 20 63 68 69 6c 64 72 65 6e 20 61 6e 64 le child ren, and  

0050 20 6d 61 6b 65 20 54 44 45 49 52 26 65 79 65 73 make TH EIR eyes  

0060 20 62 61 6b 65 20 54 44 45 49 52 26 65 79 65 73 bright and eage  

0070 72 0d 01 77 69 74 68 20 61 28 73 r-with many a's  

0080 74 72 61 6b 65 20 54 44 45 49 52 26 65 79 65 73 rrange tale, per  

0090 66 61 70 63 74 69 6c 64 72 65 6e 20 61 6e 64 haps eve n with t  

0100 68 65 20 64 72 61 6b 65 20 61 6e 64 72 65 6e 64 he dream of Won  

0110 68 65 20 64 72 61 6b 65 20 61 6e 64 72 65 6e 64 derland of long  

0120 60 70 66 65 20 64 6a 6f 79 73 2c 0d 02 72 65 6d 65 make TH EIR eyes  

0130 62 62 65 72 69 6a 6f 79 68 65 72 20 6f 77 6e 20  

0140 68 68 65 20 64 6a 6f 79 68 65 72 20 6f 77 6e 20  

0150 24 64 61 6b 65 20 61 6b 65 66 72 20 6f 77 6e 20  

0160 20 64 61 79 72 2e 0d 02 68 20 28 72 6f 77 6e 20 h all th eir sim  

0170 20 20 20 28 20 28 20 20 20 28 20 28 20 28 20 28 20  

0180 20 20 20 28 20 28 20 20 28 54 48 45 20 45 4e 44 0d 0a the happy summer  

0190 0d 0d 2d 2d 2d 2d 57 65 62 4b 69 74 46 6f days. . .  

01a0 72 6d 42 6f 75 6e 64 61 72 69 6b 53 33 38 76 67 T HE END.  

                                         ----- WebKitFo  

                                         rmBounda rykS38vg

```

Second case : *

No.	Time	Source	Destination	Protocol	Length	Info
168	2.258079	192.168.1.88	128.119.245.12	TCP	1486	58937 [ACK] Seq=148249 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
169	2.258081	192.168.1.88	128.119.245.12	TCP	1486	58937 - 88 [ACK] Seq=149681 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
170	2.258082	192.168.1.88	128.119.245.12	TCP	1486	58937 - 88 [ACK] Seq=151113 Ack=1 Win=262144 Len=1432 [TCP segment of a reassembled PDU]
171	2.258156	192.168.1.88	128.119.245.12	HTTP	446	POST /wireshark-labs/lab3-1-reply.htm HTTP/1.1 (text/plain)
172	2.260085	128.119.245.12	192.168.1.88	TCP	54	80 - 58937 [ACK] Seq=179513 Win=182528 Len=0
173	2.263131	128.119.245.12	192.168.1.88	TCP	54	80 - 58937 [ACK] Seq=1 Ack=86673 Win=17958 Len=0
174	2.263133	128.119.245.12	192.168.1.88	TCP	54	80 - 58937 [ACK] Seq=1 Ack=93833 Win=17958 Len=0
175	2.263133	128.119.245.12	192.168.1.88	TCP	54	80 - 58937 [ACK] Seq=1 Ack=95265 Win=17856 Len=0
176	2.317181	128.119.245.12	192.168.1.88	TCP	54	80 - 58937 [ACK] Seq=1 Ack=98129 Win=182528 Len=0
177	2.319194	128.119.245.12	192.168.1.88	TCP	54	80 - 58937 [ACK] Seq=1 Ack=102425 Win=191872 Len=0
178	2.323179	128.119.245.12	192.168.1.88	TCP	54	80 - 58937 [ACK] Seq=1 Ack=103857 Win=194816 Len=0
179	2.326340	128.119.245.12	192.168.1.88	TCP	66	[TCP Window Update] 80 - 58937 [ACK] Seq=1 Ack=103857 Win=197632 Len=0 SLE=105289 SRE=
180	2.326341	128.119.245.12	192.168.1.88	TCP	66	[TCP Window Update] 80 - 58937 [ACK] Seq=1 Ack=103857 Win=200576 Len=0 SLE=105289 SRE=
181	2.376341	128.119.245.12	192.168.1.88	TCP	66	[TCP Window Update] 80 - 58937 [ACK] Seq=1 Ack=103857 Win=203524 Len=0 SLE=105289 SRE=

Sequence Number (raw): 1793148761
[Next Sequence Number: 152937 (relative sequence number)]
Acknowledgment Number: 1 (relative ack number)
Acknowledgment number (raw): 1404487865
0101 = Header Length: 20 bytes (5)
Flags: 0x018 (PSH, ACK)
000.... = Reserved: Not set
00.... = Accurate ECN: Not set
0.... = Congestion Window Reduced: Not set
0.... = Urgent: Not set
0.... = Acknowledgment: Set
.....1.... = Push: Set
.....0.... = Reset: Not set
.....0.... = Syn: Not set
.....0.... = Fin: Not set
[TCP Flags:AP...]
Window: 4096
[Calculated window size: 262144]
[Window size scaling factor: 64]
Checksum: 0x3a53 [unverified]
[Checksum Status: Unverified]

```

0020 f5 0c e6 39 00 50 6a c1 43 d5 p3 b6 c8 b9 50 18 ...9 Pj .S ..P.  

0030 10 00 3a 53 00 6f 64 68 65 72 20 6c 74 74 ...S ot her litt  

0040 64 65 20 63 68 69 6c 64 72 65 6e 20 61 6e 64 le child ren, and  

0050 20 6d 61 6b 65 20 54 44 45 49 52 26 65 79 65 73 make TH EIR eyes  

0060 20 62 61 6b 65 20 54 44 45 49 52 26 65 79 65 73 bright and eage  

0070 72 0d 01 77 69 74 68 20 61 28 73 r-with many a's  

0080 74 72 61 6b 65 20 54 44 45 49 52 26 65 79 65 73 rrange tale, per  

0090 66 61 70 63 74 69 6c 64 72 65 6e 20 61 6e 64 haps eve n with t  

0100 68 65 20 64 72 61 6b 65 20 61 6e 64 72 65 6e 64 he dream of Won  

0110 68 65 20 64 72 61 6b 65 20 61 6e 64 72 65 6e 64 derland of long  

0120 60 70 66 65 20 64 6a 6f 79 73 2c 0d 02 72 65 6d 65 make TH EIR eyes  

0130 62 62 65 72 69 6a 6f 79 68 65 72 20 6f 77 6e 20  

0140 68 68 65 20 64 6a 6f 79 68 65 72 20 6f 77 6e 20  

0150 24 64 61 6b 65 20 61 6b 65 66 72 20 6f 77 6e 20  

0160 20 64 61 79 72 2e 0d 02 68 20 28 72 6f 77 6e 20 h all th eir sim  

0170 20 20 20 28 20 28 20 20 20 28 20 28 20 28 20 28 20  

0180 20 20 20 28 20 28 20 20 28 54 48 45 20 45 4e 44 0d 0a the happy summer  

0190 0d 0d 2d 2d 2d 2d 57 65 62 4b 69 74 46 6f days. . .  

01a0 72 6d 42 6f 75 6e 64 61 72 69 6b 53 33 38 76 67 T HE END.  

                                         ----- WebKitFo  

                                         rmBounda rykS38vg

```

Question : 11

Font face = "Arial, Helvetica, sans-serif" size="4"

Acknowledgment Number: 152937 (relative ack number)

Acknowledgment number (raw): 1793148253

Wireshark Screenshot showing a session between 128.119.245.12 and 192.168.1.88. The session includes several TCP segments, an ICMPv6 Neighbor Advertisement, and an HTTP response.

```

    No. | Time | Source | Destination | Protocol | Length | Info
    289 2.341369 128.119.245.12 192.168.1.88 TCP 66 [TCP Window Update] 80 - 58937 [ACK] Seq=1 Ack=103857 Win=282240 Len=0 SLE=105289 SRE=105289
    210 2.341370 128.119.245.12 192.168.1.88 TCP 66 [TCP Window Update] 80 - 58937 [ACK] Seq=1 Ack=103857 Win=285184 Len=0 SLE=105289 SRE=105289
    211 2.341371 128.119.245.12 192.168.1.88 TCP 66 [TCP Window Update] 80 - 58937 [ACK] Seq=1 Ack=103857 Win=285440 Len=0 SLE=105289 SRE=105289
    212 2.341372 128.119.245.12 192.168.1.88 TCP 66 [TCP Dup ACK 178#1] 80 - 58937 [ACK] Seq=1 Ack=103857 Win=285440 Len=0 SLE=105289 SRE=105289
    213 2.395659 2600:6c56:7cf0:1dc... 2600:4700::6812:12... TLSv1.2 149 Application Data
    214 2.409367 128.119.245.12 192.168.1.88 TCP 54 80 - 58937 [ACK] Seq=1 Ack=152937 Win=203392 Len=0
    215 2.409369 128.119.245.12 192.168.1.88 TCP 66 [TCP Window Update] 80 - 58937 [ACK] Seq=1 Ack=152937 Win=290944 Len=0 SLE=151505 SRE=151505
    216 2.411245 128.119.245.12 192.168.1.88 TCP 831 HTTP/1.1 200 OK (text/html)
    217 2.411374 192.168.1.88 128.119.245.12 TCP 54 58937 - 80 [ACK] Seq=152937 Ack=778 Win=261312 Len=0
    218 2.423249 2606:4700::6812:12... 2600:6c56:7cf0:1dc... TCP 86 443 - 58899 [ACK] Seq=1 Ack=64 Win=7 TSva=2715196439 TSecr=1141145096
    219 2.479545 2606:4700::6812:12... 2600:6c56:7cf0:1dc... TLSv1.2 145 Application Data
    220 2.479758 2600:6c56:7cf0:1dc... 2600:4700::6812:12... TCP 86 58899 - 443 [ACK] Seq=64 Ack=60 Win=2047 Len=0 TSval=1141145180 TSecr=2715196496
    221 3.225372 fe00::f2b:65ff:fe... 2600:6c56:7cf0:1dc... ICMPv6 86 Neighbor Solicitation for 2600:6c56:7cf0:1dc0:3c65:cba1:5277:ad5a from f0:7b:65:45:96
    222 3.225583 fe00::14ec:c192:88... fe00::f27b:65ff:fe... ICMPv6 78 Neighbor Advertisement 2600:6c56:7cf0:1dc0:3c65:cba1:5277:ad5a (sol)

[Next Sequence Number: 778 (relative sequence number)]
Acknowledgment Number: 152937 (relative ack number)
Acknowledgment number (raw): 1793148253
0101 .... = Header Length: 20 bytes (5)
> Flags: 0x018 (PSH, ACK)
Window: 2273
[Calculated window size: 290944]
[Window size scaling factor: 128]
Checksum: 0x0082 [unverified]
[Checksum Status: Unverified]
Urgent Pointer: 0
> [Timestamps]
> [Seq/ACK analysis]
TCP payload (777 bytes)
> Hypertext Transfer Protocol
> Line-based text data: text/html (11 lines)
<TITLE>Upload page for TCP Wireshark Lab</TITLE>\n<body bkgcolor="#FFFFFF">\n<p><font face="Arial, Helvetica, sans-serif" size="4"> Congratulations! <br> </font>\n</p>\n<p><font face="Arial, Helvetica, sans-serif"> You've now transferred a copy of ali\nvour computer to \n</font><font face="Arial, Helvetica, sans-serif"> You've now transferred a copy of ali\nvour computer to \n</font>\n</body>\n</html>

```

Selected packet details:

```

    0198 73 65 74 3d 55 54 46 3d 38 0d 0a 0d 0a 0a 3c 54 49 set=UTF-8-<TI
    01a0 61 64 20 70 61 67 65 20 TLE=>ulo ad page
    01b0 66 6f 72 20 54 43 50 20 57 69 72 65 73 68 61 72 for TCP, Wireshar
    01c0 20 4c 62 62 2f 2f 54 49 54 45 3e 0a 3c 62 k Lab=>TLE=>b
    01d0 6f 64 79 20 62 67 63 6f 66 6f 72 3d 22 23 46 46 ody bgco lsr="#FF
    01e0 46 46 46 22 23 0a 3c 70 3e 3c 6d 6f 66 74 28 FFFF-< p><font
    01f0 66 61 63 65 3d 22 41 73 69 6c 2c 28 45 6c face="Ar ja, Hel
    0200 76 65 74 3d 63 61 20 59 66 21 66 73 20 43 67 vertical sans-ser
    0210 69 67 22 23 24 24 59 66 30 22 23 24 66 73 21 28 3d
    0220 66 6f 72 61 74 75 6c 61 74 69 6f 66 73 21 28 3d
    0230 62 72 3e 20 3c 2f 6f 66 74 3e 0a 0a 0c 50 3e mgmt@10.1.1.1<
    0240 3c 66 6f 5e 74 20 66 61 63 65 3d 22 41 72 69 61 <font fa ces="Aria
    0250 6c 20 48 65 66 76 65 74 69 63 61 2c 20 73 61 l, Helv tica, sa
    0260 66 73 2d 73 65 72 69 66 22 3e 20 59 6f 75 27 76 ns-serif "> You've
    0270 65 28 6e 77 20 74 72 61 73 66 65 72 65 e now tr ansfere
    0280 68 26 61 28 63 6f 70 79 28 6f 66 26 61 6c 69 63 d a copy of alic
    0290 65 2e 74 78 74 20 66 73 61 6d 0a 79 64 75 28 e.txt f om your
    0300 61 26 69 73 26 75 6d 61 73 26 64 75 28 70 captivelan/api
    0310 61 26 69 73 26 75 6d 61 73 26 64 75 28 70 a.cs.umb.edu
    0320 59 6f 75 20 73 68 6f 75 6c 64 20 6e 6f 77 28 You sho uld now
    0330 73 74 6f 78 20 57 69 72 65 73 68 61 72 6b 28 70 stop Wireshark p
    0340 63 20 61 61 66 79 76 69 67 28 74 68 65 20 ackett ca pto. I
    0350 74 27 73 28 74 69 6d 65 20 74 6f 22 73 74 61 72 t's time to star
    0360 72 66 20 70 61 63 66 65 74 63 73 21 20 3c 2f 66 65 20 t analyzing the
    0370 63 61 70 74 75 72 65 64 20 57 69 72 65 73 68 61 captured Wiresha
    0380 72 66 20 70 61 63 66 65 74 63 73 21 20 3c 2f 66 65 20 rk packe ts! </fo
    0390 74 3e 0a 0a 0c 2f 46 47 52 4d 3e 0a 0a 0a nt>--</F ORM>...

```

Question 12

The signals sent between sender and receiver, FIN flag is the signals termination of a connection . It means the connection is being closed for the frame.

Wireshark Screenshot showing a session between 128.119.245.12 and 192.168.1.88. The session includes several TCP segments, an ICMPv6 Neighbor Advertisement, and a DNS query.

```

    No. | Time | Source | Destination | Protocol | Length | Info
    222 3.225583 fe00::14ec:c192:88... fe00::f27b:65ff:fe... ICMPv6 78 Neighbor Advertisement 2600:6c56:7cf0:1dc0:3c65:cba1:5277:ad5a (sol)
    223 3.408366 2606:4700::6812:12... 2600:6c56:7cf0:1dc... TCP 145 [TCP Spurious Retransmission] 443 - 58899 [PSH, ACK] Seq=1 Ack=64 Win=59 TSval=1141146109 TSecr=1141146109
    224 3.498584 2600:6c56:7cf0:1dc... 2606:4700::6812:12... TCP 98 [TCP Window Update] 58899 - 443 [ACK] Seq=64 Ack=60 Win=2048 Len=0 TSval=1141146109 TSecr=1141146109
    225 5.634795 Sagencom_45:96:12 Apple_49:a7:d4 ARP 52 192.168.1.1 is at f0:7b:65:45:96:12
    226 7.527503 128.119.245.12 192.168.1.88 TCP 54 80 - 58937 [FIN, ACK] Seq=778 Ack=152937 Win=290944 Len=0
    227 7.527642 192.168.1.88 128.119.245.12 TCP 54 58937 - 80 [ACK] Seq=152937 Ack=779 Win=262144 Len=0
    228 7.527793 192.168.1.88 128.119.245.12 TCP 54 58937 - 80 [FIN, ACK] Seq=779 Ack=152937 Ack=779 Win=262144 Len=0
    229 7.666576 128.119.245.12 192.168.1.88 TCP 54 80 - 58937 [ACK] Seq=779 Ack=152938 Win=290944 Len=0
    230 9.322938 192.168.1.88 208.6.87.3 UDPENCAP 43 NAT-keepalive
    231 10.455357 192.168.1.88 224.0.0.251 MDNS 397 Standard query 0x0000 PTR lb._dns-sd._udp.local, "QM" question PTR _airport._tcp.local
    232 10.455486 fe00::14ec:c192:88... ff02::fb MDNS 417 Standard query 0x0000 PTR lb._dns-sd._udp.local, "QM" question PTR _airport._tcp.local

[Conversation completeness: Complete, WITH_DATA (31)]
[TCP Segment Len: 0]
Sequence Number: 152937 (relative sequence number)
Sequence Number (raw): 1793148253
[Next Sequence Number: 152938 (relative sequence number)]
Acknowledgment Number: 779 (relative ack number)
Acknowledgment number (raw): 1404488643
0101 .... = Header Length: 20 bytes (5)
> Flags: 0x011 (FIN, ACK)
    000. .... = Reserved: Not set
    ...0. .... = Accurate ECN: Not set
    ...0. .... = Congestion Window Reduced: Not set
    ...0. .... = ECN-Echo: Not set
    ...0. .... = Urgent: Not set
    ...1 .... = Acknowledgment: Set
    ...0.. = Push: Not set
    ...0.. = Reset: Not set
    ...0.. = Syn: Not set
    ...1.. = Fin: Set
    > [TCP Flags: .....A-F]
    > [Expert Info (Note/Sequence): This frame undergoes the connection closing]
    Window: 4096
    [Calculated window size: 262144]
    [Window size scaling factor: 64]
    Checksum: 0xh20r [unverified]

```

Question : 13

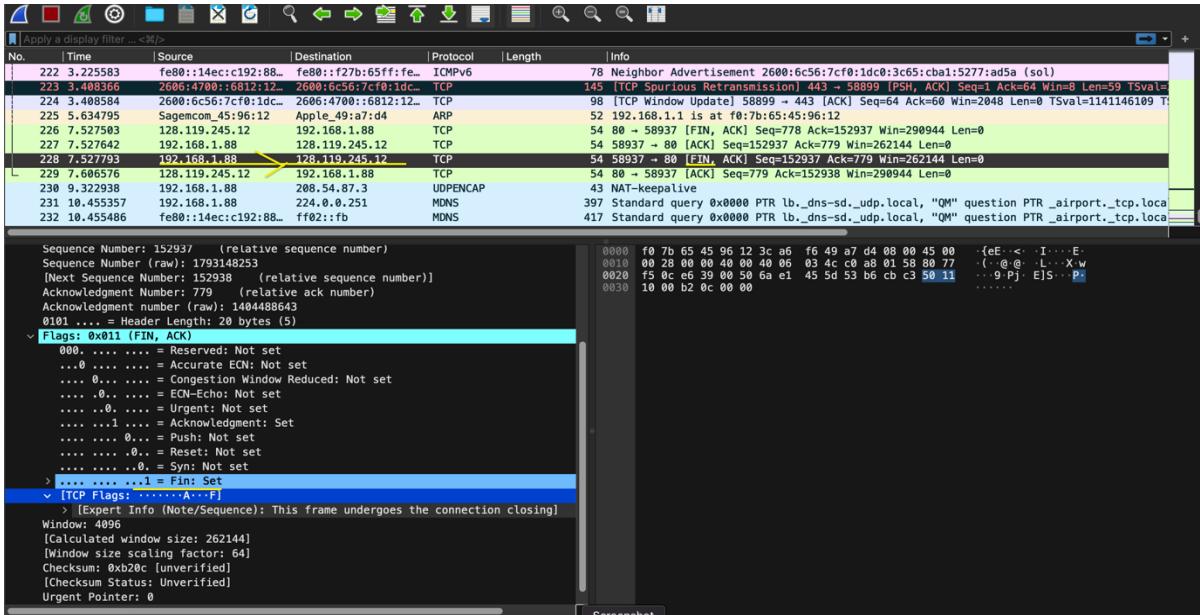
- Here , the Server(umass.edu). sent the started {FIN,ACK} packet
- Client has responded the connection closing from the server side
- Then , the client choose to send the [FIN,ACK] to the server
- Server responded it with an ACK.

So, server is the party that initiated the connection .

But , here the source server and the client can choose anytime to close the termination.

No.	Time	Source	Destination	Protocol	Length	Info
222	3.225583	fe80::14ec:c192:88...	fe80::f27b:65ff:fe...	ICMPv6	78	Neighbor Advertisement 2600:6c56:7cf0:1dc0:3c65:cba1:5277:ad5a (sol)
223	3.408566	2606:4700::6812:12...	2600:6c56:7cf0:1dc0:...	TCP	145	[TCP Spurious Retransmission] 443 → 58899 [PSH, ACK] Seq=1 Ack=64 Win=59 TStamp=1141145096
224	3.408584	2600:6c56:7cf0:1dc0:...	2606:4700::6812:12...	TCP	98	[TCP Window Update] 58899 → 443 [ACK] Seq=64 Ack=60 Win=2048 Len=0 TStamp=1141146109
225	5.634795	Sagemcom_45:96:12	Apple_49:a7:d4	ARP	52	192.168.1.1 is at f0:7b:65:45:96:12
226	7.527503	128.119.245.12	192.168.1.88	TCP	54	80 → 58937 [FIN, ACK] Seq=778 Ack=152937 Win=290944 Len=0
227	7.527642	192.168.1.88	128.119.245.12	TCP	54	58937 → 80 [ACK] Seq=152937 Ack=779 Win=262144 Len=0
228	7.527793	192.168.1.88	128.119.245.12	TCP	54	58937 → 80 [FIN, ACK] Seq=152937 Ack=779 Win=262144 Len=0
229	7.686576	128.119.245.12	192.168.1.88	TCP	54	80 → 58937 [ACK] Seq=779 Ack=152938 Win=290944 Len=0
230	9.322938	192.168.1.88	208.54.87.3	UDPENCAP	43	NAT-keepalive
231	10.455357	192.168.1.88	224.0.0.251	MDNS	397	Standard query 0x0000 PTR lb._dns-sd._udp.local, "QM" question PTR _airport._tcp.local
232	10.455486	fe80::14ec:c192:88...	ff02::fb	MDNS	417	Standard query 0x0000 PTR lb._dns-sd._udp.local, "QM" question PTR _airport._tcp.local

Sequence Number: 152937 (relative sequence number)
Sequence Number (raw): 1793148253
[Next Sequence Number: 152938 (relative sequence number)]
Acknowledgment Number: 779 (relative ack number)
Acknowledgment number (raw): 1404488643
0101 = Header Length: 28 bytes (5)
Flags: 0x011 (FIN, ACK)
000. = Reserved: Not set
....0 = Accurate ECN: Not set
....0.... = Congestion Window Reduced: Not set
....0.... = ECN-Echo: Not set
....0.... = Urgent: Not set
....1.... = Acknowledgment: Set
....0... = Push: Not set
....0... = Reset: Not set
....0... = Syn: Not set
>0....1 = Fin: Set
[TCP Flags:A....F]
> [Expert Info (Note/Sequence): This frame undergoes the connection closing]
Window: 4096
[Calculated window size: 262144]
[Window size scaling factor: 64]
Checksum: 0xb20c [unverified]
[Checksum Status: Unverified]
Urgent Pointer: 0



Question: 14

Here, I considered the ultimate last one, the one where tcp connection terminated ack is being transmitted.

Acknowledgment Number: 152938 (relative ack number)

Acknowledgment number (raw): 1793148254

