5️⃣

Bikash_Sah_002010501018_Computer Networks Lab Report_5

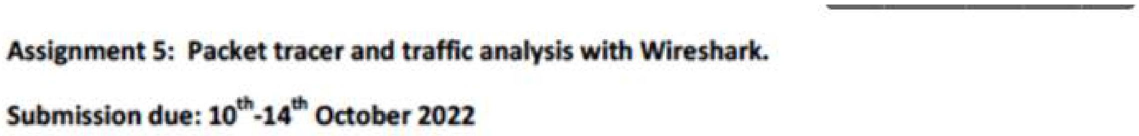
Name: Bikash Sah

Class: BCSE-3

Group: A1

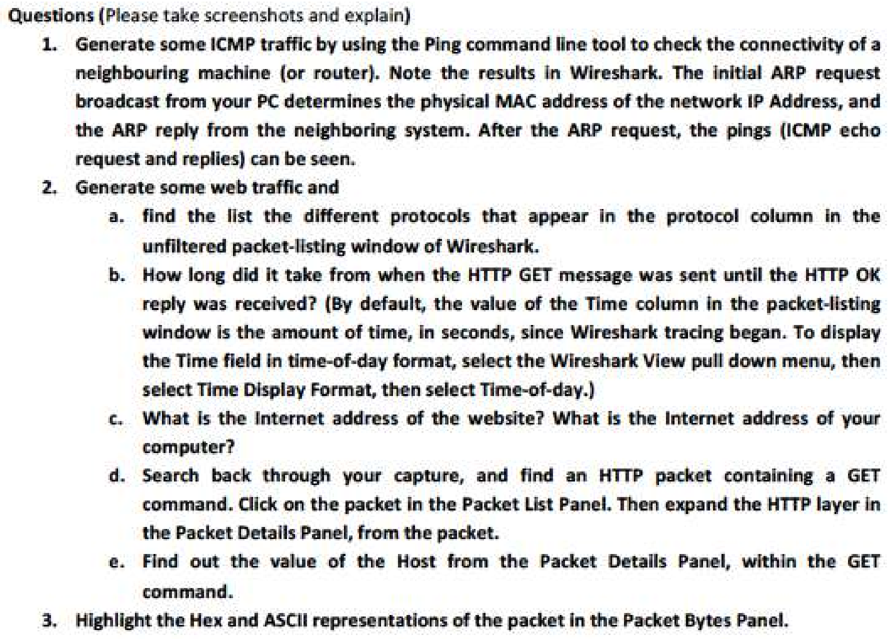
Assignment Number: 5

Problem Statement:



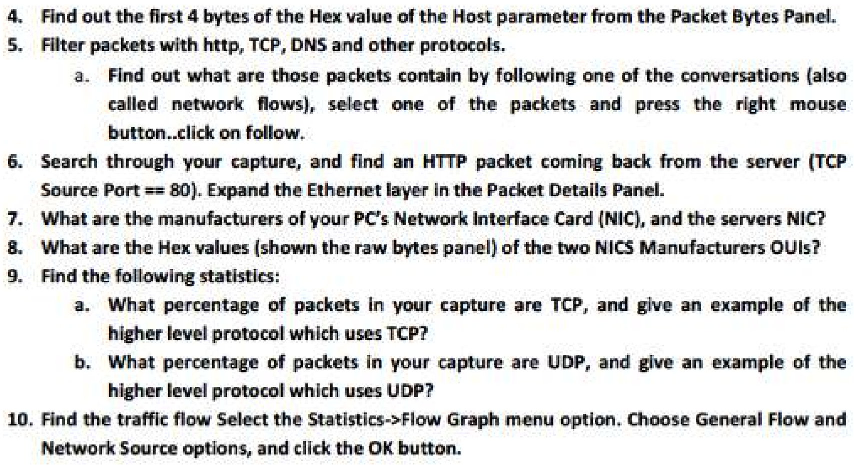
Assignment 5: Packet tracer and traffic analysis with Wireshark.

Submission due: 10th-14th October 2022



Questions (Please take screenshots and explain)

1. Generate some ICMP traffic by using the Ping command line tool to check the connectivity of a neighbouring machine (or router). Note the results in Wireshark. The initial ARP request broadcast from your PC determines the physical MAC address of the network IP Address, and the ARP reply from the neighboring system. After the ARP request, the pings (ICMP echo request and replies) can be seen.
2. Generate some web traffic and
   a. find the list the different protocols that appear in the protocol column in the unfiltered packet-listing window of Wireshark.
   b. How long did it take from when the HTTP GET message was sent until the HTTP OK reply was received? (By default, the value of the Time column in the packet-listing window is the amount of time, in seconds, since Wireshark tracing began. To display the Time field in time-of-day format, select the Wireshark View pull down menu, then select Time Display Format, then select Time-of-day.)
   c. What is the Internet address of the website? What is the Internet address of your computer?
   d. Search back through your capture, and find an HTTP packet containing a GET command. Click on the packet in the Packet List Panel. Then expand the HTTP layer in the Packet Details Panel, from the packet.
   e. Find out the value of the Host from the Packet Details Panel, within the GET command.
3. Highlight the Hex and ASCII representations of the packet in the Packet Bytes Panel.



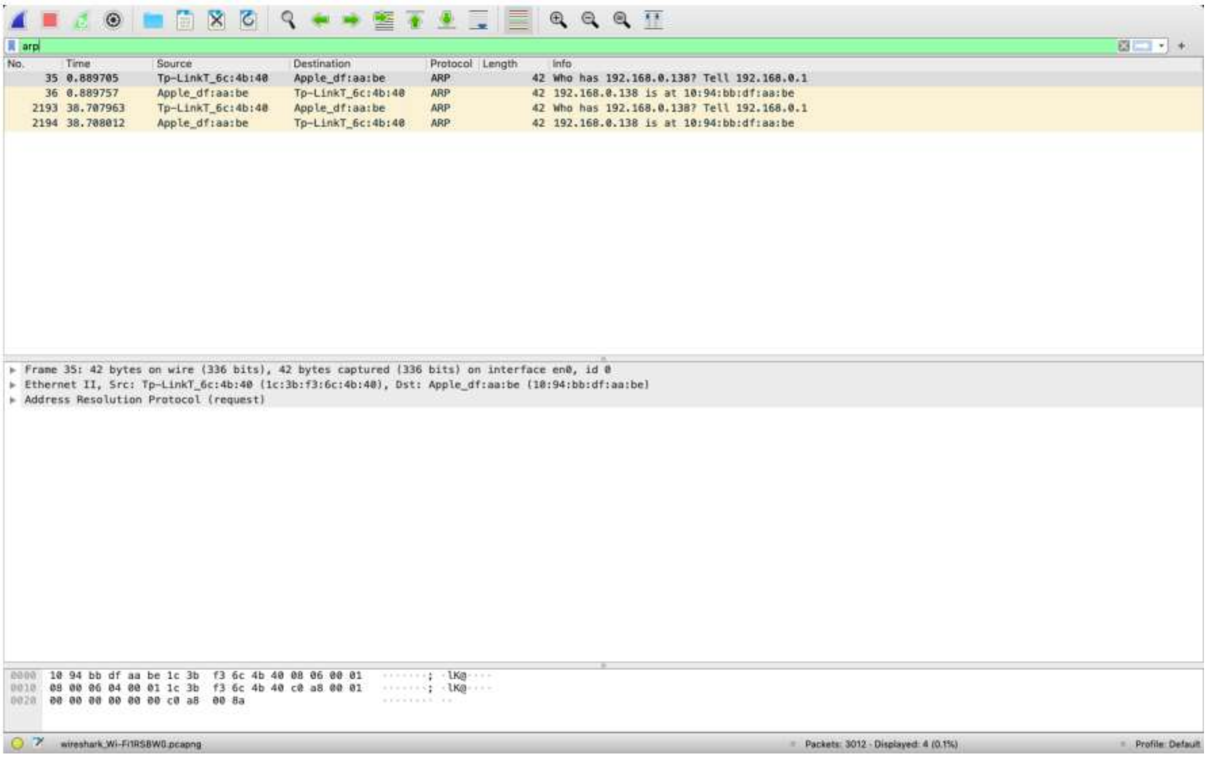
4. Find out the first 4 bytes of the Hex value of the Host parameter from the Packet Bytes Panel.
5. Filter packets with http, TCP, DNS and other protocols.
   a. Find out what are those packets contain by following one of the conversations (also called network flows), select one of the packets and press the right mouse button..click on follow.
6. Search through your capture, and find an HTTP packet coming back from the server (TCP Source Port == 80). Expand the Ethernet layer in the Packet Details Panel.
7. What are the manufacturers of your PC's Network Interface Card (NIC), and the servers NIC?
8. What are the Hex values (shown the raw bytes panel) of the two NICS Manufacturers OUIs?
9. Find the following statistics:
   a. What percentage of packets in your capture are TCP, and give an example of the higher level protocol which uses TCP?
   b. What percentage of packets in your capture are UDP, and give an example of the higher level protocol which uses UDP?
10. Find the traffic flow Select the Statistics->Flow Graph menu option. Choose General Flow and Network Source options, and click the OK button.

Submission Date: **21 November, 2022**

Deadline: 14th October, 2022

Q1

1. **Generate some ICMP traffic by using the Ping command line tool to check the connectivity of a neighbouring machine (or router). Note the results in Wireshark. The initial ARP request broadcast from your PC determines the physical MAC address of the network IP Address, and the ARP reply from the neighboring system. After the ARP request, the pings (ICMP echo request and replies) can be seen.**



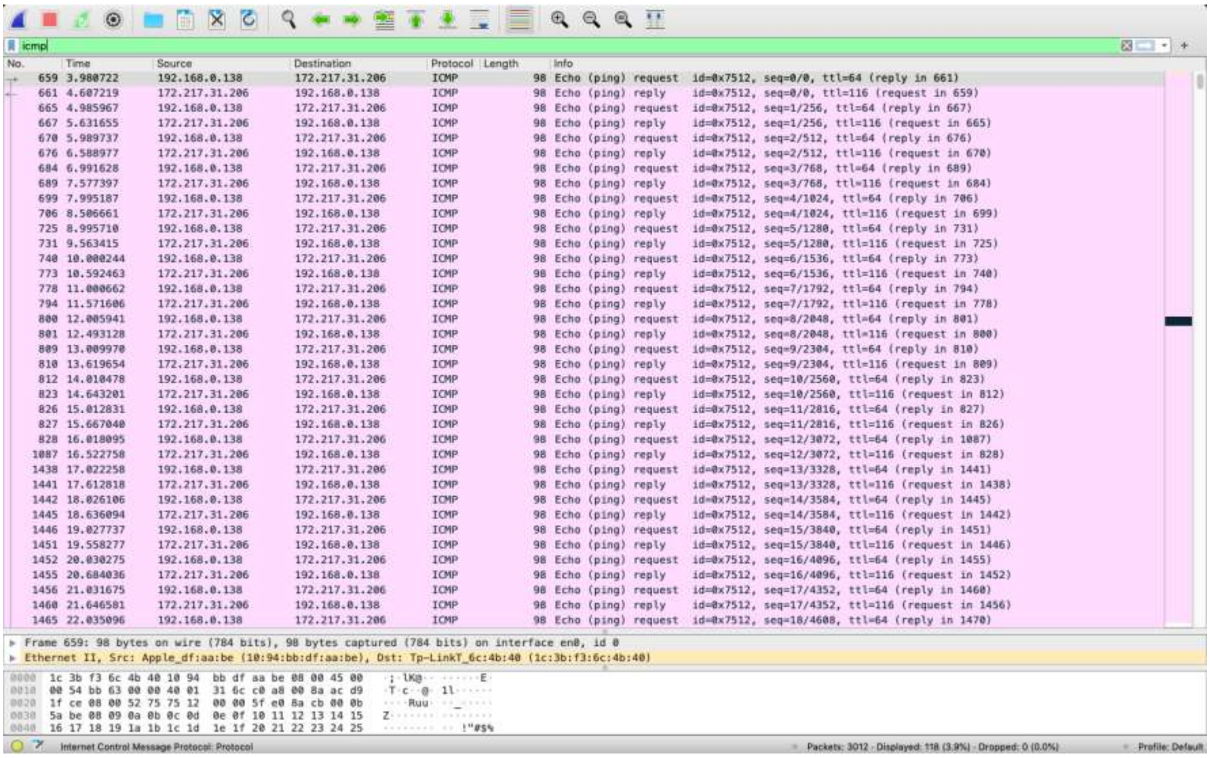
No.	Time	Source	Destination	Protocol	Length	Info
35	0.889705	Tp-LinkT_6c:4b:40	Apple_df:aa:be	ARP	42	Who has 192.168.0.138? Tell 192.168.0.1
36	0.889757	Apple_df:aa:be	Tp-LinkT_6c:4b:40	ARP	42	192.168.0.138 is at 10:94:bb:df:aa:be
2193	38.707963	Tp-LinkT_6c:4b:40	Apple_df:aa:be	ARP	42	Who has 192.168.0.138? Tell 192.168.0.1
2194	38.708012	Apple_df:aa:be	Tp-LinkT_6c:4b:40	ARP	42	192.168.0.138 is at 10:94:bb:df:aa:be

```
▸ Frame 35: 42 bytes on wire (336 bits), 42 bytes captured (336 bits) on interface en0, id 0
▸ Ethernet II, Src: Tp-LinkT_6c:4b:40 (1c:3b:f3:6c:4b:40), Dst: Apple_df:aa:be (10:94:bb:df:aa:be)
▸ Address Resolution Protocol (request)
```

```
0000  10 94 bb df aa be 1c 3b  f3 6c 4b 40 08 06 00 01   .......;  lK@....
0010  08 00 06 04 00 01 1c 3b  f3 6c 4b 40 c0 a8 00 01   .......;  lK@....
0020  00 00 00 00 00 00 c0 a8  00 8a                     ..........
```

wireshark_Wi-Fi1RSBW0.pcapng
Packets: 3012 · Displayed: 4 (0.1%)
Profile: Default

The different ARP requests generated as a part of locating MAC addresses of neighbouring machines.Tp-LinkT_6c is the Wifi-adaptor and the origin machine while Apple_df is the destination (Macbook Air).



```
icmp
No.   Time       Source          Destination     Protocol Length Info
  659 3.980722   192.168.0.138   172.217.31.206  ICMP     98 Echo (ping) request  id=0x7512, seq=0/0, ttl=64 (reply in 661)
  661 4.607219   172.217.31.206  192.168.0.138   ICMP     98 Echo (ping) reply    id=0x7512, seq=0/0, ttl=116 (request in 659)
  665 4.985967   192.168.0.138   172.217.31.206  ICMP     98 Echo (ping) request  id=0x7512, seq=1/256, ttl=64 (reply in 667)
  667 5.631655   172.217.31.206  192.168.0.138   ICMP     98 Echo (ping) reply    id=0x7512, seq=1/256, ttl=116 (request in 665)
  670 5.989737   192.168.0.138   172.217.31.206  ICMP     98 Echo (ping) request  id=0x7512, seq=2/512, ttl=64 (reply in 676)
  676 6.588977   172.217.31.206  192.168.0.138   ICMP     98 Echo (ping) reply    id=0x7512, seq=2/512, ttl=116 (request in 670)
  684 6.991628   192.168.0.138   172.217.31.206  ICMP     98 Echo (ping) request  id=0x7512, seq=3/768, ttl=64 (reply in 689)
  689 7.577397   172.217.31.206  192.168.0.138   ICMP     98 Echo (ping) reply    id=0x7512, seq=3/768, ttl=116 (request in 684)
  699 7.995187   192.168.0.138   172.217.31.206  ICMP     98 Echo (ping) request  id=0x7512, seq=4/1024, ttl=64 (reply in 706)
  706 8.506661   172.217.31.206  192.168.0.138   ICMP     98 Echo (ping) reply    id=0x7512, seq=4/1024, ttl=116 (request in 699)
  725 8.995710   192.168.0.138   172.217.31.206  ICMP     98 Echo (ping) request  id=0x7512, seq=5/1280, ttl=64 (reply in 731)
  731 9.563415   172.217.31.206  192.168.0.138   ICMP     98 Echo (ping) reply    id=0x7512, seq=5/1280, ttl=116 (request in 725)
  740 10.000244  192.168.0.138   172.217.31.206  ICMP     98 Echo (ping) request  id=0x7512, seq=6/1536, ttl=64 (reply in 773)
  773 10.592463  172.217.31.206  192.168.0.138   ICMP     98 Echo (ping) reply    id=0x7512, seq=6/1536, ttl=116 (request in 740)
  778 11.000662  192.168.0.138   172.217.31.206  ICMP     98 Echo (ping) request  id=0x7512, seq=7/1792, ttl=64 (reply in 794)
  794 11.571606  172.217.31.206  192.168.0.138   ICMP     98 Echo (ping) reply    id=0x7512, seq=7/1792, ttl=116 (request in 778)
  800 12.005941  192.168.0.138   172.217.31.206  ICMP     98 Echo (ping) request  id=0x7512, seq=8/2048, ttl=64 (reply in 801)
  801 12.493128  172.217.31.206  192.168.0.138   ICMP     98 Echo (ping) reply    id=0x7512, seq=8/2048, ttl=116 (request in 800)
  809 13.009970  192.168.0.138   172.217.31.206  ICMP     98 Echo (ping) request  id=0x7512, seq=9/2304, ttl=64 (reply in 810)
  810 13.619654  172.217.31.206  192.168.0.138   ICMP     98 Echo (ping) reply    id=0x7512, seq=9/2304, ttl=116 (request in 809)
  812 14.010478  192.168.0.138   172.217.31.206  ICMP     98 Echo (ping) request  id=0x7512, seq=10/2560, ttl=64 (reply in 823)
  823 14.643201  172.217.31.206  192.168.0.138   ICMP     98 Echo (ping) reply    id=0x7512, seq=10/2560, ttl=116 (request in 812)
  826 15.012831  192.168.0.138   172.217.31.206  ICMP     98 Echo (ping) request  id=0x7512, seq=11/2816, ttl=64 (reply in 827)
  827 15.667040  172.217.31.206  192.168.0.138   ICMP     98 Echo (ping) reply    id=0x7512, seq=11/2816, ttl=116 (request in 826)
  828 16.018095  192.168.0.138   172.217.31.206  ICMP     98 Echo (ping) request  id=0x7512, seq=12/3072, ttl=64 (reply in 1087)
 1087 16.522758  172.217.31.206  192.168.0.138   ICMP     98 Echo (ping) reply    id=0x7512, seq=12/3072, ttl=116 (request in 828)
 1438 17.022258  192.168.0.138   172.217.31.206  ICMP     98 Echo (ping) request  id=0x7512, seq=13/3328, ttl=64 (reply in 1441)
 1441 17.612818  172.217.31.206  192.168.0.138   ICMP     98 Echo (ping) reply    id=0x7512, seq=13/3328, ttl=116 (request in 1438)
 1442 18.026106  192.168.0.138   172.217.31.206  ICMP     98 Echo (ping) request  id=0x7512, seq=14/3584, ttl=64 (reply in 1445)
 1445 18.636094  172.217.31.206  192.168.0.138   ICMP     98 Echo (ping) reply    id=0x7512, seq=14/3584, ttl=116 (request in 1442)
 1446 19.027737  192.168.0.138   172.217.31.206  ICMP     98 Echo (ping) request  id=0x7512, seq=15/3840, ttl=64 (reply in 1451)
 1451 19.558277  172.217.31.206  192.168.0.138   ICMP     98 Echo (ping) reply    id=0x7512, seq=15/3840, ttl=116 (request in 1446)
 1452 20.030275  192.168.0.138   172.217.31.206  ICMP     98 Echo (ping) request  id=0x7512, seq=16/4096, ttl=64 (reply in 1455)
 1455 20.684036  172.217.31.206  192.168.0.138   ICMP     98 Echo (ping) reply    id=0x7512, seq=16/4096, ttl=116 (request in 1452)
 1456 21.031675  192.168.0.138   172.217.31.206  ICMP     98 Echo (ping) request  id=0x7512, seq=17/4352, ttl=64 (reply in 1460)
 1460 21.646581  172.217.31.206  192.168.0.138   ICMP     98 Echo (ping) reply    id=0x7512, seq=17/4352, ttl=116 (request in 1456)
 1465 22.035096  192.168.0.138   172.217.31.206  ICMP     98 Echo (ping) request  id=0x7512, seq=18/4608, ttl=64 (reply in 1470)

▸ Frame 659: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface en0, id 0
▸ Ethernet II, Src: Apple_df:aa:be (10:94:bb:df:aa:be), Dst: Tp-LinkT_6c:4b:40 (1c:3b:f3:6c:4b:40)

0000  1c 3b f3 6c 4b 40 10 94  bb df aa be 08 00 45 00   ·;·lK@·· ······E·
0010  00 54 bb 63 00 00 40 01  31 6c c0 a8 00 8a ac d9   ·T·c··@· 1l······
0020  1f ce 08 00 52 75 75 12  00 00 5f e0 8a cb 00 0b   ····Ruu· ··_·····
0030  5a be 08 09 0a 0b 0c 0d  0e 0f 10 11 12 13 14 15   Z······· ········
0040  16 17 18 19 1a 1b 1c 1d  1e 1f 20 21 22 23 24 25   ········ ·· !"#$%

Internet Control Message Protocol: Protocol        Packets: 3012 · Displayed: 118 (3.9%) · Dropped: 0 (0.0%)        Profile: Default
```

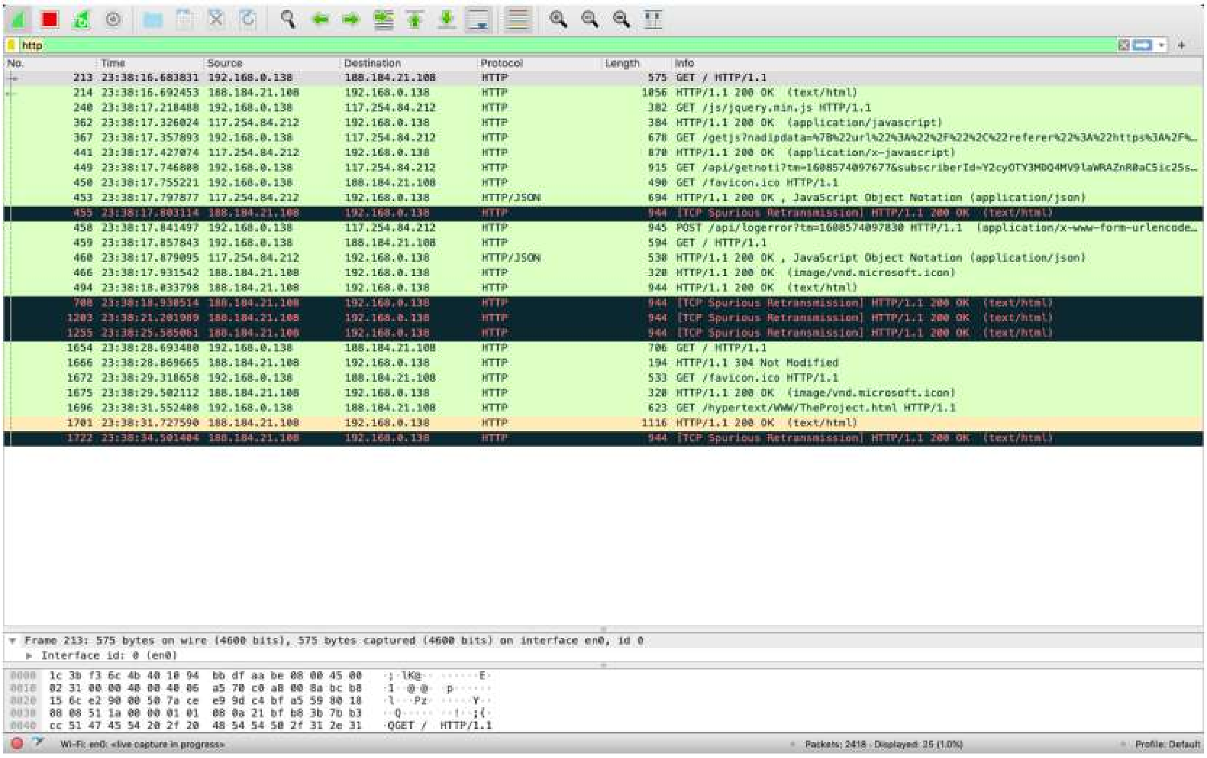
The different ICMP request-replies generated as a part of pinging google.com

Q2

a. find the list the different protocols that appear in the protocol column in the unfiltered packet-listing window of Wireshark.

1. ARP
2. DCP-AF
3. DNS
4. DHCP
5. ICMP
6. IGMPv2
7. MDNS
8. TCP
9. UDP
10. TLSv1.3
11. TLSv1.2

b. How long did it take from when the HTTP GET message was sent until the HTTP OK reply was received? (By default, the value of the Time column in the packet-listing window is the amount of time, in seconds, since Wireshark tracing began. To display the Time field in time-of-day format, select the Wireshark View pull down menu, then select Time Display Format, then select Time-of-day.)



```
No.    Time              Source           Destination      Protocol    Length  Info
  213  23:38:16.683831   192.168.0.138    188.184.21.108   HTTP           575  GET / HTTP/1.1
  214  23:38:16.692453   188.184.21.108   192.168.0.138    HTTP          1056  HTTP/1.1 200 OK  (text/html)
  240  23:38:17.218488   192.168.0.138    117.254.84.212   HTTP           382  GET /js/jquery.min.js HTTP/1.1
  362  23:38:17.326024   117.254.84.212   192.168.0.138    HTTP           384  HTTP/1.1 200 OK  (application/javascript)
  367  23:38:17.357893   192.168.0.138    117.254.84.212   HTTP           678  GET /getjs?nadipdata=%7B%22url%22%3A%22%2F%22%2C%22referer%22%3A%22https%3A%2F%…
  441  23:38:17.427074   117.254.84.212   192.168.0.138    HTTP           870  HTTP/1.1 200 OK  (application/x-javascript)
  449  23:38:17.746808   192.168.0.138    117.254.84.212   HTTP           915  GET /api/getnoti?tm=1608574097677&subscriberId=Y2cyOTY3MDQ4MV9laWRAZnR0aC5ic25s…
  450  23:38:17.755221   192.168.0.138    188.184.21.108   HTTP           490  GET /favicon.ico HTTP/1.1
  453  23:38:17.797877   117.254.84.212   192.168.0.138    HTTP/JSON      694  HTTP/1.1 200 OK , JavaScript Object Notation (application/json)
  455  23:38:17.803114   188.184.21.108   192.168.0.138    HTTP           944  [TCP Spurious Retransmission] HTTP/1.1 200 OK  (text/html)
  458  23:38:17.841497   192.168.0.138    117.254.84.212   HTTP           945  POST /api/logerror?tm=1608574097830 HTTP/1.1  (application/x-www-form-urlencode…
  459  23:38:17.857843   192.168.0.138    188.184.21.108   HTTP           594  GET / HTTP/1.1
  460  23:38:17.879095   117.254.84.212   192.168.0.138    HTTP/JSON      538  HTTP/1.1 200 OK , JavaScript Object Notation (application/json)
  466  23:38:17.931542   188.184.21.108   192.168.0.138    HTTP           320  HTTP/1.1 200 OK  (image/vnd.microsoft.icon)
  494  23:38:18.033798   188.184.21.108   192.168.0.138    HTTP           944  HTTP/1.1 200 OK  (text/html)
  700  23:38:18.938514   188.184.21.108   192.168.0.138    HTTP           944  [TCP Spurious Retransmission] HTTP/1.1 200 OK  (text/html)
 1203  23:38:21.201989   188.184.21.108   192.168.0.138    HTTP           944  [TCP Spurious Retransmission] HTTP/1.1 200 OK  (text/html)
 1255  23:38:25.585061   188.184.21.108   192.168.0.138    HTTP           944  [TCP Spurious Retransmission] HTTP/1.1 200 OK  (text/html)
 1654  23:38:28.693480   192.168.0.138    188.184.21.108   HTTP           706  GET / HTTP/1.1
 1666  23:38:28.869665   188.184.21.108   192.168.0.138    HTTP           194  HTTP/1.1 304 Not Modified
 1672  23:38:29.318658   192.168.0.138    188.184.21.108   HTTP           533  GET /favicon.ico HTTP/1.1
 1675  23:38:29.502112   188.184.21.108   192.168.0.138    HTTP           320  HTTP/1.1 200 OK  (image/vnd.microsoft.icon)
 1696  23:38:31.552408   192.168.0.138    188.184.21.108   HTTP           623  GET /hypertext/WWW/TheProject.html HTTP/1.1
 1701  23:38:31.727590   188.184.21.108   192.168.0.138    HTTP          1116  HTTP/1.1 200 OK  (text/html)
 1722  23:38:34.501404   188.184.21.108   192.168.0.138    HTTP           944  [TCP Spurious Retransmission] HTTP/1.1 200 OK  (text/html)
```

```
▼ Frame 213: 575 bytes on wire (4600 bits), 575 bytes captured (4600 bits) on interface en0, id 0
   ▶ Interface id: 0 (en0)
```

```
0000  1c 3b f3 6c 4b 40 10 94  bb df aa be 08 00 45 00   ·;·lK@·· ······E·
0010  02 31 00 00 40 00 40 06  a5 70 c0 a8 00 8a bc b8   ·1··@·@· ·p······
0020  15 6c e2 90 00 50 7a ce  e9 9d c4 bf a5 59 80 18   ·l···Pz· ·····Y··
0030  08 08 51 1a 00 00 01 01  08 0a 21 bf b8 3b 7b b3   ··Q····· ··!··;{·
0040  cc 51 47 45 54 20 2f 20  48 54 54 50 2f 31 2e 31   ·QGET /  HTTP/1.1
```

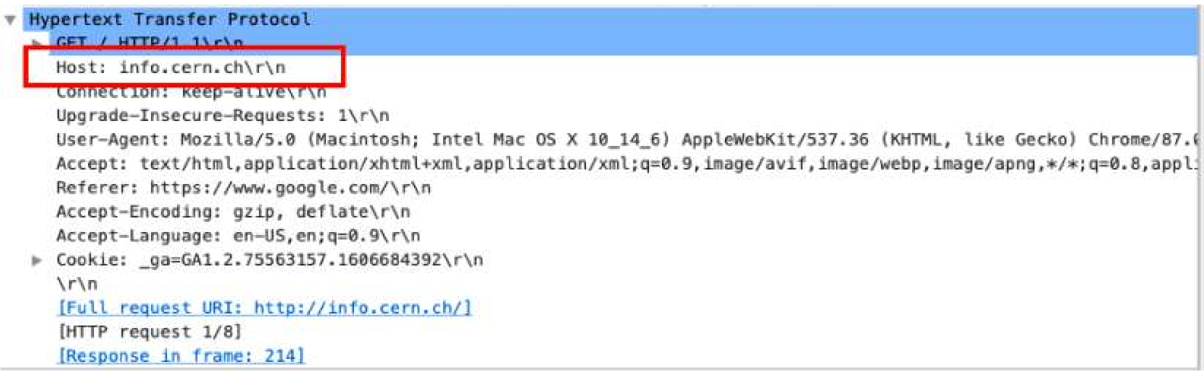
Wi-Fi: en0: «live capture in progress»
Packets: 2418 · Displayed: 25 (1.0%)
Profile: Default

The first HTTP GET request was sent at 23:38:16.218488 and the HTTP OK response was received at 23:38:17.326034. and thus it took 1.11 seconds.

c. What is the Internet address of the website? What is the Internet address of your computer?

The internet address of the website http://info.cern.ch/(had to look up an ancient website) is 188.184.21.108 and the internet address of my computer is 192.168.0.138.

d. Search back through your capture, and find an HTTP packet containing a GET command. Click on the packet in the Packet List Panel. Then expand the HTTP layer in the Packet Details Panel, from the packet.



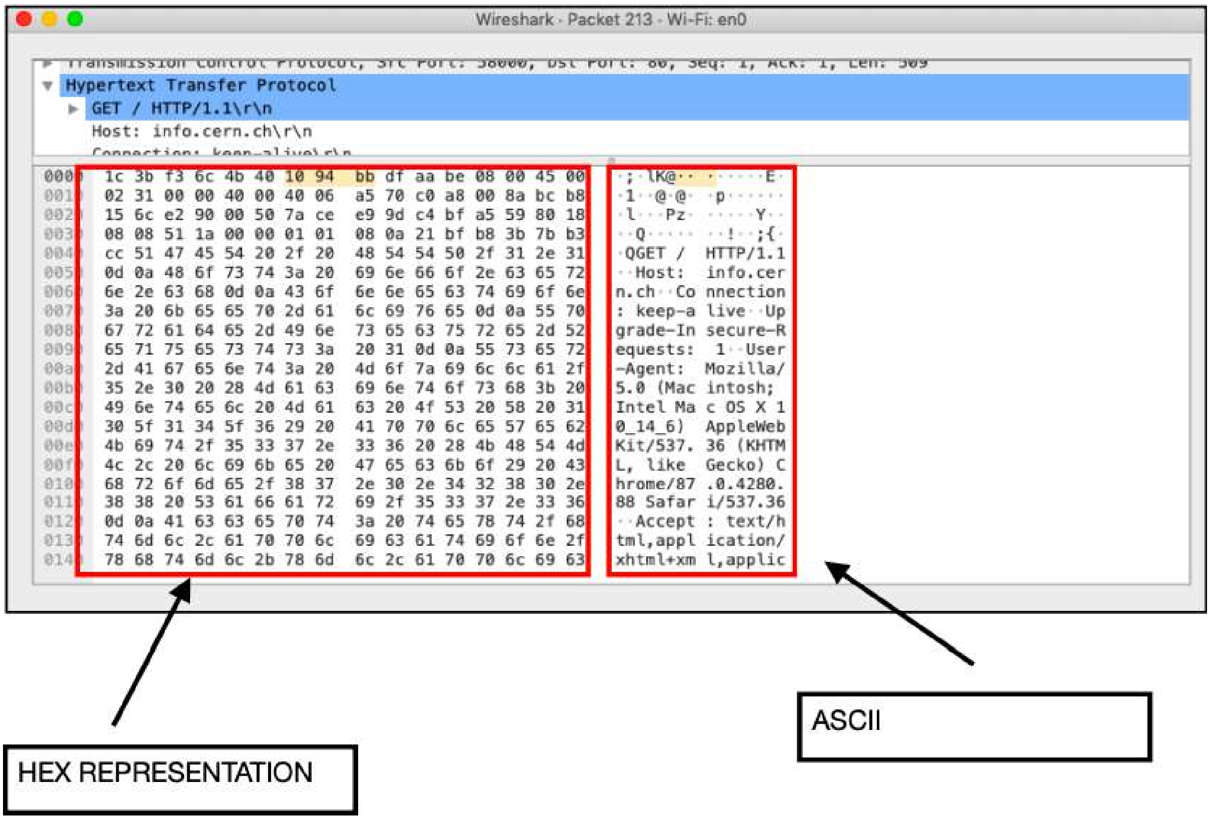
```
▼ Hypertext Transfer Protocol
  ▶ GET / HTTP/1.1\r\n
    Host: info.cern.ch\r\n
    Connection: keep-alive\r\n
    Upgrade-Insecure-Requests: 1\r\n
    User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_14_6) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/87.
    Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,appl
    Referer: https://www.google.com/\r\n
    Accept-Encoding: gzip, deflate\r\n
    Accept-Language: en-US,en;q=0.9\r\n
  ▶ Cookie: _ga=GA1.2.75563157.1606684392\r\n
    \r\n
    [Full request URI: http://info.cern.ch/]
    [HTTP request 1/8]
    [Response in frame: 214]
```

e. Find out the value of the Host from the Packet Details Panel, within the GET command.

The figure 2d shows the hostname.- http://info.cern.ch/

Q3

3. Highlight the Hex and ASCII representations of the packet in the Packet Bytes Panel.

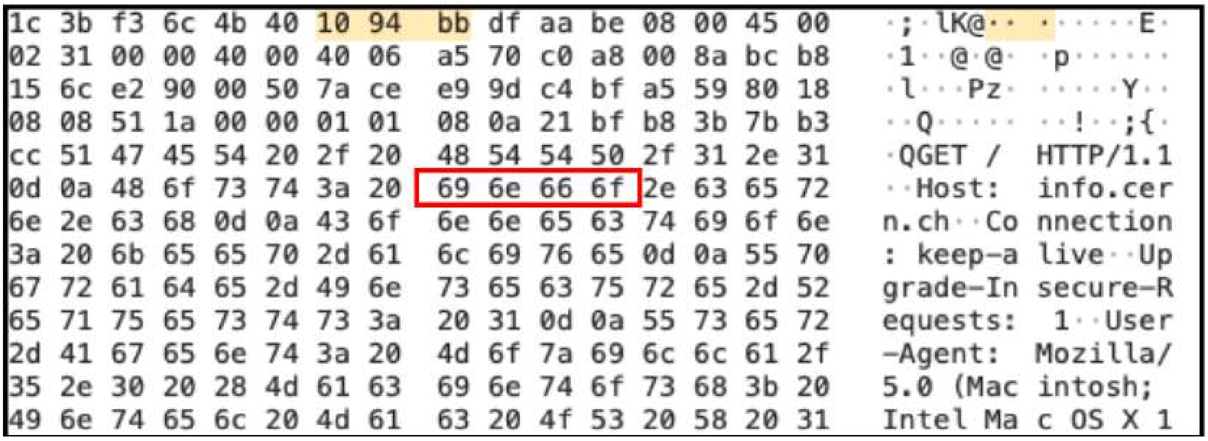


Wireshark · Packet 213 · Wi-Fi: en0

```
  ▶ Transmission Control Protocol, Src Port: 58000, Dst Port: 80, Seq: 1, Ack: 1, Len: 509
  ▼ Hypertext Transfer Protocol
    ▶ GET / HTTP/1.1\r\n
      Host: info.cern.ch\r\n
      Connection: keep-alive\r\n

0000  1c 3b f3 6c 4b 40 10 94  bb df aa be 08 00 45 00   ·;·lK@·· ······E·
0010  02 31 00 00 40 00 40 06  a5 70 c0 a8 00 8a bc b8   ·1··@·@· ·p······
0020  15 6c e2 90 00 50 7a ce  e9 9d c4 bf a5 59 80 18   ·l···Pz· ·····Y··
0030  08 08 51 1a 00 00 01 01  08 0a 21 bf b8 3b 7b b3   ··Q····· ··!··;{·
0040  cc 51 47 45 54 20 2f 20  48 54 54 50 2f 31 2e 31   ·QGET /  HTTP/1.1
0050  0d 0a 48 6f 73 74 3a 20  69 6e 66 6f 2e 63 65 72   ··Host:  info.cer
0060  6e 2e 63 68 0d 0a 43 6f  6e 6e 65 63 74 69 6f 6e   n.ch··Co nnection
0070  3a 20 6b 65 65 70 2d 61  6c 69 76 65 0d 0a 55 70   : keep-a live··Up
0080  67 72 61 64 65 2d 49 6e  73 65 63 75 72 65 2d 52   grade-In secure-R
0090  65 71 75 65 73 74 73 3a  20 31 0d 0a 55 73 65 72   equests:  1··User
00a0  2d 41 67 65 6e 74 3a 20  4d 6f 7a 69 6c 6c 61 2f   -Agent:  Mozilla/
00b0  35 2e 30 20 28 4d 61 63  69 6e 74 6f 73 68 3b 20   5.0 (Mac intosh;
00c0  49 6e 74 65 6c 20 4d 61  63 20 4f 53 20 58 20 31   Intel Ma c OS X 1
00d0  30 5f 31 34 5f 36 29 20  41 70 70 6c 65 57 65 62   0_14_6)  AppleWeb
00e0  4b 69 74 2f 35 33 37 2e  33 36 20 28 4b 48 54 4d   Kit/537. 36 (KHTM
00f0  4c 2c 20 6c 69 6b 65 20  47 65 63 6b 6f 29 20 43   L, like  Gecko) C
0100  68 72 6f 6d 65 2f 38 37  2e 30 2e 34 32 38 30 2e   hrome/87 .0.4280.
0110  38 38 20 53 61 66 61 72  69 2f 35 33 37 2e 33 36   88 Safar i/537.36
0120  0d 0a 41 63 63 65 70 74  3a 20 74 65 78 74 2f 68   ··Accept : text/h
0130  74 6d 6c 2c 61 70 70 6c  69 63 61 74 69 6f 6e 2f   tml,appl ication/
0140  78 68 74 6d 6c 2b 78 6d  6c 2c 61 70 70 6c 69 63   xhtml+xm l,applic
```

Q4

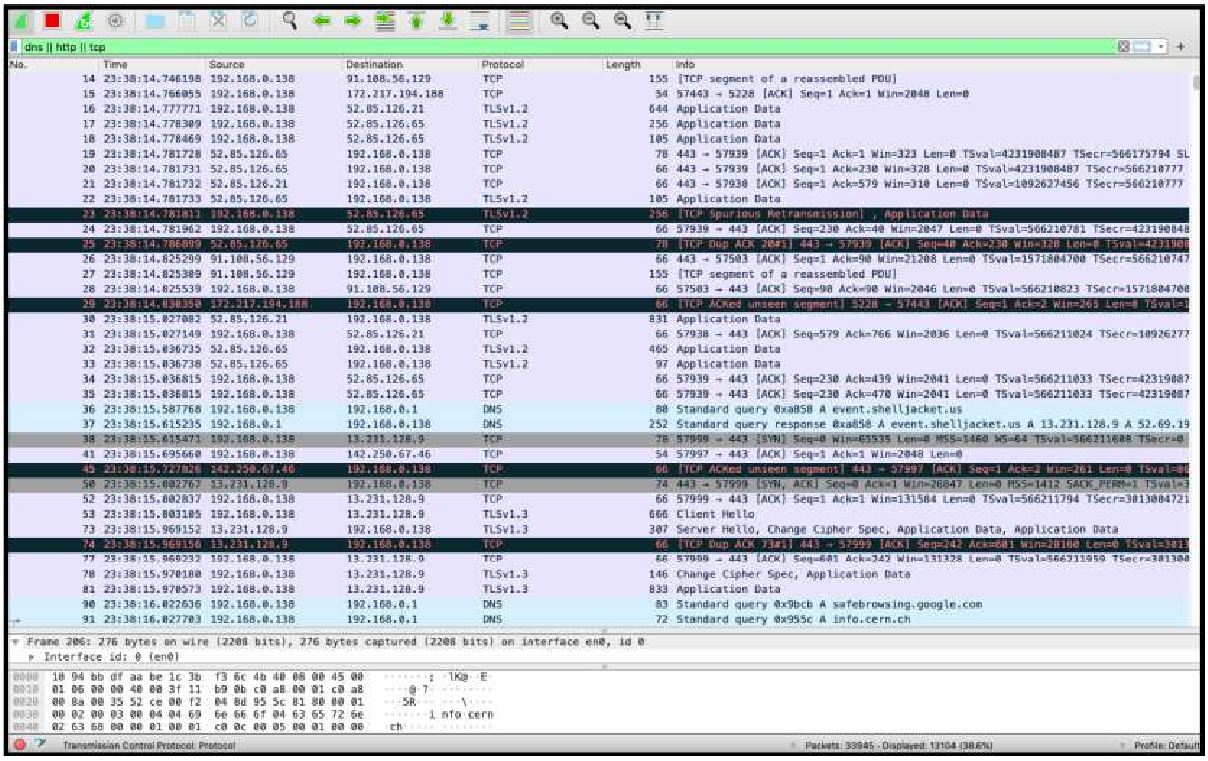
4. **Find out the first 4 bytes of the Hex value of the Host parameter from the Packet Bytes Panel.**



```
1c 3b f3 6c 4b 40 10 94  bb df aa be 08 00 45 00   ·;·lK@·· ······E·
02 31 00 00 40 00 40 06  a5 70 c0 a8 00 8a bc b8   ·1··@·@· ·p······
15 6c e2 90 00 50 7a ce  e9 9d c4 bf a5 59 80 18   ·l···Pz· ·····Y··
08 08 51 1a 00 00 01 01  08 0a 21 bf b8 3b 7b b3   ··Q····· ··!··;{·
cc 51 47 45 54 20 2f 20  48 54 54 50 2f 31 2e 31   ·QGET /  HTTP/1.1
0d 0a 48 6f 73 74 3a 20  69 6e 66 6f 2e 63 65 72   ··Host:  info.cer
6e 2e 63 68 0d 0a 43 6f  6e 6e 65 63 74 69 6f 6e   n.ch··Co nnection
3a 20 6b 65 65 70 2d 61  6c 69 76 65 0d 0a 55 70   : keep-a live··Up
67 72 61 64 65 2d 49 6e  73 65 63 75 72 65 2d 52   grade-In secure-R
65 71 75 65 73 74 73 3a  20 31 0d 0a 55 73 65 72   equests:  1··User
2d 41 67 65 6e 74 3a 20  4d 6f 7a 69 6c 6c 61 2f   -Agent:  Mozilla/
35 2e 30 20 28 4d 61 63  69 6e 74 6f 73 68 3b 20   5.0 (Mac intosh;
49 6e 74 65 6c 20 4d 61  63 20 4f 53 20 58 20 31   Intel Ma c OS X 1
```

Q5

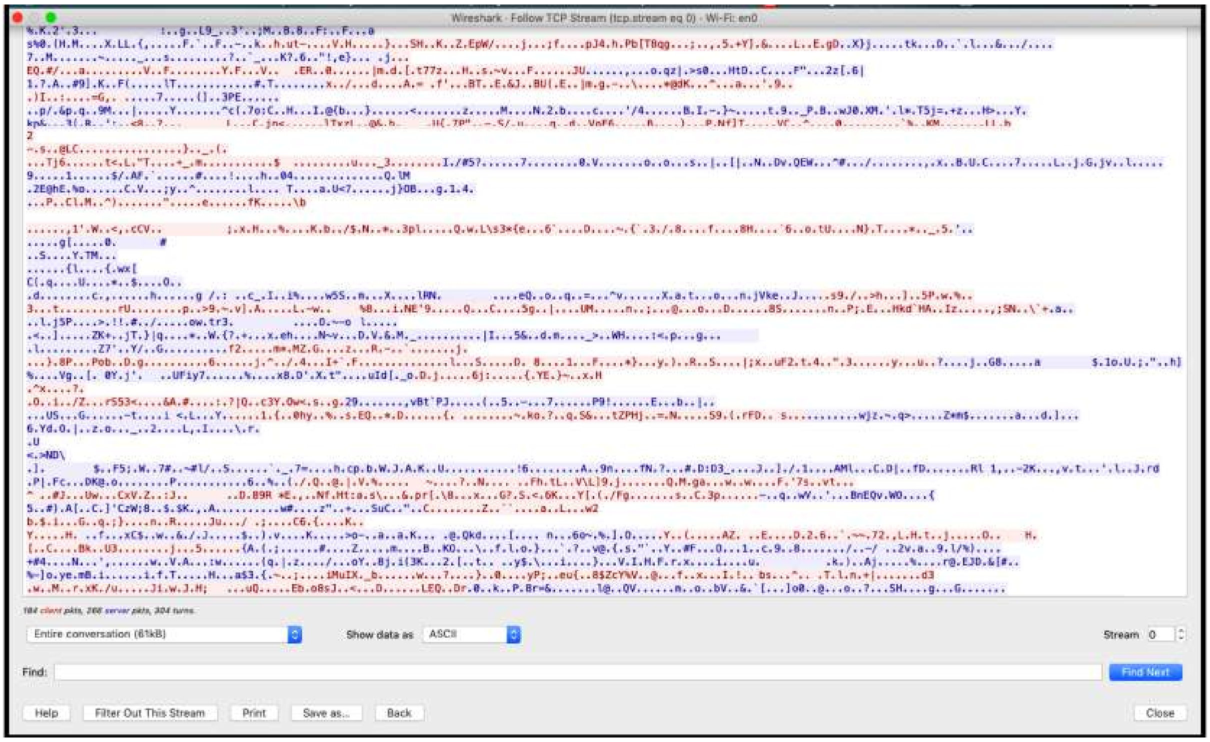
5. **Filter packets with http, TCP, DNS and other protocols.**
   a. **Find out what are those packets contain by following one of the conversations (also called network flows), select one of the packets and press the right mouse button..click on follow.**



dns || http || tcp

```
No.     Time             Source           Destination      Protocol  Length  Info
     14 23:38:14.746198  192.168.0.138    91.108.56.129    TCP          155  [TCP segment of a reassembled PDU]
     15 23:38:14.766055  192.168.0.138    172.217.194.188  TCP           54  57443 → 5228 [ACK] Seq=1 Ack=1 Win=2048 Len=0
     16 23:38:14.777771  192.168.0.138    52.85.126.21     TLSv1.2      644  Application Data
     17 23:38:14.778309  192.168.0.138    52.85.126.65     TLSv1.2      256  Application Data
     18 23:38:14.778469  192.168.0.138    52.85.126.65     TLSv1.2      105  Application Data
     19 23:38:14.781728  52.85.126.65     192.168.0.138    TCP           78  443 → 57939 [ACK] Seq=1 Ack=1 Win=323 Len=0 TSval=4231908487 TSecr=566175794 SL
     20 23:38:14.781731  52.85.126.65     192.168.0.138    TCP           66  443 → 57939 [ACK] Seq=1 Ack=230 Win=328 Len=0 TSval=4231908487 TSecr=566210777
     21 23:38:14.781732  52.85.126.21     192.168.0.138    TCP           66  443 → 57938 [ACK] Seq=1 Ack=579 Win=310 Len=0 TSval=1092627456 TSecr=566210777
     22 23:38:14.781733  52.85.126.65     192.168.0.138    TLSv1.2      105  Application Data
     23 23:38:14.781811  192.168.0.138    52.85.126.65     TLSv1.2      256  [TCP Spurious Retransmission] , Application Data
     24 23:38:14.781962  192.168.0.138    52.85.126.65     TCP           66  57939 → 443 [ACK] Seq=230 Ack=40 Win=2047 Len=0 TSval=566210781 TSecr=423190848
     25 23:38:14.786899  52.85.126.65     192.168.0.138    TCP           78  [TCP Dup ACK 20#1] 443 → 57939 [ACK] Seq=40 Ack=230 Win=328 Len=0 TSval=4231908
     26 23:38:14.825299  91.108.56.129    192.168.0.138    TCP           66  443 → 57503 [ACK] Seq=1 Ack=90 Win=21208 Len=0 TSval=1571804700 TSecr=566210747
     27 23:38:14.825309  91.108.56.129    192.168.0.138    TCP          155  [TCP segment of a reassembled PDU]
     28 23:38:14.825539  192.168.0.138    91.108.56.129    TCP           66  57503 → 443 [ACK] Seq=90 Ack=90 Win=2046 Len=0 TSval=566210823 TSecr=1571804700
     29 23:38:14.830350  172.217.194.188  192.168.0.138    TCP           66  [TCP ACKed unseen segment] 5228 → 57443 [ACK] Seq=1 Ack=2 Win=265 Len=0 TSval=1
     30 23:38:15.027082  52.85.126.21     192.168.0.138    TLSv1.2      831  Application Data
     31 23:38:15.027149  192.168.0.138    52.85.126.21     TCP           66  57938 → 443 [ACK] Seq=579 Ack=766 Win=2036 Len=0 TSval=566211024 TSecr=10926277
     32 23:38:15.036735  52.85.126.65     192.168.0.138    TLSv1.2      465  Application Data
     33 23:38:15.036738  52.85.126.65     192.168.0.138    TLSv1.2       97  Application Data
     34 23:38:15.036815  192.168.0.138    52.85.126.65     TCP           66  57939 → 443 [ACK] Seq=230 Ack=439 Win=2041 Len=0 TSval=566211033 TSecr=42319087
     35 23:38:15.036815  192.168.0.138    52.85.126.65     TCP           66  57939 → 443 [ACK] Seq=230 Ack=470 Win=2041 Len=0 TSval=566211033 TSecr=42319087
     36 23:38:15.587768  192.168.0.138    192.168.0.1      DNS           80  Standard query 0xa858 A event.shelljacket.us
     37 23:38:15.615235  192.168.0.1      192.168.0.138    DNS          252  Standard query response 0xa858 A event.shelljacket.us A 13.231.128.9 A 52.69.19
     38 23:38:15.615471  192.168.0.138    13.231.128.9     TCP           78  57999 → 443 [SYN] Seq=0 Win=65535 Len=0 MSS=1460 WS=64 TSval=566211608 TSecr=0
     41 23:38:15.695660  192.168.0.138    142.250.67.46    TCP           54  57997 → 443 [ACK] Seq=1 Ack=1 Win=2048 Len=0
     45 23:38:15.727826  142.250.67.46    192.168.0.138    TCP           66  [TCP ACKed unseen segment] 443 → 57997 [ACK] Seq=1 Ack=2 Win=261 Len=0 TSval=86
     50 23:38:15.802767  13.231.128.9     192.168.0.138    TCP           74  443 → 57999 [SYN, ACK] Seq=0 Ack=1 Win=26847 Len=0 MSS=1412 SACK_PERM=1 TSval=3
     52 23:38:15.802837  192.168.0.138    13.231.128.9     TCP           66  57999 → 443 [ACK] Seq=1 Ack=1 Win=131584 Len=0 TSval=566211794 TSecr=3013004721
     53 23:38:15.803105  192.168.0.138    13.231.128.9     TLSv1.3      666  Client Hello
     73 23:38:15.969152  13.231.128.9     192.168.0.138    TLSv1.3      307  Server Hello, Change Cipher Spec, Application Data, Application Data
     74 23:38:15.969156  13.231.128.9     192.168.0.138    TCP           66  [TCP Dup ACK 73#1] 443 → 57999 [ACK] Seq=242 Ack=601 Win=28160 Len=0 TSval=3013
     77 23:38:15.969232  192.168.0.138    13.231.128.9     TCP           66  57999 → 443 [ACK] Seq=601 Ack=242 Win=131328 Len=0 TSval=566211959 TSecr=381300
     78 23:38:15.970180  192.168.0.138    13.231.128.9     TLSv1.3      146  Change Cipher Spec, Application Data
     81 23:38:15.970573  192.168.0.138    13.231.128.9     TLSv1.3      833  Application Data
     90 23:38:16.022636  192.168.0.138    192.168.0.1      DNS           83  Standard query 0x9bcb A safebrowsing.google.com
     91 23:38:16.027703  192.168.0.138    192.168.0.1      DNS           72  Standard query 0x955c A info.cern.ch

▾ Frame 206: 276 bytes on wire (2208 bits), 276 bytes captured (2208 bits) on interface en0, id 0
  ▸ Interface id: 0 (en0)

0000  10 94 bb df aa be 1c 3b  f3 6c 4b 40 08 00 45 00   ·······;  ·lK@··E·
0010  01 06 00 00 40 00 3f 11  b9 0b c0 a8 00 01 c0 a8   ····@·?· ········
0020  00 8a 00 35 52 ce 00 f2  04 8d 95 5c 81 80 00 01   ···5R··· ···\····
0030  00 02 00 03 00 04 04 69  6e 66 6f 04 63 65 72 6e   ·······i nfo·cern
0040  02 63 68 00 00 01 00 01  c0 0c 00 05 00 01 00 00   ·ch····· ········
```

Transmission Control Protocol: Protocol   Packets: 33945 · Displayed: 13104 (38.6%)   Profile: Default

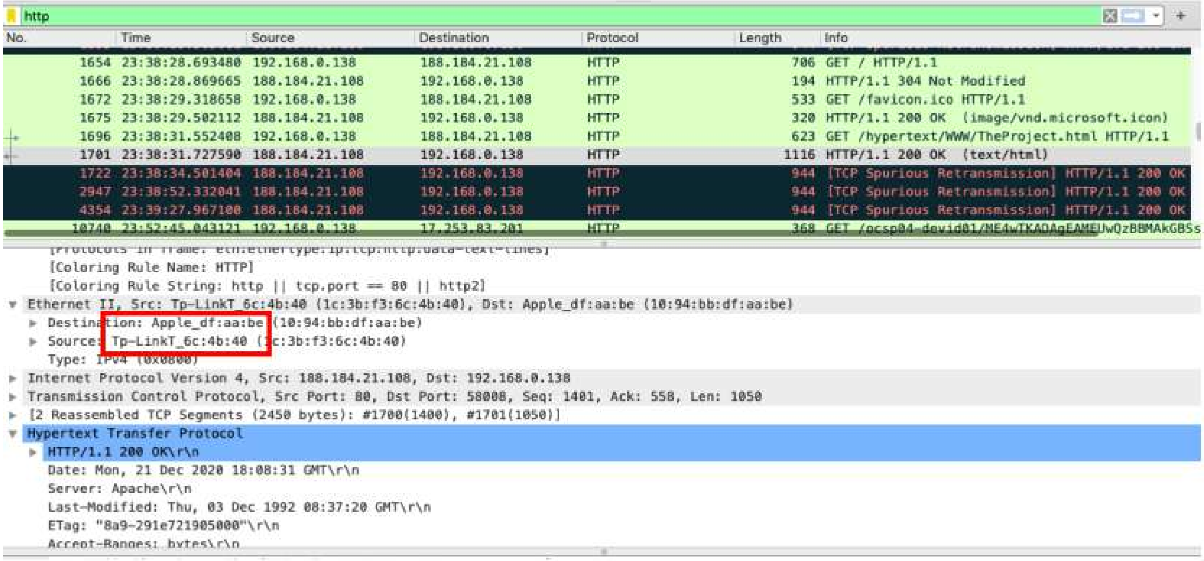


Wireshark · Follow TCP Stream (tcp.stream eq 0) · Wi-Fi: en0
184 client pkts, 266 server pkts, 304 turns.
Entire conversation (61kB)
Show data as
ASCII
Stream
0
Find:
Find Next
Help
Filter Out This Stream
Print
Save as...
Back
Close

Q6

6. **Search through your capture, and find an HTTP packet coming back from the server (TCP Source Port == 80). Expand the Ethernet layer in the Packet Details Panel.**

fig6. Showing the ethernet details of a HTTP OK request.



```
No.          Time             Source           Destination      Protocol     Length  Info
      1654  23:38:28.693480  192.168.0.138    188.184.21.108   HTTP            706  GET / HTTP/1.1
      1666  23:38:28.869665  188.184.21.108   192.168.0.138    HTTP            194  HTTP/1.1 304 Not Modified
      1672  23:38:29.318658  192.168.0.138    188.184.21.108   HTTP            533  GET /favicon.ico HTTP/1.1
      1675  23:38:29.502112  188.184.21.108   192.168.0.138    HTTP            320  HTTP/1.1 200 OK  (image/vnd.microsoft.icon)
      1696  23:38:31.552408  192.168.0.138    188.184.21.108   HTTP            623  GET /hypertext/WWW/TheProject.html HTTP/1.1
      1701  23:38:31.727590  188.184.21.108   192.168.0.138    HTTP           1116  HTTP/1.1 200 OK  (text/html)
      1722  23:38:34.501404  188.184.21.108   192.168.0.138    HTTP            944  [TCP Spurious Retransmission] HTTP/1.1 200 OK
      2947  23:38:52.332041  188.184.21.108   192.168.0.138    HTTP            944  [TCP Spurious Retransmission] HTTP/1.1 200 OK
      4354  23:39:27.967100  188.184.21.108   192.168.0.138    HTTP            944  [TCP Spurious Retransmission] HTTP/1.1 200 OK
     10740  23:52:45.043121  192.168.0.138    17.253.83.201    HTTP            368  GET /ocsp04-devid01/ME4wTKADAgEAMEUwQzBBMAkGBSs

    [Protocols in frame: eth:ethertype:ip:tcp:http:data-text-lines]
    [Coloring Rule Name: HTTP]
    [Coloring Rule String: http || tcp.port == 80 || http2]
▼ Ethernet II, Src: Tp-LinkT_6c:4b:40 (1c:3b:f3:6c:4b:40), Dst: Apple_df:aa:be (10:94:bb:df:aa:be)
  ▶ Destination: Apple_df:aa:be (10:94:bb:df:aa:be)
  ▶ Source: Tp-LinkT_6c:4b:40 (1c:3b:f3:6c:4b:40)
    Type: IPv4 (0x0800)
▶ Internet Protocol Version 4, Src: 188.184.21.108, Dst: 192.168.0.138
▶ Transmission Control Protocol, Src Port: 80, Dst Port: 58008, Seq: 1401, Ack: 558, Len: 1050
▶ [2 Reassembled TCP Segments (2450 bytes): #1700(1400), #1701(1050)]
▼ Hypertext Transfer Protocol
  ▶ HTTP/1.1 200 OK\r\n
    Date: Mon, 21 Dec 2020 18:08:31 GMT\r\n
    Server: Apache\r\n
    Last-Modified: Thu, 03 Dec 1992 08:37:20 GMT\r\n
    ETag: "8a9-291e721905000"\r\n
    Accept-Ranges: bytes\r\n
```

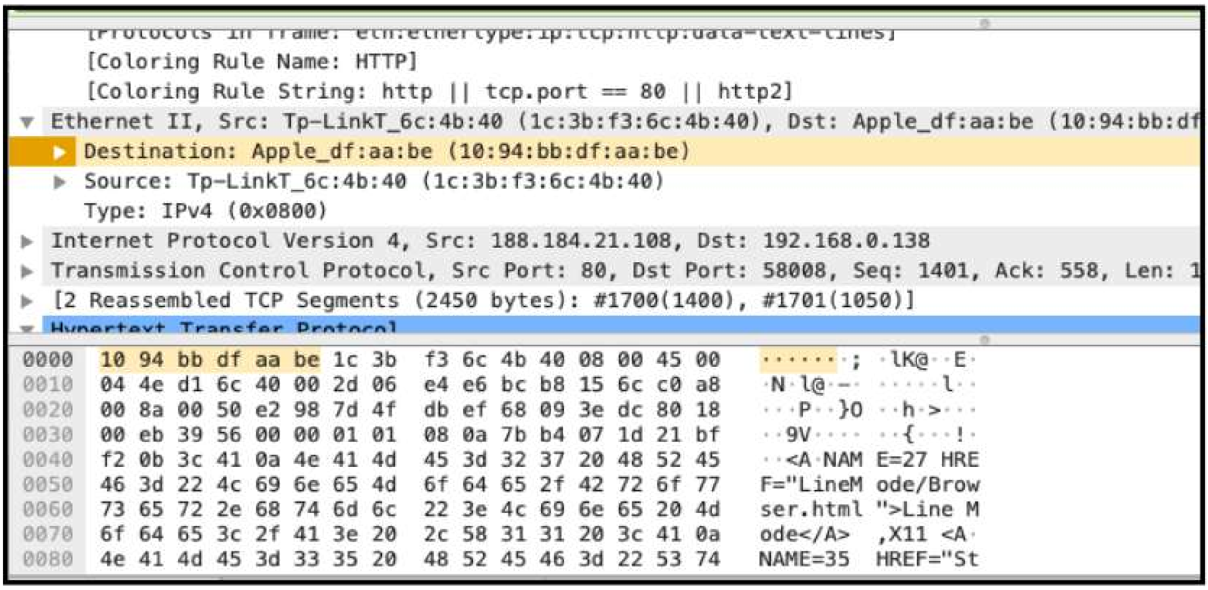
Q7

7. What are the manufacturers of your PC's Network Interface Card (NIC), and the servers NIC?

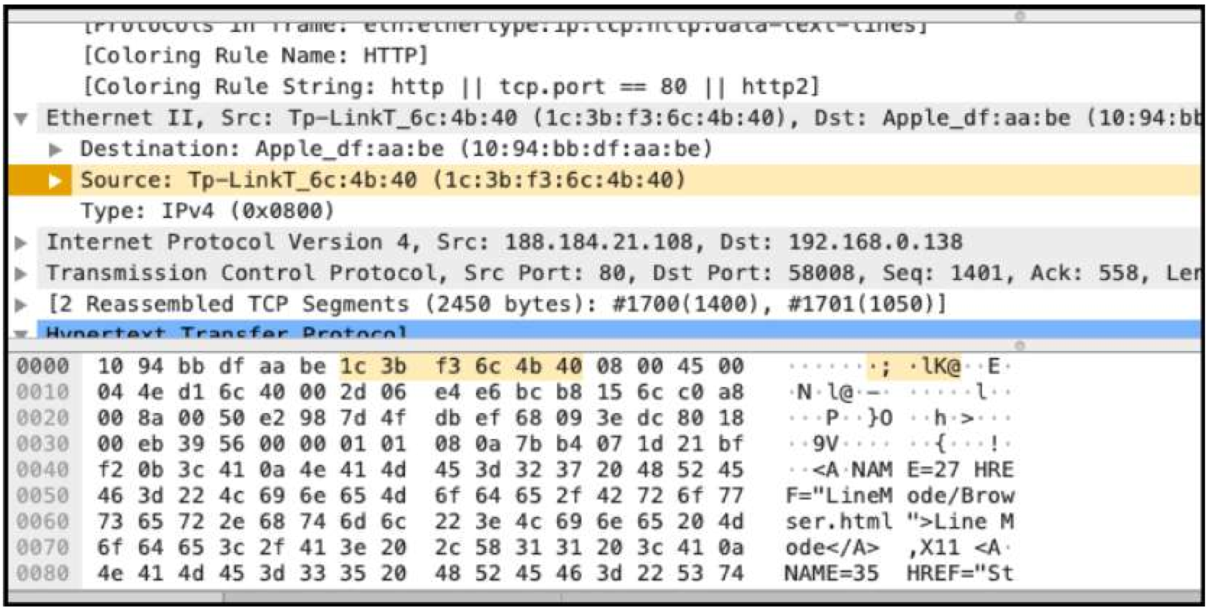
PC's NIC : Apple_df
Servers's NIC : Tp-LinkT_6c

Q8

8. What are the Hex values (shown the raw bytes panel) of the two NICS Manufacturers OUIs?



```
    [Protocols in frame: eth:ethertype:ip:tcp:http:data-text-lines]
    [Coloring Rule Name: HTTP]
    [Coloring Rule String: http || tcp.port == 80 || http2]
▼ Ethernet II, Src: Tp-LinkT_6c:4b:40 (1c:3b:f3:6c:4b:40), Dst: Apple_df:aa:be (10:94:bb:df
  ▶ Destination: Apple_df:aa:be (10:94:bb:df:aa:be)
  ▶ Source: Tp-LinkT_6c:4b:40 (1c:3b:f3:6c:4b:40)
    Type: IPv4 (0x0800)
▶ Internet Protocol Version 4, Src: 188.184.21.108, Dst: 192.168.0.138
▶ Transmission Control Protocol, Src Port: 80, Dst Port: 58008, Seq: 1401, Ack: 558, Len: 1
▶ [2 Reassembled TCP Segments (2450 bytes): #1700(1400), #1701(1050)]
▼ Hypertext Transfer Protocol

0000  10 94 bb df aa be 1c 3b  f3 6c 4b 40 08 00 45 00   ·······; ·lK@··E·
0010  04 4e d1 6c 40 00 2d 06  e4 e6 bc b8 15 6c c0 a8   ·N·l@·-· ·····l··
0020  00 8a 00 50 e2 98 7d 4f  db ef 68 09 3e dc 80 18   ···P··}O ··h·>···
0030  00 eb 39 56 00 00 01 01  08 0a 7b b4 07 1d 21 bf   ··9V···· ··{···!·
0040  f2 0b 3c 41 0a 4e 41 4d  45 3d 32 37 20 48 52 45   ··<A·NAM E=27 HRE
0050  46 3d 22 4c 69 6e 65 4d  6f 64 65 2f 42 72 6f 77   F="LineM ode/Brow
0060  73 65 72 2e 68 74 6d 6c  22 3e 4c 69 6e 65 20 4d   ser.html ">Line M
0070  6f 64 65 3c 2f 41 3e 20  2c 58 31 31 20 3c 41 0a   ode</A>  ,X11 <A·
0080  4e 41 4d 45 3d 33 35 20  48 52 45 46 3d 22 53 74   NAME=35  HREF="St
```



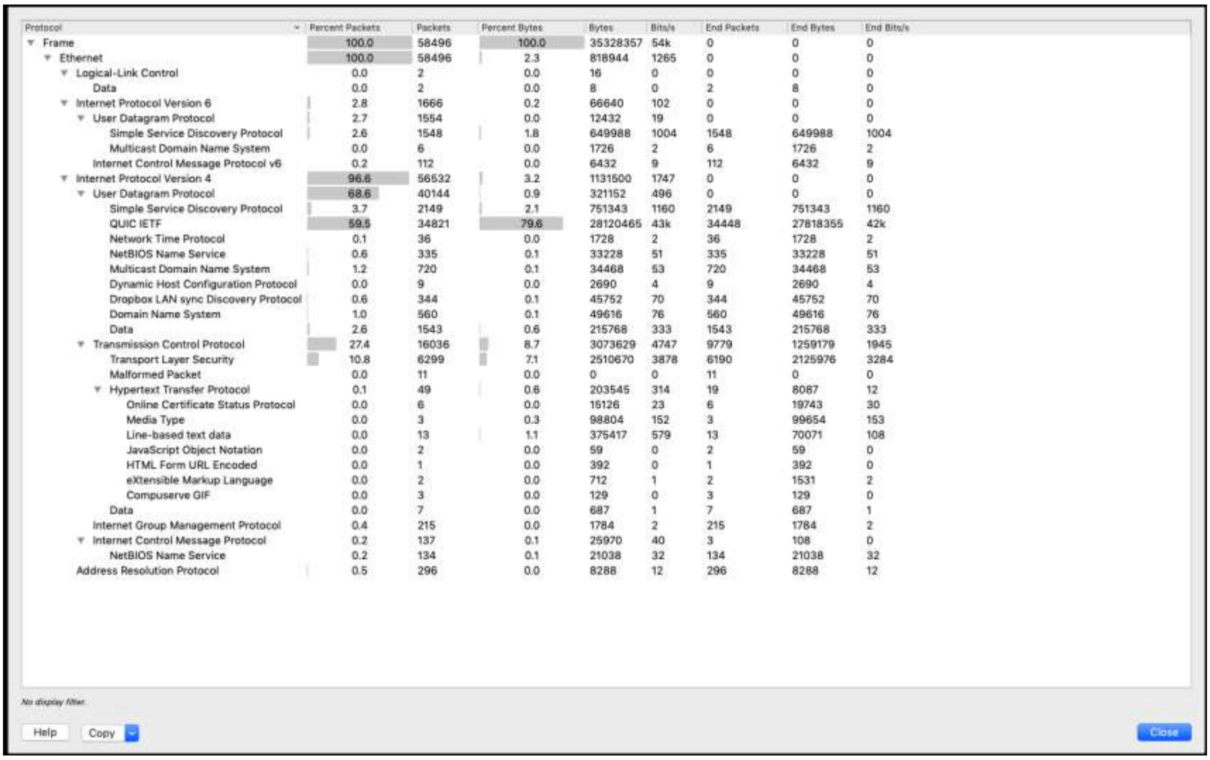
```
    [Protocols in frame: eth:ethertype:ip:tcp:http:data-text-lines]
    [Coloring Rule Name: HTTP]
    [Coloring Rule String: http || tcp.port == 80 || http2]
▼ Ethernet II, Src: Tp-LinkT_6c:4b:40 (1c:3b:f3:6c:4b:40), Dst: Apple_df:aa:be (10:94:bb
  ▶ Destination: Apple_df:aa:be (10:94:bb:df:aa:be)
  ▶ Source: Tp-LinkT_6c:4b:40 (1c:3b:f3:6c:4b:40)
    Type: IPv4 (0x0800)
▶ Internet Protocol Version 4, Src: 188.184.21.108, Dst: 192.168.0.138
▶ Transmission Control Protocol, Src Port: 80, Dst Port: 58008, Seq: 1401, Ack: 558, Len
▶ [2 Reassembled TCP Segments (2450 bytes): #1700(1400), #1701(1050)]
▼ Hypertext Transfer Protocol

0000  10 94 bb df aa be 1c 3b  f3 6c 4b 40 08 00 45 00   ·······; ·lK@··E·
0010  04 4e d1 6c 40 00 2d 06  e4 e6 bc b8 15 6c c0 a8   ·N·l@·-· ·····l··
0020  00 8a 00 50 e2 98 7d 4f  db ef 68 09 3e dc 80 18   ···P··}O ··h·>···
0030  00 eb 39 56 00 00 01 01  08 0a 7b b4 07 1d 21 bf   ··9V···· ··{···!·
0040  f2 0b 3c 41 0a 4e 41 4d  45 3d 32 37 20 48 52 45   ··<A·NAM E=27 HRE
0050  46 3d 22 4c 69 6e 65 4d  6f 64 65 2f 42 72 6f 77   F="LineM ode/Brow
0060  73 65 72 2e 68 74 6d 6c  22 3e 4c 69 6e 65 20 4d   ser.html ">Line M
0070  6f 64 65 3c 2f 41 3e 20  2c 58 31 31 20 3c 41 0a   ode</A>  ,X11 <A·
0080  4e 41 4d 45 3d 33 35 20  48 52 45 46 3d 22 53 74   NAME=35  HREF="St
```

Q9

9. Find the following statistics:

a. What percentage of packets in your capture are TCP, and give an example of the higher level protocol which uses TCP?

b. What percentage of packets in your capture are UDP, and give an example of the higher level protocol which uses UDP?



Protocol	Percent Packets	Packets	Percent Bytes	Bytes	Bits/s	End Packets	End Bytes	End Bits/s
▼ Frame	100.0	58496	100.0	35328357	54k	0	0	0
▼ Ethernet	100.0	58496	2.3	818944	1265	0	0	0
▼ Logical-Link Control	0.0	2	0.0	16	0	0	0	0
Data	0.0	2	0.0	8	0	2	8	0
▼ Internet Protocol Version 6	2.8	1666	0.2	66640	102	0	0	0
▼ User Datagram Protocol	2.7	1554	0.0	12432	19	0	0	0
Simple Service Discovery Protocol	2.6	1548	1.8	649988	1004	1548	649988	1004
Multicast Domain Name System	0.0	6	0.0	1726	2	6	1726	2
Internet Control Message Protocol v6	0.2	112	0.0	6432	9	112	6432	9
▼ Internet Protocol Version 4	96.6	56532	3.2	1131500	1747	0	0	0
▼ User Datagram Protocol	68.6	40144	0.9	321152	496	0	0	0
Simple Service Discovery Protocol	3.7	2149	2.1	751343	1160	2149	751343	1160
QUIC IETF	59.5	34821	79.6	28120465	43k	34448	27818355	42k
Network Time Protocol	0.1	36	0.0	1728	2	36	1728	2
NetBIOS Name Service	0.6	335	0.1	33228	51	335	33228	51
Multicast Domain Name System	1.2	720	0.1	34468	53	720	34468	53
Dynamic Host Configuration Protocol	0.0	9	0.0	2690	4	9	2690	4
Dropbox LAN sync Discovery Protocol	0.6	344	0.1	45752	70	344	45752	70
Domain Name System	1.0	560	0.1	49616	76	560	49616	76
Data	2.6	1543	0.6	215768	333	1543	215768	333
▼ Transmission Control Protocol	27.4	16036	8.7	3073629	4747	9779	1259179	1945
Transport Layer Security	10.8	6299	7.1	2510670	3878	6190	2125976	3284
Malformed Packet	0.0	11	0.0	0	0	11	0	0
▼ Hypertext Transfer Protocol	0.1	49	0.6	203545	314	19	8087	12
Online Certificate Status Protocol	0.0	6	0.0	15126	23	6	19743	30
Media Type	0.0	3	0.3	98804	152	3	99654	153
Line-based text data	0.0	13	1.1	375417	579	13	70071	108
JavaScript Object Notation	0.0	2	0.0	59	0	2	59	0
HTML Form URL Encoded	0.0	1	0.0	392	0	1	392	0
eXtensible Markup Language	0.0	2	0.0	712	1	2	1531	2
Compuserve GIF	0.0	3	0.0	129	0	3	129	0
Data	0.0	7	0.0	687	1	7	687	1
Internet Group Management Protocol	0.4	215	0.0	1784	2	215	1784	2
▼ Internet Control Message Protocol	0.2	137	0.1	25970	40	3	108	0
NetBIOS Name Service	0.2	134	0.1	21038	32	134	21038	32
Address Resolution Protocol	0.5	296	0.0	8288	12	296	8288	12

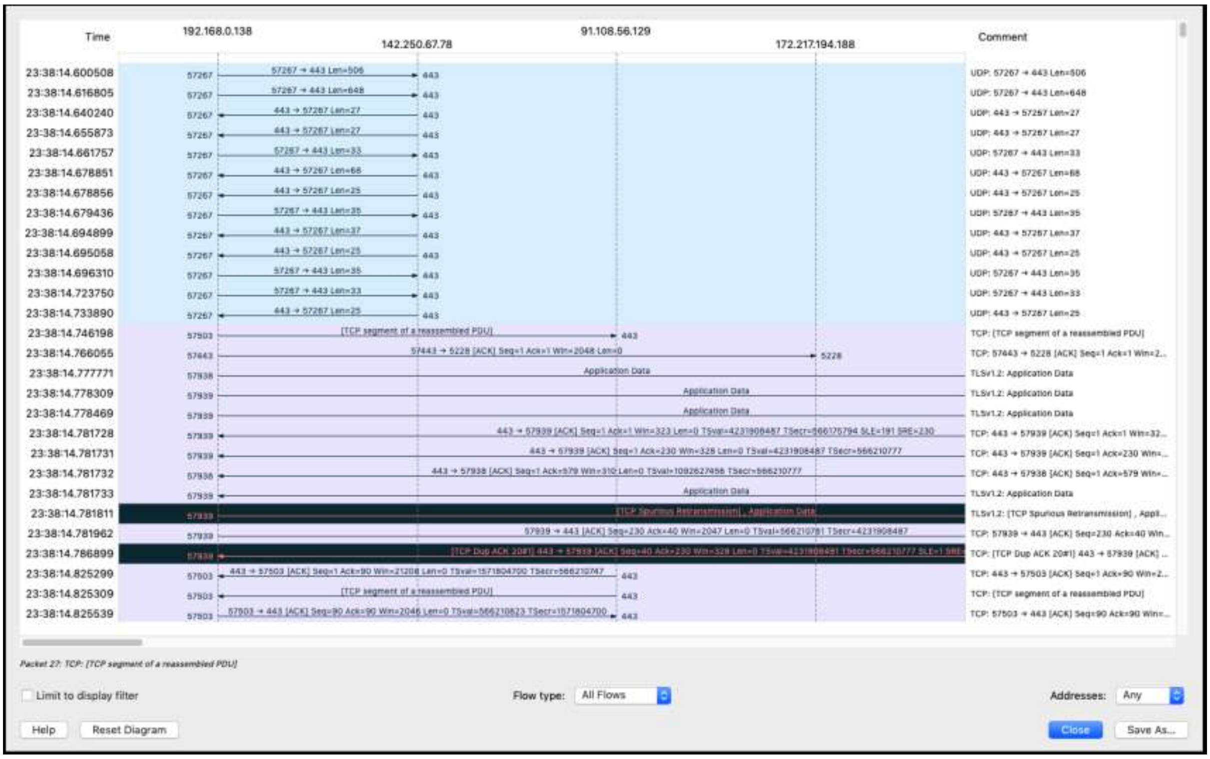
No display filter.

a. TCP Packet Percentage : 27.4% . A high level protocol that uses TCP is HTTP.

b. UDP Packet Percentage : 68.6%. A high level protocol that uses UDP is DNS.

Q10

10. Find the traffic flow Select the Statistics->Flow Graph menu option. Choose General Flow and Network Source options, and click the OK button.



Time	192.168.0.138		142.250.67.78	91.108.56.129	172.217.194.188	Comment
23:38:14.600508	57267	57267 → 443 Len=506	443			UDP: 57267 → 443 Len=506
23:38:14.616805	57267	57267 → 443 Len=648	443			UDP: 57267 → 443 Len=648
23:38:14.640240	57267	443 → 57267 Len=27	443			UDP: 443 → 57267 Len=27
23:38:14.655873	57267	443 → 57267 Len=27	443			UDP: 443 → 57267 Len=27
23:38:14.661757	57267	57267 → 443 Len=33	443			UDP: 57267 → 443 Len=33
23:38:14.678851	57267	443 → 57267 Len=68	443			UDP: 443 → 57267 Len=68
23:38:14.678856	57267	443 → 57267 Len=25	443			UDP: 443 → 57267 Len=25
23:38:14.679436	57267	57267 → 443 Len=35	443			UDP: 57267 → 443 Len=35
23:38:14.694899	57267	443 → 57267 Len=37	443			UDP: 443 → 57267 Len=37
23:38:14.695058	57267	443 → 57267 Len=25	443			UDP: 443 → 57267 Len=25
23:38:14.696310	57267	57267 → 443 Len=35	443			UDP: 57267 → 443 Len=35
23:38:14.723750	57267	57267 → 443 Len=33	443			UDP: 57267 → 443 Len=33
23:38:14.733890	57267	443 → 57267 Len=25	443			UDP: 443 → 57267 Len=25
23:38:14.746198	57503	[TCP segment of a reassembled PDU]		443		TCP: [TCP segment of a reassembled PDU]
23:38:14.766055	57443	57443 → 5228 [ACK] Seq=1 Ack=1 Win=2048 Len=0			5228	TCP: 57443 → 5228 [ACK] Seq=1 Ack=1 Win=2...
23:38:14.777771	57938	Application Data				TLSv1.2: Application Data
23:38:14.778309	57939	Application Data				TLSv1.2: Application Data
23:38:14.778469	57939	Application Data				TLSv1.2: Application Data
23:38:14.781728	57939	443 → 57939 [ACK] Seq=1 Ack=1 Win=323 Len=0 TSval=4231908487 TSecr=566175794 SLE=191 SRE=230				TCP: 443 → 57939 [ACK] Seq=1 Ack=1 Win=32...
23:38:14.781731	57939	443 → 57939 [ACK] Seq=1 Ack=230 Win=328 Len=0 TSval=4231908487 TSecr=566210777				TCP: 443 → 57939 [ACK] Seq=1 Ack=230 Win=...
23:38:14.781732	57938	443 → 57938 [ACK] Seq=1 Ack=579 Win=310 Len=0 TSval=1092627456 TSecr=566210777				TCP: 443 → 57938 [ACK] Seq=1 Ack=579 Win=...
23:38:14.781733	57939	Application Data				TLSv1.2: Application Data
23:38:14.781811	57939	[TCP Spurious Retransmission] , Application Data				TLSv1.2: [TCP Spurious Retransmission] , Appl...
23:38:14.781962	57939	57939 → 443 [ACK] Seq=230 Ack=40 Win=2047 Len=0 TSval=566210781 TSecr=4231908487				TCP: 57939 → 443 [ACK] Seq=230 Ack=40 Win...
23:38:14.786899	57939	[TCP Dup ACK 20#1] 443 → 57939 [ACK] Seq=40 Ack=230 Win=328 Len=0 TSval=4231908491 TSecr=566210777 SLE=1 SRE				TCP: [TCP Dup ACK 20#1] 443 → 57939 [ACK] ...
23:38:14.825299	57503	443 → 57503 [ACK] Seq=1 Ack=90 Win=21208 Len=0 TSval=1571804700 TSecr=566210747		443		TCP: 443 → 57503 [ACK] Seq=1 Ack=90 Win=2...
23:38:14.825309	57503	[TCP segment of a reassembled PDU]		443		TCP: [TCP segment of a reassembled PDU]
23:38:14.825539	57503	57503 → 443 [ACK] Seq=90 Ack=90 Win=2046 Len=0 TSval=566210823 TSecr=1571804700		443		TCP: 57503 → 443 [ACK] Seq=90 Ack=90 Win=...

Packet 27: TCP: [TCP segment of a reassembled PDU]

□ Limit to display filter

Flow type: All Flows

Addresses: Any