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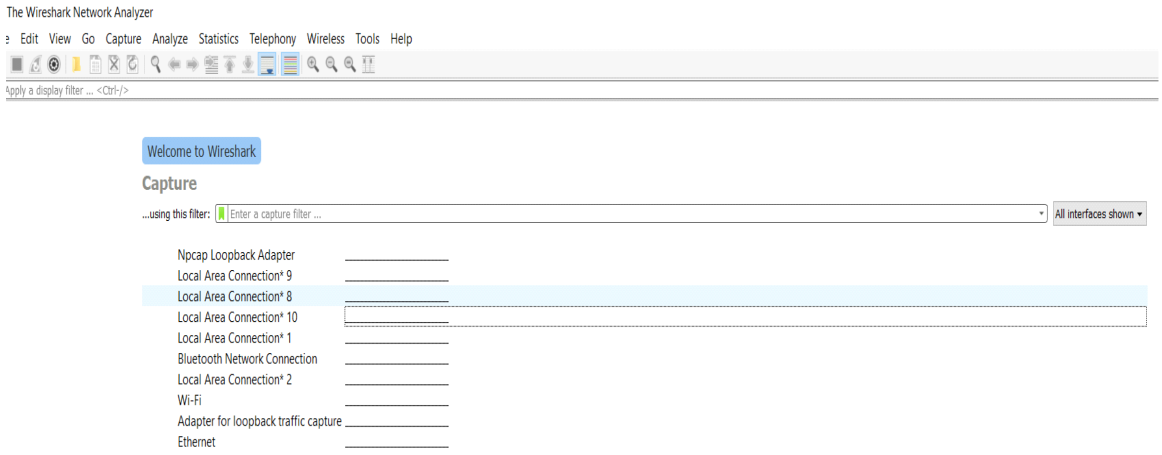
CSE3501 INFORMATION SECURITY ANALYSIS AND AUDIT

EXERCISE - 1

DATE: 16.07.2020

Implement the following in Wireshark:

1. Wireshark Download, Installation and Configuration

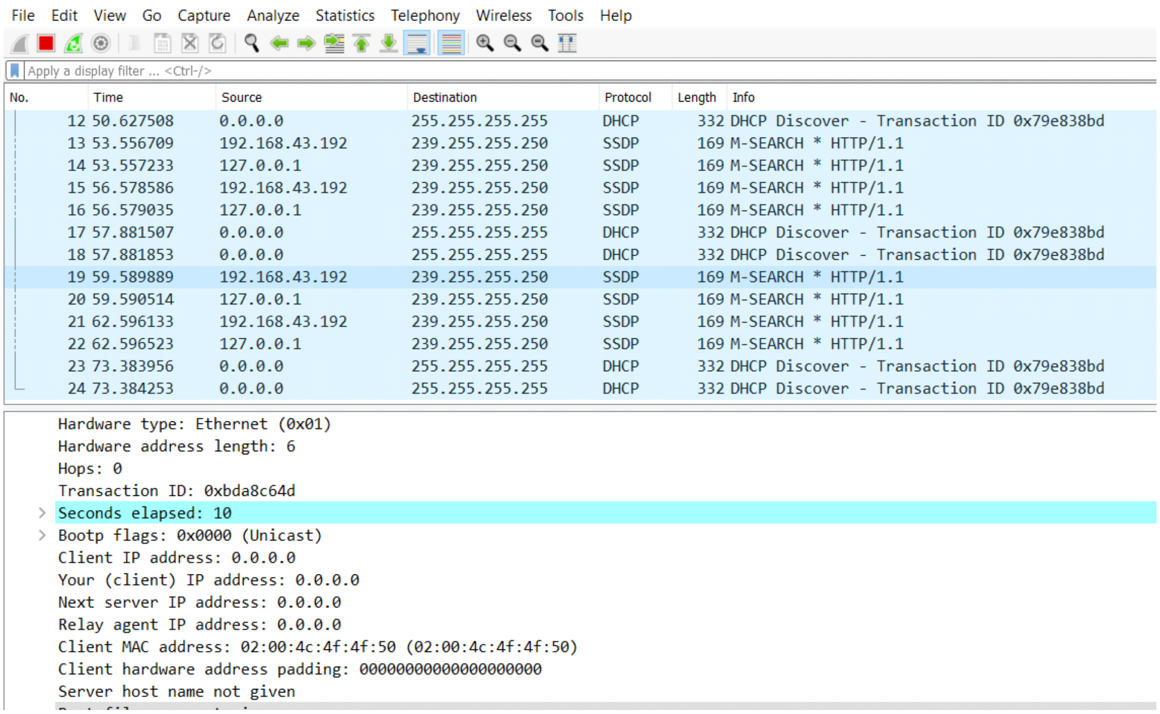

The Wireshark Network Analyzer
e Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Apply a display filter … <Ctrl-/>
Welcome to Wireshark
Capture
…using this filter:
Enter a capture filter …
All interfaces shown ▾

Npcap Loopback Adapter
Local Area Connection* 9
Local Area Connection* 8
Local Area Connection* 10
Local Area Connection* 1
Bluetooth Network Connection
Local Area Connection* 2
Wi-Fi
Adapter for loopback traffic capture
Ethernet

2. Wireshark Tool Functionality understanding

a. Interface

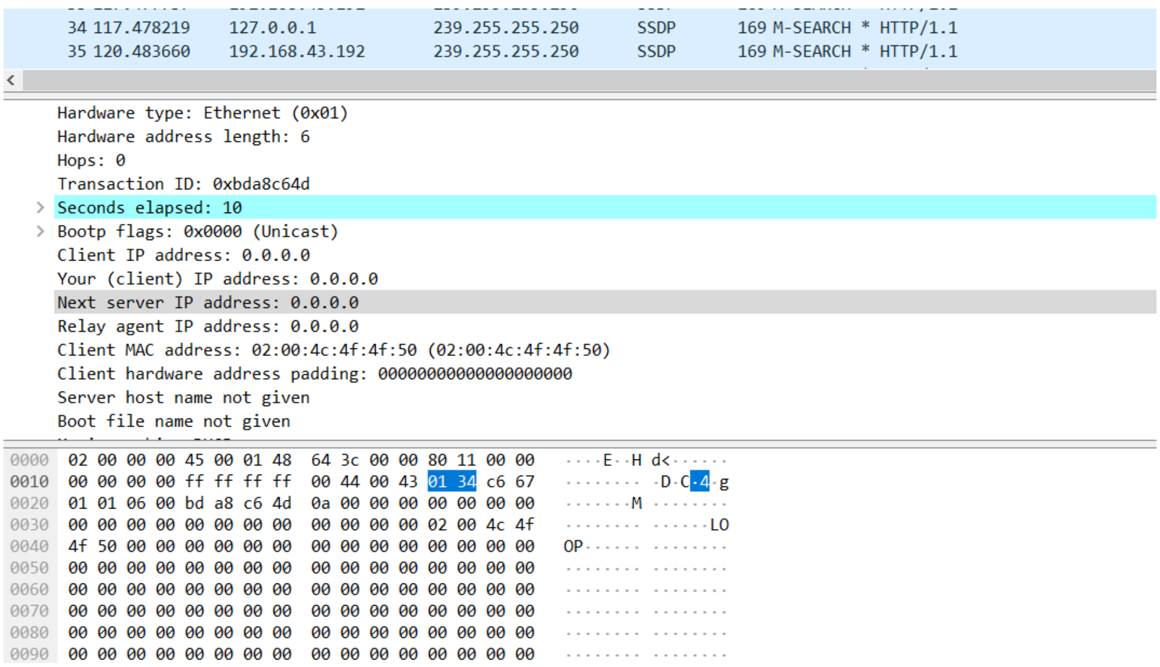
b. Packet capture – Browser instance



```
No.  Time         Source          Destination       Protocol  Length  Info
  12 50.627508    0.0.0.0         255.255.255.255   DHCP       332 DHCP Discover - Transaction ID 0x79e838bd
  13 53.556709    192.168.43.192  239.255.255.250   SSDP       169 M-SEARCH * HTTP/1.1
  14 53.557233    127.0.0.1       239.255.255.250   SSDP       169 M-SEARCH * HTTP/1.1
  15 56.578586    192.168.43.192  239.255.255.250   SSDP       169 M-SEARCH * HTTP/1.1
  16 56.579035    127.0.0.1       239.255.255.250   SSDP       169 M-SEARCH * HTTP/1.1
  17 57.881507    0.0.0.0         255.255.255.255   DHCP       332 DHCP Discover - Transaction ID 0x79e838bd
  18 57.881853    0.0.0.0         255.255.255.255   DHCP       332 DHCP Discover - Transaction ID 0x79e838bd
  19 59.589889    192.168.43.192  239.255.255.250   SSDP       169 M-SEARCH * HTTP/1.1
  20 59.590514    127.0.0.1       239.255.255.250   SSDP       169 M-SEARCH * HTTP/1.1
  21 62.596133    192.168.43.192  239.255.255.250   SSDP       169 M-SEARCH * HTTP/1.1
  22 62.596523    127.0.0.1       239.255.255.250   SSDP       169 M-SEARCH * HTTP/1.1
  23 73.383956    0.0.0.0         255.255.255.255   DHCP       332 DHCP Discover - Transaction ID 0x79e838bd
  24 73.384253    0.0.0.0         255.255.255.255   DHCP       332 DHCP Discover - Transaction ID 0x79e838bd
```

```
    Hardware type: Ethernet (0x01)
    Hardware address length: 6
    Hops: 0
    Transaction ID: 0xbda8c64d
  > Seconds elapsed: 10
  > Bootp flags: 0x0000 (Unicast)
    Client IP address: 0.0.0.0
    Your (client) IP address: 0.0.0.0
    Next server IP address: 0.0.0.0
    Relay agent IP address: 0.0.0.0
    Client MAC address: 02:00:4c:4f:4f:50 (02:00:4c:4f:4f:50)
    Client hardware address padding: 00000000000000000000
    Server host name not given
```

c. Analysis

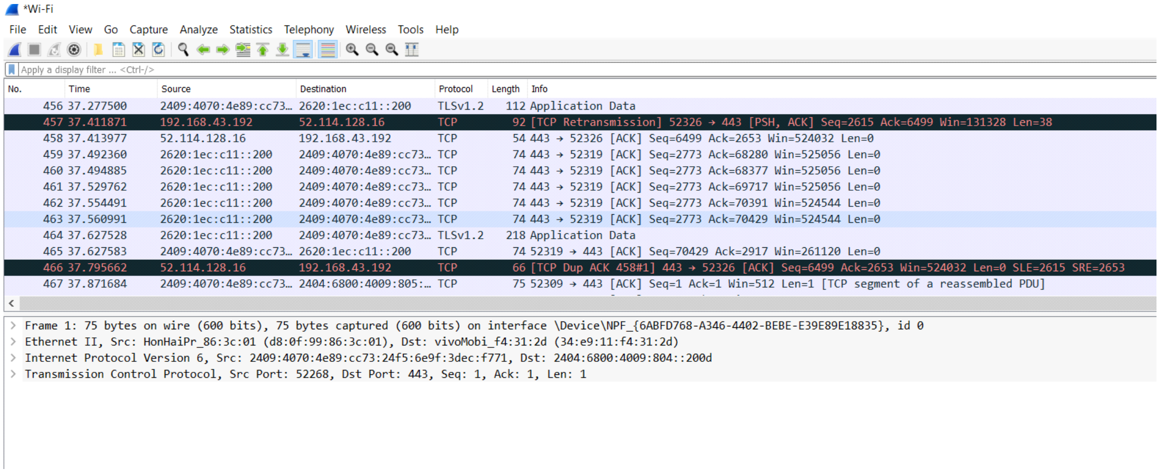


```
  34 117.478219    127.0.0.1        239.255.255.250    SSDP      169 M-SEARCH * HTTP/1.1
  35 120.483660    192.168.43.192   239.255.255.250    SSDP      169 M-SEARCH * HTTP/1.1
```

```
    Hardware type: Ethernet (0x01)
    Hardware address length: 6
    Hops: 0
    Transaction ID: 0xbda8c64d
  > Seconds elapsed: 10
  > Bootp flags: 0x0000 (Unicast)
    Client IP address: 0.0.0.0
    Your (client) IP address: 0.0.0.0
    Next server IP address: 0.0.0.0
    Relay agent IP address: 0.0.0.0
    Client MAC address: 02:00:4c:4f:4f:50 (02:00:4c:4f:4f:50)
    Client hardware address padding: 00000000000000000000
    Server host name not given
    Boot file name not given
```

```
0000  02 00 00 00 45 00 01 48  64 3c 00 00 80 11 00 00   ····E··H d<······
0010  00 00 00 00 ff ff ff ff  00 44 00 43 01 34 c6 67   ········ ·D·C·4·g
0020  01 01 06 00 bd a8 c6 4d  0a 00 00 00 00 00 00 00   ·······M ········
0030  00 00 00 00 00 00 00 00  00 00 00 00 02 00 4c 4f   ········ ······LO
0040  4f 50 00 00 00 00 00 00  00 00 00 00 00 00 00 00   OP······ ········
0050  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ········ ········
0060  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ········ ········
0070  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ········ ········
0080  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ········ ········
0090  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ········ ········
```

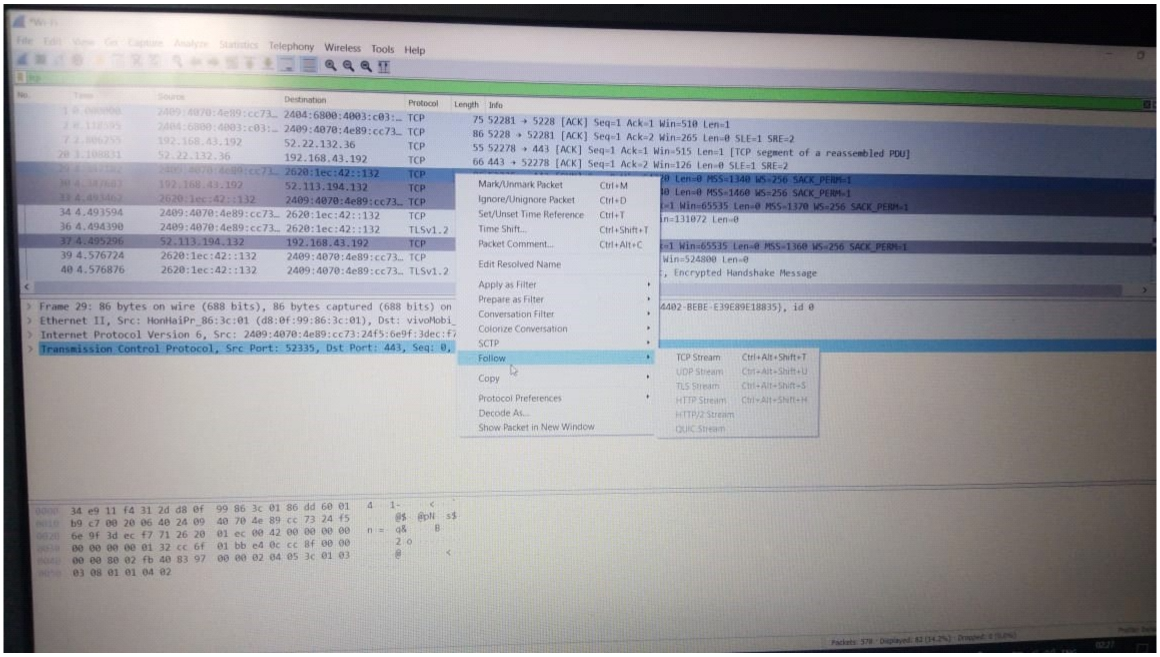
d. Network Flow : TCP/UDP Stream follow



*Wi-Fi
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Apply a display filter ... <Ctrl-/>

```
No.   Time       Source                Destination           Protocol Length Info
  456 37.277500  2409:4070:4e89:cc73…  2620:1ec:c11::200     TLSv1.2  112 Application Data
  457 37.411871  192.168.43.192        52.114.128.16         TCP       92 [TCP Retransmission] 52326 → 443 [PSH, ACK] Seq=2615 Ack=6499 Win=131328 Len=38
  458 37.413977  52.114.128.16         192.168.43.192        TCP       54 443 → 52326 [ACK] Seq=6499 Ack=2653 Win=524032 Len=0
  459 37.492360  2620:1ec:c11::200     2409:4070:4e89:cc73…  TCP       74 443 → 52319 [ACK] Seq=2773 Ack=68280 Win=525056 Len=0
  460 37.494885  2620:1ec:c11::200     2409:4070:4e89:cc73…  TCP       74 443 → 52319 [ACK] Seq=2773 Ack=68377 Win=525056 Len=0
  461 37.529762  2620:1ec:c11::200     2409:4070:4e89:cc73…  TCP       74 443 → 52319 [ACK] Seq=2773 Ack=69717 Win=525056 Len=0
  462 37.554491  2620:1ec:c11::200     2409:4070:4e89:cc73…  TCP       74 443 → 52319 [ACK] Seq=2773 Ack=70391 Win=524544 Len=0
  463 37.560991  2620:1ec:c11::200     2409:4070:4e89:cc73…  TCP       74 443 → 52319 [ACK] Seq=2773 Ack=70429 Win=524544 Len=0
  464 37.627528  2620:1ec:c11::200     2409:4070:4e89:cc73…  TLSv1.2  218 Application Data
  465 37.627583  2409:4070:4e89:cc73…  2620:1ec:c11::200     TCP       74 52319 → 443 [ACK] Seq=70429 Ack=2917 Win=261120 Len=0
  466 37.795662  52.114.128.16         192.168.43.192        TCP       66 [TCP Dup ACK 458#1] 443 → 52326 [ACK] Seq=6499 Ack=2653 Win=524032 Len=0 SLE=2615 SRE=2653
  467 37.871684  2409:4070:4e89:cc73…  2404:6800:4009:805:…  TCP       75 52309 → 443 [ACK] Seq=1 Ack=1 Win=512 Len=1 [TCP segment of a reassembled PDU]

> Frame 1: 75 bytes on wire (600 bits), 75 bytes captured (600 bits) on interface \Device\NPF_{6ABFD768-A346-4402-BEBE-E39E89E18835}, id 0
> Ethernet II, Src: HonHaiPr_86:3c:01 (d8:0f:99:86:3c:01), Dst: vivoMobi_f4:31:2d (34:e9:11:f4:31:2d)
> Internet Protocol Version 6, Src: 2409:4070:4e89:cc73:24f5:6e9f:3dec:f771, Dst: 2404:6800:4009:804::200d
> Transmission Control Protocol, Src Port: 52268, Dst Port: 443, Seq: 1, Ack: 1, Len: 1
```



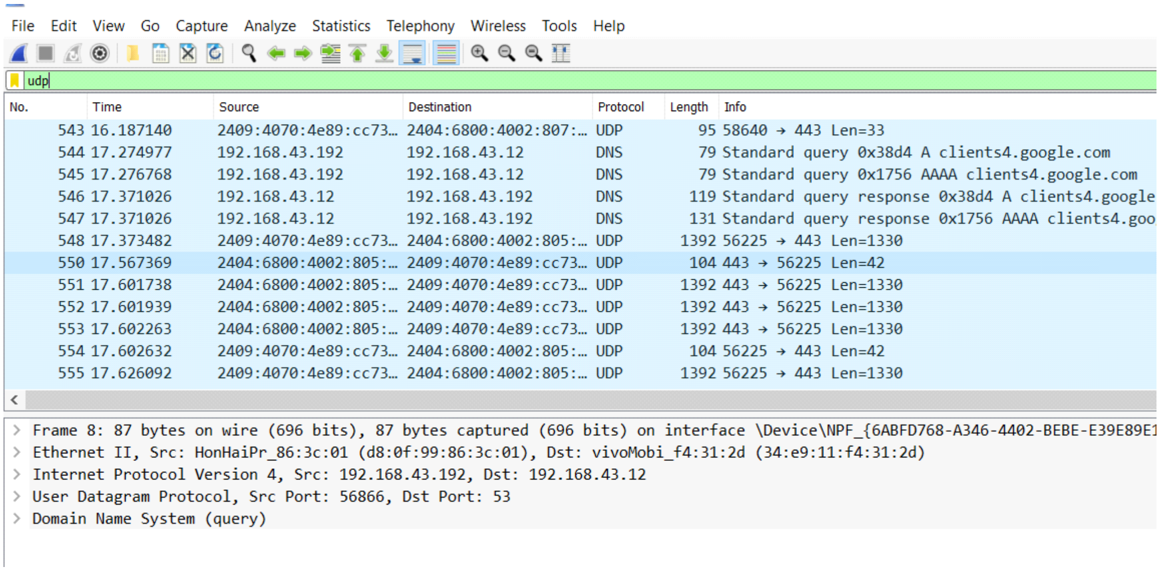
*Wi-Fi
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
tcp
Mark/Unmark Packet Ctrl+M
Ignore/Unignore Packet Ctrl+D
Set/Unset Time Reference Ctrl+T
Time Shift... Ctrl+Shift+T
Packet Comment... Ctrl+Alt+C
Edit Resolved Name
Apply as Filter
Prepare as Filter
Conversation Filter
Colorize Conversation
SCTP
Follow
Copy
Protocol Preferences
Decode As...
Show Packet in New Window
TCP Stream Ctrl+Alt+Shift+T
UDP Stream Ctrl+Alt+Shift+U
TLS Stream Ctrl+Alt+Shift+S
HTTP Stream Ctrl+Alt+Shift+H
HTTP/2 Stream
QUIC Stream

```
No.  Time       Source                Destination           Protocol Length Info
   1 0.000000   2409:4070:4e89:cc73…  2404:6800:4003:c03:…  TCP      75 52281 → 5228 [ACK] Seq=1 Ack=1 Win=510 Len=1
   2 0.118595   2404:6800:4003:c03:…  2409:4070:4e89:cc73…  TCP      86 5228 → 52281 [ACK] Seq=1 Ack=2 Win=265 Len=0 SLE=1 SRE=2
   7 2.806255   192.168.43.192        52.22.132.36          TCP      55 52278 → 443 [ACK] Seq=1 Ack=1 Win=515 Len=1 [TCP segment of a reassembled PDU]
  20 3.108831   52.22.132.36          192.168.43.192        TCP      66 443 → 52278 [ACK] Seq=1 Ack=2 Win=126 Len=0 SLE=1 SRE=2
  29 4.347182   2409:4070:4e89:cc73…  2620:1ec:42::132      TCP      …0 Len=0 MSS=1340 WS=256 SACK_PERM=1
  30 4.347603   192.168.43.192        52.113.194.132        TCP      …0 Len=0 MSS=1460 WS=256 SACK_PERM=1
  33 4.493462   2620:1ec:42::132      2409:4070:4e89:cc73…  TCP      …=1 Win=65535 Len=0 MSS=1370 WS=256 SACK_PERM=1
  34 4.493594   2409:4070:4e89:cc73…  2620:1ec:42::132      TCP      …in=131072 Len=0
  36 4.494390   2409:4070:4e89:cc73…  2620:1ec:42::132      TLSv1.2
  37 4.495296   52.113.194.132        192.168.43.192        TCP      …=1 Win=65535 Len=0 MSS=1360 WS=256 SACK_PERM=1
  39 4.576724   2620:1ec:42::132      2409:4070:4e89:cc73…  TCP      … Win=524800 Len=0
  40 4.576876   2620:1ec:42::132      2409:4070:4e89:cc73…  TLSv1.2  …, Encrypted Handshake Message

> Frame 29: 86 bytes on wire (688 bits), 86 bytes captured (688 bits) on …4402-BEBE-E39E89E18835}, id 0
> Ethernet II, Src: HonHaiPr_86:3c:01 (d8:0f:99:86:3c:01), Dst: vivoMobi_
> Internet Protocol Version 6, Src: 2409:4070:4e89:cc73:24f5:6e9f:3dec:f7
> Transmission Control Protocol, Src Port: 52335, Dst Port: 443, Seq: 0,

0000  34 e9 11 f4 31 2d d8 0f  99 86 3c 01 86 dd 60 01   4  1-    <
0010  b9 c7 00 20 06 40 24 09  40 70 4e 89 cc 73 24 f5      @$ @pN  s$
0020  6e 9f 3d ec f7 71 26 20  01 ec 00 42 00 00 00 00   n = q&     B
0030  00 00 00 00 01 32 cc 6f  01 bb e4 0c cc 8f 00 00      2 o
0040  00 00 80 02 fb 40 83 97  00 00 02 04 05 3c 01 03      @       <
0050  03 08 01 01 04 02
```

By the above screenshots   if we follow TCP we will get only TCP stream



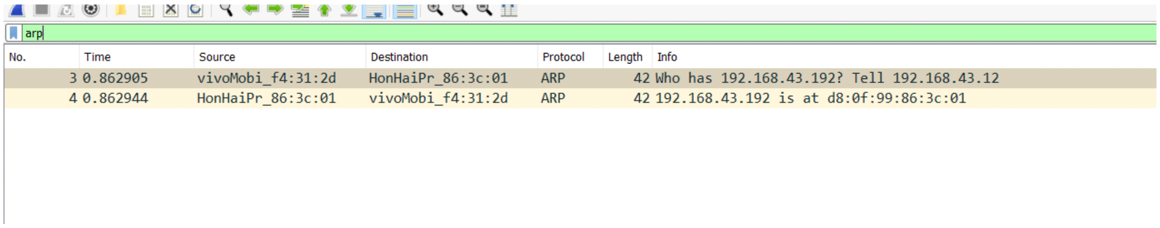
```
udp
```

```
No.      Time        Source                  Destination             Protocol  Length  Info
     543 16.187140   2409:4070:4e89:cc73…  2404:6800:4002:807:…  UDP         95 58640 → 443 Len=33
     544 17.274977   192.168.43.192        192.168.43.12         DNS         79 Standard query 0x38d4 A clients4.google.com
     545 17.276768   192.168.43.192        192.168.43.12         DNS         79 Standard query 0x1756 AAAA clients4.google.com
     546 17.371026   192.168.43.12         192.168.43.192        DNS        119 Standard query response 0x38d4 A clients4.google
     547 17.371026   192.168.43.12         192.168.43.192        DNS        131 Standard query response 0x1756 AAAA clients4.goo
     548 17.373482   2409:4070:4e89:cc73…  2404:6800:4002:805:…  UDP       1392 56225 → 443 Len=1330
     550 17.567369   2404:6800:4002:805:…  2409:4070:4e89:cc73…  UDP        104 443 → 56225 Len=42
     551 17.601738   2404:6800:4002:805:…  2409:4070:4e89:cc73…  UDP       1392 443 → 56225 Len=1330
     552 17.601939   2404:6800:4002:805:…  2409:4070:4e89:cc73…  UDP       1392 443 → 56225 Len=1330
     553 17.602263   2404:6800:4002:805:…  2409:4070:4e89:cc73…  UDP       1392 443 → 56225 Len=1330
     554 17.602632   2409:4070:4e89:cc73…  2404:6800:4002:805:…  UDP        104 56225 → 443 Len=42
     555 17.626092   2409:4070:4e89:cc73…  2404:6800:4002:805:…  UDP       1392 56225 → 443 Len=1330
```

```
> Frame 8: 87 bytes on wire (696 bits), 87 bytes captured (696 bits) on interface \Device\NPF_{6ABFD768-A346-4402-BEBE-E39E89E1
> Ethernet II, Src: HonHaiPr_86:3c:01 (d8:0f:99:86:3c:01), Dst: vivoMobi_f4:31:2d (34:e9:11:f4:31:2d)
> Internet Protocol Version 4, Src: 192.168.43.192, Dst: 192.168.43.12
> User Datagram Protocol, Src Port: 56866, Dst Port: 53
> Domain Name System (query)
```

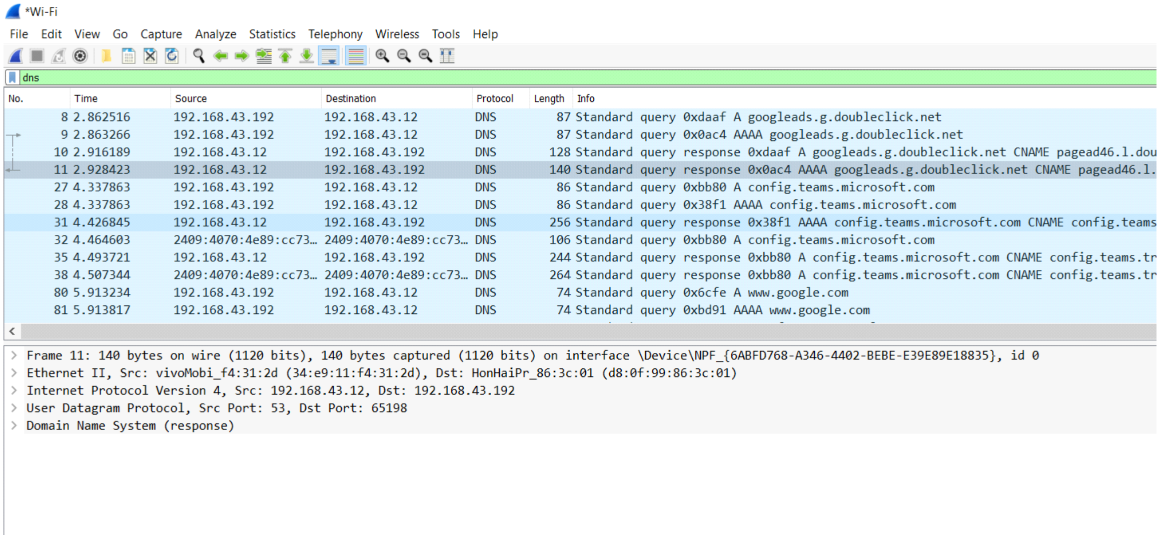
By the above screenshots if we follow DNS we will get only UDP stream.

e. Packet Filter [arp,dns ,tslv filter]



```
arp
```

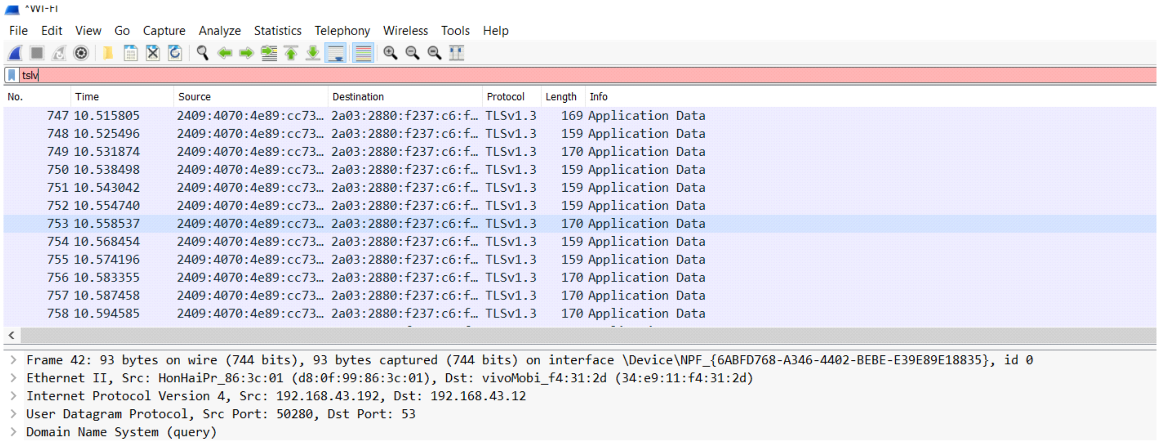
```
No.      Time       Source             Destination        Protocol  Length  Info
       3 0.862905   vivoMobi_f4:31:2d  HonHaiPr_86:3c:01  ARP         42 Who has 192.168.43.192? Tell 192.168.43.12
       4 0.862944   HonHaiPr_86:3c:01  vivoMobi_f4:31:2d  ARP         42 192.168.43.192 is at d8:0f:99:86:3c:01
```


*Wi-Fi
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

```
dns
```

```
No.   Time       Source               Destination          Protocol  Length Info
    8 2.862516   192.168.43.192       192.168.43.12        DNS         87 Standard query 0xdaaf A googleads.g.doubleclick.net
    9 2.863266   192.168.43.192       192.168.43.12        DNS         87 Standard query 0x0ac4 AAAA googleads.g.doubleclick.net
   10 2.916189   192.168.43.12        192.168.43.192       DNS        128 Standard query response 0xdaaf A googleads.g.doubleclick.net CNAME pagead46.l.dou
   11 2.928423   192.168.43.12        192.168.43.192       DNS        140 Standard query response 0x0ac4 AAAA googleads.g.doubleclick.net CNAME pagead46.l.
   27 4.337863   192.168.43.192       192.168.43.12        DNS         86 Standard query 0xbb80 A config.teams.microsoft.com
   28 4.337863   192.168.43.192       192.168.43.12        DNS         86 Standard query 0x38f1 AAAA config.teams.microsoft.com
   31 4.426845   192.168.43.12        192.168.43.192       DNS        256 Standard query response 0x38f1 AAAA config.teams.microsoft.com CNAME config.teams
   32 4.464603   2409:4070:4e89:cc73… 2409:4070:4e89:cc73… DNS        106 Standard query 0xbb80 A config.teams.microsoft.com
   35 4.493721   192.168.43.12        192.168.43.192       DNS        244 Standard query response 0xbb80 A config.teams.microsoft.com CNAME config.teams.tr
   38 4.507344   2409:4070:4e89:cc73… 2409:4070:4e89:cc73… DNS        264 Standard query response 0xbb80 A config.teams.microsoft.com CNAME config.teams.tr
   80 5.913234   192.168.43.192       192.168.43.12        DNS         74 Standard query 0x6cfe A www.google.com
   81 5.913817   192.168.43.192       192.168.43.12        DNS         74 Standard query 0xbd91 AAAA www.google.com
```

```
> Frame 11: 140 bytes on wire (1120 bits), 140 bytes captured (1120 bits) on interface \Device\NPF_{6ABFD768-A346-4402-BEBE-E39E89E18835}, id 0
> Ethernet II, Src: vivoMobi_f4:31:2d (34:e9:11:f4:31:2d), Dst: HonHaiPr_86:3c:01 (d8:0f:99:86:3c:01)
> Internet Protocol Version 4, Src: 192.168.43.12, Dst: 192.168.43.192
> User Datagram Protocol, Src Port: 53, Dst Port: 65198
> Domain Name System (response)
```

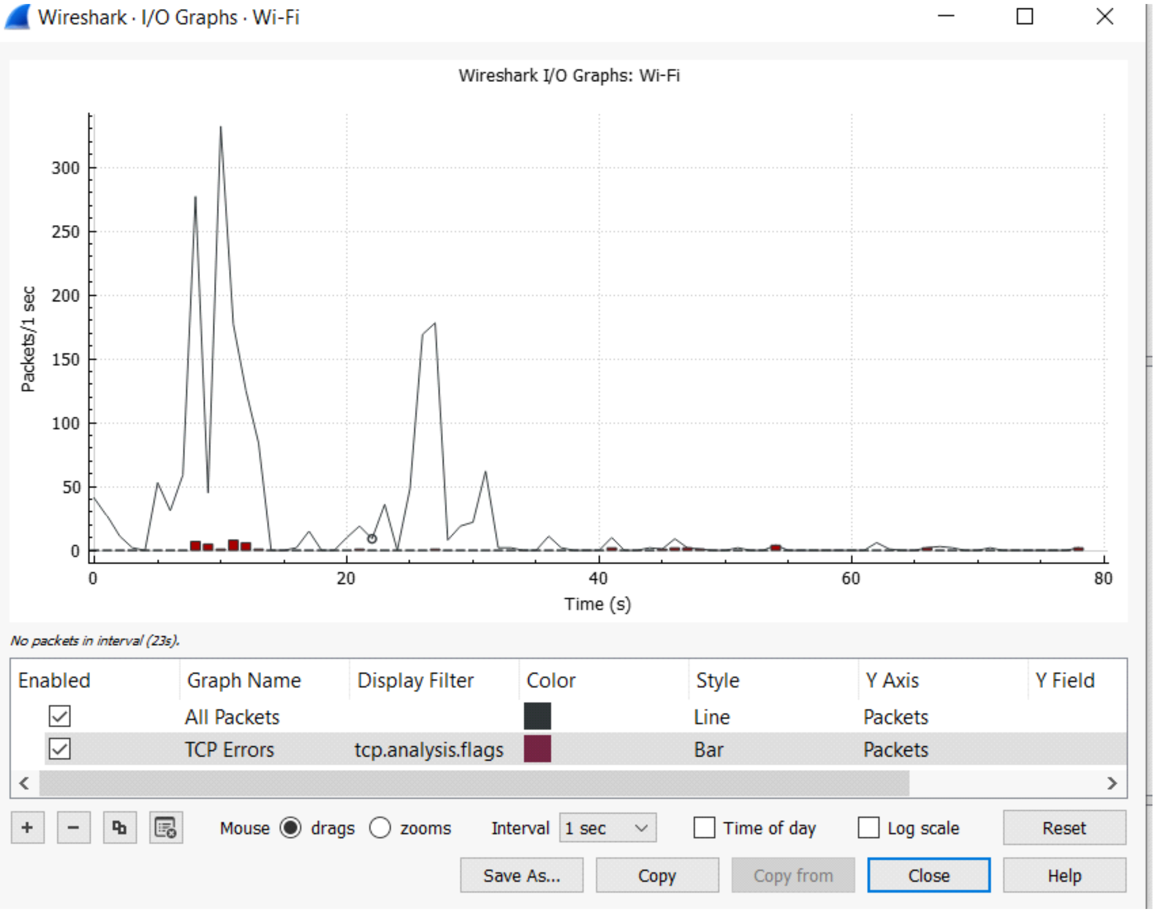

*Wi-Fi
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

```
tslv
```

```
No.   Time        Source               Destination          Protocol Length Info
  747 10.515805   2409:4070:4e89:cc73… 2a03:2880:f237:c6:f… TLSv1.3    169 Application Data
  748 10.525496   2409:4070:4e89:cc73… 2a03:2880:f237:c6:f… TLSv1.3    159 Application Data
  749 10.531874   2409:4070:4e89:cc73… 2a03:2880:f237:c6:f… TLSv1.3    170 Application Data
  750 10.538498   2409:4070:4e89:cc73… 2a03:2880:f237:c6:f… TLSv1.3    159 Application Data
  751 10.543042   2409:4070:4e89:cc73… 2a03:2880:f237:c6:f… TLSv1.3    159 Application Data
  752 10.554740   2409:4070:4e89:cc73… 2a03:2880:f237:c6:f… TLSv1.3    159 Application Data
  753 10.558537   2409:4070:4e89:cc73… 2a03:2880:f237:c6:f… TLSv1.3    170 Application Data
  754 10.568454   2409:4070:4e89:cc73… 2a03:2880:f237:c6:f… TLSv1.3    159 Application Data
  755 10.574196   2409:4070:4e89:cc73… 2a03:2880:f237:c6:f… TLSv1.3    159 Application Data
  756 10.583355   2409:4070:4e89:cc73… 2a03:2880:f237:c6:f… TLSv1.3    170 Application Data
  757 10.587458   2409:4070:4e89:cc73… 2a03:2880:f237:c6:f… TLSv1.3    170 Application Data
  758 10.594585   2409:4070:4e89:cc73… 2a03:2880:f237:c6:f… TLSv1.3    170 Application Data
```

```
> Frame 42: 93 bytes on wire (744 bits), 93 bytes captured (744 bits) on interface \Device\NPF_{6ABFD768-A346-4402-BEBE-E39E89E18835}, id 0
> Ethernet II, Src: HonHaiPr_86:3c:01 (d8:0f:99:86:3c:01), Dst: vivoMobi_f4:31:2d (34:e9:11:f4:31:2d)
> Internet Protocol Version 4, Src: 192.168.43.192, Dst: 192.168.43.12
> User Datagram Protocol, Src Port: 50280, Dst Port: 53
> Domain Name System (query)
```

f. Statistics – I/O Graph

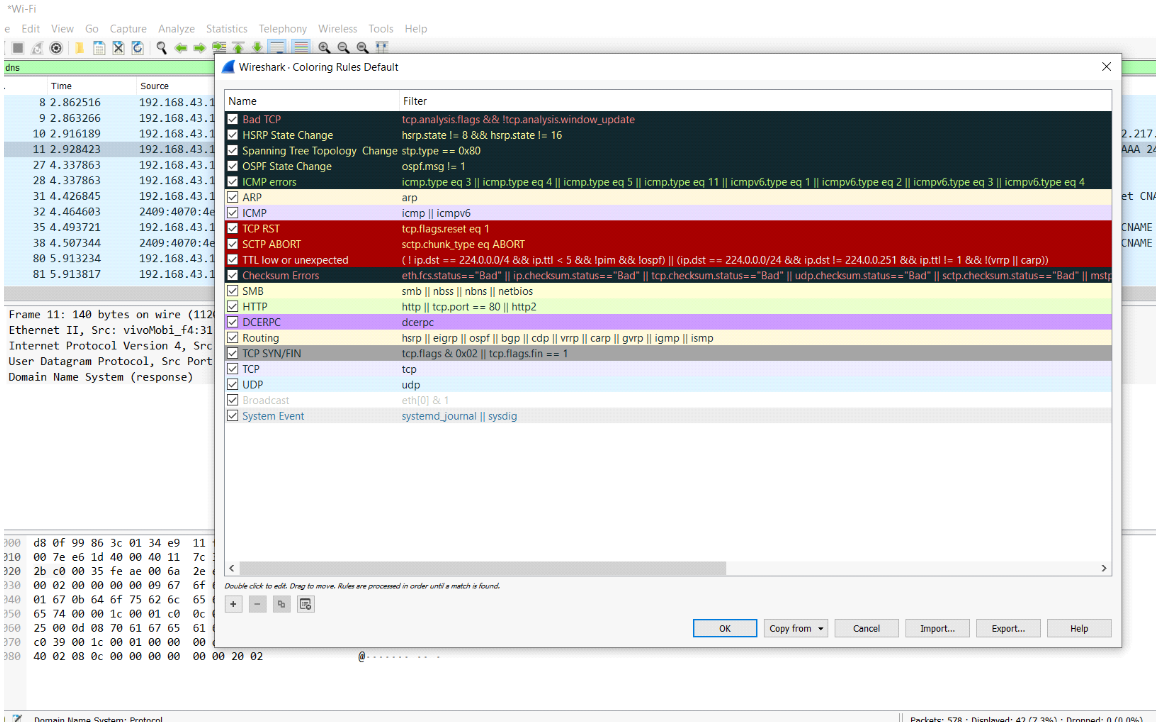


No packets in interval (23s).

Enabled	Graph Name	Display Filter	Color	Style	Y Axis	Y Field
☑	All Packets		⬛	Line	Packets	
☑	TCP Errors	tcp.analysis.flags	🟥	Bar	Packets	

Mouse ● drags ○ zooms Interval 1 sec □ Time of day □ Log scale

g. Color coding


*Wi-Fi
e Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
dns
Wireshark · Coloring Rules Default
OK
Copy from
Cancel
Import...
Export...
Help

```
.     Time        Source
    8 2.862516    192.168.43.1
    9 2.863266    192.168.43.1
   10 2.916189    192.168.43.1
   11 2.928423    192.168.43.1
   27 4.337863    192.168.43.1
   28 4.337863    192.168.43.1
   31 4.426845    192.168.43.1
   32 4.464603    2409:4070:4e
   35 4.493721    192.168.43.1
   38 4.507344    2409:4070:4e
   80 5.913234    192.168.43.1
   81 5.913817    192.168.43.1
```

```
Frame 11: 140 bytes on wire (112
Ethernet II, Src: vivoMobi_f4:31
Internet Protocol Version 4, Src
User Datagram Protocol, Src Port
Domain Name System (response)
```

Name	Filter
☑ Bad TCP	tcp.analysis.flags && !tcp.analysis.window_update
☑ HSRP State Change	hsrp.state != 8 && hsrp.state != 16
☑ Spanning Tree Topology Change	stp.type == 0x80
☑ OSPF State Change	ospf.msg != 1
☑ ICMP errors	icmp.type eq 3 || icmp.type eq 4 || icmp.type eq 5 || icmp.type eq 11 || icmpv6.type eq 1 || icmpv6.type eq 2 || icmpv6.type eq 3 || icmpv6.type eq 4
☑ ARP	arp
☑ ICMP	icmp || icmpv6
☑ TCP RST	tcp.flags.reset eq 1
☑ SCTP ABORT	sctp.chunk_type eq ABORT
☑ TTL low or unexpected	(! ip.dst == 224.0.0.0/4 && ip.ttl < 5 && !pim && !ospf) || (ip.dst == 224.0.0.0/24 && ip.dst != 224.0.0.251 && ip.ttl != 1 && !(vrrp || carp))
☑ Checksum Errors	eth.fcs.status=="Bad" || ip.checksum.status=="Bad" || tcp.checksum.status=="Bad" || udp.checksum.status=="Bad" || sctp.checksum.status=="Bad" || mstp
☑ SMB	smb || nbss || nbns || netbios
☑ HTTP	http || tcp.port == 80 || http2
☑ DCERPC	dcerpc
☑ Routing	hsrp || eigrp || ospf || bgp || cdp || vrrp || carp || gvrp || igmp || ismp
☑ TCP SYN/FIN	tcp.flags & 0x02 || tcp.flags.fin == 1
☑ TCP	tcp
☑ UDP	udp
☑ Broadcast	eth[0] & 1
☑ System Event	systemd_journal || sysdig

Double click to edit. Drag to move. Rules are processed in order until a match is found.

```
000  d8 0f 99 86 3c 01 34 e9  11
010  00 7e e6 1d 40 00 40 11  7c
020  2b c0 00 35 fe ae 00 6a  2e
030  00 02 00 00 00 00 09 67  6f
040  01 67 0b 64 6f 75 62 6c  65
050  65 74 00 00 1c 00 01 c0  0c
060  25 00 0d 08 70 61 67 65  61
070  c0 39 00 1c 00 01 00 00  00
080  40 02 08 0c 00 00 00 00  00 00 20 02        @·······  ··  ·
```

```
2.217
AAA 2
et CN
CNAME
CNAME
```

Domain Name System: Protocol

Packets: 578 · Displayed: 42 (7.3%) · Dropped: 0 (0.0%)

3. Answer the following:

a. If a packet is highlighted by black, what does it mean for the packet?

Black shows that there is a problem with the TCP package , they could be error of out-of-order**.**

b. What is the filter command for listing all outgoing http traffic?

Sudo wireshark

c. Why does DNS use Follow UDP Stream while HTTP use Follow TCP Stream?

Dns uses the UDP protocol on port 53 to help with the DNS queries which is fast and of low overhead.A DNS query is a single query request from DNS client followed by a single UDP reply from the server.Dns manages a lot of load so handshaking protocols can make it slower than usual.

The HTTP uses the TCP to ensure that the entire request gets to the client or sever intact

d. Differentiate http and https traffic

HTTPS is HTTP but with provided encryption for security of data.

The HTTPS uses the TLS(SSL) to encrypt the normal HTTP request and response. HTTP is faster than HTTP as they consume less computation power to encrypt communication channel.

HTTPS is secured where as HTTP is not. HTTPS sends data over port 443 while HTTP sends data over port 80.