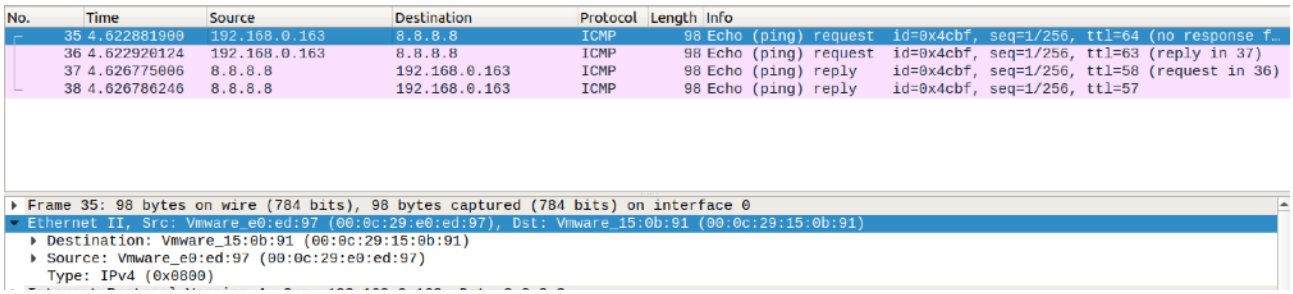
Project 2: MITM & Pharming Attacks in Wi-Fi Networks

1. Man-In-The-Middle (MITM) Attack

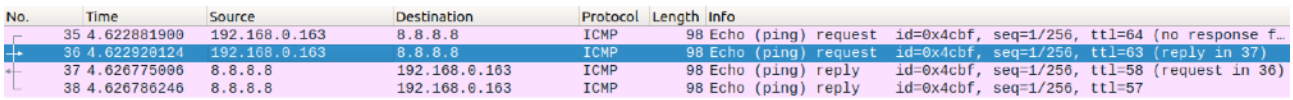
Testing Environment:

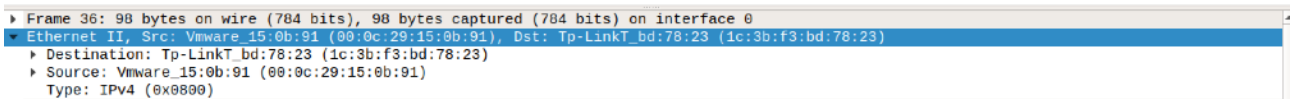
Attacker: 192.168.0.177 (00:0c:29:15:0b:91)
Victim : 192.168.0.163 (00:0c:29:e0:ed:97)
Gateway: 192.168.0.1 (1c:3b:f3:bd:78:23) Tp-LinkT_bd

Both attacker and victim are Ubuntu VM provided by the requirement uses bridge mode connect to the real Wi-Fi router.

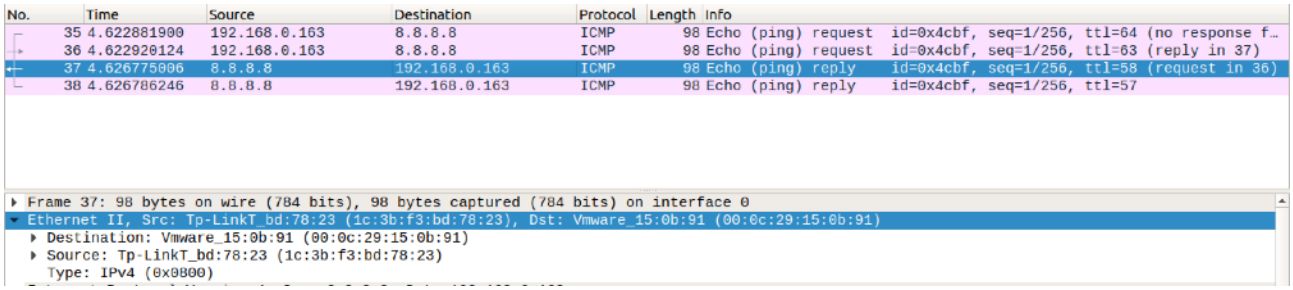


Ping packet first sent from victim(e0:ed:97) to attacker(15:0b:91).

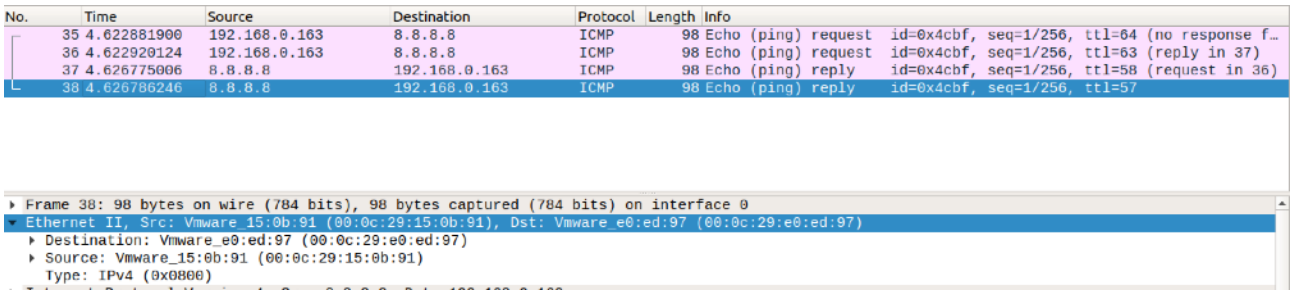




And transmit to router from attacker(15:0b:91).



The return packet also sent to the attacker(15:0b:91) first from the router.



Finally, send packet back to the victim(e0:ed:97) from the attacker(15:0b:91).
The overall path is “victim -> attacker -> router -> attacker -> victim”.

```
Available devices
---------------------------------------
IP Address        MAC Address
---------------------------------------
192.168.0.129     d8:bb:c1:9c:54:94
192.168.0.163     00:0c:29:e0:ed:97
192.168.0.177     2c:6d:c1:0f:2f:0d
192.168.0.127     c4:b3:01:c5:e9:3b
192.168.0.147     56:c4:1e:5b:7d:d2
192.168.0.158     14:7d:da:bf:91:d6
192.168.0.185     0e:60:51:fb:1c:a1
---------------------------------------
Username: 123
Password: 999
```

Also, the program could also get the username and password from the e3 login page when the victim try to login.

2. Pharming Attack

The screenshot on the left was captured on victim(.163). First use the 'dig' command to see what we got from the DNS query and it shows that we get the attacker's server. Uses 'curl' command and we got the spoofed web page.

```
cs2022@ubuntu:~$ sudo systemd-resolve --flush-caches
cs2022@ubuntu:~$ dig www.nycu.edu.tw

; <<>> DiG 9.11.3-1ubuntu1.14-Ubuntu <<>> www.nycu.edu.tw
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 51466
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 65494
;; QUESTION SECTION:
;www.nycu.edu.tw.               IN      A

;; ANSWER SECTION:
www.nycu.edu.tw.        0       IN      A       140.113.207.237

;; Query time: 12 msec
;; SERVER: 127.0.0.53#53(127.0.0.53)
;; WHEN: Thu Apr 14 14:54:22 CST 2022
;; MSG SIZE  rcvd: 60

cs2022@ubuntu:~$ curl www.nycu.edu.tw
<!DOCTYPE html>
<html>
<body>

<h1 style="text-align:center;">This is a spoofed web page!</h1>
<p style="text-align:center;"><b>Good Job!</b></p>

</body>
</html>
```

```
cs2022@ubuntu:~/Desktop/Computer-Security-Capstone/HW2$ sudo ./pharm_attack
Available devices
---------------------------------------
IP Address        MAC Address
---------------------------------------
192.168.0.163     00:0c:29:e0:ed:97
192.168.0.177     2c:6d:c1:0f:2f:0d
192.168.0.129     d8:bb:c1:9c:54:94
192.168.0.127     c4:b3:01:c5:e9:3b
192.168.0.128     ee:8b:62:4b:74:cc
192.168.0.147     56:c4:1e:5b:7d:d2
192.168.0.158     14:7d:da:bf:91:d6
192.168.0.185     0e:60:51:fb:1c:a1
---------------------------------------
```

3. Defend against ARP Spoofing Attack

- **Devices**
  - Fixed ARP table — Not to change the ARP table when receive the arp response.
- **Router**
  - Router could check the ARP table to find duplicate MAC address but different IP.
  - Send the ARP packet to every devices periodically to ensure their gateway MAC address is correct.
  - Devices could not send ARP packet to each other.