Computer Security

Lab 7 Demo: ICMP Redirect Attack Lab

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Set up:

Located lab setup files in shared folder.

```
stephaniesalgado@VM:~/Share/Labsetup$ sudo docker-compose build
victim uses an image, skipping
attacker uses an image, skipping
malicious-router uses an image, skipping
HostB1 uses an image, skipping
HostB2 uses an image, skipping
Router uses an image, skipping
stephaniesalgado@VM:~/Share/Labsetup$ sudo docker-compose up
Creating network "net-10.9.0.0" with the default driver
Creating network "net-192.168.60.0" with the default driver
Creating malicious-router-10.9.0.111 ... done
Creating host-192.168.60.5           ... done
Creating host-192.168.60.6           ... done
Creating victim-10.9.0.5             ... done
Creating router                      ... done
Creating attacker-10.9.0.105         ... done
Attaching to host-192.168.60.5, host-192.168.60.6, malicious-router-10.9.0.111,
attacker-10.9.0.105, router, victim-10.9.0.5
```

To begin, I built and started the containers.

Task 1: Launching ICMP Redirect Attack

I start a shell on the attacker and victim containers.

Attacker:

```
stephaniesalgado@VM:~/Share/Labsetup$ sudo docker exec -it attacker-10.9.0.105 bash
root@993212ab9004:/#
```

Victim:

```
stephaniesalgado@VM:~/Share/Labsetup$ sudo docker exec -it victim-10.9.0.5 bash
root@b670f4f51ee3:/#
```

```
stephaniesalgado@VM: ~/Share/Labsetup
root@b670f4f51ee3:/# mtr -n 192.168.60.5
```

I run the “mtr -n 192.168.60.5” command on the victim to view the route from victim to “192.168.60.5”.

```
stephaniesalgado@VM: ~/Share/Labsetup   stephaniesalgado@VM: ~/Share/Labsetup
                             My traceroute  [v0.93]
b670f4f51ee3 (10.9.0.5)                                  2024-03-21T19:20:27+0000
Keys:  Help   Display mode   Restart statistics   Order of fields   quit
                                        Packets               Pings
 Host                                 Loss%   Snt   Last   Avg  Best  Wrst StDev
 1. 10.9.0.11                          0.0%    30    0.0   0.1   0.0   0.1   0.0
 2. 192.168.60.5                       0.0%    30    0.1   0.1   0.1   0.1   0.0
```

The routing looks normal. Now, I can get started on the attack.

```
stephaniesalgado@VM: ~/Share/Labs...   stephaniesalgado@VM: ~/Share/Labs...
root@b670f4f51ee3:/# ping 192.168.60.5 &
[1] 31
root@b670f4f51ee3:/# PING 192.168.60.5 (192.168.60.5) 56(84) bytes of data.
64 bytes from 192.168.60.5: icmp_seq=1 ttl=63 time=0.048 ms
64 bytes from 192.168.60.5: icmp_seq=2 ttl=63 time=0.064 ms
64 bytes from 192.168.60.5: icmp_seq=3 ttl=63 time=0.083 ms
64 bytes from 192.168.60.5: icmp_seq=4 ttl=63 time=0.065 ms
64 bytes from 192.168.60.5: icmp_seq=5 ttl=63 time=0.065 ms
```

```
stephaniesalgado@VM: ~/Share/Labs...   stephaniesalgado
root@993212ab9004:/# cd /volumes
root@993212ab9004:/volumes# touch icmp_redirect.py
root@993212ab9004:/volumes# nano icmp_redirect.py
root@993212ab9004:/volumes# chmod a+x icmp_redirect.py
```

I ping “192.168.60.5” first. Next, I make sure I’m in the “volumes” directory then create and edit “icmp_redirect.py”.

```
stephaniesalgado@VM: ~/Share/Labs...   stepha
root@993212ab9004:/volumes# ./icmp_redirect.py
.
Sent 1 packets.
root@993212ab9004:/volumes#
```

While the ping is still going, I run the file.

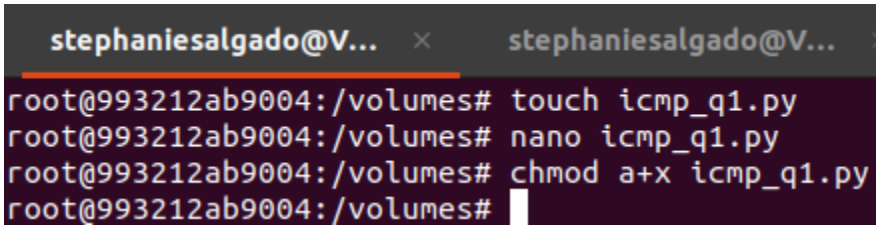
```
stephaniesalgado@V...   stephaniesalgado@V...   stephaniesalgado@V...
                        My traceroute  [v0.93]
b670f4f51ee3 (10.9.0.5)                          2024-03-21T20:06:15+0000
Keys:  Help   Display mode   Restart statistics   Order of fields   quit
                                Packets                Pings
 Host                         Loss%   Snt   Last   Avg  Best  Wrst StDev
 1. 10.9.0.111                 0.0%     9    0.1   0.1   0.0   0.1   0.0
 2. 10.9.0.11                  0.0%     9    0.1   0.1   0.1   0.1   0.0
 3. 192.168.60.5               0.0%     9    0.1   0.1   0.1   0.1   0.0
```

I use “mtr -n 192.168.60.5” again, and this time, we can see “10.9.0.111” appear, which is the malicious router.

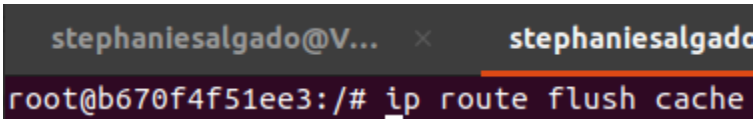
```
root@b670f4f51ee3:/# ip route show cache
192.168.60.5 via 10.9.0.111 dev eth0
    cache <redirected> expires 276sec
```

This can also be verified when running “ip route show cache”.

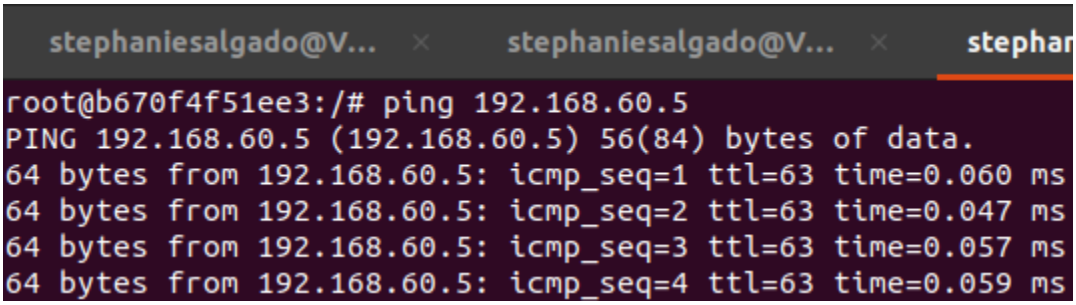
Question 1:



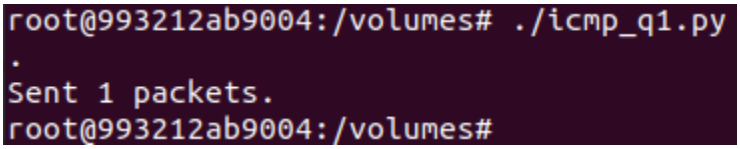
For this question, I make another file (icmp_q1.py) and paste the contents of “icmp_redirect.py” then make it executable. This is because the file can mostly stay the same. I only changed one thing. Since the question asks if the attack can be used when the IP address assigned to “icmp.gw" is a computer not on the local LAN.



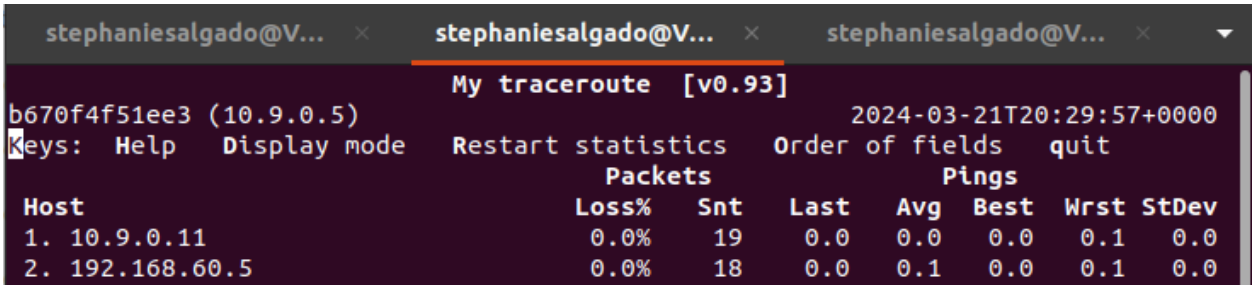
Before repeating the steps I took earlier, I use a command to clear the cache.



Now that it’s ready, I ping and let it run in the background again.

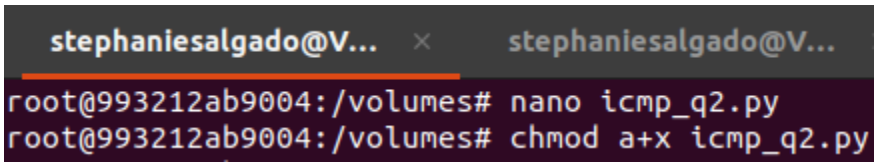


I ran the modified file.

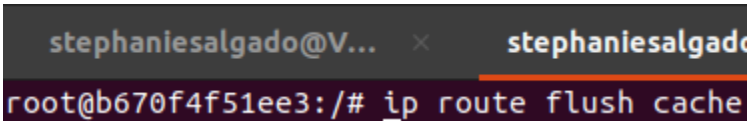


Then, I used “mtr -n 192.168.60.5” again and found there were no changes.

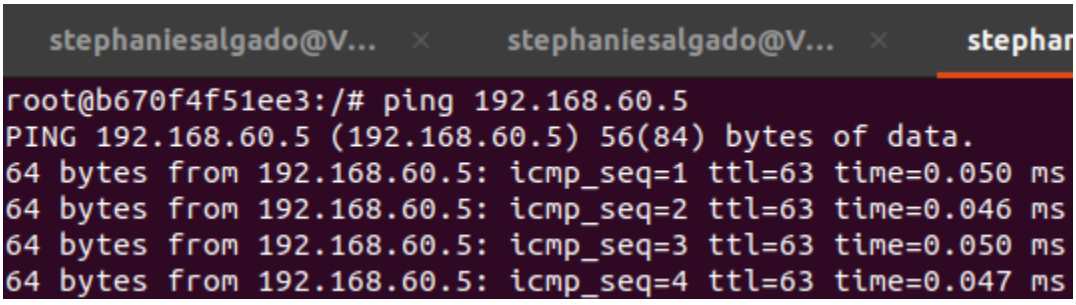
Question 2:



Similar to question 1, I paste the contents of the file and only modify the entry for “icmp.gw”, this time setting it to an IP address of a local computer that is either offline or non-existing.



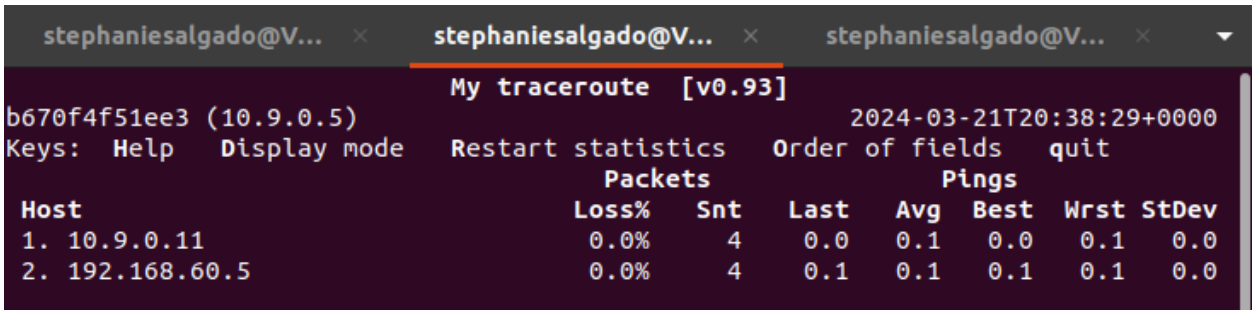
I cleared the cache again.



Then ping once more.

```
root@993212ab9004:/volumes# ./icmp_q2.py
.
Sent 1 packets.
```

Once I repeated those steps, I ran the code.



I observed the same results. The cache went unchanged again.

Question 3:

```
stephaniesalgado@VM:~/Share/Labsetup$ ls
docker-compose.yml  mitm_sample.py  volumes
stephaniesalgado@VM:~/Share/Labsetup$ cat docker-compose.yml
version: "3"

services:
    victim:
        image: handsonsecurity/seed-ubuntu:large
        container_name: victim-10.9.0.5
        tty: true
        cap_add:
                - ALL
        sysctls:
                - net.ipv4.conf.all.accept_redirects=1
        privileged: true
        networks:
            net-10.9.0.0:
                ipv4_address: 10.9.0.5
        command: bash -c "
                      ip route add 192.168.60.0/24 via 10.9.0.11 &&
                      tail -f /dev/null
                 "

    attacker:
```

Since this question is concerned with the contents of “docker-compose.yml” I cat the file to view the entries mentioned in the lab directions.

```
  malicious-router:
      image: handsonsecurity/seed-ubuntu:large
      container_name: malicious-router-10.9.0.111
      tty: true
      cap_add:
              - ALL
      sysctls:
              - net.ipv4.ip_forward=1
              - net.ipv4.conf.all.send_redirects=0
              - net.ipv4.conf.default.send_redirects=0
              - net.ipv4.conf.eth0.send_redirects=0
```

I have to change the “0”s to “1”s.

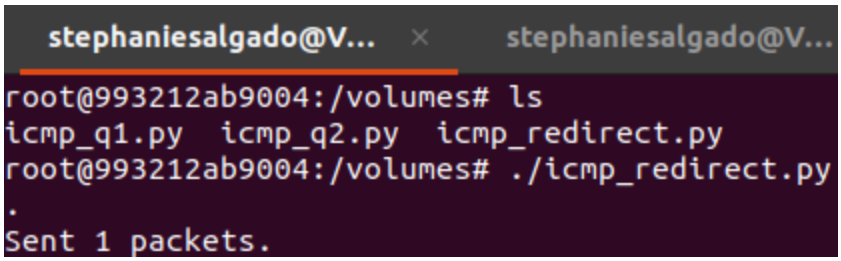
```
stephaniesal...   stephaniesal...   stephaniesal...   stephaniesal...
GNU nano 4.8                    docker-compose.yml                Modified
      networks:
          net-10.9.0.0:
              ipv4_address: 10.9.0.105
      command: bash -c "
                    ip route add 192.168.60.0/24 via 10.9.0.11 &&
                    tail -f /dev/null
               "

  malicious-router:
      image: handsonsecurity/seed-ubuntu:large
      container_name: malicious-router-10.9.0.111
      tty: true
      cap_add:
              - ALL
      sysctls:
              - net.ipv4.ip_forward=1
              - net.ipv4.conf.all.send_redirects=1
              - net.ipv4.conf.default.send_redirects=1
              - net.ipv4.conf.eth0.send_redirects=1
```

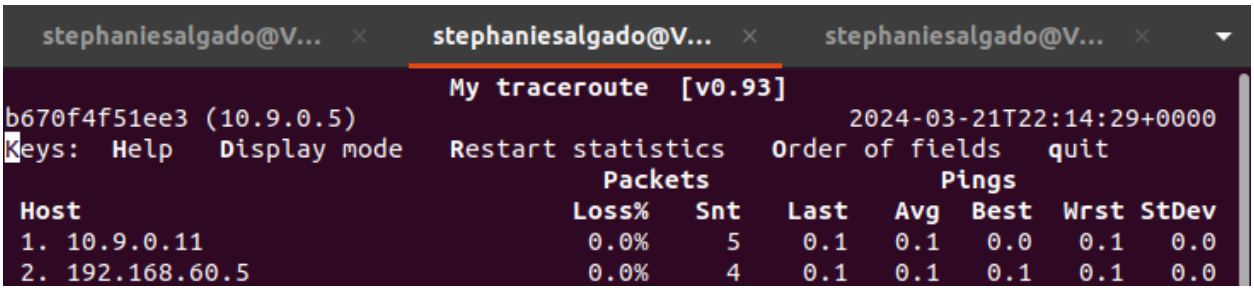
I use “nano docker-compose.yml” and make the changes. Then I save the file.

```
stephaniesalgado@V...   stephaniesalgado@V...   stephar
root@b670f4f51ee3:/# ping 192.168.60.5
PING 192.168.60.5 (192.168.60.5) 56(84) bytes of data.
64 bytes from 192.168.60.5: icmp_seq=1 ttl=63 time=0.049 ms
64 bytes from 192.168.60.5: icmp_seq=2 ttl=63 time=0.045 ms
64 bytes from 192.168.60.5: icmp_seq=3 ttl=63 time=0.048 ms
64 bytes from 192.168.60.5: icmp_seq=4 ttl=63 time=0.103 ms
```

I begin the attack by pinging again.

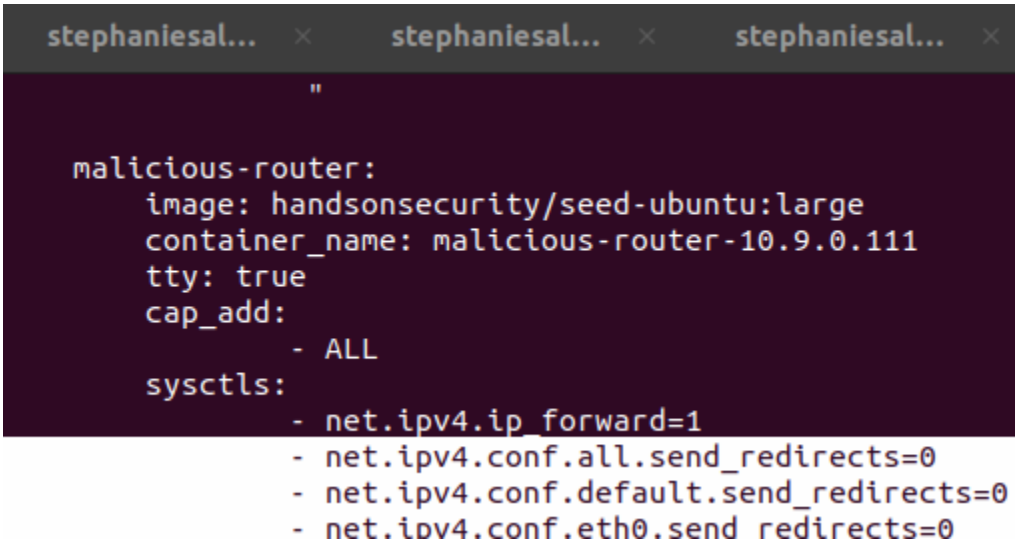


After that, I ran the original file as the ping was in progress.



However this time, the attack was unsuccessful.

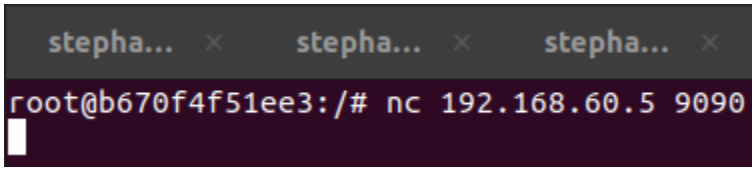
Task 2: Launching the MITM Attack



To start this task, I make sure I set the docker file to how it was originally.

```
stephaniesalgado@VM:~/Share/Labsetup$ sudo docker exec -it host-192.168.60.5 bash
root@ce5c019da2aa:/# nc -lp 9090
```

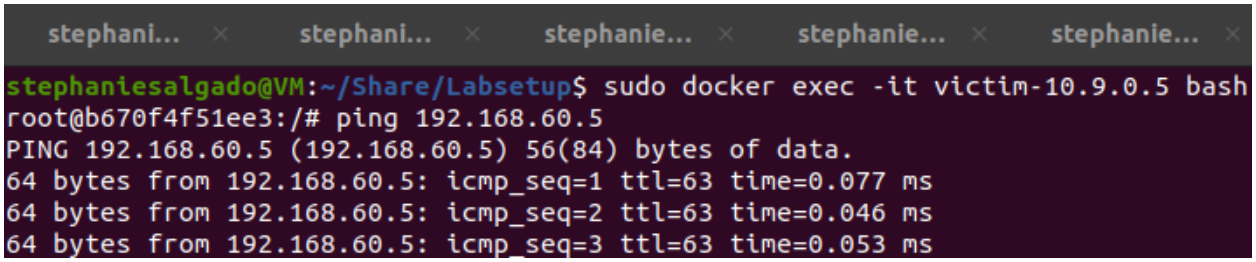
I start a shell on “host-192.168.60.5” and then start the netcat server.



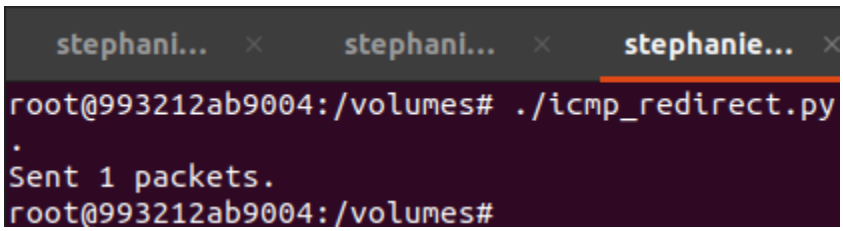
I connect to the server on the victim.

```
stephaniesalgado@VM:~/Share/Labsetup$ sudo sysctl net.ipv4.ip_forward=0
net.ipv4.ip_forward = 0
```

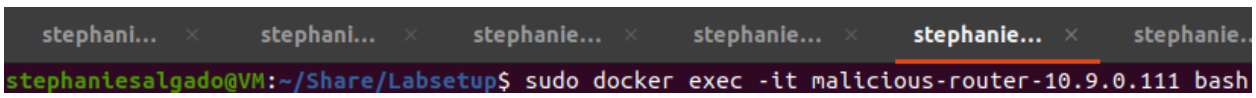
Using nano once again, I disable IP forwarding on the malicious router



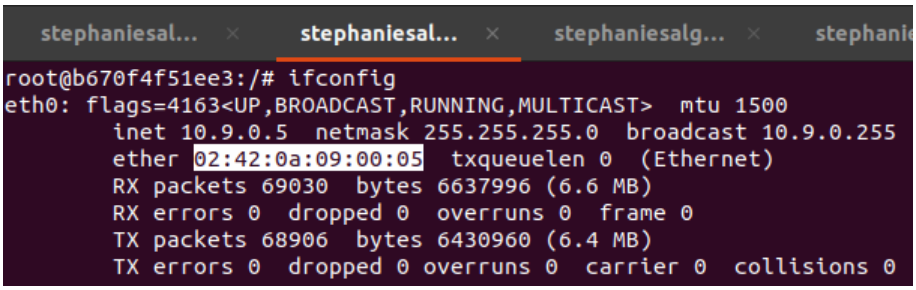
The victim will continue pinging.



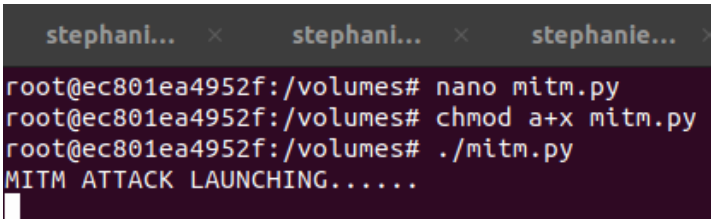
Now, I reuse the same “icmp_redirect.py” file and run it from the attacker.



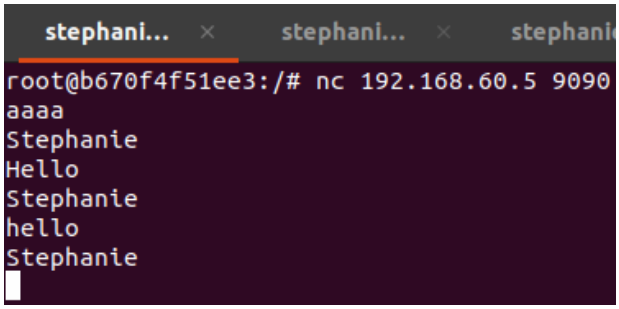
I launch a shell on the malicious router container.



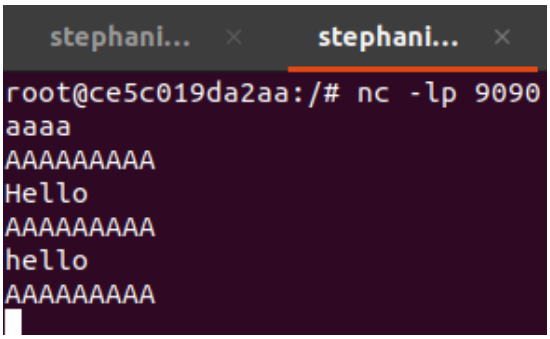
I use “ifconfig” to find the victim’s MAC address so that I can use that in the filter field.



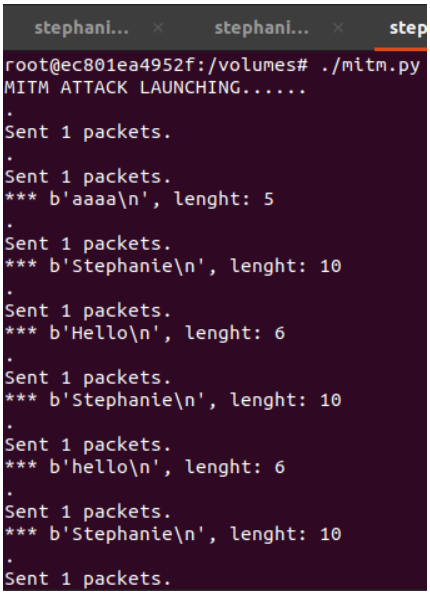
I create and edit the “mitm.py” file, make sure it’s executable then run it.



From the victim, I enter some words, letters and my name (which I used in the code) and should be replaced with “AAAAAAAAA”.



This is what the host received.

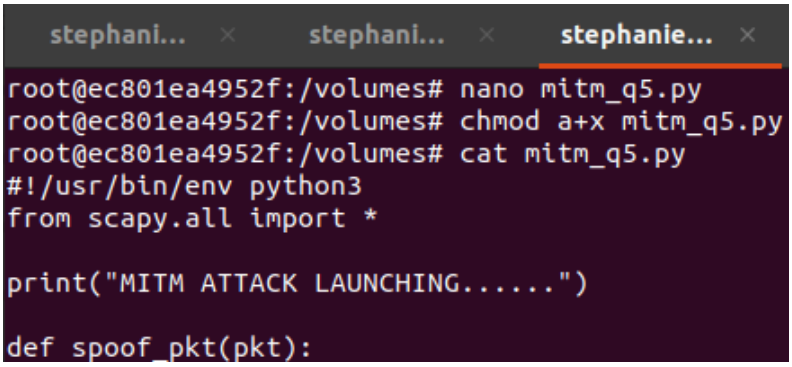


This is what it looks like from the malicious router.

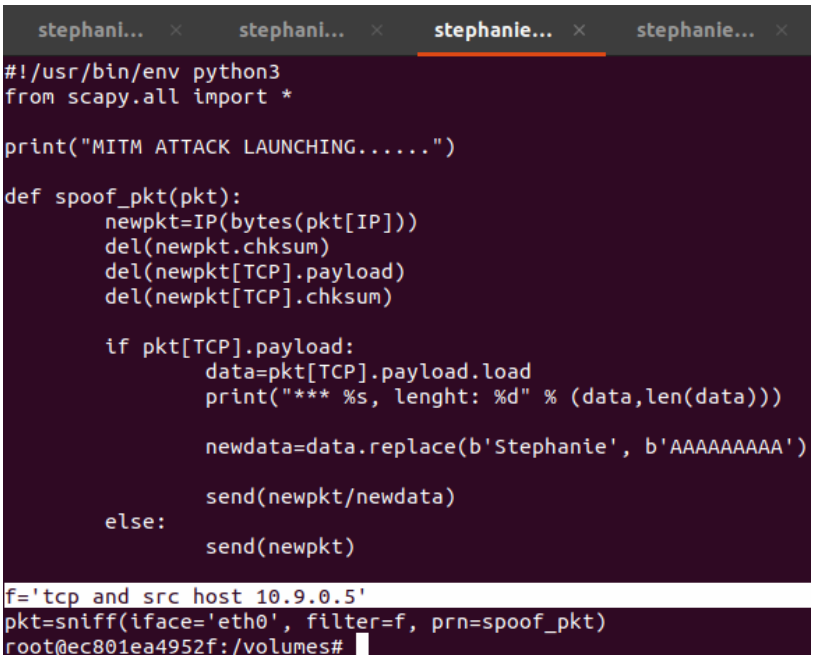
Question 4:

In the mitm program, you only need to capture traffic going from the victim to the host because packets being modified are in that direction.

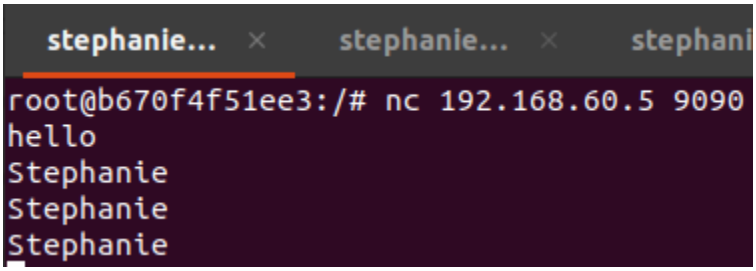
Question 5:



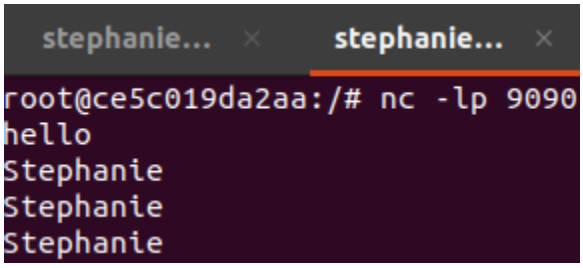
I copy the contents from “mitm.py” and paste them into “mitm_q5.py”. I then make sure it’s executable.



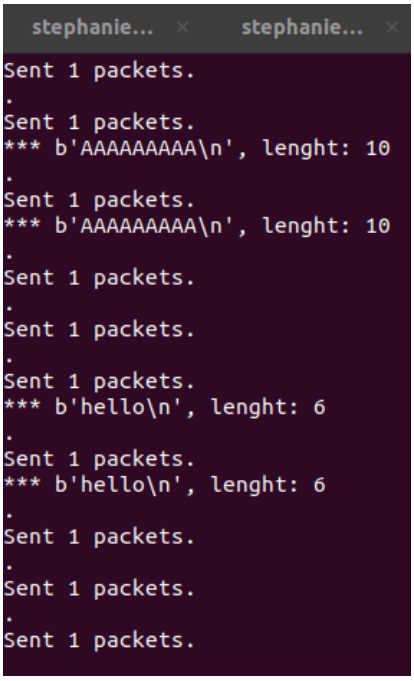
I only had to change the filter from MAC address to IP address. I repeated the steps from before. I already had the host pinging so I just went and ran the new man in the middle file.



I connected to the server and then sent this from the victim.



Somehow, this time around the output on the host wasn't changed at all.



For some reason the attack wasn't successful for me. It seems this time the malicious router output was crazy and the results that came out on the host now showed up on it for some reason. It also kept sending messages in a loop.

Summary:

I learned that Ubuntu has a built-in countermeasure against the ICMP redirect attack, but it was disabled for this lab. I found this lab to be really similar to the previous lab. Once again we used containers and the scapy library, which I've now found to be quite fun and useful. In this lab I learned how to "show" and "flush" the cache. The part I found most challenging was actually conducting the man in the middle attack. I'm not sure if it was just the timing or if I completed the steps out of order, but it took me a while to achieve success. After modifying my "mitm_q5.py" file to filter using the IP address the attack stopped working for me. I wanted to figure it out, but I'm not even sure what went wrong. Especially when the router's output was a spam of looping messages. Overall, I feel that I've been able to apply the things I've learned in previous labs here.