

گزارش آزمایش 4

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(الف)

سوال 1: باید از NAT استفاده کنیم، یعنی source IP را یک مقدار valid بگذاریم زیرا در غیر این صورت، بسته ها در router های میانی drop می شوند.

(ب) برای پل سازی ابتدا باید تعیین کنیم که VM ما از کدام اینترفیس برای دسترسی به اینترنت استفاده می کند.

برای این کار باید wireshark را روی vm اجرا کنیم و ببینیم بسته ها از کدام پورت دریافت می شوند.

سوال 2: آدرس IP مورد استفاده برای دسترسی به اینترنت: 10.0.2.15

```
roostamkhani@roostamkhani:~$ ifconfig -a
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.2.15 netmask 255.255.255.0 broadcast 10.0.2.255
    inet6 fe80::d9f3:d6cd:e1b4:d1f7 prefixlen 64 scopeid 0x20<link>
    ether 08:00:27:ab9e:2268 txqueuelen 1000 (Ethernet)
    RX packets 3181 bytes 4877822 (4.8 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 2366 bytes 287402 (287.4 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 6519 bytes 390731 (390.7 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 6519 bytes 390731 (390.7 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

ovs-system: flags=4098<BROADCAST,MULTICAST> mtu 1500
    ether e6:f4:49:a3:78:2b txqueuelen 1000 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s3: flags=4098<BROADCAST,MULTICAST> mtu 1500
    ether be:b7:e0:66:93:40 txqueuelen 1000 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 8 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s12: flags=4098<BROADCAST,MULTICAST> mtu 1500
    ether 32:e6:d0:63:79:4a txqueuelen 1000 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 24 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

s12-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::88de:c4ff:fe97:ab3e prefixlen 64 scopeid 0x20<link>
    ether 8a:de:c4:97:ab:3e txqueuelen 1000 (Ethernet)
    RX packets 16 bytes 1216 (1.2 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 53 bytes 5193 (5.1 KB)
```

```
Activities Terminal
Apr 12 21:37
rostamkhani@rostamkhani: ~
rostamkhani@rostamkhani:~$ sudo wireshark
[sudo] password for rostamkhani:
Sorry, try again.
[sudo] password for rostamkhani:
QStandardPaths: XDG_RUNTIME_DIR not set, defaulting to '/tmp/runtime-root'
^C
rostamkhani@rostamkhani:~$ sudo wireshark
QStandardPaths: XDG_RUNTIME_DIR not set, defaulting to '/tmp/runtime-root'
^Z
[2]+  Stopped                  sudo wireshark
rostamkhani@rostamkhani:~$ bg
[2]+  sudo wireshark &
rostamkhani@rostamkhani:~$ ping google.com -c 1
PING google.com (172.217.169.238) 56(84) bytes of data:
64 bytes from mct01s10-lin-f14.1ei00.net (172.217.169.238): icmp_seq=1 ttl=105 time=85.1 ms

--- google.com ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/ndev = 85.136/85.136/85.136/0.000 ms
rostamkhani@rostamkhani:~$
```

Activities Wireshark

Apr 12 21:39

Capturing from 5 interfaces

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter... <Ctrl-J>

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	10.0.2.15	172.217.169.238	ICMP	98	Echo (ping) request id=0x0005, seq=1/256, ttl=64 (reply in 2)
2	0.083069286	172.217.169.238	10.0.2.15	ICMP	98	Echo (ping) reply id=0x0005, seq=1/256, ttl=105 (request 1)

5 interfaces: <live capture in progress>

Packets: 2 / Displayed: 2 (100.0%)

Profile: Default

سیس توپولوژی را اجرا کرده و پل را اضافه می کنیم.

```
rostamkhani@rostamkhani: ~/Desktop/mininet/mininet/custom
rostamkhani@rostamkhani:~/Desktop/mininet/mininet/custom$ sudo python3 topo2_int.py
[sudo] password for rostamkhani:
*** Adding controller
*** Adding hosts
*** Adding router
*** Adding switch
*** Creating links
*** Starting network
*** Configuring hosts
h1 h2 h3 r1
*** Starting controller
c0
*** Starting 2 switches
s12 s3 ...
*** Configuring hosts
*** Starting xterm on hosts
*** Running the command line interface
*** Starting CLI:
mininet> sh ovs-vsctl add-port s3 eth0
ovs-vsctl: Error detected while setting up 'eth0': could not open network device eth0 (No such device)
. See ovs-vswitchd log for details.
ovs-vsctl: The default log directory is "/var/log/openvswitch".
mininet> sh ovs-vsctl add-port s3 enp0s3
mininet>
```

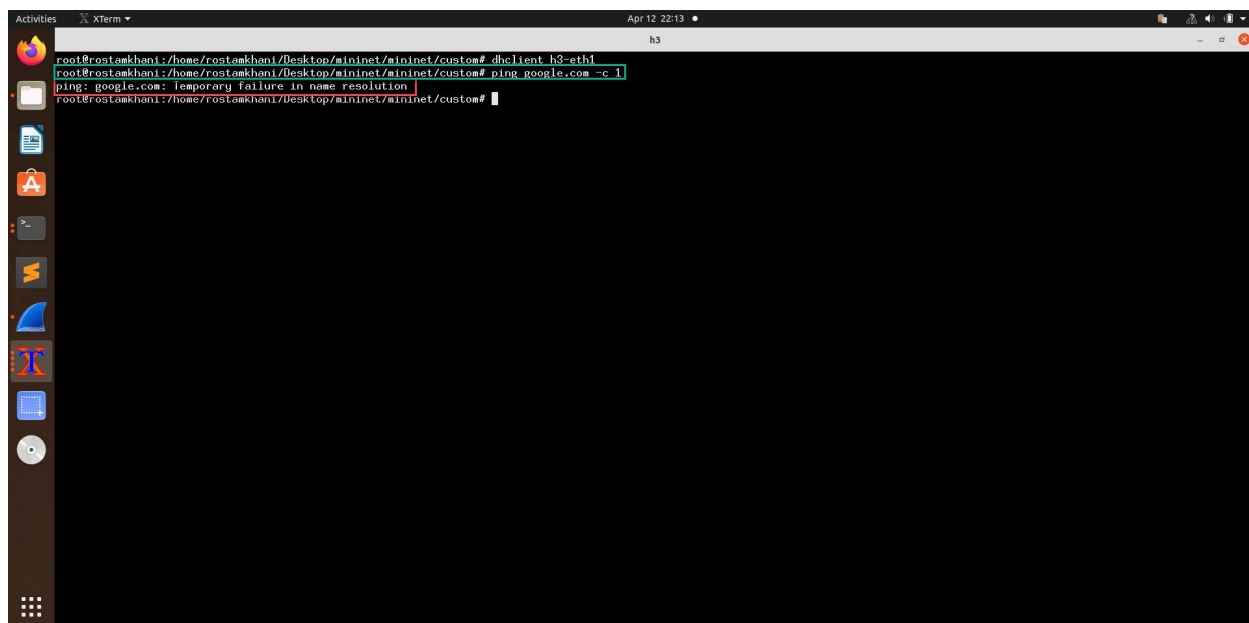
می توانیم مشاهده کنیم که اینترفیس به کار رفته ، اینترفیس s3 شده است و دیگر متعلق به vm نیست.

```
rostamkhani@rostamkhani: ~/Desktop/mininet/mininet/custom
mininet> sh ovs-vsctl add-port s3 eth0
ovs-vsctl: Error detected while setting up 'eth0': could not open network device eth0 (No such device)
. See ovs-vswitchd log for details.
ovs-vsctl: The default log directory is "/var/log/openvswitch".
mininet> sh ovs-vsctl add-port s3 enp0s3
mininet> sh ovs-vsctl show
d974712f-705b-47fd-a219-edab9d255c6b
    Bridge s12
        Controller "tcp:127.0.0.1:6653"
            is_connected: true
        fail_mode: secure
        Port s12
            Interface s12
                type: internal
        Port s12-eth1
            Interface s12-eth1
        Port s12-eth2
            Interface s12-eth2
        Port s12-eth3
            Interface s12-eth3
    Bridge s3
        Controller "tcp:127.0.0.1:6653"
            is_connected: true
        fail_mode: secure
        Port eth0
            Interface eth0
                error: "could not open network device eth0 (No such device)"
        Port s3
            Interface s3
                type: internal
        Port s3-eth1
            Interface s3-eth1
        Port enp0s3
            Interface enp0s3
    ovs_version: "2.13.5"
mininet>
```

سپس به h3-eth1 ، یک IP اختصاص می دهیم.

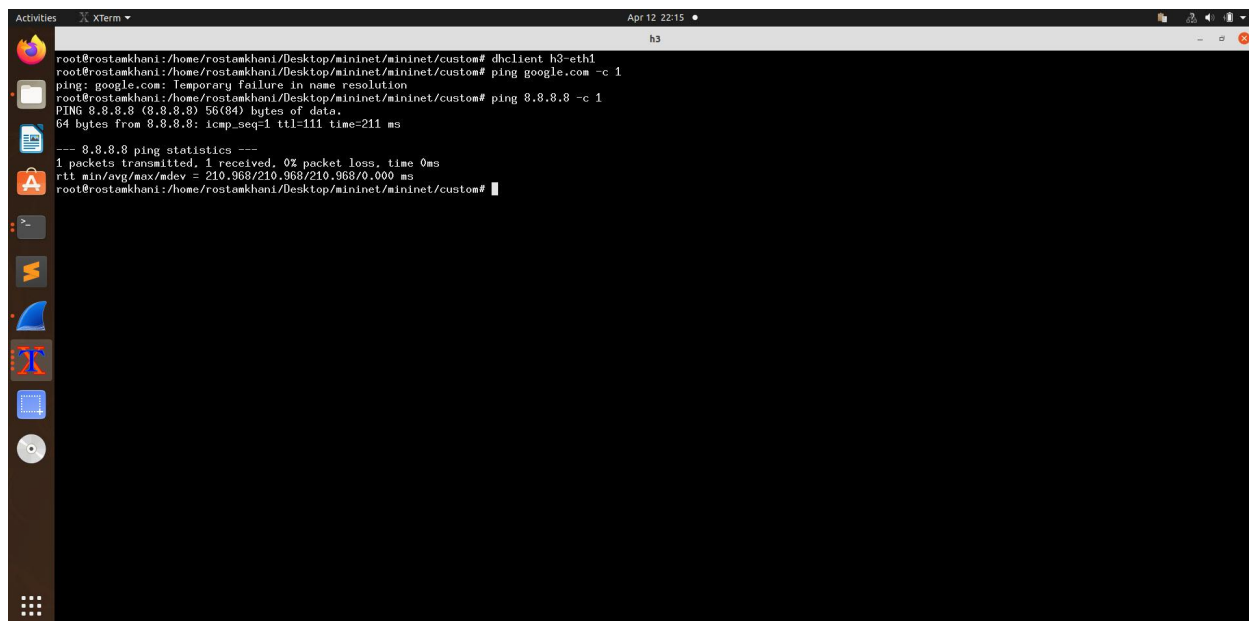
```
Activities  XTerm  Apr 12 22:12
h3
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# dhclient h3-eth1
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom#
```

سپس google را ping می کنیم. و مشاهده می کنیم که با ارور مواجه می شویم. این ارور مربوط به DNS است.



```
root@roostamkhani:/home/roostamkhani/Desktop/mininet/mininet/custom# dhclient h3-eth1
root@roostamkhani:/home/roostamkhani/Desktop/mininet/mininet/custom# ping google.com -c 1
ping: google.com: temporary failure in name resolution
root@roostamkhani:/home/roostamkhani/Desktop/mininet/mininet/custom#
```

به جای google، آدرس ip مربوط به آن را قرار می دهیم.



```
root@roostamkhani:/home/roostamkhani/Desktop/mininet/mininet/custom# dhclient h3-eth1
root@roostamkhani:/home/roostamkhani/Desktop/mininet/mininet/custom# ping google.com -c 1
ping: google.com: temporary failure in name resolution
root@roostamkhani:/home/roostamkhani/Desktop/mininet/mininet/custom# ping 8.8.8.8 -c 1
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data:
64 bytes from 8.8.8.8: icmp_seq=1 ttl=111 time=211 ms

--- 8.8.8.8 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 210.968/210.968/210.968/0.000 ms
root@roostamkhani:/home/roostamkhani/Desktop/mininet/mininet/custom#
```

سپس باید source IP مربوطه به بسته ها را تغییر دهیم تا بسته ها drop نشوند.

```
Activities XTerm Apr 12 22:18 h3
root@rostaakhani:/home/rostaakhani/Desktop/mininet/mininet/custom# dhclient h3-eth1
root@rostaakhani:/home/rostaakhani/Desktop/mininet/mininet/custom# ping google.com -c 1
ping: google.com: Temporary failure in name resolution
root@rostaakhani:/home/rostaakhani/Desktop/mininet/mininet/custom# ping 8.8.8.8 -c 1
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data:
64 bytes from 8.8.8.8: icmp_seq=1 ttl=111 time=211 ms

--- 8.8.8.8 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 210.968/210.968/210.968/0.000 ms
root@rostaakhani:/home/rostaakhani/Desktop/mininet/mininet/custom# iptables -t nat -A POSTROUTING -o h3-eth1 -j MASQUERADE
root@rostaakhani:/home/rostaakhani/Desktop/mininet/mininet/custom#
```

```
Activities XTerm Apr 12 22:18 h3
root@rostaakhani:/home/rostaakhani/Desktop/mininet/mininet/custom# dhclient h3-eth1
root@rostaakhani:/home/rostaakhani/Desktop/mininet/mininet/custom# ping google.com -c 1
ping: google.com: Temporary failure in name resolution
root@rostaakhani:/home/rostaakhani/Desktop/mininet/mininet/custom# ping 8.8.8.8 -c 1
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data:
64 bytes from 8.8.8.8: icmp_seq=1 ttl=111 time=211 ms

--- 8.8.8.8 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 210.968/210.968/210.968/0.000 ms
root@rostaakhani:/home/rostaakhani/Desktop/mininet/mininet/custom# iptables -t nat -A POSTROUTING -o h3-eth1 -j MASQUERADE
root@rostaakhani:/home/rostaakhani/Desktop/mininet/mininet/custom# ping 8.8.8.8 -c 1
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data:
64 bytes from 8.8.8.8: icmp_seq=1 ttl=111 time=106 ms

--- 8.8.8.8 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 105.976/105.976/105.976/0.000 ms
root@rostaakhani:/home/rostaakhani/Desktop/mininet/mininet/custom#
```

سپیس آدرس DNS server مربوط به google را اضافه میکنیم.

```
Activities XTerm Apr 12 22:19 h3
root@rostaakhani:/home/rostaakhani/Desktop/mininet/mininet/custom# dhclient h3-eth1
root@rostaakhani:/home/rostaakhani/Desktop/mininet/mininet/custom# ping google.com -c 1
ping: google.com: Temporary failure in name resolution
root@rostaakhani:/home/rostaakhani/Desktop/mininet/mininet/custom# ping 8.8.8.8 -c 1
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data:
64 bytes from 8.8.8.8: icmp_seq=1 ttl=111 time=211 ms

--- 8.8.8.8 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 210.968/210.968/210.968/0.000 ms
root@rostaakhani:/home/rostaakhani/Desktop/mininet/mininet/custom# iptables -t nat -A POSTROUTING -o h3-eth1 -j MASQUERADE
root@rostaakhani:/home/rostaakhani/Desktop/mininet/mininet/custom# ping 8.8.8.8 -c 1
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data:
64 bytes from 8.8.8.8: icmp_seq=1 ttl=111 time=106 ms

--- 8.8.8.8 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 105.976/105.976/105.976/0.000 ms
root@rostaakhani:/home/rostaakhani/Desktop/mininet/mininet/custom# sudo echo nameserver 8.8.8.8 > /etc/resolv.conf
root@rostaakhani:/home/rostaakhani/Desktop/mininet/mininet/custom#
```

سپیس google را ping می کنیم.

```
Activities XTerm Apr 12 22:19 h3
root@rostaakhani:/home/rostaakhani/Desktop/mininet/mininet/custom# dhclient h3-eth1
root@rostaakhani:/home/rostaakhani/Desktop/mininet/mininet/custom# ping google.com -c 1
ping: google.com: Temporary failure in name resolution
root@rostaakhani:/home/rostaakhani/Desktop/mininet/mininet/custom# ping 8.8.8.8 -c 1
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data:
64 bytes from 8.8.8.8: icmp_seq=1 ttl=111 time=211 ms

--- 8.8.8.8 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 210.968/210.968/210.968/0.000 ms
root@rostaakhani:/home/rostaakhani/Desktop/mininet/mininet/custom# iptables -t nat -A POSTROUTING -o h3-eth1 -j MASQUERADE
root@rostaakhani:/home/rostaakhani/Desktop/mininet/mininet/custom# ping 8.8.8.8 -c 1
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data:
64 bytes from 8.8.8.8: icmp_seq=1 ttl=111 time=106 ms

--- 8.8.8.8 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 105.976/105.976/105.976/0.000 ms
root@rostaakhani:/home/rostaakhani/Desktop/mininet/mininet/custom# sudo echo nameserver 8.8.8.8 > /etc/resolv.conf
root@rostaakhani:/home/rostaakhani/Desktop/mininet/mininet/custom# ping google.com -c 1
PING google.com (142.250.185.46) 56(84) bytes of data:
64 bytes from mct01s19-in-f14.1c100.net (142.250.185.46): icmp_seq=1 ttl=108 time=104 ms

--- google.com ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 103.505/103.505/103.505/0.000 ms
root@rostaakhani:/home/rostaakhani/Desktop/mininet/mininet/custom#
```