گزارش آزمایش 2

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الف و ب)

```
#!/usr/bin/python


"""
This example shows how to create a Mininet object and add nodes to it manually.
"""
"Importing Libraries"
from mininet.net import Mininet
from mininet.node import Controller
from mininet.cli import CLI
from mininet.log import setLogLevel, info


"Function definition: This is called from the main function"
def firstNetwork():
    "Create an empty network and add nodes to it."
    net = Mininet()


    info( '*** Adding controller\n' )
```

```
net.addController( 'c0' )


info( '*** Adding hosts\n' )
h1 = net.addHost( 'h1', ip='10.10.14.1/24')
h2 = net.addHost( 'h2', ip='10.10.24.2/24')
h3 = net.addHost( 'h3', ip='10.10.34.3/24')
h4 = net.addHost( 'h4', ip='10.10.14.4/24')

info( '*** Adding switch\n' )
s14 = net.addSwitch( 's14' )
s24 = net.addSwitch( 's24' )
s34 = net.addSwitch( 's34' )

info( '*** Creating links\n' )
net.addLink( h1, s14 )
net.addLink( h4, s14 )
net.addLink( h2, s24 )
net.addLink( h4, s24 )
net.addLink( h3, s34 )
net.addLink( h4, s34 )

h4.cmd('ip addr add 10.10.24.4/24 dev h4-eth1')
```

```
h4.cmd('ip addr add 10.10.34.4/24 dev h4-eth2')



h3.cmd('echo 1 > /proc/sys/net/ipv4/ip_forward')

h4.cmd('echo 1 > /proc/sys/net/ipv4/ip_forward')

info( '*** Starting network\n')

net.start()

info( '*** Adding Gateways\n')

h1.cmd('ip route add default via 10.10.14.4')

h2.cmd('ip route add default via 10.10.24.4')

h3.cmd('ip route add default via 10.10.34.4')

info( '*** Starting terminals on hosts\n' )

h1.cmd('xterm -xrm "XTerm.vt100.allowTitleOps: false" -T h1 &')

h2.cmd('xterm -xrm "XTerm.vt100.allowTitleOps: false" -T h2 &')

h3.cmd('xterm -xrm "XTerm.vt100.allowTitleOps: false" -T h3 &')

h4.cmd('xterm -xrm "XTerm.vt100.allowTitleOps: false" -T h4 &')

info( '*** Running the command line interface\n' )

CLI( net )
```

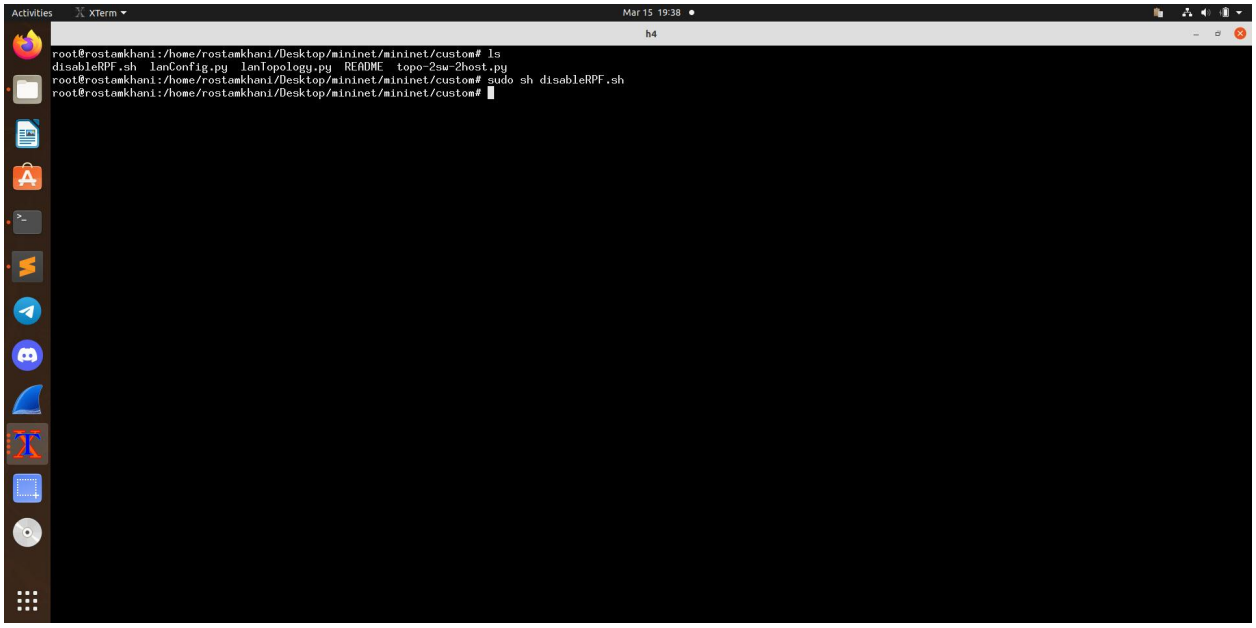
```
    info( '*** Closing the terminals on the hosts\n' )
    h1.cmd("killall xterm")
    h2.cmd("killall xterm")
    h3.cmd("killall xterm")
    h4.cmd("killall xterm")

    info( '*** Stopping network' )
    net.stop()

"main Function: This is called when the Python file is run"
if __name__ == '__main__':
    setLogLevel( 'info' )
    firstNetwork()
```

ج) برای غیر فعال سازی RPF دستور زیر را در ترمینال مربوط به h4 اجرا می کنیم:

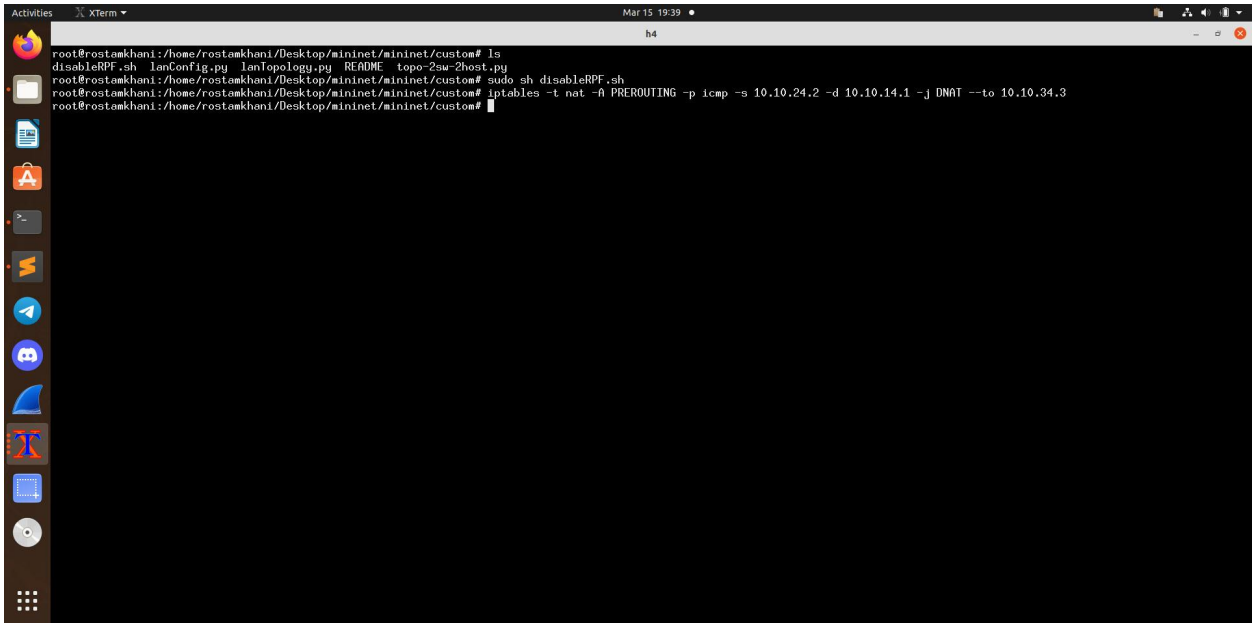
```
sudo sh disableRPF.sh
```



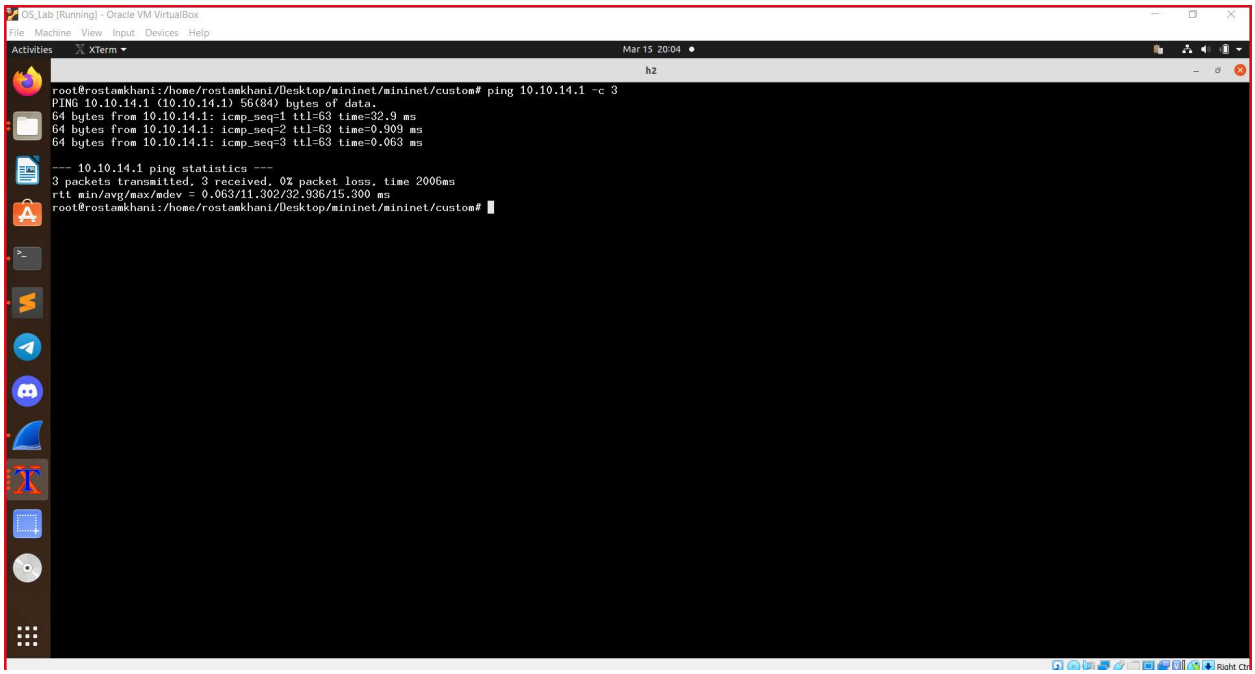
د) سوال 2:

برای هدایت بسته هایی که باید از h2 به سمت h1 منتقل شوند، به h3 باید در h4 دستور زیر را وارد کنیم:

```
iptables -t nat -A PREROUTING -p icmp -s 10.10.24.2 -d 10.10.14.1 -j DNAT --to 10.10.34.3
```

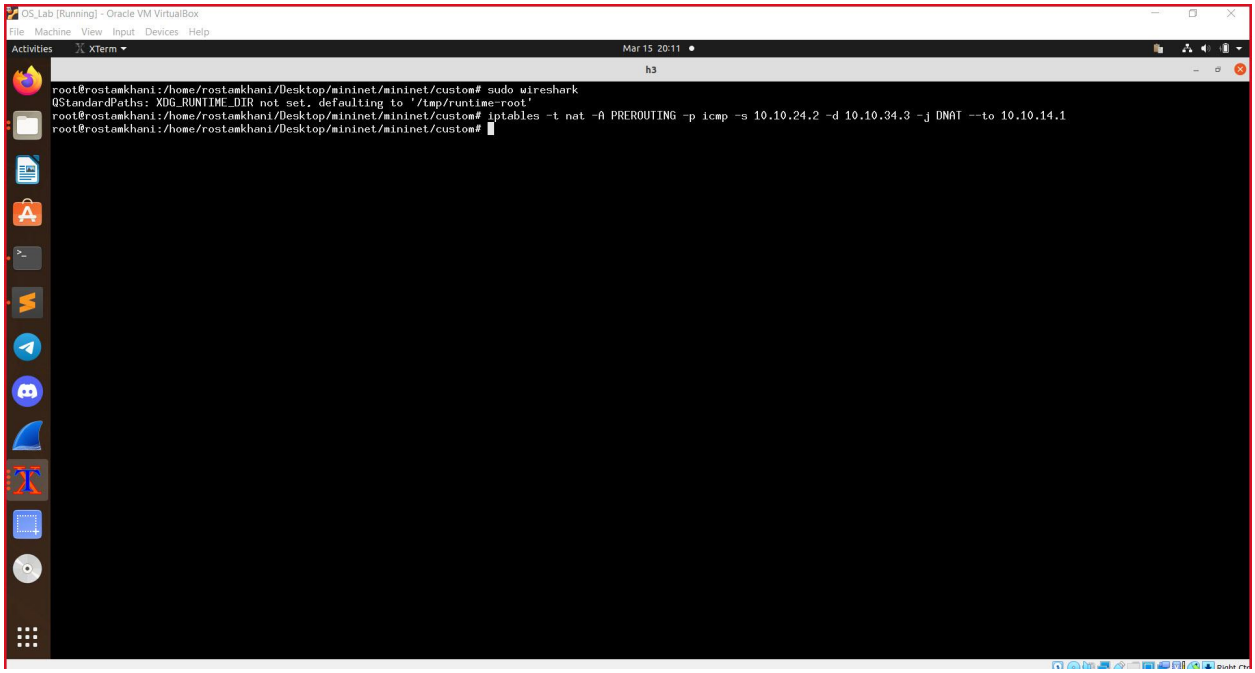


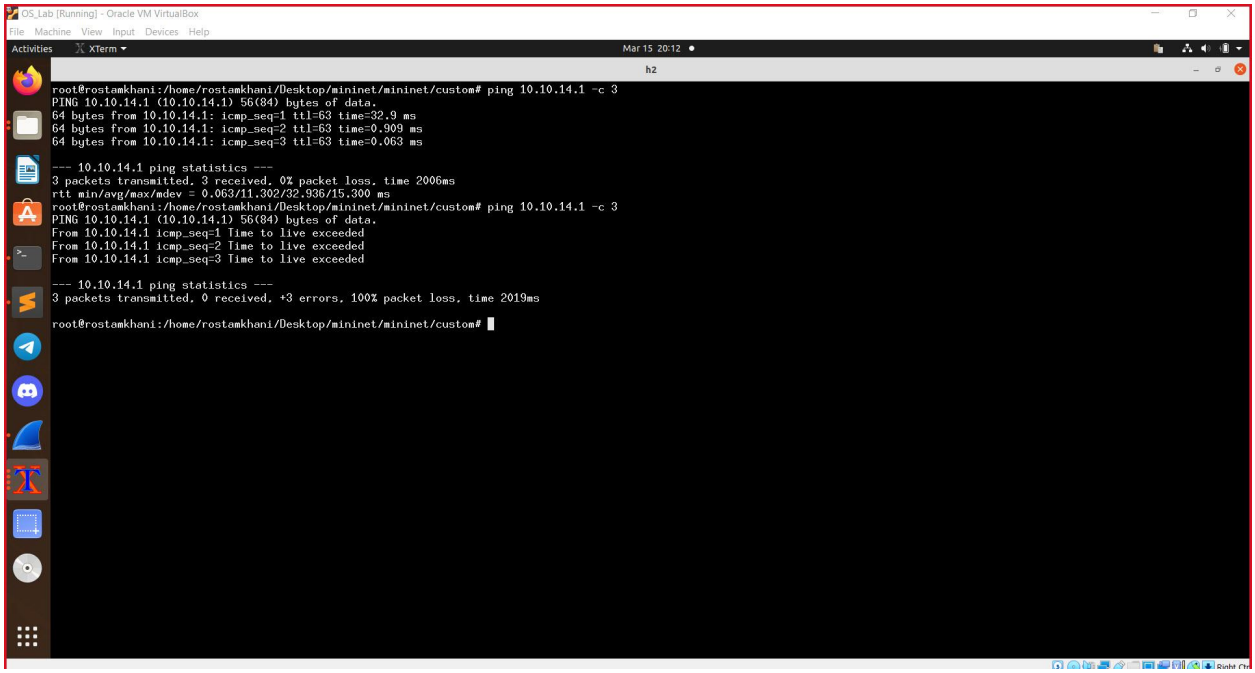
با اجرای wireshark روی h3 داریم:

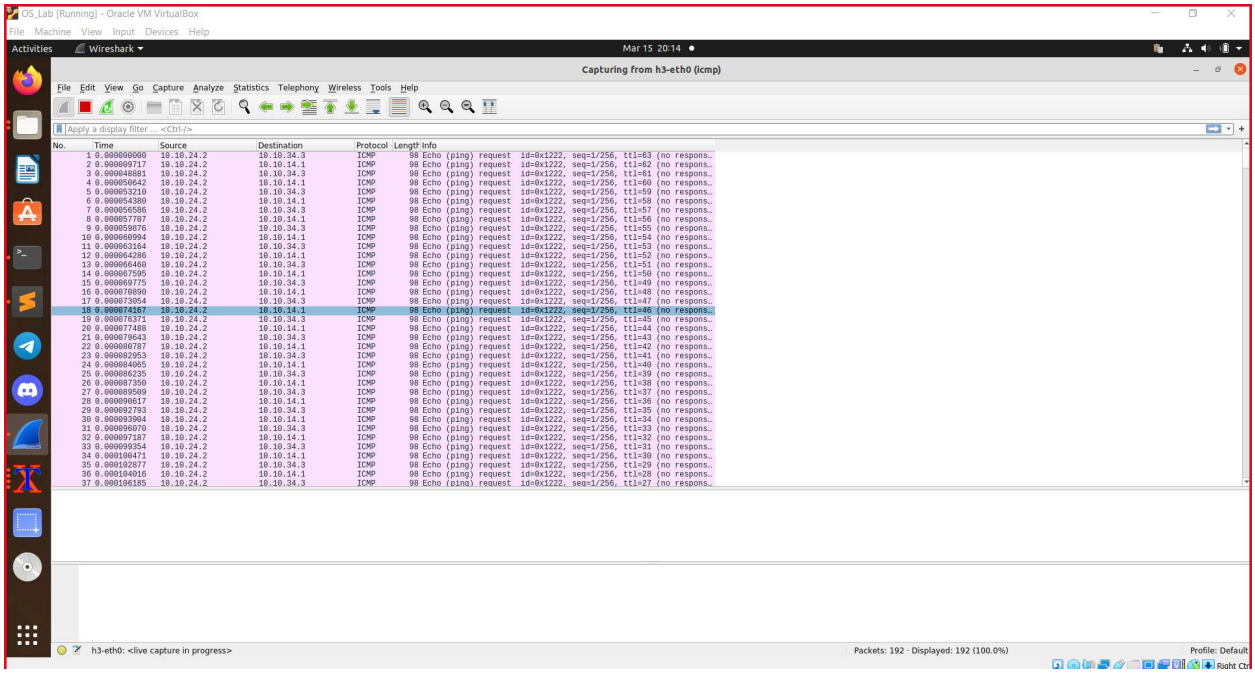


سپس برای انتقال ترافیک از h3 به سمت h1 باید دستور زیر را در h3 وارد کنیم:

```
iptables -t nat -A PREROUTING -p icmp -s 10.10.24.2 -d 10.10.34.3
-j DNAT --to 10.10.14.1
```


OS_Lab [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities
XTerm
Mar 15 20:11
h3
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# sudo wireshark
QStandardPaths: XDG_RUNTIME_DIR not set, defaulting to '/tmp/runtime-root'
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# iptables -t nat -A PREROUTING -p icmp -s 10.10.24.2 -d 10.10.34.3 -j DNAT --to 10.10.14.1
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom#


OS_Lab [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities
XTerm
Mar 15 20:12
h2
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.14.1 -c 3
PING 10.10.14.1 (10.10.14.1) 56(84) bytes of data.
64 bytes from 10.10.14.1: icmp_seq=1 ttl=63 time=32.9 ms
64 bytes from 10.10.14.1: icmp_seq=2 ttl=63 time=0.909 ms
64 bytes from 10.10.14.1: icmp_seq=3 ttl=63 time=0.063 ms
--- 10.10.14.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2006ms
rtt min/avg/max/mdev = 0.063/11.302/32.936/15.300 ms
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.14.1 -c 3
PING 10.10.14.1 (10.10.14.1) 56(84) bytes of data.
From 10.10.14.1 icmp_seq=1 Time to live exceeded
From 10.10.14.1 icmp_seq=2 Time to live exceeded
From 10.10.14.1 icmp_seq=3 Time to live exceeded
--- 10.10.14.1 ping statistics ---
3 packets transmitted, 0 received, +3 errors, 100% packet loss, time 2019ms
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom#



سوال3:

باید دستورات زیر را در host های مربوطه وارد کنیم:

h4:

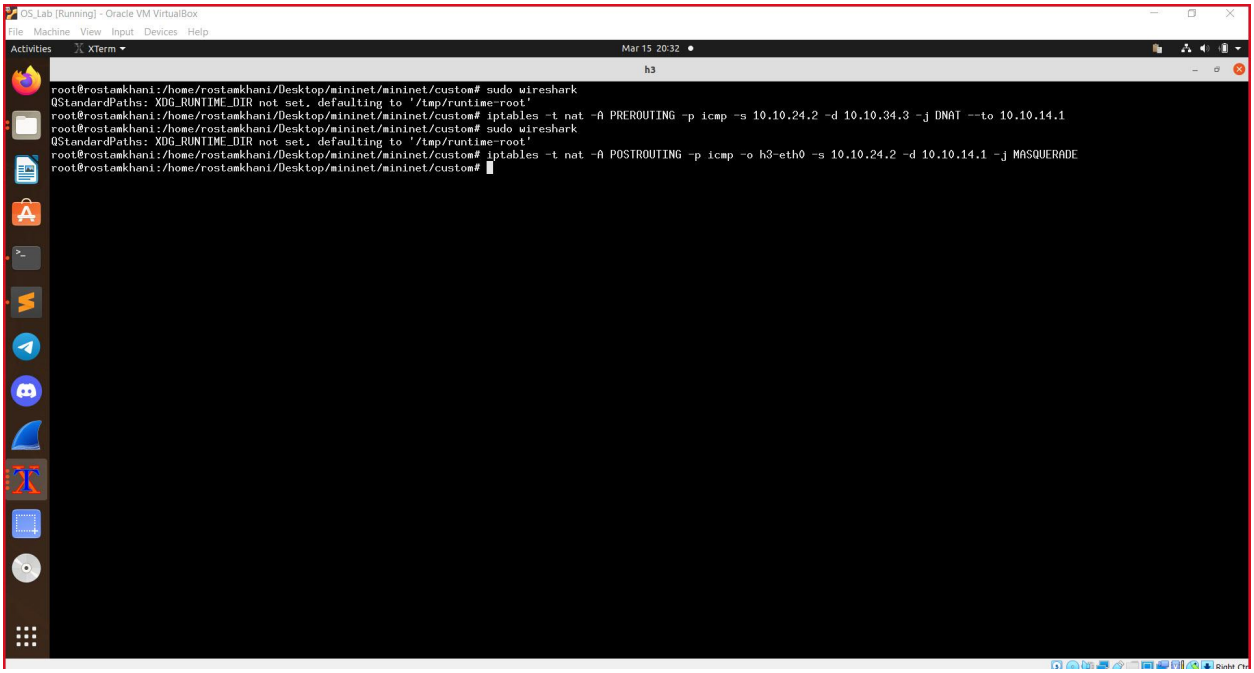
```
iptables -t nat -A PREROUTING -p icmp -s 10.10.24.2 -d 10.10.14.1 -j DNAT --to 10.10.34.3
```

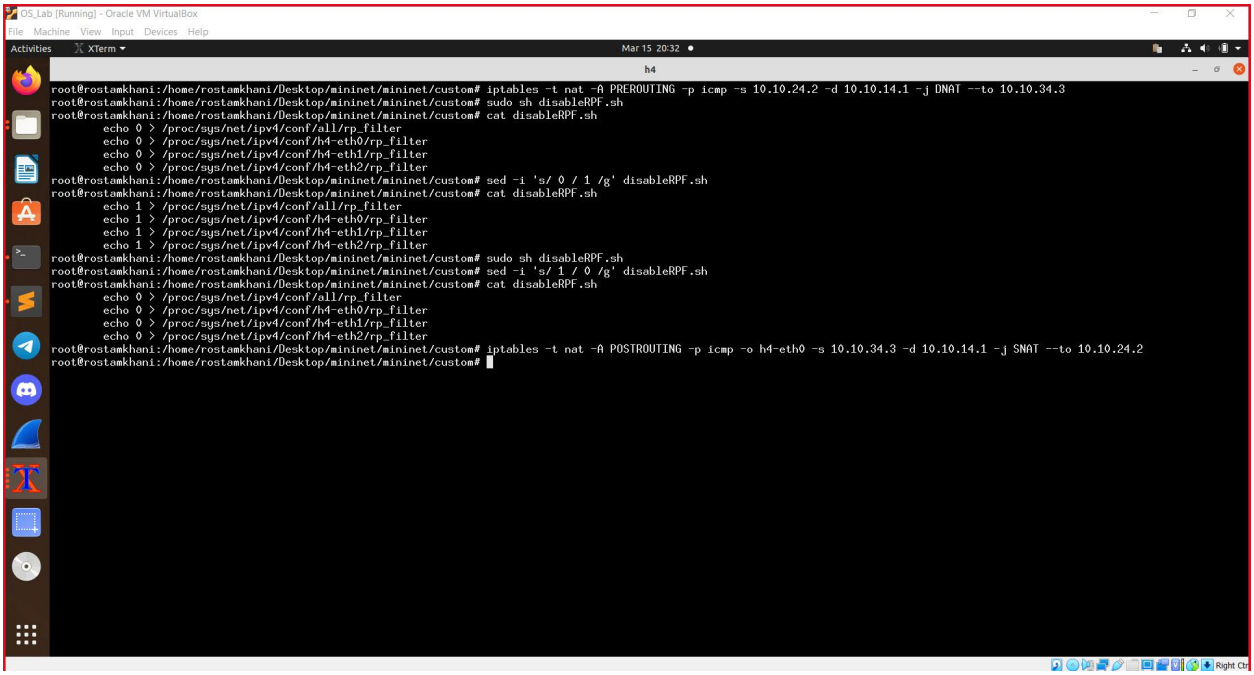
```
iptables -t nat -A POSTROUTING [-p icmp] -o h4-eth0 -s 10.10.34.3 -d 10.10.14.1 -j SNAT --to 10.10.24.2
```

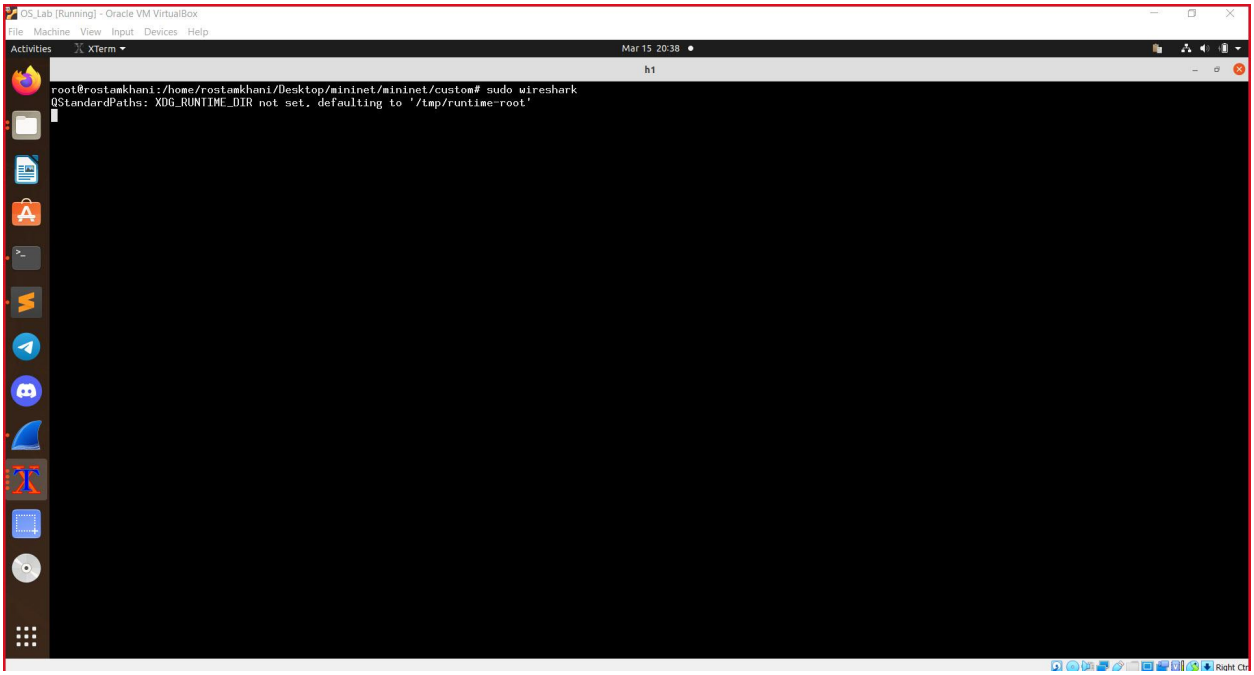
h3:

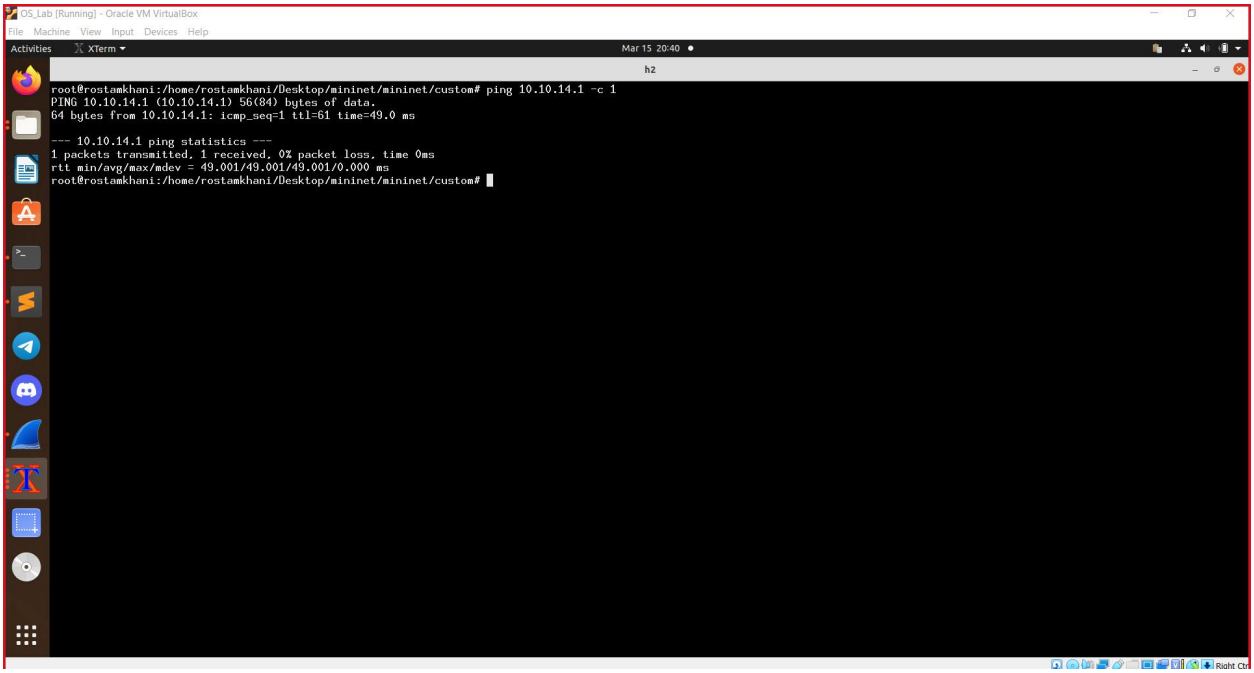
```
iptables -t nat -A PREROUTING -p icmp -s 10.10.24.2 -d 10.10.34.3 -j DNAT --to 10.10.14.1
```

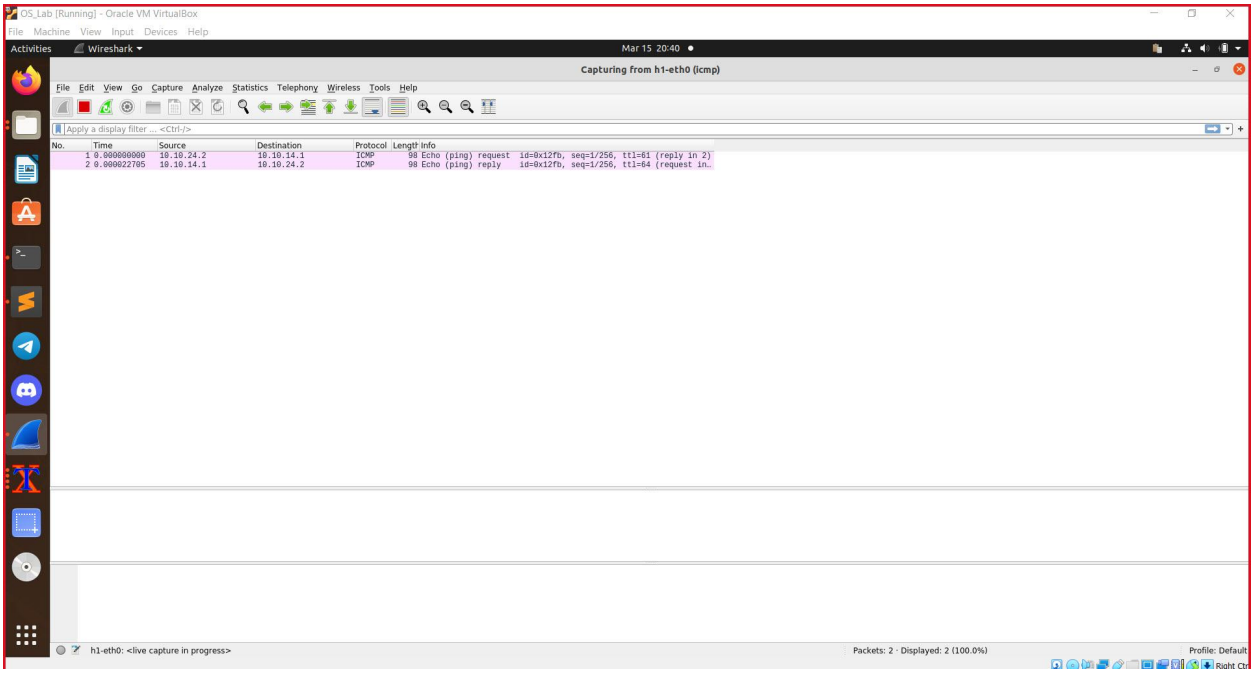
```
iptables -t nat -A POSTROUTING [-p icmp] -o h3-eth0 -s 10.10.24.2 -d 10.10.14.1 -j MASQUERADE
```


OS_Lab [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities
XTerm
Mar 15 20:32
h3
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# sudo wireshark
QStandardPaths: XDG_RUNTIME_DIR not set, defaulting to '/tmp/runtime-root'
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# iptables -t nat -A PREROUTING -p icmp -s 10.10.24.2 -d 10.10.34.3 -j DNAT --to 10.10.14.1
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# sudo wireshark
QStandardPaths: XDG_RUNTIME_DIR not set, defaulting to '/tmp/runtime-root'
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# iptables -t nat -A POSTROUTING -p icmp -o h3-eth0 -s 10.10.24.2 -d 10.10.14.1 -j MASQUERADE
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom#


OS_Lab [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities
XTerm
Mar 15 20:32
h4
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# iptables -t nat -A PREROUTING -p icmp -s 10.10.24.2 -d 10.10.14.1 -j DNAT --to 10.10.34.3
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# sudo sh disableRPF.sh
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# cat disableRPF.sh
echo 0 > /proc/sys/net/ipv4/conf/all/rp_filter
echo 0 > /proc/sys/net/ipv4/conf/h4-eth0/rp_filter
echo 0 > /proc/sys/net/ipv4/conf/h4-eth1/rp_filter
echo 0 > /proc/sys/net/ipv4/conf/h4-eth2/rp_filter
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# sed -i 's/ 0 / 1 /g' disableRPF.sh
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# cat disableRPF.sh
echo 1 > /proc/sys/net/ipv4/conf/all/rp_filter
echo 1 > /proc/sys/net/ipv4/conf/h4-eth0/rp_filter
echo 1 > /proc/sys/net/ipv4/conf/h4-eth1/rp_filter
echo 1 > /proc/sys/net/ipv4/conf/h4-eth2/rp_filter
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# sudo sh disableRPF.sh
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# sed -i 's/ 1 / 0 /g' disableRPF.sh
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# cat disableRPF.sh
echo 0 > /proc/sys/net/ipv4/conf/all/rp_filter
echo 0 > /proc/sys/net/ipv4/conf/h4-eth0/rp_filter
echo 0 > /proc/sys/net/ipv4/conf/h4-eth1/rp_filter
echo 0 > /proc/sys/net/ipv4/conf/h4-eth2/rp_filter
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# iptables -t nat -A POSTROUTING -p icmp -o h4-eth0 -s 10.10.34.3 -d 10.10.14.1 -j SNAT --to 10.10.24.2
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom#


OS_Lab [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities
XTerm
Mar 15 20:38
h1
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# sudo wireshark
QStandardPaths: XDG_RUNTIME_DIR not set, defaulting to '/tmp/runtime-root'


OS_Lab [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities
XTerm
Mar 15 20:40
h2
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.14.1 -c 1
PING 10.10.14.1 (10.10.14.1) 56(84) bytes of data.
64 bytes from 10.10.14.1: icmp_seq=1 ttl=61 time=49.0 ms
--- 10.10.14.1 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 49.001/49.001/49.001/0.000 ms
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom#



سوال4:

جداول routing table ها بر اساس ip مقصد کار میکنند و اگر ما آنها را تغییر دهیم صرفا مسیر بسته تغییر می کند(ip ها تغییر نمی کنند). اگر RPF غیر فعال باشد، پاسخ به این سوال مثبت است یعنی با تغییر routing table ها نیز میتوان این کار را کرد.(این حالت یک حالت خاص است) در حالت کلی از آنجایی که RPF فعال است، پاسخ به این سوال خیر است و نیاز داریم تا ip مبدا را تغییر دهیم و نمی توانیم فقط با تغییر ip مقصد این کار را انجام دهیم.

سوال5:

سیستم h2 میتواند با استفاده از RTT و TTL بفهمد که مورد حمله قرار گرفته است یا خیر.

یا دانستن توپولوژی شبکه میتوانیم طوری مقدار TTL را قرار دهیم که مورد حمله قرار نگیریم. در صورت مورد حمله قرار گرفتن، مقدار RTT زیاد می شود زیرا بسته باید مسیر طولانی تری را طی کند.