

# گزارش آزمایش 1

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(الف)

```
#!/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' )
```

```
h2 = net.addHost( 'h2' )
```

```
h3 = net.addHost( 'h3' )
```

```
h4 = net.addHost( 'h4' )
```

```
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( h2, s24 )
```

```
net.addLink( h3, s34 )
```

```
net.addLink( h4, s14 )
```

```
net.addLink( h4, s24 )
```

```
net.addLink( h4, s34 )
```

---

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

net.start()

#This is used to run commands on the hosts

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")

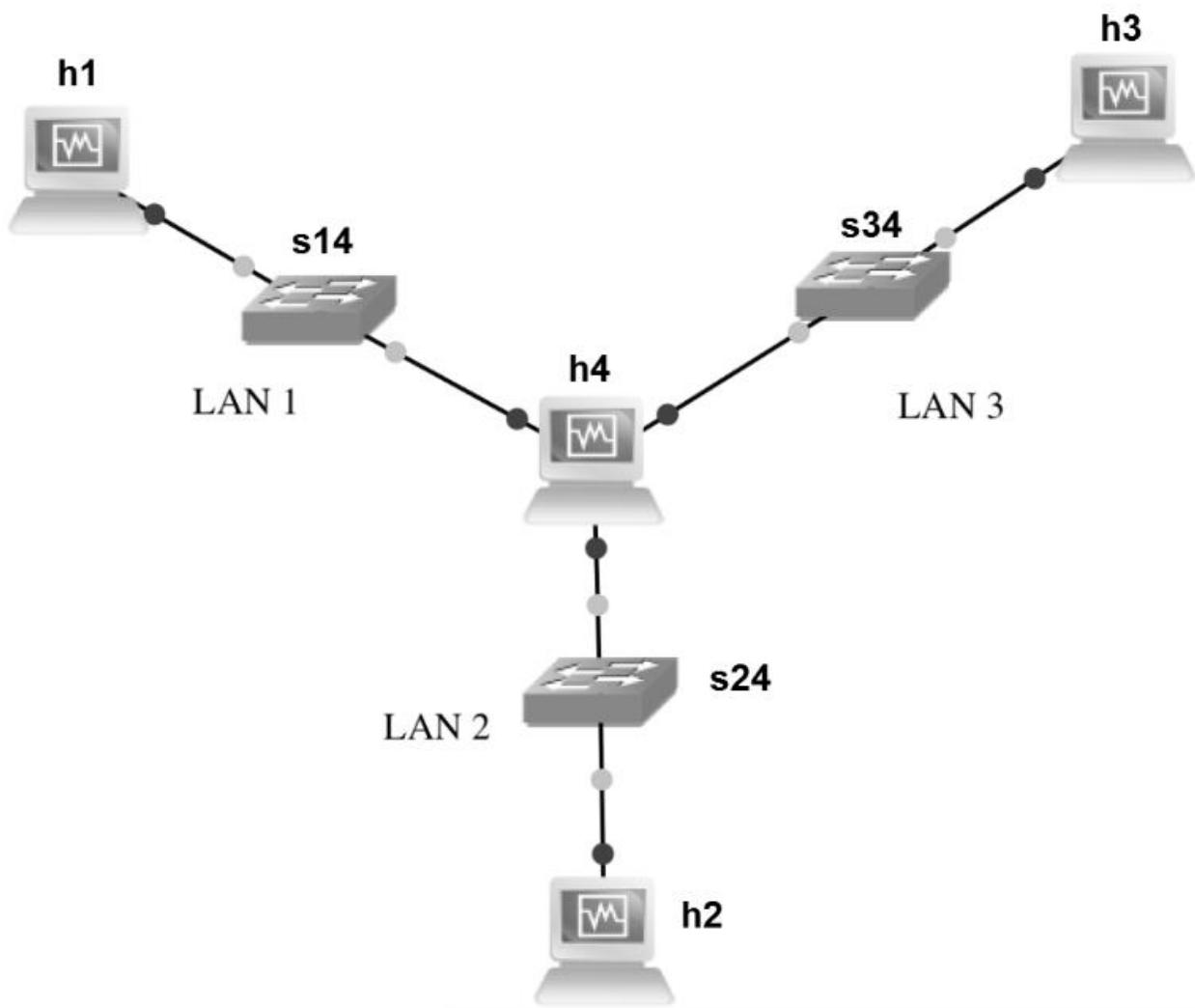
info( '*** Stopping network' )

net.stop()
```

---

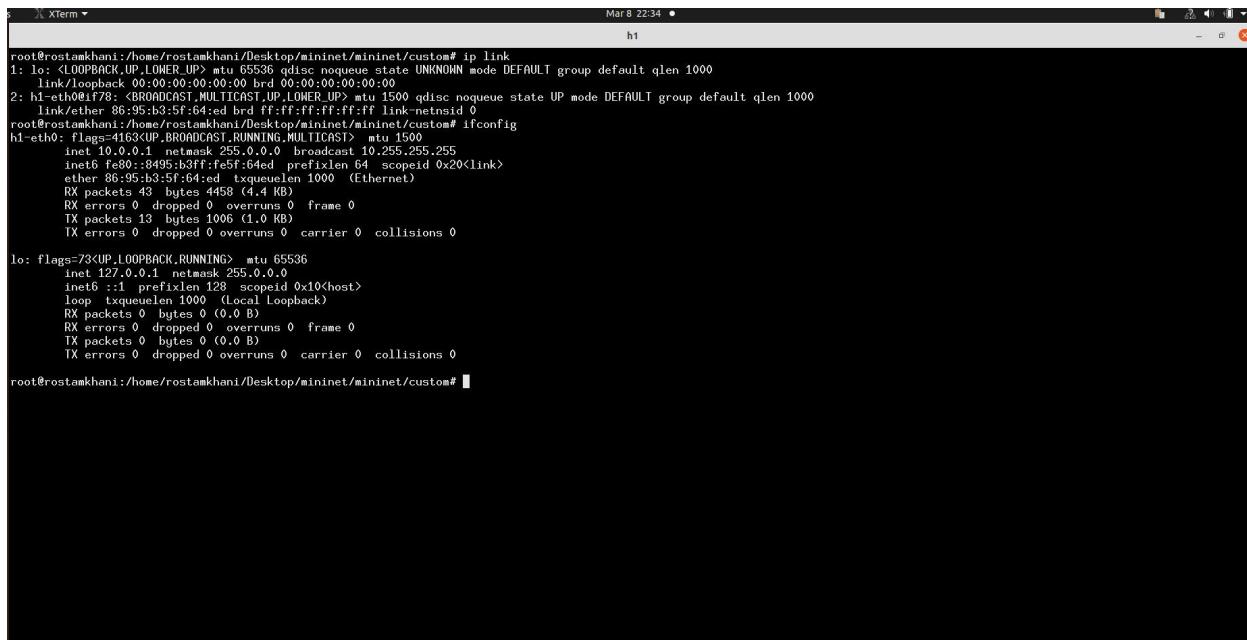
```
#main Function: This is called when the Python file is run
```

```
if __name__ == '__main__':  
    setLogLevel( 'info' )  
    firstNetwork()
```

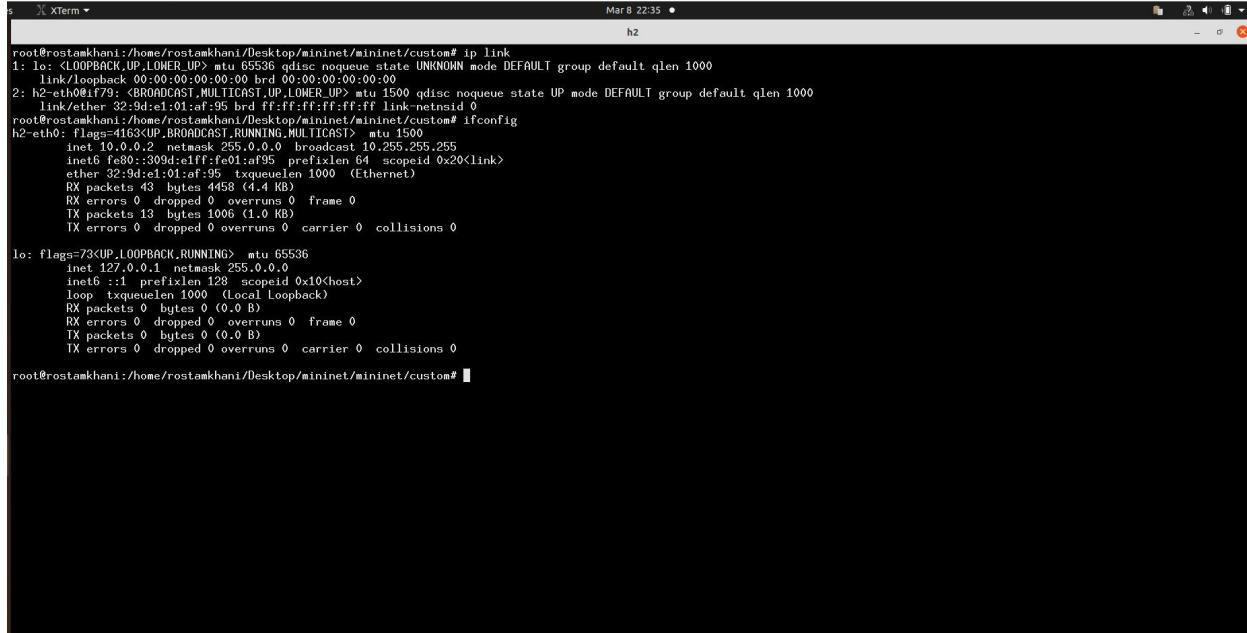


(ب)

ابتدا دستور ifconfig و ip link را برای هر host اجرا می کنیم:



```
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip link
1: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: h1-eth0@if79: <BR0,BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP mode DEFAULT group default qlen 1000
    link/ether 86:95:b3:5f:64:ed brd ff:ff:ff:ff:ff:ff link-netnsid 0
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ifconfig
h1-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.0.1 netmask 255.0.0.0 broadcast 10.255.255.255
        inet6 fe80::8695:b3ff:fe5f:64ed prefixlen 64 scopeid 0x20<link>
            ether 86:95:b3:5f:64:ed txqueuelen 1000 (Ethernet)
            RX packets 43 bytes 4458 (4.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 13 bytes 1006 (1.0 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 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
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom#
```



```
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip link
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: h2-eth0@if79: <BR0,BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP mode DEFAULT group default qlen 1000
    link/ether 32:9d:e1:01:af:95 brd ff:ff:ff:ff:ff:ff link-netnsid 0
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ifconfig
h2-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.0.2 netmask 255.0.0.0 broadcast 10.255.255.255
        inet6 fe80::329d:e1ff:fe01:af95 prefixlen 64 scopeid 0x20<link>
            ether 32:9d:e1:01:af:95 txqueuelen 1000 (Ethernet)
            RX packets 43 bytes 4458 (4.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 13 bytes 1006 (1.0 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 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
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom#
```

```
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip link
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: h3:eth0@if90: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP mode DEFAULT group default qlen 1000
    link/ether 7a:e4:f6:85:a0:28 brd ff:ff:ff:ff:ff:ff link-netnsid 0
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ifconfig
h3:eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.0.3 netmask 255.0.0.0 broadcast 10.255.255.255
        inet6 fe80::7ae4:f6ff:fe85:a028 prefixlen 64 scopeid 0x20<link>
            ether 7a:e4:f6:85:a0:28 txqueuelen 1000 (Ethernet)
            RX packets 43 bytes 4458 (4.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 13 bytes 1006 (1.0 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 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
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom#
```

```
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip link
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: h4:eth0@if81: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP mode DEFAULT group default qlen 1000
    link/ether 4a:f2:db:3a:5c:63 brd ff:ff:ff:ff:ff:ff link-netnsid 0
3: h4:eth1@if82: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP mode DEFAULT group default qlen 1000
    link/ether 06:5e:6b:2f:e5:c3 brd ff:ff:ff:ff:ff:ff link-netnsid 0
4: h4:eth2@if83: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP mode DEFAULT group default qlen 1000
    link/ether 7a:b9:35:68:44:22 brd ff:ff:ff:ff:ff:ff link-netnsid 0
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ifconfig
h4:eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.0.4 netmask 255.0.0.0 broadcast 10.255.255.255
        inet6 fe80::4af2:dbff:fe3a:5c63 prefixlen 64 scopeid 0x20<link>
            ether 4a:f2:db:3a:5c:63 txqueuelen 1000 (Ethernet)
            RX packets 43 bytes 4458 (4.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 13 bytes 1006 (1.0 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
h4:eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.0.5 netmask 255.0.0.0 broadcast 10.255.255.255
        inet6 fe80::45e6:6fff:fe2f:e5c3 prefixlen 64 scopeid 0x20<link>
            ether 06:5e:6b:2f:e5:c3 txqueuelen 1000 (Ethernet)
            RX packets 43 bytes 4458 (4.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 13 bytes 1006 (1.0 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
h4:eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.0.6 netmask 255.0.0.0 broadcast 10.255.255.255
        inet6 fe80::78b9:35ff:fe68:4422 prefixlen 64 scopeid 0x20<link>
            ether 7a:b9:35:68:44:22 txqueuelen 1000 (Ethernet)
            RX packets 43 bytes 4458 (4.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 13 bytes 1006 (1.0 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 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
```

از آنجایی که همه لینک ها فعال بودند نیازی به up کردن آنها نبود.

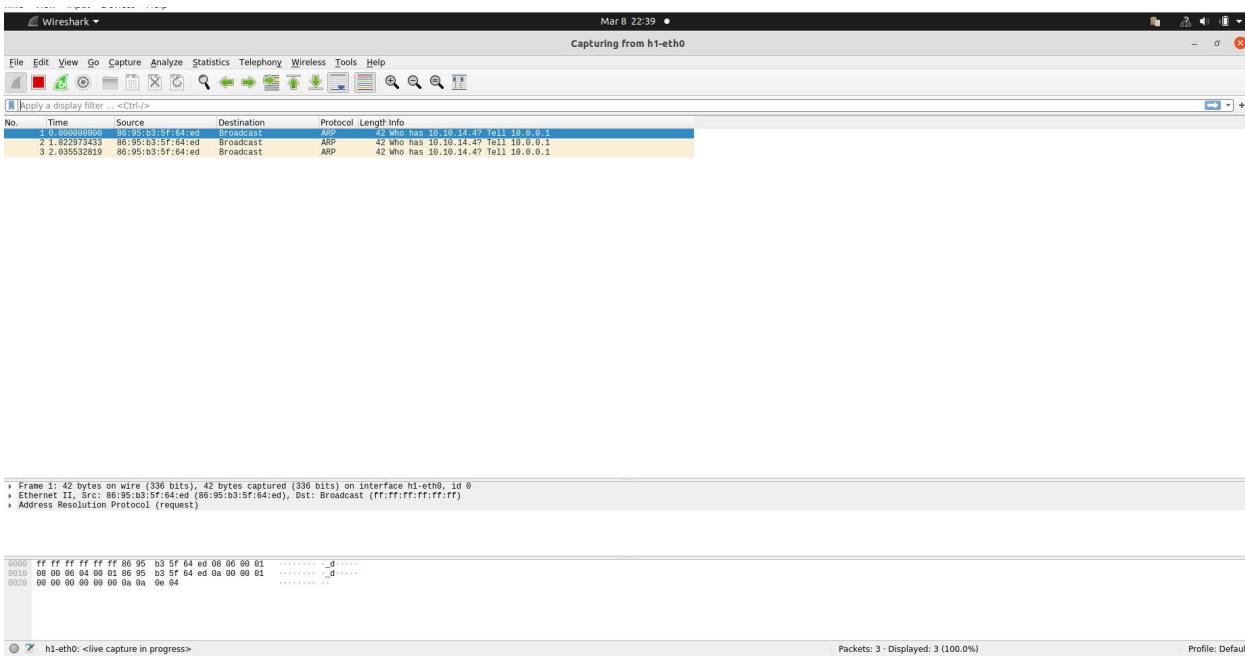
در ادامه روی h1 برنامه ping را باز می کنیم و سپس ip داده شده را wireshark می کنیم:

```

root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# sudo wireshark
0StandardPaths: XDG_RUNTIME_DIR not set, defaulting to '/tmp/runtime-root'
^Z
[1]+  Stopped                  sudo wireshark
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# bg
[1]+  sudo wireshark &
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.14.4 -c 3
PING 10.10.14.4 (10.10.14.4) 56(84) bytes of data.
From 10.0.0.1 icmp_seq=1 Destination Host Unreachable
From 10.0.0.1 icmp_seq=2 Destination Host Unreachable
From 10.0.0.1 icmp_seq=3 Destination Host Unreachable

--- 10.10.14.4 ping statistics ---
3 packets transmitted, 0 received, +3 errors, 100% packet loss, time 2036ms
pipe 3
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# 

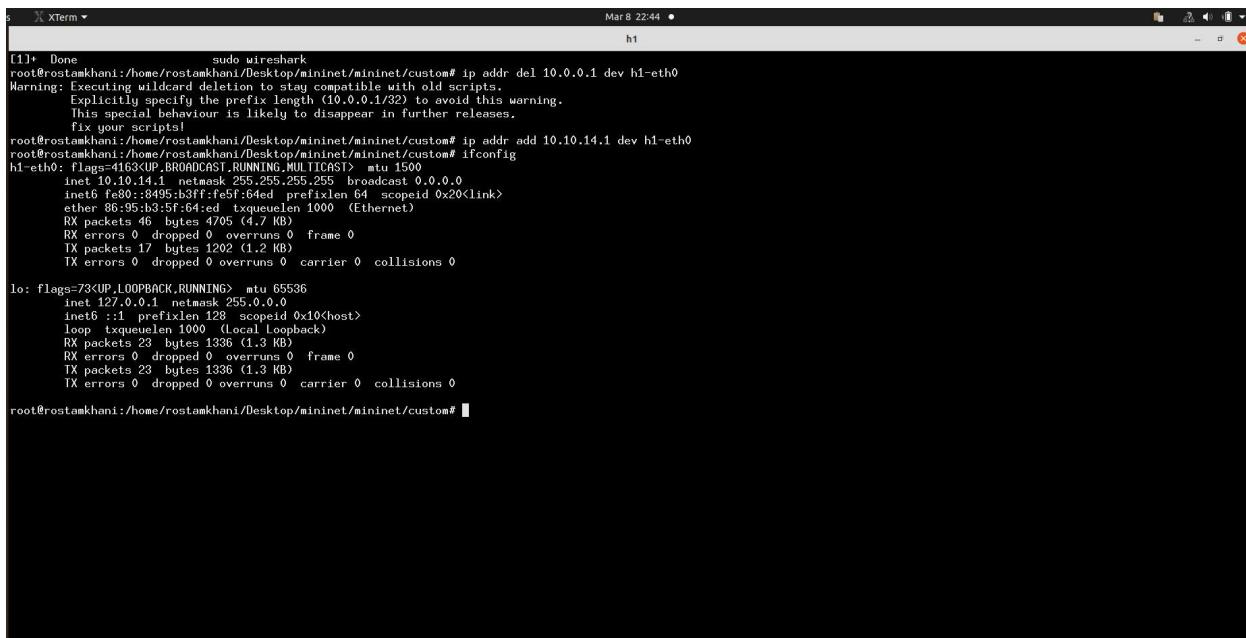
```



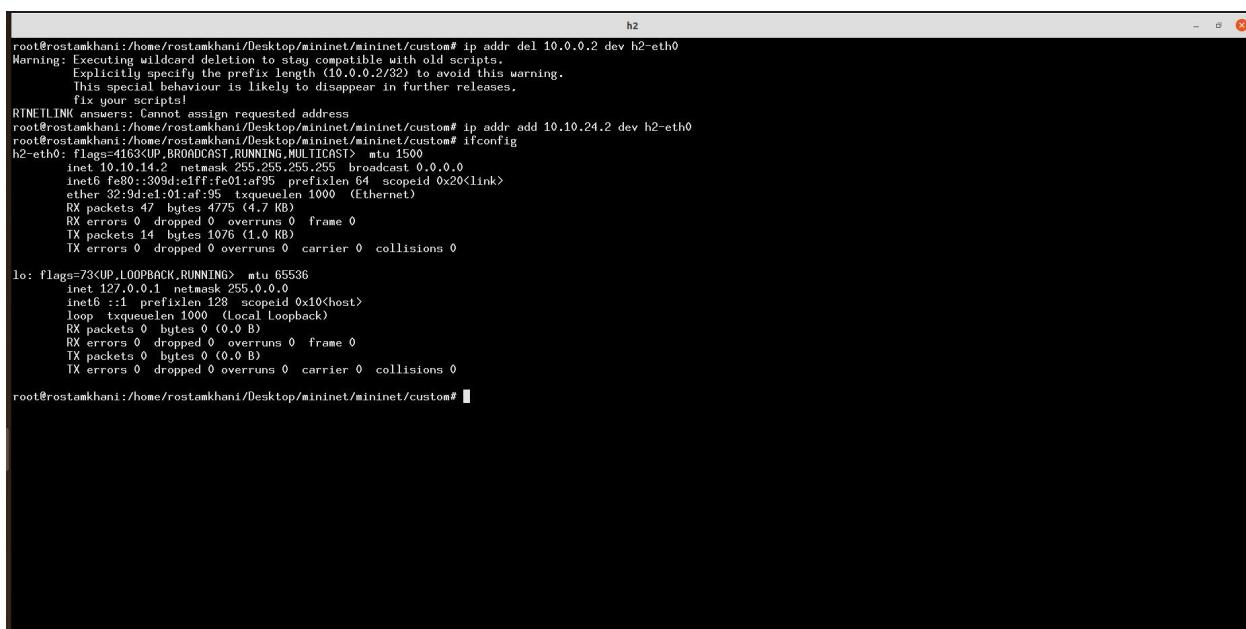
پاسخ سوال 1: همانطور که مشاهده می کنیم، ICMP request ارسال نمی شود. جدول arp در h1 آدرس فیزیکی معادل ip داده شده را ندارد. در ابتدا ARP request فرستاده می شود و از آنجایی که چنین ip ای در شبکه موجود نیست، کسی پاسخی نمی دهد. یعنی ARP reply ارسال نمی شود و دریافت نیز نمی شود.

(ج)

در ابتدا ip های گفته شده در گزارش کار را به host ها تخصیص می دهیم:



```
[1]+ Done sudo wireshark
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr del 10.0.0.1 dev h1-eth0
Warning: Executing wildcard deletion to stay compatible with old scripts.
Explicitly specify the prefix length (10.0.0.1/32) to avoid this warning.
This special behaviour is likely to disappear in further releases.
fix your scripts!
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr add 10.10.14.1 dev h1-eth0
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ifconfig
h1-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.10.14.1 brd 255.255.255.255 broadcast 0.0.0.0
        netmask 255.255.255.255
        ether 8c:05:b3:5f:64:01 txqueuelen 1000 (Ethernet)
        RX packets 46 bytes 4705 (4.7 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 17 bytes 1202 (1.2 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 brd 255.0.0.0
        netmask 255.0.0.0
        loop txqueuelen 1000 (Local Loopback)
        RX packets 23 bytes 1336 (1.3 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 23 bytes 1336 (1.3 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom#
```



```
h2
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr del 10.0.0.2 dev h2-eth0
Warning: Executing wildcard deletion to stay compatible with old scripts.
Explicitly specify the prefix length (10.0.0.2/32) to avoid this warning.
This special behaviour is likely to disappear in further releases.
fix your scripts!
RTNETLINK answers: Cannot assign requested address
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr add 10.10.24.2 dev h2-eth0
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ifconfig
h2-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.10.14.2 brd 255.255.255.255 broadcast 0.0.0.0
        netmask 255.255.255.255
        ether 32:9d:af:01:af:95 txqueuelen 1000 (Ethernet)
        RX packets 47 bytes 4775 (4.7 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 14 bytes 1076 (1.0 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 brd 255.0.0.0
        netmask 255.0.0.0
        loop txqueuelen 1000 (Local Loopback)
        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
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom#
```

```

h3
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr del 10.0.0.3 dev h3-eth0
Warning: Executing wildcard deletion to stay compatible with old scripts.
  Explicitly specify the prefix length (10.0.0.3/32) to avoid this warning.
  This special behaviour is likely to disappear in further releases.
  fix your scripts!
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr add 10.10.34.3 dev h3-eth0
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ifconfig
h3-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.10.34.3 netmask 255.255.255.255 broadcast 0.0.0.0
        inet6 fe80::7ae4:f6ff:fe85:a028 prefixlen 64 scopeid 0x20<link>
            ether 7a:4:f6:85:a0:28 txqueuelen 1000 (Ethernet)
            RX packets 47 bytes 4778 (4.7 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 15 bytes 1146 (1.1 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 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
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# 

```

```

h4
Mar 8 22:58 ●
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr del 10.0.0.4 dev h4-eth0
Warning: Executing wildcard deletion to stay compatible with old scripts.
  Explicitly specify the prefix length (10.0.0.4/32) to avoid this warning.
  This special behaviour is likely to disappear in further releases.
  fix your scripts!
RTNETLINK answers: Cannot assign requested address
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr add 10.10.14.4 dev h4-eth0
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr add 10.10.24.4 dev h4-eth1
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr add 10.10.34.4 dev h4-eth2
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ifconfig
h4-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.10.14.4 netmask 255.255.255.255 broadcast 0.0.0.0
        inet6 fe80::4bf2:dbff:fea3:5c63 prefixlen 64 scopeid 0x20<link>
            ether 4:b2:db:3:a:5c:63 txqueuelen 1000 (Ethernet)
            RX packets 51 bytes 5008 (5.0 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 15 bytes 1146 (1.1 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
h4-eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.10.24.4 netmask 255.255.255.255 broadcast 0.0.0.0
        inet6 fe80::45e6:6bff:fe2f:e5c3 prefixlen 64 scopeid 0x20<link>
            ether 06:5e:6:6:bff:fe txqueuelen 1000 (Ethernet)
            RX packets 47 bytes 4812 (4.8 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 15 bytes 1146 (1.1 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
h4-eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.10.34.4 netmask 255.255.255.255 broadcast 0.0.0.0
        inet6 fe80::7b93:35ff:fe68:4422 prefixlen 64 scopeid 0x20<link>
            ether 7:a:b9:3:68:44 txqueuelen 1000 (Ethernet)
            RX packets 49 bytes 4952 (4.9 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 15 bytes 1146 (1.1 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 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
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# 

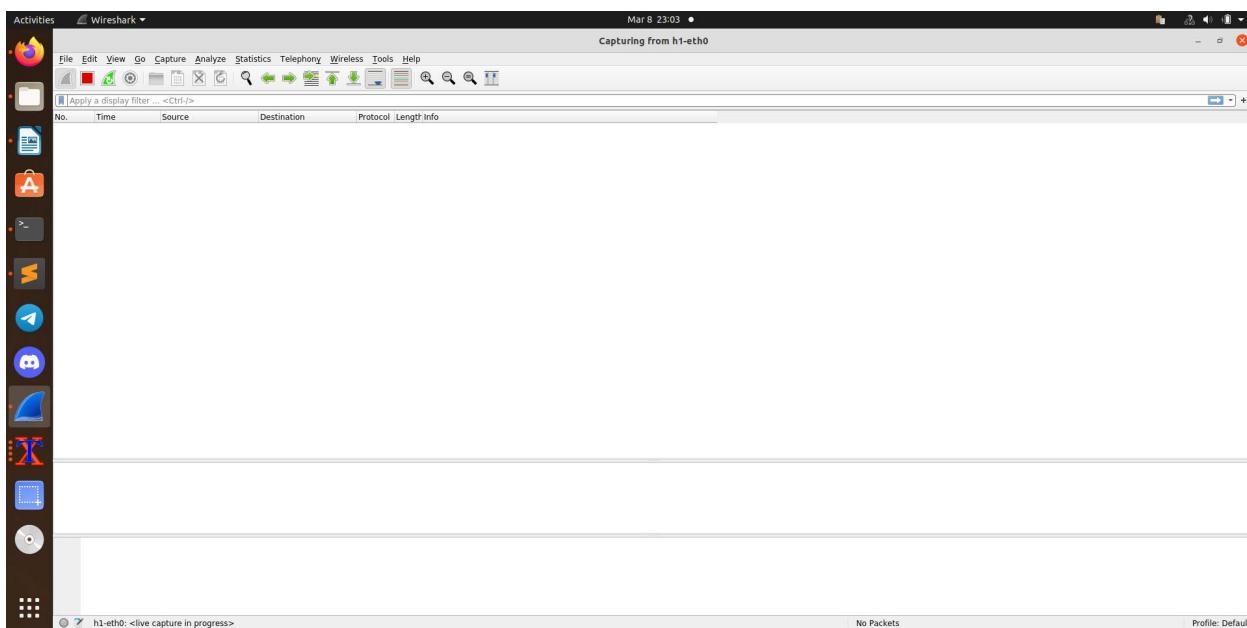
```

حال مجددا از h1 به ping 10.10.14.4 می کنیم:

```

Activities XTerm Mar 8 23:00 • h1
[1]+ Done sudo wireshark
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr del 10.0.0.1 dev h1-eth0
Warning: Executing wildcard deletion to stay compatible with old scripts.
Explicitly specify the prefix length (10.0.0.1/32) to avoid this warning.
This special behaviour is likely to disappear in further releases.
fix your scripts!
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr add 10.10.14.1 dev h1-eth0
h1-eth0: flags=4163UP,BR0ODCAST,RUNNING,MULTICAST mtu 1500
          inet 10.10.14.1 netmask 255.255.255.255 broadcast 0.0.0.0
            inet6 fe80::8495:b3ff:fe5f:64ed prefixlen 64 scopeid 0x20<link>
              ether 86:95:b3:5f:64:ed txqueuelen 1000 (Ethernet)
            RX packets 16 bytes 1056 (4.7 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 17 bytes 1202 (1.2 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
lo: flags=73UP,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 23 bytes 1336 (1.3 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 23 bytes 1336 (1.3 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# sudo wireshark
QStandardPaths: XDG_RUNTIME_DIR set, defaulting to '/tmp/runtime-root'
^Z
[1]+ Stopped sudo wireshark
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# bg
[1]+ sudo wireshark &
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.14.4 -c 3
ping: connect: Network is unreachable
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# 

```

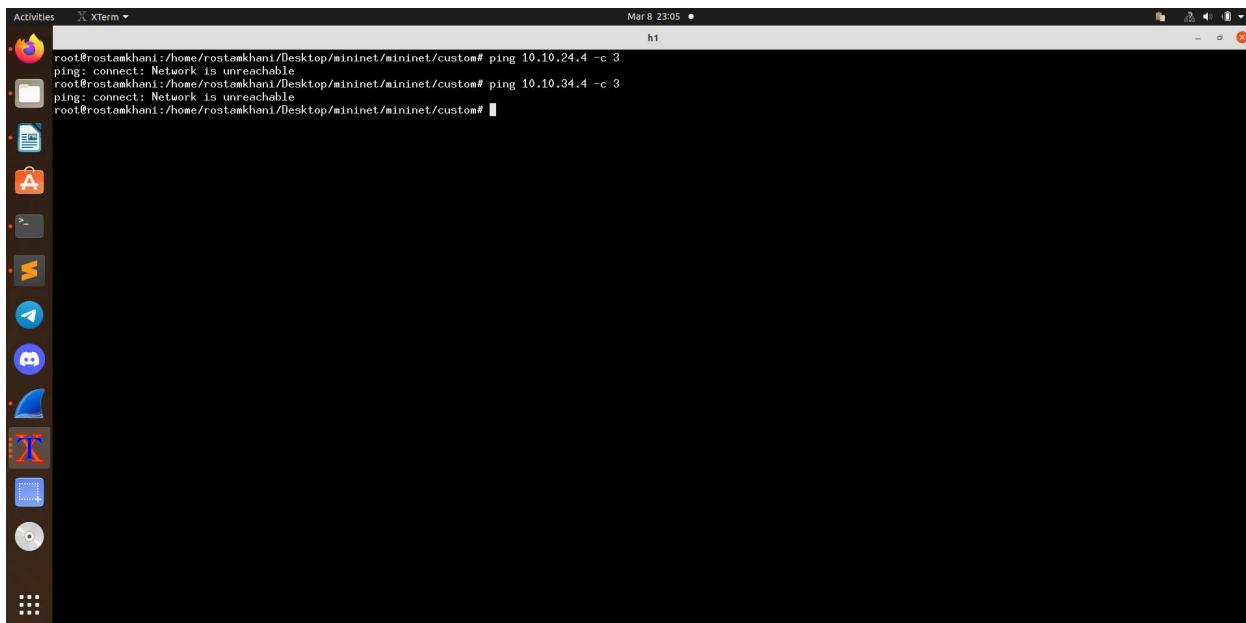


**پاسخ سوال 2:** مشاهده میکنیم که از آنجایی که این دو host در شبکه های مختلف هستند نمی توانند همدیگر را ping کنند.

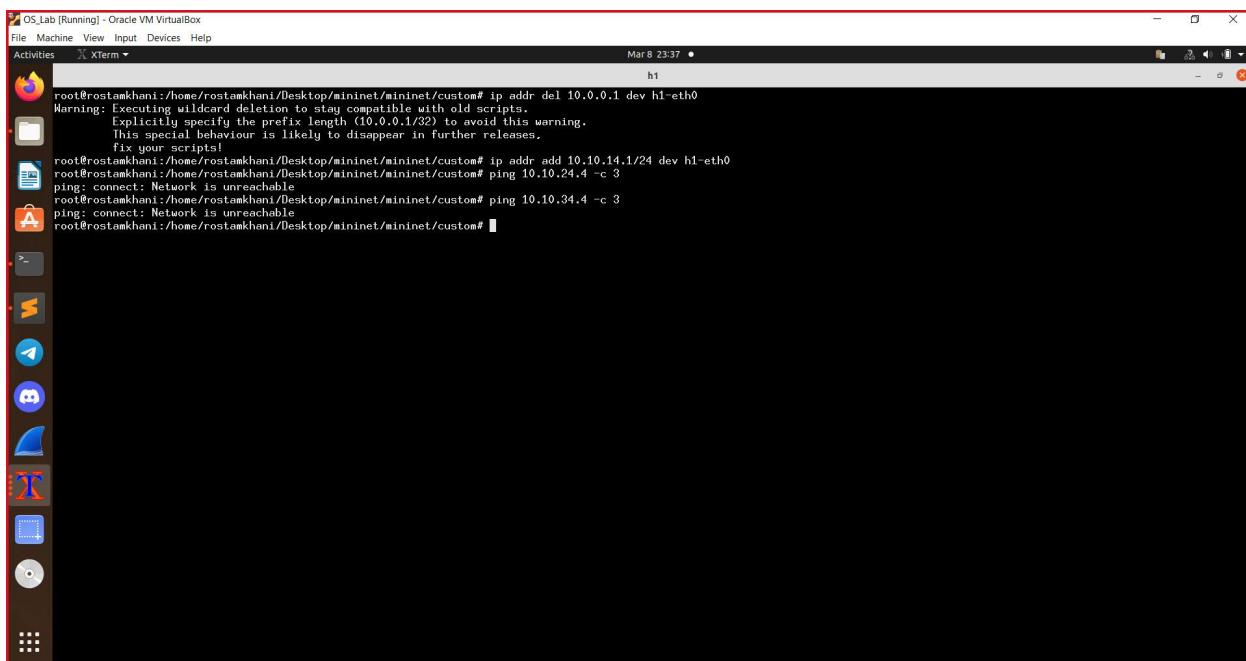
همانطور که مشاهده می شود نه ARP reply شنود شده و نه ICMP reply

(د)

در ابتدا دو دستور ping گفته شده در گزارش کار را اجرا می کنیم:



```
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.24.4 -c 3
ping: connect: Network is unreachable
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.34.4 -c 3
ping: connect: Network is unreachable
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom#
```



```
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr del 10.0.0.1 dev h1-eth0
Warning: Executing wildcard deletion to stay compatible with old scripts.
          Explicitly specify the prefix length (10.0.0.1/32) to avoid this warning.
          This special behaviour is likely to disappear in further releases.
fix your scripts!
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr add 10.10.14.1/24 dev h1-eth0
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.24.4 -c 3
ping: connect: Network is unreachable
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.34.4 -c 3
ping: connect: Network is unreachable
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom#
```

پاسخ سوال 3: همانطور که مشاهده می کنیم این دستور کار نمی کند. زیرا **h4** باید تنظیم بشود که پیام های ICMP را **forward** کند.

سپس دستور ip route را اجرا می کنیم:

```
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr del 10.0.0.1 dev h1-eth0
Warning: Executing wildcard deletion to stay compatible with old scripts.
Explicitly specify the prefix length (10.0.0.1/32) to avoid this warning.
This special behaviour is likely to disappear in further releases.
fix your scripts!
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr add 10.10.14.1/24 dev h1-eth0
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.24.4 -c 3
ping: connect: Network is unreachable
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.34.4 -c 3
ping: connect: Network is unreachable
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip route
10.10.14.0/24 dev h1-eth0 proto kernel scope link src 10.10.14.1
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip route add default via 10.10.14.4
PING 10.10.34.4 (10.10.34.4) 56(84) bytes of data.
64 bytes from 10.10.34.4: icmp_seq=1 ttl=64 time=21.2 ms
64 bytes from 10.10.34.4: icmp_seq=2 ttl=64 time=0.224 ms
64 bytes from 10.10.34.4: icmp_seq=3 ttl=64 time=0.063 ms
--- 10.10.34.4 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2018ms
rtt min/avg/max/mdev = 0.063/7.165/21.210/9.931 ms
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom#
```

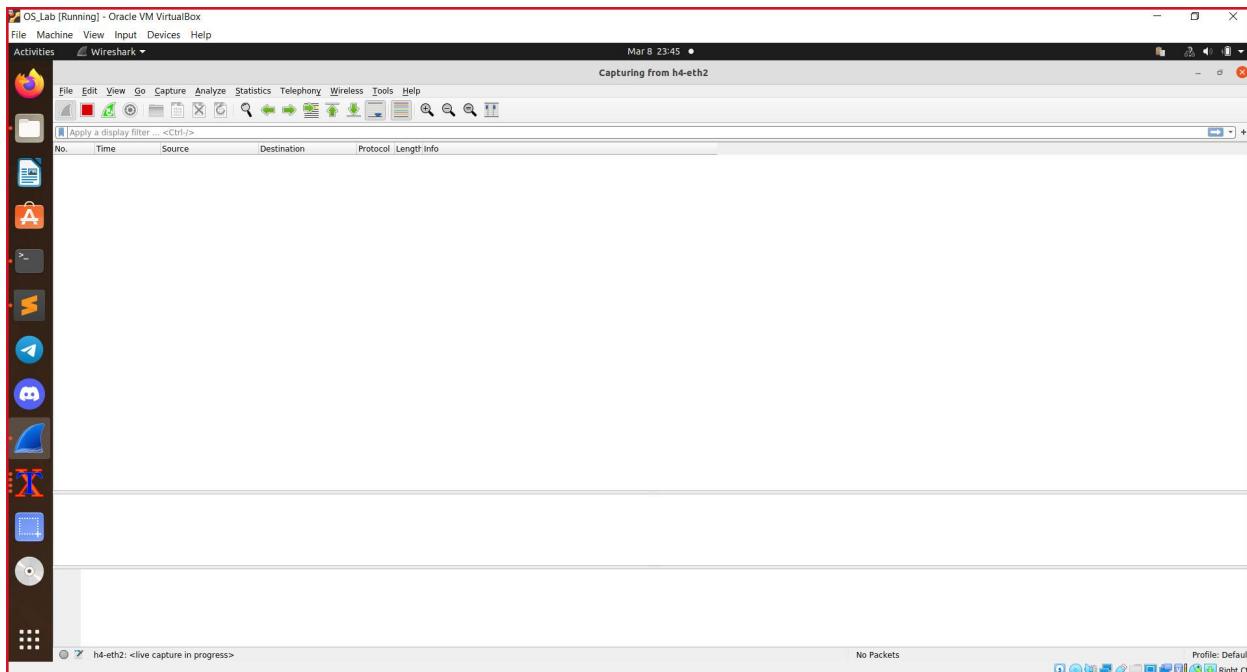
#### پاسخ سوال: 4

در اینجا دو default entry دیگری داریم. یک entry 10.10.14.0/24. هر کدام از این entry ها به معنای زیر هستند:

- دیفالت: به این معناست که هر آی پی ای که برایش entry ای وجود نداشت از این کانفیگ برای ارسالش استفاده بشود (مثلا از طریق اینترفیس eth0 انتقال و برای آی پی 10.10.14.4 برود).
- 10.10.14.0/24: به این معناست که هر آی پی ای که در شبکه ی گفته شده وجود دارد از این کانفیگ برای ارسالش استفاده شود (مثلا از اینترفیس eth0 ارسال بشود).

```
OS_Lab [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities XTerm Mar 8 23:44 •
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr del 10.0.0.1 dev h1-eth0
Warning: Executing wildcard deletion to stay compatible with old scripts.
    Explicitly specify the prefix length (10.0.0.1/32) to avoid this warning.
    This special behaviour is likely to disappear in further releases,
    fix your scripts!
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr add 10.10.14.1/24 dev h1-eth0
ping: connect: Network is unreachable
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.24.4 -c 3
ping: connect: Network is unreachable
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.34.4 -c 3
ping: connect: Network is unreachable
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip route
10.10.14.0/24 dev h1-eth0 proto kernel scope link src 10.10.14.1
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip route add default via 10.10.14.4
PING 10.10.34.4 (10.10.34.4) 56(84) bytes of data.
64 bytes from 10.10.34.4: icmp_seq=1 ttl=64 time=21.2 ms
64 bytes from 10.10.34.4: icmp_seq=2 ttl=64 time=0.224 ms
64 bytes from 10.10.34.4: icmp_seq=3 ttl=64 time=0.063 ms
--- 10.10.34.4 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2018ms
rtt min/avg/max/mdev = 0.063/7.165/21.210/9.931 ms
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.34.3 -c 3
PING 10.10.34.3 (10.10.34.3) 56(84) bytes of data.
--- 10.10.34.3 ping statistics ---
3 packets transmitted, 0 received, 100% packet loss, time 2028ms
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom#
```

پاسخ سوال 5: همانطور که مشاهده می شود، این بار اینترفیس h4 eth2 از h1 از طریق h1 قابل دسترسی است.



```
OS_Lab [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities X XTerm Mar 8 23:46
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr del 10.0.0.4 dev h4-eth0
Warning: Executing wildcard deletion to stay compatible with old scripts.
    Explicitly specify the prefix length (10.0.0.4/32) to avoid this warning.
    This special behaviour is likely to disappear in further releases.
fix your scripts!
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr add 10.10.14.4/24 dev h4-eth0
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr add 10.10.24.4/24 dev h4-eth1
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr add 10.10.34.4/24 dev h4-eth2
0
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# sudo wireshark
QStandardPaths: XDG_RUNTIME_DIR not set, defaulting to '/tmp/runtime-root'
^Z
[1]+ Stopped sudo wireshark
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# bg
[1]+ sudo wireshark &
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# echo 1 > /proc/sys/net/ipv4/ip_forward
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom#
```

```
OS_Lab [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities X XTerm Mar 8 23:47
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr del 10.0.0.1 dev h1-eth0
Warning: Executing wildcard deletion to stay compatible with old scripts.
    Explicitly specify the prefix length (10.0.0.1/32) to avoid this warning.
    This special behaviour is likely to disappear in further releases.
fix your scripts!
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr add 10.10.14.1/24 dev h1-eth0
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.24.4 -c 3
ping: connect: Network is unreachable
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.34.4 -c 3
ping: connect: Network is unreachable
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip route
10.10.14.0/24 dev h1-eth0 proto kernel scope link src 10.10.14.1
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip route add default via 10.10.14.4
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.34.3 -c 3
PING 10.10.34.4 (10.10.34.4) 56(84) bytes of data.
64 bytes from 10.10.34.4: icmp_seq=1 ttl=64 time=21.2 ms
64 bytes from 10.10.34.4: icmp_seq=2 ttl=64 time=0.224 ms
64 bytes from 10.10.34.4: icmp_seq=3 ttl=64 time=0.063 ms
--- 10.10.34.4 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2018ms
rtt min/avg/max/mdev = 0.063/7.165/21.210/9.931 ms
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.34.3 -c 3
PING 10.10.34.3 (10.10.34.3) 56(84) bytes of data.
--- 10.10.34.3 ping statistics ---
3 packets transmitted, 0 received, 100% packet loss, time 2028ms
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.34.3 -c 3
PING 10.10.34.3 (10.10.34.3) 56(84) bytes of data.
```

```

OS_Lab [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities X Terminal Mar 8 23:49
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr del 10.0.0.1 dev h1-eth0
Warning: Executing wildcard deletion to stay compatible with old scripts.
Explicitly specify the prefix length (10.0.0.1/32) to avoid this warning.
This special behaviour is likely to disappear in further releases,
fix your scripts!
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr add 10.10.14.1/24 dev h1-eth0
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.24.4 -c 3
ping: connect: Network is unreachable
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.34.4 -c 3
ping: connect: Network is unreachable
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip route
10.10.14.0/24 dev h1-eth0 src kernel scope link dev h1-eth0
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip route add default via 10.10.14.4
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.34.4 -c 3
PING 10.10.34.4 (10.10.34.4) 56(84) bytes of data.
64 bytes from 10.10.34.4: icmp_seq=1 ttl=64 time=21.2 ms
64 bytes from 10.10.34.4: icmp_seq=2 ttl=64 time=0.224 ms
64 bytes from 10.10.34.4: icmp_seq=3 ttl=64 time=0.063 ms

--- 10.10.34.4 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2018ms
rtt min/avg/max/mdev = 0.063/7.165/21.210/9.931 ms
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.34.3 -c 3
PING 10.10.34.3 (10.10.34.3) 56(84) bytes of data.

--- 10.10.34.3 ping statistics ---
3 packets transmitted, 0 received, 100% packet loss, time 2028ms
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.34.3 -c 3
PING 10.10.34.3 (10.10.34.3) 56(84) bytes of data.

--- 10.10.34.3 ping statistics ---
3 packets transmitted, 0 received, 100% packet loss, time 2078ms
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.34.3 -c 3
PING 10.10.34.3 (10.10.34.3) 56(84) bytes of data.

--- 10.10.34.3 ping statistics ---
3 packets transmitted, 0 received, 100% packet loss, time 2033ms
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# 

```

```

OS_Lab [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Wireshark Mar 8 23:49
Capturing from h4-eth0 and h4-eth2
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Apply a display filter: <Ctrl>/>
No. Time Source Destination Protocol Length Info
1 0.000000000 10.10.14.1 10.10.34.3 ICMP 88 Echo (ping) request 10.10.34.3 seq=1,tseq=1,ttl=64 no response
2 0.000012120 10.10.14.1 10.10.34.3 ICMP 88 Echo (ping) request 10.10.34.3 seq=2,tseq=2,ttl=64 no response
3 1.000779613 10.10.14.1 10.10.34.3 ICMP 88 Echo (ping) request 10.10.34.3 seq=3,tseq=3,ttl=64 no response
4 1.000778850 10.10.14.1 10.10.34.3 ICMP 88 Echo (ping) request 10.10.34.3 seq=4,tseq=4,ttl=64 no response
5 1.000778850 10.10.14.1 10.10.34.3 ICMP 88 Echo (ping) request 10.10.34.3 seq=5,tseq=5,ttl=64 no response
6 2.034667234 10.10.14.1 10.10.34.3 ICMP 88 Echo (ping) request 10.10.34.3 seq=6,tseq=6,ttl=64 no response
7 5.067984959 10.10.14.1 10.10.34.3 ICMP 88 Echo (ping) request 10.10.34.3 seq=7,tseq=7,ttl=64 no response
8 5.067984959 10.10.14.1 10.10.34.3 ARP 42 Who has 10.10.34.3? Tell 10.10.34.4
9 5.074907086 c8:89:b7:e5:16:07 22:59:1c:c7:a1:41 ARP 42 Who has 10.10.14.4? Tell 10.10.14.1
10 5.074915300 22:59:1c:c7:a1:41 c8:89:b7:e5:16:07 ARP 42 Who has 10.10.14.4? Tell 10.10.14.1
11 5.074915300 22:59:1c:c7:a1:41 00:0c:29:28:2d:26 ICMPv6 79 Router Selection Request from c8:89:b7:e5:16:07
12 24.290658214 fe80::201a:9cff:fe6.. ff02::fb MDNS 107 Standard query 0x0000 PTR _ipp._tcp.local, "QNm" question PTR.
13 24.795983499 fe80::a807:1aff:fe7.. ff02::fb MDNS 107 Standard query 0x0000 PTR _ipp._tcp.local, "QNm" question PTR.

Frame 5: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface h4-eth2, id 1
Ethernet II, Src: MS-NB-PhysServer-3 (00:0c:29:28:2d:26), Dst: MS-NB-PhysServer-32_18 (00:0c:29:1e:1d:18)
Internet Protocol Version 4, Src: 10.10.14.1, Dst: 10.10.34.3
Internet Control Message Protocol

0000: 02 38 e5 37 d9 19 aa a3 55 4e 13 d5 08 80 45 08 8 7 ... UN... E
0010: 00 54 c5 e5 48 09 3f 01 31 cc 6a 6a 0e b1 8a 0a .T @? 1... 0
0020: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .S01%`0...
0030: 00 98 3c 35 09 09 00 00 00 00 00 11 12 13 14 15 .< ...
0040: 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 22 23 24 25 !#%#
0050: 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 32 33 34 35 &(!)*,- ./012345
0060: 36 37 67

```

Packets: 13 - Displayed: 13 (100.0%) Profile: Default Right Ctrl

**پاسخ سوال 6:** برای رفع این مشکل، باید روی h2 دستور ip route add default via 10.10.24.4 و روی h3 دستور ip route add default via 10.10.34.4 را اجرا کنیم.

```
OS_Lab [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities X XTerm Mar 8 23:53 •
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr del 10.0.0.2 dev h2-eth0
h2
Warning: Executing wildcard deletion to stay compatible with old scripts.
Explicitly specify the prefix length (10.0.0.2/32) to avoid this warning.
This special behaviour is likely to disappear in further releases.
fix your scripts!
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr add 10.10.24.2/24 dev h2-eth0
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip route add default via 10.10.24.4
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom#
```

```
OS_Lab [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities X XTerm Mar 8 23:53 •
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr del 10.0.0.3 dev h3-eth0
h3
Warning: Executing wildcard deletion to stay compatible with old scripts.
Explicitly specify the prefix length (10.0.0.3/32) to avoid this warning.
This special behaviour is likely to disappear in further releases.
fix your scripts!
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr add 10.10.34.3/24 dev h3-eth0
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip route add default via 10.10.34.4
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom#
```

## پاسخ سوال 7: از آنجایی که شبکه متقارن است، اختلاف بین rtt ها بسیار کم است.

```
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.24.4 -c 3
ping: cannot reach Network is unreachable
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.34.4 -c 3
ping: cannot reach Network is unreachable
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip route
10.10.14.0/24 dev h1-eth0 proto kernel scope link src 10.10.14.1
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip route add default via 10.10.14.4
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.34.4 -c 3
PING 10.10.34.4 (10.10.34.4) 56(84) bytes of data.
64 bytes from 10.10.34.4: icmp_seq=1 ttl=64 time=21.2 ms
64 bytes from 10.10.34.4: icmp_seq=2 ttl=64 time=0.224 ms
64 bytes from 10.10.34.4: icmp_seq=3 ttl=64 time=0.063 ms
--- 10.10.34.4 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2018ms
rtt min/avg/max/mdev = 0.063/7.165/21.210/9.931 ms
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.34.3 -c 3
PING 10.10.34.3 (10.10.34.3) 56(84) bytes of data.
--- 10.10.34.3 ping statistics ---
3 packets transmitted, 0 received, 100% packet loss, time 2028ms
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.34.3 -c 3
PING 10.10.34.3 (10.10.34.3) 56(84) bytes of data.
--- 10.10.34.3 ping statistics ---
3 packets transmitted, 0 received, 100% packet loss, time 2078ms
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.34.3 -c 3
PING 10.10.34.3 (10.10.34.3) 56(84) bytes of data.
--- 10.10.34.3 ping statistics ---
3 packets transmitted, 0 received, 100% packet loss, time 2033ms
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.34.3 -c 3
PING 10.10.34.3 (10.10.34.3) 56(84) bytes of data.
64 bytes from 10.10.34.3: icmp_seq=1 ttl=63 time=18.1 ms
64 bytes from 10.10.34.3: icmp_seq=2 ttl=63 time=7.62 ms
64 bytes from 10.10.34.3: icmp_seq=3 ttl=63 time=0.386 ms
--- 10.10.34.3 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2002ms
rtt min/avg/max/mdev = 0.386/8.693/18.075/7.261 ms
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom#
```

```
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.34.4: icmp_seq=1 ttl=64 time=21.2 ms
64 bytes from 10.10.34.4: icmp_seq=2 ttl=64 time=0.224 ms
64 bytes from 10.10.34.4: icmp_seq=3 ttl=64 time=0.063 ms
--- 10.10.34.4 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2018ms
rtt min/avg/max/mdev = 0.063/7.165/21.210/9.931 ms
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.34.3 -c 3
PING 10.10.34.3 (10.10.34.3) 56(84) bytes of data.
--- 10.10.34.3 ping statistics ---
3 packets transmitted, 0 received, 100% packet loss, time 2028ms
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.34.3 -c 3
PING 10.10.34.3 (10.10.34.3) 56(84) bytes of data.
--- 10.10.34.3 ping statistics ---
3 packets transmitted, 0 received, 100% packet loss, time 2078ms
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.34.3 -c 3
PING 10.10.34.3 (10.10.34.3) 56(84) bytes of data.
--- 10.10.34.3 ping statistics ---
3 packets transmitted, 0 received, 100% packet loss, time 2033ms
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.34.3 -c 3
PING 10.10.34.3 (10.10.34.3) 56(84) bytes of data.
64 bytes from 10.10.34.3: icmp_seq=1 ttl=63 time=18.1 ms
64 bytes from 10.10.34.3: icmp_seq=2 ttl=63 time=7.62 ms
64 bytes from 10.10.34.3: icmp_seq=3 ttl=63 time=0.396 ms
--- 10.10.34.3 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2002ms
rtt min/avg/max/mdev = 0.386/8.693/18.075/7.261 ms
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ping 10.10.24.2 -c 3
PING 10.10.24.2 (10.10.24.2) 56(84) bytes of data.
64 bytes from 10.10.24.2: icmp_seq=1 ttl=63 time=46.2 ms
64 bytes from 10.10.24.2: icmp_seq=2 ttl=63 time=5.89 ms
64 bytes from 10.10.24.2: icmp_seq=3 ttl=63 time=0.269 ms
--- 10.10.24.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2009ms
rtt min/avg/max/mdev = 0.269/17.447/46.181/20.446 ms
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom#
```

```
OS_Lab [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities XTerm Mar 8 23:55
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr del 10.0.0.2 dev h2-eth0
Warning: Executing wildcard deletion to stay compatible with old scripts.
        Explicitly specify the prefix length (10.0.0.2/32) to avoid this warning.
        This special behaviour is likely to disappear in further releases.
        Fix your scripts!
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr add 10.10.24.2/24 dev h2-eth0
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip route add default via 10.10.24.4
PING 10.10.34.3 (10.10.34.3) 56(84) bytes of data.
64 bytes from 10.10.34.3: icmp_seq=1 ttl=63 time=14.8 ms
64 bytes from 10.10.34.3: icmp_seq=2 ttl=63 time=4.43 ms
64 bytes from 10.10.34.3: icmp_seq=3 ttl=63 time=0.256 ms
--- 10.10.34.3 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2025ms
rtt min/avg/max/mdev = 0.256/6.501/14.817/6.121 ms
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom#
```

```
OS_Lab [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities XTerm Mar 8 23:56
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr del 10.0.0.3 dev h3-eth0
Warning: Executing wildcard deletion to stay compatible with old scripts.
        Explicitly specify the prefix length (10.0.0.3/32) to avoid this warning.
        This special behaviour is likely to disappear in further releases.
        Fix your scripts!
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip addr add 10.10.34.3/24 dev h3-eth0
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom# ip route add default via 10.10.34.4
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=27.9 ms
64 bytes from 10.10.14.1: icmp_seq=2 ttl=63 time=4.00 ms
64 bytes from 10.10.14.1: icmp_seq=3 ttl=63 time=0.259 ms
--- 10.10.14.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2023ms
rtt min/avg/max/mdev = 0.259/10.732/27.943/12.264 ms
root@rostamkhani:/home/rostamkhani/Desktop/mininet/mininet/custom#
```