

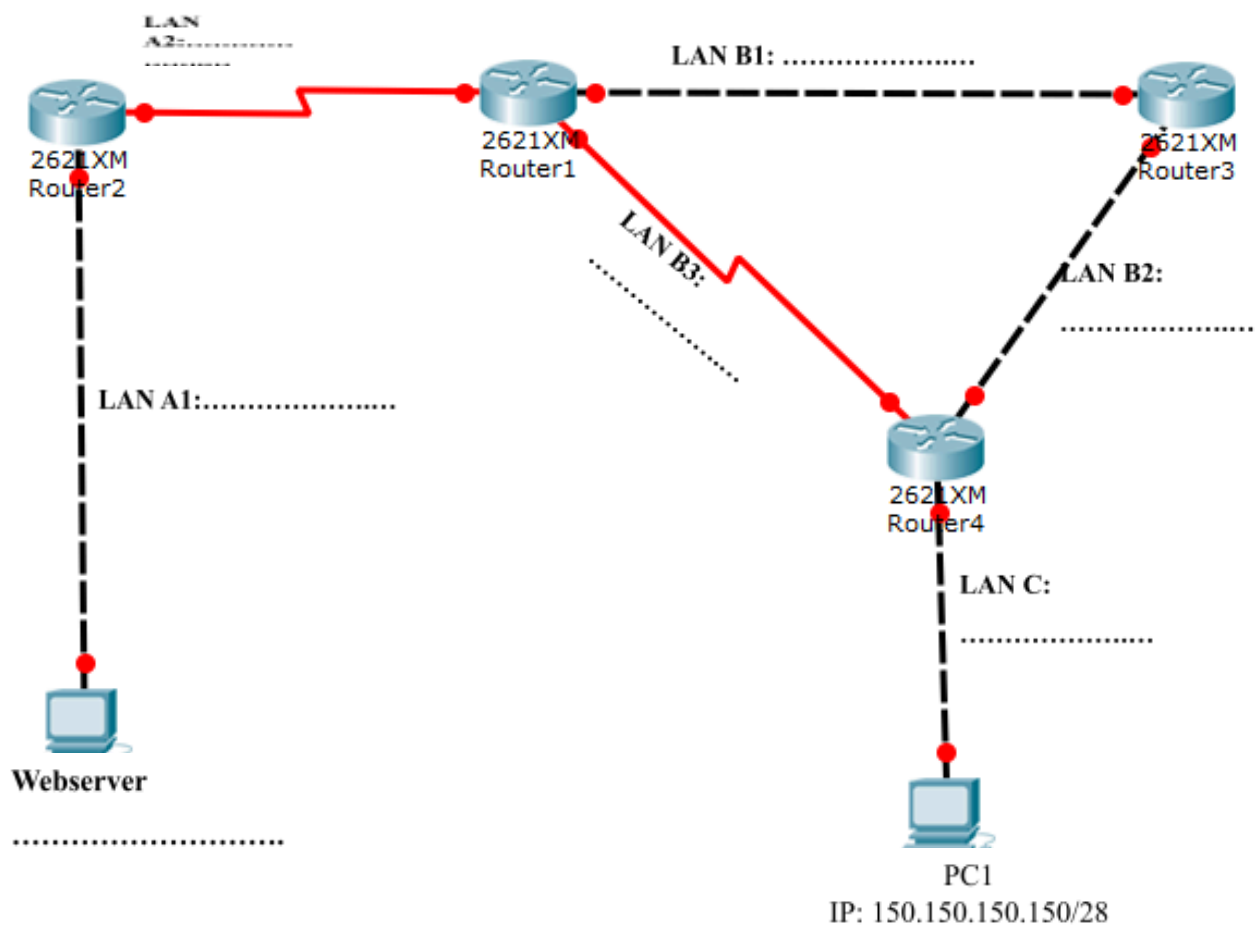
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ID: B2206005

Group: M01

Construct a network system as follows:

- LAN A has a single network address of 156.156.156.0/24, using static routing. LAN A is divided into 2 subnets, consisting of A1 and A2. In addition, there is a Web server running a simple webpage showing “YEAH! My name is *YOUR_FULL_NAME*” (replace *YOUR_FULL_NAME* by your full name) in LAN A1.
- LAN B1 has a network address of 140.140.140.0/27, using the RIPv2 protocol.
- LAN B2 has a network address of 140.140.140.128/27, using the RIPv2 protocol.
- LAN B3 has a network address of 140.140.140.192/27, using the RIPv2 protocol.
- LAN C includes PC1 and Router 4. The IP address of PC1 is 150.150.150.150/28.

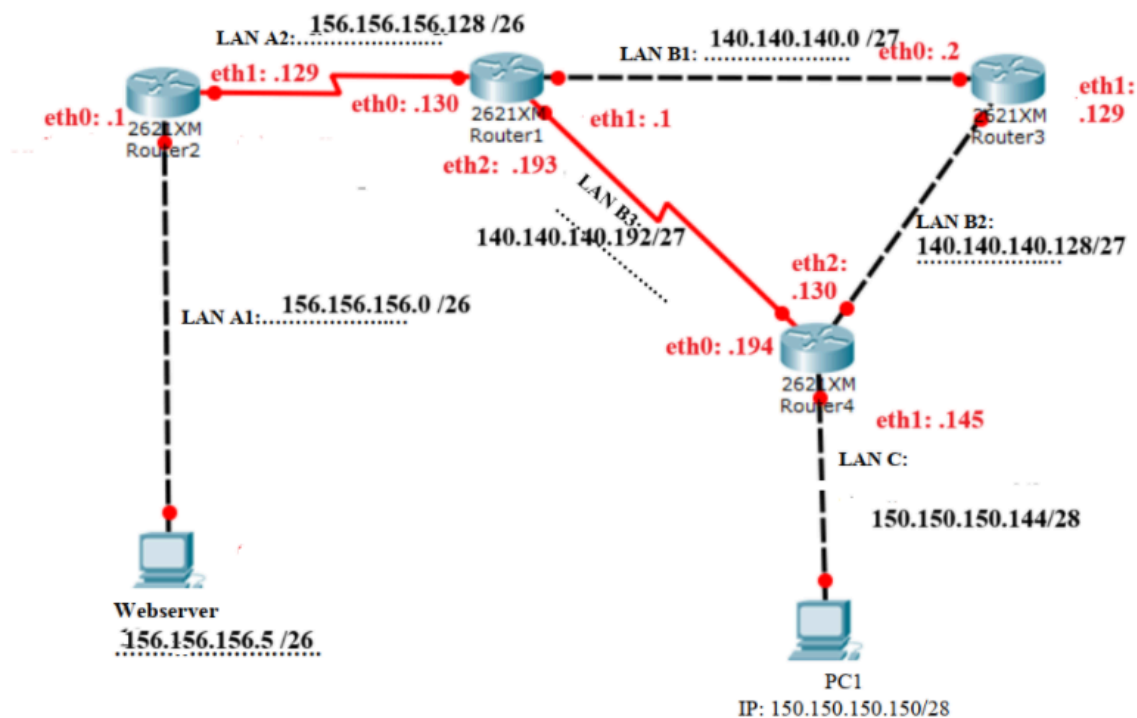


Please take screenshots showing:

1. (0,5 point) select and assign the IP addresses for all of the Ethernet interfaces.
2. (1,0 point) the directory tree structure of this network system (using the *tree* command).
3. (1,0 point) the content of the file *lab.conf*?
4. (5,0 points) the content of all files *. *startup*
5. (1,0 point) the contents of all files and commands you use in order to set up the web service on the web server
6. (0,5 point) the command line to check the hops for transmitting data from PC1 to the web server?
List all hops between PC1 and the Web server.
7. (1,0 points) check the network system constructed (using the *ping* command).

*****GOOD LUCK*****

1.(0,5 point) select and assign the IP addresses for all of the Ethernet interfaces.



2.(1,0 point) the directory tree structure of this network system (using the *tree* command).

command: ~/CT106H/lab6\$tree

vboxuser@PhuongUbuntu: ~/CT106H/lab6

vboxuser@PhuongUbuntu:~/CT106H/lab6\$ tree

```
├── lab.conf
├── pc1
├── pc1.startup
├── router1
│   └── etc
│       └── quagga
│           ├── daemons
│           ├── ripd.conf
│           └── zebra.conf
├── router1.startup
├── router2
├── router2.startup
├── router3
│   └── etc
│       └── quagga
│           ├── daemons
│           ├── ripd.conf
│           └── zebra.conf
├── router3.startup
├── router4
│   └── etc
│       └── quagga
│           ├── daemons
│           ├── ripd.conf
│           └── zebra.conf
├── router4.startup
├── shared
├── webserver
│   └── var
│       └── www
│           └── html
│               └── index.html
└── webserver.startup
```

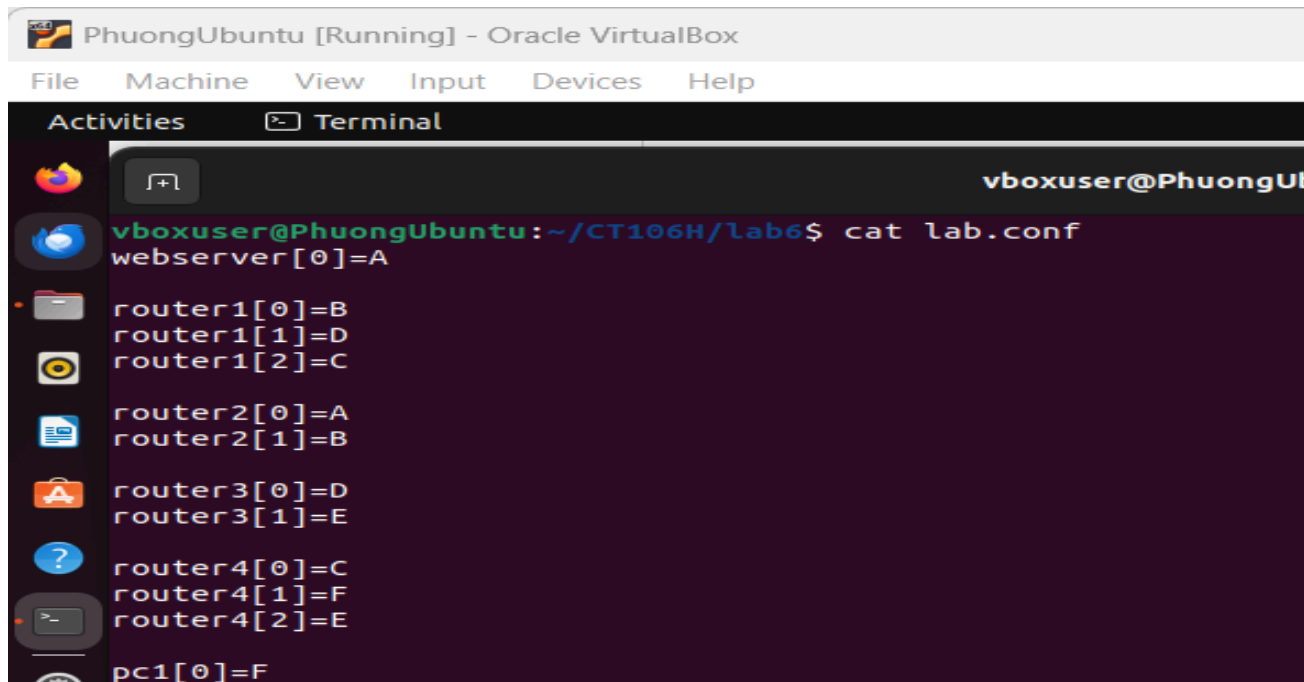
16 directories, 17 files

vboxuser@PhuongUbuntu:~/CT106H/lab6\$

3.(1,0 point) the content of the file *lab.conf*?

command:

~/CT106H/lab6\$cat lab.conf



The screenshot shows a terminal window titled "PhuongUbuntu [Running] - Oracle VirtualBox". The terminal output is as follows:

```
vboxuser@PhuongUbuntu:~/CT106H/lab6$ cat lab.conf
webserver[0]=A

router1[0]=B
router1[1]=D
router1[2]=C

router2[0]=A
router2[1]=B

router3[0]=D
router3[1]=E

router4[0]=C
router4[1]=F
router4[2]=E

pc1[0]=F
```

4.(5,0 points) the content of all files *. startup

~/CT106H/lab6\$cat pc1.startup

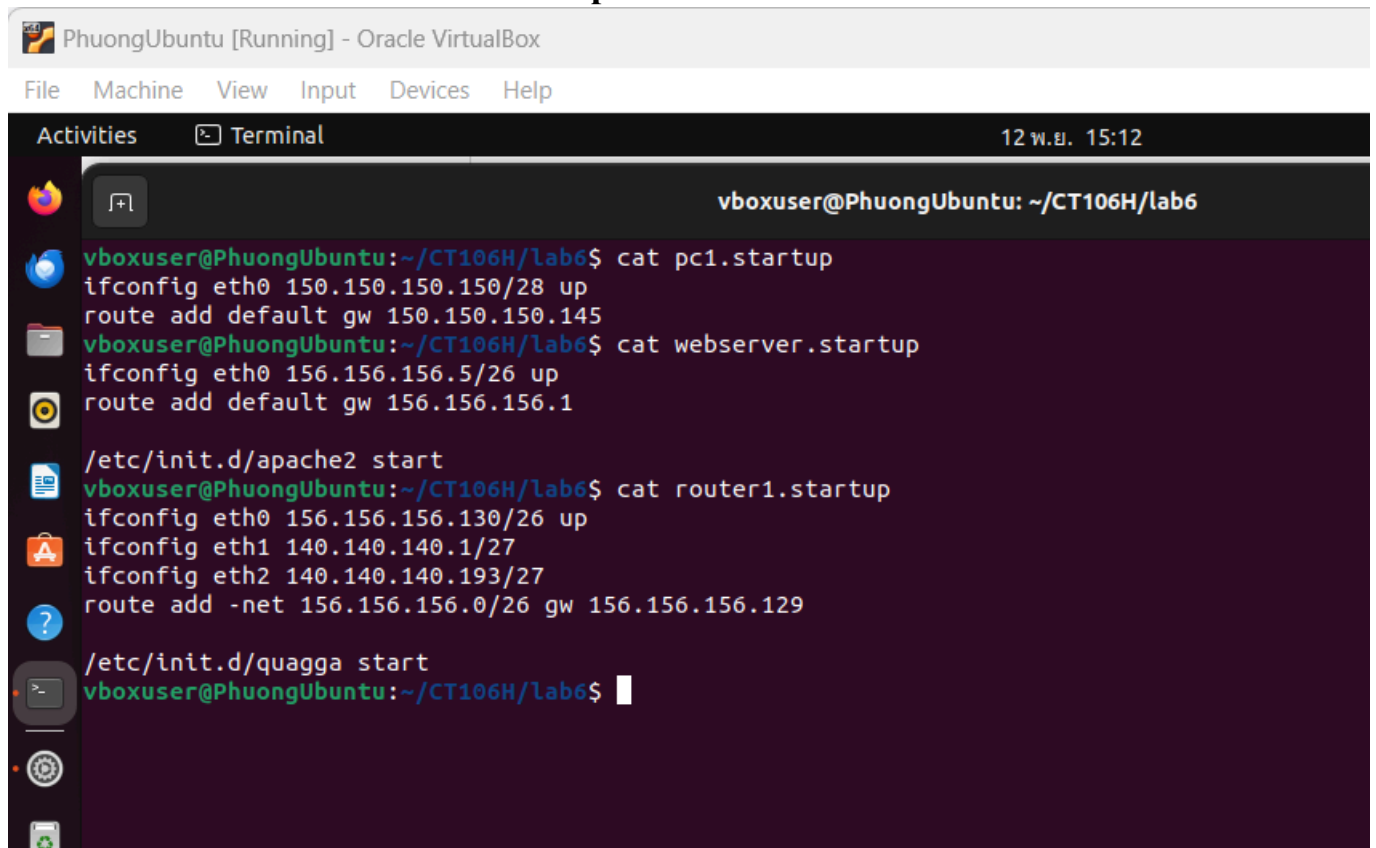
~/CT106H/lab6\$cat router1.startup

~/CT106H/lab6\$cat router2.startup

~/CT106H/lab6\$cat router3.startup

~/CT106H/lab6\$cat router4.startup

~/CT106H/lab6\$cat webserver.startup



The screenshot shows a terminal window titled "PhuongUbuntu [Running] - Oracle VirtualBox". The terminal output is as follows:

```
vboxuser@PhuongUbuntu: ~/CT106H/lab6

vboxuser@PhuongUbuntu:~/CT106H/lab6$ cat pc1.startup
ifconfig eth0 150.150.150.150/28 up
route add default gw 150.150.150.145

vboxuser@PhuongUbuntu:~/CT106H/lab6$ cat webserver.startup
ifconfig eth0 156.156.156.5/26 up
route add default gw 156.156.156.1

/etc/init.d/apache2 start

vboxuser@PhuongUbuntu:~/CT106H/lab6$ cat router1.startup
ifconfig eth0 156.156.156.130/26 up
ifconfig eth1 140.140.140.1/27
ifconfig eth2 140.140.140.193/27
route add -net 156.156.156.0/26 gw 156.156.156.129

/etc/init.d/quagga start

vboxuser@PhuongUbuntu:~/CT106H/lab6$
```

```
PhuongUbuntu [Running] - Oracle VirtualBox
File Machine View Input Devices Help
Activities Terminal 12 พ.ย. 15:02
vboxuser@PhuongUbuntu: ~/CT106H/

vboxuser@PhuongUbuntu:~/CT106H/lab6$ cat router2.startup
ifconfig eth0 156.156.156.1/26 up
ifconfig eth1 156.156.156.129/26 up
route add -net 0.0.0.0/0 gw 156.156.156.130

vboxuser@PhuongUbuntu:~/CT106H/lab6$ cat router3.startup
ifconfig eth0 140.140.140.2/27 up
ifconfig eth1 140.140.140.129/27 up
route add -net 0.0.0.0/0 gw 140.140.140.1
/etc/init.d/quagga start
vboxuser@PhuongUbuntu:~/CT106H/lab6$ cat router4.startup
ifconfig eth0 140.140.140.194/27 up
ifconfig eth1 150.150.150.145/28 up
ifconfig eth2 140.140.140.130/27 up
route add -net 0.0.0.0/0 gw 140.140.140.193

/etc/init.d/quagga start
vboxuser@PhuongUbuntu:~/CT106H/lab6$
```

RIPv2 configuration

```
~/CT106H/lab6$ cat router1/etc/quagga/daemons
~/CT106H/lab6$ cat router1/etc/quagga/ripd.conf
~/CT106H/lab6$ cat router1/etc/quagga/zebra.conf
~/CT106H/lab6$ cat router3/etc/quagga/ripd.conf
~/CT106H/lab6$ cat router4/etc/quagga/ripd.conf
```

```
PhuongUbuntu [Running] - Oracle VirtualBox
File Machine View Input Devices Help
Activities Terminal 12 พ.ย. 15:06
vboxuser@PhuongUbuntu: ~/CT106H/lab6

vboxuser@PhuongUbuntu:~/CT106H/lab6$ cat router1/etc/quagga/daemons
zebra=yes
bgpd=no
ospfd=no
ospfd6d=no
ripd=yes
ripngd=no

vboxuser@PhuongUbuntu:~/CT106H/lab6$ cat router1/etc/quagga/ripd.conf
hostname ripd
password zebra
enable password zebra

router rip
redistribute connected
network 140.140.140.0/24

log file /var/log/quagga/ripd.log
vboxuser@PhuongUbuntu:~/CT106H/lab6$ cat router1/etc/quagga/zebra.conf
hostname r1
password zebra
enable password zebra

log file /var/log/quagga/zebra.log
vboxuser@PhuongUbuntu:~/CT106H/lab6$
```

```
PhuongUbuntu [Running] - Oracle VirtualBox
File Machine View Input Devices Help

Activities Terminal 12 W.Я. 15:06

vboxuser@PhuongUbuntu: ~/CT106H/lab6

vboxuser@PhuongUbuntu:~/CT106H/lab6$ cat router3/etc/quagga/zebra.conf
hostname r3
password zebra
enable password zebra

log file /var/log/quagga/zebra.log
vboxuser@PhuongUbuntu:~/CT106H/lab6$ cat router4/etc/quagga/zebra.conf
hostname r4
password zebra
enable password zebra

log file /var/log/quagga/zebra.log
vboxuser@PhuongUbuntu:~/CT106H/lab6$
```

5.(1,0 point) the contents of all files and commands you use in order to set up the web service on the web server

The contents of file index.html:

`~/CT106H/lab6$ cat webserver/var/www/html/index.html`

```
PhuongUbuntu [Running] - Oracle VirtualBox
File Machine View Input Devices Help

Activities Terminal 12 W.Я. 15:09

vboxuser@PhuongUbuntu: ~/CT106H/lab6

vboxuser@PhuongUbuntu:~/CT106H/lab6$ cat webserver/var/www/html/index.html
<html>
<body>
YEAH! My Name is Huynh Tu Phuong
</body>
</html>
vboxuser@PhuongUbuntu:~/CT106H/lab6$
```

Skathara lstart

```
PhuongUbuntu [Running] - Oracle VirtualBox
File Machine View Input Devices Help

Activities Terminal 12 W.Я. 15:13

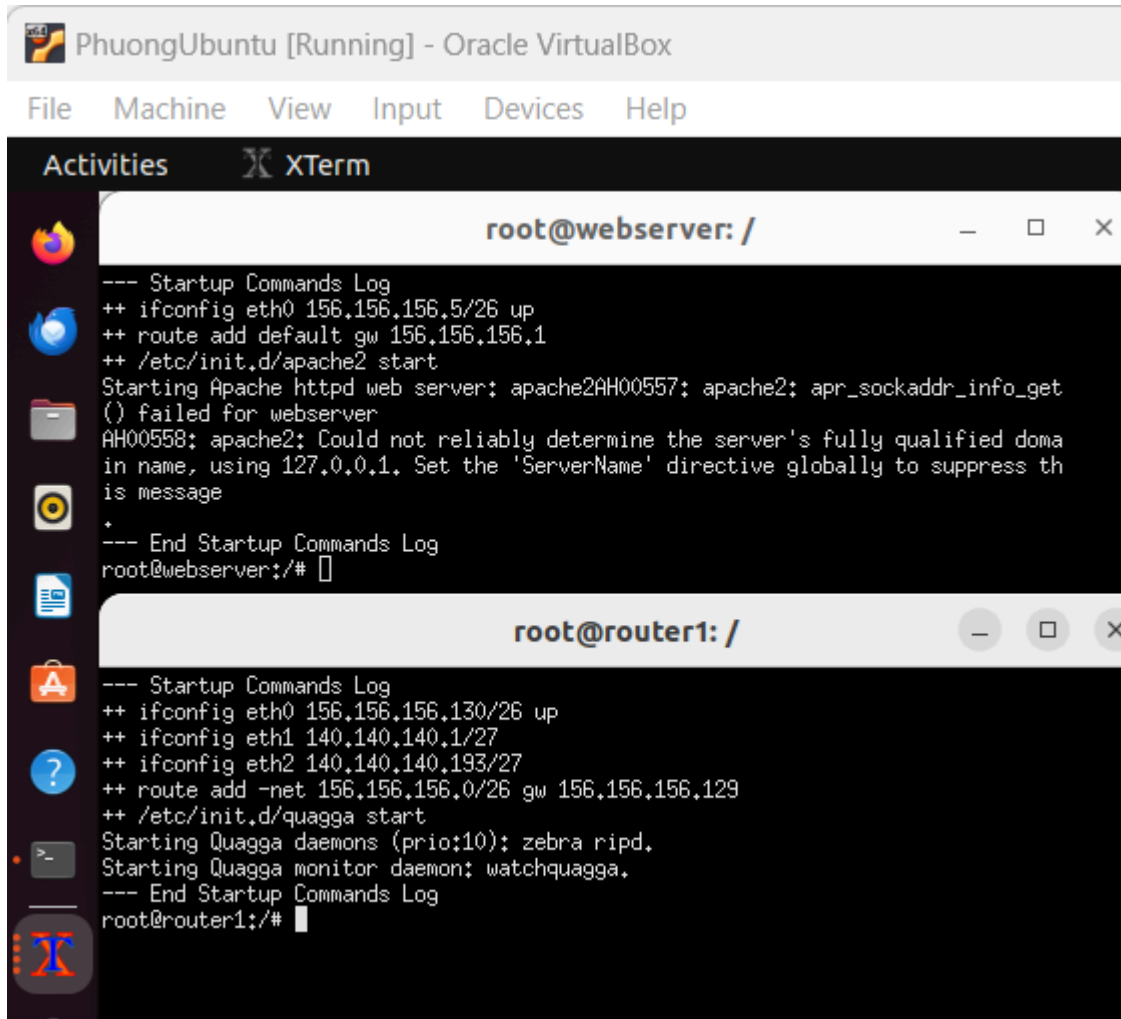
vboxuser@PhuongUbuntu: ~/CT106H/lab6

vboxuser@PhuongUbuntu:~/CT106H/lab6$ kathara lstart

Starting Network Scenario

[Deploying collision domains] 6/6
[Deploying devices] 6/6
vboxuser@PhuongUbuntu:~/CT106H/lab6$
```

IFCONFIG



```
PhuongUbuntu [Running] - Oracle VirtualBox
File Machine View Input Devices Help

Activities XTerm

root@webserver: /
--- Startup Commands Log
++ ifconfig eth0 156.156.156.5/26 up
++ route add default gw 156.156.156.1
++ /etc/init.d/apache2 start
Starting Apache httpd web server: apache2AH00557: apache2: apr_sockaddr_info_get
() failed for webserver
AH00558: apache2: Could not reliably determine the server's fully qualified domain
name, using 127.0.0.1. Set the 'ServerName' directive globally to suppress this message
+
--- End Startup Commands Log
root@webserver: /#

root@router1: /
--- Startup Commands Log
++ ifconfig eth0 156.156.156.130/26 up
++ ifconfig eth1 140.140.140.1/27
++ ifconfig eth2 140.140.140.193/27
++ route add -net 156.156.156.0/26 gw 156.156.156.129
++ /etc/init.d/quagga start
Starting Quagga daemons (prio:10): zebra ripd.
Starting Quagga monitor daemon: watchquagga.
--- End Startup Commands Log
root@router1: /#
```

PhuongUbuntu [Running] - Oracle VirtualBox

File Machine View Input Devices Help

Activities XTerm 12 W. 15:

root@router2: /

```
--- Startup Commands Log
++ ifconfig eth0 156.156.156.1/26 up
++ ifconfig eth1 156.156.156.129/26 up
++ route add -net 0.0.0.0/0 gw 156.156.156.130
--- End Startup Commands Log
root@router2:/#
```

root@router4: /

```
--- Startup Commands Log
++ ifconfig eth0 140.140.140.194/27 up
++ ifconfig eth1 150.150.150.145/28 up
++ ifconfig eth2 140.140.140.130/27 up
++ route add -net 0.0.0.0/0 gw 140.140.140.193
++ /etc/init.d/quagga start
Starting Quagga daemons (prio:10): zebra ripd.
Starting Quagga monitor daemon: watchquagga.
--- End Startup Commands Log
root@router4:/#
```

root@pc1: /

```
--- Startup Commands Log
++ ifconfig eth0 150.150.150.150/28 up
++ route add default gw 150.150.150.145
--- End Startup Commands Log
root@pc1:/#
```

root@router3: /

```
--- Startup Commands Log
++ ifconfig eth0 140.140.140.2/27 up
++ ifconfig eth1 140.140.140.129/27 up
++ route add -net 0.0.0.0/0 gw 140.140.140.1
++ /etc/init.d/quagga start
Starting Quagga daemons (prio:10): zebra ripd.
Starting Quagga monitor daemon: watchquagga.
--- End Startup Commands Log
root@router3:/#
```

PhuongUbuntu [Running] - Oracle VirtualBox

File Machine View Input Devices Help

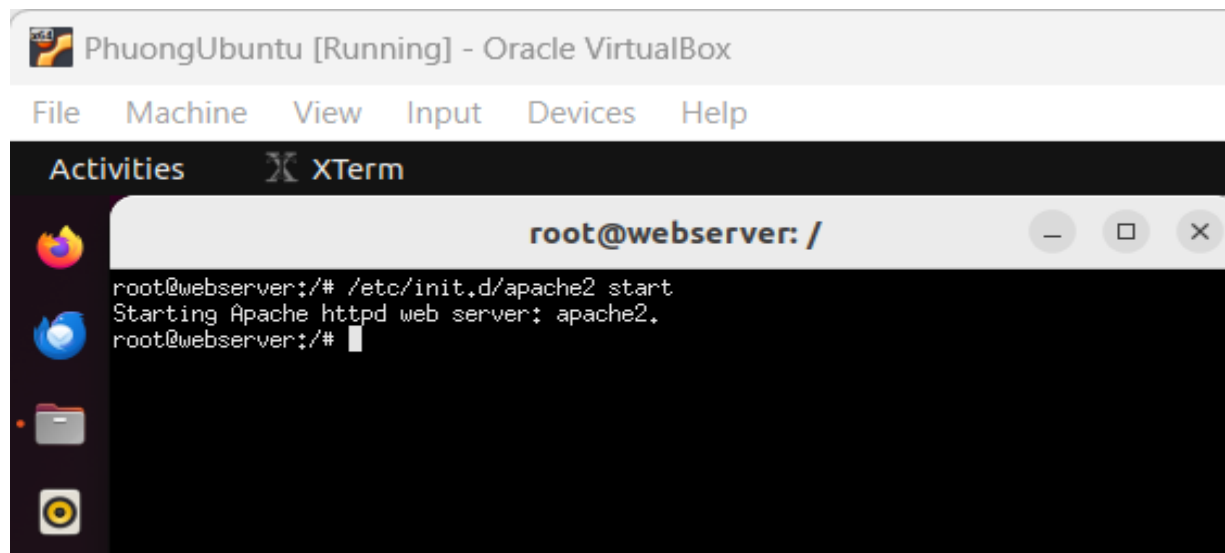
Activities XTerm

root@pc1: /

```
--- Startup Commands Log
++ ifconfig eth0 150.150.150.150/28 up
++ route add default gw 150.150.150.145
--- End Startup Commands Log
root@pc1:/# ping -c 3 156.156.156.5
PING 156.156.156.5 (156.156.156.5) 56(84) bytes of data:
64 bytes from 156.156.156.5: icmp_seq=1 ttl=61 time=1.41 ms
64 bytes from 156.156.156.5: icmp_seq=2 ttl=61 time=0.532 ms
64 bytes from 156.156.156.5: icmp_seq=3 ttl=61 time=0.509 ms

--- 156.156.156.5 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2050ms
rtt min/avg/max/mdev = 0.509/0.818/1.414/0.421 ms
root@pc1:/#
```

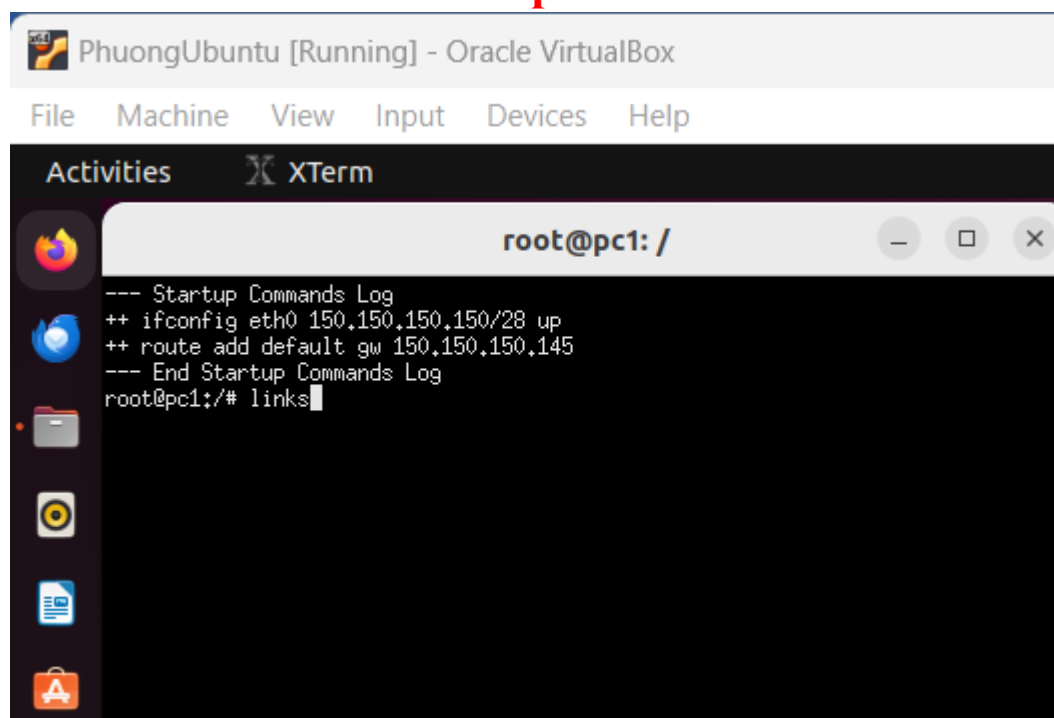

On server



The screenshot shows a terminal window titled "root@webserver: /" within the Oracle VM VirtualBox interface. The terminal displays the command `/etc/init.d/apache2 start` and its output: `Starting Apache httpd web server: apache2.` The prompt returns to `root@webserver:/#`. The background shows the Ubuntu desktop environment with icons for Firefox, Dash, Files, and Sound.

```
PhuongUbuntu [Running] - Oracle VirtualBox
File Machine View Input Devices Help
Activities XTerm
root@webserver: /
root@webserver:/# /etc/init.d/apache2 start
Starting Apache httpd web server: apache2.
root@webserver:/#
```

Use links command from pc1

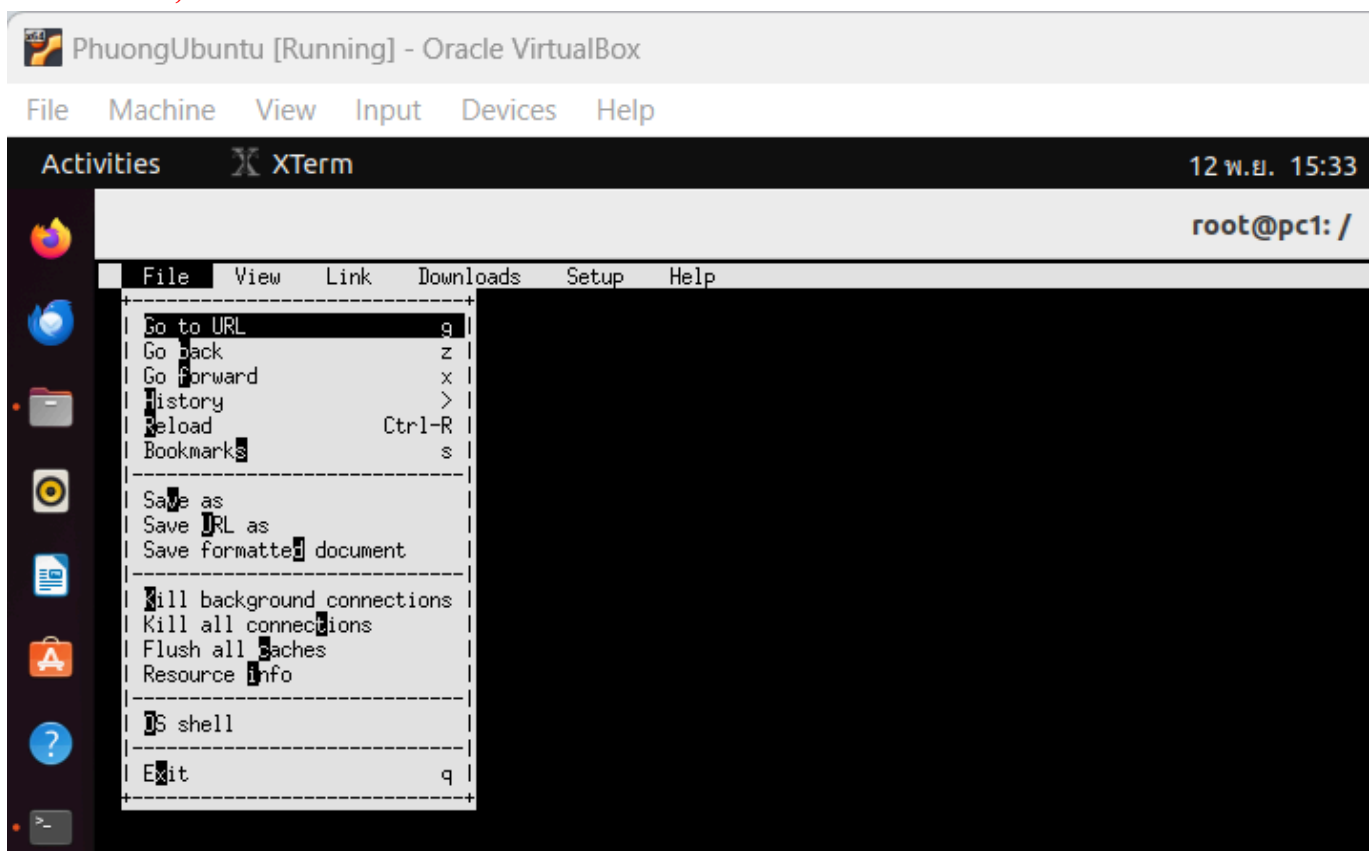


The screenshot shows a terminal window titled "root@pc1: /" within the Oracle VM VirtualBox interface. The terminal displays a log of startup commands: `ifconfig eth0 150.150.150.150/28 up` and `route add default gw 150.150.150.145`. The prompt returns to `root@pc1:/#` where the command `links` is entered. The background shows the Ubuntu desktop environment with icons for Firefox, Dash, Files, Sound, Documents, and Applications.

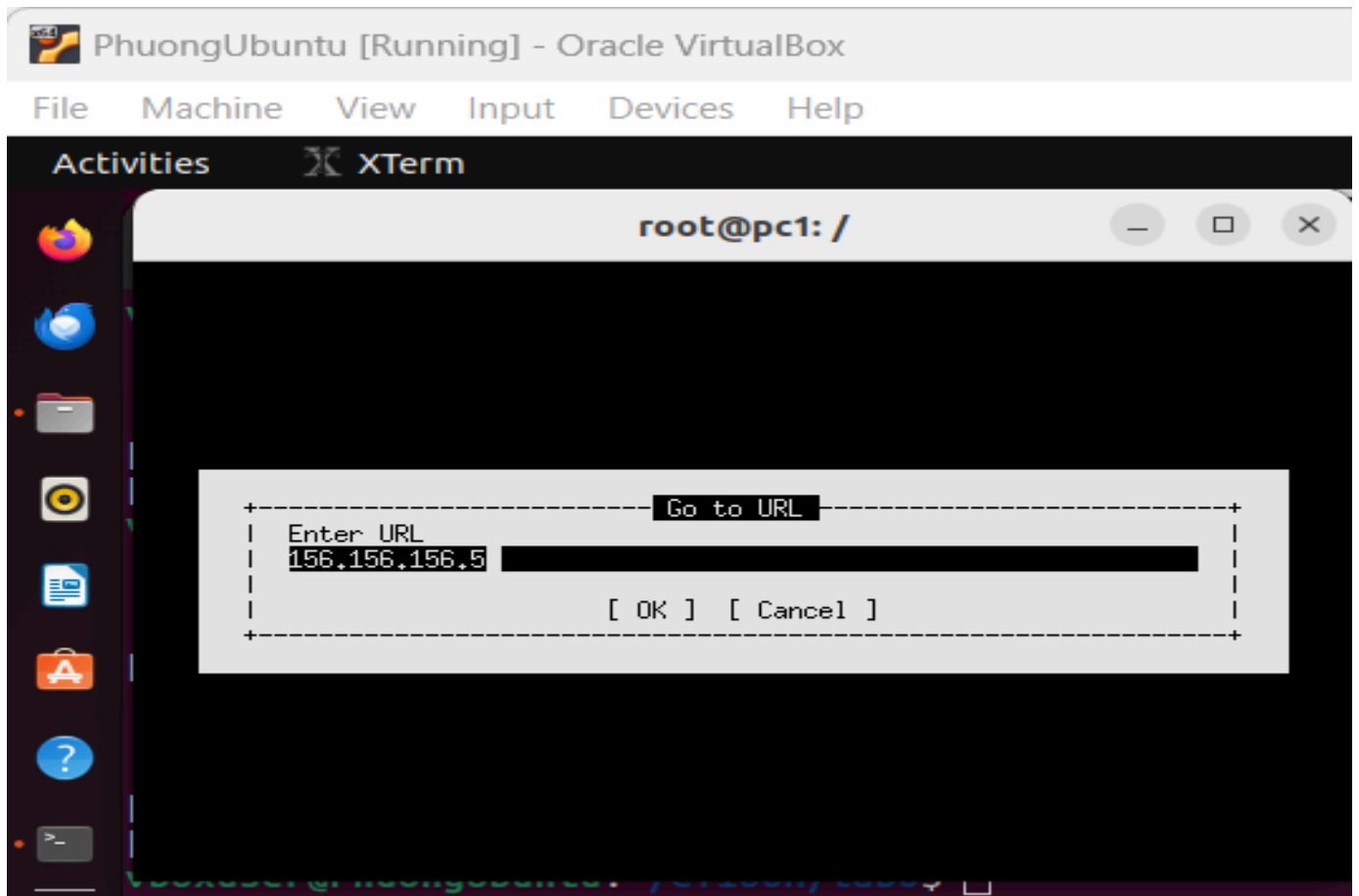
```
PhuongUbuntu [Running] - Oracle VirtualBox
File Machine View Input Devices Help
Activities XTerm
root@pc1: /
--- Startup Commands Log
++ ifconfig eth0 150.150.150.150/28 up
++ route add default gw 150.150.150.145
--- End Startup Commands Log
root@pc1:/# links
```



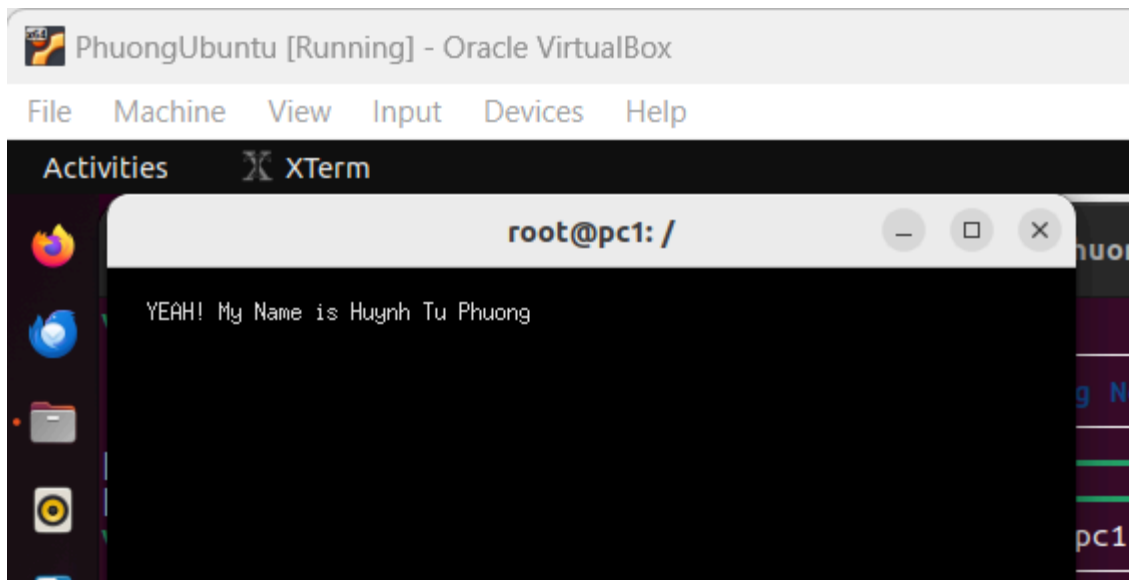
Press F10, then select "Go to URL"



Enter IP ADDRESS: 156.156.156.5



Result



6. The command line to check the hops for transmitting data from PC1 to the web server? List all hops between PC1 and the Web server. The command is traceroute:

The output from traceroute 156.156.156.5 indicates how many servers or hops it takes for transmitting data from pc1 to the server. (from 150.150.150.150 to 156.156.156.5).

```
root@pc1: /  
root@pc1:~# traceroute 156.156.156.5  
traceroute to 156.156.156.5 (156.156.156.5), 30 hops max, 60 byte packets  
 1 150.150.150.145 (150.150.150.145) 1.269 ms 9.797 ms 9.754 ms  
 2 140.140.140.193 (140.140.140.193) 11.859 ms 11.867 ms 11.863 ms  
 3 156.156.156.129 (156.156.156.129) 15.994 ms 16.344 ms 16.318 ms  
 4 156.156.156.5 (156.156.156.5) 22.260 ms 22.395 ms 22.392 ms  
root@pc1:~#
```

The destination is 156.156.156.5 and we need 4 hops:

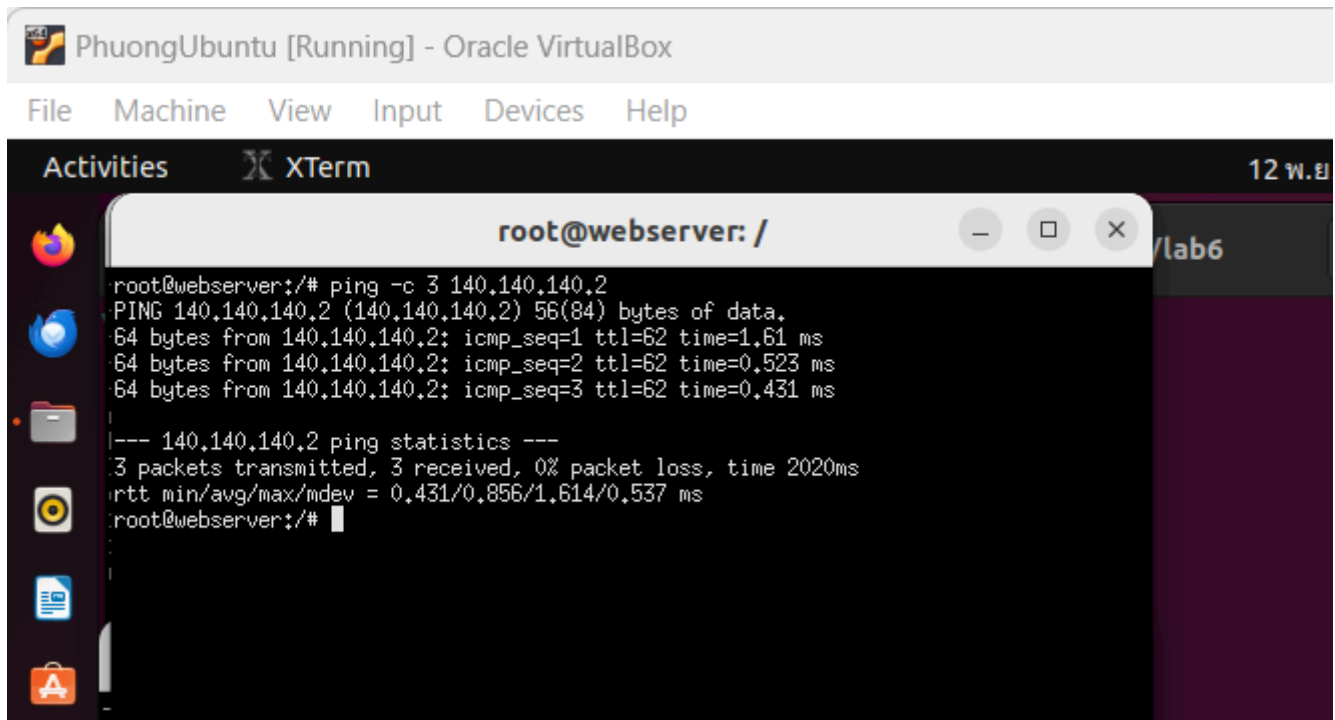
- The first next hop is 150.150.150.145 (r4).
- The second is 140.140.140.193 (r1).
- The third is 156.156.156.129 (r2).
- The final is 156.156.156.5 (server).

7. Check the network system constructed

ping from pc1 to router1

```
root@pc1: /  
root@pc1:~# ping 156.156.156.130  
PING 156.156.156.130 (156.156.156.130) 56(84) bytes of data:  
64 bytes from 156.156.156.130: icmp_seq=1 ttl=63 time=0.421 ms  
64 bytes from 156.156.156.130: icmp_seq=2 ttl=63 time=0.260 ms  
64 bytes from 156.156.156.130: icmp_seq=3 ttl=63 time=0.388 ms  
64 bytes from 156.156.156.130: icmp_seq=4 ttl=63 time=0.288 ms  
^C  
--- 156.156.156.130 ping statistics ---  
4 packets transmitted, 4 received, 0% packet loss, time 3050ms  
rtt min/avg/max/mdev = 0.260/0.339/0.421/0.067 ms  
root@pc1:~#
```

ping from webserver to router3



PhuongUbuntu [Running] - Oracle VirtualBox

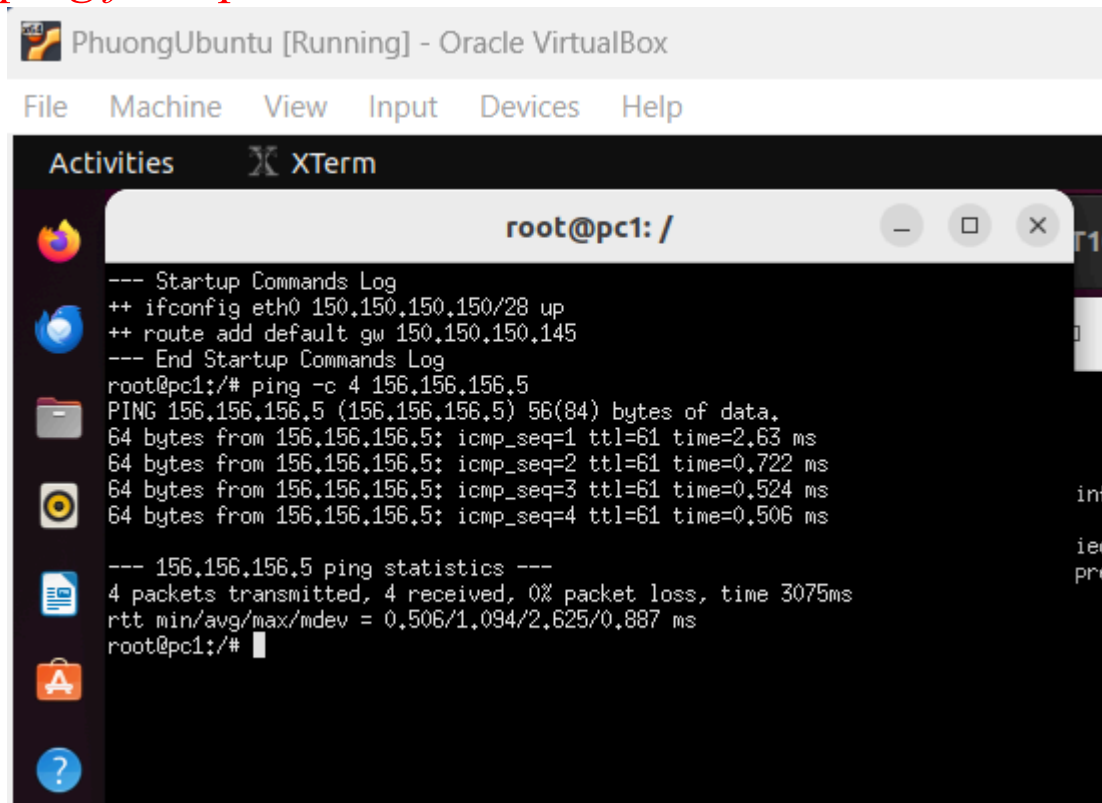
File Machine View Input Devices Help

Activities XTerm 12 W. E

```
root@webserver: /
root@webserver:~# ping -c 3 140.140.140.2
PING 140.140.140.2 (140.140.140.2) 56(84) bytes of data:
64 bytes from 140.140.140.2: icmp_seq=1 ttl=62 time=1.61 ms
64 bytes from 140.140.140.2: icmp_seq=2 ttl=62 time=0.523 ms
64 bytes from 140.140.140.2: icmp_seq=3 ttl=62 time=0.431 ms

--- 140.140.140.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2020ms
rtt min/avg/max/mdev = 0.431/0.856/1.614/0.537 ms
root@webserver:~#
```

ping from pc1 to webserver



PhuongUbuntu [Running] - Oracle VirtualBox

File Machine View Input Devices Help

Activities XTerm

```
root@pc1: /
--- Startup Commands Log
++ ifconfig eth0 150.150.150.150/28 up
++ route add default gw 150.150.150.145
--- End Startup Commands Log
root@pc1:~# ping -c 4 156.156.156.5
PING 156.156.156.5 (156.156.156.5) 56(84) bytes of data:
64 bytes from 156.156.156.5: icmp_seq=1 ttl=61 time=2.63 ms
64 bytes from 156.156.156.5: icmp_seq=2 ttl=61 time=0.722 ms
64 bytes from 156.156.156.5: icmp_seq=3 ttl=61 time=0.524 ms
64 bytes from 156.156.156.5: icmp_seq=4 ttl=61 time=0.506 ms

--- 156.156.156.5 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3075ms
rtt min/avg/max/mdev = 0.506/1.094/2.625/0.887 ms
root@pc1:~#
```

Routing tables



root@router2: /

```
--- Startup Commands Log
++ ifconfig eth0 156.156.156.1/26 up
++ ifconfig eth1 156.156.156.129/26 up
++ route add -net 0.0.0.0/0 gw 156.156.156.130
--- End Startup Commands Log
root@router2:/# route
Kernel IP routing table
Destination      Gateway          Genmask          Flags Metric Ref    Use Iface
default          156.156.156.130 0.0.0.0          UG        0      0      0 eth1
156.156.156.0    0.0.0.0          255.255.255.192 U         0      0      0 eth0
156.156.156.128 0.0.0.0          255.255.255.192 U         0      0      0 eth1
root@router2:/#
```

root@router1: /

```
--- Startup Commands Log
++ ifconfig eth0 156.156.156.130/26 up
++ ifconfig eth1 140.140.140.1/27
++ ifconfig eth2 140.140.140.193/27
++ route add -net 156.156.156.0/26 gw 156.156.156.129
++ /etc/init.d/quagga start
Starting Quagga daemons (prio:10): zebra ripd.
Starting Quagga monitor daemon: watchquagga.
--- End Startup Commands Log
root@router1:/# route
Kernel IP routing table
Destination      Gateway          Genmask          Flags Metric Ref    Use Iface
140.140.140.0    0.0.0.0          255.255.255.224 U         0      0      0 eth1
140.140.140.128 140.140.140.2    255.255.255.224 UG        20     0      0 eth1
140.140.140.192 0.0.0.0          255.255.255.224 U         0      0      0 eth2
150.150.150.144 140.140.140.194 255.255.255.240 UG        20     0      0 eth2
156.156.156.0    156.156.156.129 255.255.255.192 UG        0      0      0 eth0
156.156.156.128 0.0.0.0          255.255.255.192 U         0      0      0 eth0
root@router1:/#
```

PhuongUbuntu [Running] - Oracle VirtualBox

File Machine View Input Devices Help

Activities XTerm

```
root@router3: /
---- Startup Commands Log
++ ifconfig eth0 140.140.140.2/27 up
++ ifconfig eth1 140.140.140.129/27 up
++ route add -net 0.0.0.0/0 gw 140.140.140.1
++ /etc/init.d/quagga start
Starting Quagga daemons (prio:10): zebra ripd.
Starting Quagga monitor daemon: watchquagga.
---- End Startup Commands Log
root@router3:/# route
Kernel IP routing table
Destination      Gateway          Genmask          Flags Metric Ref    Use Iface
default          140.140.140.1   0.0.0.0          UG        0      0      0 eth0
140.140.140.0    0.0.0.0         255.255.255.224  U        0      0      0 eth0
140.140.140.128  0.0.0.0         255.255.255.224  U        0      0      0 eth1
140.140.140.192  140.140.140.1   255.255.255.224  UG       20     0      0 eth0
150.150.150.144  140.140.140.130 255.255.255.240  UG       20     0      0 eth1
156.156.156.128  140.140.140.1   255.255.255.192  UG       20     0      0 eth0
root@router3:/#
```

```
root@router4: /
---- Startup Commands Log
++ ifconfig eth0 140.140.140.194/27 up
++ ifconfig eth1 150.150.150.145/28 up
++ ifconfig eth2 140.140.140.130/27 up
++ route add -net 0.0.0.0/0 gw 140.140.140.193
++ /etc/init.d/quagga start
Starting Quagga daemons (prio:10): zebra ripd.
Starting Quagga monitor daemon: watchquagga.
---- End Startup Commands Log
root@router4:/# route
Kernel IP routing table
Destination      Gateway          Genmask          Flags Metric Ref    Use Iface
default          140.140.140.193 0.0.0.0          UG        0      0      0 eth0
140.140.140.0    140.140.140.193 255.255.255.224  UG       20     0      0 eth0
140.140.140.128  0.0.0.0         255.255.255.224  U        0      0      0 eth2
140.140.140.192  0.0.0.0         255.255.255.224  U        0      0      0 eth0
150.150.150.144  0.0.0.0         255.255.255.240  U        0      0      0 eth1
156.156.156.128  140.140.140.193 255.255.255.192  UG       20     0      0 eth0
root@router4:/#
```

~/CT106H/lab6\$ kathara lclean

PhuongUbuntu [Running] - Oracle VirtualBox

File Machine View Input Devices Help

Activities Terminal 12 W.B. 16:06

```
vboxuser@PhuongUbuntu: ~/CT106H/lab6
vboxuser@PhuongUbuntu:~/CT106H/lab6$ kathara lclean

Stopping Network Scenario

[Deleting devices] _____ 6/6
[Deleting collision domains] _____ 6/6
vboxuser@PhuongUbuntu:~/CT106H/lab6$
```

-----END-----