

## LAB 2



### CONSTRUCT A SIMPLE NETWORK

Name: Huỳnh Tú Phương

ID: B2206005

Group: M01

*Submission: an ID\_NAME\_Lab02.pdf file describes clearly how did you solve the problem*

**Exercise 0:** change the directory to your home directory

Answer: \$cd

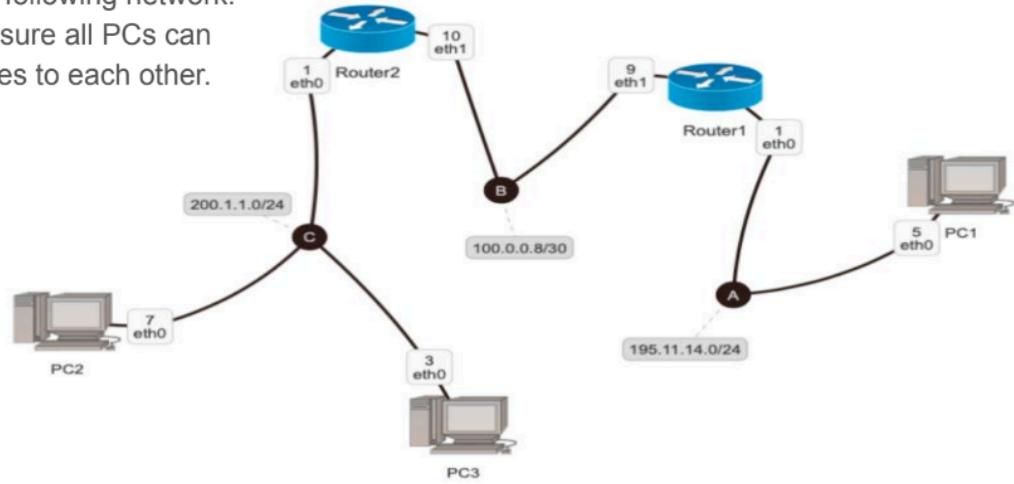
A screenshot of an Ubuntu 20.04 LTS desktop environment in Oracle VM VirtualBox. The terminal window is open and shows the command '\$cd' being typed at the prompt 'lnk@lnk:~\$'. The window title is 'Terminal'. The desktop background is a purple gradient. The taskbar shows icons for the Dash, Home, and other applications like Firefox and Mail.



## Exercise 6

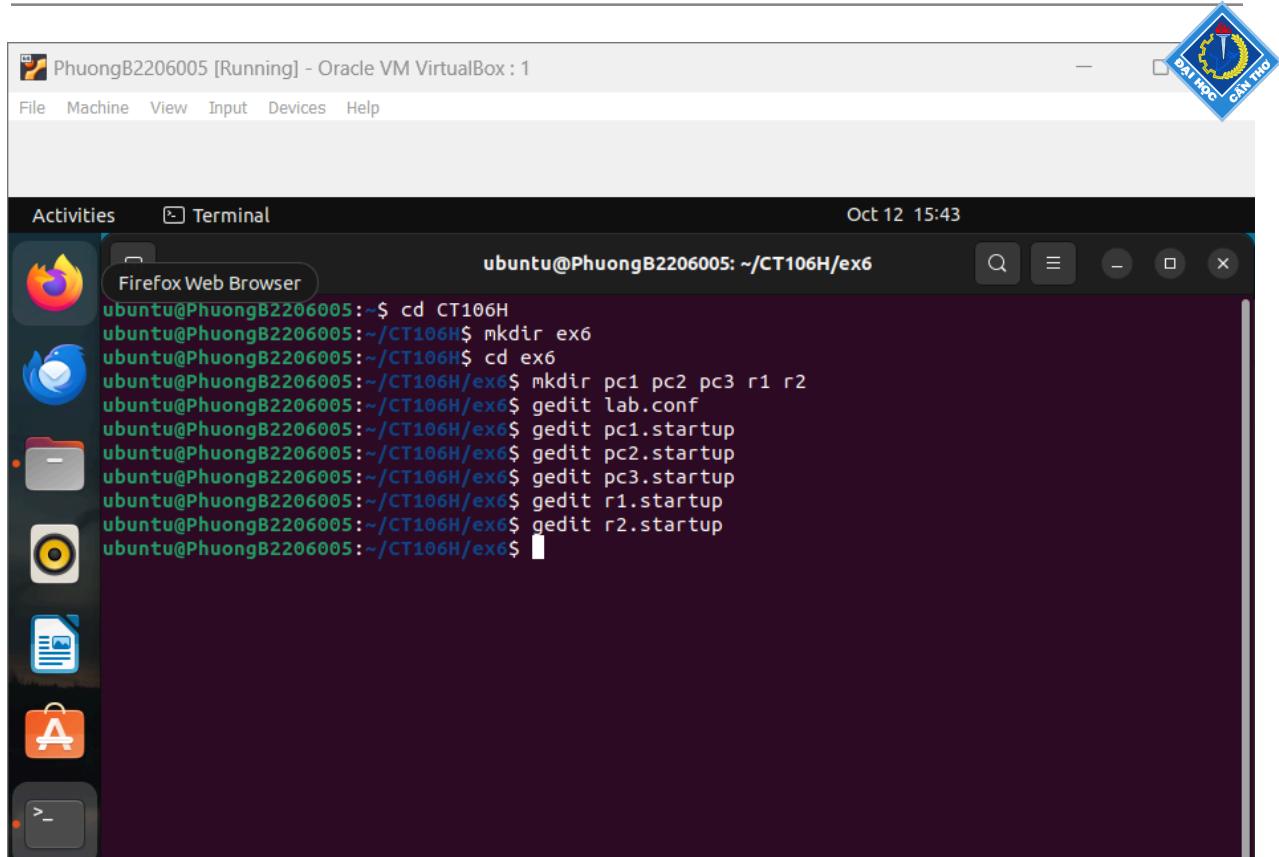
Construct the following network.

Please make sure all PCs can send messages to each other.



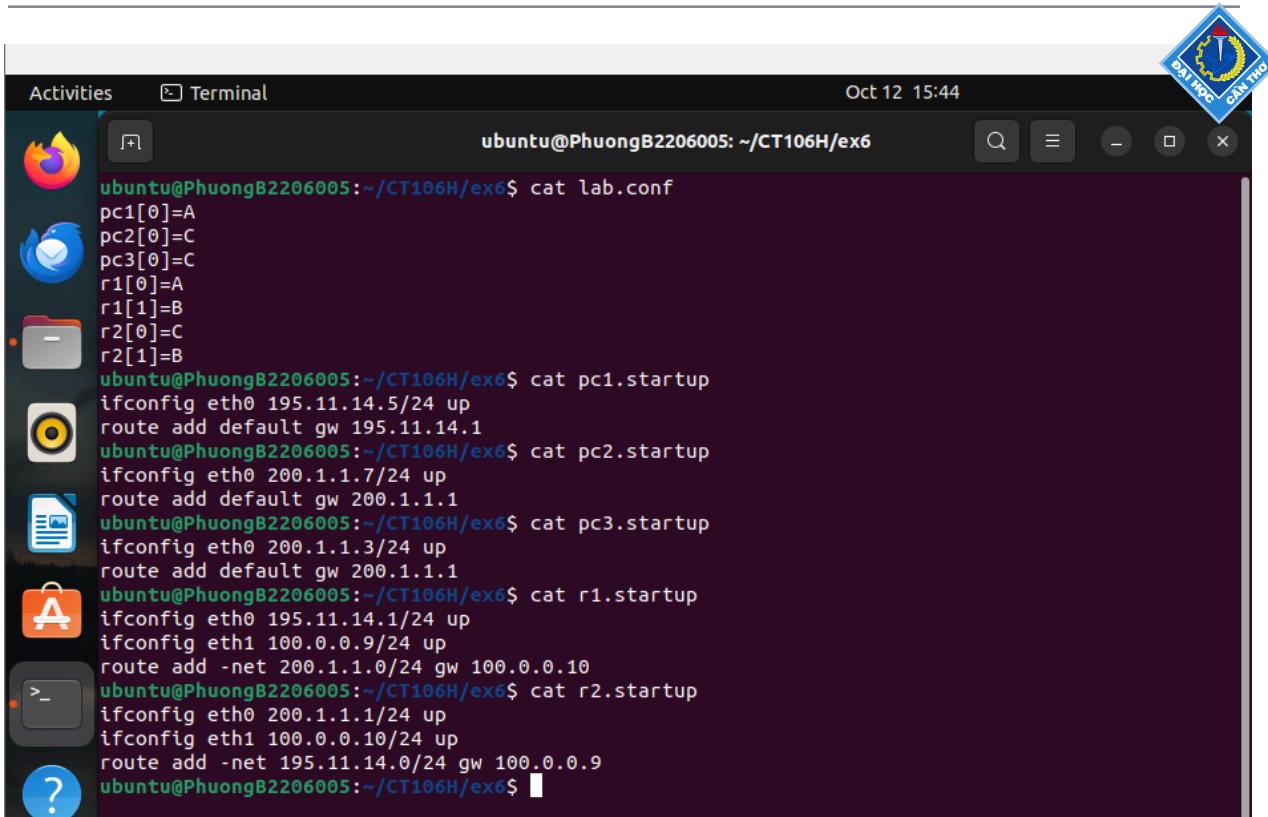
### Prepared for the lab

```
/CT106H$ mkdir ex6  
/CT106H$ cd ex6  
/CT106H/ex6$ gedit lab.conf  
/CT106H/ex6$ gedit pc1.startup  
/CT106H/ex6$ gedit pc2.startup  
/CT106H/ex6$ gedit pc3.startup  
/CT106H/ex6$ gedit pc4.startup  
/CT106H/ex6$ gedit r1.startup  
/CT106H/ex6$ gedit r2.startup
```



## Start the lab

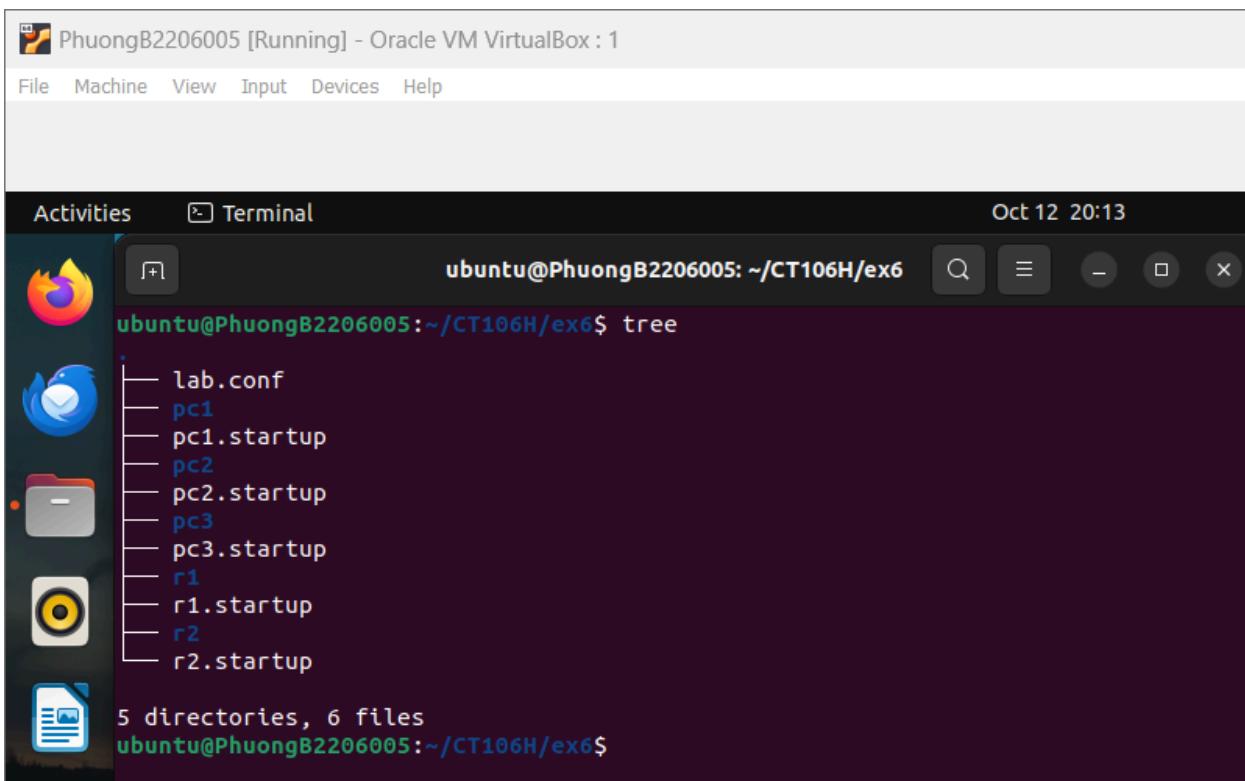
```
/CT106H/ex6$cat lab.conf
/CT106H/ex6$cat pc1.startup
/CT106H/ex6$cat pc2.startup
/CT106H/ex6$cat pc3.startup
/CT106H/ex6$cat pc4.startup
/CT106H/ex6$cat r1.startup
/CT106H/ex6$cat r2.startup
```



A screenshot of an Ubuntu desktop environment. The terminal window shows the output of several commands:

```
ubuntu@PhuongB2206005:~/CT106H/ex6$ cat lab.conf
pc1[0]=A
pc2[0]=C
pc3[0]=C
r1[0]=A
r1[1]=B
r2[0]=C
r2[1]=B
ubuntu@PhuongB2206005:~/CT106H/ex6$ cat pc1.startup
ifconfig eth0 195.11.14.5/24 up
route add default gw 195.11.14.1
ubuntu@PhuongB2206005:~/CT106H/ex6$ cat pc2.startup
ifconfig eth0 200.1.1.7/24 up
route add default gw 200.1.1.1
ubuntu@PhuongB2206005:~/CT106H/ex6$ cat pc3.startup
ifconfig eth0 200.1.1.3/24 up
route add default gw 200.1.1.1
ubuntu@PhuongB2206005:~/CT106H/ex6$ cat r1.startup
ifconfig eth0 195.11.14.1/24 up
ifconfig eth1 100.0.0.9/24 up
route add -net 200.1.1.0/24 gw 100.0.0.10
ubuntu@PhuongB2206005:~/CT106H/ex6$ cat r2.startup
ifconfig eth0 200.1.1.1/24 up
ifconfig eth1 100.0.0.10/24 up
route add -net 195.11.14.0/24 gw 100.0.0.9
ubuntu@PhuongB2206005:~/CT106H/ex6$
```

/CT106H/ex6\$tree



A screenshot of an Ubuntu desktop environment. The terminal window shows the output of the tree command:

```
PhuongB2206005 [Running] - Oracle VM VirtualBox : 1
File Machine View Input Devices Help
Activities Terminal Oct 12 20:13
ubuntu@PhuongB2206005:~/CT106H/ex6$ tree
.
├── lab.conf
├── pc1
├── pc1.startup
├── pc2
├── pc2.startup
├── pc3
├── pc3.startup
└── r1
    ├── r1.startup
    └── r2
        └── r2.startup
5 directories, 6 files
ubuntu@PhuongB2206005:~/CT106H/ex6$
```



/CT106H/ex6\$ kathara lstart

```

ubuntu@PhuongB2206005:~/CT106H/ex6$ kathara lstart
Starting Network Scenario
[Deploying collision domains] 3/3
[Deploying devices] 5/5
ubuntu@PhuongB2206005:~/CT106H/ex6$

root@pc1:/#
--- Startup Commands Log
++ ifconfig eth0 195.11.14.5/24 up
++ route add default gw 195.11.14.1
--- End Startup Commands Log
root@pc1:# ping 200.1.1.7
PING 200.1.1.7 (200.1.1.7) 56(84) bytes of data.
64 bytes from 200.1.1.7: icmp_seq=1 ttl=62 time=8.68 ms
64 bytes from 200.1.1.7: icmp_seq=2 ttl=62 time=2.46 ms
64 bytes from 200.1.1.7: icmp_seq=3 ttl=62 time=3.31 ms
64 bytes from 200.1.1.7: icmp_seq=4 ttl=62 time=2.44 ms
64 bytes from 200.1.1.7: icmp_seq=5 ttl=62 time=2.22 ms
64 bytes from 200.1.1.7: icmp_seq=6 ttl=62 time=2.52 ms
64 bytes from 200.1.1.7: icmp_seq=7 ttl=62 time=4.78 ms
64 bytes from 200.1.1.7: icmp_seq=8 ttl=62 time=3.09 ms
64 bytes from 200.1.1.7: icmp_seq=9 ttl=62 time=2.95 ms
^C
--- 200.1.1.7 ping statistics ---
9 packets transmitted, 9 received, 0% packet loss, time 8100ms
rtt min/avg/max/mdev = 2.222/3.607/8.684/1.935 ms
root@pc1:#

root@r2:/#
--- Startup Commands Log
++ ifconfig eth0 200.1.1.1/24 up
++ ifconfig eth1 100.0.0.10/24 up
++ route add -net 195.11.14.0/24 gw 100.0.0.9
--- End Startup Commands Log
root@r2:# route -n
Kernel IP routing table
Destination     Gateway         Genmask        Flags Metric Ref    Use Iface
100.0.0.0       0.0.0.0        255.255.255.0   U     0      0        0 eth1
195.11.14.0     100.0.0.9      255.255.255.0   UG    0      0        0 eth1
200.1.1.0       0.0.0.0        255.255.255.0   U     0      0        0 eth0
root@r2:#

root@pc3:/#
Log
1.1.3/24 up
gw 200.1.1.1
nds Log

root@r1:/#
--- Startup Commands Log
++ ifconfig eth0 195.11.14.1/24 up
++ ifconfig eth1 100.0.0.9/24 up
++ route add -net 200.1.1.0/24 gw 100.0.0.10
--- End Startup Commands Log
root@r1:# route -n
Kernel IP routing table
Destination     Gateway         Genmask        Flags Metric Ref    Use Iface
100.0.0.0       0.0.0.0        255.255.255.0   U     0      0        0 eth1
195.11.14.0     0.0.0.0        255.255.255.0   U     0      0        0 eth0
200.1.1.0       100.0.0.10     255.255.255.0   UG    0      0        0 eth1
root@r1:# 
```

/CT106H/ex6\$ kathara lc当地

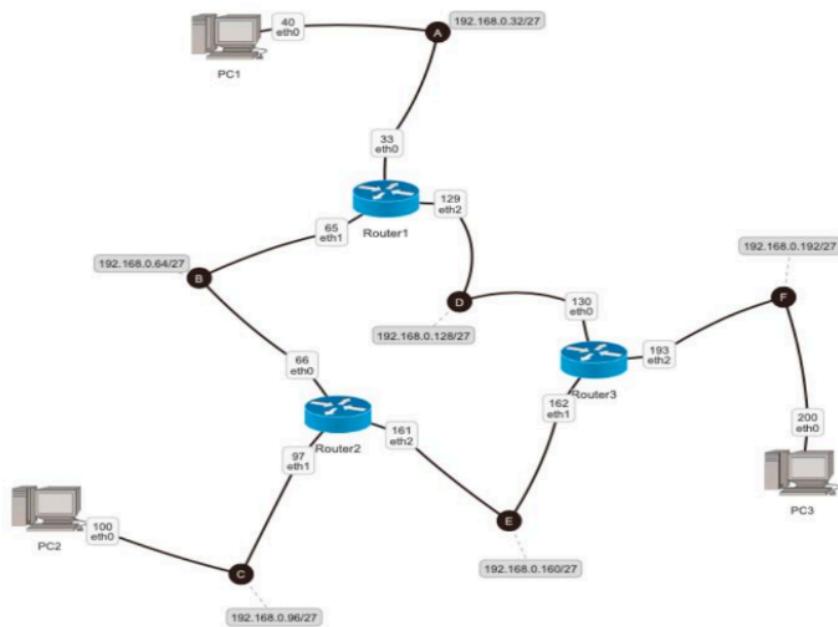
```

ubuntu@PhuongB2206005:~/CT106H/ex6$ kathara lstart
Starting Network Scenario
[Deploying collision domains] 3/3
[Deploying devices] 5/5
ubuntu@PhuongB2206005:~/CT106H/ex6$

ubuntu@PhuongB2206005:~/CT106H/ex6$ kathara lc当地
Stopping Network Scenario
[Deleting devices] 5/5
[Deleting collision domains] 3/3
ubuntu@PhuongB2206005:~/CT106H/ex6$ 
```

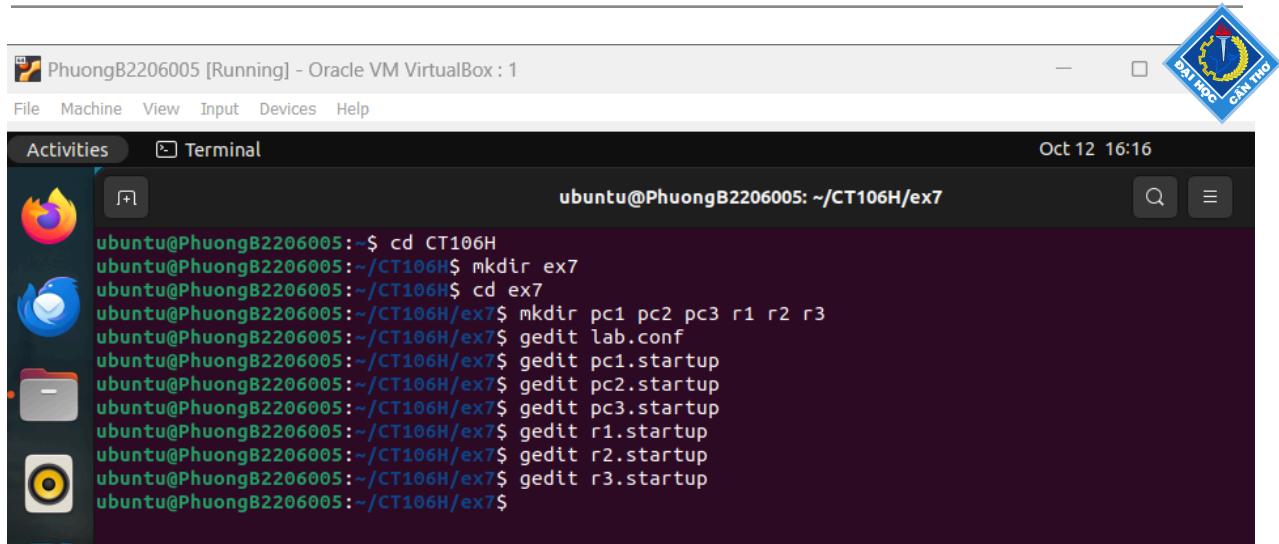


## Exercise 7



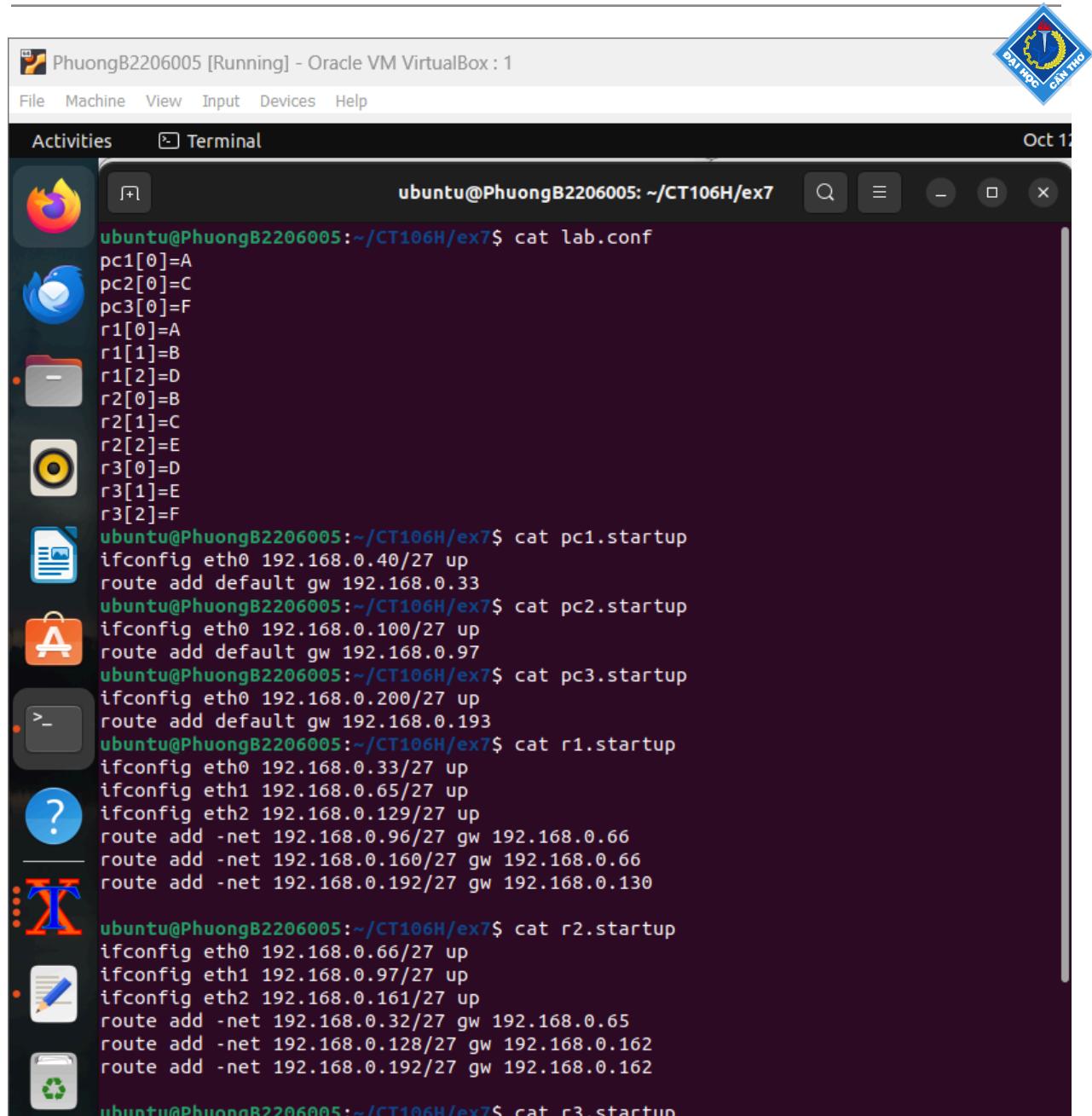
### Prepared for the lab

```
$cd CT106H
/CT106H$mkdir ex7
/CT106H$cd ex7
/CT106H/ex7$mkdir pc1 pc2 pc3 r1 r2 r3
/CT106H/ex7$gedit lab.conf
/CT106H/ex7$gedit pc1.startup
/CT106H/ex7$gedit pc2.startup
/CT106H/ex7$gedit pc3.startup
/CT106H/ex7$gedit r1.startup
/CT106H/ex7$gedit r2.startup
/CT106H/ex7$gedit r3.startup
```



## Start the lab

```
/CT106H/ex7$cat lab.conf
/CT106H/ex7$cat pc1.startup
/CT106H/ex7$cat pc2.startup
/CT106H/ex7$cat pc3.startup
/CT106H/ex7$cat r1.startup
/CT106H/ex7$cat r2.startup
/CT106H/ex7$cat r3.startup
```



PhuongB2206005 [Running] - Oracle VM VirtualBox : 1

File Machine View Input Devices Help

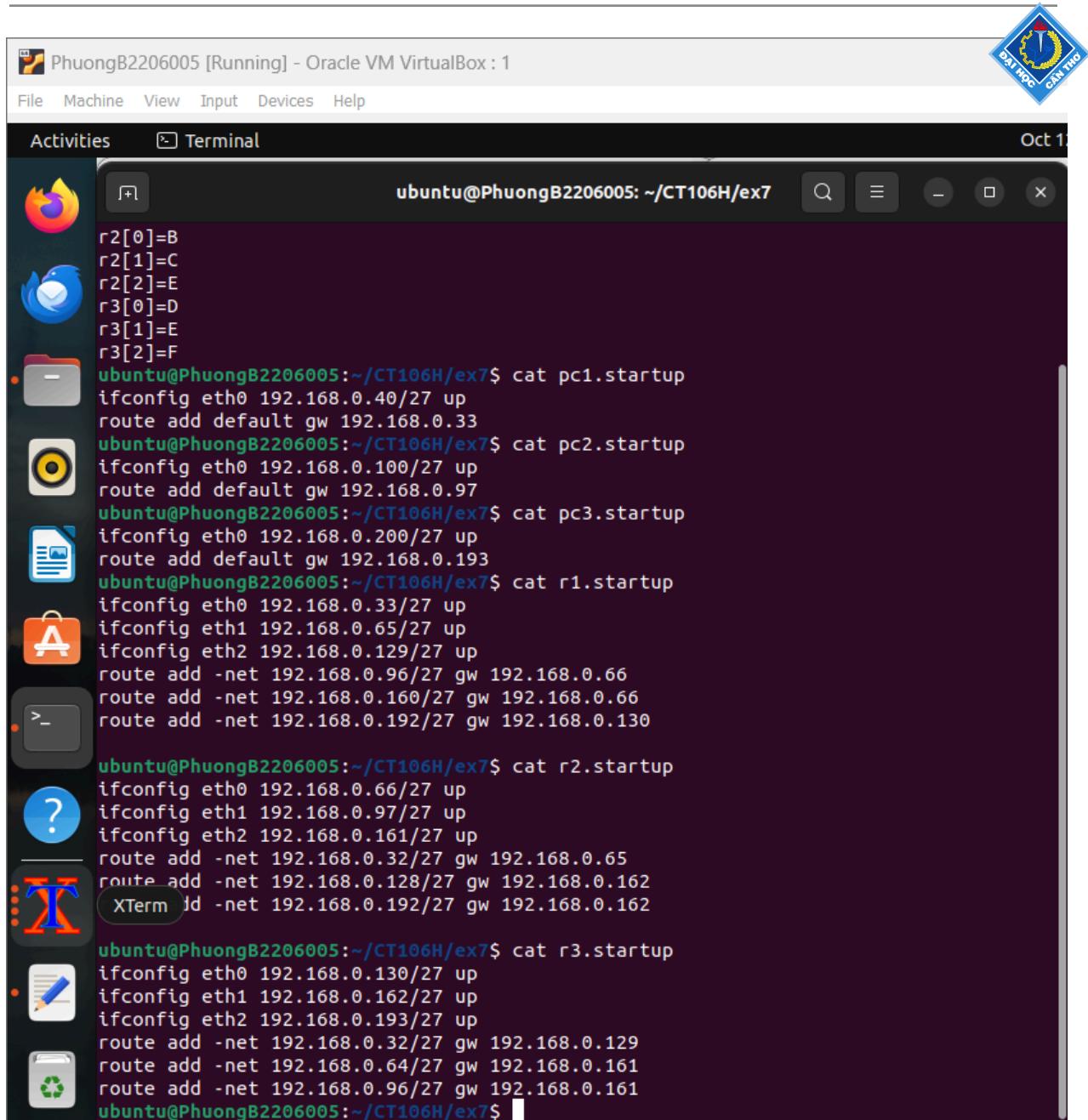
Activities Terminal Oct 12

```
ubuntu@PhuongB2206005:~/CT106H/ex7$ cat lab.conf
pc1[0]=A
pc2[0]=C
pc3[0]=F
r1[0]=A
r1[1]=B
r1[2]=D
r2[0]=B
r2[1]=C
r2[2]=E
r3[0]=D
r3[1]=E
r3[2]=F

ubuntu@PhuongB2206005:~/CT106H/ex7$ cat pc1.startup
ifconfig eth0 192.168.0.40/27 up
route add default gw 192.168.0.33
ubuntu@PhuongB2206005:~/CT106H/ex7$ cat pc2.startup
ifconfig eth0 192.168.0.100/27 up
route add default gw 192.168.0.97
ubuntu@PhuongB2206005:~/CT106H/ex7$ cat pc3.startup
ifconfig eth0 192.168.0.200/27 up
route add default gw 192.168.0.193
ubuntu@PhuongB2206005:~/CT106H/ex7$ cat r1.startup
ifconfig eth0 192.168.0.33/27 up
ifconfig eth1 192.168.0.65/27 up
ifconfig eth2 192.168.0.129/27 up
route add -net 192.168.0.96/27 gw 192.168.0.66
route add -net 192.168.0.160/27 gw 192.168.0.66
route add -net 192.168.0.192/27 gw 192.168.0.130

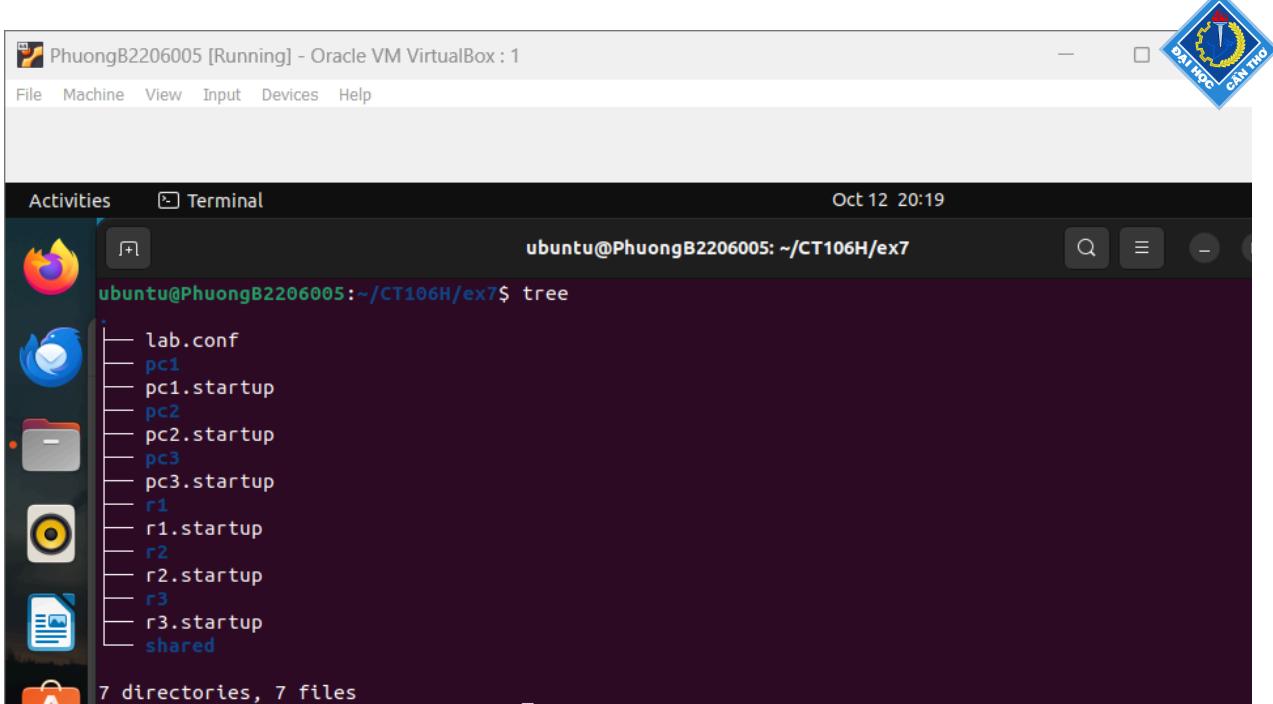
ubuntu@PhuongB2206005:~/CT106H/ex7$ cat r2.startup
ifconfig eth0 192.168.0.66/27 up
ifconfig eth1 192.168.0.97/27 up
ifconfig eth2 192.168.0.161/27 up
route add -net 192.168.0.32/27 gw 192.168.0.65
route add -net 192.168.0.128/27 gw 192.168.0.162
route add -net 192.168.0.192/27 gw 192.168.0.162

ubuntu@PhuongB2206005:~/CT106H/ex7$ cat r3.startup
```



```
r2[0]=B
r2[1]=C
r2[2]=E
r3[0]=D
r3[1]=E
r3[2]=F
ubuntu@PhuongB2206005:~/CT106H/ex7$ cat pc1.startup
ifconfig eth0 192.168.0.40/27 up
route add default gw 192.168.0.33
ubuntu@PhuongB2206005:~/CT106H/ex7$ cat pc2.startup
ifconfig eth0 192.168.0.100/27 up
route add default gw 192.168.0.97
ubuntu@PhuongB2206005:~/CT106H/ex7$ cat pc3.startup
ifconfig eth0 192.168.0.200/27 up
route add default gw 192.168.0.193
ubuntu@PhuongB2206005:~/CT106H/ex7$ cat r1.startup
ifconfig eth0 192.168.0.33/27 up
ifconfig eth1 192.168.0.65/27 up
ifconfig eth2 192.168.0.129/27 up
route add -net 192.168.0.96/27 gw 192.168.0.66
route add -net 192.168.0.160/27 gw 192.168.0.66
route add -net 192.168.0.192/27 gw 192.168.0.130
ubuntu@PhuongB2206005:~/CT106H/ex7$ cat r2.startup
ifconfig eth0 192.168.0.66/27 up
ifconfig eth1 192.168.0.97/27 up
ifconfig eth2 192.168.0.161/27 up
route add -net 192.168.0.32/27 gw 192.168.0.65
route add -net 192.168.0.128/27 gw 192.168.0.162
XTerm 1d -net 192.168.0.192/27 gw 192.168.0.162
ubuntu@PhuongB2206005:~/CT106H/ex7$ cat r3.startup
ifconfig eth0 192.168.0.130/27 up
ifconfig eth1 192.168.0.162/27 up
ifconfig eth2 192.168.0.193/27 up
route add -net 192.168.0.32/27 gw 192.168.0.129
route add -net 192.168.0.64/27 gw 192.168.0.161
route add -net 192.168.0.96/27 gw 192.168.0.161
ubuntu@PhuongB2206005:~/CT106H/ex7$
```

/CT106H/ex7\$tree



/CT106H/ex7\$kathara lstart

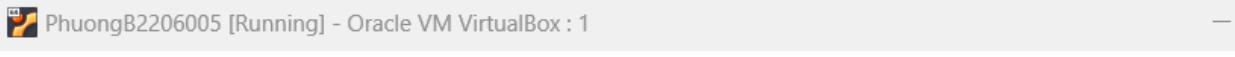
```
root@pc1: /  
--- Startup Commands Log  
++ ifconfig eth0 192.168.0.40/27 up  
++ route add default gw 192.168.0.33  
--- End Startup Commands Log  
root@pc1:/# []  
  
root@pc2: /  
--- Startup Commands Log  
++ ifconfig eth0 192.168.0.100/27 up  
++ route add default gw 192.168.0.97  
--- End Startup Commands Log  
root@pc2:/# []  
  
root@r3: /  
--- Startup Commands Log  
++ ifconfig eth0 192.168.0.130/27 up  
++ ifconfig eth1 192.168.0.162/27 up  
++ ifconfig eth2 192.168.0.193/27 up  
++ route add -net 192.168.0.32/27 gw 192.168.0.129  
++ route add -net 192.168.0.64/27 gw 192.168.0.161  
++ route add -net 192.168.0.96/27 gw 192.168.0.161  
--- End Startup Commands Log  
root@r3:/# []  
  
root@pc3: /  
--- Startup Commands Log  
++ ifconfig eth0 192.168.0.200/27 up  
++ route add default gw 192.168.0.193  
--- End Startup Commands Log  
root@pc3:/# []
```



```
root@r2: /  
--- Startup Commands Log  
++ ifconfig eth0 192.168.0.66/27 up  
++ ifconfig eth1 192.168.0.97/27 up  
++ ifconfig eth2 192.168.0.161/27 up  
++ route add -net 192.168.0.32/27 gw 192.168.0.65  
++ route add -net 192.168.0.128/27 gw 192.168.0.162  
++ route add -net 192.168.0.192/27 gw 192.168.0.162  
--- End Startup Commands Log  
root@r2:/#   
  
root@r1: /  
--- Startup Commands Log  
++ ifconfig eth0 192.168.0.33/27 up  
++ ifconfig eth1 192.168.0.65/27 up  
++ ifconfig eth2 192.168.0.129/27 up  
++ route add -net 192.168.0.96/27 gw 192.168.0.66  
++ route add -net 192.168.0.160/27 gw 192.168.0.66  
++ route add -net 192.168.0.192/27 gw 192.168.0.130  
--- End Startup Commands Log  
root@r1:/#   

```

/CT106H/ex7\$ kathara lclean

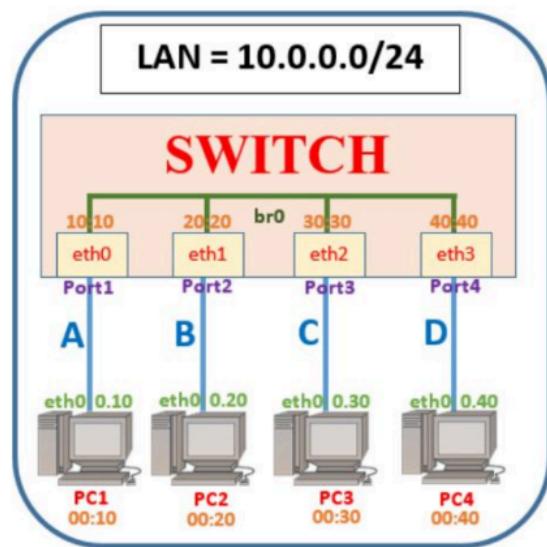


```
PhuongB2206005 [Running] - Oracle VM VirtualBox : 1  
File Machine View Input Devices Help  
Activities Terminal Oct 1  
ubuntu@PhuongB2206005: ~/CT106H/ex7$ kathara lclean  
Stopping Network Scenario  
[Deleting devices] 6/6  
[Deleting collision domains] 6/6  
ubuntu@PhuongB2206005: ~/CT106H/ex7$
```



## Exercise 8

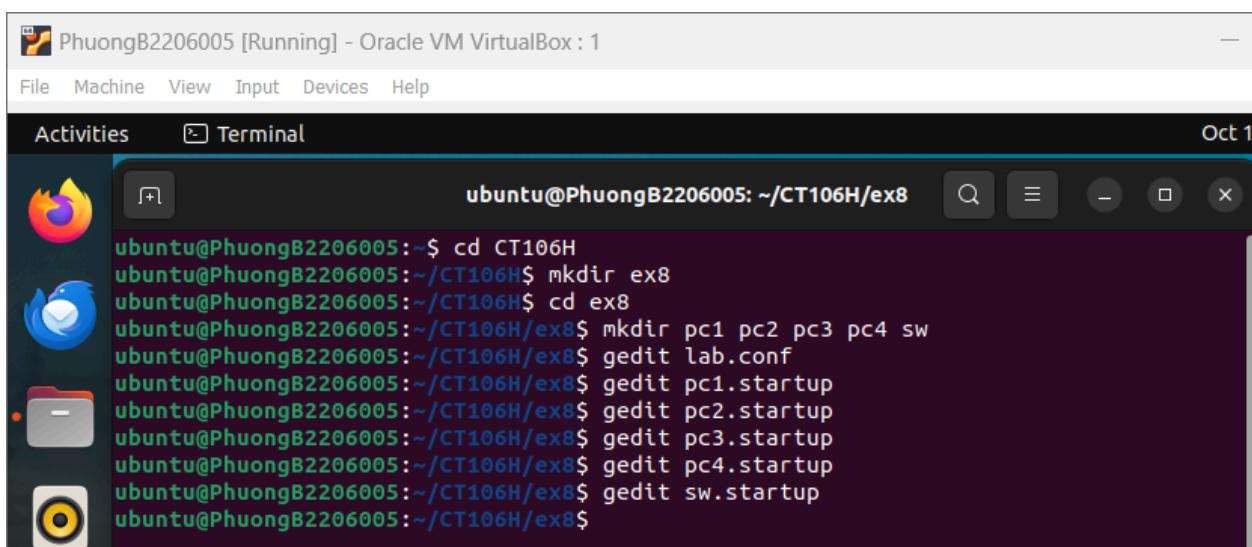
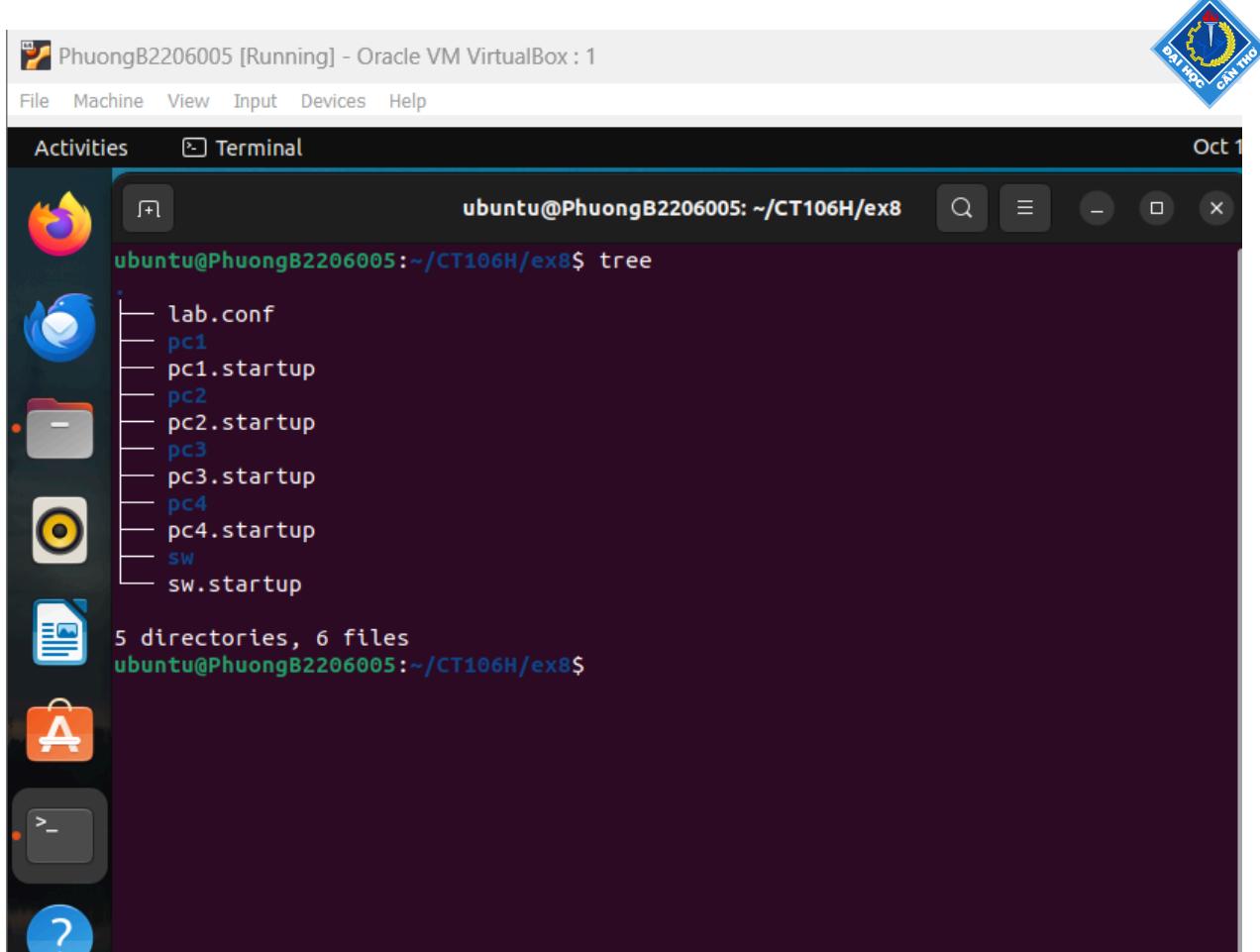
1. Self-study “SWITCH”
2. Construct a LAN using a switch



## Prepared for the lab

```
$cd CT106H  
/CT106H$mkdir ex8  
/CT106H$cd ex8  
/CT106H/ex8$mkdir pc1 pc2 pc3 pc4 sw  
/CT106H/ex8$gedit lab.conf  
/CT106H/ex8$gedit pc1.startup  
/CT106H/ex8$gedit pc2.startup  
/CT106H/ex8$gedit pc3.startup  
/CT106H/ex8$gedit pc4.startup  
/CT106H/ex8$gedit sw.startup
```

## CT106H – Computer Network





## Start the lab

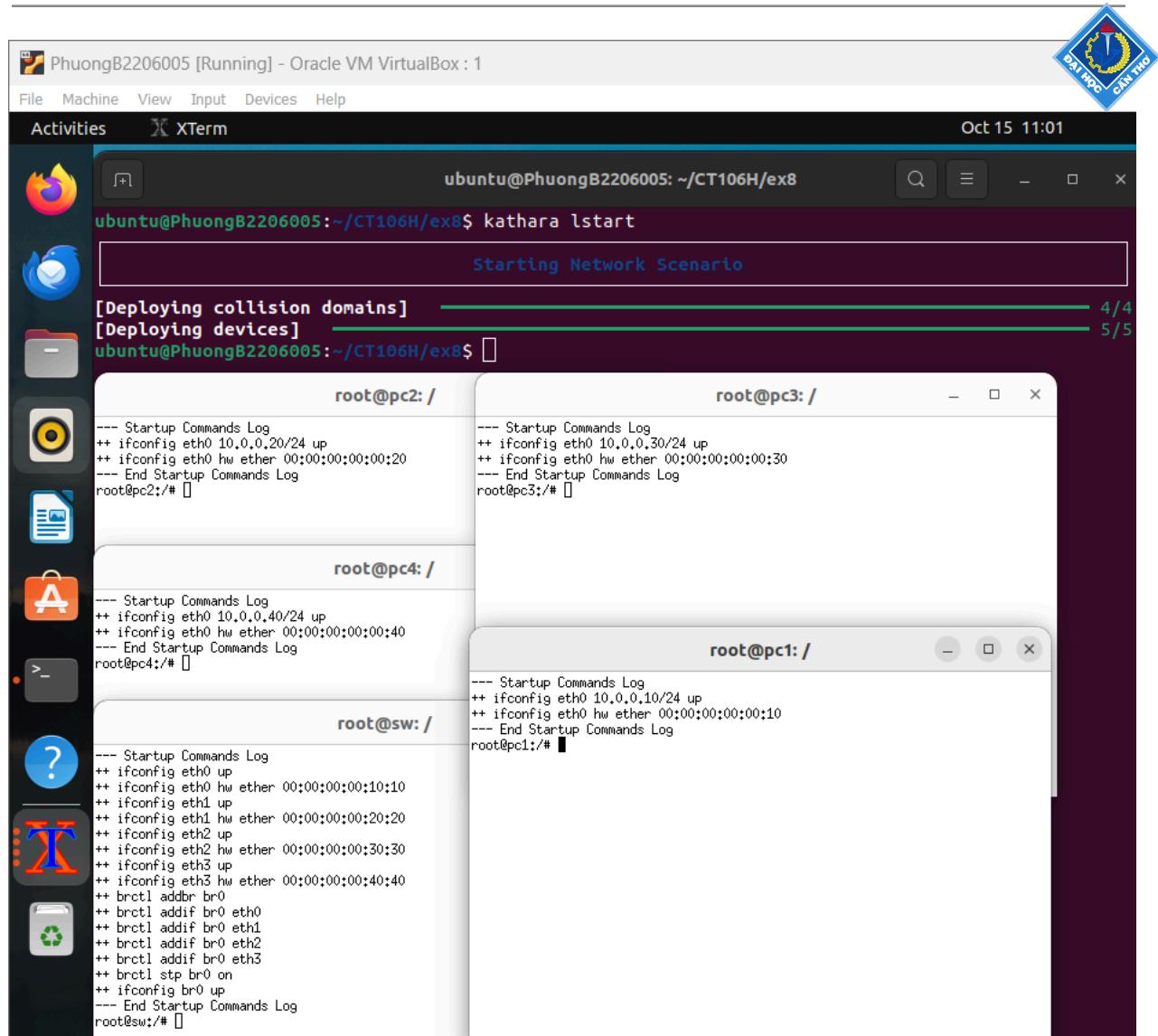
```
/CT106H/ex8$cat lab.conf  
/CT106H/ex8$cat pc1.startup  
/CT106H/ex8$cat pc2.startup  
/CT106H/ex8$cat pc3.startup  
/CT106H/ex8$cat pc4.startup  
/CT106H/ex8$cat sw.startup
```

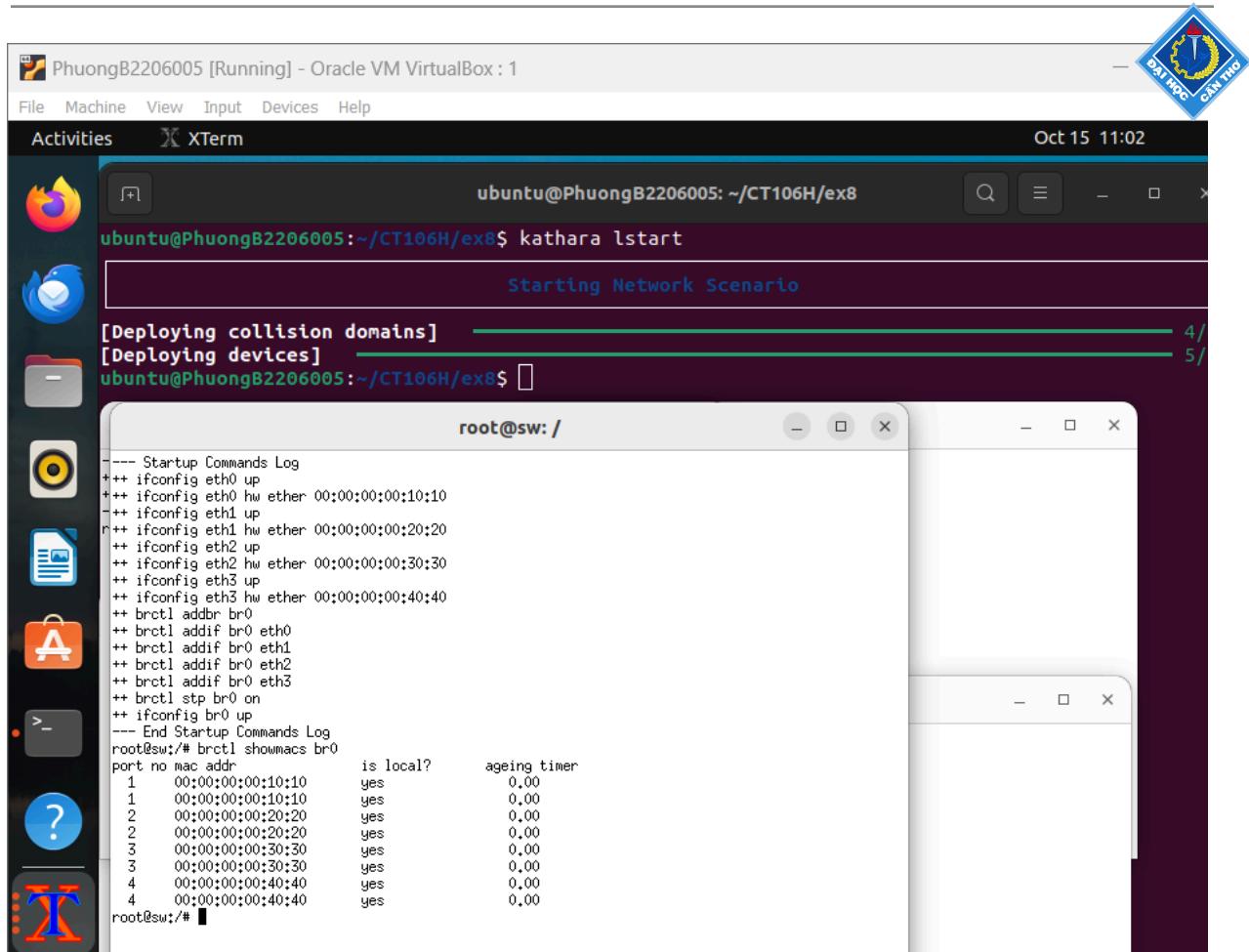
The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "Terminal" and the command prompt is "ubuntu@PhuongB2206005: ~/CT106H/ex8". The terminal displays the following commands and their outputs:

```
ubuntu@PhuongB2206005:~/CT106H/ex8$ cat lab.conf
pc1[0]=A
pc2[0]=B
pc3[0]=C
pc4[0]=D
sw[0]=A
sw[1]=B
sw[2]=C
sw[3]=D
ubuntu@PhuongB2206005:~/CT106H/ex8$ cat pc1.startup
ifconfig eth0 10.0.0.10/24 up
ifconfig eth0 hw ether 00:00:00:00:00:10
ubuntu@PhuongB2206005:~/CT106H/ex8$ cat pc2.startup
ifconfig eth0 10.0.0.20/24 up
ifconfig eth0 hw ether 00:00:00:00:00:20
ubuntu@PhuongB2206005:~/CT106H/ex8$ cat pc3.startup
ifconfig eth0 10.0.0.30/24 up
ifconfig eth0 hw ether 00:00:00:00:00:30
ubuntu@PhuongB2206005:~/CT106H/ex8$ cat pc4.startup
ifconfig eth0 10.0.0.40/24 up
ifconfig eth0 hw ether 00:00:00:00:00:40
ubuntu@PhuongB2206005:~/CT106H/ex8$ cat sw.startup
ifconfig eth0 up
ifconfig eth0 hw ether 00:00:00:00:10:10
ifconfig eth1 up
ifconfig eth1 hw ether 00:00:00:00:20:20
ifconfig eth2 up
ifconfig eth2 hw ether 00:00:00:00:30:30
ifconfig eth3 up
ifconfig eth3 hw ether 00:00:00:00:40:40
brctl addbr br0
brctl addif br0 eth0
brctl addif br0 eth1
brctl addif br0 eth2
brctl addif br0 eth3
brctl stp br0 on
ifconfig br0 up
```

```
/CT106H/ex8$kathara lstart
```

## CT106H – Computer Network





On the switch, pc1 and pc3, run the command:

- tcpdump -e -q -w /shared/ex8\_switch.pcap
- tcpdump -e -q -w /shared/ex8\_pc1.pcap
- tcpdump -e -q -w /shared/ex8\_pc3.pcap



```

es XTerm Oct 15 11:05
ubuntu@PhuongB2206005: ~/CT106H/ex8$ kathara lstart
Starting Network Scenario
[Deploying collision domains] 4/4
[Deploying devices] 5/5
ubuntu@PhuongB2206005:~/CT106H/ex8$ 

root@pc3:/ 
Rhythmbox: tcpdump -e -q -w /shared/ex8_pc3.pcap
tcpdump: listening on eth0, link-type EN10MB (Ethernet), snapshot length 262144 bytes
root@pc1:/ 
--- Startup Commands Log
++ ifconfig eth0 10.0.0.10/24 up
++ ifconfig eth0 hw ether 00:00:00:00:00:10
--- End Startup Commands Log
root@pc1:# tcpdump -e -q -w /shared/ex8_pc1.pcap
tcpdump: listening on eth0, link-type EN10MB (Ethernet), snapshot length 262144 bytes
root@pc2:/ 
--- Startup Commands Log
++ ifconfig eth0 10.0.0.20/24 up
++ ifconfig eth0 hw ether 00:00:00:00:00:20
--- End Startup Commands Log
root@pc2:# 

root@sw:/ 
root@sw:# tcpdump -e -q -w /shared/ex8_switch.pcap
tcpdump: listening on br0, link-type EN10MB (Ethernet), snapshot length 262144 bytes

```

On pc2, send the message to pc3 using the command ping 10.0.0.30 , then wait for about 10 seconds, and stop all the the ping command on pc2, and stop tcpdump commands on other devices.

```

root@pc3:/ 
root@pc3:# tcpdump -e -q -w /shared/ex8_pc3.pcap
tcpdump: listening on eth0, link-type EN10MB (Ethernet), snapshot length 262144 bytes
^C119 packets captured
119 packets received by filter
0 packets dropped by kernel
root@pc3:# 

root@pc2:/ 
--- Startup Commands Log
++ ifconfig eth0 10.0.0.20/24 up
++ ifconfig eth0 hw ether 00:00:00:00:00:20
--- End Startup Commands Log
root@pc2:# ping 10.0.0.30
PING 10.0.0.30 (10.0.0.30) 56(84) bytes of data.
64 bytes from 10.0.0.30: icmp_seq=1 ttl=64 time=2.34 ms
64 bytes from 10.0.0.30: icmp_seq=2 ttl=64 time=0.834 ms
64 bytes from 10.0.0.30: icmp_seq=3 ttl=64 time=2.06 ms
64 bytes from 10.0.0.30: icmp_seq=4 ttl=64 time=1.72 ms
64 bytes from 10.0.0.30: icmp_seq=5 ttl=64 time=2.36 ms
64 bytes from 10.0.0.30: icmp_seq=6 ttl=64 time=2.24 ms
64 bytes from 10.0.0.30: icmp_seq=7 ttl=64 time=2.02 ms
64 bytes from 10.0.0.30: icmp_seq=8 ttl=64 time=1.20 ms

```



```
root@pc2: /  
64 bytes from 10.0.0.30: icmp_seq=4 ttl=64 time=1.72 ms  
64 bytes from 10.0.0.30: icmp_seq=5 ttl=64 time=2.36 ms  
64 bytes from 10.0.0.30: icmp_seq=6 ttl=64 time=2.24 ms  
64 bytes from 10.0.0.30: icmp_seq=7 ttl=64 time=2.02 ms  
64 bytes from 10.0.0.30: icmp_seq=8 ttl=64 time=1.20 ms  
64 bytes from 10.0.0.30: icmp_seq=9 ttl=64 time=2.47 ms  
64 bytes from 10.0.0.30: icmp_seq=10 ttl=64 time=1.88 ms  
64 bytes from 10.0.0.30: icmp_seq=11 ttl=64 time=2.17 ms  
64 bytes from 10.0.0.30: icmp_seq=12 ttl=64 time=1.63 ms  
64 bytes from 10.0.0.30: icmp_seq=13 ttl=64 time=0.877 ms  
64 bytes from 10.0.0.30: icmp_seq=14 ttl=64 time=0.769 ms  
64 bytes from 10.0.0.30: icmp_seq=15 ttl=64 time=1.63 ms  
64 bytes from 10.0.0.30: icmp_seq=16 ttl=64 time=0.728 ms  
64 bytes from 10.0.0.30: icmp_seq=17 ttl=64 time=2.12 ms  
64 bytes from 10.0.0.30: icmp_seq=18 ttl=64 time=0.778 ms  
64 bytes from 10.0.0.30: icmp_seq=19 ttl=64 time=1.66 ms  
64 bytes from 10.0.0.30: icmp_seq=20 ttl=64 time=1.11 ms  
64 bytes from 10.0.0.30: icmp_seq=21 ttl=64 time=1.93 ms  
64 bytes from 10.0.0.30: icmp_seq=22 ttl=64 time=2.53 ms  
^C  
--- 10.0.0.30 ping statistics ---  
22 packets transmitted, 22 received, 0% packet loss, time 21367ms  
rtt min/avg/max/mdev = 0.728/1.683/2.527/0.596 ms  
root@pc2:/#
```

On the switch check the contain of the Mac Lookup Table again using the command brctl showmacs br0, and explain the information lists in the Table

```
root@sw: /  
root@sw:/# tcpdump -e -q -w /shared/ex8_switch.pcap  
tcpdump: listening on br0, link-type EN10MB (Ethernet), snapshot length 26  
^C48 packets captured  
48 packets received by filter  
0 packets dropped by kernel  
root@sw:/# brctl showmacs br0  
port no mac addr           is local?    ageing timer  
 2  00:00:00:00:00:20      no          41.48  
 3  00:00:00:00:00:30      no          41.48  
 1  00:00:00:00:10:10      yes         0.00  
 1  00:00:00:00:10:10      yes         0.00  
 2  00:00:00:00:20:20      yes         0.00  
 2  00:00:00:00:20:20      yes         0.00  
 3  00:00:00:00:30:30      yes         0.00  
 3  00:00:00:00:30:30      yes         0.00  
 4  00:00:00:00:40:40      yes         0.00  
 4  00:00:00:00:40:40      yes         0.00  
root@sw:/#
```

There are 2 mac addresses with 41.48 ageing timer. If there is no frame for ethernet bridge br0 within 41.48 seconds, they will be killed.



**Use Wireshark to open ex8\_switch.pcap, open the frame using ARP protocol with the source MAC address of 00:00:00:00:00:20, explain the contain in the frame**

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	00:00:00_00:00:20	Broadcast	ARP	60	Who has 10.0.0.30? Te
2	0.000432	00:00:00_00:00:30	00:00:00_00:00:20	ARP	60	10.0.0.30 is at 00:00:
3	0.000791	10.0.0.20	10.0.0.30	ICMP	98	Echo (ping) request
4	0.001473	10.0.0.30	10.0.0.20	ICMP	98	Echo (ping) reply
5	1.004489	10.0.0.20	10.0.0.30	ICMP	98	Echo (ping) request
6	1.004881	10.0.0.30	10.0.0.20	ICMP	98	Echo (ping) reply
7	2.032753	10.0.0.20	10.0.0.30	ICMP	98	Echo (ping) request
8	2.033623	10.0.0.30	10.0.0.20	ICMP	98	Echo (ping) reply
9	3.040669	10.0.0.20	10.0.0.30	ICMP	98	Echo (ping) request
10	3.041364	10.0.0.30	10.0.0.20	ICMP	98	Echo (ping) reply

Frame 1: 60 bytes on wire (480 bits), 60 bytes captured (480 bits)  
**Ethernet II, Src: 00:00:00\_00:00:20 (00:00:00:00:00:20), Dst: Broadcast (ff:ff:ff:ff:ff:ff)**  
Address Resolution Protocol (request)  
Hardware type: Ethernet (1)  
Protocol type: IPv4 (0x0800)  
Hardware size: 6  
Protocol size: 4  
Opcode: request (1)  
Sender MAC address: 00:00:00\_00:00:20 (00:00:00:00:00:20)  
Sender IP address: 10.0.0.20  
Target MAC address: 00:00:00\_00:00:00 (00:00:00:00:00:00)  
Target IP address: 10.0.0.30

```

0000 ff ff ff ff ff 00 00 00 00 00 20 08 06 00 01 ..... .
0010 08 00 06 04 00 01 00 00 00 00 00 20 0a 00 00 14 ..... .
0020 00 00 00 00 00 00 0a 00 00 1e 80 02 00 00 14 00 ..... .
0030 02 00 0f 00 00 00 00 00 00 00 00 00 00 00 00 00 ..... .

```

Frame 1 with the length is 60 bytes. This request frame (ARP) is sended from device with IP address 10.0.0.20 (00:00:00:00:00:20) to Broadcast(ff:ff:ff:ff:ff:ff) in order to find device 10.0.0.30

**Use Wireshark to open ex8\_switch.pcap, open the frame using ARP protocol with the source MAC address of 00:00:00:00:00:30, explain the contain in the frame**

Wireshark Screenshot:

- Frame 2:** 60 bytes on wire (480 bits), 60 bytes captured (480 bits)
- Ethernet II, Src: 00:00:00\_00:00:30 (00:00:00:00:00:30), Dst: 00:00:00\_00:00:20 (00:00:00:00:00:20)**
- Address Resolution Protocol (reply)**
  - Hardware type: Ethernet (1)
  - Protocol type: IPv4 (0x0800)
  - Hardware size: 6
  - Protocol size: 4
  - Opcode: reply (2)
  - Sender MAC address: 00:00:00\_00:00:30 (00:00:00:00:00:30)
  - Target MAC address: 00:00:00\_00:00:20 (00:00:00:00:00:20)
  - Target IP address: 10.0.0.20

Selected Frame Details:

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	00:00:00_00:00:20	Broadcast	ARP	60	Who has 10.0.0.30? Tell 10.0.0.20
2	0.000432	00:00:00_00:00:30	00:00:00_00:00:20	ARP	60	10.0.0.30 is at 00:00:00:00:00:30
3	0.000791	10.0.0.20	10.0.0.30	ICMP	98	Echo (ping) request id=0x0001, seq=1/25
4	0.001473	10.0.0.30	10.0.0.20	ICMP	98	Echo (ping) reply id=0x0001, seq=1/25
5	1.004489	10.0.0.20	10.0.0.30	ICMP	98	Echo (ping) request id=0x0001, seq=2/51
6	1.004881	10.0.0.30	10.0.0.20	ICMP	98	Echo (ping) reply id=0x0001, seq=2/51
7	2.032753	10.0.0.20	10.0.0.30	ICMP	98	Echo (ping) request id=0x0001, seq=3/76
8	2.033623	10.0.0.30	10.0.0.20	ICMP	98	Echo (ping) reply id=0x0001, seq=3/76
9	3.040669	10.0.0.20	10.0.0.30	ICMP	98	Echo (ping) request id=0x0001, seq=4/10
10	3.041364	10.0.0.30	10.0.0.20	ICMP	98	Echo (ping) reply id=0x0001, seq=4/10

Frame 2 with the length is 60 bytes. This request frame (ARP) is sended from device with IP address 10.0.0.30 (00:00:00:00:00:30) to device with IP address 10.0.0.20 (00:00:00:00:00:20)



**Use Wireshark to open ex8\_pc1.pcap, open the frame using ARP protocol with the source MAC address of 00:00:00:00:00:30, explain the contain in the frame**

PhuongB2206005 [Running] - Oracle VM VirtualBox : 1

File Machine View Input Devices Help

Activities Wireshark Oct 15 12:44

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

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

No.	Time	Source	Destination	Protocol	Length	Info
50	96.602779	00:00:00_00:00:20	Broadcast	ARP	60	Who has 10.0.0.30? Tell 10.0.0.20
51	97.987728	00:00:00_00:10:10	Spanning-tree-(for...	STP	60	Conf. Root = 32768/0/00:00:00:00:10:10
52	99.971522	00:00:00_00:10:10	Spanning-tree-(for...	STP	60	Conf. Root = 32768/0/00:00:00:00:10:10
53	102.110175	00:00:00_00:10:10	Spanning-tree-(for...	STP	60	Conf. Root = 32768/0/00:00:00:00:10:10
54	104.010664	00:00:00_00:10:10	Spanning-tree-(for...	STP	60	Conf. Root = 32768/0/00:00:00:00:10:10
55	106.002970	00:00:00_00:10:10	Spanning-tree-(for...	STP	60	Conf. Root = 32768/0/00:00:00:00:10:10
56	107.984948	00:00:00_00:10:10	Spanning-tree-(for...	STP	60	Conf. Root = 32768/0/00:00:00:00:10:10

Frame 50: 60 bytes on wire (480 bits), 60 bytes captured (480 bits)  
**Ethernet II, Src: 00:00:00\_00:00:20 (00:00:00:00:00:20), Dst: Broadcast (ff:ff:ff:ff:ff:ff)**  
**Address Resolution Protocol (request)**  
 Hardware type: Ethernet (1)  
 Protocol type: IPv4 (0x0800)  
 Hardware size: 6  
 Protocol size: 4  
 Opcode: request (1)  
 Sender MAC address: 00:00:00\_00:00:20 (00:00:00:00:00:20)  
 Sender IP address: 10.0.0.20  
 Target MAC address: 00:00:00\_00:00:00 (00:00:00:00:00:00)  
 Target IP address: 10.0.0.30

0000 ff ff ff ff ff 00 00 00 00 20 08 06 00 01 ..  
 0010 08 00 06 04 00 01 00 00 00 00 20 0a 00 00 14 ..  
 0020 00 00 00 00 00 00 0a 00 00 1e 80 02 00 00 14 00 ..  
 0030 02 00 0f 00 00 00 00 00 00 00 00 00 00 00 00 ..

There's no “frame using ARP protocol with the source MAC address of 00:00:00:00:00:30”



**Use Wireshark to open ex8\_switch.pcap, open the frame using ARP protocol with the source MAC address of 00:00:00:00:00:20, explain the contain in the frame**

No.	Time	Source	Destination	Protocol	Length	Info
55	108.033999	00:00:00_00:30:30	Spanning-tree-(for...)	STP	60	Conf. Root = 32768/0/00:00:00:00:10:10
56	110.008175	00:00:00_00:30:30	Spanning-tree-(for...)	STP	60	Conf. Root = 32768/0/00:00:00:10:10
57	110.609588	00:00:00_00:00:20	Broadcast	ARP	60	Who has 10.0.0.30? Tell 10.0.0.20
58	110.609605	00:00:00_00:00:30	00:00:00_00:00:20	ARP	42	10.0.0.30 is at 00:00:00:00:00:30
59	110.610359	10.0.0.20	10.0.0.30	ICMP	98	Echo (ping) request id=0x0001, seq=1/25
60	110.610387	10.0.0.30	10.0.0.20	ICMP	98	Echo (ping) reply id=0x0001, seq=1/25
61	111.613967	10.0.0.20	10.0.0.30	ICMP	98	Echo (ping) request id=0x0001, seq=2/51

Frame 58: 42 bytes on wire (336 bits), 42 bytes captured (336 bits)  
Ethernet II, Src: 00:00:00\_00:00:30 (00:00:00:00:00:30), Dst: 00:00:00\_00:00:20 (00:00:00:00:00:20)  
Address Resolution Protocol (reply)  
Hardware type: Ethernet (1)  
Protocol type: IPv4 (0x0800)  
Hardware size: 6  
Protocol size: 4  
Opcode: reply (2)  
Sender MAC address: 00:00:00\_00:00:30 (00:00:00:00:00:30)  
Sender IP address: 10.0.0.30  
Target MAC address: 00:00:00\_00:00:20 (00:00:00:00:00:20)  
Target IP address: 10.0.0.20

```

0000  00 00 00 00 20 00 00 00 00 00 30 08 06 00 01  .....
0010  08 00 06 04 00 02 00 00 00 00 30 0a 00 00 1e  .....
0020  00 00 00 00 20 0a 00 00 14  .....

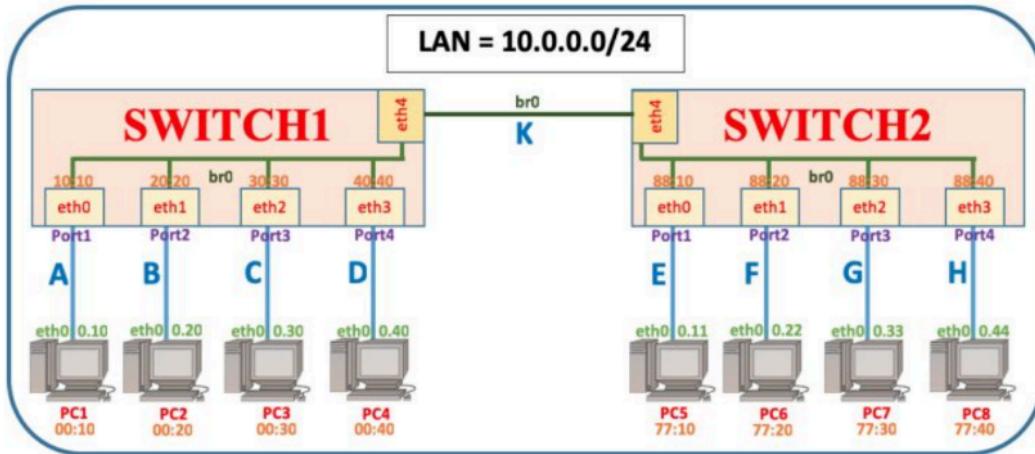
```

Frame 58 with the length is 42 bytes. This request frame (ARP) is sended from device with IP address 10.0.0.20 (00:00:00:00:00:20) to device with IP address 10.0.0.20 (00:00:00:00:00:30)



## Exercise 9

Construct the following network



### Prepare for lab

\$cd CT106H

/CT106H\$mkdir ex9

/CT106H\$cd ex9

/CT106H/ex9\$mkdir pc1 pc2 pc3 pc4 pc5 pc6 pc7 pc8 sw1 sw2

/CT106H/ex9\$gedit lab.conf

/CT106H/ex9\$gedit pc1.startup

/CT106H/ex9\$gedit pc2.startup

/CT106H/ex9\$gedit pc3.startup

/CT106H/ex9\$gedit pc4.startup

/CT106H/ex9\$gedit pc5.startup

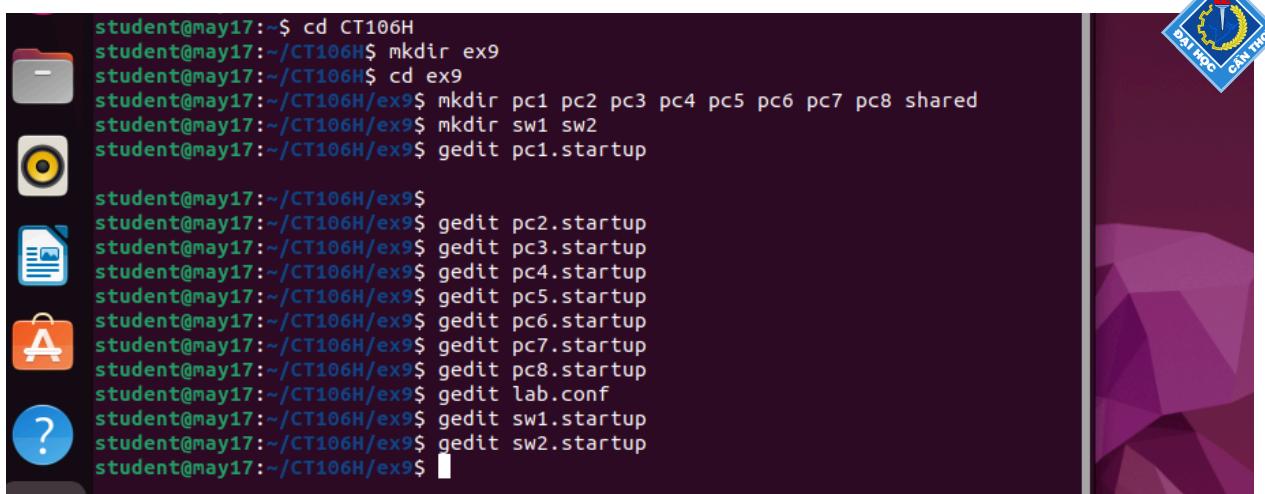
/CT106H/ex9\$gedit pc6.startup

/CT106H/ex9\$gedit pc7.startup

/CT106H/ex9\$gedit pc8.startup

/CT106H/ex9\$gedit sw1.startup

/CT106H/ex9\$gedit sw2.startup

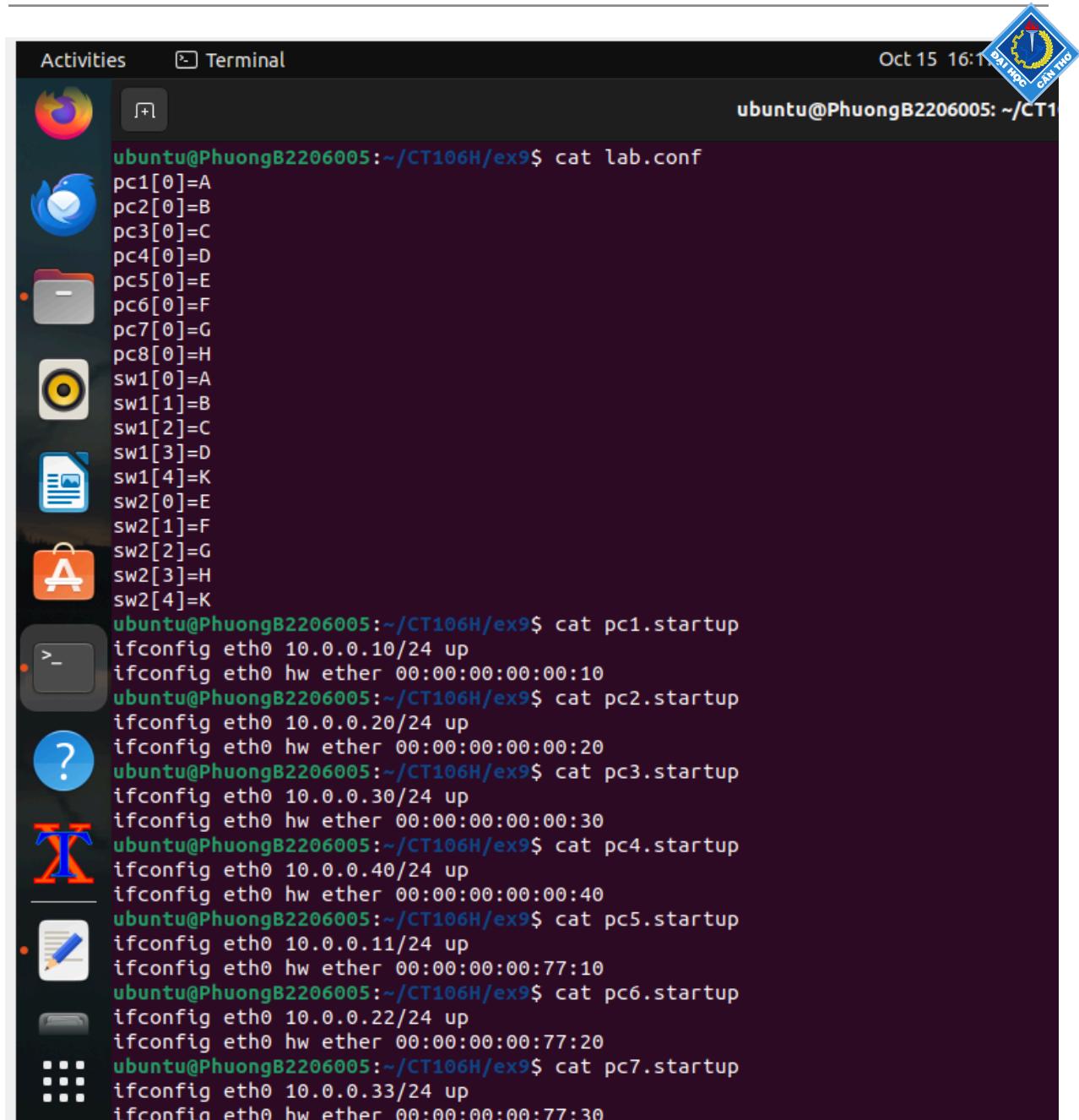


```
student@may17:~$ cd CT106H
student@may17:~/CT106H$ mkdir ex9
student@may17:~/CT106H$ cd ex9
student@may17:~/CT106H/ex9$ mkdir pc1 pc2 pc3 pc4 pc5 pc6 pc7 pc8 shared
student@may17:~/CT106H/ex9$ mkdir sw1 sw2
student@may17:~/CT106H/ex9$ gedit pc1.startup

student@may17:~/CT106H/ex9$ 
student@may17:~/CT106H/ex9$ gedit pc2.startup
student@may17:~/CT106H/ex9$ gedit pc3.startup
student@may17:~/CT106H/ex9$ gedit pc4.startup
student@may17:~/CT106H/ex9$ gedit pc5.startup
student@may17:~/CT106H/ex9$ gedit pc6.startup
student@may17:~/CT106H/ex9$ gedit pc7.startup
student@may17:~/CT106H/ex9$ gedit pc8.startup
student@may17:~/CT106H/ex9$ gedit lab.conf
student@may17:~/CT106H/ex9$ gedit sw1.startup
student@may17:~/CT106H/ex9$ gedit sw2.startup
student@may17:~/CT106H/ex9$
```

## Start the lab

```
/CT106H/ex9$cat lab.conf
/CT106H/ex9$cat pc1.startup
/CT106H/ex9$cat pc2.startup
/CT106H/ex9$cat pc3.startup
/CT106H/ex9$catt pc4.startup
/CT106H/ex9$cat pc5.startup
/CT106H/ex9$cat pc6.startup
/CT106H/ex9$cat pc7.startup
/CT106H/ex9$cat pc8.startup
/CT106H/ex9$cat sw1.startup
/CT106H/ex9$cat sw2.startup
```



The image shows a screenshot of an Ubuntu desktop environment. At the top, there is a dock with icons for the Dash, Home, Activities, and Terminal. The Terminal window is open and displays several commands related to network configuration:

```
ubuntu@PhuongB2206005:~/CT106H/ex9$ cat lab.conf
pc1[0]=A
pc2[0]=B
pc3[0]=C
pc4[0]=D
pc5[0]=E
pc6[0]=F
pc7[0]=G
pc8[0]=H
sw1[0]=A
sw1[1]=B
sw1[2]=C
sw1[3]=D
sw1[4]=K
sw2[0]=E
sw2[1]=F
sw2[2]=G
sw2[3]=H
sw2[4]=K

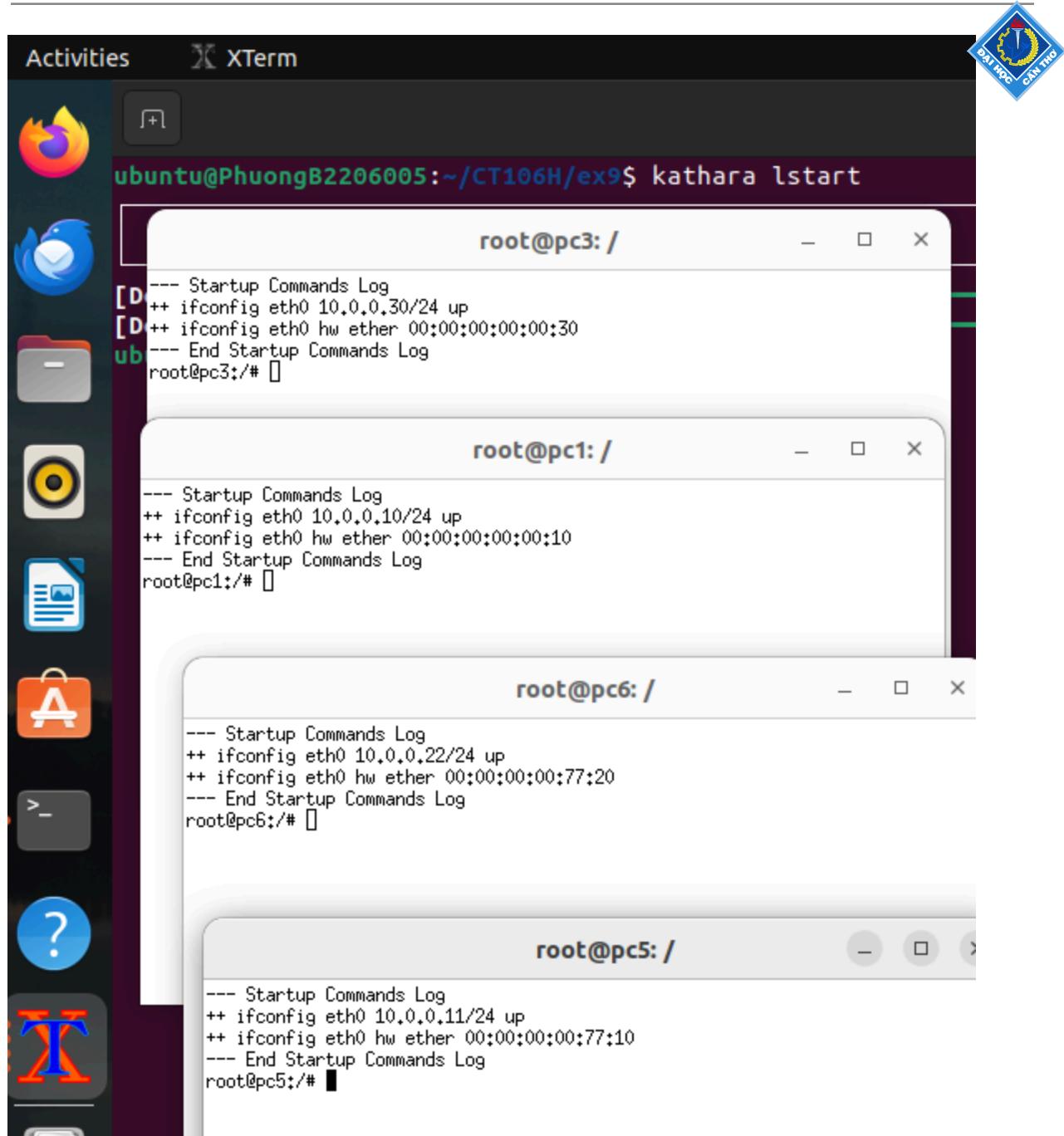
ubuntu@PhuongB2206005:~/CT106H/ex9$ cat pc1.startup
ifconfig eth0 10.0.0.10/24 up
ifconfig eth0 hw ether 00:00:00:00:00:10
ubuntu@PhuongB2206005:~/CT106H/ex9$ cat pc2.startup
ifconfig eth0 10.0.0.20/24 up
ifconfig eth0 hw ether 00:00:00:00:00:20
ubuntu@PhuongB2206005:~/CT106H/ex9$ cat pc3.startup
ifconfig eth0 10.0.0.30/24 up
ifconfig eth0 hw ether 00:00:00:00:00:30
ubuntu@PhuongB2206005:~/CT106H/ex9$ cat pc4.startup
ifconfig eth0 10.0.0.40/24 up
ifconfig eth0 hw ether 00:00:00:00:00:40
ubuntu@PhuongB2206005:~/CT106H/ex9$ cat pc5.startup
ifconfig eth0 10.0.0.11/24 up
ifconfig eth0 hw ether 00:00:00:00:77:10
ubuntu@PhuongB2206005:~/CT106H/ex9$ cat pc6.startup
ifconfig eth0 10.0.0.22/24 up
ifconfig eth0 hw ether 00:00:00:00:77:20
ubuntu@PhuongB2206005:~/CT106H/ex9$ cat pc7.startup
ifconfig eth0 10.0.0.33/24 up
ifconfig eth0 hw ether 00:00:00:00:77:30
```

A blue diamond-shaped watermark in the top right corner contains the text "ĐẠI HỌC CÁT TƯỜNG" and "CT106H".

Activities Terminal Oct 15 16:30:00  
ubuntu@PhuongB2206005: ~/CT106H/ex9\$ cat pc8.startup  
ifconfig eth0 10.0.0.44/24 up  
ifconfig eth0 hw ether 00:00:00:00:77:40  
ubuntu@PhuongB2206005: ~/CT106H/ex9\$ cat sw1.startup  
ifconfig eth0 up  
ifconfig eth0 hw ether 00:00:00:00:10:10  
ifconfig eth1 up  
ifconfig eth1 hw ether 00:00:00:00:20:20  
ifconfig eth2 up  
ifconfig eth2 hw ether 00:00:00:00:30:30  
ifconfig eth3 up  
ifconfig eth3 hw ether 00:00:00:00:40:40  
ifconfig eth4 up  
ifconfig eth4 hw ether 00:00:00:00:50:50  
brctl addbr br0  
brctl addif br0 eth0  
brctl addif br0 eth1  
brctl addif br0 eth2  
brctl addif br0 eth3  
brctl addif br0 eth4  
brctl stp br0 on  
ifconfig br0 up

ifconfig br0 up  
ubuntu@PhuongB2206005: ~/CT106H/ex9\$ cat sw2.startup  
ifconfig eth0 up  
ifconfig eth0 hw ether 00:00:00:00:88:10  
ifconfig eth1 up  
ifconfig eth1 hw ether 00:00:00:00:88:20  
ifconfig eth2 up  
ifconfig eth2 hw ether 00:00:00:00:88:30  
ifconfig eth3 up  
ifconfig eth3 hw ether 00:00:00:00:88:40  
ifconfig eth4 up  
ifconfig eth4 hw ether 00:00:00:00:88:50  
brctl addbr br0  
brctl addif br0 eth0  
brctl addif br0 eth1  
brctl addif br0 eth2  
brctl addif br0 eth3  
brctl addif br0 eth4  
brctl stp br0 on  
ifconfig br0 up

/CT106H/ex9\$kathara lstart





```
root@pc2: /  
--- Startup Commands Log  
++ ifconfig eth0 10.0.0.20/24 up  
++ ifconfig eth0 hw ether 00:00:00:00:00:20  
--- End Startup Commands Log  
root@pc2:/# []  
  
root@sw1: /  
--- Startup Commands Log  
++ ifconfig eth0 up  
++ ifconfig eth0 hw ether 00:00:00:00:10:10  
++ ifconfig eth1 up  
++ ifconfig eth1 hw ether 00:00:00:00:20:20  
++ ifconfig eth2 up  
++ ifconfig eth2 hw ether 00:00:00:00:30:30  
++ ifconfig eth3 up  
++ ifconfig eth3 hw ether 00:00:00:00:40:40  
++ ifconfig eth4 up  
++ ifconfig eth4 hw ether 00:00:00:00:50:50  
++ brctl addbr br0  
++ brctl addif br0 eth0  
++ brctl addif br0 eth1  
++ brctl addif br0 eth2  
++ brctl addif br0 eth3  
++ brctl addif br0 eth4  
++ brctl stp br0 on  
++ ifconfig br0 up  
--- End Startup Commands Log  
root@sw1:/# []  
  
root@pc4: /  
--- Startup Commands Log  
++ ifconfig eth0 10.0.0.40/24 up  
++ ifconfig eth0 hw ether 00:00:00:00:00:40  
--- End Startup Commands Log  
root@pc4:/# []
```



```
root@sw2: /  
--- Startup Commands Log  
++ ifconfig eth0 up  
++ ifconfig eth0 hw ether 00:00:00:00:88:10  
++ ifconfig eth1 up  
++ ifconfig eth1 hw ether 00:00:00:00:88:20  
++ ifconfig eth2 up  
++ ifconfig eth2 hw ether 00:00:00:00:88:30  
++ ifconfig eth3 up  
++ ifconfig eth3 hw ether 00:00:00:00:88:40  
++ ifconfig eth4 up  
++ ifconfig eth4 hw ether 00:00:00:00:88:50  
++ brctl addbr br0  
++ brctl addif br0 eth0  
++ brctl addif br0 eth1  
++ brctl addif br0 eth2  
++ brctl addif br0 eth3  
++ brctl addif br0 eth4  
++ brctl stp br0 on  
++ ifconfig br0 up  
--- End Startup Commands Log  
root@sw2:/# []
```

```
root@pc8: /  
--- Startup Commands Log  
++ ifconfig eth0 10.0.0.44/24 up  
++ ifconfig eth0 hw ether 00:00:00:00:77:40  
--- End Startup Commands Log  
root@pc8:/# []
```

```
root@pc7: /  
--- Startup Commands Log  
++ ifconfig eth0 10.0.0.33/24 up  
++ ifconfig eth0 hw ether 00:00:00:00:77:30  
--- End Startup Commands Log  
root@pc7:/# []
```

## Test connecting

#ping -c 5 10.0.0.44



```

root@pc2: / --- Startup Commands Log
++ ifconfig eth0 10.0.0.20/24 up
++ ifconfig eth0 hw ether 00:00:00:00:00:20
--- End Startup Commands Log
root@pc2:/# ping -c 5 10.0.0.44
PING 10.0.0.44 (10.0.0.44) 56(84) bytes of data.
64 bytes from 10.0.0.44: icmp_seq=1 ttl=64 time=3.16 ms
64 bytes from 10.0.0.44: icmp_seq=2 ttl=64 time=2.81 ms
64 bytes from 10.0.0.44: icmp_seq=3 ttl=64 time=1.79 ms
64 bytes from 10.0.0.44: icmp_seq=4 ttl=64 time=1.72 ms
64 bytes from 10.0.0.44: icmp_seq=5 ttl=64 time=1.57 ms
--- 10.0.0.44 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4009ms
rtt min/avg/max/mdev = 1.568/2.206/3.155/0.644 ms
root@pc2:/# 

root@sw2: / --- Startup Commands Log
++ ifconfig eth0 up
++ ifconfig eth0 hw ether 00:00:00:00:88:10
++ ifconfig eth1 up
++ ifconfig eth1 hw ether 00:00:00:00:88:20
++ ifconfig eth2 up
++ ifconfig eth2 hw ether 00:00:00:00:88:30
++ ifconfig eth3 up
++ ifconfig eth3 hw ether 00:00:00:00:88:40
++ ifconfig eth4 up
++ ifconfig eth4 hw ether 00:00:00:00:88:50
++ brctl addbr br0
++ brctl addif br0 eth0
++ brctl addif br0 eth1
++ brctl addif br0 eth2
++ brctl addif br0 eth3
++ brctl addif br0 eth4
++ brctl stp br0 on
++ ifconfig br0 up
--- End Startup Commands Log
root@sw2:/# 

root@pc8: / --- Startup Commands Log
++ ifconfig eth0 10.0.0.44/24 up
++ ifconfig eth0 hw ether 00:00:00:00:77:40
--- End Startup Commands Log
root@pc8:/# 

```

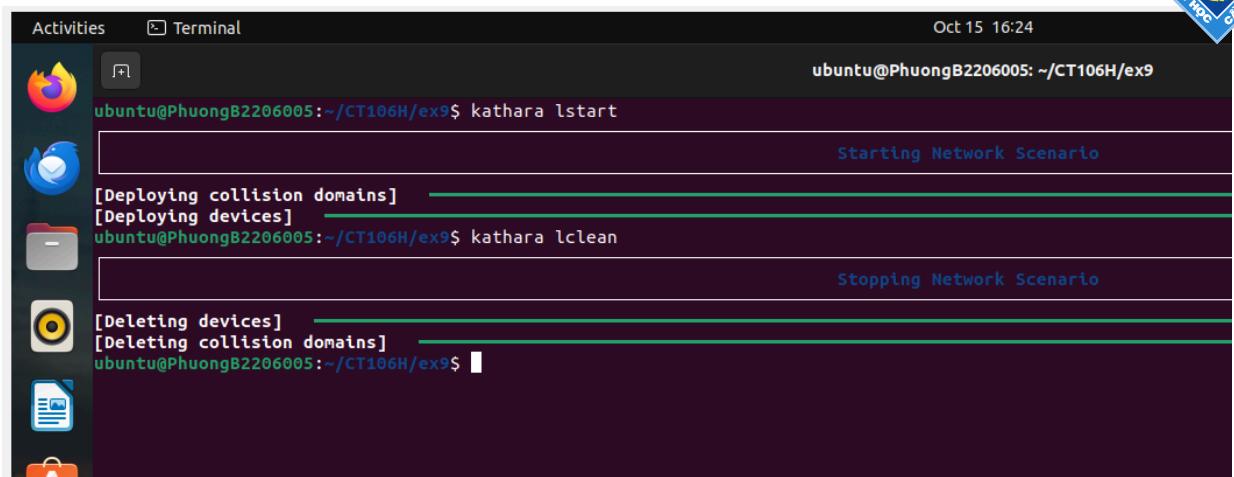
#ping 10.0.0.33 ( ping pc3 from pc7)

```

root@pc7: / --- Startup Commands Log
++ ifconfig eth0 10.0.0.33/24 up
++ ifconfig eth0 hw ether 00:00:00:00:77:30
--- End Startup Commands Log
root@pc7:/# ping 10.0.0.30
PING 10.0.0.30 (10.0.0.30) 56(84) bytes of data.
64 bytes from 10.0.0.30: icmp_seq=1 ttl=64 time=7.88 ms
64 bytes from 10.0.0.30: icmp_seq=2 ttl=64 time=3.18 ms
64 bytes from 10.0.0.30: icmp_seq=3 ttl=64 time=1.60 ms
64 bytes from 10.0.0.30: icmp_seq=4 ttl=64 time=0.877 ms
64 bytes from 10.0.0.30: icmp_seq=5 ttl=64 time=4.10 ms
^C
--- 10.0.0.30 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4006ms
rtt min/avg/max/mdev = 0.877/3.528/7.884/2.456 ms
root@pc7:/# 

```

/CT106H/ex9\$ kathara clean



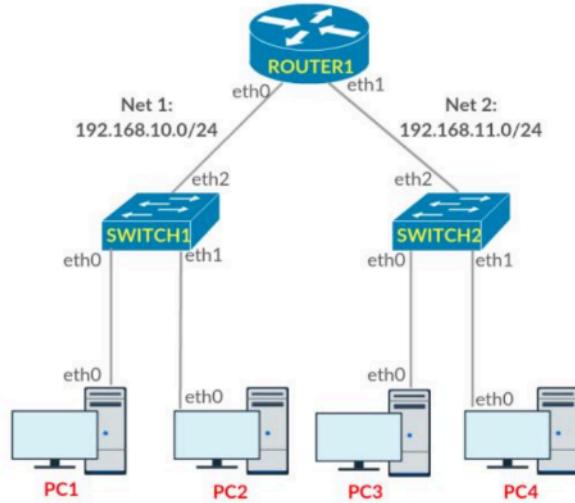
The image shows a screenshot of an Ubuntu desktop environment. In the top right corner, there is a blue diamond-shaped logo with white text that reads "ĐẠI HỌC CÁN TRẠM". The main focus is a terminal window titled "Terminal" located in the Activities overview. The terminal window has a dark background and contains the following text:

```
Activities Terminal Oct 15 16:24
ubuntu@PhuongB2206005:~/CT106H/ex9$ kathara lstart
Starting Network Scenario
[Deploying collision domains]
[Deploying devices]
ubuntu@PhuongB2206005:~/CT106H/ex9$ kathara lclean
Stopping Network Scenario
[Deleting devices]
[Deleting collision domains]
ubuntu@PhuongB2206005:~/CT106H/ex9$
```



## Exercise 10

Construct the following network



### Prepared for lab

**\$cd CT106H**

/CT106H\$mkdir ex10

/CT106H\$cd ex10

/CT106H/ex10\$mkdir pc1 pc2 pc3 pc4 r1 sw1 sw2

/CT106H/ex10\$gedit lab.conf

/CT106H/ex10\$gedit pc1.startup

/CT106H/ex10\$gedit pc2.startup

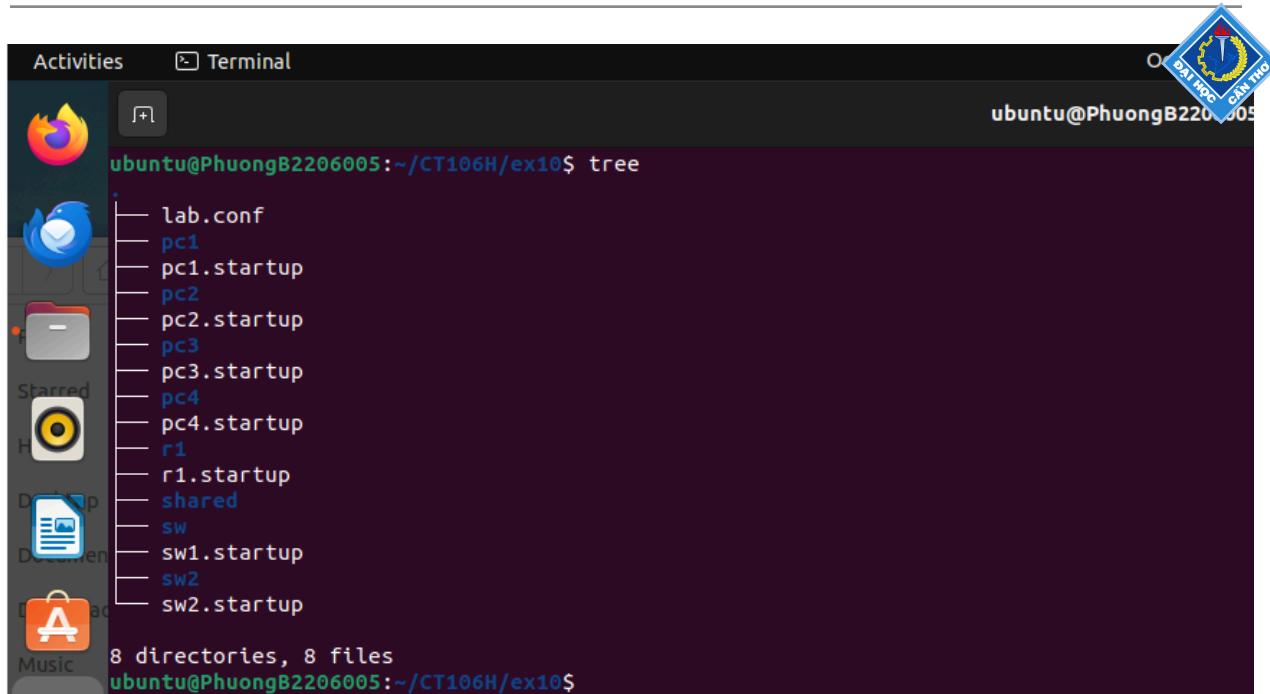
/CT106H/ex10\$gedit pc3.startup

/CT106H/ex10\$gedit pc4.startup

/CT106H/ex10\$gedit r1.startup

/CT106H/ex10\$gedit sw1.startup

/CT106H/ex10\$gedit sw2.startup



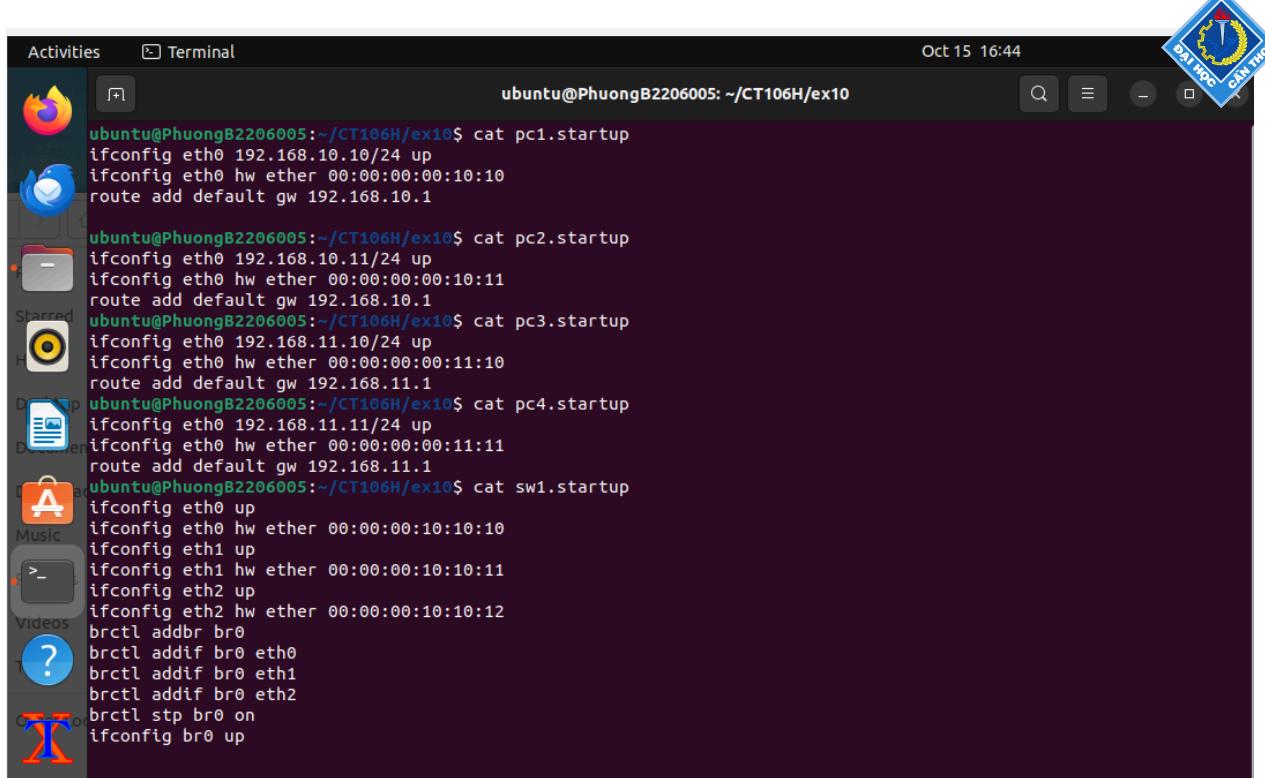
A screenshot of an Ubuntu desktop environment. The terminal window shows the command `tree` being run in the directory `~/CT106H/ex10`. The output of the command is as follows:

```
.
├── lab.conf
├── pc1
├── pc1.startup
├── pc2
├── pc2.startup
├── pc3
├── pc3.startup
├── pc4
├── pc4.startup
└── r1
    └── r1.startup
    └── shared
        ├── sw
        └── sw1.startup
        └── sw2
            └── sw2.startup
8 directories, 8 files
```

The terminal prompt at the bottom is `ubuntu@PhuongB2206005:~/CT106H/ex10$`.

## Start the lab

```
/CT106H/ex10$cat lab.conf
/CT106H/ex10$cat pc1.startup
/CT106H/ex10$cat pc2.startup
/CT106H/ex10$cat pc3.startup
/CT106H/ex10$cat pc4.startup
/CT106H/ex10$cat r1.startup
/CT106H/ex10$cat sw1.startup
/CT106H/ex10$cat sw2.startup
```



A screenshot of an Ubuntu desktop environment. On the left is a dock with icons for Dash, Home, Activities, Terminal, and a file manager. The main window is a terminal window titled "Terminal" with the command "ubuntu@PhuongB2206005:~/CT106H/ex10\$". The terminal displays several startup configuration scripts:

```
ubuntu@PhuongB2206005:~/CT106H/ex10$ cat pc1.startup
ifconfig eth0 192.168.10.10/24 up
ifconfig eth0 hw ether 00:00:00:00:10:10
route add default gw 192.168.10.1

ubuntu@PhuongB2206005:~/CT106H/ex10$ cat pc2.startup
ifconfig eth0 192.168.10.11/24 up
ifconfig eth0 hw ether 00:00:00:00:10:11
route add default gw 192.168.10.1

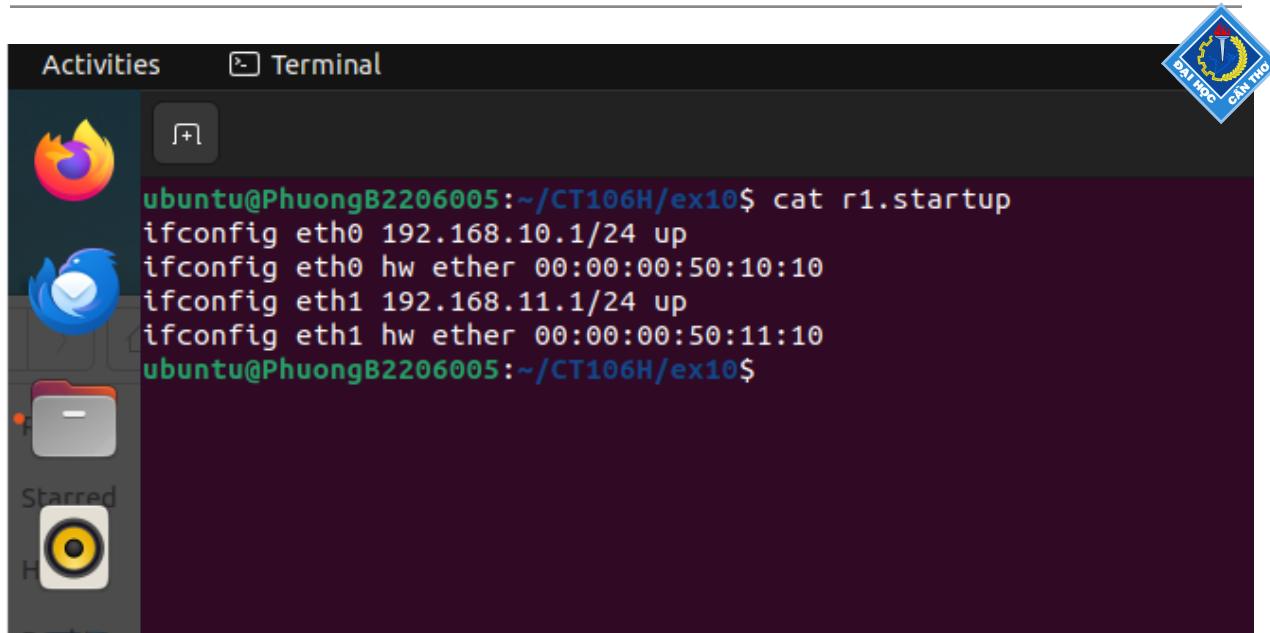
ubuntu@PhuongB2206005:~/CT106H/ex10$ cat pc3.startup
ifconfig eth0 192.168.11.10/24 up
ifconfig eth0 hw ether 00:00:00:00:11:10
route add default gw 192.168.11.1

ubuntu@PhuongB2206005:~/CT106H/ex10$ cat pc4.startup
ifconfig eth0 192.168.11.11/24 up
ifconfig eth0 hw ether 00:00:00:00:11:11
route add default gw 192.168.11.1

ubuntu@PhuongB2206005:~/CT106H/ex10$ cat sw1.startup
ifconfig eth0 up
ifconfig eth0 hw ether 00:00:00:10:10:10
ifconfig eth1 up
ifconfig eth1 hw ether 00:00:00:10:10:11
ifconfig eth2 up
ifconfig eth2 hw ether 00:00:00:10:10:12
brctl addbr br0
brctl addif br0 eth0
brctl addif br0 eth1
brctl addif br0 eth2
brctl stp br0 on
ifconfig br0 up
```

```
ubuntu@PhuongB2206005:~/CT106H/ex10$ cat sw2.startup
ifconfig eth0 up
ifconfig eth0 hw ether 00:00:00:20:11:10
ifconfig eth1 up
ifconfig eth1 hw ether 00:00:00:20:11:11
ifconfig eth2 up
ifconfig eth2 hw ether 00:00:00:20:10:12
brctl addbr br1
brctl addif br1 eth0
brctl addif br1 eth1
brctl addif br1 eth2
brctl stp br1 on
ifconfig br1 up
```

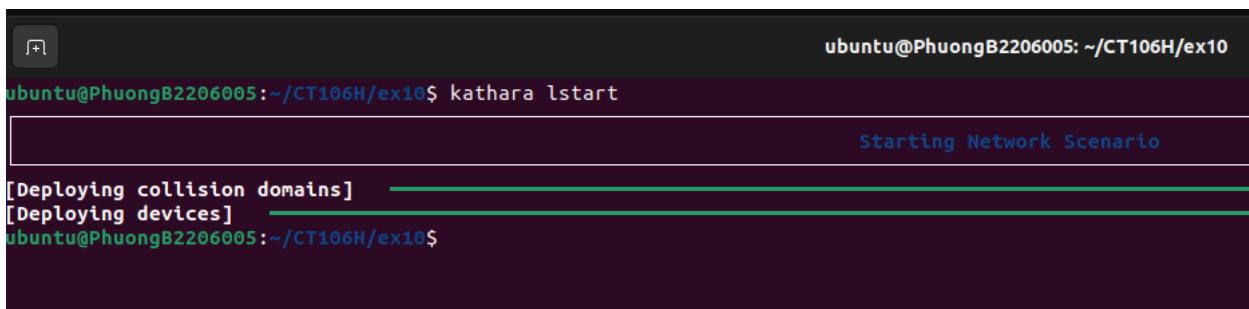
```
ubuntu@PhuongB2206005:~/CT106H/ex10$ cat lab.conf
pc1[0]=C
pc2[0]=D
pc3[0]=E
pc4[0]=F
sw1[0]=C
sw1[1]=D
sw1[2]=A
sw2[0]=E
sw2[1]=F
sw2[2]=B
r1[0]=A
r1[1]=B
```



The screenshot shows a standard Ubuntu desktop environment. On the left, there's a dock with icons for the Dash, Home, and a folder. Below the dock are icons for 'Starred' and 'HDMI'. In the top right corner, there's a blue diamond-shaped logo with the text 'ĐẠI HỌC CĂN TRÍ' around a central emblem. A terminal window is open in the center, showing the command 'cat r1.startup' followed by the output of the 'ifconfig' command, which lists two interfaces: eth0 and eth1 with their respective IP addresses and MAC addresses. The terminal window has a dark purple background.

```
ubuntu@PhuongB2206005:~/CT106H/ex10$ cat r1.startup
ifconfig eth0 192.168.10.1/24 up
ifconfig eth0 hw ether 00:00:00:50:10:10
ifconfig eth1 192.168.11.1/24 up
ifconfig eth1 hw ether 00:00:00:50:11:10
ubuntu@PhuongB2206005:~/CT106H/ex10$
```

/CT106H/ex10\$kathara lstart



This screenshot shows a terminal window with a dark purple background. The command 'kathara lstart' is entered at the prompt. The output shows the process of starting a network scenario, with progress bars indicating the deployment of collision domains and devices. The terminal window has a dark purple background.

```
ubuntu@PhuongB2206005:~/CT106H/ex10$ kathara lstart
Starting Network Scenario
[Deploying collision domains] _____
[Deploying devices] _____
ubuntu@PhuongB2206005:~/CT106H/ex10$
```

```

root@pc2: /
--- Startup Commands Log
++ ifconfig eth0 192.168.10.11/24 up
++ ifconfig eth0 hw ether 00:00:00:00:10:11
++ route add default gw 192.168.10.1
--- End Startup Commands Log
root@pc2:/# 

root@pc4: /
--- Startup Commands Log
++ ifconfig eth0 192.168.11.11/24 up
++ ifconfig eth0 hw ether 00:00:00:00:11:11
++ route add default gw 192.168.11.1
--- End Startup Commands Log
root@pc4:/# 

root@sw1: /
--- Startup Commands Log
++ ifconfig eth0 up
++ ifconfig eth0 hw ether 00:00:00:10:10:10
++ ifconfig eth1 up
++ ifconfig eth1 hw ether 00:00:00:10:10:11
++ ifconfig eth2 up
++ ifconfig eth2 hw ether 00:00:00:10:10:12
++ brctl addbr br0
++ brctl addif br0 eth0
++ brctl addif br0 eth1
++ brctl addif br0 eth2
++ brctl stp br0 on
++ ifconfig br0 up
--- End Startup Commands Log

root@pc3: /
--- Startup Commands Log
++ ifconfig eth0 192.168.11.10/24 up
++ ifconfig eth0 hw ether 00:00:00:00:11:10
++ route add default gw 192.168.11.1
--- End Startup Commands Log
root@pc3:/# 

root@pc1: /
--- Startup Commands Log
++ ifconfig eth0 192.168.10.10/24 up
++ ifconfig eth0 hw ether 00:00:00:00:10:10
++ route add default gw 192.168.10.1
--- End Startup Commands Log
root@pc1:/# 

root@sw2: /
--- Startup Commands Log
++ ifconfig eth0 up
++ ifconfig eth0 hw ether 00:00:00:20:11:10
++ ifconfig eth1 up
++ ifconfig eth1 hw ether 00:00:00:20:11:11
++ ifconfig eth2 up
++ ifconfig eth2 hw ether 00:00:00:20:10:12
++ brctl addbr br1
++ brctl addif br1 eth0
++ brctl addif br1 eth1
++ brctl addif br1 eth2
++ brctl stp br1 on
++ ifconfig br1 up
--- End Startup Commands Log
root@sw2:/# 

root@r1: /
--- Startup Commands Log
++ ifconfig eth0 192.168.10.1/24 up
++ ifconfig eth0 hw ether 00:00:00:50:10:10
++ ifconfig eth1 192.168.11.1/24 up
++ ifconfig eth1 hw ether 00:00:00:50:11:10
--- End Startup Commands Log
root@r1:/#

```



#ping 192.168.11.11 pc4 to check the connecting

```
root@pc1: /  
--- Startup Commands Log  
++ ifconfig eth0 192.168.10.10/24 up  
++ ifconfig eth0 hw ether 00:00:00:00:10:10  
++ route add default gw 192.168.10.1  
--- End Startup Commands Log  
root@pc1:/# ping 192.168.11.11  
PING 192.168.11.11 (192.168.11.11) 56(84) bytes of data.  
64 bytes from 192.168.11.11: icmp_seq=1 ttl=63 time=9.33 ms  
64 bytes from 192.168.11.11: icmp_seq=2 ttl=63 time=1.94 ms  
64 bytes from 192.168.11.11: icmp_seq=3 ttl=63 time=1.59 ms  
64 bytes from 192.168.11.11: icmp_seq=4 ttl=63 time=4.12 ms  
64 bytes from 192.168.11.11: icmp_seq=5 ttl=63 time=3.82 ms  
64 bytes from 192.168.11.11: icmp_seq=6 ttl=63 time=1.95 ms  
64 bytes from 192.168.11.11: icmp_seq=7 ttl=63 time=3.66 ms  
^C  
--- 192.168.11.11 ping statistics ---  
7 packets transmitted, 7 received, 0% packet loss, time 6011ms  
rtt min/avg/max/mdev = 1.593/3.772/9.325/2.460 ms  
root@pc1:/#
```

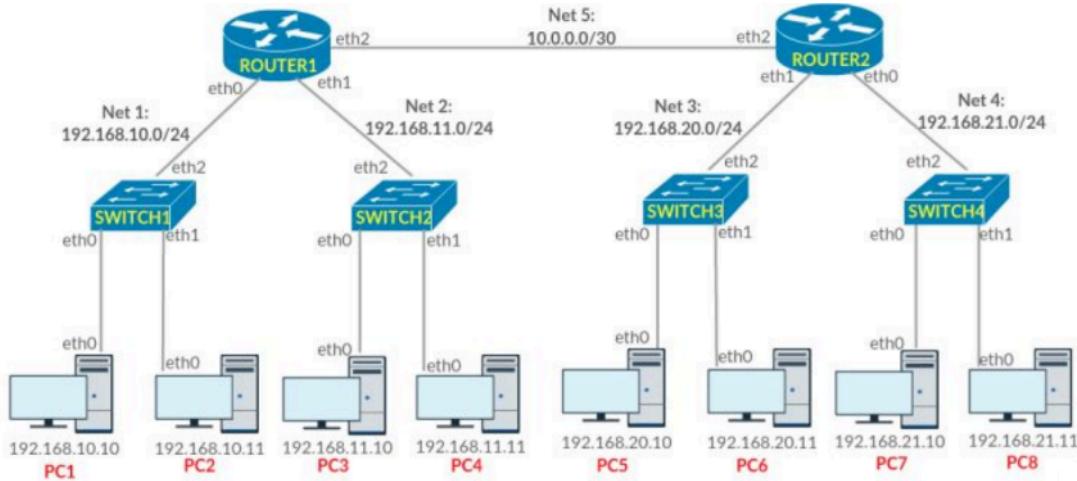
/CT106H/ex10\$ kathara lclean

```
Activities Terminal Oct 15 16:51  
ubuntu@PhuongB2206005: ~/CT106H/ex10$ kathara lstart  
Starting Network Scenario  
[Deploying collision domains] _____  
[Deploying devices] _____  
ubuntu@PhuongB2206005: ~/CT106H/ex10$ kathara lclean  
Stopping Network Scenario  
[Rhythmbox devices] _____  
[Detected collision domains] _____  
ubuntu@PhuongB2206005: ~/CT106H/ex10$
```



## Exercise 11

Construct the following network



### Prepared for lab

**\$cd CT106H**

/CT106H\$mkdir ex11

/CT106H\$cd ex11

/CT106H/ex11\$mkdir pc1 pc2 pc3 pc4 pc5 pc6 pc7 pc8 r1 sw1 sw2 sw3  
sw4 r1 r2

/CT106H/ex11\$gedit lab.conf

/CT106H/ex11\$gedit pc1.startup

/CT106H/ex11\$gedit pc2.startup

/CT106H/ex11\$gedit pc3.startup

/CT106H/ex11\$gedit pc4.startup

/CT106H/ex11\$gedit pc5.startup

/CT106H/ex11\$gedit pc6.startup

/CT106H/ex11\$gedit pc7.startup

/CT106H/ex11\$gedit pc8.startup

/CT106H/ex11\$gedit r1.startup

/CT106H/ex11\$gedit r2.startup

/CT106H/ex11\$gedit sw1.startup

/CT106H/ex11\$gedit sw2.startup

### Start for lab

/CT106H/ex11\$cat lab.conf

/CT106H/ex11\$cat t pc1.startup



```
/CT106H/ex11$cat pc2.startup  
/CT106H/ex11$cat pc3.startup  
/CT106H/ex11$cat pc4.startup  
/CT106H/ex11$cat pc5.startup  
/CT106H/ex11$cat pc6.startup  
/CT106H/ex11$cat pc7.startup  
/CT106H/ex11$cat pc8.startup  
/CT106H/ex11$cat r1.startup  
/CT106H/ex11$cat r2.startup  
/CT106H/ex11$cat sw1.startup  
/CT106H/ex11$cat sw2.startup
```

Activities    Terminal

```
ubuntu@PhuongB2206005:~/CT106H/ex11$ cat lab.conf  
pc1[0]=A  
pc2[0]=B  
pc3[0]=C  
pc4[0]=D  
pc5[0]=E  
pc6[0]=F  
pc7[0]=G  
pc8[0]=H  
sw1[0]=A  
sw1[1]=B  
sw1[2]=J  
sw2[0]=C  
sw2[1]=D  
sw2[2]=K  
sw3[0]=E  
sw3[1]=F  
sw3[2]=L  
sw4[0]=G  
sw4[1]=H  
sw4[2]=M  
r1[0]=J  
r1[1]=K  
r1[2]=N  
r2[0]=M  
r2[1]=L  
r2[2]=N
```

```
[~] ~
ubuntu@PhuongB2206005:~/CT106H/ex11$ cat pc1.startup
ifconfig eth0 192.168.10.10/24 up
ifconfig eth0 hw ether 00:00:00:00:10:10
route add default gw 192.168.10.1
ubuntu@PhuongB2206005:~/CT106H/ex11$ cat pc2.startup
ifconfig eth0 192.168.10.11/24 up
ifconfig eth0 hw ether 00:00:00:00:10:11
route add default gw 192.168.10.1
ubuntu@PhuongB2206005:~/CT106H/ex11$ cat pc3.startup
ifconfig eth0 192.168.11.10/24 up
ifconfig eth0 hw ether 00:00:00:00:11:10
route add default gw 192.168.11.1
ubuntu@PhuongB2206005:~/CT106H/ex11$
```



```
ubuntu@PhuongB2206005:~/CT106H/ex11$ cat pc4.startup
ifconfig eth0 192.168.11.11/24 up
ifconfig eth0 hw ether 00:00:00:00:11:11
route add default gw 192.168.11.1
ubuntu@PhuongB2206005:~/CT106H/ex11$ cat pc5.startup
ifconfig eth0 192.168.20.10/24 up
ifconfig eth0 hw ether 00:00:00:00:20:10
route add default gw 192.168.20.1
ubuntu@PhuongB2206005:~/CT106H/ex11$ cat pc6.startup
ifconfig eth0 192.168.20.11/24 up
ifconfig eth0 hw ether 00:00:00:00:20:11
route add default gw 192.168.20.1
ubuntu@PhuongB2206005:~/CT106H/ex11$ cat pc7.startup
ifconfig eth0 192.168.21.10/24 up
ifconfig eth0 hw ether 00:00:00:00:21:10
route add default gw 192.168.21.1
ubuntu@PhuongB2206005:~/CT106H/ex11$ cat pc8.startup
ifconfig eth0 192.168.21.11/24 up
ifconfig eth0 hw ether 00:00:00:00:21:11
route add default gw 192.168.21.1
```

Activities Terminal Oct 15 17:20

```
ubuntu@PhuongB2206005: ~/CT106H/ex11$ cat r1.startup
ifconfig eth0 192.168.10.1/24 up
ifconfig eth0 hw ether 00:00:00:50:10:10
ifconfig eth1 192.168.11.1/24 up
ifconfig eth1 hw ether 00:00:00:50:11:10
ifconfig eth2 10.0.0.1/30 up
route add default gw 10.0.0.1
ubuntu@PhuongB2206005: ~/CT106H/ex11$ cat r2.startup
ifconfig eth0 192.168.21.1/24 up
ifconfig eth0 hw ether 00:00:00:51:21:10
ifconfig eth1 192.168.20.1/24 up
ifconfig eth1 hw ether 00:00:00:51:20:10
ifconfig eth2 10.0.0.2/30 up
route add default gw 10.0.0.1
ubuntu@PhuongB2206005: ~/CT106H/ex11$ cat sw2.startup
ifconfig eth0 up
ifconfig eth0 hw ether 00:00:00:20:11:10
ifconfig eth1 up
ifconfig eth1 hw ether 00:00:00:20:11:11
ifconfig eth2 up
ifconfig eth2 hw ether 00:00:00:20:11:12
brctl addbr br1
brctl addif br1 eth0
brctl addif br1 eth1
brctl addif br1 eth2
brctl stp br1 on
ifconfig br1 up
```



```
ubuntu@PhuongB2206005:~/CT106H/ex11$ cat sw1.startup
ifconfig eth0 up
ifconfig eth0 hw ether 00:00:00:10:10:10
ifconfig eth1 up
ifconfig eth1 hw ether 00:00:00:10:10:11
ifconfig eth2 up
ifconfig eth2 hw ether 00:00:00:10:10:12
brctl addbr br0
brctl addif br0 eth0
brctl addif br0 eth1
brctl addif br0 eth2
brctl stp br0 on
ifconfig br0 up
ubuntu@PhuongB2206005:~/CT106H/ex11$ cat sw3.startup
ifconfig eth0 up
ifconfig eth0 hw ether 00:00:00:30:20:10
ifconfig eth1 up
ifconfig eth1 hw ether 00:00:00:30:20:11
ifconfig eth2 up
ifconfig eth2 hw ether 00:00:00:30:20:12
brctl addbr br2
brctl addif br2 eth0
brctl addif br2 eth1
brctl addif br2 eth2
brctl stp br2 on
ifconfig br2 up

ubuntu@PhuongB2206005:~/CT106H/ex11$ cat sw4.startup
ifconfig eth0 up
ifconfig eth0 hw ether 00:00:00:40:21:10
ifconfig eth1 up
ifconfig eth1 hw ether 00:00:00:40:21:11
ifconfig eth2 up
ifconfig eth2 hw ether 00:00:00:40:21:12
brctl addbr br3
brctl addif br3 eth0
brctl addif br3 eth1
brctl addif br3 eth2
brctl stp br3 on
ifconfig br3 up
```

/CT106H/ex11\$kathara lstart

```
+1                                         ubuntu@PhuongB2206005: ~/CT106H/ex11
ubuntu@PhuongB2206005:~/CT106H/ex11$ kathara lstart
[Deploying collision domains]  _____
[Deploying devices]  _____
Starting Network Scenario
ubuntu@PhuongB2206005:~/CT106H/ex11$
```

root@pc1: /

```
--- Startup Commands Log
++ ifconfig eth0 192.168.10.10/24 up
++ ifconfig eth0 hw ether 00:00:00:00:10:10
++ route add default gw 192.168.10.1
--- End Startup Commands Log
root@pc1:/# 
```

root@sw3: /

root@sw1: /

```
--- Startup Commands Log
++ ifconfig eth0 up
++ ifconfig eth0 hw ether 00:00:00:10:10:10
++ ifconfig eth1 up
++ ifconfig eth1 hw ether 00:00:00:10:10:11
++ ifconfig eth2 up
++ ifconfig eth2 hw ether 00:00:00:10:10:12
++ brctl addbr br0
++ brctl addif br0 eth0
++ brctl addif br0 eth1
++ brctl addif br0 eth2
++ brctl stp br0 on
++ ifconfig br0 up
--- End Startup Commands Log
root@sw1:/# 
```

root@sw2: /

root@pc8: /





```

root@pc8: / --- Startup Commands Log
++ ifconfig eth0 192.168.21.11/24 up
++ ifconfig eth0 hw ether 00:00:00:00:21:11
++ route add default gw 192.168.21.1
--- End Startup Commands Log
root@pc8:/# []

root@r1: / --- Startup Commands Log
++ ifconfig eth0 192.168.10.1/24 up
++ ifconfig eth0 hw ether 00:00:00:50:10:10
++ ifconfig eth1 192.168.11.1/24 up
++ ifconfig eth1 hw ether 00:00:00:50:11:10
++ ifconfig eth2 10.0.0.1/30 up
++ route add default gw 10.0.0.2
--- End Startup Commands Log
root@r1:/# []

root@r2: / --- Startup Commands Log
++ ifconfig eth0 192.168.21.1/24 up
++ ifconfig eth0 hw ether 00:00:00:51:21:10
++ ifconfig eth1 192.168.20.1/24 up
++ ifconfig eth1 hw ether 00:00:00:51:20:10
++ ifconfig eth2 10.0.0.2/30 up
++ route add default gw 10.0.0.1
--- End Startup Commands Log
root@r2:/# []

root@sw4: / --- Startup Commands Log
++ ifconfig eth0 up
++ ifconfig eth0 hw ether 00:00:00:40:21:10
++ ifconfig eth1 up
++ ifconfig eth1 hw ether 00:00:00:40:21:11
++ ifconfig eth2 up
++ ifconfig eth2 hw ether 00:00:00:40:21:12
++ brctl addbr br3
++ brctl addif br3 eth0
++ brctl addif br3 eth1
++ brctl addif br3 eth2
++ brctl stp br3 on
++ ifconfig br3 up
--- End Startup Commands Log
root@sw4:/# []

```



```

root@pc2: / --- Startup Commands Log
++ ifconfig eth0 192.168.10.11/24 up
++ ifconfig eth0 hw ether 00:00:00:00:10:11
++ route add default gw 192.168.10.1
--- End Startup Commands Log
root@pc2:/# []

root@pc6: / --- Startup Commands Log
++ ifconfig eth0 192.168.20.11/24 up
++ ifconfig eth0 hw ether 00:00:00:00:20:11
++ route add default gw 192.168.20.1
--- End Startup Commands Log
root@pc6:/# []

root@pc5: / --- Startup Commands Log
++ ifconfig eth0 192.168.20.10/24 up
++ ifconfig eth0 hw ether 00:00:00:00:20:10
++ route add default gw 192.168.20.1
--- End Startup Commands Log
root@pc5:/# []

root@pc3: / --- Startup Commands Log
++ ifconfig eth0 192.168.11.10/24 up
++ ifconfig eth0 hw ether 00:00:00:00:11:10
++ route add default gw 192.168.11.1
--- End Startup Commands Log
root@pc3:/# []

```



```
root@pc7: /  
--- Startup Commands Log  
++ ifconfig eth0 192.168.21.10/24 up  
++ ifconfig eth0 hw ether 00:00:00:00:21:10  
++ route add default gw 192.168.21.1  
--- End Startup Commands Log  
root@pc7:/# []
```

```
root@pc4: /  
--- Startup Commands Log  
++ ifconfig eth0 192.168.11.11/24 up  
++ ifconfig eth0 hw ether 00:00:00:00:11:11  
++ route add default gw 192.168.11.1  
--- End Startup Commands Log  
root@pc4:/# []
```

### Test connecting

#ping 192.168.21.10 Ping pc6 from pc3

#ping 192.168.10.10 ping pc1 from pc7

```
t  
root@pc3: /  
--- Startup Commands Log  
++ ifconfig eth0 192.168.11.10/24 up  
++ ifconfig eth0 hw ether 00:00:00:00:11:10  
++ route add default gw 192.168.11.1  
--- End Startup Commands Log  
root@pc3:/# ping 192.168.21.10  
PING 192.168.21.10 (192.168.21.10) 56(84) bytes of data.  
64 bytes from 192.168.21.10: icmp_seq=1 ttl=62 time=2.61 ms  
64 bytes from 192.168.21.10: icmp_seq=2 ttl=62 time=1.11 ms  
64 bytes from 192.168.21.10: icmp_seq=3 ttl=62 time=4.73 ms  
64 bytes from 192.168.21.10: icmp_seq=4 ttl=62 time=2.74 ms  
64 bytes from 192.168.21.10: icmp_seq=5 ttl=62 time=4.91 ms  
64 bytes from 192.168.21.10: icmp_seq=6 ttl=62 time=1.58 ms  
64 bytes from 192.168.21.10: icmp_seq=7 ttl=62 time=1.53 ms  
64 bytes from 192.168.21.10: icmp_seq=8 ttl=62 time=4.45 ms  
64 bytes from 192.168.21.10: icmp_seq=9 ttl=62 time=4.72 ms  
^C  
--- 192.168.21.10 ping statistics ---  
9 packets transmitted, 9 received, 0% packet loss, time 8014ms  
rtt min/avg/max/mdev = 1.113/3.153/4.905/1.470 ms  
root@pc3:/# []
```



```

root@pc7: / --- Startup Commands Log
++ ifconfig eth0 192.168.21.10/24 up
++ ifconfig eth0 hw ether 00:00:00:00:21:10
++ route add default gw 192.168.21.1
--- End Startup Commands Log
root@pc7:/# ping 192.168.10.10
PING 192.168.10.10 (192.168.10.10) 56(84) bytes of data.
64 bytes from 192.168.10.10: icmp_seq=1 ttl=62 time=1.66 ms
64 bytes from 192.168.10.10: icmp_seq=2 ttl=62 time=4.07 ms
64 bytes from 192.168.10.10: icmp_seq=3 ttl=62 time=6.82 ms
64 bytes from 192.168.10.10: icmp_seq=4 ttl=62 time=1.14 ms
64 bytes from 192.168.10.10: icmp_seq=5 ttl=62 time=4.36 ms
64 bytes from 192.168.10.10: icmp_seq=6 ttl=62 time=1.35 ms
64 bytes from 192.168.10.10: icmp_seq=7 ttl=62 time=2.52 ms
64 bytes from 192.168.10.10: icmp_seq=8 ttl=62 time=2.24 ms
64 bytes from 192.168.10.10: icmp_seq=9 ttl=62 time=1.04 ms
^C
--- 192.168.10.10 ping statistics ---
9 packets transmitted, 9 received, 0% packet loss, time 8011ms
rtt min/avg/max/mdev = 1.043/2.800/6.822/1.820 ms
root@pc7:/# 

```

```

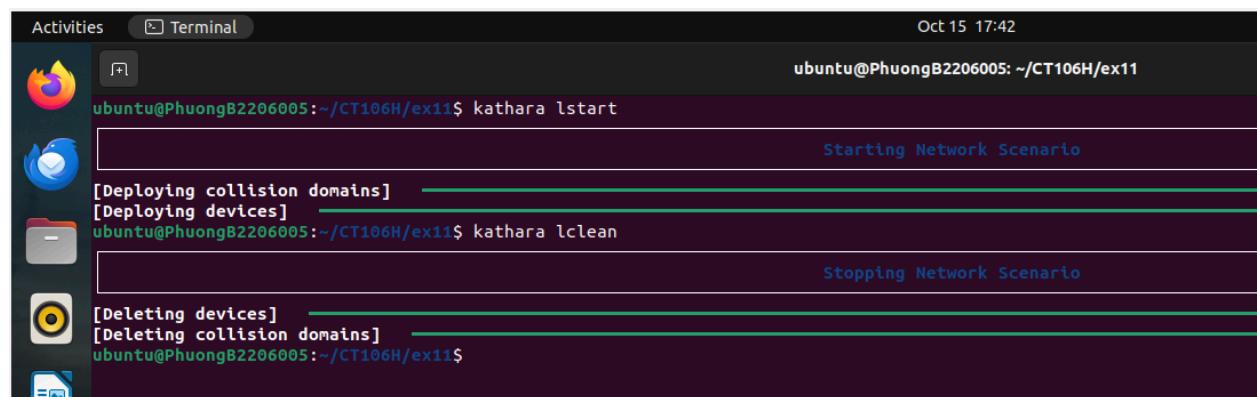
root@r2: / --- Startup Commands Log
i++ ifconfig eth0 192.168.21.1/24 up
i++ ifconfig eth0 hw ether 00:00:00:51:21:10
i++ ifconfig eth1 192.168.20.1/24 up
- i++ ifconfig eth1 hw ether 00:00:00:51:20:10
it++ ifconfig eth2 10.0.0.2/30 up
++ route add default gw 10.0.0.1
--- End Startup Commands Log
root@r2:/# route -n
Kernel IP routing table
Destination      Gateway          Genmask        Flags Metric Ref    Use Iface
0.0.0.0          10.0.0.1        0.0.0.0       UG    0      0        0 eth2
10.0.0.0         0.0.0.0         255.255.255.252 U      0      0        0 eth2
192.168.20.0     0.0.0.0         255.255.255.0   U      0      0        0 eth1
192.168.21.0     0.0.0.0         255.255.255.0   U      0      0        0 eth0
root@r2:/# 

```



```
root@r1: /  
--- Startup Commands Log  
++ ifconfig eth0 192.168.10.1/24 up  
++ ifconfig eth0 hw ether 00:00:00:50:10:10  
++ ifconfig eth1 192.168.11.1/24 up  
++ ifconfig eth1 hw ether 00:00:00:50:11:10  
++ ifconfig eth2 10.0.0.1/30 up  
++ route add default gw 10.0.0.2  
--- End Startup Commands Log  
root@r1:/# route -n  
Kernel IP routing table  
Destination     Gateway         Genmask        Flags Metric Ref    Use Iface  
0.0.0.0         10.0.0.2      0.0.0.0       UG    0      0        0 eth2  
10.0.0.0        0.0.0.0       255.255.255.252 U     0      0        0 eth2  
192.168.10.0   0.0.0.0       255.255.255.0  U     0      0        0 eth0  
192.168.11.0   0.0.0.0       255.255.255.0  U     0      0        0 eth1  
root@r1:/# █
```

#kathara lclean



```
Activities Terminal Oct 15 17:42  
ubuntu@PhuongB2206005:~/CT106H/ex1$ kathara lstart  
Starting Network Scenario  
[Deploying collision domains]  
[Deploying devices]  
ubuntu@PhuongB2206005:~/CT106H/ex1$ kathara lcold  
Stopping Network Scenario  
[Deleting devices]  
[Deleting collision domains]  
ubuntu@PhuongB2206005:~/CT106H/ex1$
```

-----END-----