LAB 2

CONSTRUCT A SIMPLE NETWORK

Name: Nguyễn Võ Thuận Thiên

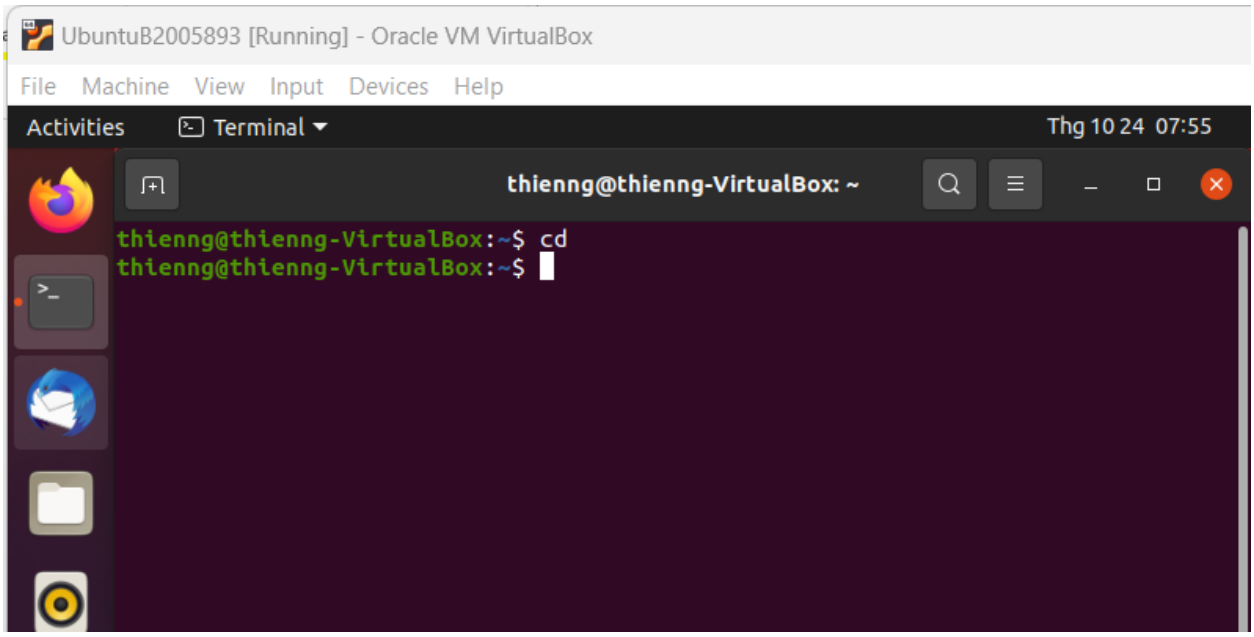
ID: B2005893

Group: M01

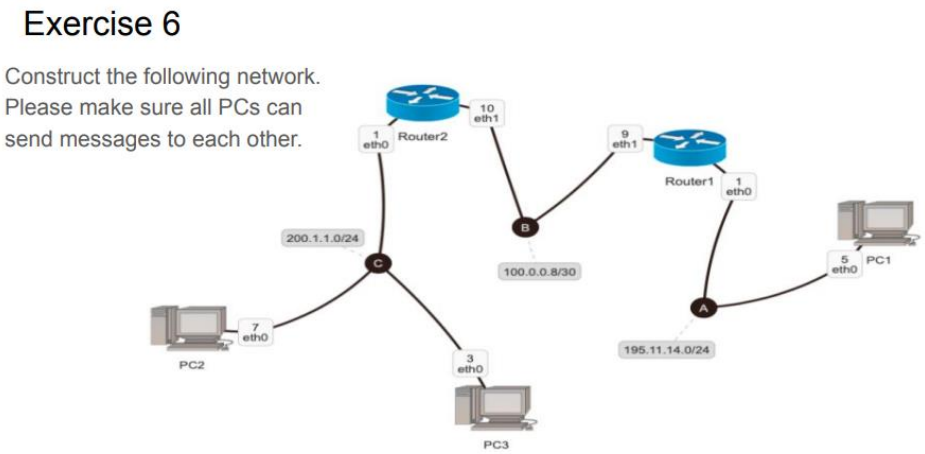
Submission: an ID_NAME_Lab02.pdf file describes clearly how did you solve the problem

Exercise 0: change the directory to your home directory

Answer: $cd

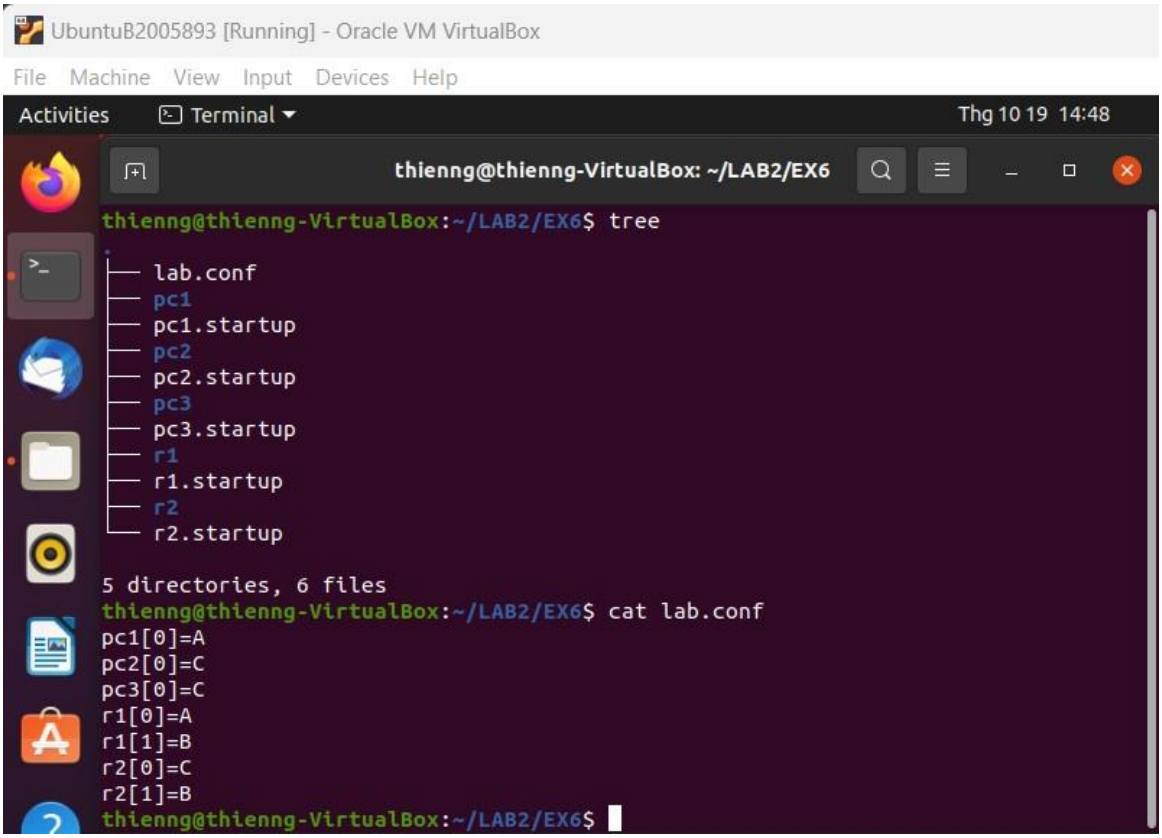


Exercise 6: Construct the following network. Please make sure all PCs can send messages to each other.

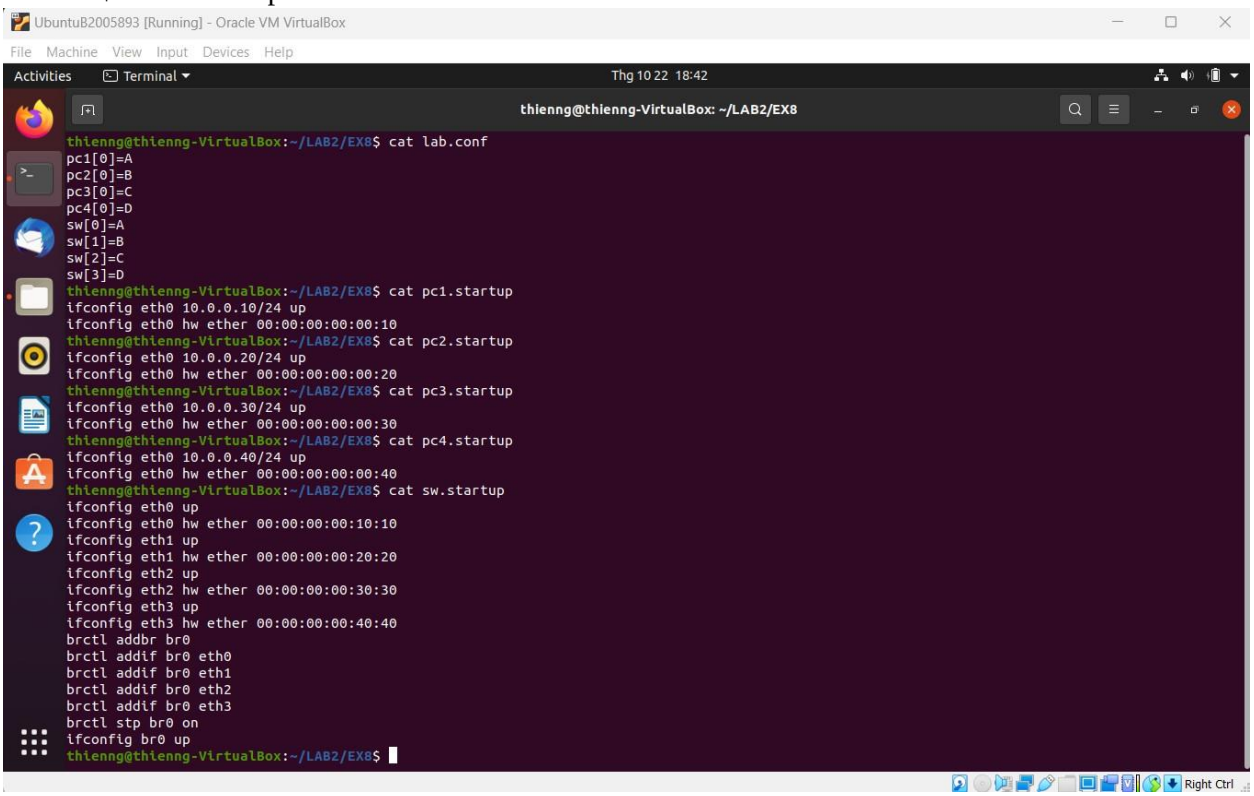


Answer:

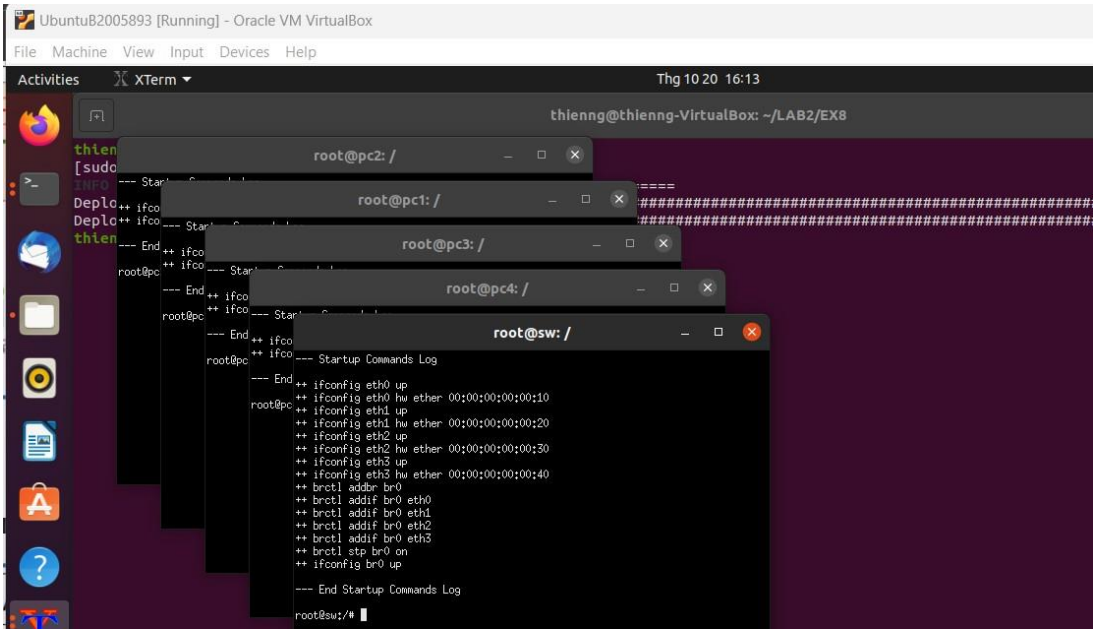
1. Create folders and files for exercise 6
   Here is the lab configurations:
   $ tree
   $ cat lab.conf



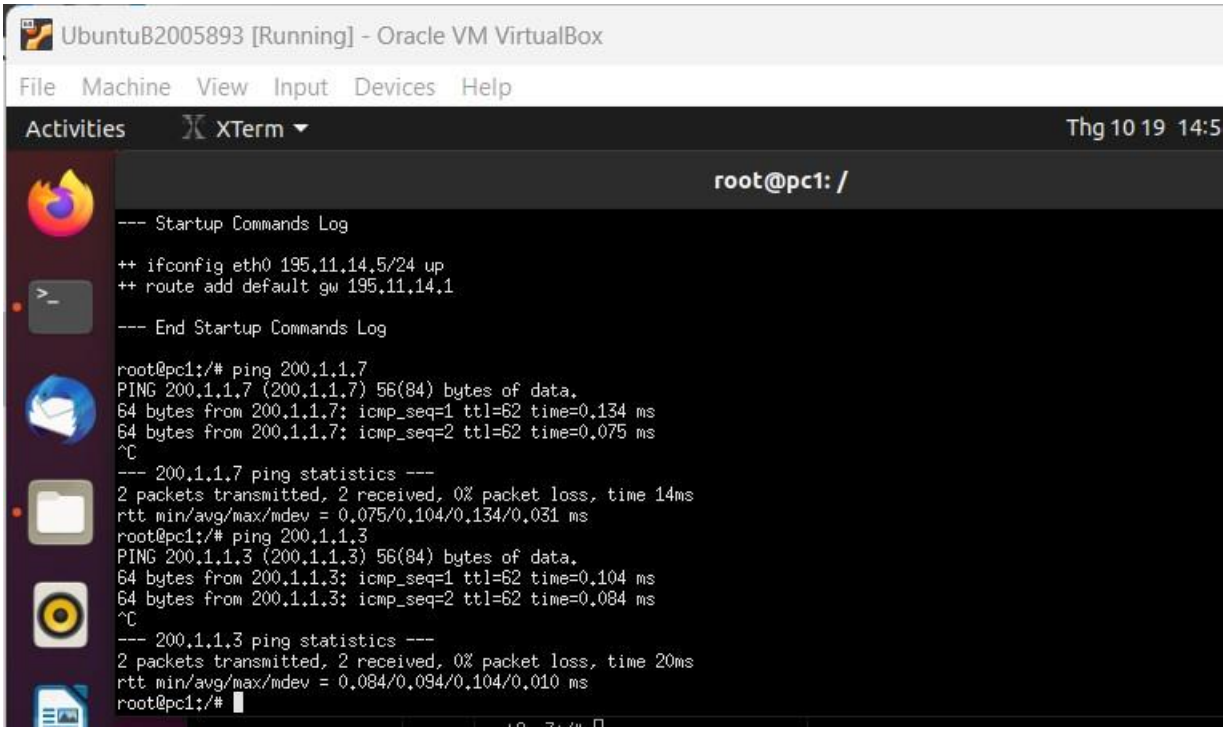
$ cat pc1.startup
$ cat pc2.startup
$ cat pc3.startup
$ cat pc4.startup
$ cat sw.startup



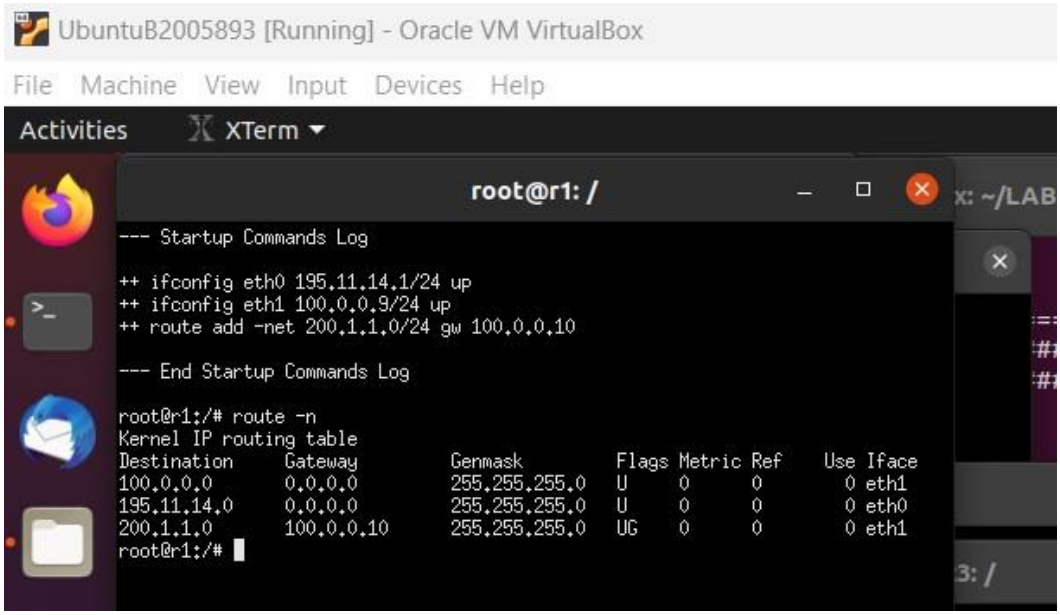
2. Start kathara
   $ sudo kathara lstart



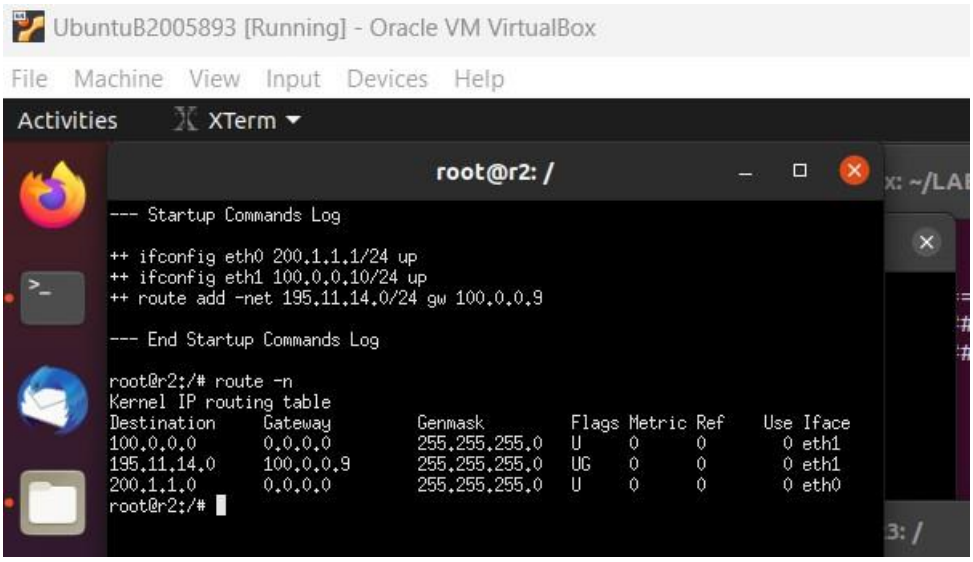
3. Ping on pc1 to pc2 and pc3
   From pc1:
   # ping 200.1.1.7
   # ping 200.1.1.3



4. Route on r1and r2
   From r1:
   # route -n

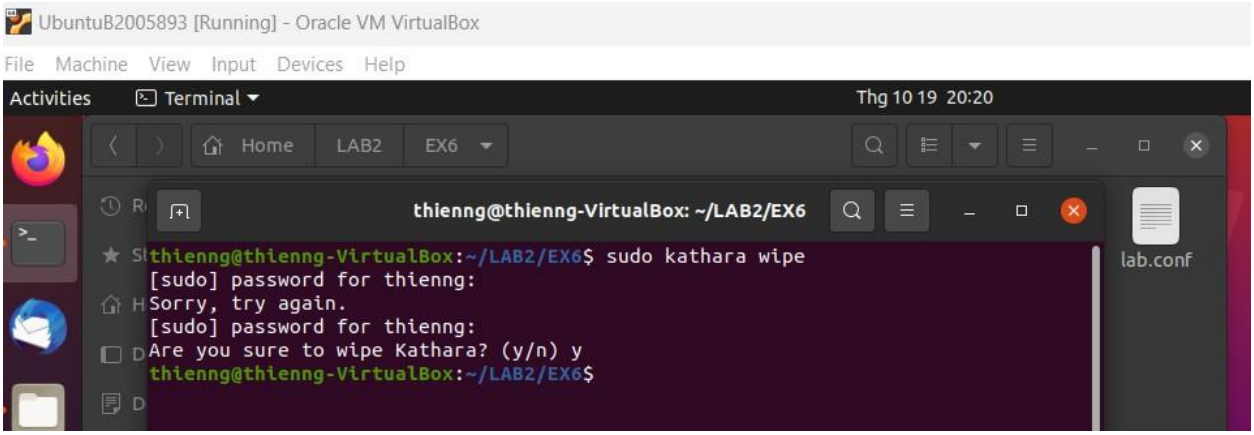


From r2:
route –n

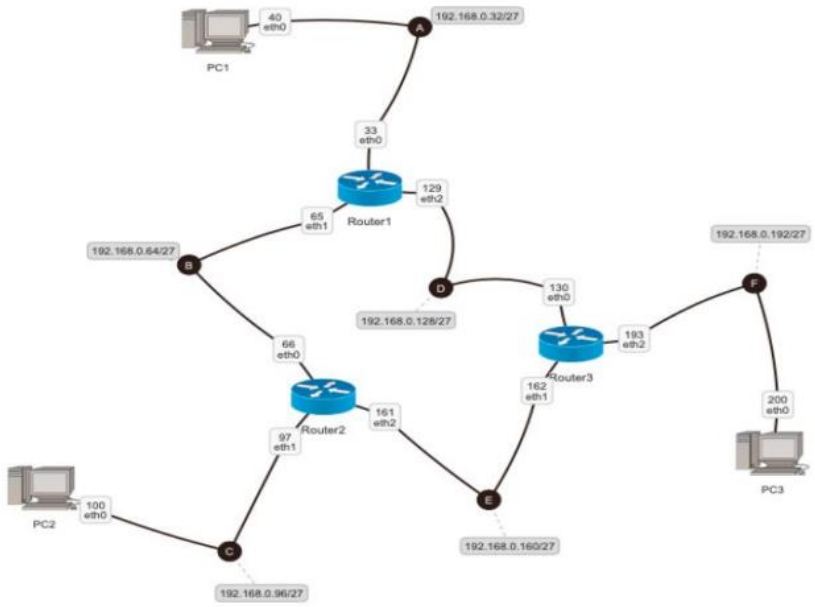


5. Delete VMs

$sudo kathara wipe

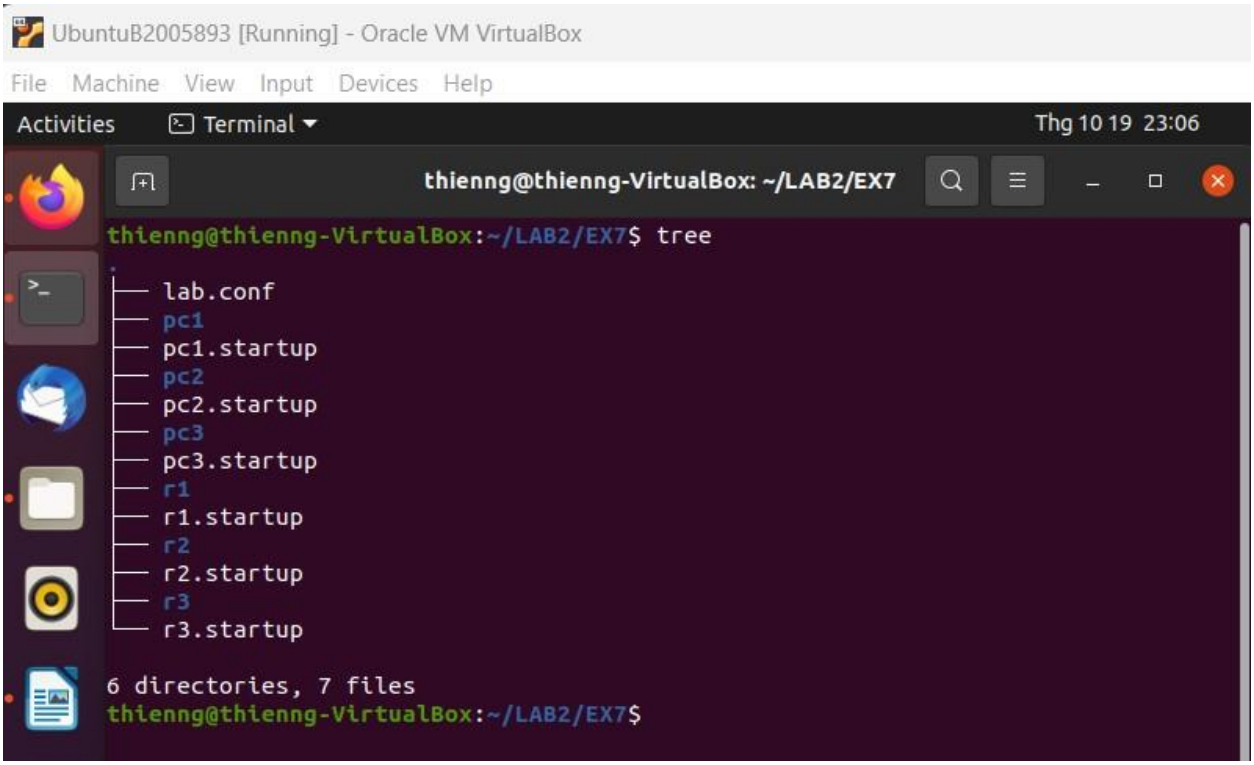


Exercise 7: Construct the following network.

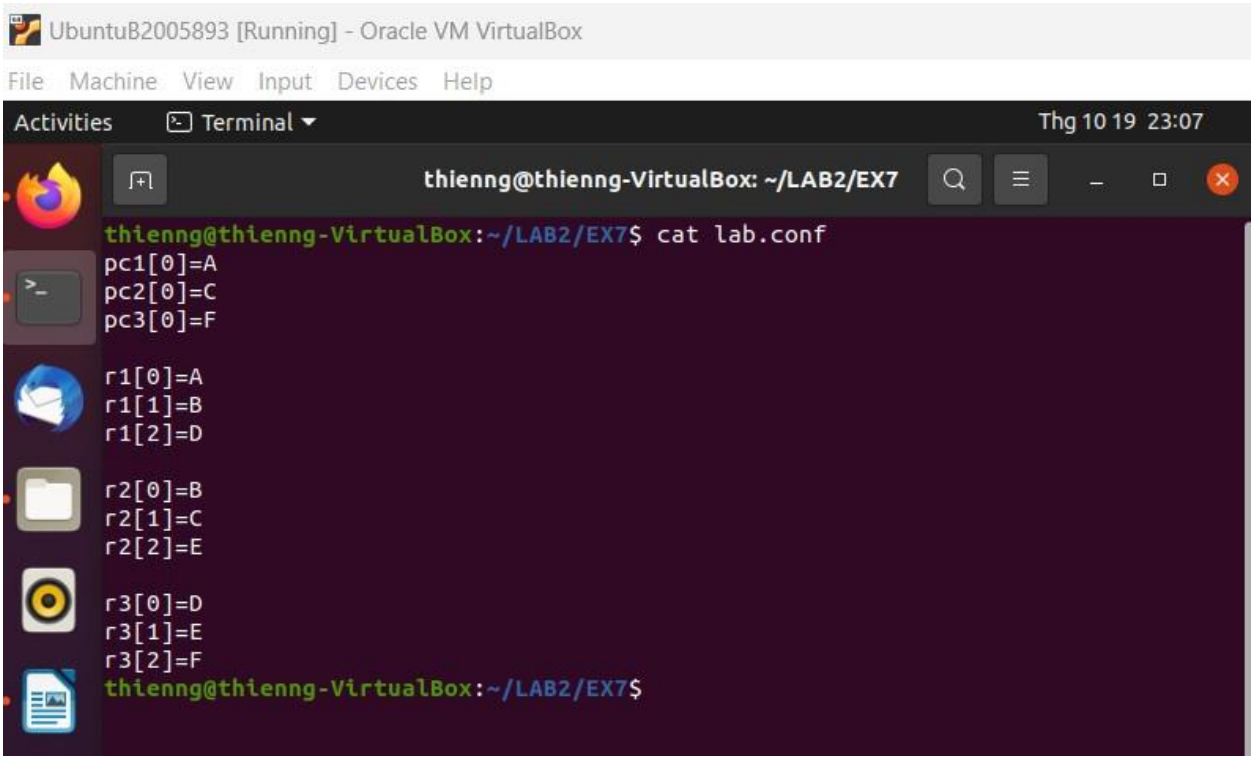


1. Lab configuration

   $ tree



$ cat lab.conf



$ cat pc1.starttup

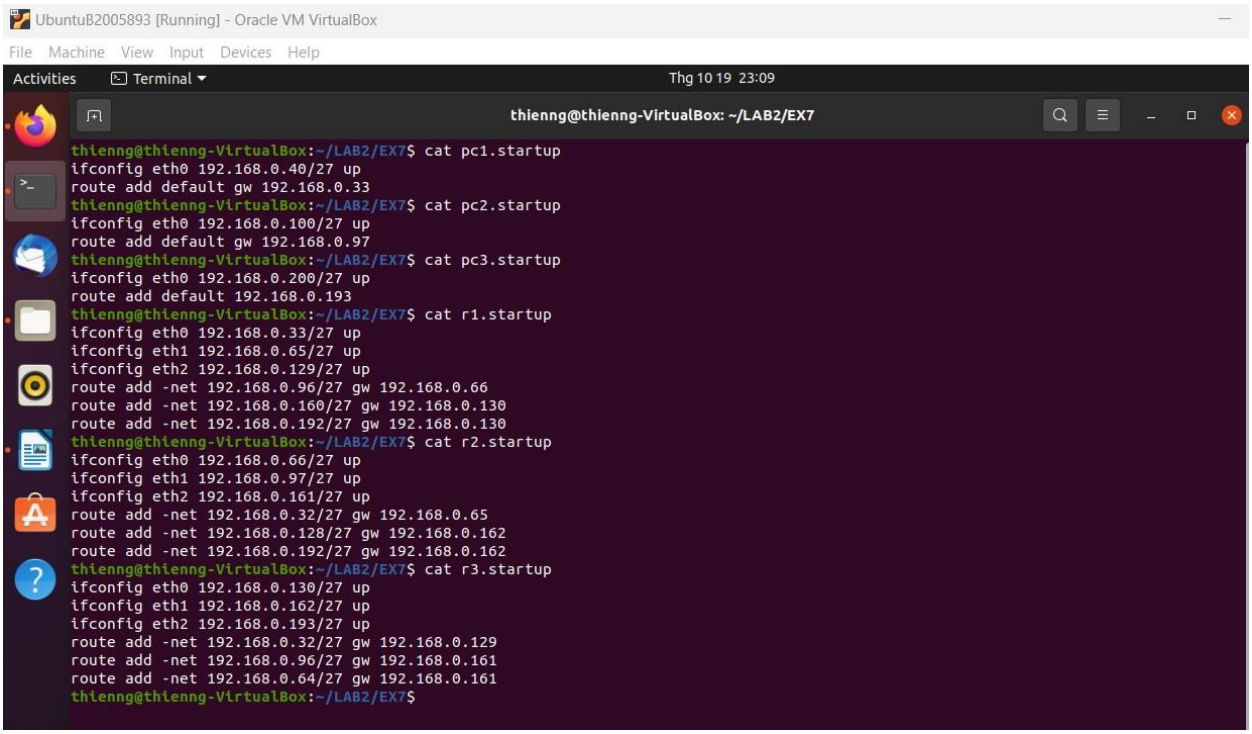
$ cat pc2.startup

$ cat pc3. Startup

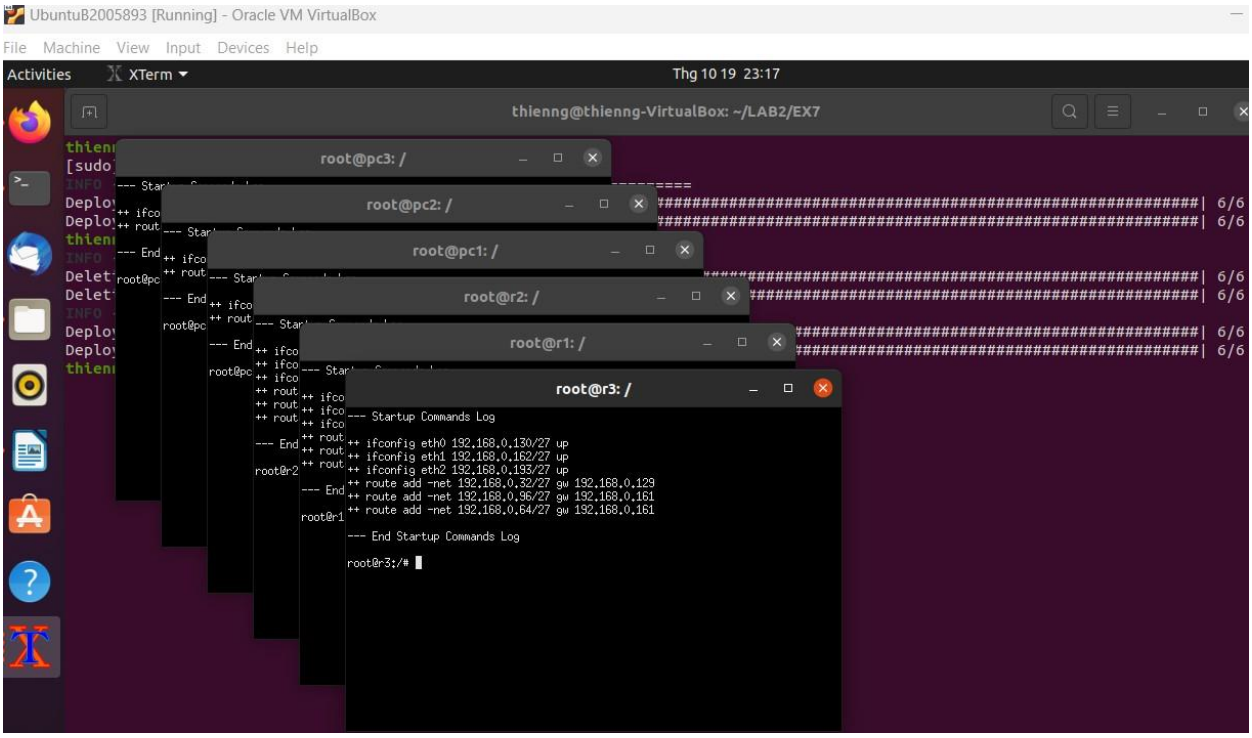
$ cat r1.startup

$ cat r2.startup

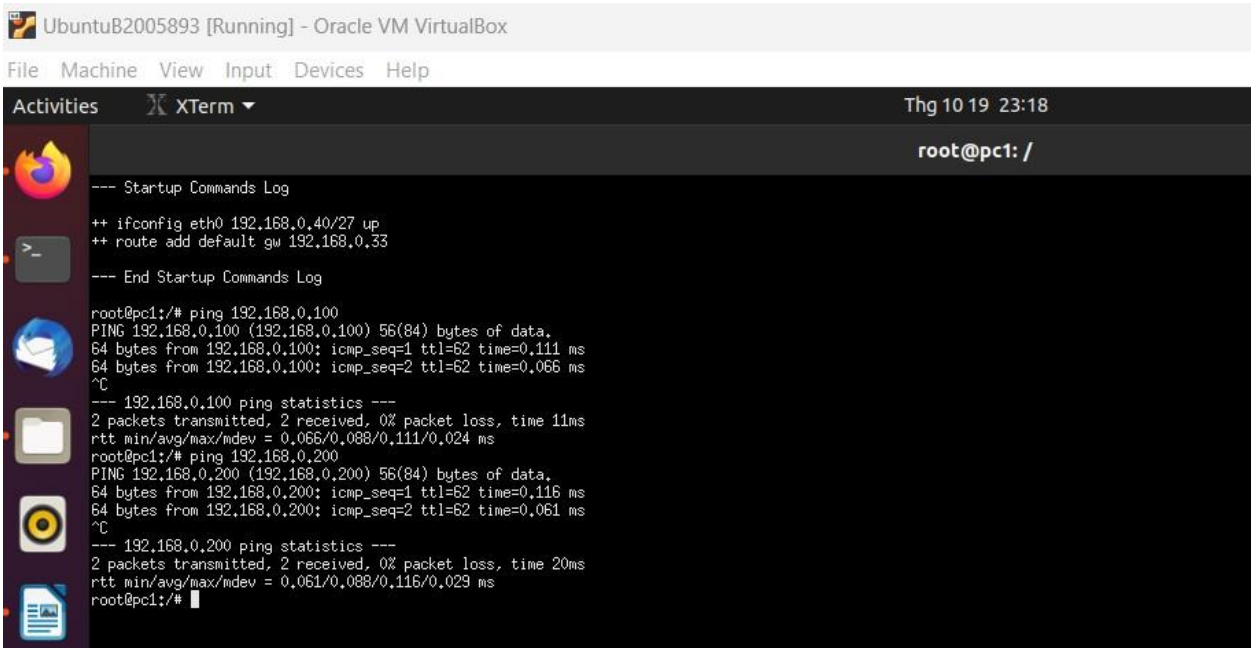
$ cat r3.startup



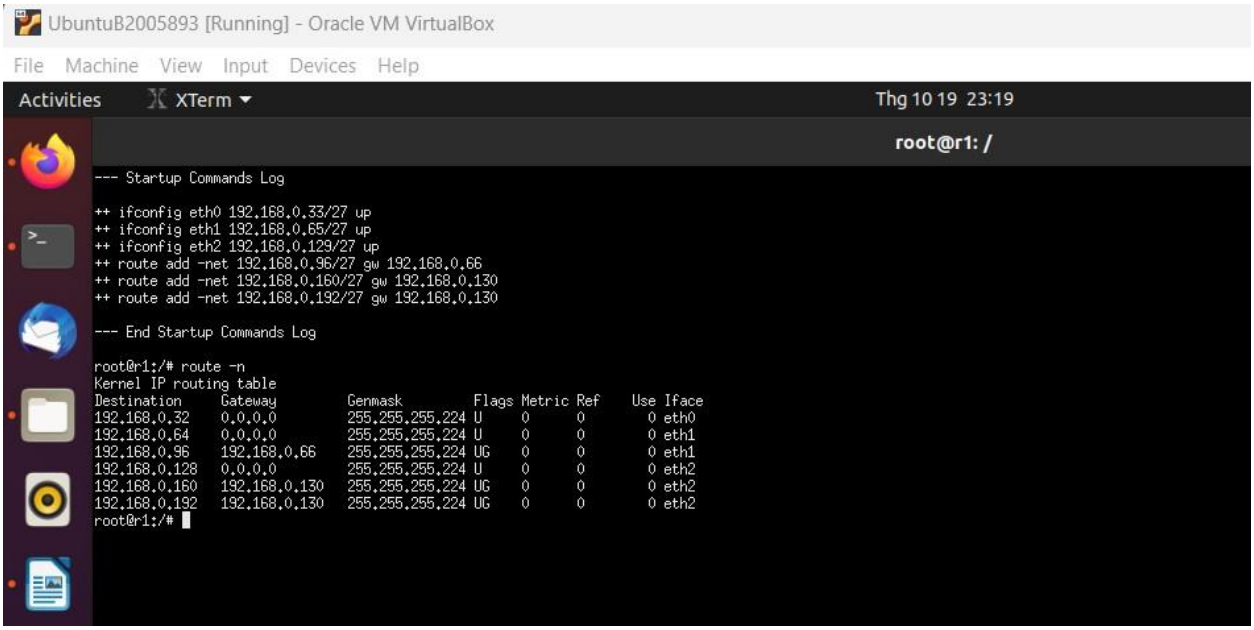
2. Start kathara
   $ sudo kathara lstart



3. Check if all pcs can sen messages to each others
   From pc1, ping to pc2 and pc3:
   # ping 192.168.0.100
   # ping 192.168.0.200

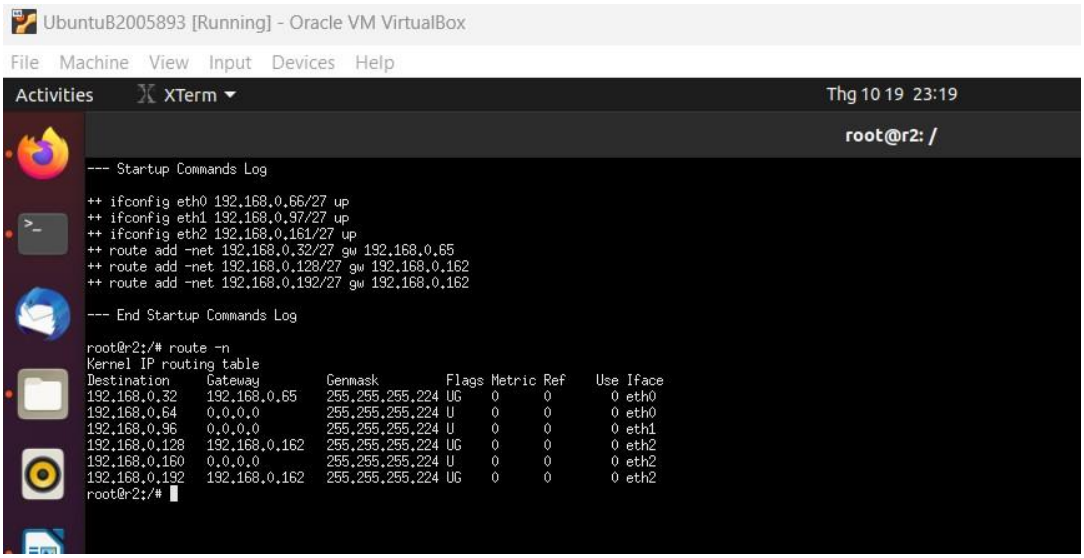


4. Route on r1, r2 and r3
   From r1:
   # route –n



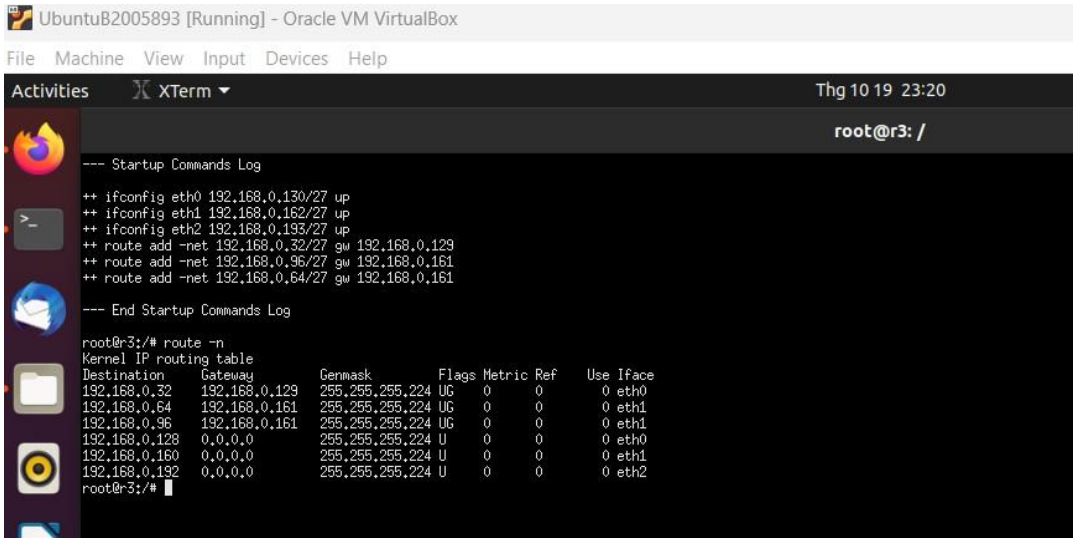
From r2:

route –n



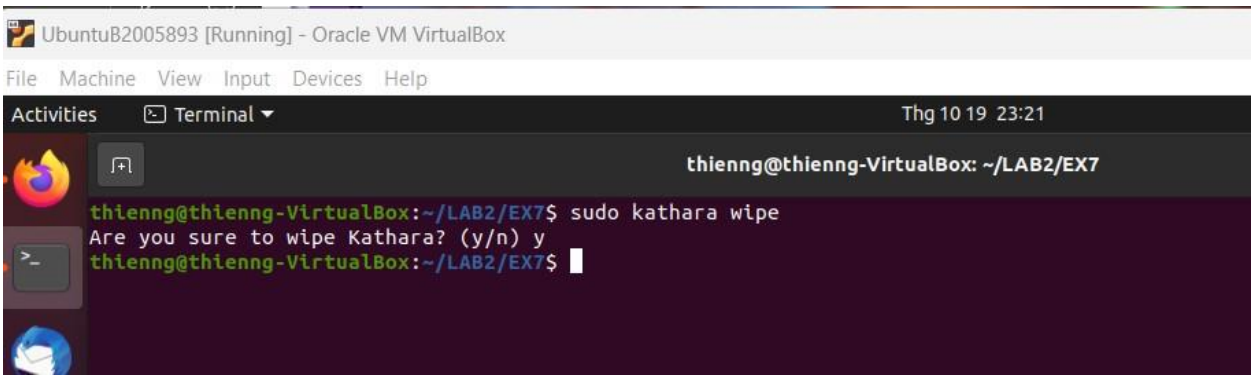
From r3:

route –n

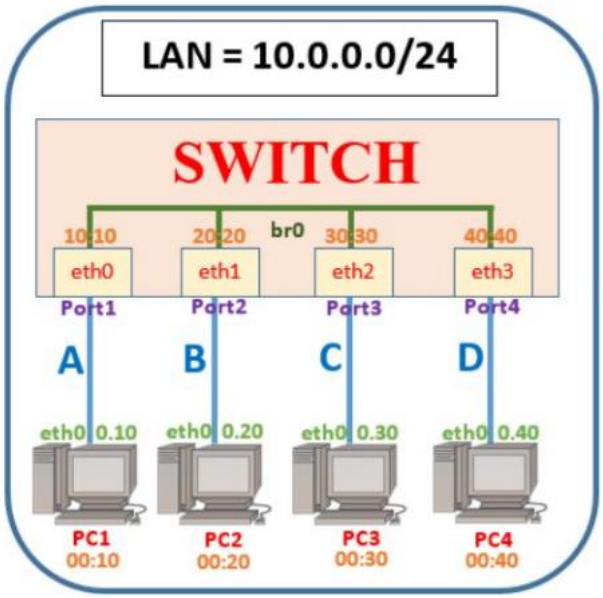


5. Delete all VMs

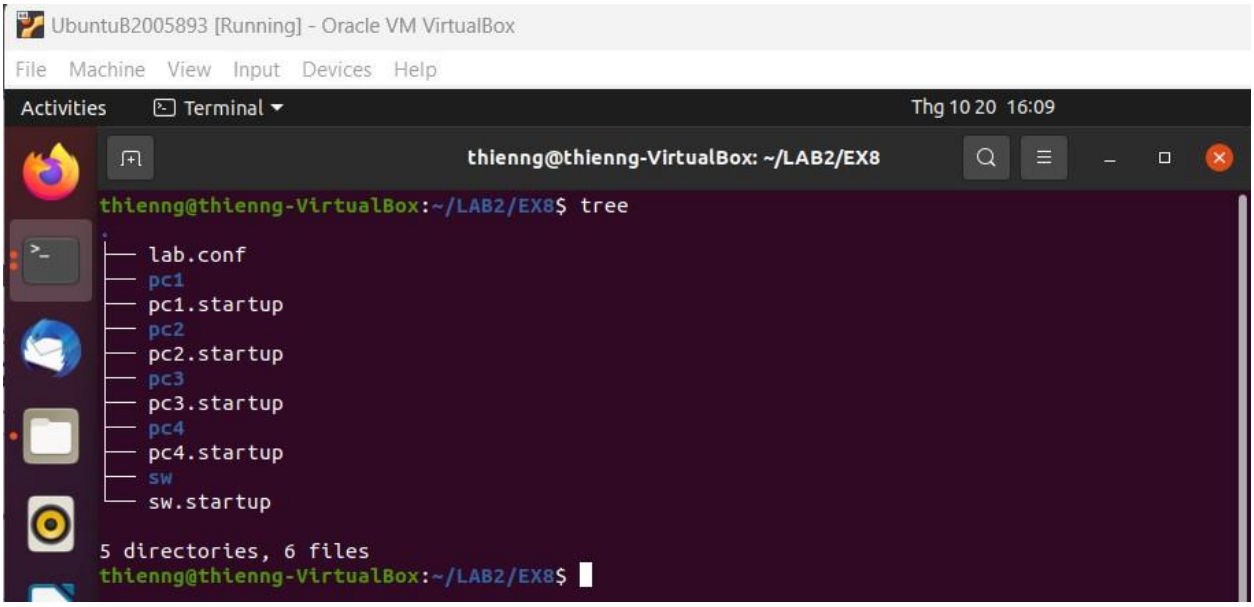
   $ sudo kathara wipe

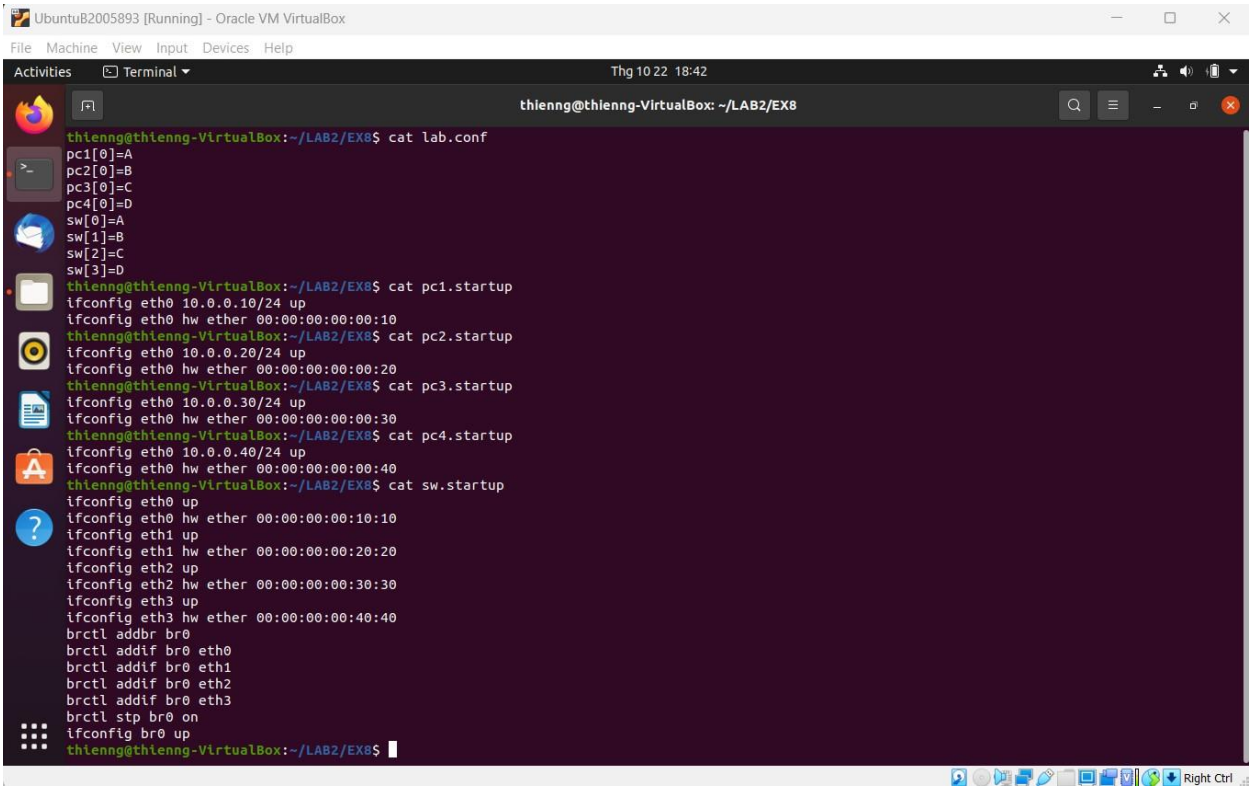


Exercise 8: Construct a LAN using a switch

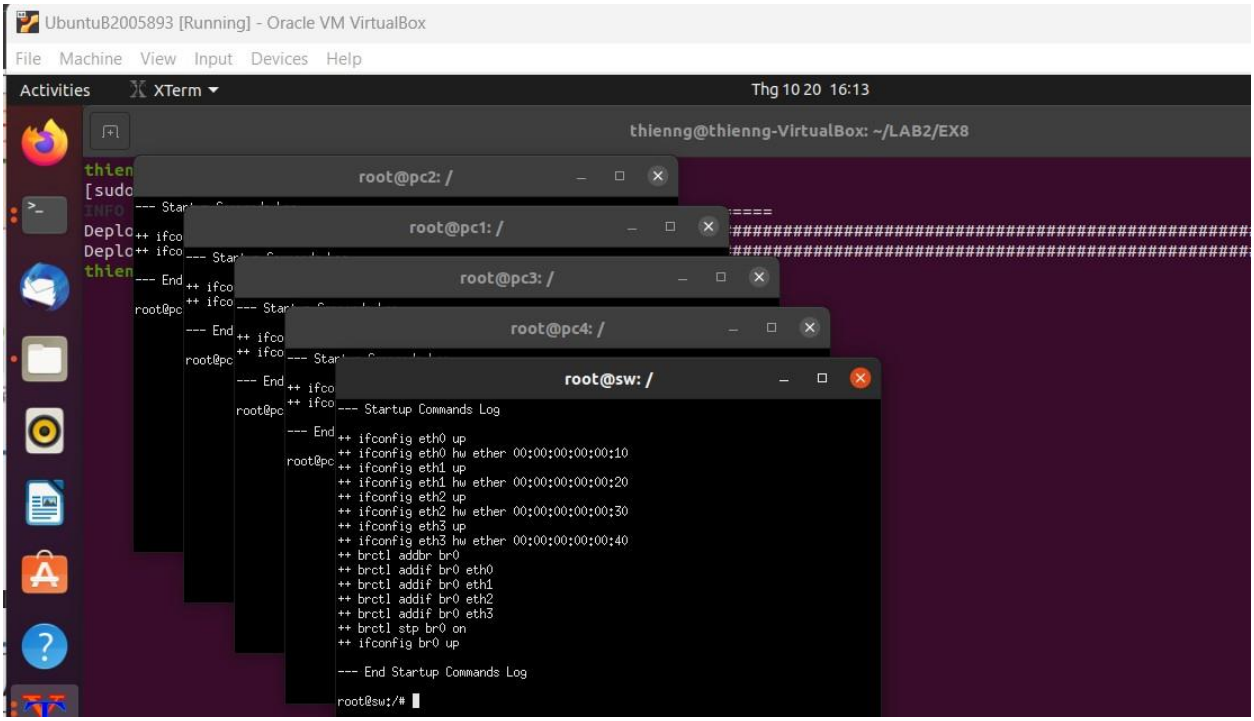


- Lab Configuration:
  $ tree
  $ cat lab.conf
  $ cat pc1.startup
  $ cat pc2.startup
  $ cat pc3.startup
  $ cat pc4.startup
  $ cat sw.startup

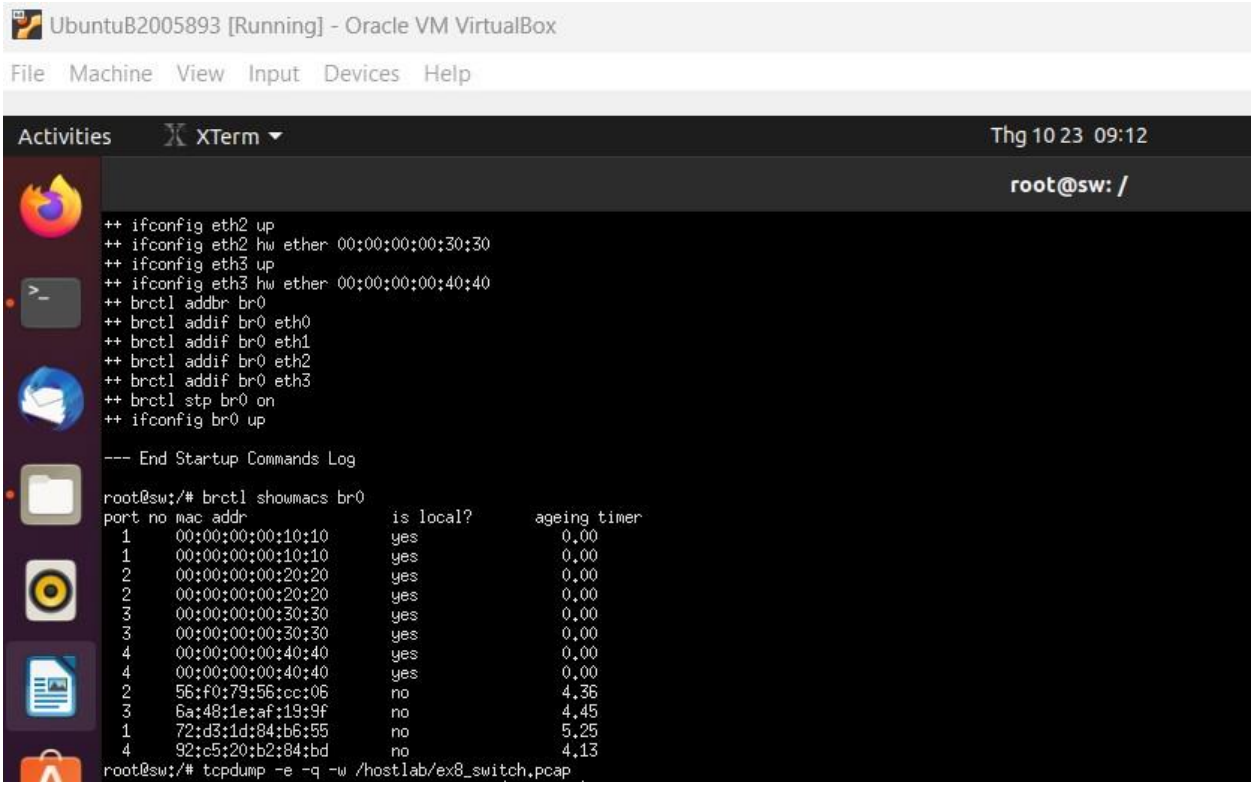




- Start Kathara
  $ sudo kathara lstart



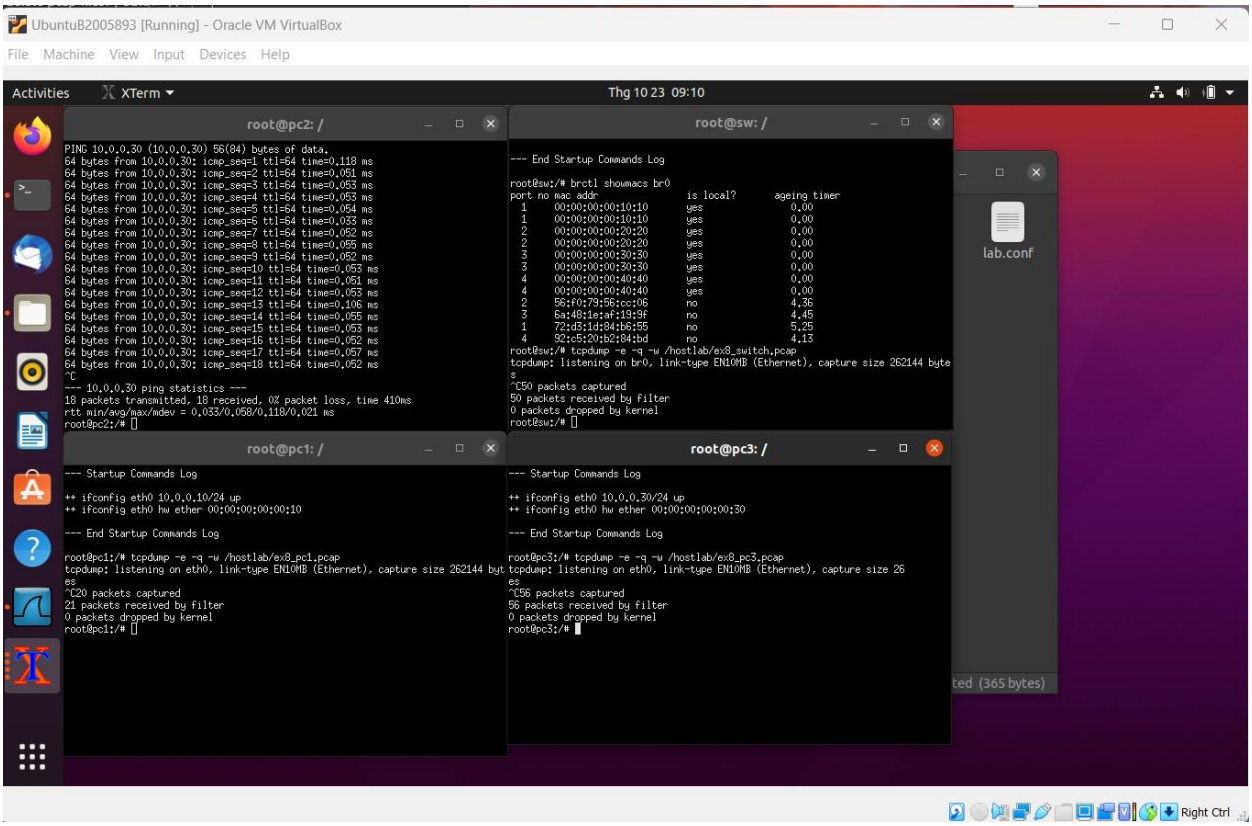
- $ brctl showmacs br0



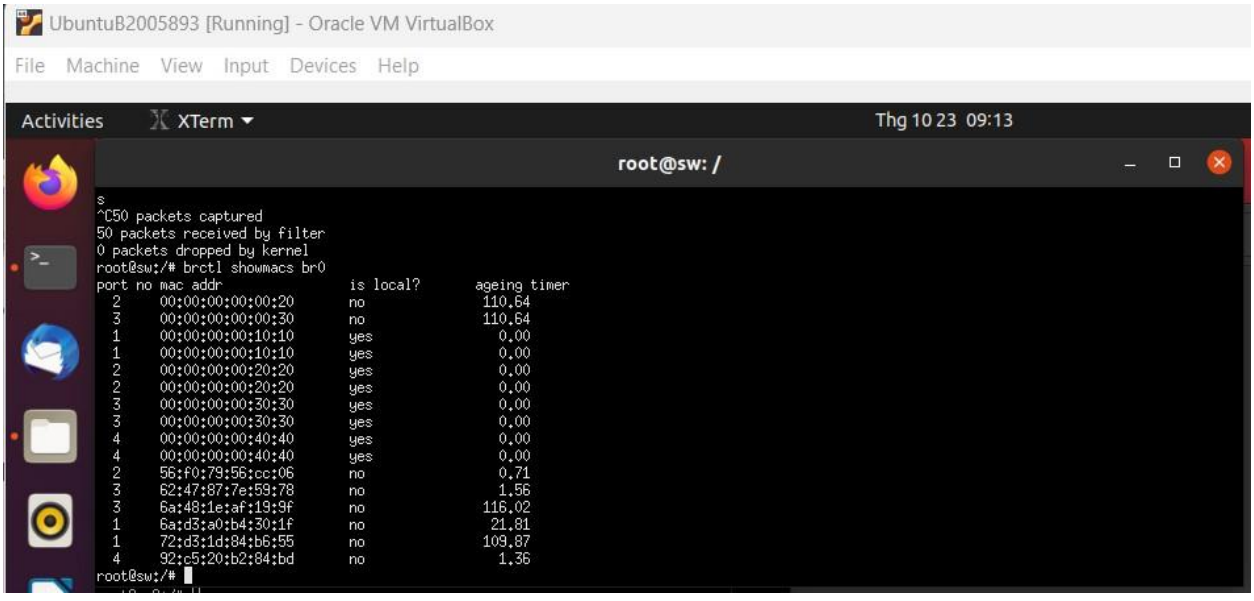
1. sniff switch, pc1, pc3. On pc2, send message to pc3

   $ tcpdump -e -q -w /hostlab/ex8_switch.pcap
   $ tcpdump -e -q -w /hostlab/ex8_pc1.pcap
   $ tcpdump -e -q -w /hostlab/ex8_pc3.pcap
   On pc2:
   # ping 10.0.0.30

2.

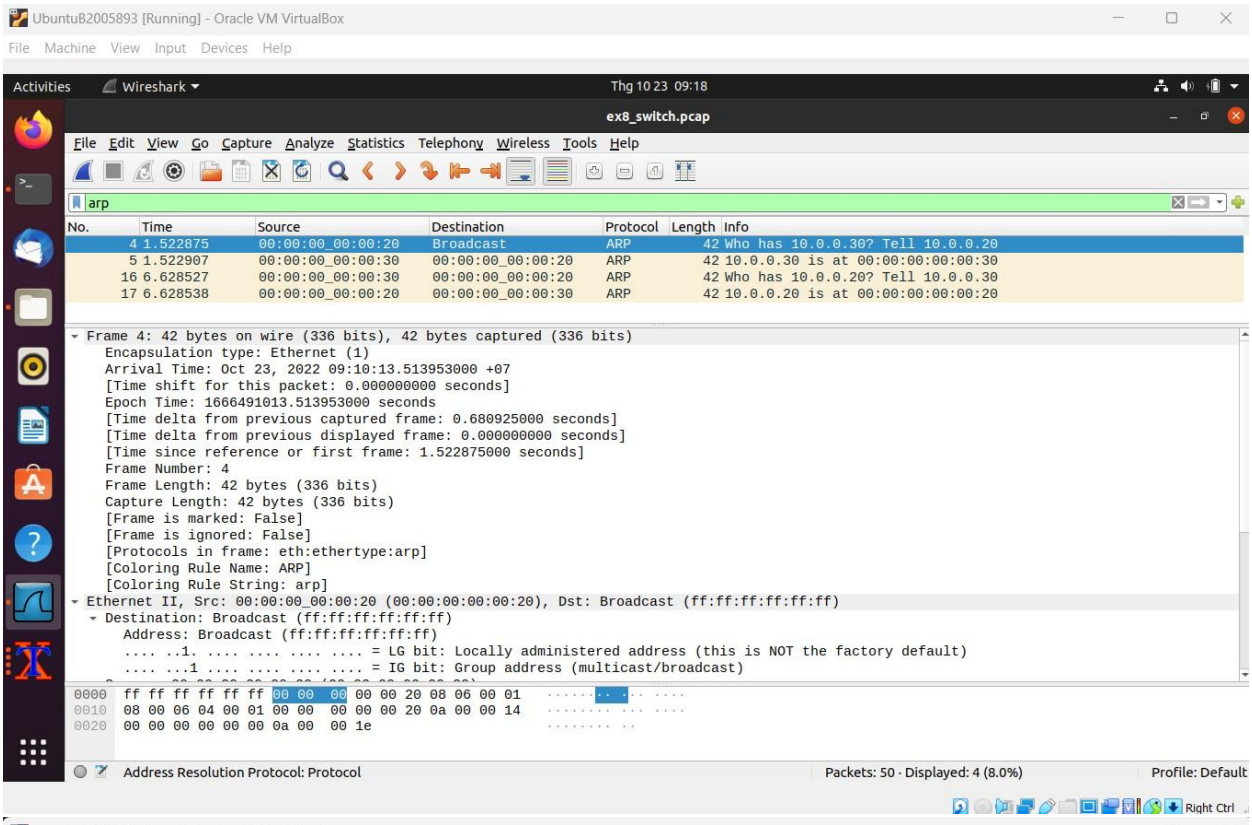


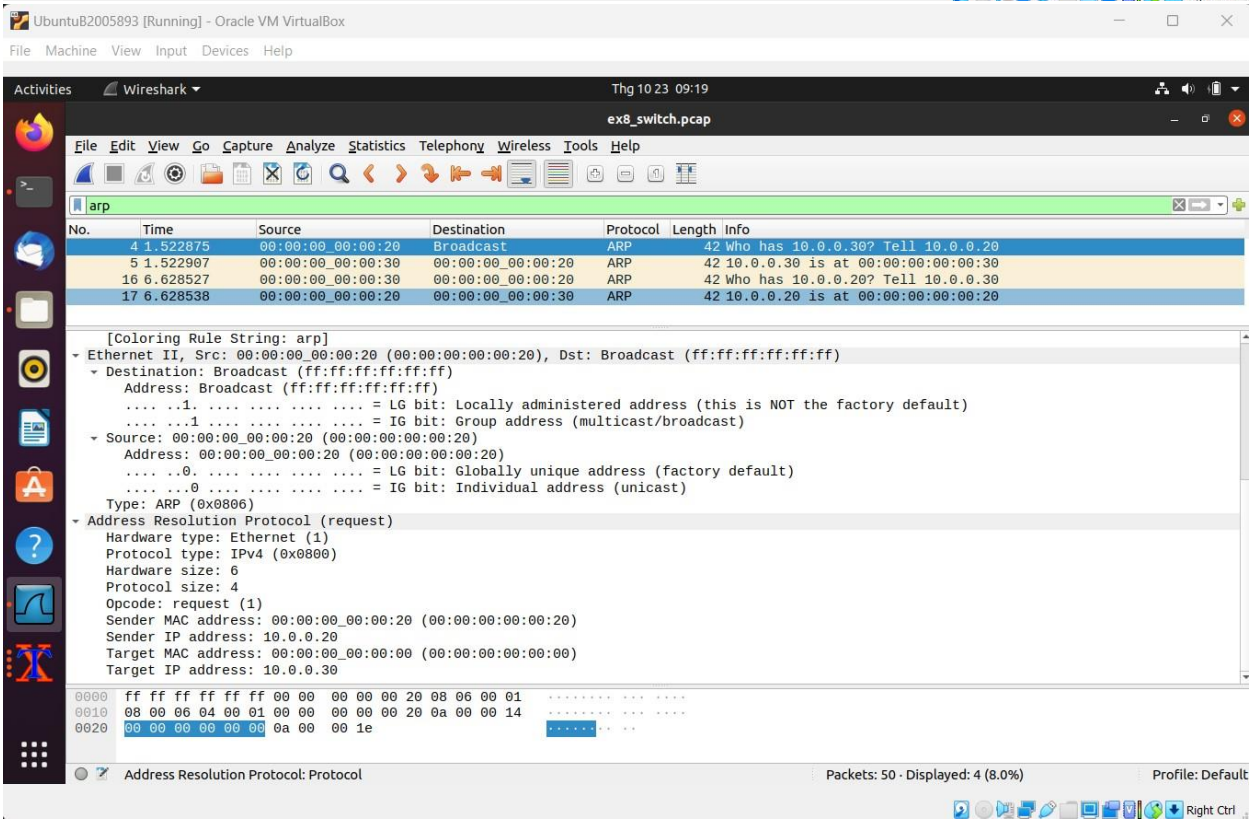
3. On the switch check the contain of the Mac Lookup Table again
   # brctl showmacs br0



➔ Answer: Compared to the previous MAC table, we can see that the interfaces can connected on the network. Besides, static entries are manually added to the table by a switch administrator

4. 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

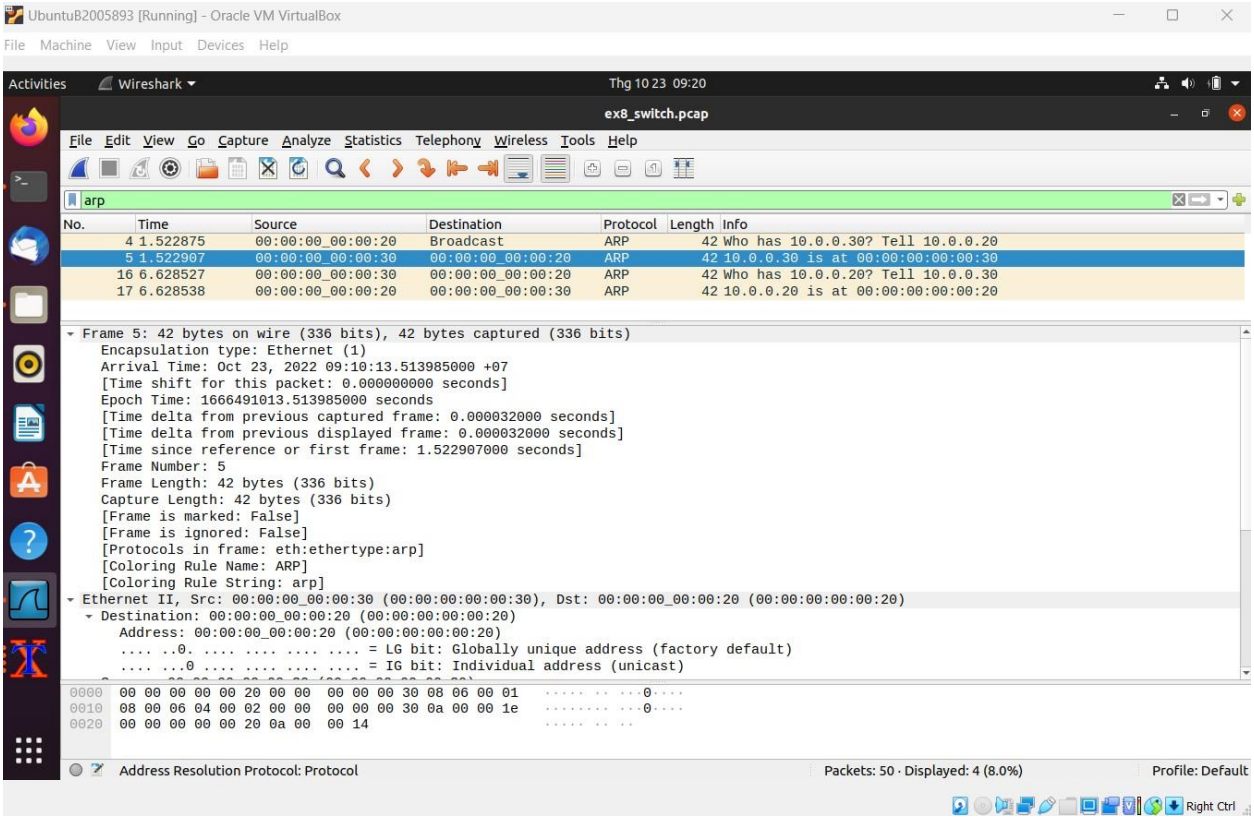




➔ Answer: The frame contain:

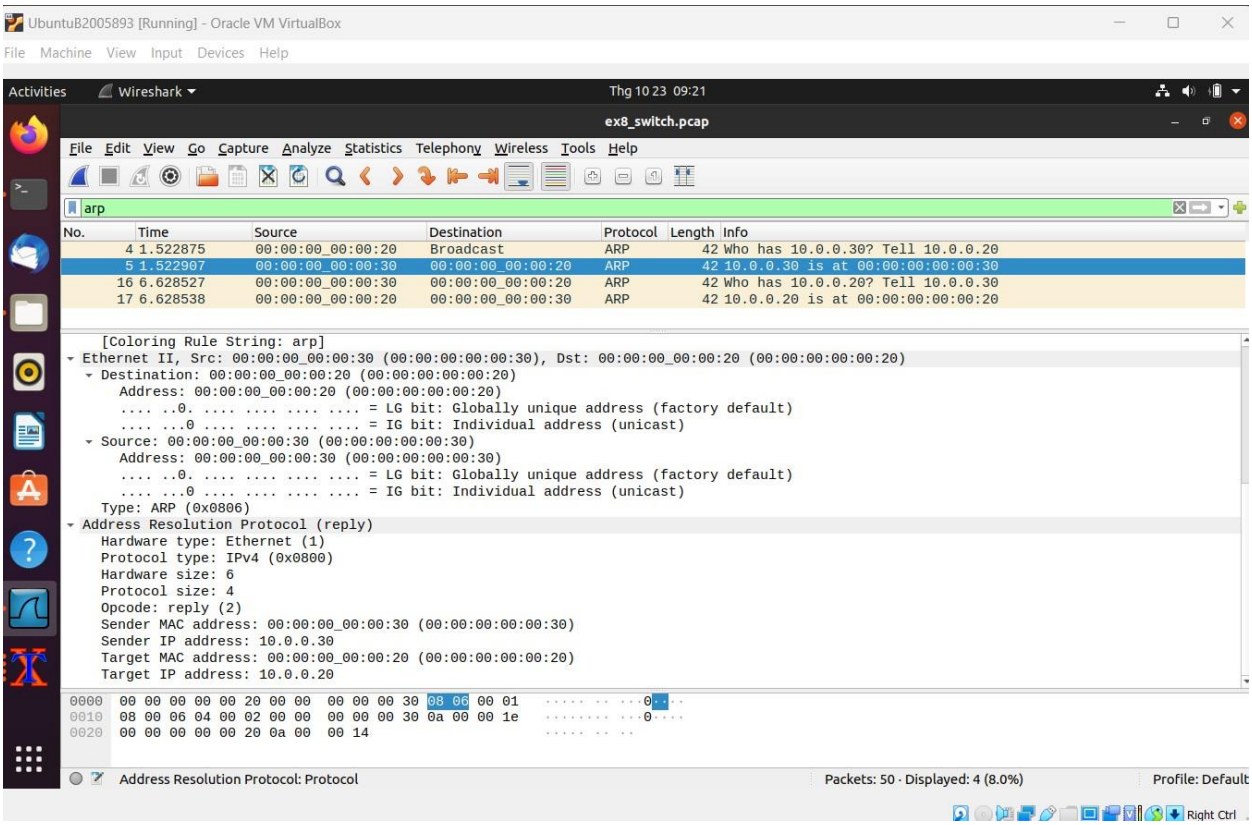
- The source address *00:00:00:00:00:20*
- The hex value for the destination address is *ff:ff:ff:ff:ff:ff*, the broadcast address
- The hex value for the Ethernet Frame Type is *0x0806*, for ARP
- The ARP message containing the IP address (*10.0.0.20*) for the sender and it wants to send this data to (*10.0.0.30*), but it doesn't know the MAC address to send it to, so it has sent an Address Resolution Protocol (ARP) request to find out that information. We can also see that in the field "Target MAC address" is set to *00:00:00:00:00:00* to question the machince whose corresponding IP address (*10.0.0.30*) is being querried

5. 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

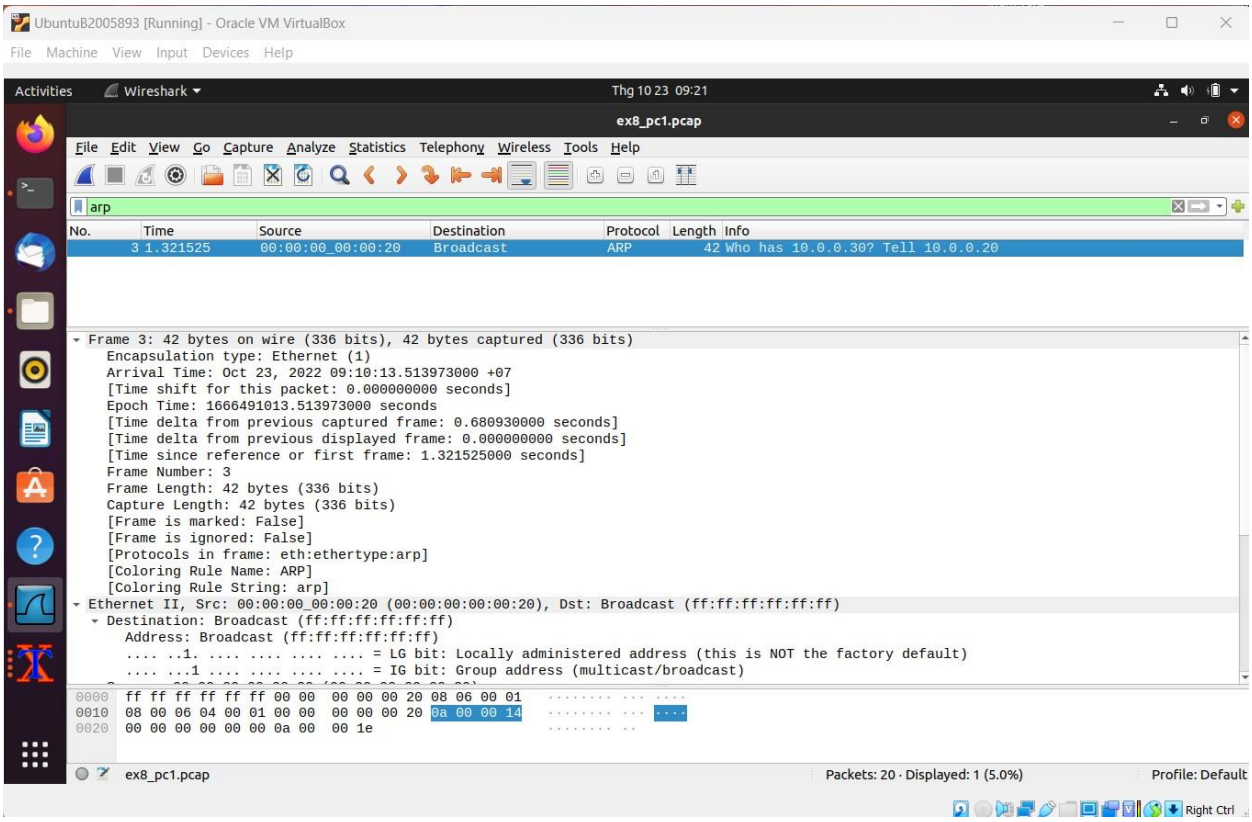


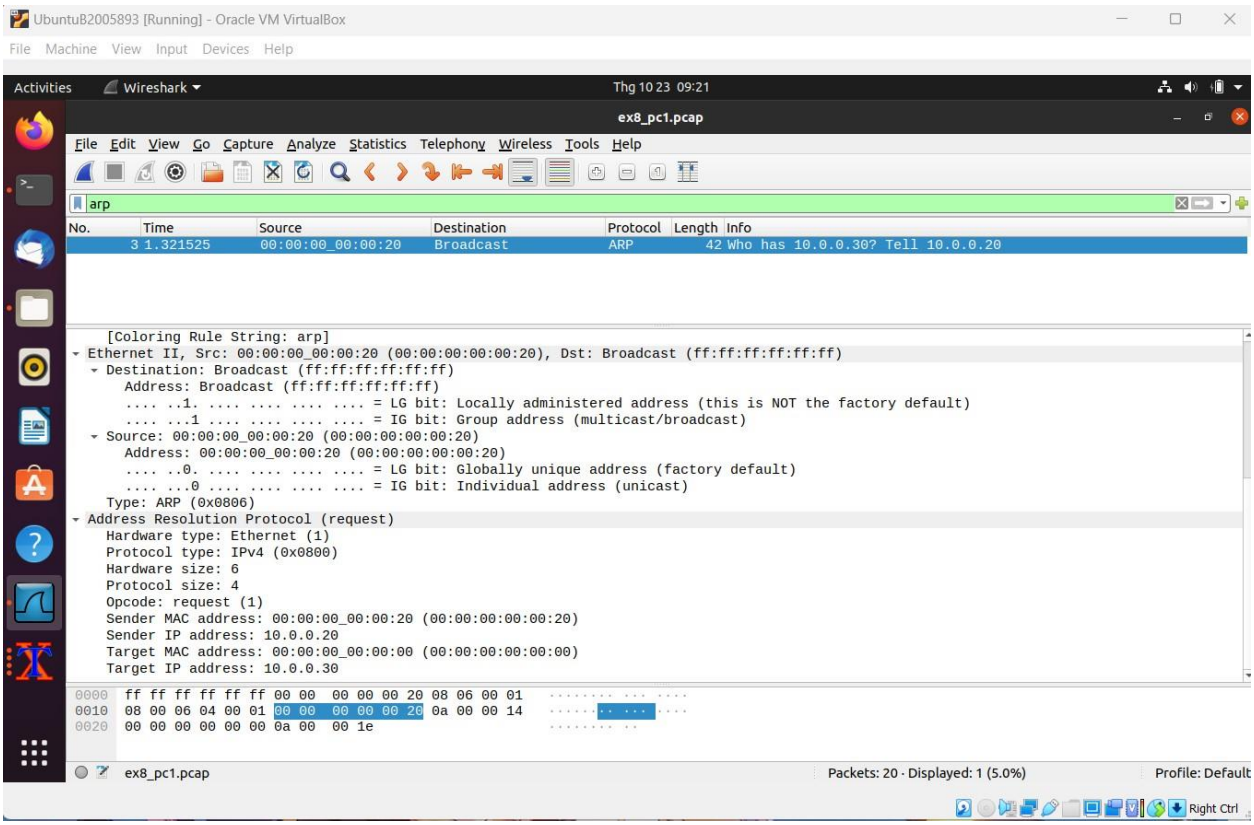
➔ Answer: The frame contain:

- The source address *00:00:00:00:00:30*
- The destination address *00:00:00:00:00:20*
- The hex value for opcode field withing the ARP-payload of the request is 2, for reply
- The ARP message containing the answer to the earlier ARP request appears in the"Sender MAC address" field, which contains the Ethernet address 00:00:00:00:00:30 for the sender with IP address 10.0.0.30



6. 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





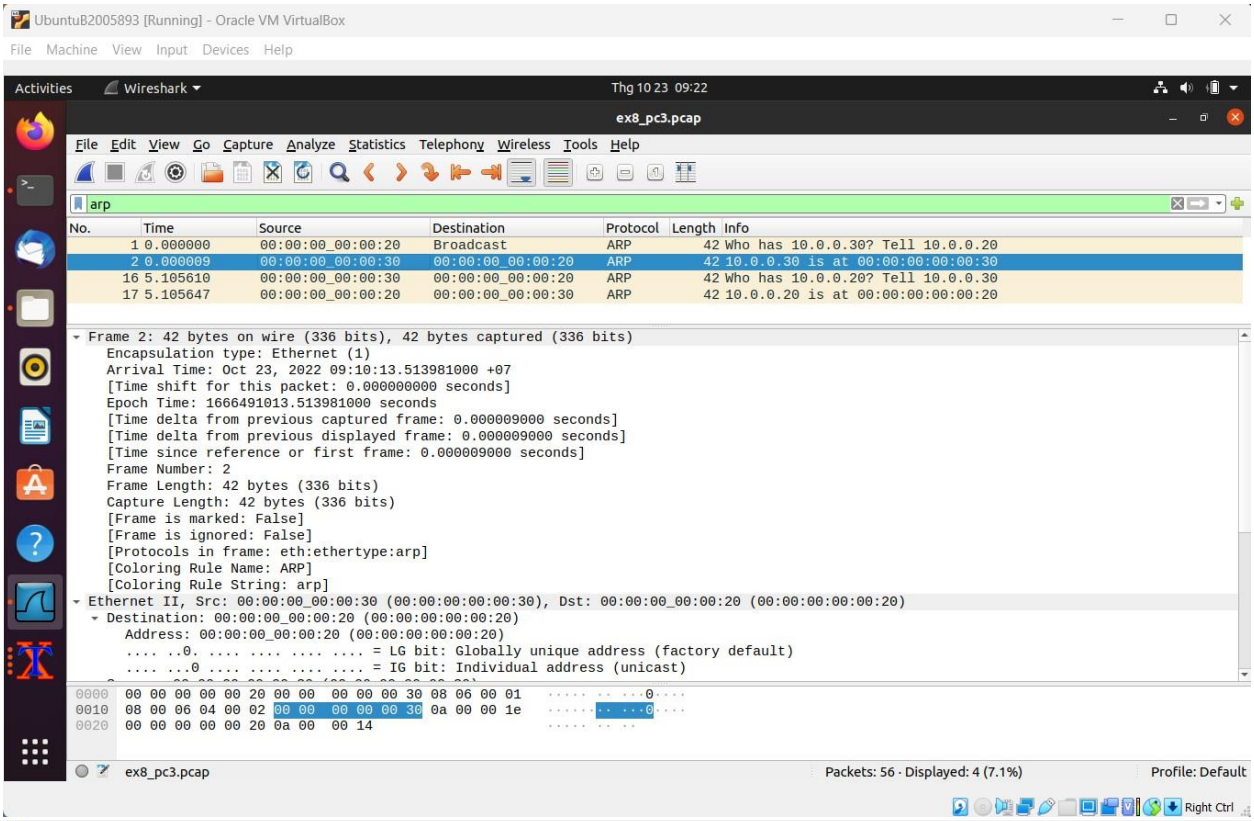
➔ Answer: The frame contain:

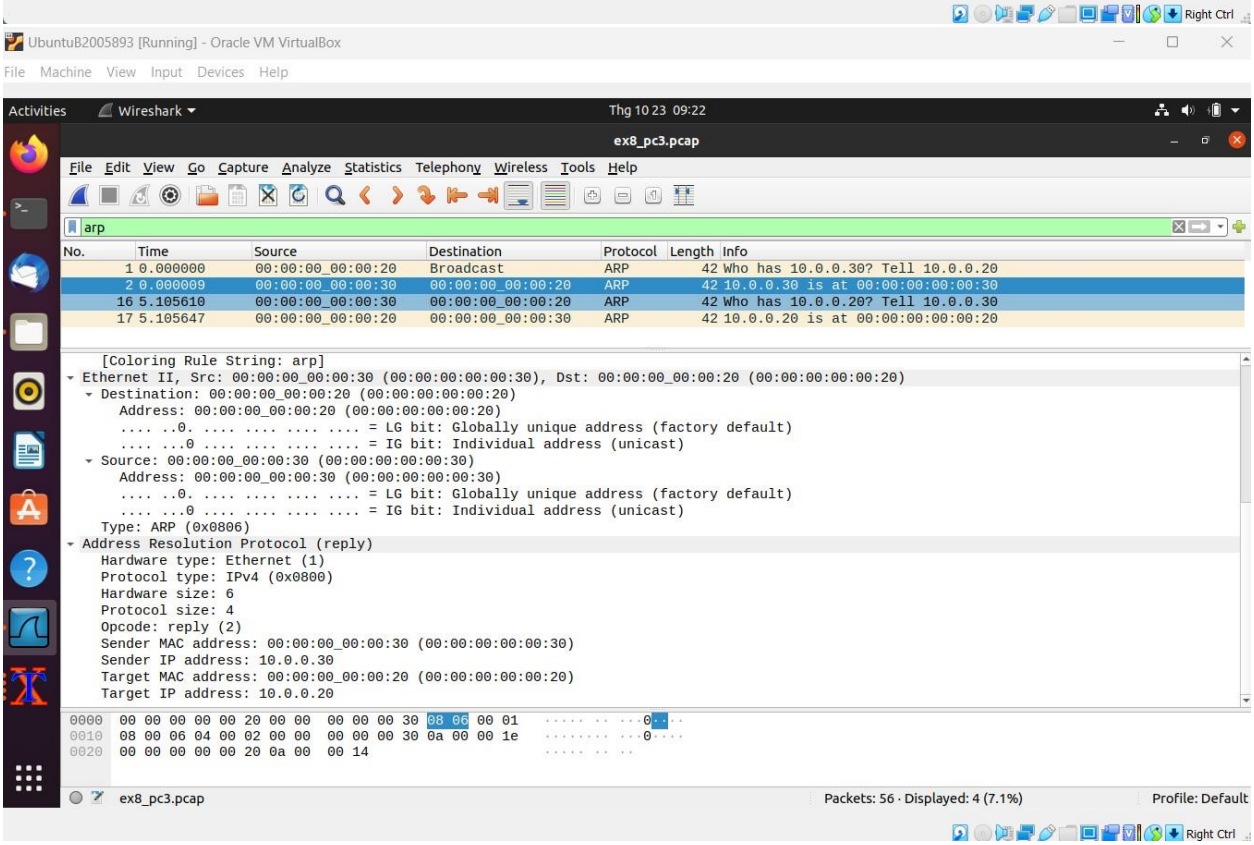
- The source address *00:00:00:00:00:20*
- The hex value for the destination address is *ff:ff:ff:ff:ff:ff*, the broadcast address
- The hex value for the Ethernet Frame Type is *0x0806*, for ARP
- The ARP message containing the IP address (*10.0.0.20*) for the sender and it wants to send this data to (*10.0.0.30*), but it doesn't know the MAC address to send it to, so it has sent an Address Resolution Protocol (ARP) request to find out that information. We can also see that in the field "Target MAC address" is set to *00:00:00:00:00:00* to question the machince whose corresponding IP address (*10.0.0.30*) is being querried

7. Use Wireshark to open pc3_switch.pcap, open the frame using ARP protocol with the source MAC address of 00:00:00:00:00:30

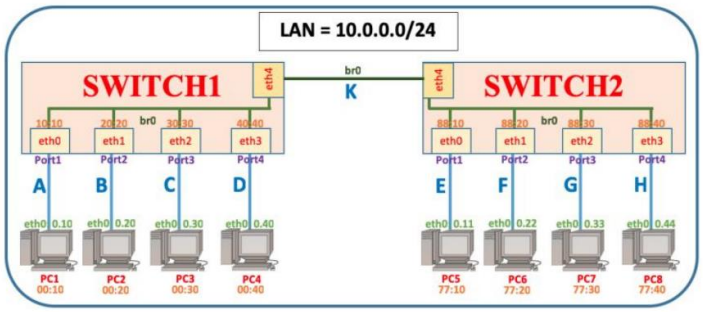
➔ Answer: The frame contain:

- The source address *00:00:00:00:00:30*
- The destination address *00:00:00:00:00:20*
- The hex value for opcode field withing the ARP-payload of the request is 2, for reply
- The ARP message containing the answer to the earlier ARP request appears in the"Sender MAC address" field, which contains the Ethernet address 00:00:00:00:00:30 for the sender with IP address 10.0.0.30

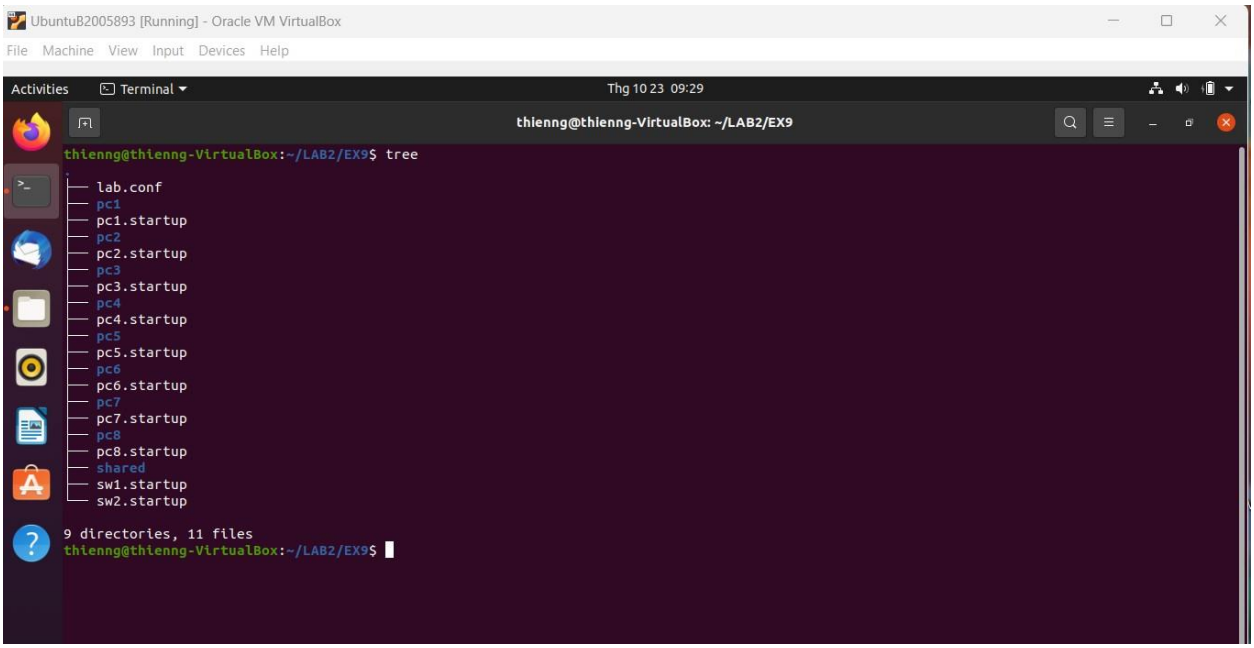

UbuntuB2005893 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities
Wireshark
Thg 10 23 09:22
ex8_pc3.pcap
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
arp
No. Time Source Destination Protocol Length Info
1 0.000000 00:00:00_00:00:20 Broadcast ARP 42 Who has 10.0.0.30? Tell 10.0.0.20
2 0.000009 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
16 5.105610 00:00:00_00:00:30 00:00:00_00:00:20 ARP 42 Who has 10.0.0.20? Tell 10.0.0.30
17 5.105647 00:00:00_00:00:20 00:00:00_00:00:30 ARP 42 10.0.0.20 is at 00:00:00:00:00:20
Frame 2: 42 bytes on wire (336 bits), 42 bytes captured (336 bits)
Encapsulation type: Ethernet (1)
Arrival Time: Oct 23, 2022 09:10:13.513981000 +07
[Time shift for this packet: 0.000000000 seconds]
Epoch Time: 1666491013.513981000 seconds
[Time delta from previous captured frame: 0.000009000 seconds]
[Time delta from previous displayed frame: 0.000009000 seconds]
[Time since reference or first frame: 0.000009000 seconds]
Frame Number: 2
Frame Length: 42 bytes (336 bits)
Capture Length: 42 bytes (336 bits)
[Frame is marked: False]
[Frame is ignored: False]
[Protocols in frame: eth:ethertype:arp]
[Coloring Rule Name: ARP]
[Coloring Rule String: arp]
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)
Destination: 00:00:00_00:00:20 (00:00:00:00:00:20)
Address: 00:00:00_00:00:20 (00:00:00:00:00:20)
.... ..0. .... = LG bit: Globally unique address (factory default)
....0 .... = IG bit: Individual address (unicast)
0000 00 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 00 30 0a 00 00 1e
0020 00 00 00 00 00 20 0a 00 00 14
ex8_pc3.pcap
Packets: 56 · Displayed: 4 (7.1%)
Profile: Default
Right Ctrl


UbuntuB2005893 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities
Wireshark
Thg 10 23 09:22
ex8_pc3.pcap
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
arp
No. Time Source Destination Protocol Length Info
1 0.000000 00:00:00_00:00:20 Broadcast ARP 42 Who has 10.0.0.30? Tell 10.0.0.20
2 0.000009 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
16 5.105610 00:00:00_00:00:30 00:00:00_00:00:20 ARP 42 Who has 10.0.0.20? Tell 10.0.0.30
17 5.105647 00:00:00_00:00:20 00:00:00_00:00:30 ARP 42 10.0.0.20 is at 00:00:00:00:00:20
[Coloring Rule String: arp]
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)
Destination: 00:00:00_00:00:20 (00:00:00:00:00:20)
Address: 00:00:00_00:00:20 (00:00:00:00:00:20)
.... ..0. .... = LG bit: Globally unique address (factory default)
....0 .... = IG bit: Individual address (unicast)
Source: 00:00:00_00:00:30 (00:00:00:00:00:30)
Address: 00:00:00_00:00:30 (00:00:00:00:00:30)
.... ..0. .... = LG bit: Globally unique address (factory default)
....0 .... = IG bit: Individual address (unicast)
Type: ARP (0x0806)
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 00 20 00 00 00 00 00 30 08 06 00 01
0010 08 00 06 04 00 02 00 00 00 00 00 30 0a 00 00 1e
0020 00 00 00 00 00 20 0a 00 00 14
ex8_pc3.pcap
Packets: 56 · Displayed: 4 (7.1%)
Profile: Default
Right Ctrl

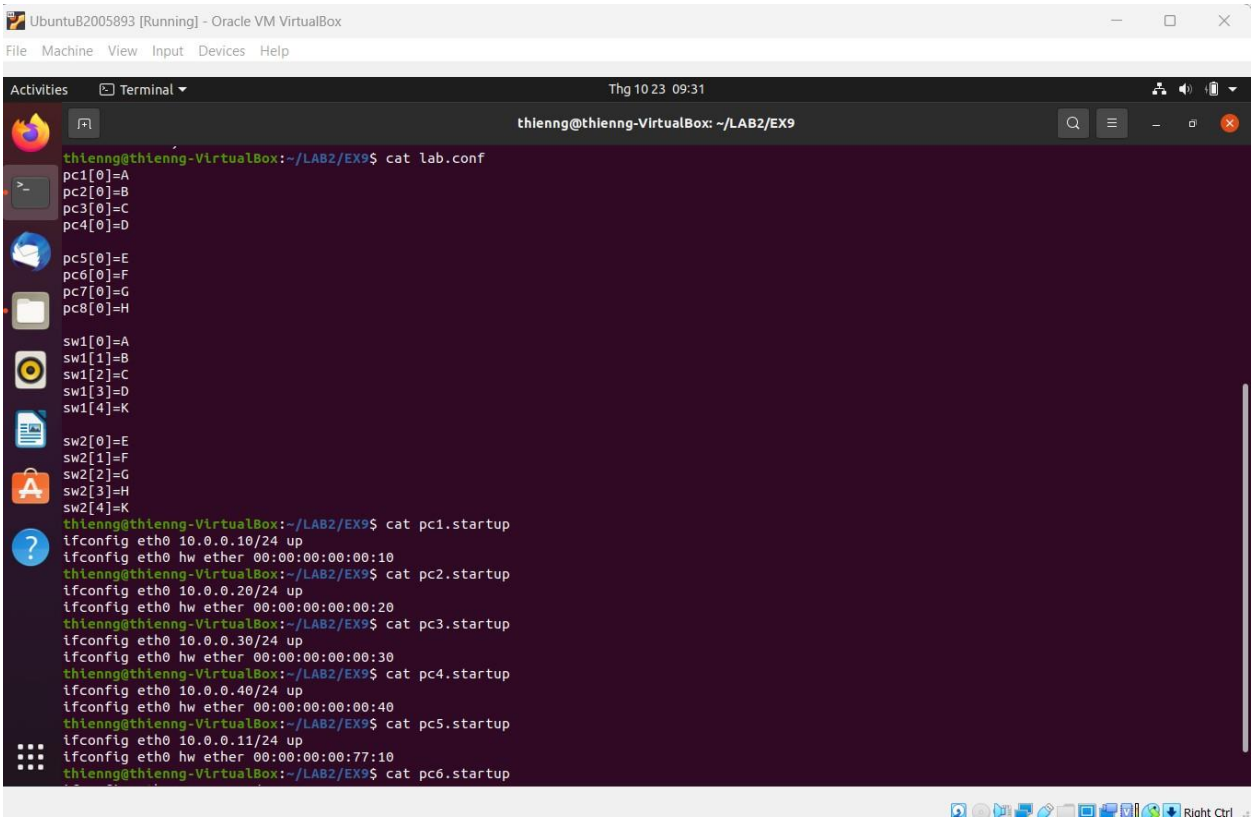
Exercise 9: Construct the following network

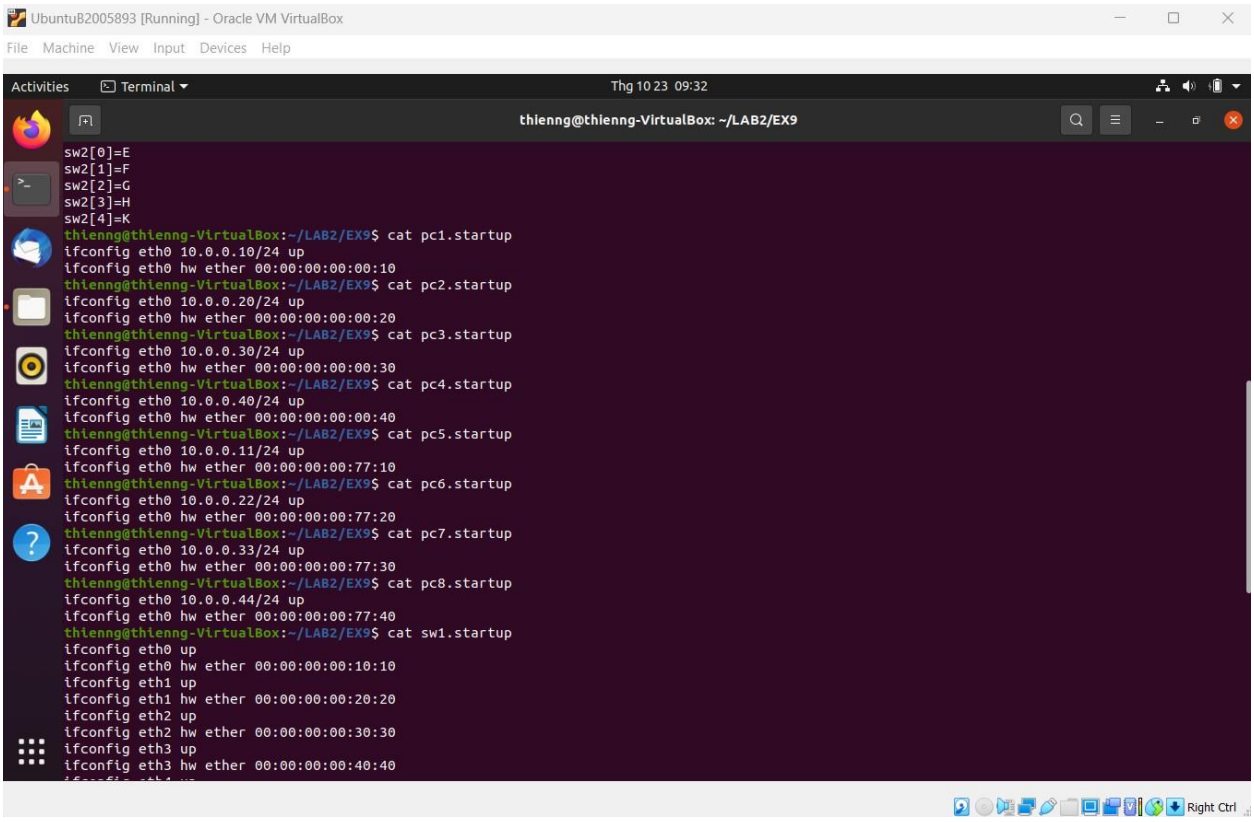


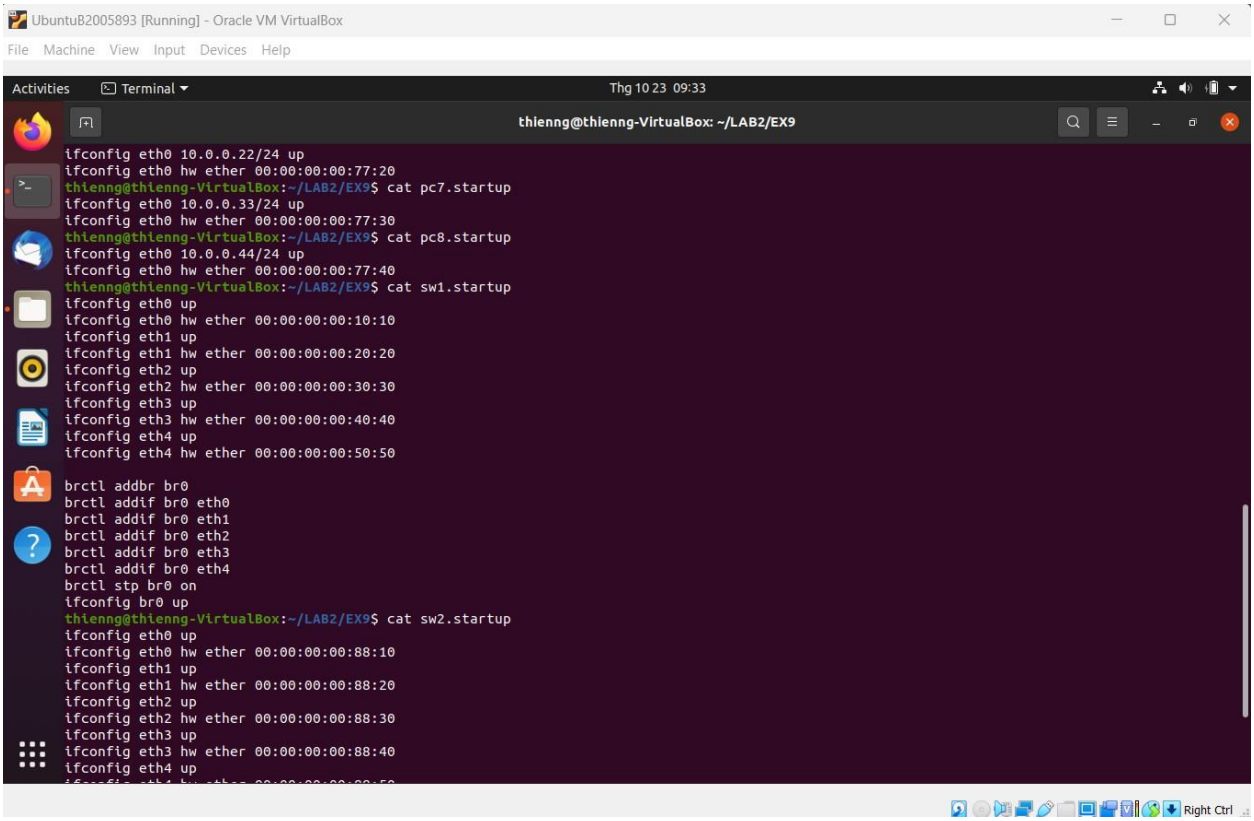
1. Lab configuration
   $ tree

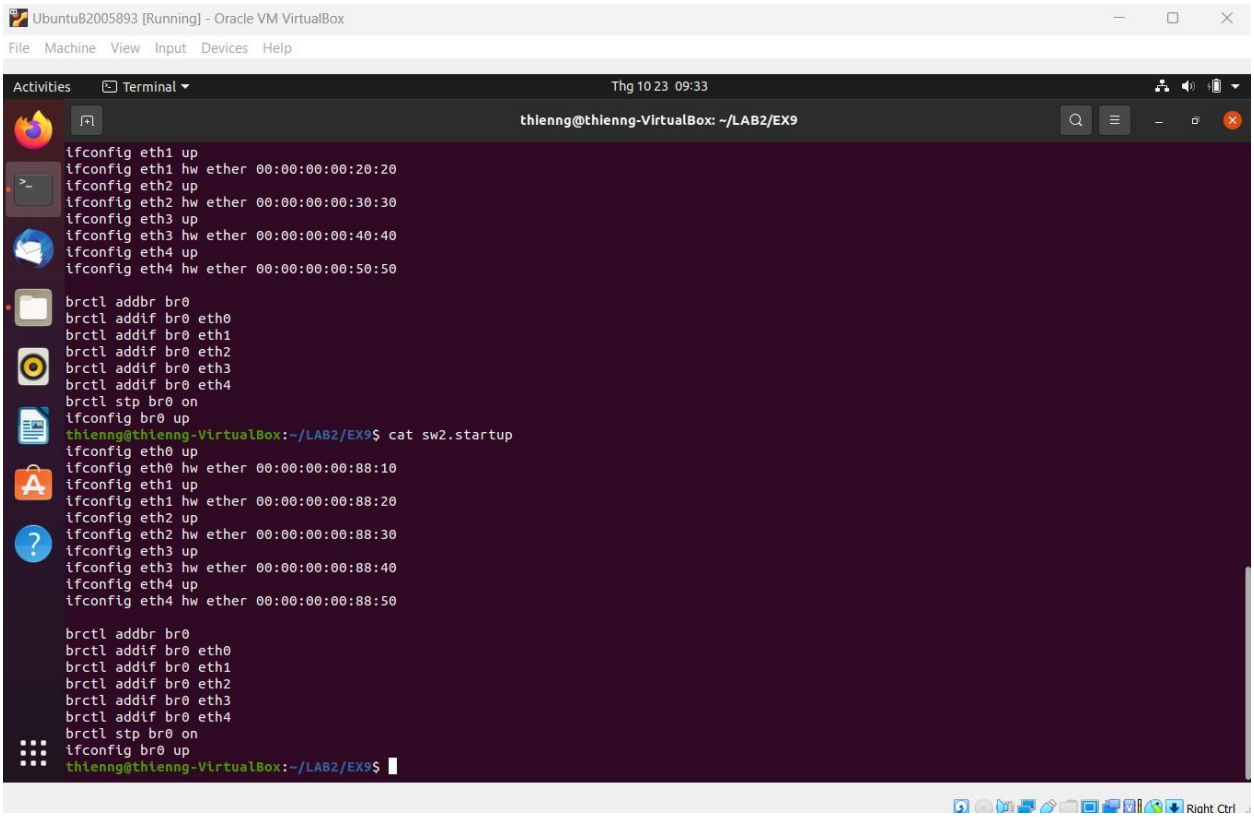


$ cat lab.conf
$ lab pc1.startup
$ lab pc2.startup
$ lab pc3.startup
$ lab pc4.startup
$ lab pc5.startup
$ lab pc6.startup
$ lab pc7.startup
$ lab pc8.startup
$ lab sw1.startup
$ lab sw2.startup

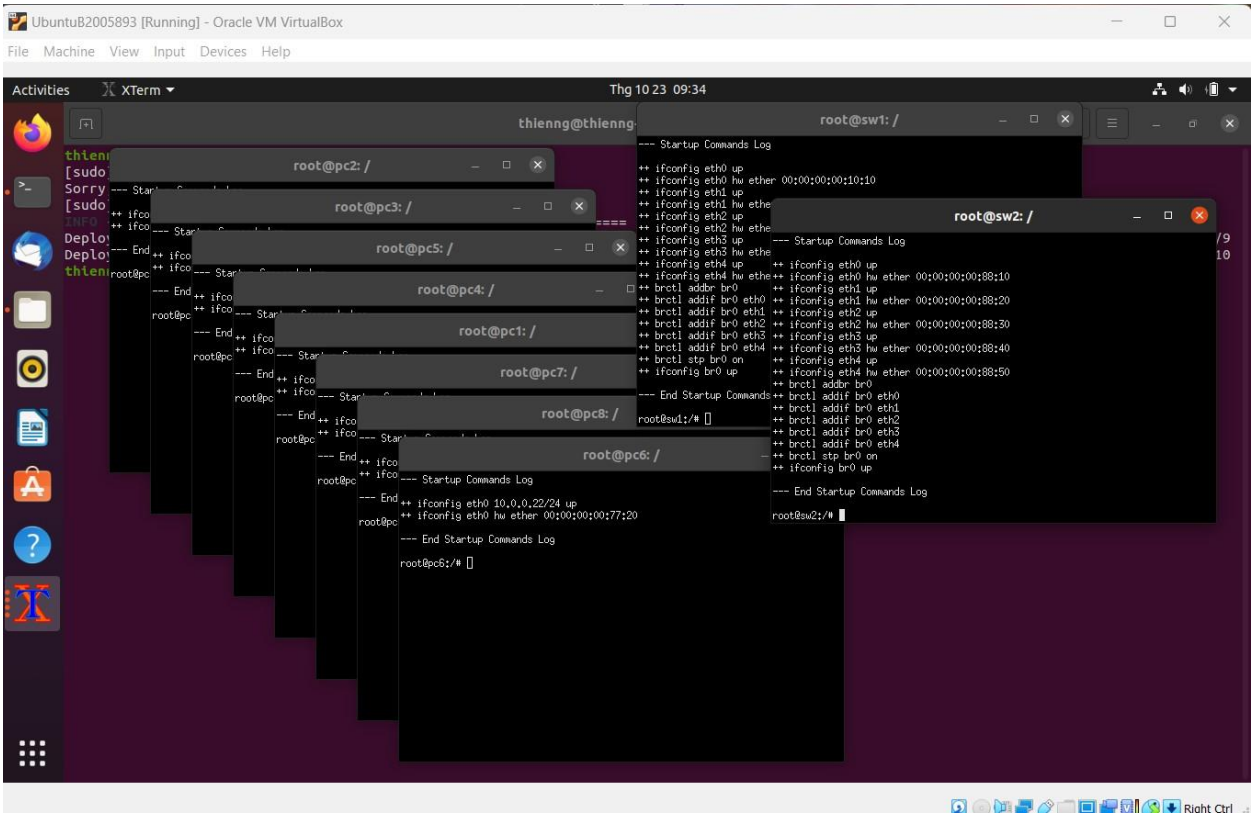

UbuntuB2005893 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Thg 10 23 09:31
thienng@thienng-VirtualBox: ~/LAB2/EX9
thienng@thienng-VirtualBox:~/LAB2/EX9$ cat lab.conf
pc1[0]=A
pc2[0]=B
pc3[0]=C
pc4[0]=D
pc5[0]=E
pc6[0]=F
pc7[0]=G
pc8[0]=H
sw1[0]=A
sw1[1]=B
sw1[2]=C
sw1[3]=D
sw1[4]=K
sw2[0]=E
sw2[1]=F
sw2[2]=G
sw2[3]=H
sw2[4]=K
thienng@thienng-VirtualBox:~/LAB2/EX9$ cat pc1.startup
ifconfig eth0 10.0.0.10/24 up
ifconfig eth0 hw ether 00:00:00:00:00:10
thienng@thienng-VirtualBox:~/LAB2/EX9$ cat pc2.startup
ifconfig eth0 10.0.0.20/24 up
ifconfig eth0 hw ether 00:00:00:00:00:20
thienng@thienng-VirtualBox:~/LAB2/EX9$ cat pc3.startup
ifconfig eth0 10.0.0.30/24 up
ifconfig eth0 hw ether 00:00:00:00:00:30
thienng@thienng-VirtualBox:~/LAB2/EX9$ cat pc4.startup
ifconfig eth0 10.0.0.40/24 up
ifconfig eth0 hw ether 00:00:00:00:00:40
thienng@thienng-VirtualBox:~/LAB2/EX9$ cat pc5.startup
ifconfig eth0 10.0.0.11/24 up
ifconfig eth0 hw ether 00:00:00:00:77:10
thienng@thienng-VirtualBox:~/LAB2/EX9$ cat pc6.startup
Right Ctrl


UbuntuB2005893 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Thg 10 23 09:32
thienng@thienng-VirtualBox: ~/LAB2/EX9
sw2[0]=E
sw2[1]=F
sw2[2]=G
sw2[3]=H
sw2[4]=K
thienng@thienng-VirtualBox:~/LAB2/EX9$ cat pc1.startup
ifconfig eth0 10.0.0.10/24 up
ifconfig eth0 hw ether 00:00:00:00:00:10
thienng@thienng-VirtualBox:~/LAB2/EX9$ cat pc2.startup
ifconfig eth0 10.0.0.20/24 up
ifconfig eth0 hw ether 00:00:00:00:00:20
thienng@thienng-VirtualBox:~/LAB2/EX9$ cat pc3.startup
ifconfig eth0 10.0.0.30/24 up
ifconfig eth0 hw ether 00:00:00:00:00:30
thienng@thienng-VirtualBox:~/LAB2/EX9$ cat pc4.startup
ifconfig eth0 10.0.0.40/24 up
ifconfig eth0 hw ether 00:00:00:00:00:40
thienng@thienng-VirtualBox:~/LAB2/EX9$ cat pc5.startup
ifconfig eth0 10.0.0.11/24 up
ifconfig eth0 hw ether 00:00:00:00:77:10
thienng@thienng-VirtualBox:~/LAB2/EX9$ cat pc6.startup
ifconfig eth0 10.0.0.22/24 up
ifconfig eth0 hw ether 00:00:00:00:77:20
thienng@thienng-VirtualBox:~/LAB2/EX9$ cat pc7.startup
ifconfig eth0 10.0.0.33/24 up
ifconfig eth0 hw ether 00:00:00:00:77:30
thienng@thienng-VirtualBox:~/LAB2/EX9$ cat pc8.startup
ifconfig eth0 10.0.0.44/24 up
ifconfig eth0 hw ether 00:00:00:00:77:40
thienng@thienng-VirtualBox:~/LAB2/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
Right Ctrl

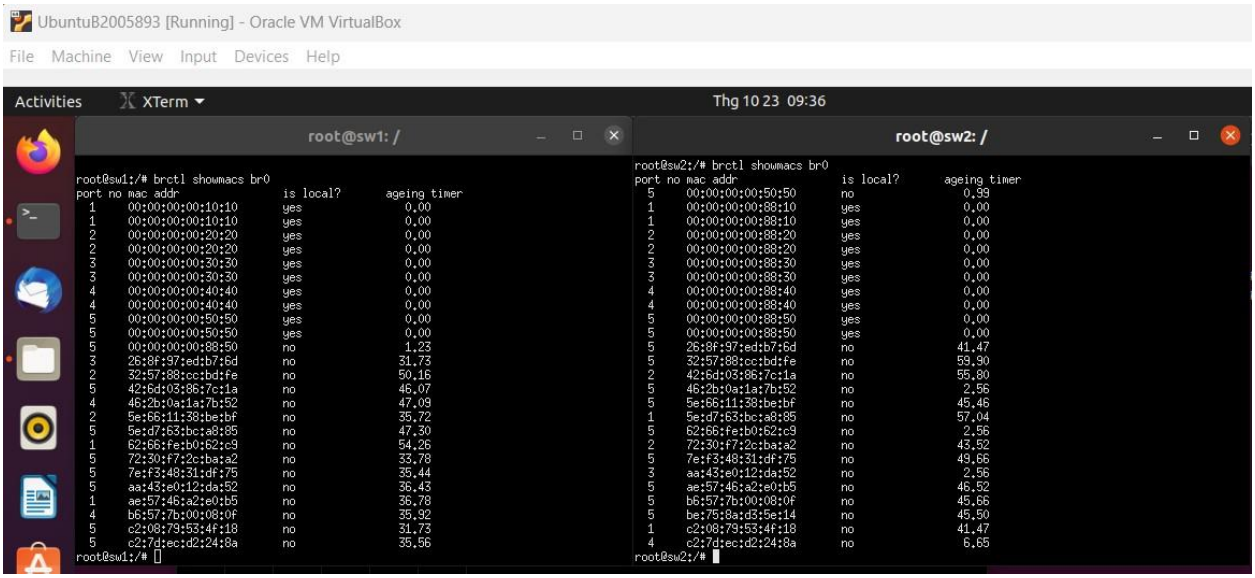

UbuntuB2005893 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Thg 10 23 09:33
thienng@thienng-VirtualBox: ~/LAB2/EX9
ifconfig eth0 10.0.0.22/24 up
ifconfig eth0 hw ether 00:00:00:00:77:20
thienng@thienng-VirtualBox:~/LAB2/EX9$ cat pc7.startup
ifconfig eth0 10.0.0.33/24 up
ifconfig eth0 hw ether 00:00:00:00:77:30
thienng@thienng-VirtualBox:~/LAB2/EX9$ cat pc8.startup
ifconfig eth0 10.0.0.44/24 up
ifconfig eth0 hw ether 00:00:00:00:77:40
thienng@thienng-VirtualBox:~/LAB2/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
thienng@thienng-VirtualBox:~/LAB2/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
Right Ctrl


UbuntuB2005893 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Thg 10 23 09:33
thienng@thienng-VirtualBox: ~/LAB2/EX9
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
thienng@thienng-VirtualBox:~/LAB2/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
thienng@thienng-VirtualBox:~/LAB2/EX9$
Right Ctrl

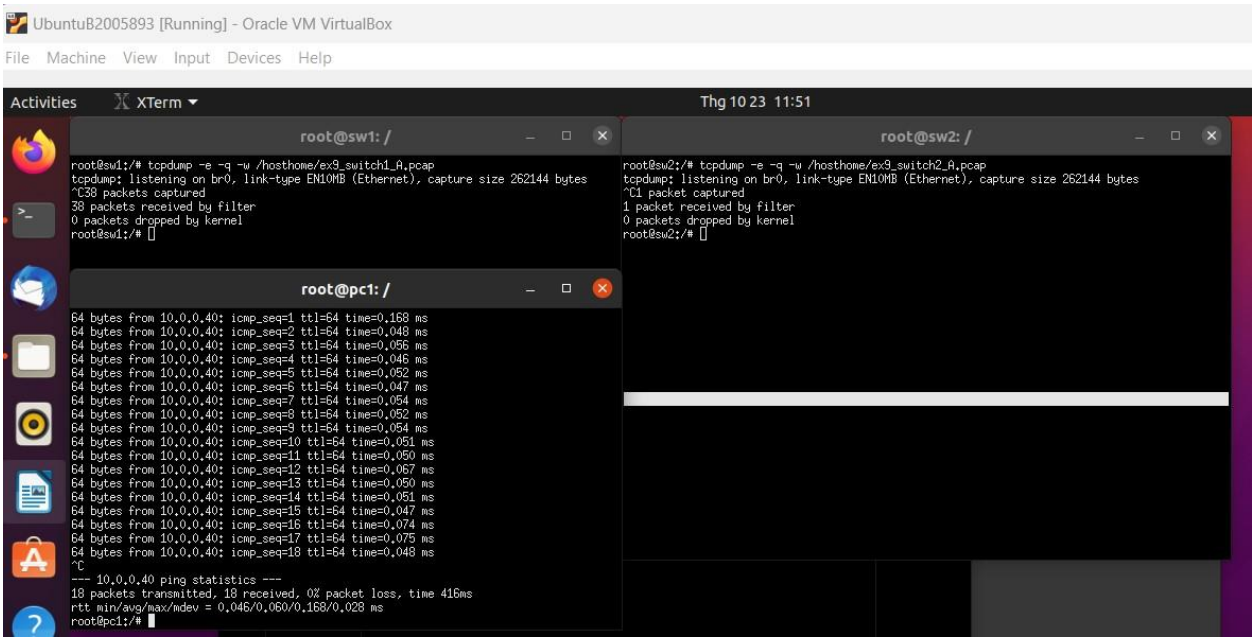
2. Start kathara
   $ sudo kathara lstart



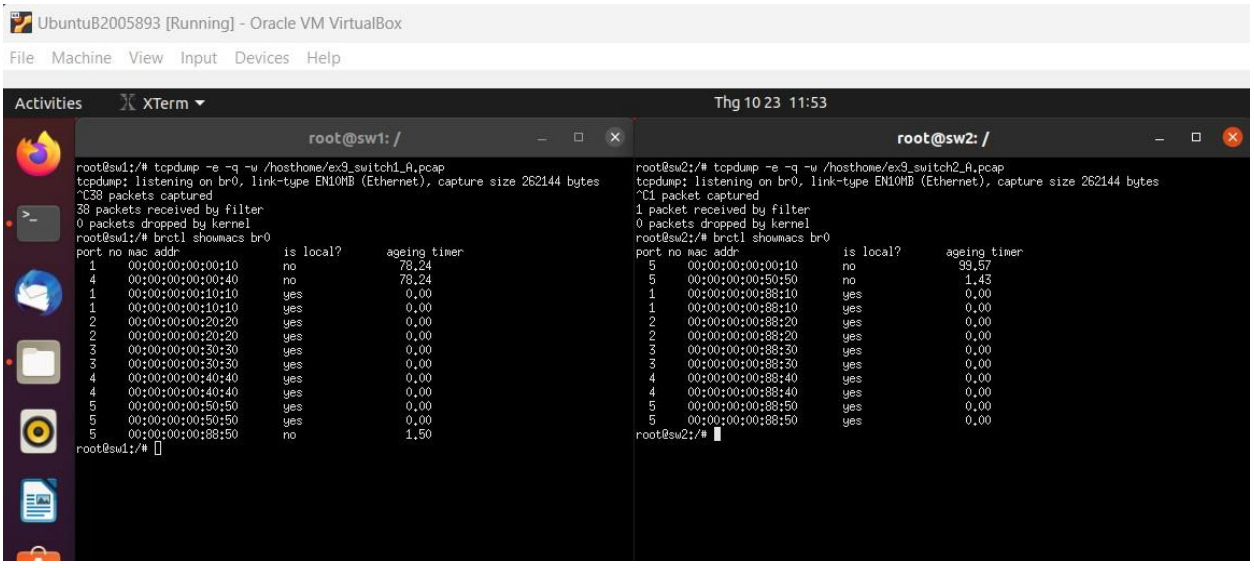
3. Mac Lookup Table
   On sw1 and sw2:
   # brctl showmacs br0



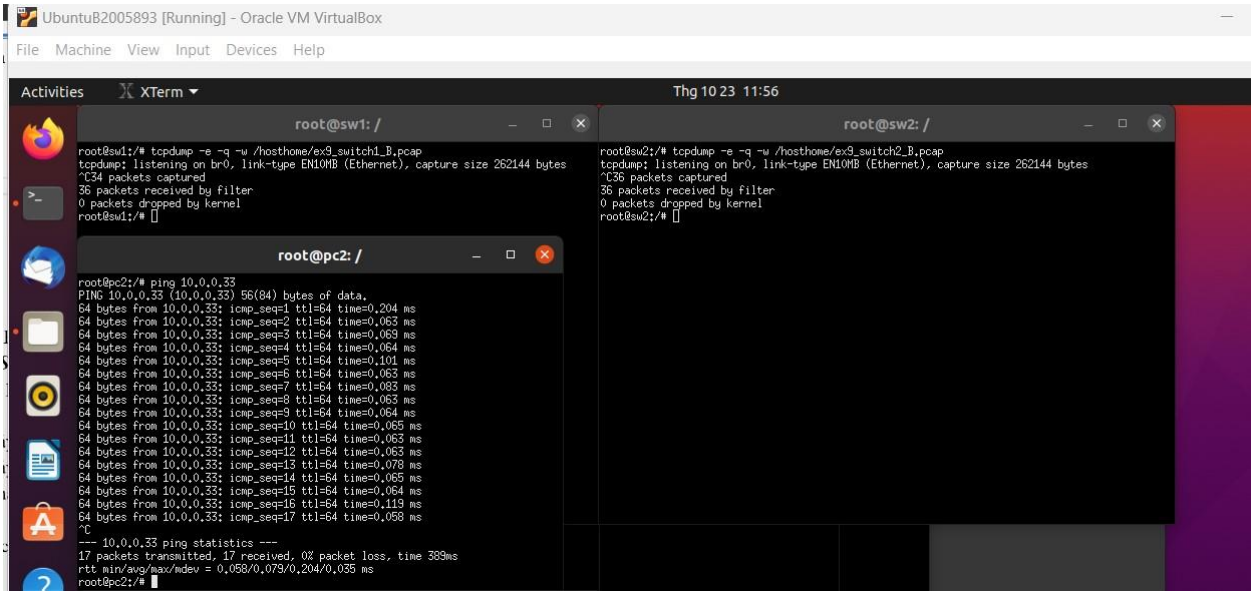
4. Test connectivity
   A. Send frame between 2 pcs of the same switch
      On pc1, ping to pc4 while sniffing on sw1 and sw2, and then show the mac lookup table on switch 1 and switch 2
      # ping 10.0.0.40
      # brctl showmacs br0



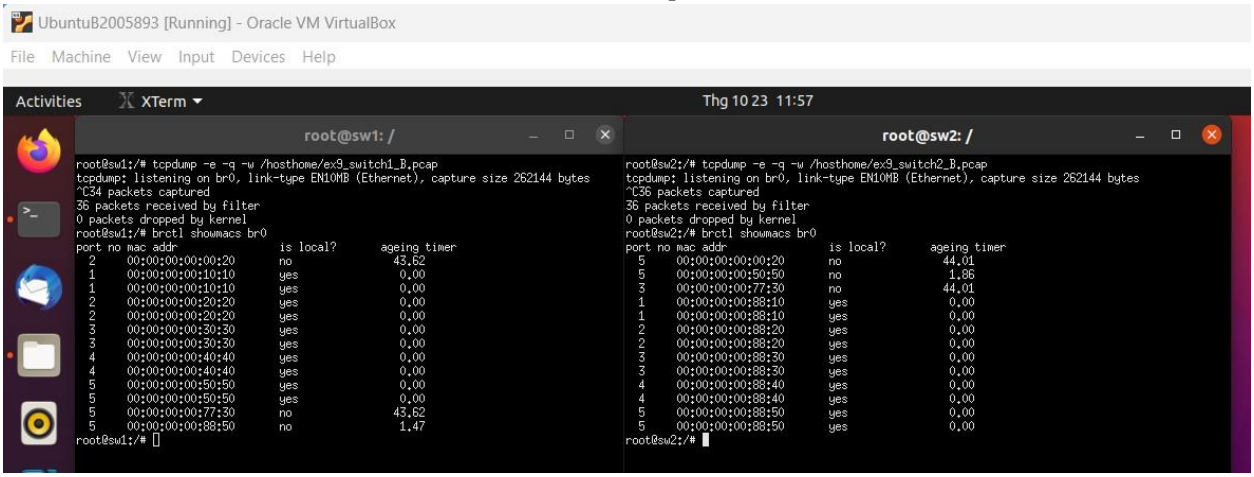
We can see that switch 2 does not receive any frame because pc1 and pc4 are on switch 1



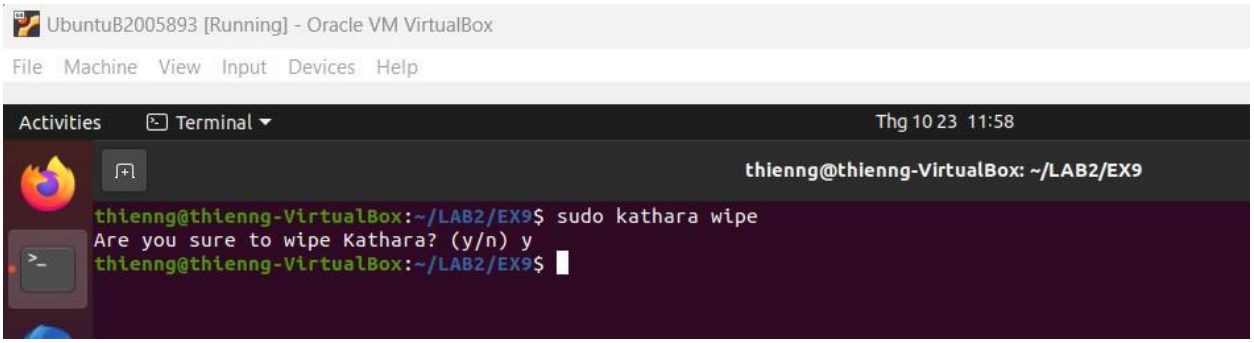
B. Send frame between 2 pcs on both switch
On pc1, ping to pc7 while sniffing on sw1 and sw2, and then show the mac lookup table on switch 1 and switch 2



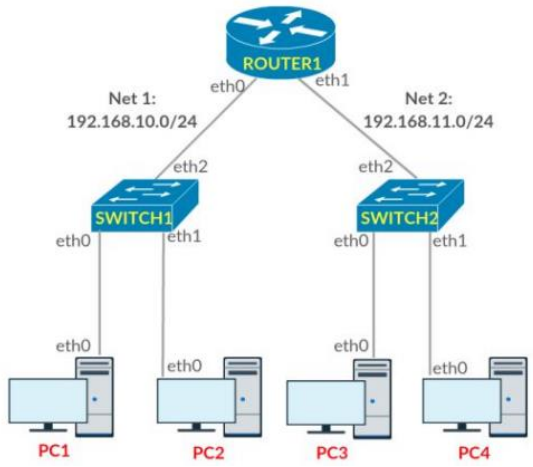
We can see now that switch had received frame because pc7 is of switch 2



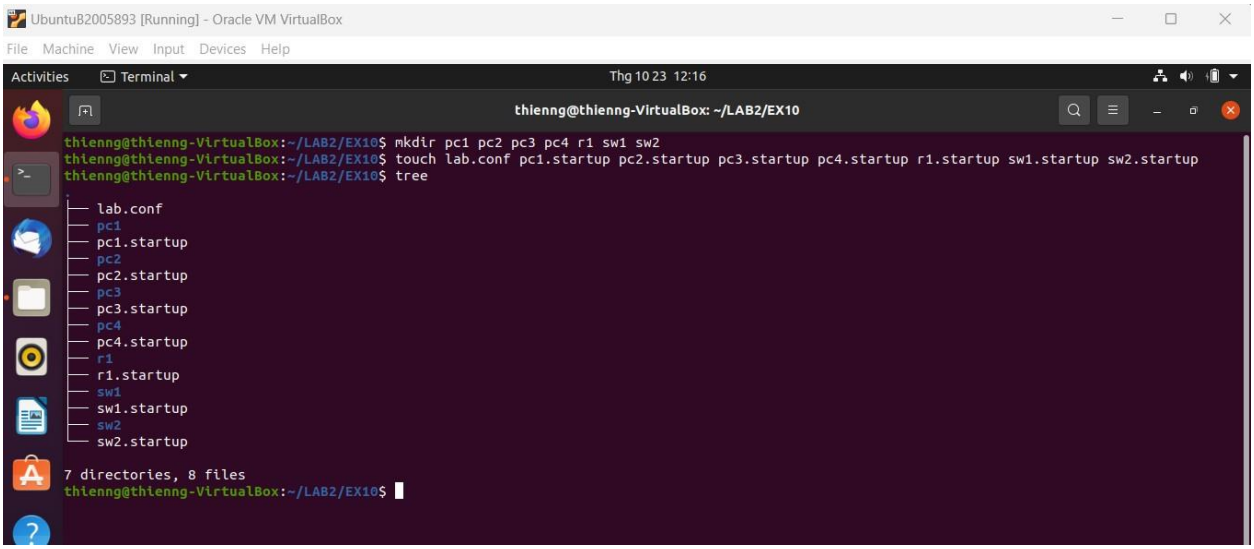
5. Delete all VMs
$ sudo kathara wipe

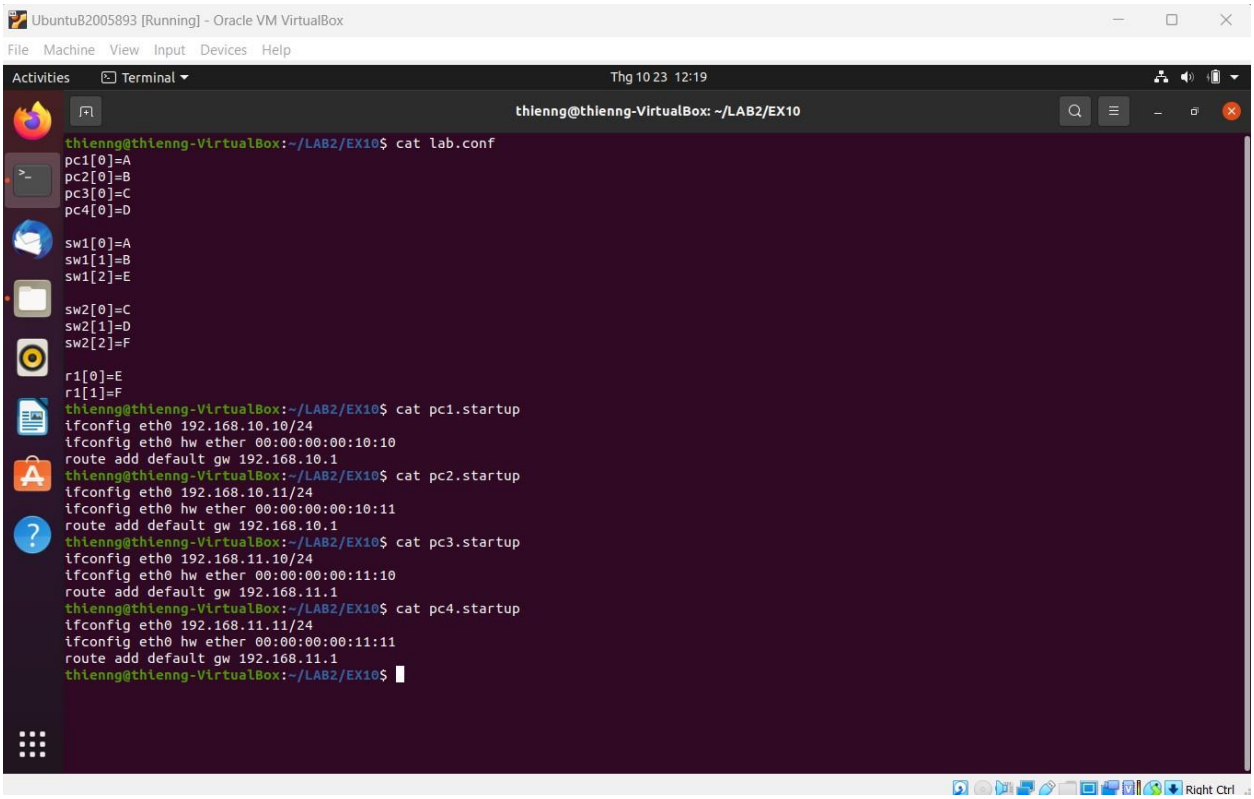


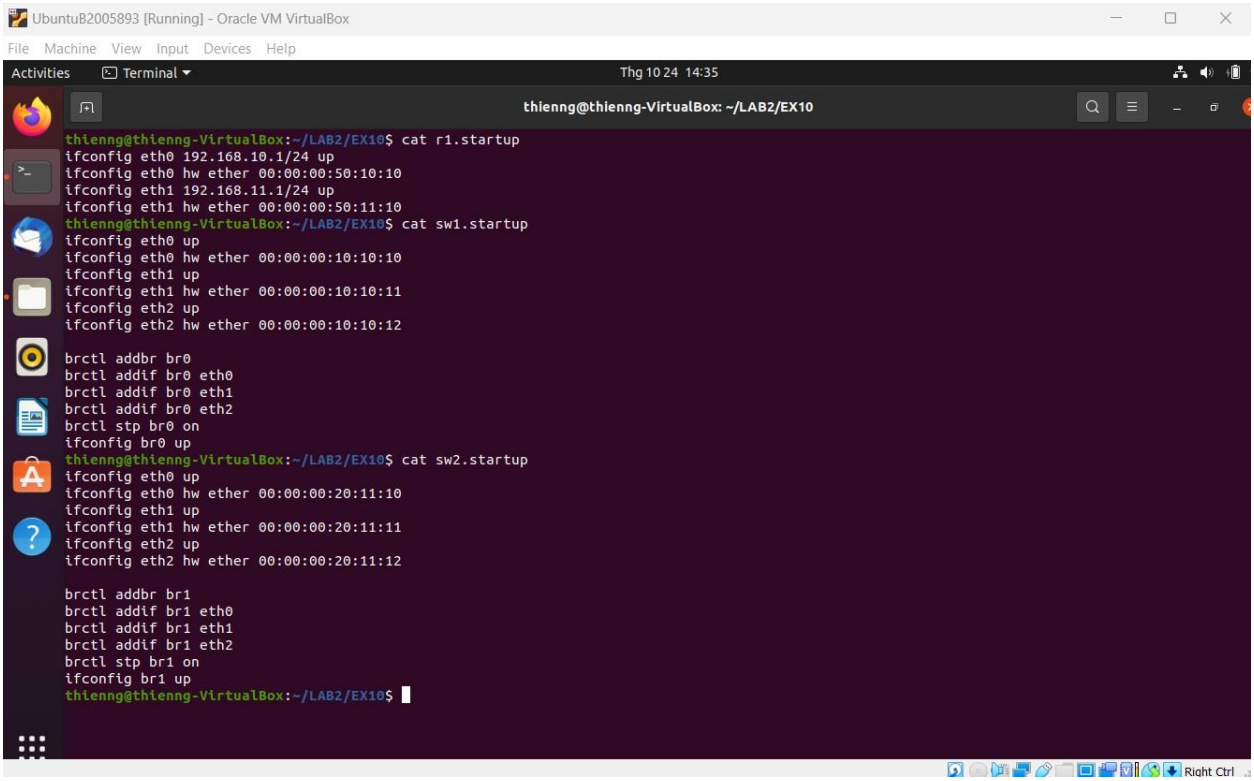
Exercise 10: Construct the following network



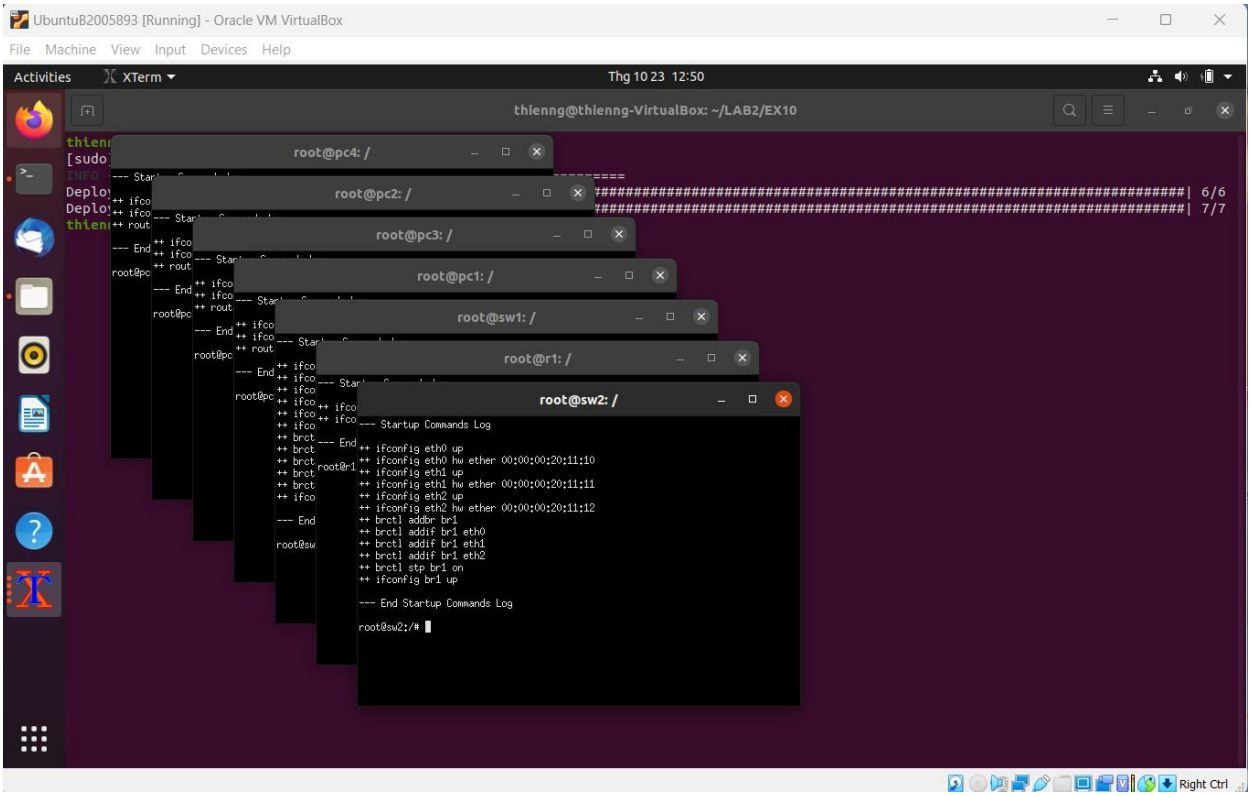
1. Lab configuration
   $ tree
   $ cat lab.conf
   $ cat pc1.startup
   $ cat pc2.startup
   $ cat pc3.startup
   $ cat pc4.startup
   $ cat r1.startup
   $ cat sw1.startup
   $ cat sw2.startup



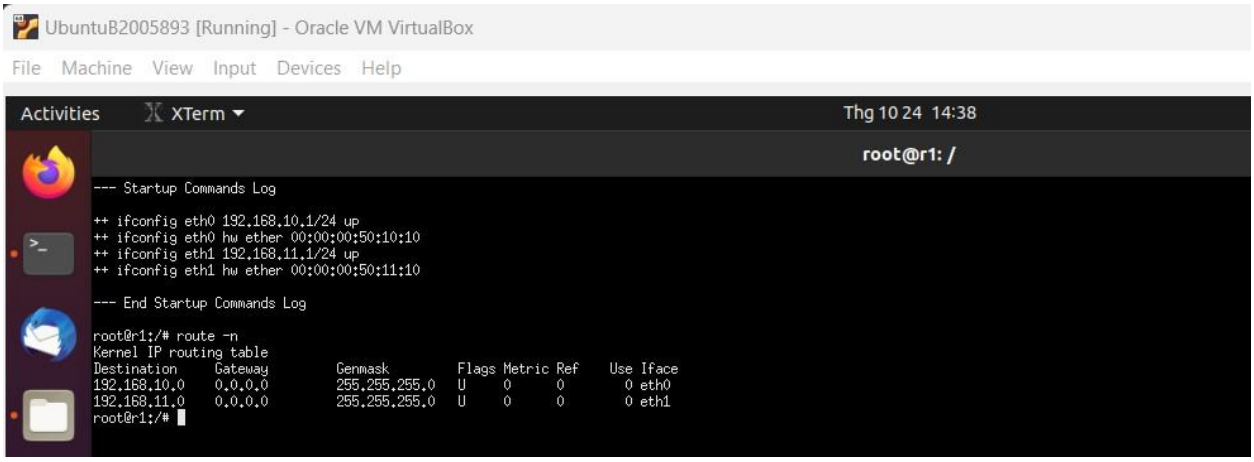

UbuntuB2005893 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Thg 10 23 12:19
thienng@thienng-VirtualBox: ~/LAB2/EX10
thienng@thienng-VirtualBox:~/LAB2/EX10$ cat lab.conf
pc1[0]=A
pc2[0]=B
pc3[0]=C
pc4[0]=D
sw1[0]=A
sw1[1]=B
sw1[2]=E
sw2[0]=C
sw2[1]=D
sw2[2]=F
r1[0]=E
r1[1]=F
thienng@thienng-VirtualBox:~/LAB2/EX10$ cat pc1.startup
ifconfig eth0 192.168.10.10/24
ifconfig eth0 hw ether 00:00:00:00:10:10
route add default gw 192.168.10.1
thienng@thienng-VirtualBox:~/LAB2/EX10$ cat pc2.startup
ifconfig eth0 192.168.10.11/24
ifconfig eth0 hw ether 00:00:00:00:10:11
route add default gw 192.168.10.1
thienng@thienng-VirtualBox:~/LAB2/EX10$ cat pc3.startup
ifconfig eth0 192.168.11.10/24
ifconfig eth0 hw ether 00:00:00:00:11:10
route add default gw 192.168.11.1
thienng@thienng-VirtualBox:~/LAB2/EX10$ cat pc4.startup
ifconfig eth0 192.168.11.11/24
ifconfig eth0 hw ether 00:00:00:00:11:11
route add default gw 192.168.11.1
thienng@thienng-VirtualBox:~/LAB2/EX10$
Right Ctrl


UbuntuB2005893 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Thg 10 24 14:35
thienng@thienng-VirtualBox: ~/LAB2/EX10
thienng@thienng-VirtualBox:~/LAB2/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
thienng@thienng-VirtualBox:~/LAB2/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
thienng@thienng-VirtualBox:~/LAB2/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 00:00:00:20:11:12
brctl addbr br1
brctl addif br1 eth0
brctl addif br1 eth1
brctl addif br1 eth2
brctl stp br1 on
ifconfig br1 up
thienng@thienng-VirtualBox:~/LAB2/EX10$
Right Ctrl

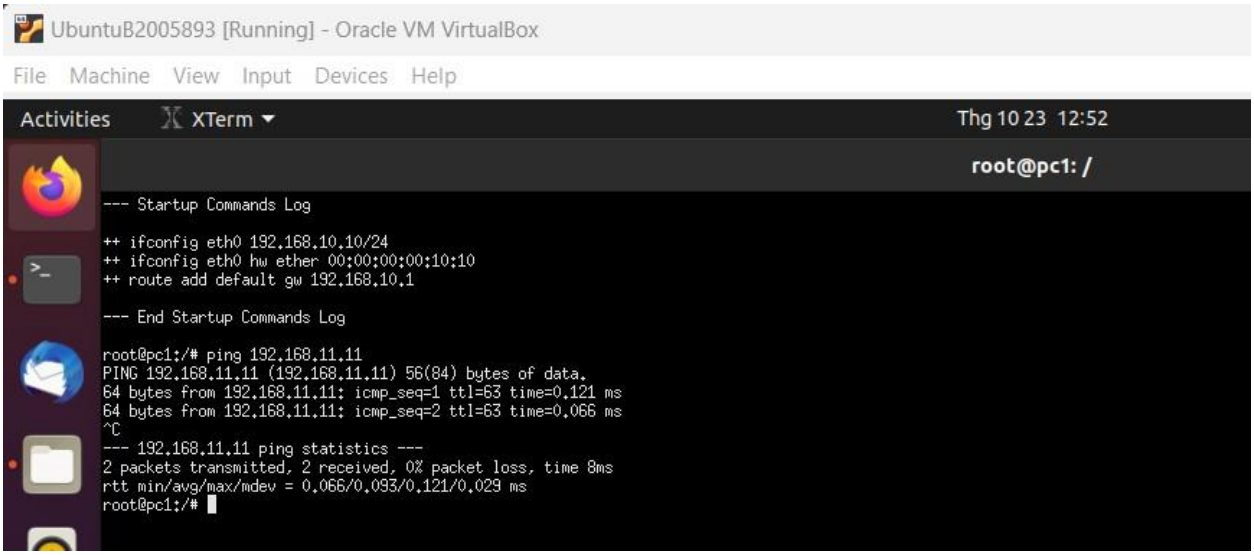
2. Start kathara
   $ sudo kathara lstart



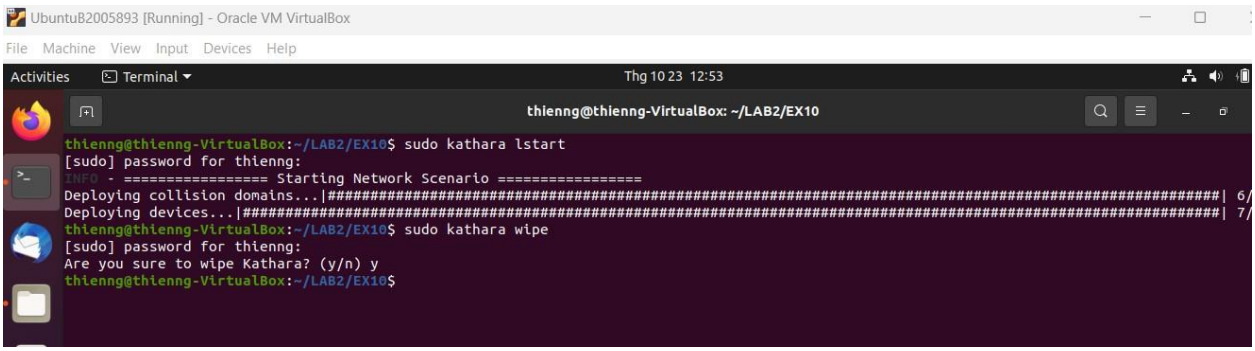
3. Routing table on r1
   # route –n



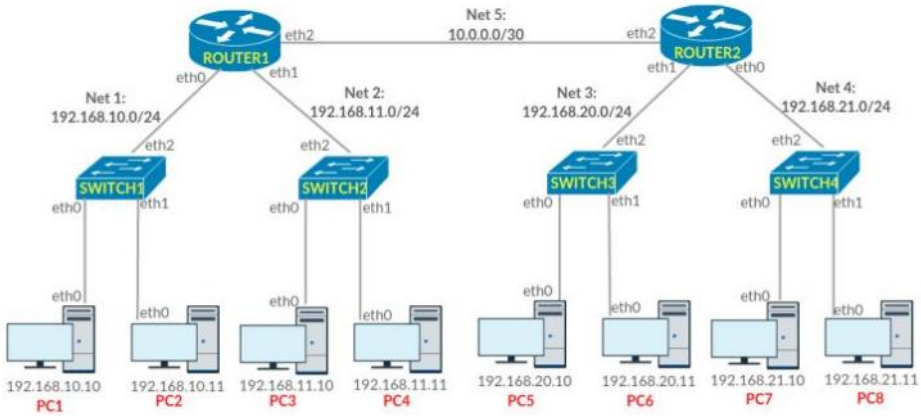
4. Ping from pc1 to pc4
   # ping 192.168.11.11



5. Delete all VMs
   $ sudo kathara wipe

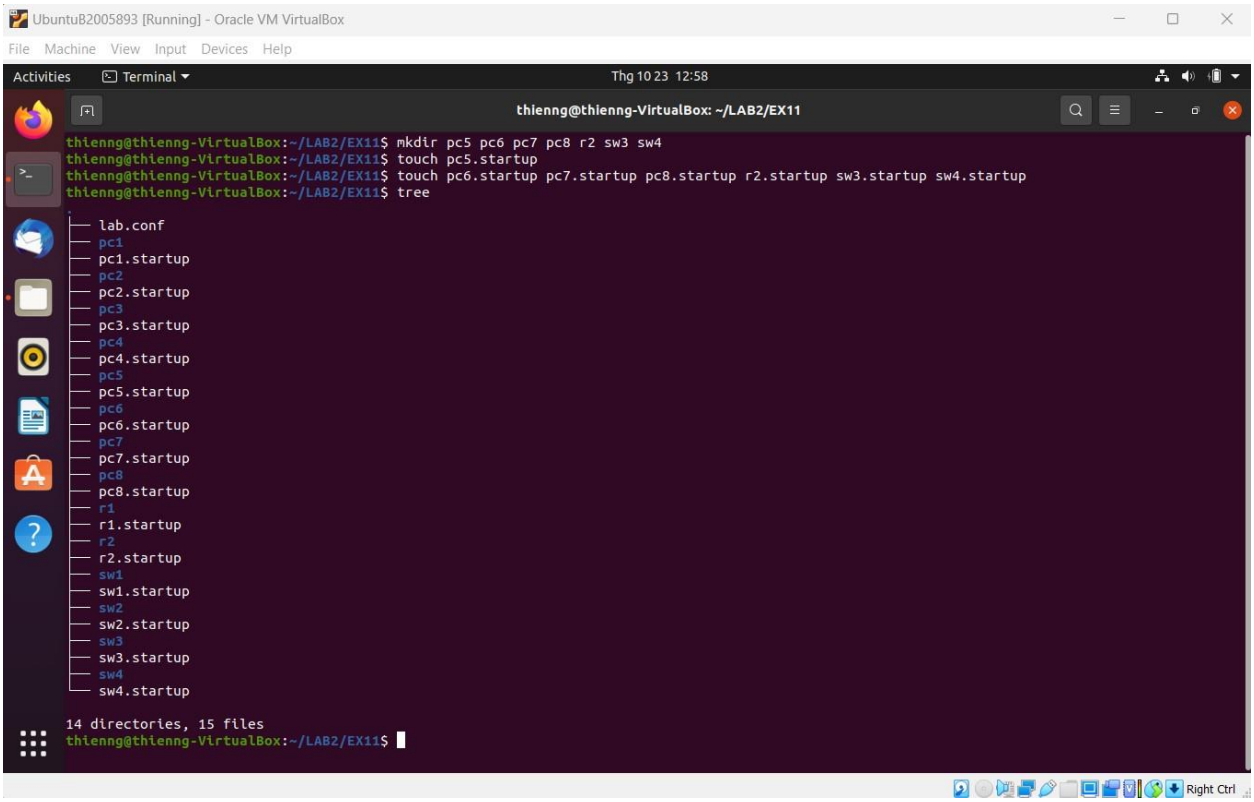


Exercise 11: Construct the following network

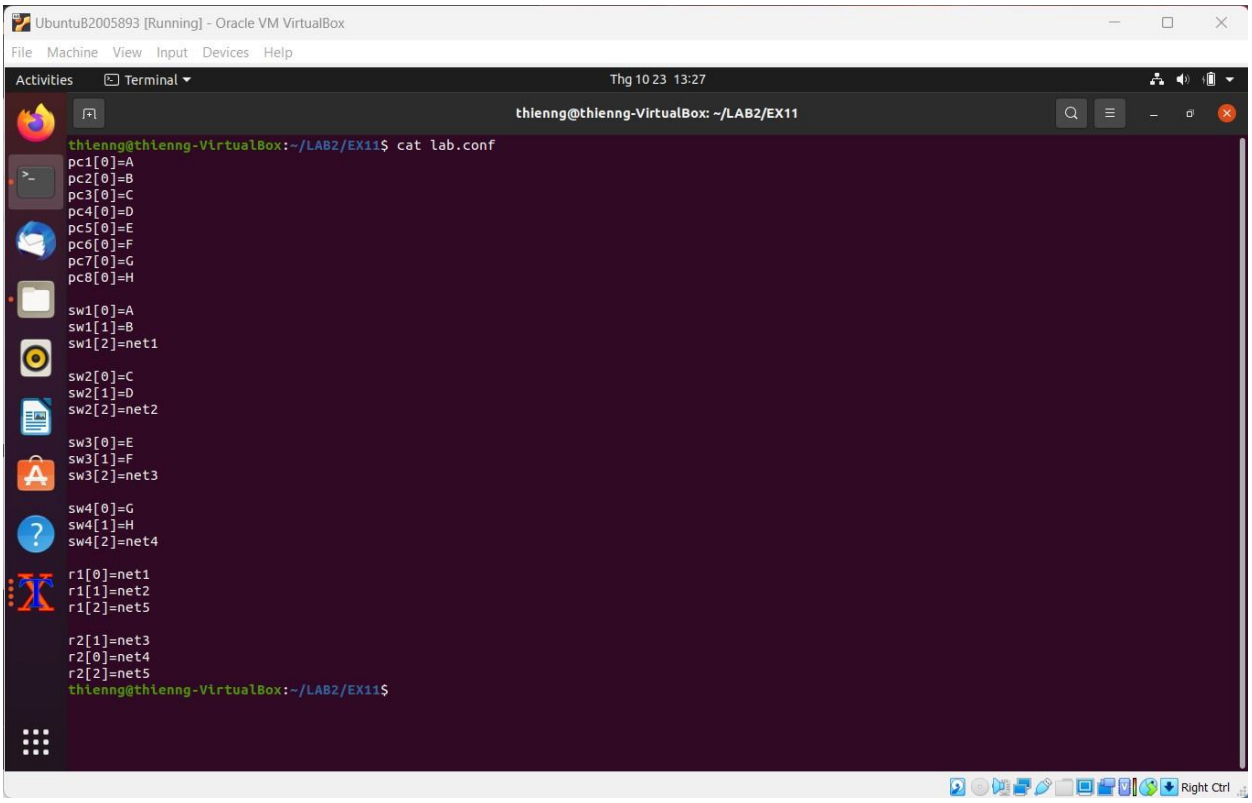


1. Lab configuration

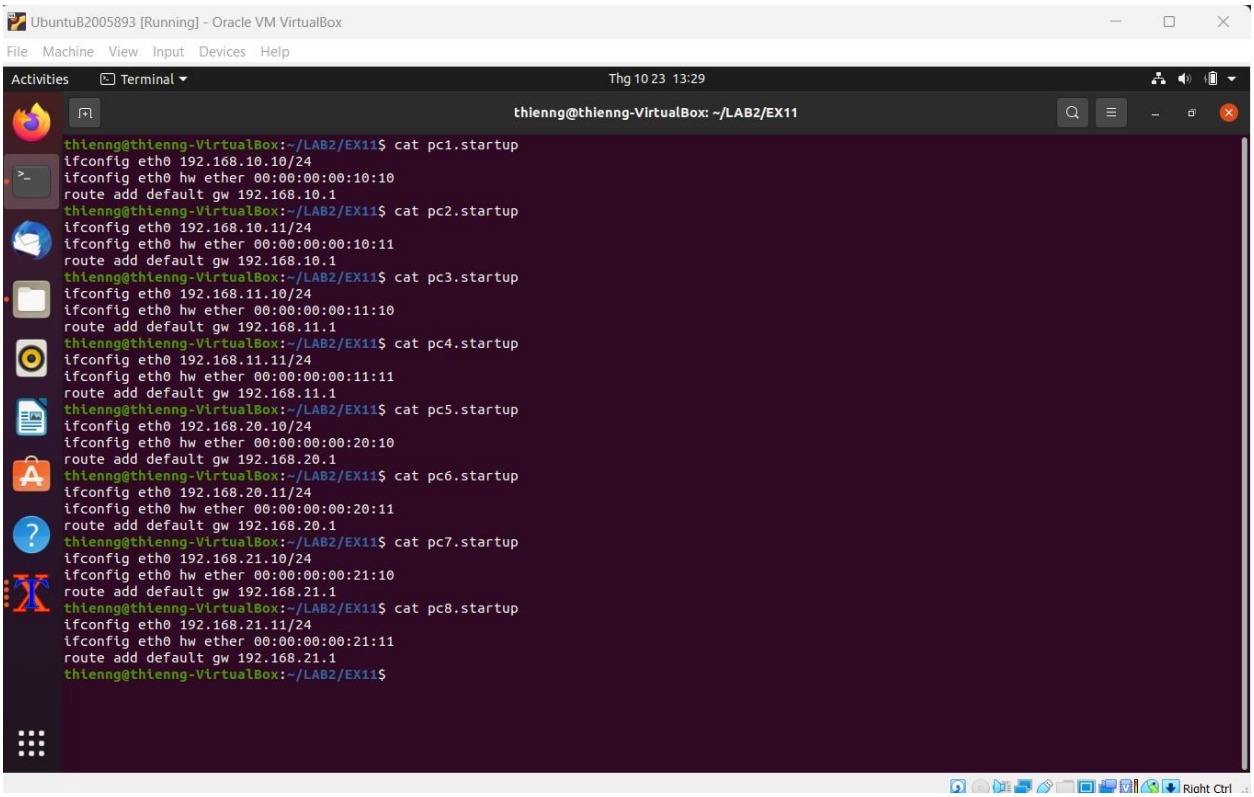
   $ tree

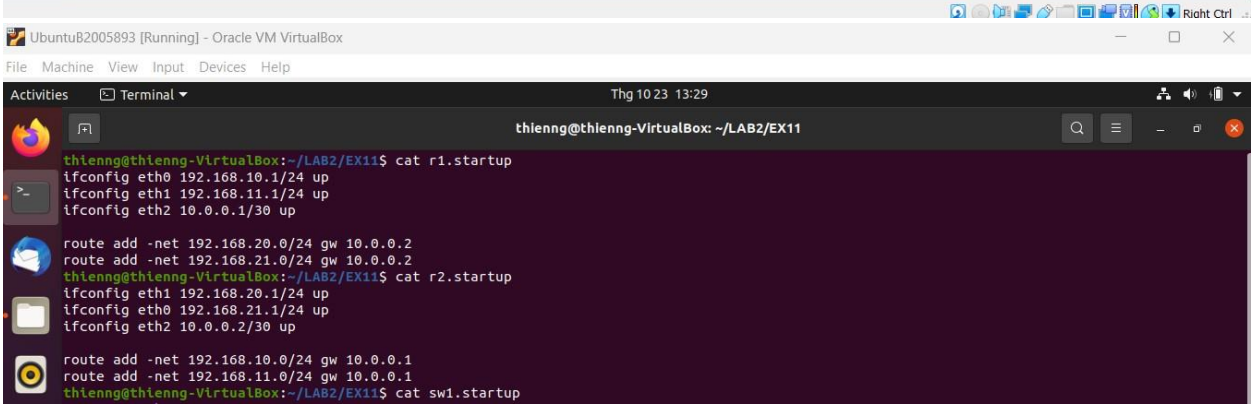


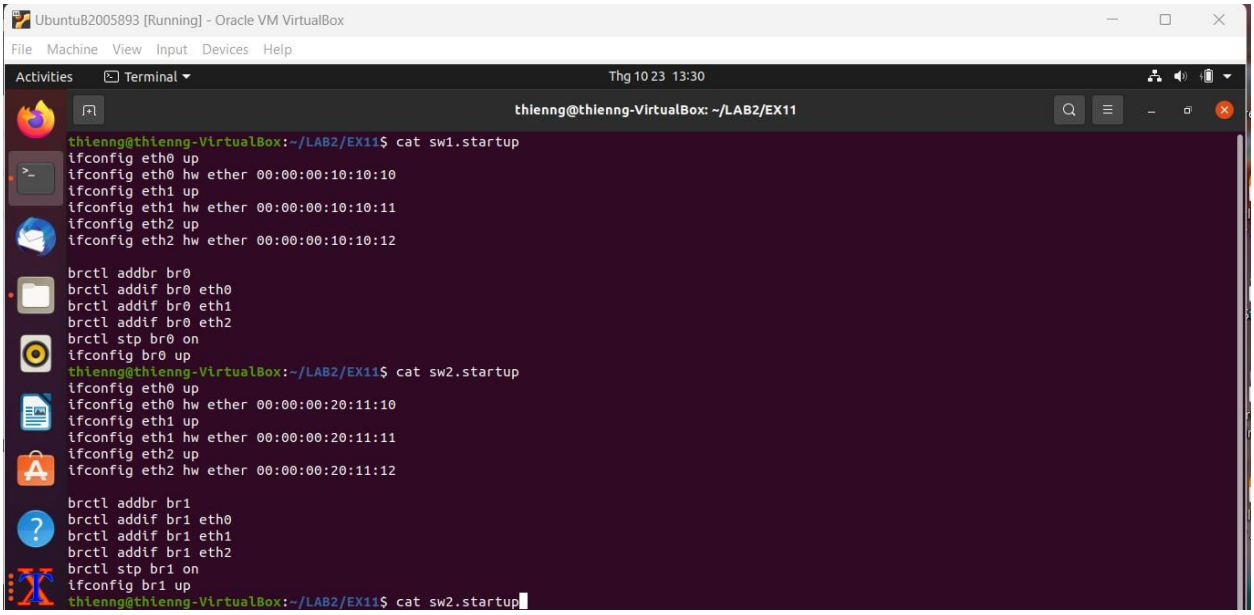
$ cat lab.conf

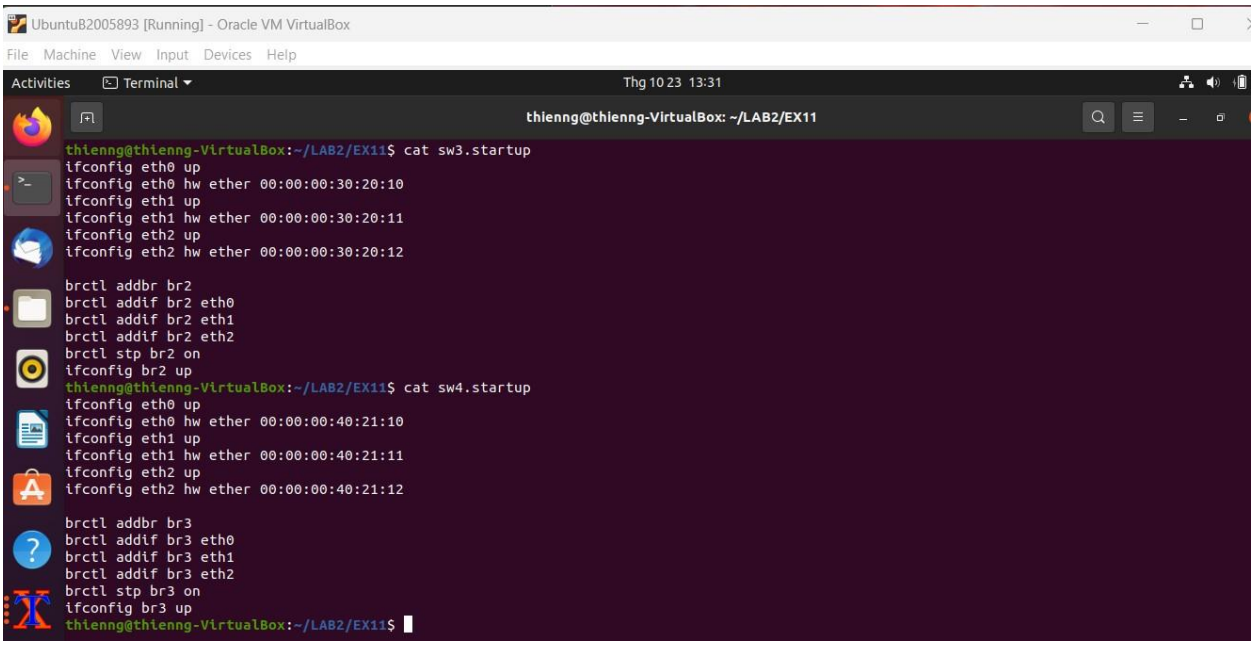


$ cat pc1.startup
$ cat pc2.startup
$ cat pc3.startup
$ cat pc4.startup
$ cat pc5.startup
$ cat pc6.startup
$ cat pc7.startup
$ cat pc8.startup
$ cat r1.startup
$ cat r2.startup
$ cat sw1.startup
$ cat sw2.startup
$ cat sw3.startup
$ cat sw4.startup

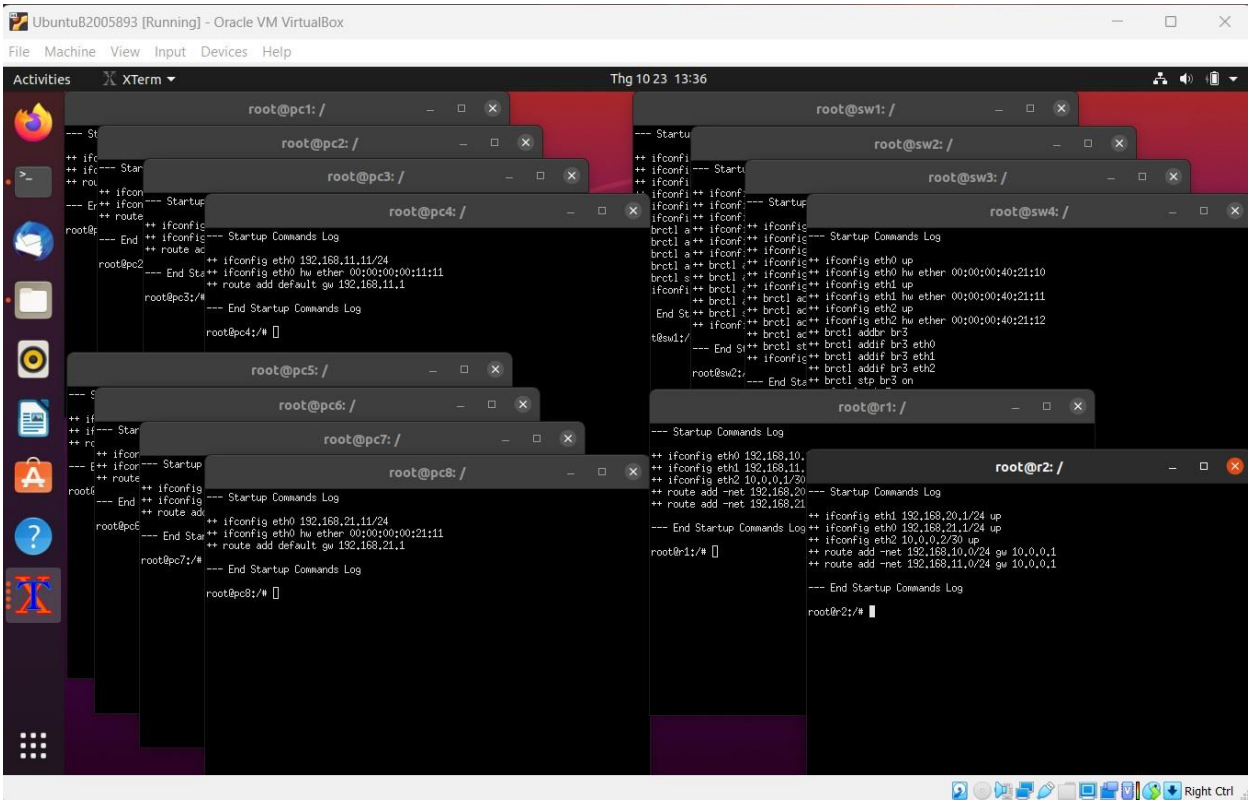

UbuntuB2005893 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Thg 10 23 13:29
thienng@thienng-VirtualBox: ~/LAB2/EX11
thienng@thienng-VirtualBox:~/LAB2/EX11$ cat pc1.startup
ifconfig eth0 192.168.10.10/24
ifconfig eth0 hw ether 00:00:00:00:10:10
route add default gw 192.168.10.1
thienng@thienng-VirtualBox:~/LAB2/EX11$ cat pc2.startup
ifconfig eth0 192.168.10.11/24
ifconfig eth0 hw ether 00:00:00:00:10:11
route add default gw 192.168.10.1
thienng@thienng-VirtualBox:~/LAB2/EX11$ cat pc3.startup
ifconfig eth0 192.168.11.10/24
ifconfig eth0 hw ether 00:00:00:00:11:10
route add default gw 192.168.11.1
thienng@thienng-VirtualBox:~/LAB2/EX11$ cat pc4.startup
ifconfig eth0 192.168.11.11/24
ifconfig eth0 hw ether 00:00:00:00:11:11
route add default gw 192.168.11.1
thienng@thienng-VirtualBox:~/LAB2/EX11$ cat pc5.startup
ifconfig eth0 192.168.20.10/24
ifconfig eth0 hw ether 00:00:00:00:20:10
route add default gw 192.168.20.1
thienng@thienng-VirtualBox:~/LAB2/EX11$ cat pc6.startup
ifconfig eth0 192.168.20.11/24
ifconfig eth0 hw ether 00:00:00:00:20:11
route add default gw 192.168.20.1
thienng@thienng-VirtualBox:~/LAB2/EX11$ cat pc7.startup
ifconfig eth0 192.168.21.10/24
ifconfig eth0 hw ether 00:00:00:00:21:10
route add default gw 192.168.21.1
thienng@thienng-VirtualBox:~/LAB2/EX11$ cat pc8.startup
ifconfig eth0 192.168.21.11/24
ifconfig eth0 hw ether 00:00:00:00:21:11
route add default gw 192.168.21.1
thienng@thienng-VirtualBox:~/LAB2/EX11$
Right Ctrl


UbuntuB2005893 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Thg 10 23 13:29
thienng@thienng-VirtualBox: ~/LAB2/EX11
thienng@thienng-VirtualBox:~/LAB2/EX11$ cat r1.startup
ifconfig eth0 192.168.10.1/24 up
ifconfig eth1 192.168.11.1/24 up
ifconfig eth2 10.0.0.1/30 up
route add -net 192.168.20.0/24 gw 10.0.0.2
route add -net 192.168.21.0/24 gw 10.0.0.2
thienng@thienng-VirtualBox:~/LAB2/EX11$ cat r2.startup
ifconfig eth1 192.168.20.1/24 up
ifconfig eth0 192.168.21.1/24 up
ifconfig eth2 10.0.0.2/30 up
route add -net 192.168.10.0/24 gw 10.0.0.1
route add -net 192.168.11.0/24 gw 10.0.0.1
thienng@thienng-VirtualBox:~/LAB2/EX11$ cat sw1.startup

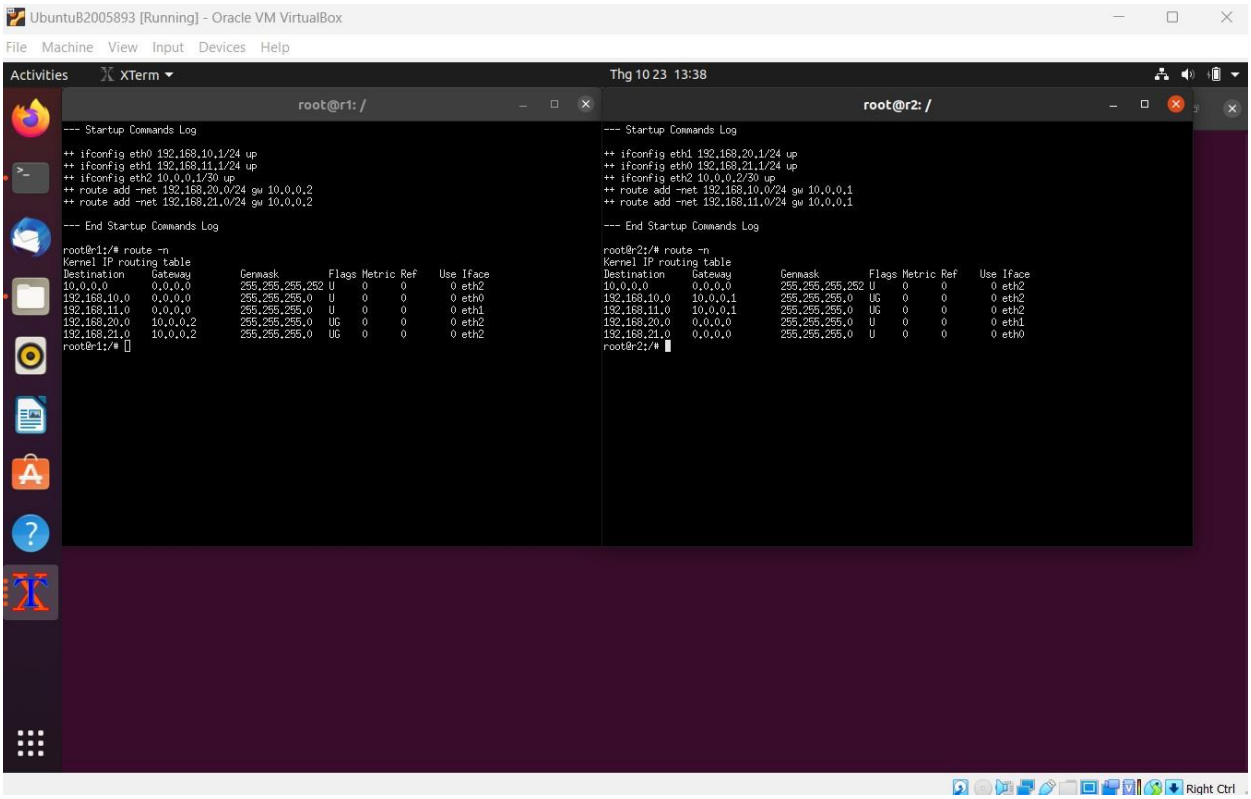

UbuntuB2005893 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Thg 10 23 13:30
thienng@thienng-VirtualBox: ~/LAB2/EX11
thienng@thienng-VirtualBox:~/LAB2/EX11$ cat sw1.startup
ifconfig eth0 up
ifconfig eth0 hw ether 00:00:00:10:10:10
ifconfig eth1 up
ifconfig 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
thienng@thienng-VirtualBox:~/LAB2/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
thienng@thienng-VirtualBox:~/LAB2/EX11$ cat sw2.startup


UbuntuB2005893 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Thg 10 23 13:31
thienng@thienng-VirtualBox: ~/LAB2/EX11
thienng@thienng-VirtualBox:~/LAB2/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
thienng@thienng-VirtualBox:~/LAB2/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
thienng@thienng-VirtualBox:~/LAB2/EX11$

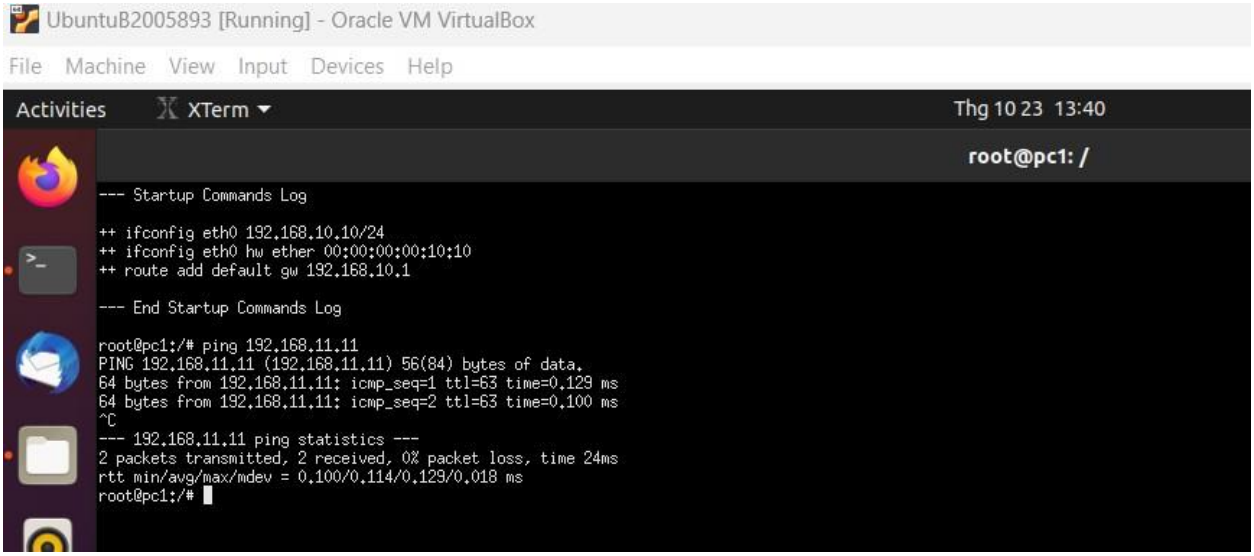
2. Start kathara
   $ sudo kathara lstart



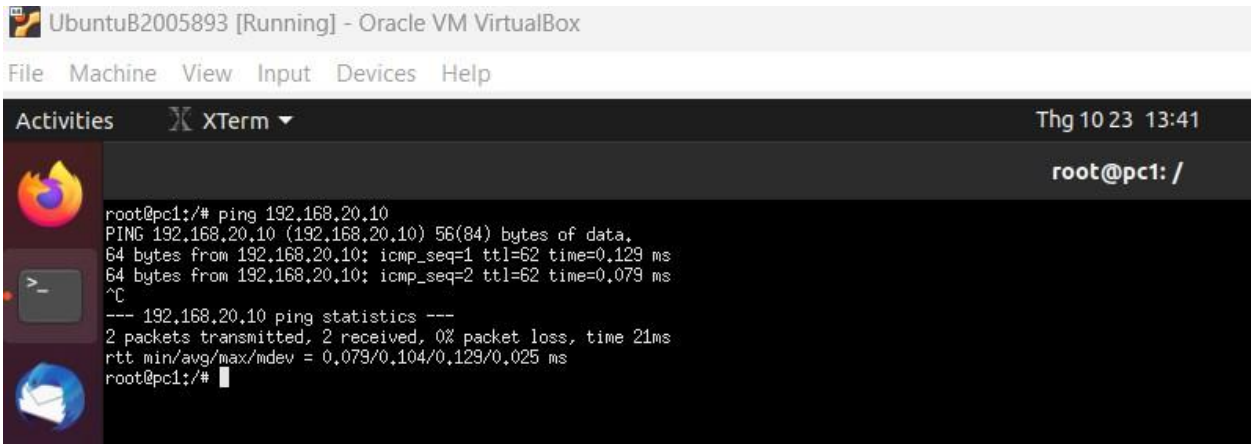
3. Routing tables of 2 routers
   On both routers: # route –n



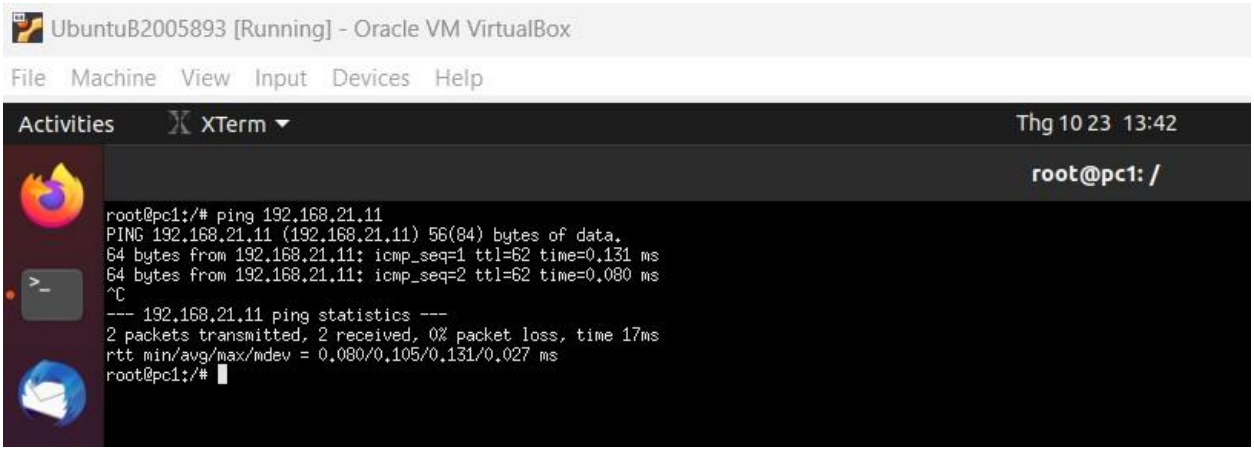
4. Test connectivity
   A. Ping from pc1 to pc4 of switch 2
      On pc1: # ping 192.168.11.11



   B. Ping from pc1 to pc5 of switch 3
      On pc1: ping 192.168.20.10



C. Ping from pc1 to pc8 of switch 4
On pc1: ping 192.168.21.11



5. Delete all VMs
$ sudo kathara wipe