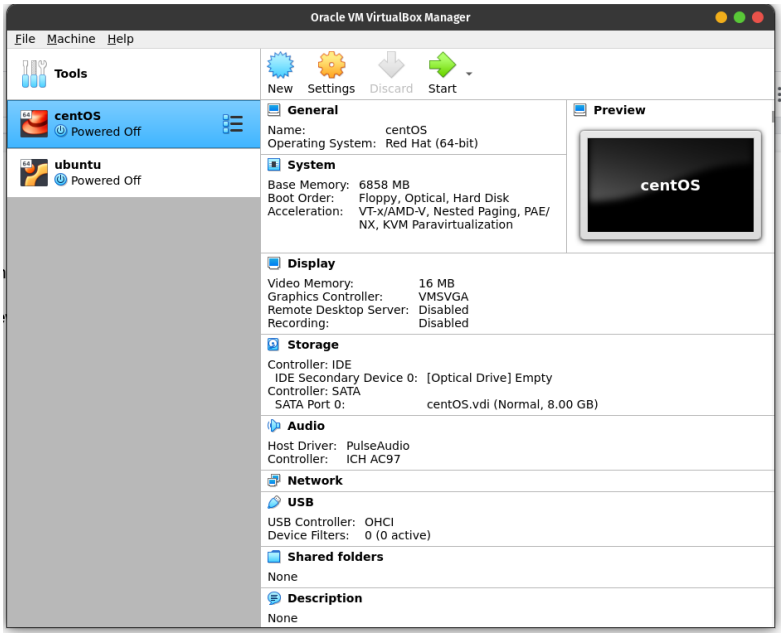
Qno1

New virtual machine centOS was created.



Qno1(a):

Firewalld was already installed in the system (centOS) by default, commands that can be used to install firewalld and check its status is:

- sudo yum install firewalld
- systemctl status firewalld

```
[rikesh@localhost ~]$ systemctl status firewalld
● firewalld.service - firewalld - dynamic firewall daemon
   Loaded: loaded (/usr/lib/systemd/system/firewalld.service; enabled; vendor preset: enabled)
   Active: active (running) since Tue 2021-11-02 07:37:03 EDT; 6min ago
     Docs: man:firewalld(1)
 Main PID: 695 (firewalld)
   CGroup: /system.slice/firewalld.service
           └─695 /usr/bin/python2 -Es /usr/sbin/firewalld --nofork --nopid

Nov 02 07:37:00 localhost.localdomain systemd[1]: Starting firewalld - dynamic firewall daemon...
Nov 02 07:37:03 localhost.localdomain systemd[1]: Started firewalld - dynamic firewall daemon.
Nov 02 07:37:04 localhost.localdomain firewalld[695]: WARNING: AllowZoneDrifting is enabled. Th...w.
Hint: Some lines were ellipsized, use -l to show in full.
[rikesh@localhost ~]$ _
```

Qno1(b)

To block certain IP addresses using firewalld following command was used:

- firewall-cmd --permanent --add-rich-rule=”rule family=’ipv4’ source address=’180.76.15.154’ reject”

```
[root@localhost rikesh]# firewall-cmd --permanent --add-rich-rule="rule family='ipv4' source address
='180.76.15.154' reject"
success
[root@localhost rikesh]# firewall-cmd --reload
success
[root@localhost rikesh]#
```

IP Address ‘180.76.15.154’ is taken as a sample.

To save the firewall rule permanently --permanent option is used in the command.

We have to reload firewalld after adding a permanent rule using the command:

- firewall-cmd --reload

Qno1(c)

To allow http, https and ssh connection using firewall, we use the following commands respectively:

- firewall-cmd --zone=public --add-service=http
- firewall-cmd --zone=public --add-service=https
- firewall-cmd --zone=public --add-service=ssh

The above rules will be removed after system reboot. We need to use the --permanent option to save the rules permanently as listed below:

- firewall-cmd --permanent --zone=public --add-service=http
- firewall-cmd --permanent --zone=public --add-service=https
- firewall-cmd --permanent --zone=public --add-service=ssh

```
[root@localhost rikesh]# firewall-cmd --zone=public --add-service=http
success
[root@localhost rikesh]# firewall-cmd --zone=public --add-service=https
success
[root@localhost rikesh]# firewall-cmd --zone=public --add-service=ssh
Warning: ALREADY_ENABLED: 'ssh' already in 'public'
success
[root@localhost rikesh]# firewall-cmd --permanent --zone=public --add-service=ssh
Warning: ALREADY_ENABLED: ssh
success
[root@localhost rikesh]# firewall-cmd --permanent --zone=public --add-service=https
success
[root@localhost rikesh]# firewall-cmd --permanent --zone=public --add-service=http
success
[root@localhost rikesh]#
```

Qno1(d)

TFTP rule was added to the Centos Firewall using the command:

- firewall-cmd --permanent --zone=public --add-service=tftp
- firewall-cmd --reload

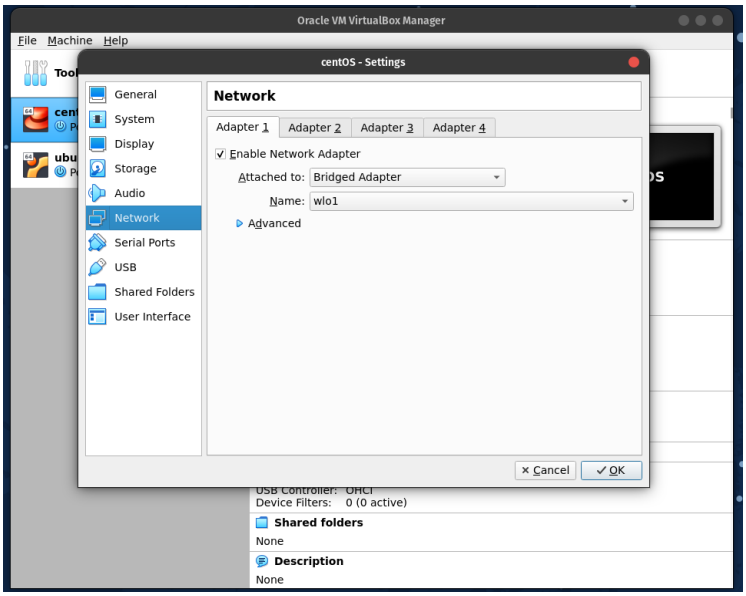
```
[root@localhost rikesh]# firewall-cmd --permanent --zone=public --add-service=tftp
success
[root@localhost rikesh]# firewall-cmd --reload
success
[root@localhost rikesh]# _
```

Trivial File Transfer Protocol is a simple lockstep File Transfer Protocol which allows a client to get a file from or put a file onto a remote host. One of its primary uses is in the early stages of nodes booting from a local area network. TFTP has been used for this application because it is very simple to implement.
So, I preferred adding this rule in the firewall.

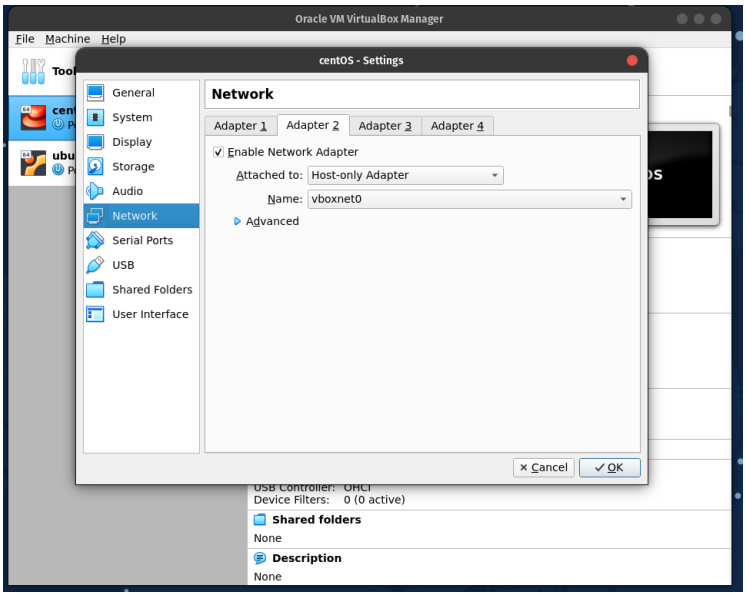
Qno2

Created the two virtual machines for this task. First virtual machine was Centos with two network interfaces where one behaves as WAN and another as LAN and the second virtual machine was Ubuntu where we attached the previously created LAN interface from VM1.

- ➔ In the first VM (centOS) we establish two network interfaces:
  - ◆ Bridged Adaptor (name: wlo1/ enp0s3)



  - ◆ Host-Only Adaptor (name: vboxnet0/ enp0s8)

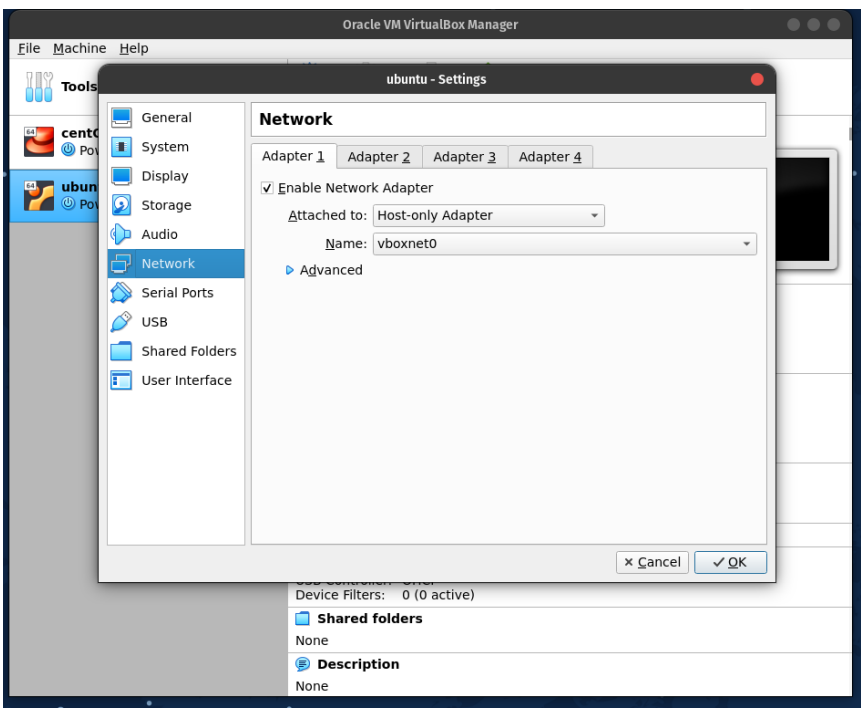


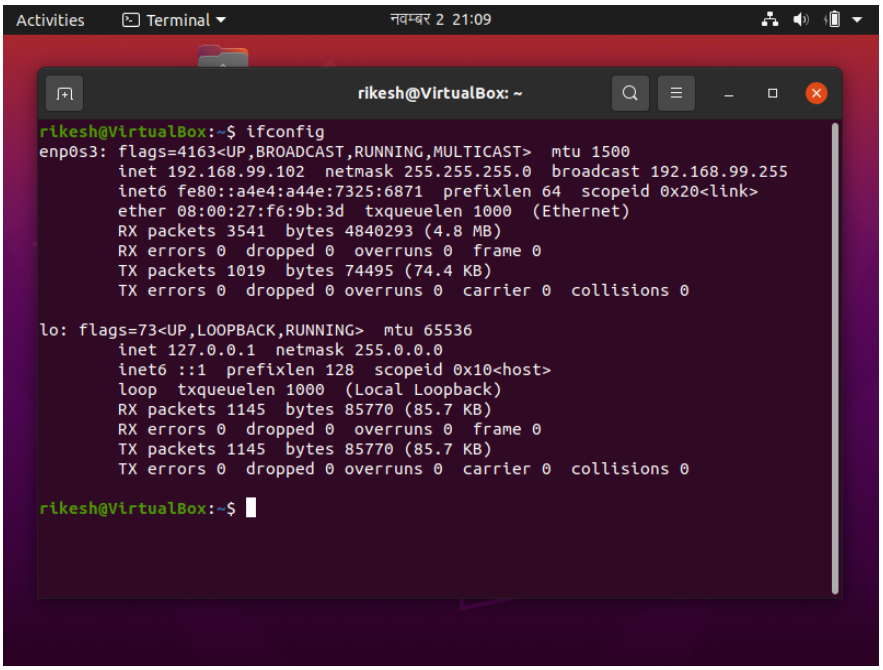
```
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.254.131  netmask 255.255.255.0  broadcast 192.168.254.255
        inet6 fe80::ad9:2f72:5ea:1261  prefixlen 64  scopeid 0x20<link>
        inet6 2407:5200:400:8f7b:ed5b:f53:a2aa:5742  prefixlen 64  scopeid 0x0<global>
        ether 08:00:27:7f:fe:72  txqueuelen 1000  (Ethernet)
        RX packets 48  bytes 6524 (6.3 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 88  bytes 10501 (10.2 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

enp0s8: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.99.101  netmask 255.255.255.0  broadcast 192.168.99.255
        inet6 fe80::2ab2:2701:2cce:861a  prefixlen 64  scopeid 0x20<link>
        ether 08:00:27:c6:23:9f  txqueuelen 1000  (Ethernet)
        RX packets 19  bytes 5875 (5.7 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 23  bytes 4237 (4.1 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

virbr0: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        inet 192.168.122.1  netmask 255.255.255.0  broadcast 192.168.122.255
        ether 52:54:00:79:82:c4  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

[rikesh@localhost ~]$ _
```

enp0s3 = 192.168.254.131
enp0s8 = 192.168.99.101

➔ Again on the second VM (Ubuntu) we establish another network interface:

- ◆ Host-Only Adaptor (name: vboxnet0/ enp0s3)

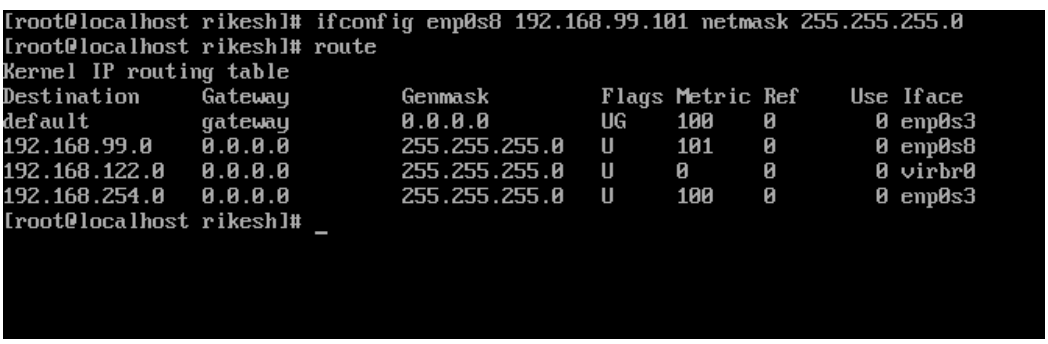




enp0s3 = 192.168.99.102

➔ Now we configure *enp0s8* on VM1(centOS) using the following commands:

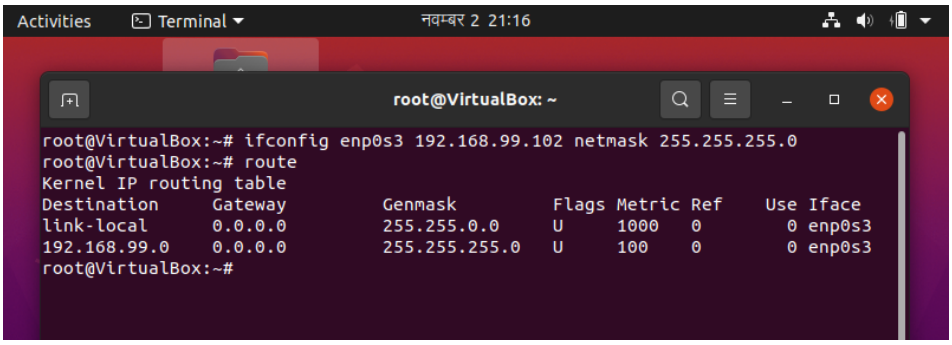
- ifconfig enp0s8 192.168.99.101 netmask 255.255.255.0
- route



After using the route command we can see the IP routing table. From the above table the network ‘192.168.254.0’ is the network that we are using for internet access (enp0s3 card of VM1) and the network ‘192.168.99.0’ represents the network that links out VM1(centOS) with VM2(Ubuntu) using the enp0s8 card of VM1.

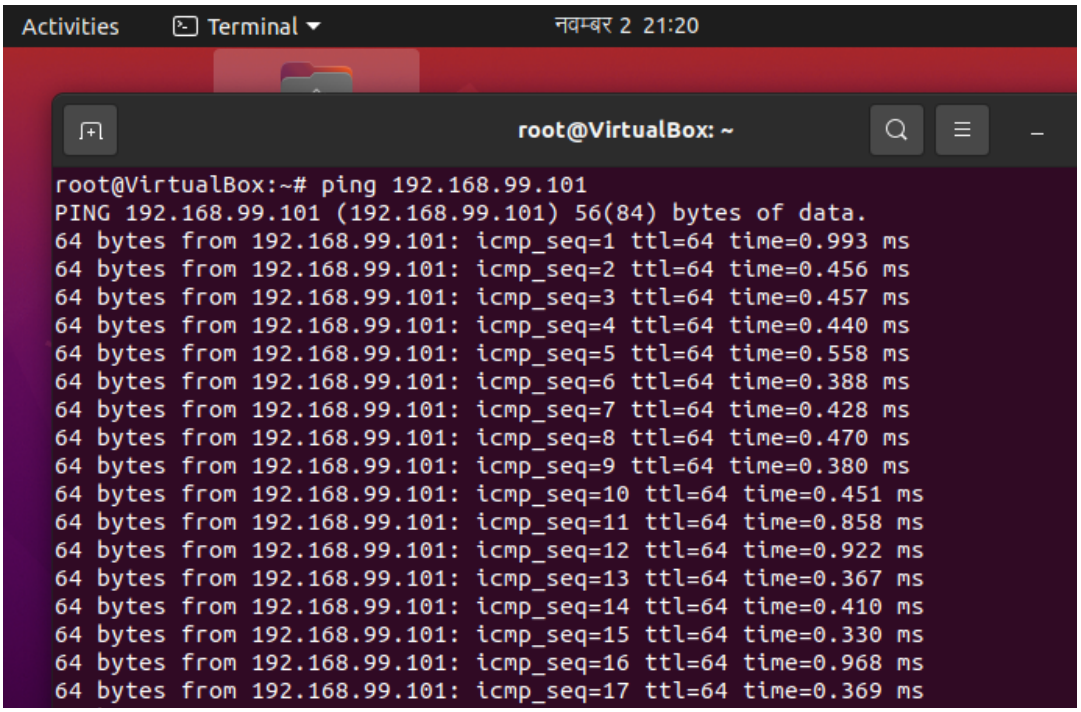
➔ Now we configure *enp0s3* on VM2(Ubuntu) using the following commands:

- ifconfig enp0s3 192.168.99.102 netmask 255.255.255.0
- route



After using the route we can see the IP routing table. Here the network '192.168.99.0' represents the network that links VM2(Ubuntu) with VM1(centOS) using the enp0s3 card of VM2.

➔ Now lets ping VM1(Centos) to VM2(Ubuntu) and vice versa to verify the connection between VM1 and VM2:



The IP address '192.168.99.101' belongs to VM1(CentOS).

```
[root@localhost rikesh]# ping 192.168.99.102
PING 192.168.99.102 (192.168.99.102) 56(84) bytes of data.
64 bytes from 192.168.99.102: icmp_seq=1 ttl=64 time=0.595 ms
64 bytes from 192.168.99.102: icmp_seq=2 ttl=64 time=0.397 ms
64 bytes from 192.168.99.102: icmp_seq=3 ttl=64 time=0.412 ms
64 bytes from 192.168.99.102: icmp_seq=4 ttl=64 time=0.808 ms
64 bytes from 192.168.99.102: icmp_seq=5 ttl=64 time=0.372 ms
64 bytes from 192.168.99.102: icmp_seq=6 ttl=64 time=0.398 ms
64 bytes from 192.168.99.102: icmp_seq=7 ttl=64 time=0.370 ms
64 bytes from 192.168.99.102: icmp_seq=8 ttl=64 time=0.348 ms
64 bytes from 192.168.99.102: icmp_seq=9 ttl=64 time=0.361 ms
64 bytes from 192.168.99.102: icmp_seq=10 ttl=64 time=0.367 ms
64 bytes from 192.168.99.102: icmp_seq=11 ttl=64 time=0.369 ms
64 bytes from 192.168.99.102: icmp_seq=12 ttl=64 time=0.340 ms
64 bytes from 192.168.99.102: icmp_seq=13 ttl=64 time=0.438 ms
64 bytes from 192.168.99.102: icmp_seq=14 ttl=64 time=0.794 ms
64 bytes from 192.168.99.102: icmp_seq=15 ttl=64 time=0.822 ms
64 bytes from 192.168.99.102: icmp_seq=16 ttl=64 time=0.389 ms
64 bytes from 192.168.99.102: icmp_seq=17 ttl=64 time=0.366 ms
64 bytes from 192.168.99.102: icmp_seq=18 ttl=64 time=0.958 ms
64 bytes from 192.168.99.102: icmp_seq=19 ttl=64 time=0.908 ms
64 bytes from 192.168.99.102: icmp_seq=20 ttl=64 time=0.406 ms
64 bytes from 192.168.99.102: icmp_seq=21 ttl=64 time=0.951 ms
64 bytes from 192.168.99.102: icmp_seq=22 ttl=64 time=0.445 ms
64 bytes from 192.168.99.102: icmp_seq=23 ttl=64 time=0.354 ms
64 bytes from 192.168.99.102: icmp_seq=24 ttl=64 time=0.429 ms
```

The IP address ‘192.168.99.102’ belongs to VM2(Ubuntu).

➔ Now we configure VM2(Ubuntu) to use enp0s8 from VM1(CentOS) using following command:

- route add default gw 192.168.99.101
- route

```
Activities   Terminal   नवम्बर 2 21:23
root@VirtualBox: ~
root@VirtualBox:~# route add default gw 192.168.99.101
root@VirtualBox:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
default         _gateway        0.0.0.0         UG    0      0        0 enp0s3
link-local      0.0.0.0         255.255.0.0     U     1000   0        0 enp0s3
192.168.99.0    0.0.0.0         255.255.255.0   U     100    0        0 enp0s3
root@VirtualBox:~#
```

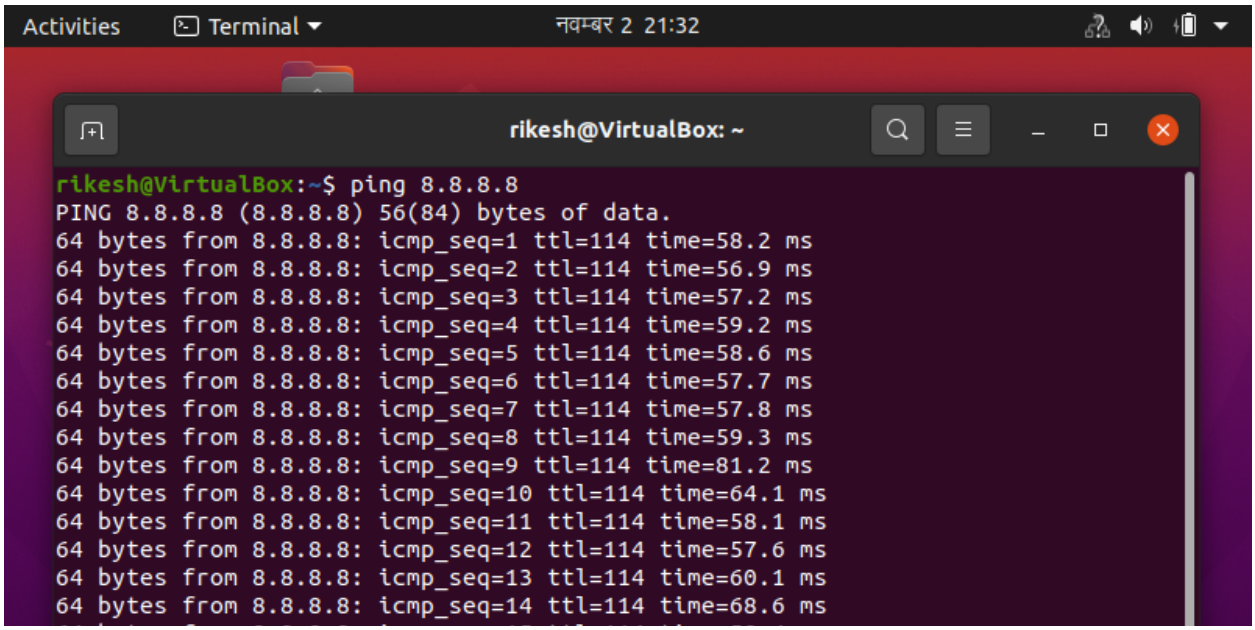
➔ Finally we can share the connection between VM1(CentOS) and VM2(Ubuntu) using the following commands:

- modprobe iptable_nat
- echo 1 > /proc/sys/net/ipv4/ip_forward
- iptables -t nat -A POSTROUTING -o enp0s3 -j MASQUERADE
- iptables -A FORWARD -i enp0s8 -j ACCEPT

```
[root@localhost rikesh]# modprobe iptable_nat
[root@localhost rikesh]# echo 1 > /proc/sys/net/ipv4/ip_forward
[root@localhost rikesh]# iptables -t nat -A POSTROUTING -o enp0s3 -j MASQUERADE
[root@localhost rikesh]# iptables -A FORWARD -i enp0s8 -j ACCEPT
[root@localhost rikesh]#
```

We have established a proper connection between VM1 and VM2 sharing the internet connection from CentOS to Ubuntu through NAT. This process can be verified by executing the following ping command in the terminal of VM2(Ubuntu):

- ping 8.8.8.8



‘8.8.8.8’ is one of the public DNS servers from Google.