

Lab No : 01

Name of the Lab : Network configuration , Routing table & Virtual interfaces

ID : IT-17017

1. Introduction :

If you have a network that ranges from 192.168.1.0 to 192.168.1.255 explain why individual devices in the network can only be assigned IP addresses in the range of 192.168.1.1 to 192.168.1.254.

Ans:

Ipv4-addresses are internally 32 bits, they're often divided into 4 groups of 8 bits. An octet can only be variety from 0 – 255, so as that leaves 256 possibilities for that last number. All addresses within the range of 192.168.1.0 to 192.168.1.255 are within an equivalent network. There are only 254 possibilities for variety . The addresses 192.168.1.0 and 192.168.1.255 are reserved for the network. 192.168.1.0, is reserved for the “network address.”

192.168.1.255, is that the “broadcast” address.

In an IP address, you've some dedicated to the network and a few of the address dedicated to the hosts. during a /24 network, meaning the first 3 octets are for the network.

192.168.1.0 is that the subsequent in binary:

11000000.10101000.00000001.00000000

A /24 subnet mask in binary looks like this:

11111111.11111111.11111111.00000000

In decimal, this is: 255.255.255.0.

so the first usable address is 192.168.1.1 and thus the last is 192.168.1.254.

Since all devices within the network need to have unique addresses meaning that you simply simply can have 254 devices therein network.

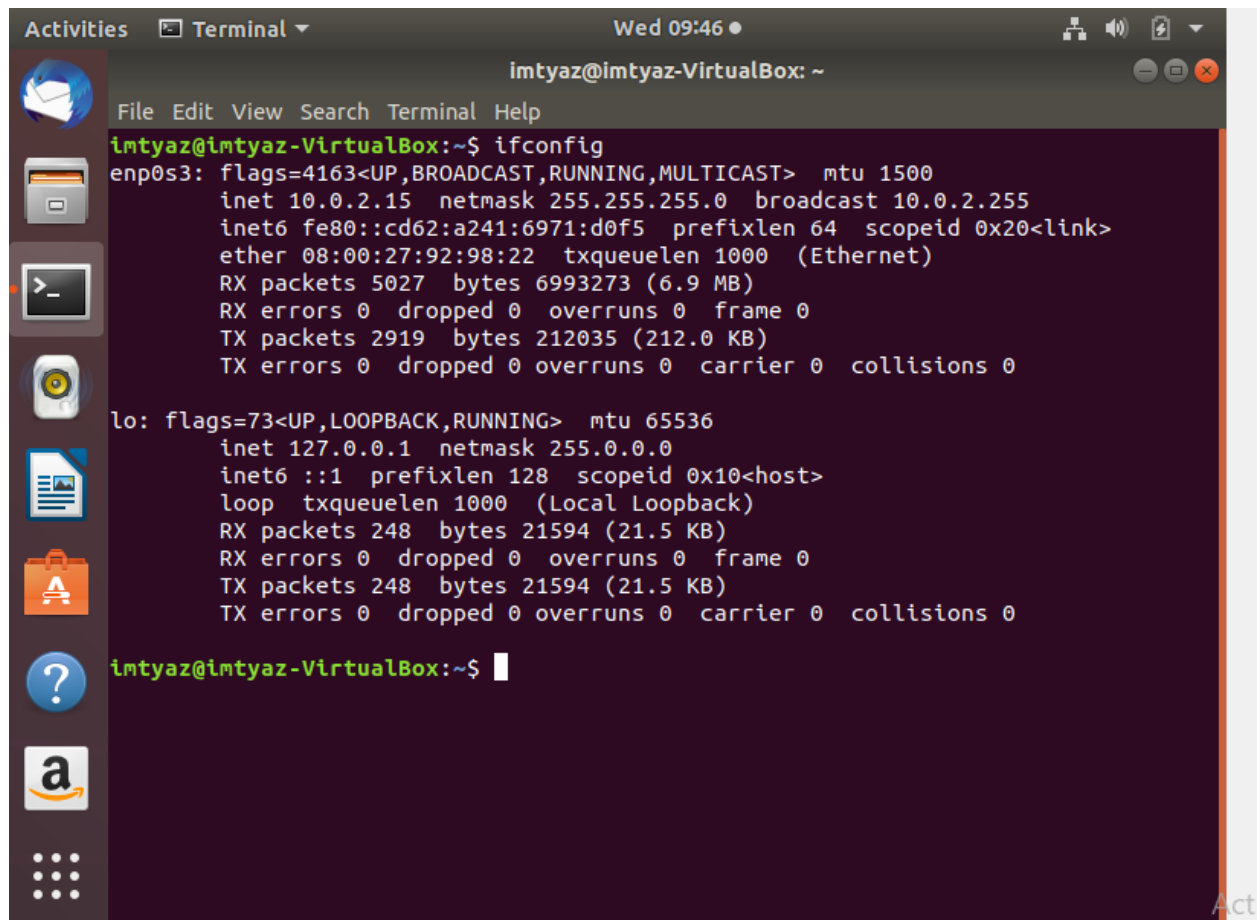
2. Find IP and MAC :

Write down the IP and MAC address of your computer ?

Ans:

IP address : 103.126.108.71

Physical address (MAC): 10-F0-05-7D-1F-7C



```
imtyaz@imtyaz-VirtualBox:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.2.15 netmask 255.255.255.0 broadcast 10.0.2.255
    inet6 fe80::cd62:a241:6971:d0f5 prefixlen 64 scopeid 0x20<link>
    ether 08:00:27:92:98:22 txqueuelen 1000 (Ethernet)
    RX packets 5027 bytes 6993273 (6.9 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 2919 bytes 212035 (212.0 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

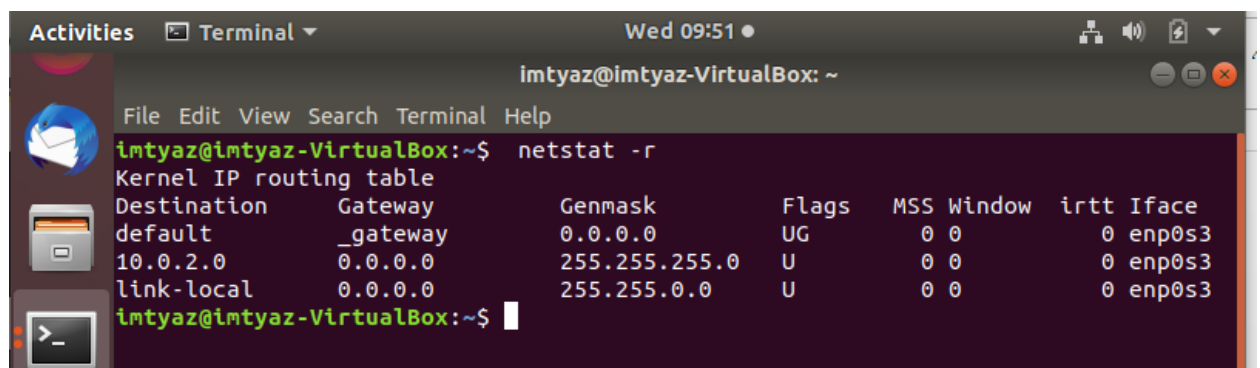
lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 248 bytes 21594 (21.5 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 248 bytes 21594 (21.5 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

imtyaz@imtyaz-VirtualBox:~$
```

3. Routing Table Basics :

Enter the command : “\$ netstat -r “ to print my computer’s routing table.

Ans:



```
imtyaz@imtyaz-VirtualBox:~$ netstat -r
Kernel IP routing table
Destination        Gateway            Genmask           Flags        MSS Window  irtt  Iface
default            _gateway          0.0.0.0           UG           0  0        0    enp0s3
10.0.2.0           0.0.0.0           255.255.255.0     U            0  0        0    enp0s3
link-local         0.0.0.0           255.255.0.0       U            0  0        0    enp0s3

imtyaz@imtyaz-VirtualBox:~$
```

The output of the kernel routing table is organized in the following columns:

- **Destination** : The destination network or destination host.

- **Gateway** : The gateway address or $\hat{\text{a}}\text{€}^{\text{TM}}*\hat{\text{a}}\text{€}^{\text{TM}}$ if none set.
- **Genmask** : The netmask for the destination net; 255.255.255.255 for a host destination and 0.0.0.0 for the default route.
- **Flags** : Possible flags include
 - U (route is up)
 - H (target is a host)
 - G (use gateway)
 - R (reinstate route for dynamic routing)
 - D (dynamically installed by daemon or redirect)
 - M (modified from routing daemon or redirect)
 - A (installed by addrconf)
 - C (cache entry)
 - ! (reject route)
- **MSS** : Default maximum segment size for TCP connections over this route.
- **Window** : Default window size for TCP connections over this route.
- **irtt** : Initial RTT (Round Trip Time). The kernel uses this to guess about the best TCP protocol parameters without waiting on (possibly slow) answers.
- **Iface** : Interface to which packets for this route will be sent.

4. Virtual interfaces :

a) Create a new virtual interface with the following IP address , 192.168.2.32 and netmask 255.255.255.0 then check to see if the interface was created successfully?

Ans:

```

Activities  Terminal  Thu 01:33
imtyaz@imtyaz-VirtualBox: ~
File Edit View Search Terminal Help
imtyaz@imtyaz-VirtualBox:~$ sudo ifconfig enp0s3 192.168.2.32 netmask 255.255.2
55.0
[sudo] password for imtyaz:
imtyaz@imtyaz-VirtualBox:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
    inet 192.168.2.32 netmask 255.255.255.0  broadcast 192.168.2.255
    inet6 fe80::cd62:a241:6971:d0f5 prefixlen 64 scopeid 0x20<link>
    ether 08:00:27:92:98:22 txqueuelen 1000 (Ethernet)
    RX packets 122  bytes 28362 (28.3 KB)
    RX errors 0  dropped 0  overruns 0  frame 0
    TX packets 317  bytes 33146 (33.1 KB)
    TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0

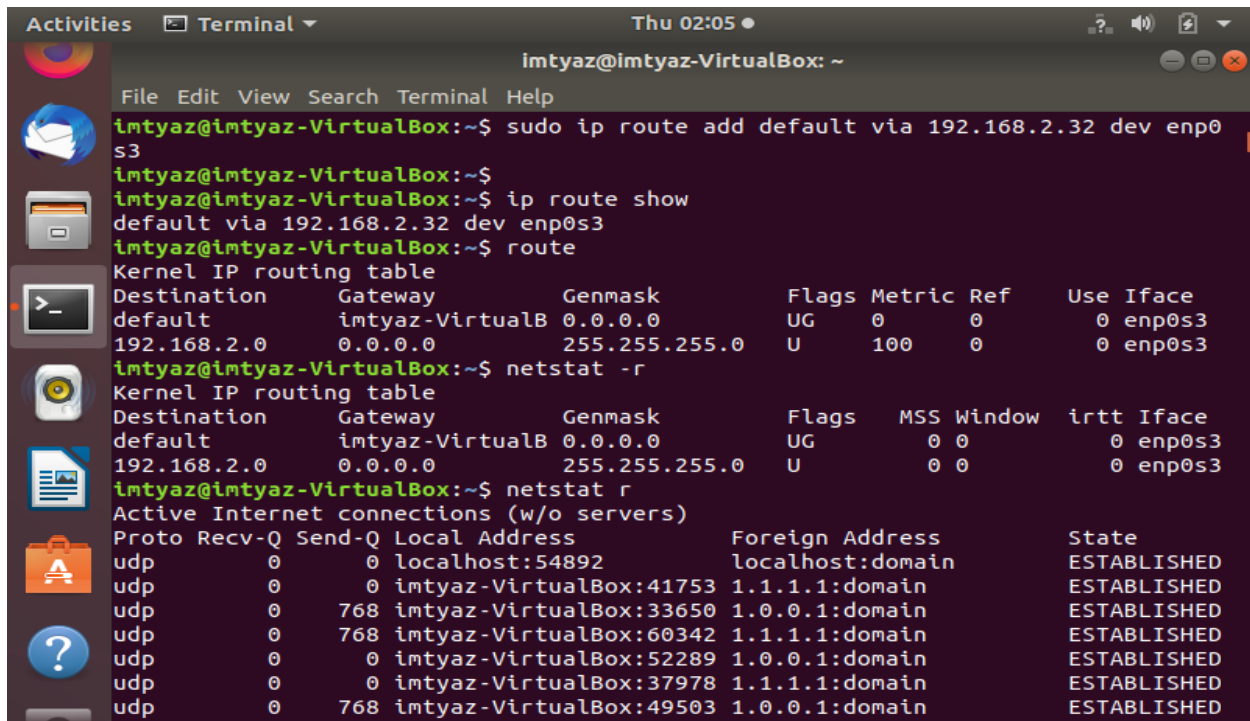
lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 291  bytes 25328 (25.3 KB)
    RX errors 0  dropped 0  overruns 0  frame 0
    TX packets 291  bytes 25328 (25.3 KB)
    TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0

imtyaz@imtyaz-VirtualBox:~$

```

b) You need to set up a route for this interface so that your computer can see it. Issue the needed command, then issue the “\$ netstat -r” command and check if the route to your added interface is visible?

Ans:



```
imtyaz@imtyaz-VirtualBox: ~  
File Edit View Search Terminal Help  
imtyaz@imtyaz-VirtualBox:~$ sudo ip route add default via 192.168.2.32 dev enp0s3  
imtyaz@imtyaz-VirtualBox:~$  
imtyaz@imtyaz-VirtualBox:~$ ip route show  
default via 192.168.2.32 dev enp0s3  
imtyaz@imtyaz-VirtualBox:~$ route  
Kernel IP routing table  
Destination      Gateway          Genmask          Flags Metric Ref    Use Iface  
default          imtyaz-VirtualB 0.0.0.0          UG    0      0      0 enp0s3  
192.168.2.0      0.0.0.0          255.255.255.0    U     100    0      0 enp0s3  
imtyaz@imtyaz-VirtualBox:~$ netstat -r  
Kernel IP routing table  
Destination      Gateway          Genmask          Flags  MSS  Window  irtt Iface  
default          imtyaz-VirtualB 0.0.0.0          UG      0    0        0 enp0s3  
192.168.2.0      0.0.0.0          255.255.255.0    U      0    0        0 enp0s3  
imtyaz@imtyaz-VirtualBox:~$ netstat -r  
Active Internet connections (w/o servers)  
Proto Recv-Q Send-Q Local Address          Foreign Address         State  
udp        0      0 localhost:54892         localhost:domain        ESTABLISHED  
udp        0      0 imtyaz-VirtualBox:41753 1.1.1.1:domain          ESTABLISHED  
udp        0    768 imtyaz-VirtualBox:33650 1.0.0.1:domain          ESTABLISHED  
udp        0    768 imtyaz-VirtualBox:60342 1.1.1.1:domain          ESTABLISHED  
udp        0      0 imtyaz-VirtualBox:52289 1.0.0.1:domain          ESTABLISHED  
udp        0      0 imtyaz-VirtualBox:37978 1.1.1.1:domain          ESTABLISHED  
udp        0    768 imtyaz-VirtualBox:49503 1.0.0.1:domain          ESTABLISHED
```

c) Next remove the route for this interface ?

Ans :

Command for removing the route ---

```
sudo route del -net 0.0.0.0 gw 192.168.2.32 netmask 0.0.0.0 dev enp0s3
```

```
Activities Terminal Thu 02:14
imtyaz@imtyaz-VirtualBox: ~
File Edit View Search Terminal Help
imtyaz@imtyaz-VirtualBox:~$ route -n
Kernel IP routing table
Destination Gateway Genmask Flags Metric Ref Use Iface
0.0.0.0 192.168.2.32 0.0.0.0 UG 0 0 0 enp0s3
192.168.2.0 0.0.0.0 255.255.255.0 U 100 0 0 enp0s3
imtyaz@imtyaz-VirtualBox:~$ sudo route del -0.0.0.0 gw 192.168.2.32 netmask 0.0
.0.0 dev enp0s3
[sudo] password for imtyaz:
route: invalid option -- '0'
route: invalid option -- '.'
route: invalid option -- '0'
route: invalid option -- '.'
route: invalid option -- '0'
route: invalid option -- '.'
route: invalid option -- '0'
Usage: route [-nNvee] [-FC] [<AF>] List kernel routing tables
route [-v] [-FC] {add|del|flush} ... Modify routing table for AF.
route {-h|--help} [<AF>] Detailed usage syntax for specific AF.
route {-V|--version} Display version/author and exit.
-v, --verbose be verbose
-n, --numeric don't resolve names
-e, --extend display other/more information
-F, --fib display Forwarding Information Base (default)
-C, --cache display routing cache instead of FIB
```

d) Then remove the interface completely .

Ans :

Command for removing the interface completely ----

Sudo ifconfig enp0s3 down

```
Activities Terminal Thu 03:50
imtyaz@imtyaz-VirtualBox: ~
File Edit View Search Terminal Help
imtyaz@imtyaz-VirtualBox:~$ sudo ifconfig enp0s3 down
[sudo] password for imtyaz:
imtyaz@imtyaz-VirtualBox:~$ ifconfig
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 2586 bytes 247486 (247.4 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 2586 bytes 247486 (247.4 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
imtyaz@imtyaz-VirtualBox:~$
```

5. Add a New Network

- a) Enter the command needed to add another network with the same values as your primary network meaning.
- b) Assign the default gateway for newly added network (Your default Gateway Address):
- c) Look for your newly added network in your routing table by issuing the “`$ netstat -r`” command.
- d) Now remove your changes meaning the double routing table setup for your primary network. First issue the command needed to delete your newly added route then issue the command to delete your newly added default gateway.

6) Multinetwork scenario configuration :

You should now set up a working routing table for a multi-network scenario. Assume that you have two network cards available connected to two different LANs. The destination of the first network is, 10.0.2.0 with netmask 255.0.0.0 and the second, 192.168.1.0 with netmask 255.255.255.0. Furthermore, a firewall is assumed to exist between the two networks, where network card eth0 is attached to the 10.0.2.0 network and eth1 is attached to the 192.168.1.0 network. To forward packets on the internet the firewall needs to route packets from the 10.0.2.0 network through the 192.168.1.0 network. The firewall system must be set up with two IP addresses, 10.0.2.1 on eth0 and 192.168.1.25 on eth1. The gateway to the internet on the 192.168.1.0 network should be 192.168.1.1.

Provide the necessary commands to route on the firewall/router system.

- a) Assign the firewall IP addresses to eth1 and eth2.
- b) Add the routes for the networks, i.e., 192.168.1.0 on eth1 and 10.0.2.0 on eth0
- c) Assign the internet gateway (meaning: 192.168.1.1) as the default gateway.
- d) Enter the necessary commands in order for packets belonging to computers in the 10.0.2.0 network to be routed to the 192.168.1.0 network and the internet. In other words this should tell each computer on the 10.0.2.0, which the default gateway is, i.e., your firewall/router. You do not need to be worried about the route back configuration it is enough to assign the proper default gateway for the 10.0.2.0 network.