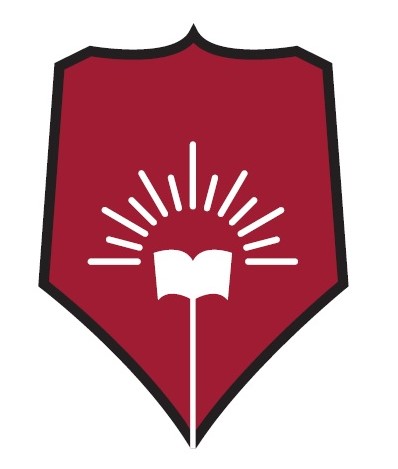
**Experiment No.: 7**

**Enabling IP forwarding using**

**IPtables in Linux **

**Aim:**  Perform packet filtering by enabling IP forwarding using IPtables in Linux.

1. Set up multiple IP addresses on a single LAN.
2. Using nestat and route commands of Linux, do the following:
   * View current routing table
   * Add and delete routes
   * Change default gateway

**Theory:**

First, let us find the IP address of the network card. In my Ubuntu 15.10 server, I use only one network card.

Run the following command to find out the IP address:

sudo ip addr

**Sample output:**

1: lo: <LOOPBACK,UP,LOWER\_UP> mtu 65536 qdisc noqueue state UNKNOWN group default

link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00

inet 127.0.0.1/8 scope host lo

valid\_lft forever preferred\_lft forever

inet6 ::1/128 scope host

valid\_lft forever preferred\_lft forever

2: **enp0s3**: <BROADCAST,MULTICAST,UP,LOWER\_UP> mtu 1500 qdisc pfifo\_fast state UP group default qlen 1000

link/ether 08:00:27:2a:03:4b brd ff:ff:ff:ff:ff:ff

inet **192.168.1.103/24** brd 192.168.1.255 scope global enp0s3

valid\_lft forever preferred\_lft forever

inet6 fe80::a00:27ff:fe2a:34e/64 scope link

valid\_lft forever preferred\_lft forever

Or

sudo ifconfig

**Sample output:**

**enp0s3** Link encap:Ethernet HWaddr 08:00:27:2a:03:4b

inet addr:**192.168.1.103** Bcast:192.168.1.255 Mask:255.255.255.0

inet6 addr: fe80::a00:27ff:fe2a:34e/64 Scope:Link

UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1

RX packets:186 errors:0 dropped:0 overruns:0 frame:0

TX packets:70 errors:0 dropped:0 overruns:0 carrier:0

collisions:0 txqueuelen:1000

RX bytes:21872 (21.8 KB) TX bytes:9666 (9.6 KB)

lo Link encap:Local Loopback

inet addr:127.0.0.1 Mask:255.0.0.0

inet6 addr: ::1/128 Scope:Host

UP LOOPBACK RUNNING MTU:65536 Metric:1

RX packets:217 errors:0 dropped:0 overruns:0 frame:0

TX packets:217 errors:0 dropped:0 overruns:0 carrier:0

collisions:0 txqueuelen:0

RX bytes:38793 (38.7 KB) TX bytes:38793 (38.7 KB)

As you see in the above output, my network card name is **enp0s3**, and its IP address is **192.168.1.103**.

Now let us add an additional IP address, for example **192.168.1.104**, to the Interface card.

Open your Terminal and run the following command to add additional IP.

sudo ip addr add 192.168.1.104/24 dev enp0s3

Now, let us check if the IP is added using command:

sudo ip address show enp0s3

**Sample output:**

2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER\_UP> mtu 1500 qdisc pfifo\_fast state UP group default qlen 1000

link/ether 08:00:27:2a:03:4e brd ff:ff:ff:ff:ff:ff

inet 192.168.1.103/24 brd 192.168.1.255 scope global enp0s3

valid\_lft forever preferred\_lft forever

inet **192.168.1.104/24** scope global secondary enp0s3

valid\_lft forever preferred\_lft forever

inet6 fe80::a00:27ff:fe2a:34e/64 scope link

valid\_lft forever preferred\_lft forever

Similarly, you can add as many IP addresses as you want.

Let us ping the IP address to verify it.

sudo ping 192.168.1.104

**Sample output:**

PING 192.168.1.104 (192.168.1.104) 56(84) bytes of data.

64 bytes from 192.168.1.104: icmp\_seq=1 ttl=64 time=0.901 ms

64 bytes from 192.168.1.104: icmp\_seq=2 ttl=64 time=0.571 ms

64 bytes from 192.168.1.104: icmp\_seq=3 ttl=64 time=0.521 ms

64 bytes from 192.168.1.104: icmp\_seq=4 ttl=64 time=0.524 ms

### To check the routing table

**Command*:***nestat -rn

$ netstat -rn

Kernel IP routing table

Destination Gateway Genmask Flags MSS Window irtt Iface

0.0.0.0 192.168.0.1 0.0.0.0 UG 0 0 0 wlan0

192.168.0.0 0.0.0.0 255.255.255.0 U 0 0 0 wlan0

### Adding route

sudo route add -net 192.168.3.0 gw 192.168.1.1 netmask 255.255.255.0 dev eth0

### Deleting route

sudo route del -net 192.168.3.0 gw 192.168.1.1 netmask 255.255.255.0 dev eth0

### A quick way to add default route

route add default gw 192.168.1.1

### A  quick way to delete defualt route

route del default gw 192.168.1.1

1. **Output Analysis:**

(Students should write output analysis based on the working of different topology and different networking devices used in simulation. Specify each scenario explicitly with output analysis)

1. **Additional Learning:**

(Students should write additional learning on their own based on what additionally they learnt after performing the experiment)

1. **Conclusion :**

(Students should write conclusion on their own)

1. **Viva Questions:**

* State the header format of DLL, IP, TCP and UDP and put values of one the packet that you have captured using Wireshark
* Explain how layers are interrelated.

1. **References:**
   1. A.S. Tanenbaum, “Computer Networks”, Pearson Education, (4e).
   2. B.A. Forouzan, “Data Communications and Networking”, TMH (5e).
2. James F. Kurose & K W Ross: Computer Networking: A Top Down Approach, Pearson Education (LPE).