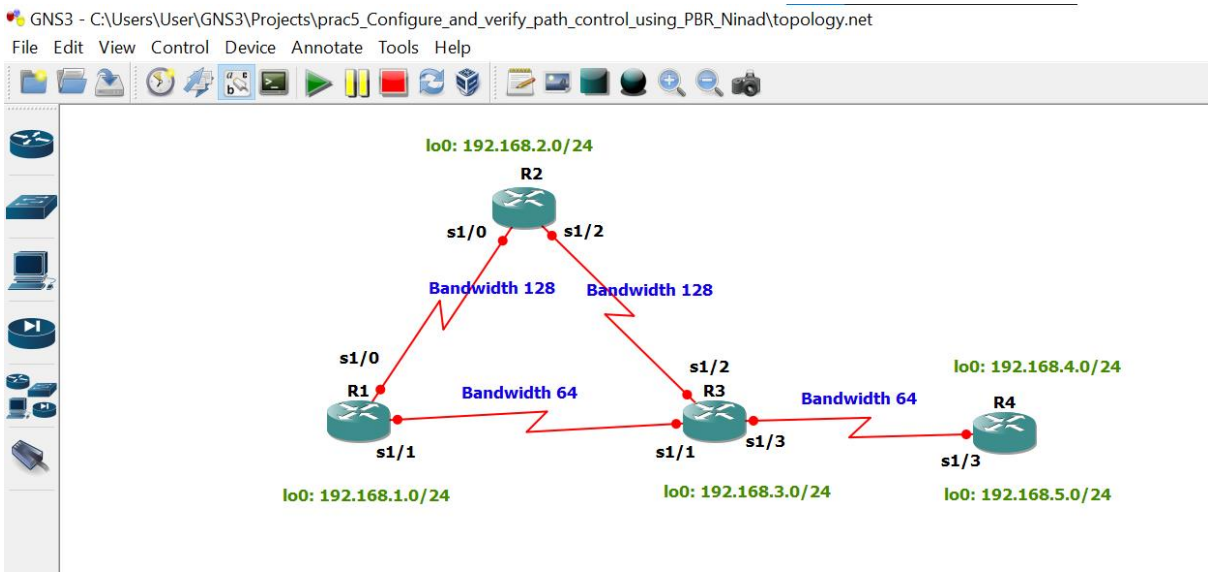
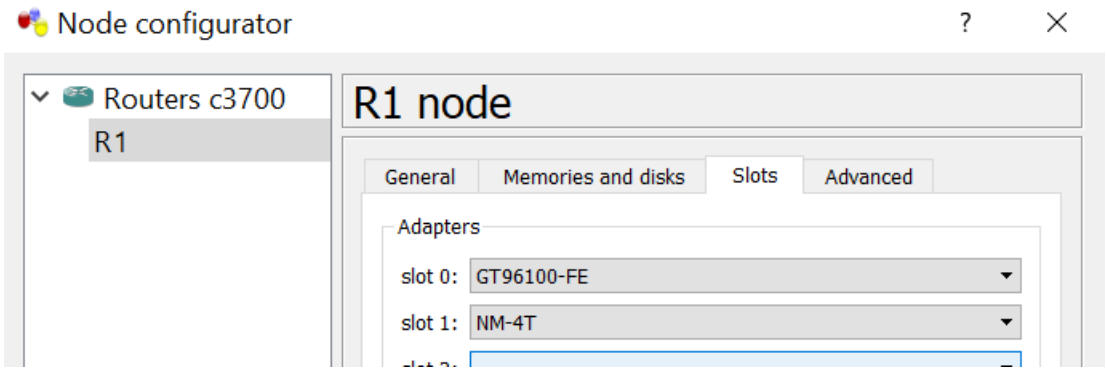
Practical No: 5 Ninad Karlekar 22306A1012 Date: 18/04/2023

Aim: Configure and verify path control using PBR (Policy Based Routing).



Take 4 routers -> Configure -> slots -> NM-4T



STEP 1: Perform IP configuration

On router 1 console

R1#conf t
R1(config)#hostname r1

```
R1#conf t
Enter configuration commands,
R1(config)#hostname r1
r1(config)#
```

r1(config)#int s1/0
r1(config-if)#ip add 172.16.12.1 255.255.255.0
r1(config-if)#bandwidth 128
r1(config-if)#no sh

```
r1(config)#
r1(config)#int s1/0
r1(config-if)#ip add 172.16.12.1 255.255.255.0
r1(config-if)#bandwidth 128
r1(config-if)#no sh
r1(config-if)#
```

r1(config-if)#int s1/1
r1(config-if)#ip add 172.16.13.1 255.255.255.0
r1(config-if)#bandwidth 64
r1(config-if)#no sh

```
r1(config-if)#
r1(config-if)#int s1/1
r1(config-if)#no sh
*Mar  1 00:05:22.339: %LINEPROTO-5-UPDOWN: Line p
down
r1(config-if)#ip add 172.16.13.1 255.255.255.0
r1(config-if)#bandwidth 64
r1(config-if)#no sh
r1(config-if)#
```

r1(config-if)#int lo0
r1(config-if)#ip add 192.168.1.1 255.255.255.0

r1(config-if)#do sh ip int br | include up

```
down
r1(config-if)#int lo0
r1(config-if)#ip ad
*Mar  1 00:06:47.047: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, cha
r1(config-if)#ip add 192.168.1.1 255.255.255.0
r1(config-if)#
r1(config-if)#do sh ip int br | include up
Serial1/0                  172.16.12.1     YES manual up                    down
Serial1/1                  172.16.13.1     YES manual up                    down
Loopback0                  192.168.1.1     YES manual up                    up
r1(config-if)#
```

On router 2 console

R2#conf t
R2(config)#hostname r2

```
R2#
R2#conf t
Enter configuration commands, one pe
R2(config)#hostname r2
r2(config)#
```

r2(config)#
r2(config)#int s1/0
r2(config-if)#ip add 172.16.12.2 255.255.255.0
r2(config-if)#bandwidth 128
r2(config-if)#no sh
r2(config-if)#

```
r2(config)#
r2(config)#int s1/0
r2(config-if)#ip add 172.16.12.2 255.255.255.0
r2(config-if)#bandwidth 128
r2(config-if)#no sh
r2(config-if)#
```

r2(config-if)#int s1/2
r2(config-if)#ip add 172.16.23.2 255.255.255.0
r2(config-if)#bandwidth 128
r2(config-if)#no sh
r2(config-if)#

```
r2(config-if)#
r2(config-if)#int s1/2
r2(config-if)#ip add 172.16.23.2 255.255.255.0
r2(config-if)#bandwidth 128
r2(config-if)#no sh
r2(config-if)#
```

r2(config-if)#int lo0
r2(config-if)#ip add 192.168.2.2 255.255.255.0
r2(config-if)#
r2(config-if)#do sh ip int br | include up

```
r2(config-if)#int lo0
r2(config-if)#
*Mar  1 00:16:58.211: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, cha
r2(config-if)#ip add
*Mar  1 00:17:02.759: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/2, cha
r2(config-if)#ip add 192.168.2.2 255.255.255.0
r2(config-if)#
r2(config-if)#do sh ip int br | include up
Serial1/0                  172.16.12.2     YES manual up                    up
Serial1/2                  172.16.23.2     YES manual up                    down
Loopback0                  192.168.2.2     YES manual up                    up
r2(config-if)#
r2(config-if)#
```

On router 3 console

R3#conf t
R3(config)#hostname r3
r3(config)#

```
R3#
R3#conf t
Enter configuration commands,
R3(config)#hostname r3
r3(config)#
```

r3(config)#int s1/1
r3(config-if)#ip add 172.16.13.3 255.255.255.0
r3(config-if)#bandwidth 64
r3(config-if)#no sh
r3(config-if)#

```
r3(config)#
r3(config)#int s1/1
r3(config-if)#ip add 172.16.13.3 255.255.255.0
r3(config-if)#bandwidth 64
r3(config-if)#no sh
r3(config-if)#
```

r3(config-if)#int s1/2
r3(config-if)#ip add 172.16.23.3 255.255.255.0
r3(config-if)#bandwidth 128
r3(config-if)#no sh
r3(config-if)#

```
r3(config-if)#
r3(config-if)#int s1/2
r3(config-if)#ip add 172.16.23.3 255.255.255.0
r3(config-if)#bandwidth 128
r3(config-if)#no sh
r3(config-if)#
```

r3(config-if)#int s1/3
r3(config-if)#ip add 172.16.34.3 255.255.255.0
r3(config-if)#bandwidth 64
r3(config-if)#no sh
r3(config-if)#

```
r3(config-if)#
r3(config-if)#int s1/3
r3(config-if)#ip add 172.16.34.3 255.255.255.0
r3(config-if)#bandwidth 64
r3(config-if)#no sh
r3(config-if)#
```

r3(config-if)#int lo0
r3(config-if)#ip add 192.168.3.3 255.255.255.0
r3(config-if)#
r3(config-if)#do sh ip int br | include up

```
r3(config-if)#int lo0
r3(config-if)#ip a
*Mar  1 00:27:31.031: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, cha
r3(config-if)#ip add 192.168.3.3 255.255.255.0
r3(config-if)#
r3(config-if)#do sh ip int br | include up
Serial1/1                  172.16.13.3     YES manual up                    up
Serial1/2                  172.16.23.3     YES manual up                    up
Serial1/3                  172.16.34.3     YES manual up                    down
Loopback0                  192.168.3.3     YES manual up                    up
r3(config-if)#
```

On router 4 console

R4#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R4(config)#hostname r4
r4(config)#

```
R4#
R4#conf t
Enter configuration commands, one per
R4(config)#hostname r4
r4(config)#
```

r4(config)#int s1/3
r4(config-if)#ip add 172.16.34.4 255.255.255.0
r4(config-if)#bandwidth 64
r4(config-if)#no sh
r4(config-if)#

```
r4(config)#
r4(config)#int s1/3
r4(config-if)#ip add 172.16.34.4 255.255.255.0
r4(config-if)#bandwidth 64
r4(config-if)#no sh
r4(config-if)#
```

r4(config-if)#int lo0
r4(config-if)#ip add 192.168.4.1 255.255.255.0
r4(config-if)#
r4(config-if)#int lo1
r4(config-if)#ip add 192.168.4.1 255.255.255.0
r4(config-if)#ip add 192.168.5.1 255.255.255.0
r4(config-if)#
r4(config-if)#do sh ip int br | include up

```
r4(config-if)#
r4(config-if)#int lo0
r4(config-if)#ip add
*Mar  1 00:31:06.559: %LINEPROTO-5-UPDOWN: Line pro
r4(config-if)#ip add 192.168.4.1 255.255.255.0
r4(config-if)#
```

```
r4(config-if)#
r4(config-if)#int lo1
r4(config-if)#ip add 192.168.4.1 255.255.255.0
*Mar  1 00:31:38.855: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback1, ch
r4(config-if)#ip add 192.168.5.1 255.255.255.0
r4(config-if)#
r4(config-if)#do sh ip int br | include up
Serial1/3                  172.16.34.4     YES manual up                    up
Loopback0                  192.168.4.1     YES manual up                    up
Loopback1                  192.168.5.1     YES manual up                    up
r4(config-if)#
```

STEP 2 : Configure eigrp on all routers

On router 1 console

r1(config)#router eigrp 1

r1(config-router)#network 172.16.12.0 0.0.0.255
r1(config-router)#network 172.16.13.0 0.0.0.255
r1(config-router)#network 192.168.1.0
r1(config-router)#no auto-summary

```
r1(config-if)#exit
r1(config)#
r1(config)#router eigrp 1
r1(config-router)#network 172.16.12.0 0.0.0.255
r1(config-router)#network 172.16.13.0 0.0.0.255
r1(config-router)#network 192.168.1.0
r1(config-router)#no auto-summary
r1(config-router)#
r1(config-router)#
*Mar  1 00:42:43.707: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 1: Neighbo
```

On router 2 console

r2(config)#router eigrp 1
r2(config-router)#network 172.16.12.0 0.0.0.255
r2(config-router)#
r2(config-router)#network 172.16.23.0 0.0.0.255
r2(config-router)#network 192.168.2.0
r2(config-router)#no auto-summary

```
r2(config)#
r2(config)#router eigrp 1
r2(config-router)#network 172.16.12.0 0.0.0.255
r2(config-router)#
*Mar  1 00:44:06.927: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 1: Neighb
r2(config-router)#network 172.16.23.0 0.0.0.255
r2(config-router)#network 192.168.2.0
r2(config-router)#no auto-summary
r2(config-router)#
r2(config-router)#
*Mar  1 00:44:54.415: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 1: Neighb
```

On router 3 console

r3(config-if)#router eigrp 1
r3(config-router)#network 172.16.13.0 0.0.0.255
r3(config-router)#network 172.16.13.0 0.0.0.255
r3(config-router)#network 172.16.23.0 0.0.0.255
r3(config-router)#network 172.16.34.0 0.0.0.255
r3(config-router)#network 192.168.3.0
r3(config-router)#no auto-summary

```
r3(config-if)#
r3(config-if)#router eigrp 1
r3(config-router)#network 172.16.13.0 0.0.0.255
r3(config-router)#network 172.16.13.0 0.0.0.255
*Mar  1 00:45:23.543: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 1: Neighbor 172.16
r3(config-router)#network 172.16.23.0 0.0.0.255
r3(config-router)#
*Mar  1 00:45:32.191: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 1: Neighbor 172.16
r3(config-router)#network 172.16.34.0 0.0.0.255
r3(config-router)#network 192.168.3.0
r3(config-router)#no auto-summary
r3(config-router)#
*Mar  1 00:46:07.631: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 1: Neighbor 172.16
```

On router 4 console

r4(config)#router eigrp 1
r4(config-router)#network 172.16.34.0 0.0.0.255
r4(config-router)#
r4(config-router)#network 192.168.4.0
r4(config-router)#network 192.168.5.0
r4(config-router)#no auto-summary

```
r4(config)#
r4(config)#router eigrp 1
r4(config-router)#network 172.16.34.0 0.0.0.255
r4(config-router)#
*Mar  1 00:44:34.247: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 1: Neig
r4(config-router)#network 192.168.4.0
r4(config-router)#network 192.168.5.0
r4(config-router)#no auto-summary
r4(config-router)#
```

STEP 3: Command on all routers

do sh ip route

r4(config)#do ping 192.168.1.1

```
r4(config)#
r4(config)#do ping 192.168.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 44/66/96 ms
r4(config)#
r4(config)#
```

r1(config)#do ping 192.168.4.1

```
r1(config)#
r1(config)#do ping 192.168.4.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.4.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 60/61/64 ms
r1(config)#
r1(config)#
```

R4

r4(config)#do traceroute 192.168.1.1 source 192.168.4.1
r4(config)#
r4(config)#do traceroute 192.168.1.1 source 192.168.5.1

```
r4(config)#
r4(config)#do traceroute 192.168.1.1 source 192.168.4.1

Type escape sequence to abort.
Tracing the route to 192.168.1.1

  1 172.16.34.3 32 msec 28 msec 28 msec
  2 172.16.23.2 60 msec 60 msec 64 msec
  3 172.16.12.1 72 msec 88 msec 80 msec
r4(config)#
r4(config)#
```

```
  3 172.16.12.1 72 msec 88 msec 80 msec
r4(config)#
r4(config)#do traceroute 192.168.1.1 source 192.168.5.1

Type escape sequence to abort.
Tracing the route to 192.168.1.1

  1 172.16.34.3 12 msec 48 msec 24 msec
  2 172.16.23.2 68 msec 52 msec 68 msec
  3 172.16.12.1 56 msec 88 msec 68 msec
r4(config)#
r4(config)#
```

Configure PBR to provide path control

- All traffic from source 192.168.5.1 should take route R4 -> R3 -> R1
- All traffic from source 192.168.4.1 should take route R4 -> R3 -> R2 -> R1

On router 3 console

r3(config)#ip access-list standard pbr-acl
r3(config-std-nacl)#permit 192.168.5.0 0.0.0.255
r3(config-std-nacl)#exit
r3(config)#
r3(config)#
r3(config)#route-map r3-to-r1 permit

r3(config-route-map)#match ip address pbr-acl
r3(config-route-map)#
r3(config-route-map)#set ip next-hop 172.16.13.1
r3(config-route-map)#exit
r3(config)#
r3(config)#int s1/3
r3(config-if)#ip policy route-map r3-to-r1
r3(config-if)#end

```
r3(config)#ip access-list standard pbr-acl
r3(config-std-nacl)#permit 192.168.5.0 0.0.0.255
r3(config-std-nacl)#exit
```

```
r3(config)#route-map r3-to-r1 permit
r3(config-route-map)#match ip address pbr-acl
r3(config-route-map)#
r3(config-route-map)#set ip next-hop 172.16.13.1
r3(config-route-map)#exit
r3(config)#
r3(config)#int s1/3
r3(config-if)#ip policy route-map r3-to-r1
r3(config-if)#end
r3#
```

On router 4 console

r4(config)#do traceroute 192.168.1.1 source 192.168.4.1
r4(config)#do traceroute 192.168.1.1 source 192.168.5.1

```
r4(config)#do traceroute 192.168.1.1 source 192.168.4.1

Type escape sequence to abort.
Tracing the route to 192.168.1.1

  1 172.16.34.3 36 msec 44 msec 28 msec
  2 172.16.23.2 28 msec 44 msec 48 msec
  3 172.16.12.1 84 msec 64 msec 92 msec
r4(config)#
r4(config)#do traceroute 192.168.1.1 source 192.168.5.1

Type escape sequence to abort.
Tracing the route to 192.168.1.1

  1 172.16.34.3 20 msec 28 msec 32 msec
  2 172.16.13.1 32 msec 60 msec 64 msec
r4(config)#
r4(config)#
r4(config)#Ninad Karlekar 22306A1012
           ^
% Invalid input detected at '^' marker.
```