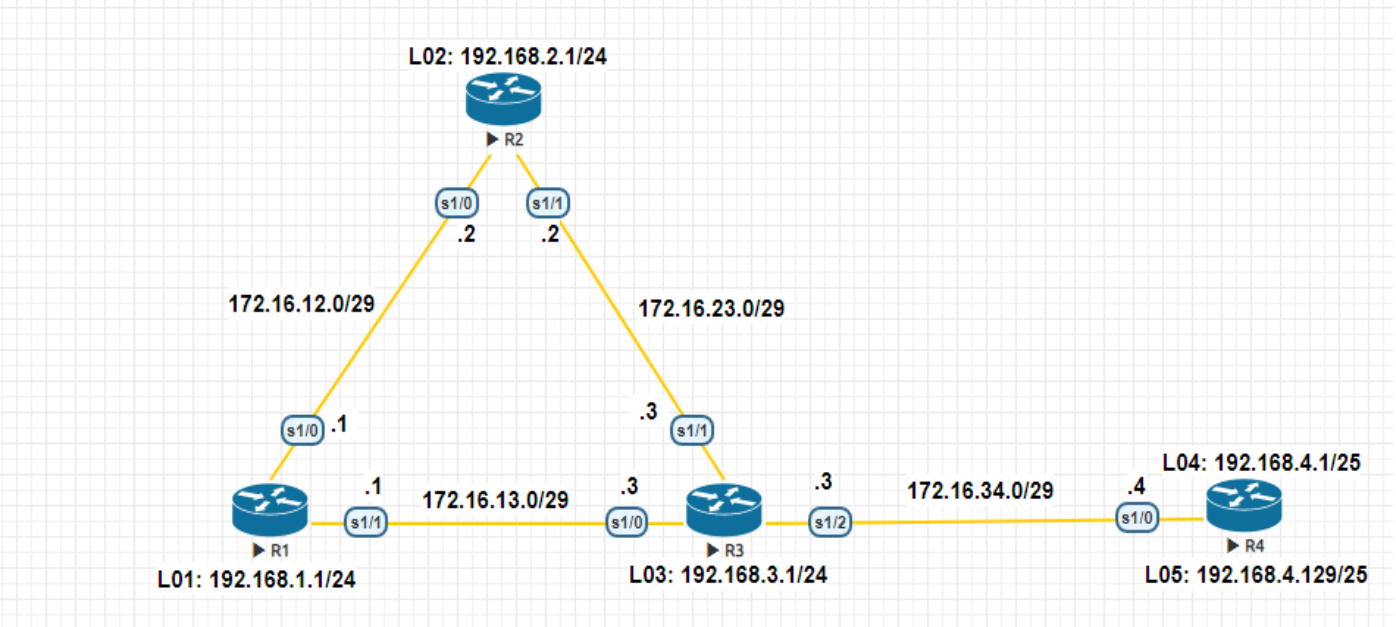
PRACTICAL NO 5: Configure and Verify Path Control Using PBR

NETWORK TOPOLOGY



TASKS

- Configure and verify policy-based routing.
- Select the required tools and commands to configure policy-based routing operations.
- Verify the configuration and operation by using the proper show and debug commands

R1

Router>enable

Router#conf t

```
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname R1
R1(config)#interface Lo1
R1(config-if)#ip address 192.168.1.1 255.255.255.0
R1(config-if)#exit
R1(config)#interface s1/0
R1(config-if)#ip address 172.16.12.1 255.255.255.248
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#interface s1/1
R1(config-if)#ip address 172.16.13.1 255.255.255.248
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#router eigrp 100
R1(config-router)#network 192.168.1.0
R1(config-router)#network 172.16.12.0
R1(config-router)#network 172.16.13.0
R1(config-router)#no auto-summary
R1(config-router)#exit


R1#sh ip eigrp neighbors
EIGRP-IPv4 Neighbors for AS(100)
H   Address                 Interface       Hold Uptime   SRTT   RTO  Q  Seq
                                            (sec)         (ms)       Cnt Num
1   172.16.13.3             Se1/1            14 00:04:43   11   100  0  10
```

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0   172.16.12.2          Se1/0                12 00:07:05   19   114  0  8
R1#sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
       a - application route
       + - replicated route, % - next hop override

Gateway of last resort is not set

     172.16.0.0/16 is variably subnetted, 6 subnets, 2 masks
C       172.16.12.0/29 is directly connected, Serial1/0
L       172.16.12.1/32 is directly connected, Serial1/0
C       172.16.13.0/29 is directly connected, Serial1/1
L       172.16.13.1/32 is directly connected, Serial1/1
D       172.16.23.0/29 [90/2681856] via 172.16.13.3, 00:08:31, Serial1/1
                       [90/2681856] via 172.16.12.2, 00:08:31, Serial1/0
D       172.16.34.0/29 [90/2681856] via 172.16.13.3, 00:08:31, Serial1/1
     192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.1.0/24 is directly connected, Loopback1
L       192.168.1.1/32 is directly connected, Loopback1
D     192.168.2.0/24 [90/2297856] via 172.16.12.2, 00:08:31, Serial1/0
```

D 192.168.3.0/24 [90/2297856] via 172.16.13.3, 00:08:31, Serial1/1

192.168.4.0/25 is subnetted, 2 subnets

D 192.168.4.0 [90/2809856] via 172.16.13.3, 00:05:15, Serial1/1

D 192.168.4.128 [90/2809856] via 172.16.13.3, 00:05:15, Serial1/1

R2

```
Router>enable
Router#conf t
Router(config)#hostname R2
R2(config)#interface Lo2
R2(config-if)#ip address 192.168.2.1 255.255.255.0
R2(config-if)#exit
R2(config)#interface s1/0
R2(config-if)#ip address 172.16.12.2 255.255.255.248
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#interface s1/1
R2(config-if)#ip address 172.16.23.2 255.255.255.248
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#router eigrp 100
R2(config-router)#network 192.168.2.0
R2(config-router)#network 172.16.12.0
R2(config-router)#network 172.16.23.0
R2(config-router)#no auto-summary

R2#sh ip eigrp neighbors
```

EIGRP-IPv4 Neighbors for AS(100)

H	Address	Interface	Hold	Uptime	SRTT	RTO	Q	Seq
			(sec)		(ms)		Cnt	Num
1	172.16.23.3	Se1/1	12	00:05:23	12	100	0	11
0	172.16.12.1	Se1/0	12	00:07:45	22	132	0	8

R3

```
Router>enable
Router#conf t
Router(config)#hostname R3
R3(config)#interface Lo3
R3(config-if)#ip address 192.168.3.1 255.255.255.0
R3(config-if)#exit
R3(config)#interface s1/0
R3(config-if)#ip address 172.16.13.3 255.255.255.248
R3(config-if)#no shutdown
R3(config-if)#exit
R3(config)#interface s1/1
R3(config-if)#ip address 172.16.23.3 255.255.255.248
R3(config-if)#no shutdown
R3(config-if)#exit
R3(config)#interface s1/2
R3(config-if)#ip address 172.16.34.3 255.255.255.248
R3(config-if)#no shutdown
R3(config-if)#exit
R3(config)#router eigrp 100
```

R3(config-router)#network 192.168.3.0

R3(config-router)#network 172.16.13.0

R3(config-router)#network 172.16.23.0

R3(config-router)#network 172.16.34.0

R3(config-router)#no auto-summary

R3#sh ip eigrp neighbors

EIGRP-IPv4 Neighbors for AS(100)

H	Address	Interface	Hold (sec)	Uptime	SRTT (ms)	RTO	Q Cnt	Seq Num
2	172.16.34.4	Se1/2	14	00:03:09	15	100	0	3
1	172.16.13.1	Se1/0	14	00:06:25	21	126	0	9
0	172.16.23.2	Se1/1	13	00:06:25	20	120	0	9

R3#sh ip route

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2

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      ia - IS-IS inter area, * - candidate default, U - per-user static route
      o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
      a - application route
      + - replicated route, % - next hop override

Gateway of last resort is not set

     172.16.0.0/16 is variably subnetted, 7 subnets, 2 masks
D       172.16.12.0/29 [90/2681856] via 172.16.23.2, 00:16:48, Serial1/1
                       [90/2681856] via 172.16.13.1, 00:16:48, Serial1/0
C       172.16.13.0/29 is directly connected, Serial1/0
L       172.16.13.3/32 is directly connected, Serial1/0
C       172.16.23.0/29 is directly connected, Serial1/1
L       172.16.23.3/32 is directly connected, Serial1/1
C       172.16.34.0/29 is directly connected, Serial1/2
L       172.16.34.3/32 is directly connected, Serial1/2
D    192.168.1.0/24 [90/2297856] via 172.16.13.1, 00:16:48, Serial1/0
D    192.168.2.0/24 [90/2297856] via 172.16.23.2, 00:16:48, Serial1/1
     192.168.3.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.3.0/24 is directly connected, Loopback3
L       192.168.3.1/32 is directly connected, Loopback3
     192.168.4.0/25 is subnetted, 2 subnets
D       192.168.4.0 [90/2297856] via 172.16.34.4, 00:13:32, Serial1/2
D       192.168.4.128 [90/2297856] via 172.16.34.4, 00:13:32, Serial1/2

R3(config)#ip access-list standard PBR-ACL
```

R3(config-std-nacl)#remark ACL matches R4 LAN B traffic

R3(config-std-nacl)#permit 192.168.4.128 0.0.0.127

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)#set ip next-hop 172.16.13.1

R3(config-route-map)#end

R3(config)#int s1/2

R3(config-if)#ip policy route-map R3-to-R1

R3(config-if)#exit

R3#sh route-map

route-map R3-to-R1, permit, sequence 10

Match clauses:

ip address (access-lists): PBR-ACL

Set clauses:

ip next-hop 172.16.13.1

Policy routing matches: 0 packets, 0 bytes

R3(config)#access-list 1 permit 192.168.4.0 0.0.0.255

R4

Router>enable

Router#conf t

Router(config)#hostname R4

R4(config)#interface lo4

R4(config-if)#ip address 192.168.4.1 255.255.255.128

R4(config-if)#exit

R4(config)#interface lo5

R4(config-if)#ip address 192.168.4.129 255.255.255.128

R4(config-if)#exit

R4(config)#interface s1/0

R4(config-if)#ip address 172.16.34.4 255.255.255.248

R4(config-if)#no shutdown

R4(config-if)#exit

R4(config)#router eigrp 100

R4(config-router)#network 192.168.4.0

R4(config-router)#network 172.16.34.0

R4(config-router)#no auto-summary

R4#sh ip eigrp neighbors

EIGRP-IPv4 Neighbors for AS(100)

H	Address	Interface	Hold (sec)	Uptime	SRTT (ms)	RTO	Q Cnt	Seq Num
0	172.16.34.3	Se1/0	14	00:04:07	25	150	0	9

<u>Before Route Maps</u>

R4#traceroute 192.168.1.1 source 192.168.4.1

Type escape sequence to abort.

Tracing the route to 192.168.1.1

VRF info: (vrf in name/id, vrf out name/id)

1 172.16.34.3 13 msec 11 msec 10 msec

2 172.16.13.1 20 msec 17 msec *

R4#traceroute 192.168.1.1 source 192.168.4.129

Type escape sequence to abort.

Tracing the route to 192.168.1.1

VRF info: (vrf in name/id, vrf out name/id)

1 172.16.34.3 15 msec 10 msec 10 msec

2 172.16.13.1 19 msec 24 msec *

<u>After Route Maps</u>

R4#traceroute 192.168.1.1 source 192.168.4.1

Type escape sequence to abort.

Tracing the route to 192.168.1.1

VRF info: (vrf in name/id, vrf out name/id)

1 172.16.34.3 11 msec 10 msec 10 msec

2 172.16.13.1 21 msec 22 msec *

R4#traceroute 192.168.1.1 source 192.168.4.129

Type escape sequence to abort.

Tracing the route to 192.168.1.1

VRF info: (vrf in name/id, vrf out name/id)

1 172.16.34.3 10 msec 10 msec 10 msec

2 172.16.13.1 18 msec 18 msec *