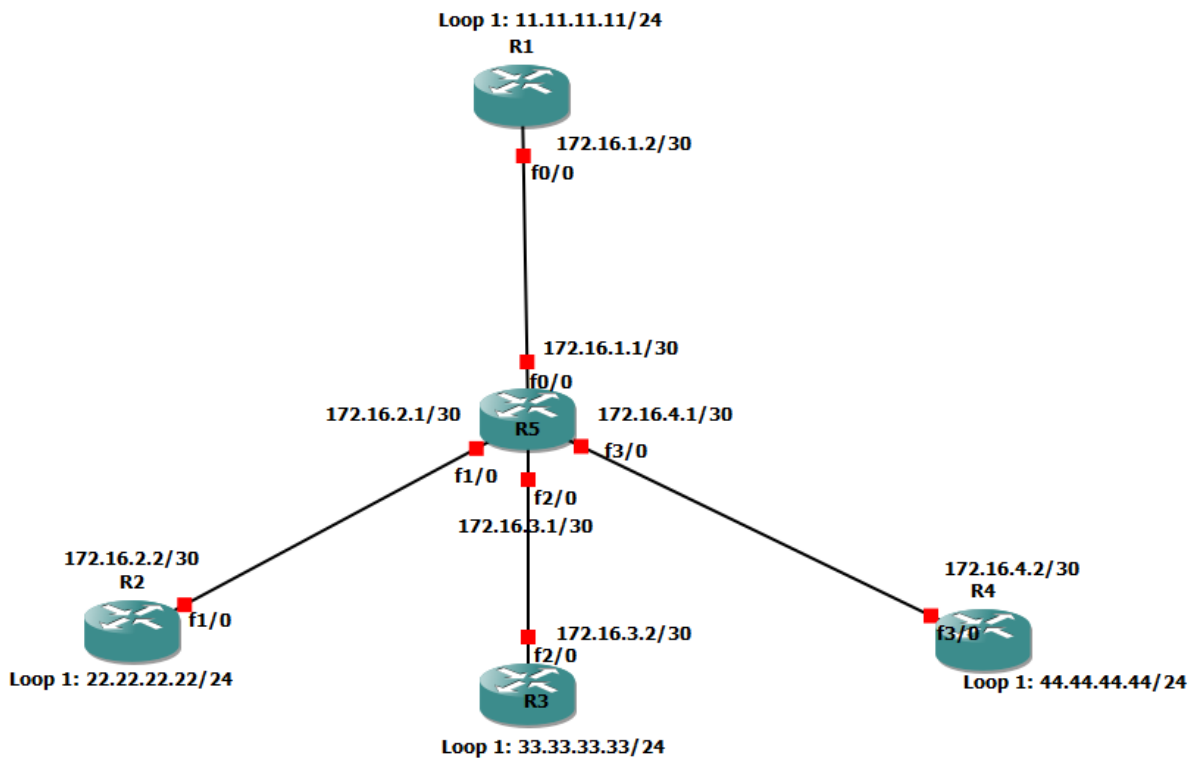


LAB 5: DMVPN – BGP

LAB 5: Diagram

Note: This Lab was developed on Cisco IOS Version 15.2(4) M1 ADVENTERPRISEK9-M.



LAB 5: Configure BGP over DMVPN Configuration

Step 1: Enable loopback and physical interfaces on R1, R2, R3, R4 and R5.

R1:

```
interface FastEthernet0/0
ip address 172.16.1.2 255.255.255.252
no shutdown
exit
```

```
interface Loopback1
ip address 11.11.11.11 255.255.255.0
exit
```

R2:

```
interface FastEthernet1/0
ip address 172.16.2.2 255.255.255.252
no shutdown
exit
```

```
interface Loopback1
ip address 22.22.22.22 255.255.255.0
exit
```

R3:

```
interface FastEthernet2/0
ip address 172.16.3.2 255.255.255.252
no shutdown
exit
```

```
interface Loopback1
ip address 33.33.33.33 255.255.255.0
exit
```

R4:

```
interface FastEthernet3/0
ip address 172.16.4.2 255.255.255.252
no shutdown
```



```
exit
interface Loopback1
ip address 44.44.44.44 255.255.255.0
exit
```

```
R5:
interface FastEthernet0/0
ip address 172.16.1.1 255.255.255.252
no shutdown
exit
```

```
interface FastEthernet1/0
ip address 172.16.2.1 255.255.255.252
no shutdown
exit
```

```
interface FastEthernet2/0
ip address 172.16.3.1 255.255.255.252
no shutdown
exit
```

```
interface FastEthernet3/0
ip address 172.16.4.1 255.255.255.252
no shutdown
exit
```

Step 2: Assign default route pointing towards internet.

```
R1:
ip route 0.0.0.0 0.0.0.0 172.16.1.1
```

```
R2:
ip route 0.0.0.0 0.0.0.0 172.16.2.1
```

```
R3:
ip route 0.0.0.0 0.0.0.0 172.16.3.1
```

```
R4:
ip route 0.0.0.0 0.0.0.0 172.16.4.1
```

Step 3: Configure DMVPN

```
R1:
```

```
interface Tunnel 0
ip address 192.168.0.1 255.255.255.0 ! (Logical ip address)
ip nhrp map multicast dynamic ! (Enable multicast traffic)
ip nhrp network-id 5 ! (Assign same network-id else tunnel
will not form)
tunnel source 172.16.1.2 ! (Physical address of HUB interface)
tunnel mode gre multipoint ! (Select gre mode)
ip mtu 1400 ! (Change mtu for DMVPN header)
exit
```

R2:

```
interface Tunnel 0
ip address 192.168.0.2 255.255.255.0
ip nhrp network-id 5
tunnel source 172.16.2.2
ip nhrp map 192.168.0.1 172.16.1.2 ! (Pointing towards NHS server)
ip nhrp map multicast 172.16.1.2 ! (Allow multicast traffic from R2
(spoke) to R1(Hub))
ip nhrp nhs 192.168.0.1 ! (Designates R1 as the NHS)
tunnel mode gre multipoint
ip mtu 1400
exit
```

R3:

```
interface Tunnel 0
ip address 192.168.0.3 255.255.255.0
ip nhrp network-id 5
tunnel source 172.16.3.2
ip nhrp map 192.168.0.1 172.16.1.2
ip nhrp map multicast 172.16.1.2
ip nhrp nhs 192.168.0.1
tunnel mode gre multipoint
ip mtu 1400
exit
```

R4:

```
interface Tunnel 0
ip address 192.168.0.4 255.255.255.0
ip nhrp network-id 5
tunnel source 172.16.4.2
ip nhrp map 192.168.0.1 172.16.1.2
ip nhrp map multicast 172.16.1.2
ip nhrp nhs 192.168.0.1
tunnel mode gre multipoint
```



```
ip mtu 1400
exit
```

Step 4: Configure BGP in routers.

```
R1:
router ospf 1
network 0.0.0.0 0.0.0.0 area 0
exit
int tunnel 0
ip ospf network broadcast
ip ospf priority 255
exit
router bgp 65000
neighbor 192.168.0.2 remote-as 65000
neighbor 192.168.0.2 soft-reconfiguration inbound
neighbor 192.168.0.3 remote-as 65000
neighbor 192.168.0.3 soft-reconfiguration inbound
neighbor 192.168.0.4 remote-as 65000
neighbor 192.168.0.4 soft-reconfiguration inbound
address-family ipv4
network 11.11.11.0 mask 255.255.255.0
exit
```

```
R2:
router ospf 1
network 0.0.0.0 0.0.0.0 area 0
exit
interface tunnel 0
ip ospf network broadcast
ip ospf priority 0
exit
router bgp 65000
neighbor 192.168.0.1 remote-as 65000
neighbor 192.168.0.1 soft-reconfiguration inbound
address-family ipv4
network 22.22.22.0 mask 255.255.255.0
exit
```

```
R3:
```



```

router ospf 1
network 0.0.0.0 0.0.0.0 area 0
exit
interface tunnel 0
ip ospf network broadcast
ip ospf priority 0
exit
router bgp 65000
neighbor 192.168.0.1 remote-as 65000
neighbor 192.168.0.1 soft-reconfiguration inbound
address-family ipv4
network 33.33.33.0 mask 255.255.255.0
exit

```

R4:

```

router ospf 1
network 0.0.0.0 0.0.0.0 area 0
exit
interface tunnel 0
ip ospf network broadcast
ip ospf priority 0
exit
router bgp 65000
neighbor 192.168.0.1 remote-as 65000
neighbor 192.168.0.1 soft-reconfiguration inbound
address-family ipv4
network 44.44.44.0 mask 255.255.255.0
exit

```

Step 6: BGP over DMVPN verification.

R1#show ip bgp

BGP table version is 9, local router ID is 11.11.11.11
 Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
 r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
 x best-external, a additional-path, c RIB-compressed,
 Origin codes: i - IGP, e - EGP, ? - incomplete
 RPKI validation codes: V valid, I invalid, N Not found

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 11.11.11.0/24	0.0.0.0	0	32768	i	
*>i 22.22.22.0/24	192.168.0.2	0	100	0	i
*>i 33.33.33.0/24	192.168.0.3	0	100	0	i
*>i 44.44.44.0/24	192.168.0.4	0	100	0	i



R2#show ip bgp

BGP table version is 5, local router ID is 22.22.22.22

Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
x best-external, a additional-path, c RIB-compressed,

Origin codes: i - IGP, e - EGP, ? - incomplete

RPKI validation codes: V valid, I invalid, N Not found

Network	Next Hop	Metric	LocPrf	Weight	Path
*>i 11.11.11.0/24	192.168.0.1	0	100	0	i
*> 22.22.22.0/24	0.0.0.0	0		32768	i

R3#show ip bgp

BGP table version is 5, local router ID is 33.33.33.33

Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
x best-external, a additional-path, c RIB-compressed,

Origin codes: i - IGP, e - EGP, ? - incomplete

RPKI validation codes: V valid, I invalid, N Not found

Network	Next Hop	Metric	LocPrf	Weight	Path
*>i 11.11.11.0/24	192.168.0.1	0	100	0	i
*> 33.33.33.0/24	0.0.0.0	0		32768	i

R4#show ip bgp

BGP table version is 5, local router ID is 44.44.44.44

Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
x best-external, a additional-path, c RIB-compressed,

Origin codes: i - IGP, e - EGP, ? - incomplete

RPKI validation codes: V valid, I invalid, N Not found

Network	Next Hop	Metric	LocPrf	Weight	Path
*>i 11.11.11.0/24	192.168.0.1	0	100	0	i
*> 44.44.44.0/24	0.0.0.0	0		32768	i

(Spilt Horizon doesn't allow spoke to forward BGP routes to other spokes because rule is routes received from one iBGP neighbor is not forwarded to other iBGP neighbor.)

Step 7: Configure BGP route reflector.

R1:

```
router bgp 65000
neighbor 192.168.0.2 remote-as 1
neighbor 192.168.0.2 route-reflector-client
neighbor 192.168.0.4 remote-as 1
neighbor 192.168.0.4 route-reflector-client
exit
```

```
R1#show ip bgp
```

```
BGP table version is 8, local router ID is 11.11.11.11
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete
```

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 11.11.11.0/24	0.0.0.0	0		32768	i
>i22.22.22.0/24	192.168.0.2	0		100	0 i
>i33.33.33.0/24	192.168.0.3	0		100	0 i
>i44.44.44.0/24	192.168.0.4	0		100	0 i

```
R2#show ip bgp
```

```
BGP table version is 14, local router ID is 22.22.22.22
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete
```

Network	Next Hop	Metric	LocPrf	Weight	Path
>i11.11.11.0/24	192.168.0.1	0		100	0 i
*>22.22.22.0/24	0.0.0.0	0		32768	i
>i33.33.33.0/24	192.168.0.3	0		100	0 i
>i44.44.44.0/24	192.168.0.4	0		100	0 i

```
R3#show ip bgp
```

```
BGP table version is 8, local router ID is 33.33.33.33
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete
```

Network	Next Hop	Metric	LocPrf	Weight	Path
>i11.11.11.0/24	192.168.0.1	0		100	0 i
>i22.22.22.0/24	192.168.0.2	0		100	0 i
*>33.33.33.0/24	0.0.0.0	0		32768	i
>i44.44.44.0/24	192.168.0.4	0		100	0 i

```
R4#show ip bgp
```

```
BGP table version is 14, local router ID is 44.44.44.44
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
```



r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete

Network	Next Hop	Metric	LocPrf	Weight	Path
>i11.11.11.0/24	192.168.0.1	0	100	0	i
>i22.22.22.0/24	192.168.0.2	0	100	0	i
>i33.33.33.0/24	192.168.0.3	0	100	0	i
*>44.44.44.0/24	0.0.0.0	0	32768		i

Step 8 Verify DMVPN Tunnel creation.

R1#show dmvpn

Legend: Attrb --> S - Static, D - Dynamic, I - Incomplete
N - NATed, L - Local, X - No Socket

Ent --> Number of NHRP entries with same NBMA peer

NHS Status: E --> Expecting Replies, R --> Responding

UpDn Time --> Up or Down Time for a Tunnel

=====
=====

Interface: Tunnel0, IPv4 NHRP Details

Type:Hub, NHRP Peers:3,

Ent Peer NBMA Addr Peer Tunnel Add State UpDn Tm Attrb

1 172.16.2.2 192.168.0.2 UP 01:35:07 D
1 172.16.3.2 192.168.0.3 UP 01:35:01 D
1 172.16.4.2 192.168.0.4 UP 01:35:02 D

R2#show dmvpn

Legend: Attrb --> S - Static, D - Dynamic, I - Incomplete
N - NATed, L - Local, X - No Socket

Ent --> Number of NHRP entries with same NBMA peer

NHS Status: E --> Expecting Replies, R --> Responding

UpDn Time --> Up or Down Time for a Tunnel

=====
=====

Interface: Tunnel0, IPv4 NHRP Details

Type:Spoke, NHRP Peers:3,

Ent Peer NBMA Addr Peer Tunnel Add State UpDn Tm Attrb

1 172.16.1.2 192.168.0.1 UP 00:55:53 S

R2#ping 192.168.0.3

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.0.3, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 196/261/340 ms

