Routing
Switching
Tigers
Forum
DMVPN
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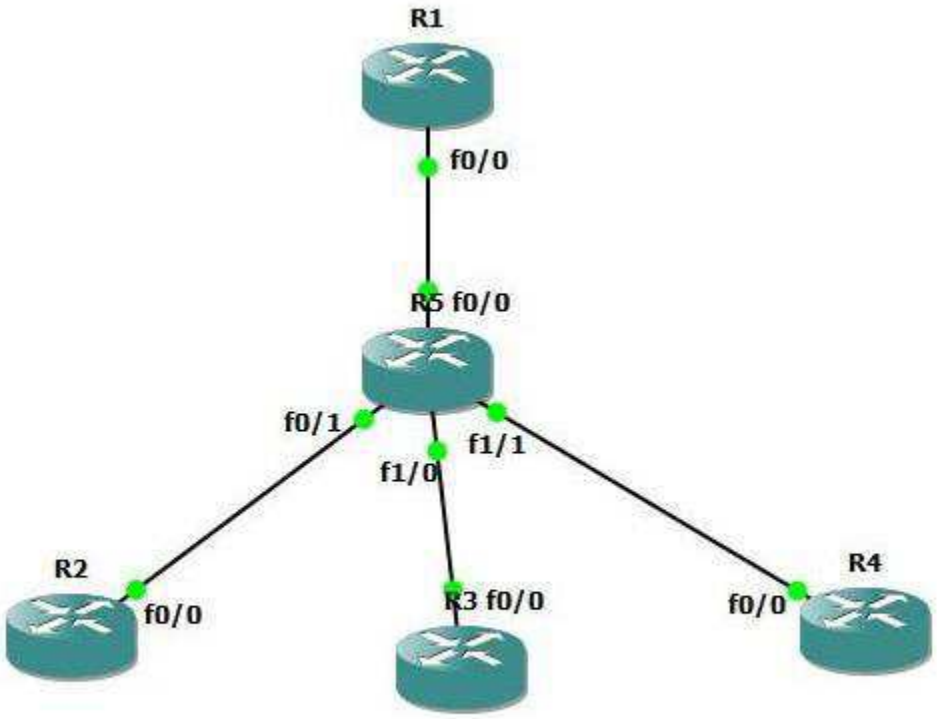
DMVPN Topology



LAB 1: Configure DMVPN:

Task 1: Configure DMVPN Initial Configuration

Step 1 In the configuration mode of router configure by following command:

R1:

```
interface FastEthernet0/0                  //creating Active interface
ip address 172.16.1.2 255.255.255.252      //Physical/Public/NBMA Address provided by ISP
no shutdown

interface loopback 1
ip address 11.11.11.11 255.255.255.0
exit

interface Tunnel 0                         //creating Virtual interface
ip address 192.168.0.1 255.255.255.0       //Overlay/Private/admin define IP address
exit

ip route 0.0.0.0 0.0.0.0 172.16.1.1        //static routes pointing toward Internet simulated router
```

R2:

```
interface FastEthernet0/0
ip address 172.16.2.2 255.255.255.252
no shutdown

interface Tunnel 0
ip address 192.168.0.2 255.255.255.0
exit

ip route 0.0.0.0 0.0.0.0 172.16.2.1

interface loopback 1
ip address 22.22.22.22 255.255.255.0
exit
```

R3:

```
interface FastEthernet0/0
ip address 172.16.3.2 255.255.255.252
no shutdown

interface Tunnel 0
ip address 192.168.0.3 255.255.255.0
exit
ip route 0.0.0.0 0.0.0.0 172.16.3.1

interface loopback 1
ip address 33.33.33.33 255.255.255.0
exit
```

R4:

```
interface FastEthernet0/0
ip address 172.16.4.2 255.255.255.252
no shutdown

interface Tunnel 0
ip address 192.168.0.4 255.255.255.0
exit

ip route 0.0.0.0 0.0.0.0 172.16.4.1

interface loop 1
ip address 44.44.44.44 255.255.255.0
exit
```

Step 2 Configuring DMVP Process

R1:

```
interface tunnel 0                  //entering virtual interface tunnel 0
ip nhrp map multicast dynamic       //enables forwarding of multicast traffic across the tunnel to
                                    dynamic spokes required by most routing protocols
ip nhrp network-id 5                //uniquely identifies the DMVPN network; tunnels will not form
                                    between routers with differing network IDs
tunnel source 172.16.1.2            //exit interface or NBMA address of exit interface
tunnel mode gre multipoint          //GRE mode multipoint
ip mtu 1400                         //tunning MTU because of DMVPN header
exit
```

Here tunnel does not have an explicit destination specified because multipoint tunnels are built dynamically from the spokes to the hub router; the hub router doesn't need to be preconfigured with spoke addresses.

R2:

```
interface tunnel 0                  //entering virtual interface tunnel 0
ip nhrp network-id 5                //nhrp network ID
tunnel source 172.16.2.2            //exit interface or NBMA address of exit interface
ip nhrp map 192.168.0.1 172.16.1.2 //statically maps the NHS address to R1's physical address
 ip nhrp map multicast 172.16.1.2 //multicast traffic is only allowed from spokes to the
                                    hub, not from spoke to spoke
ip nhrp nhs 192.168.0.1             // ip nhrp nhs 192.168.0.1 designates R1 as the Next Hop Server
tunnel mode gre multipoint          //GRE mode multipoint
ip mtu 1400                         //tunning MTU because of DMVPN header
exit
```

R3:

```
int tunnel 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
ip mtu 1400
tunnel mode gre multipoint
exit
```

R4:

```
int tunnel 0
ip nhrp network-id 5
tunnel source 172.16.4.2
ip nhrp map 192.168.0.1 172.16.1.2
ip mtu 1400
ip nhrp map multicast 172.16.1.2
ip nhrp nhs 192.168.0.1
tunnel mode gre multipoint
exit
```

Task 2: DMVPN Verification

Step 1 Verify DMVPN Tunnel creation

R1:

```
R1#show dmvpn
//shows detailts of dmvpn tunnel

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 00:15:17     D
   1     172.16.3.2     192.168.0.3    UP 00:00:05     D
   1     172.16.4.2     192.168.0.4    UP 00:03:15     D
```

Hub and spoke setup would require three separate tunnels spanning from R1 to each of the spoke routers

Hub router R1 has dynamically form the tunnel with every spoke using mGRE Multipoint tunnel mode. Multipoint GRE tunnel allows for more than two endpoints, and is treated as a non-broadcast multi-access (NBMA) network.

Conversely mGRE allows all four routers to have a single tunnel interface in the same IP subnet (192.168.0.0/24).This NBMA configuration is enabled by Next Hop Resolution Protocol, which allows multipoint tunnels to be built dynamically

R2:

```
R2#show dmvpn
//shows details of dmvpn tunnel
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:1,
 # Ent  Peer NBMA Addr Peer Tunnel Add State  UpDn Tm Attrb
 ----- --------------- --------------- ----- -------- -----
   1     172.16.1.2     192.168.0.1    UP 00:17:10     S
```

Initially every spoke router will form only static tunnel with only Hub router as multicast traffic is only allowed from spokes to the hub, not from spoke to spoke.

```
R1#show ip nhrp
//shows Next hop Resolution Protocol details
192.168.0.2/32 via 192.168.0.2
   Tunnel0 created 00:21:37, expire 01:41:53
   Type: dynamic, Flags: unique registered
   NBMA address: 172.16.2.2
192.168.0.3/32 via 192.168.0.3
   Tunnel0 created 00:21:31, expire 01:42:21
   Type: dynamic, Flags: unique registered
   NBMA address: 172.16.3.2
192.168.0.4/32 via 192.168.0.4
   Tunnel0 created 00:21:32, expire 01:42:28
   Type: dynamic, Flags: unique registered
   NBMA address: 172.16.4.2
```

```
R2#show ip nhrp
//shows Next hop Resolution Protocol details
192.168.0.1/32 via 192.168.0.1
Tunnel0 created 00:13:01, never expire
Type: static, Flags:
NBMA address: 172.16.1.2
```

NHRP clients (spoke routers) issue requests to the next hop server (hub router) to obtain the physical address of another spoke router.
NHRP facilitates dynamic tunnel establishment, providing tunnel-to-physical interface address resolution.

R2:
R2#ping 192.168.0.4

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.0.4, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 348/539/832 ms

R4#traceroute 192.168.0.2
Type escape sequence to abort.
Tracing the route to 192.168.0.2

1 192.168.0.1 396 msec 508 msec
192.168.0.2 392 msec

Spoke router R4 is able to reach R2 via Hub router.
A packet destined from R4 to R2 would need to be routed through R1, to exit the R4 tunnel and the get re-encapsulated to enter the R2 tunnel