MPLS domain with OSPF as underlay: R1-R5

R1:
conf t
int e0/0
Desc conn to R2
ip add 10.12.1.1 255.255.255.0
no sh
int lo 0
ip add 1.1.1.1 255.255.255.255
ip ospf network point-to-point
exi

int r e0/0,lo0
ip ospf 1 area 0
exit

!Mpls config:
!----------
mpls ldp router-id lo 0
mpls label range 1000 1999
mpls ip
int e0/0
mpls ip
exi

R2:
conf t
int e0/0
Desc conn to R1
ip add 10.12.1.2 255.255.255.0
no sh
int e0/1
Desc conn to R3
ip add 10.23.1.2 255.255.255.0
no sh
int lo 0
ip add 2.2.2.2 255.255.255.255
exi

int lo 0
ip ospf network point-to-point
ip ospf 1 area 0
exi

router ospf 1
net 10.0.0.0 0.255.255.255 area 0
exit

!Mpls config:
!----------
mpls ldp router-id lo 0
mpls label range 2000 2999

```
mpls ip
int  range e0/0-1
mpls ip
exi


R3:
conf t
int e0/0
Desc conn to R2
ip add 10.23.1.3 255.255.255.0
no sh
int e0/1
Desc conn to R3
ip add 10.34.1.3 255.255.255.0
no sh
int lo 0
ip add 3.3.3.3 255.255.255.255
exi

int lo 0
ip ospf network point-to-point
ip ospf 1 area 0
exi

router ospf 1
net 10.0.0.0 0.255.255.255 area 0
exit


!Mpls config:
!--------------
mpls ldp router-id lo 0
mpls label range 3000 3999
int  range e0/0-1
mpls ip
exi

R4:
conf t
int e0/0
Desc conn to R3
ip add 10.34.1.4 255.255.255.0
no sh
int e0/1
Desc conn to R5
ip add 10.45.1.4 255.255.255.0
no sh
int lo 0
ip add 4.4.4.4 255.255.255.255
exi

int lo 0
ip ospf network point-to-point
ip ospf 1 area 0
```

```
exi

router ospf 1
net 10.0.0.0 0.255.255.255 area 0
exit

!Mpls config:
!--------------
mpls ldp router-id lo 0
mpls label range 4000 4999
mpls ip
int  range e0/0-1
mpls ip
exi

R5:
conf t
int e0/0
Desc conn to R4
ip add 10.45.1.5 255.255.255.0
no sh
int lo 0
ip add 5.5.5.5 255.255.255.0
exi

int lo 0
ip ospf network point-to-point
ip ospf 1 area 0
exi

router ospf 1
net 10.0.0.0 0.255.255.255 area 0
exit
!Mpls config:
!--------------
mpls ldp router-id lo 0
mpls label range 5000 5999
mpls ip

int e0/0
mpls ip
exi

-----------------------------------------------------------------------------------------------
Creating VRF instances on PE routers R1&R5
-----------------------------------------------------------------

vrf definition RED
rd 1:100
address-family ipv4
route-target both  101:2
exi

vrf definition GREEN
rd 1:110
```

```
address-family ipv4
route-target both  100:2
exi

sh ip vrf
```

Allocating and Assiging ipv4 address to vrf interfaces
R1:

```
int e0/1
vrf forwarding RED
ip add 172.16.1.1 255.255.255.0
no sh
exi

int e0/2
vrf forwarding GREEN
ip add 172.18.1.1 255.255.255.0
no sh

sh ip vrf interfaces
```

R5:
```
int e0/1
vrf forwarding RED
ip add 172.57.1.5  255.255.255.0
no sh
exi

int e0/2
vrf forwarding GREEN
ip add 172.59.1.5  255.255.255.0
no sh

sh ip vrf interfaces
```

Customer router config
Site1
R6:Site1
```
conf t
int e0/0
ip add 172.16.1.6 255.255.255.0
no sh
int lo 0
ip add 192.168.0.1 255.255.255.0
int lo 1
ip add 10.0.0.1 255.255.255.0
exi

router bgp 100
neig 172.16.1.1 remote-as 200
neig 172.16.1.1 allowas-in
net 10.0.0.0 mask 255.255.255.0
net 192.168.0.0 mask 255.255.255.0
exi
```

CE-R2:Site2
conf t
int e0/0
ip add 172.57.1.7 255.255.255.0
no sh
int lo 0
ip add 192.168.2.2 255.255.255.0
exi

router bgp 100
neig 172.57.1.5 remote-as 12345
neig 172.57.1.5 allowas-in
net 192.168.2.0 mask 255.255.255.0
exi

MB-BGp config on PE- routers R1 and R5

R1:
router bgp 200
Desc ibgp between PE routers
 bgp router-id 1.1.1.1
 bgp log-neighbor-changes
 neighbor 5.5.5.5 remote-as 200
 neighbor 5.5.5.5 update-source Loopback0
 neighbor 5.5.5.5 next-hop-self
 !
! MP-BGp config between PE routers
 address-family vpnv4
  neighbor 5.5.5.5 activate
  neighbor 5.5.5.5 send-community both
 exit-address-family
 !
 address-family ipv4 vrf RED
  neighbor 172.16.1.6 remote-as 100
 exit-address-family

R5:
router bgp 200
 bgp router-id 5.5.5.5
 bgp log-neighbor-changes
 neighbor 1.1.1.1 remote-as 200
 neighbor 1.1.1.1 update-source Loopback0
 neighbor 1.1.1.1 next-hop-self
 !
 address-family vpnv4
  neighbor 1.1.1.1 activate
  neighbor 1.1.1.1 send-community both
 exit-address-family
 !
 address-family ipv4 vrf RED
  neighbor 172.57.1.7 remote-as 100
   exit-address-family

sh ip bgp vpnv4 all

==========
Customer -B Site 1
R8:
conf t
int e0/0
ip add 172.18.1.8 255.255.255.0
no sh
int lo 0
ip add 10.0.0.1 255.255.255.0
int lo 1
ip add 10.1.1.1 255.255.255.0
exi

router eigrp 1
no au
net 172.18.1.8 0.0.0.0
net 10.0.0.1 0.0.0.0
net 10.1.1.1 0.0.0.0
exit

R9:Customer -B site 2
conf t
int fa0/0
ip add 172.59.1.9 255.255.255.0
no sh
int lo 0
ip add 10.0.2.2 255.255.255.0
exi

router eigrp 1
no au
net 172.59.1.9 0.0.0.0
net 10.0.2.2 0.0.0.0
exit

R1:PE
router eigrp GREEN
 !
 address-family ipv4 unicast vrf GREEN autonomous-system 1
  !
  topology base
  redistribute bgp 200 metric 10000 1000 255 1 1500
  exit-af-topology
  network 172.18.1.1 0.0.0.0
 exit-address-family

router bgp 200
address-family ipv4 vrf GREEN
redistribute eigrp 1
exi

R5:PE
router eigrp GREEN
 !
 address-family ipv4 unicast vrf GREEN autonomous-system 1

```
 !
 topology base
 redistribute bgp 200   metric 10000 1000 255 1 1500
 exit-af-topology
 network 172.59.1.5 0.0.0.0
exit-address-family

router bgp 200
address-family ipv4 vrf GREEN
redistribute eigrp 1
exi
```

sh ip bgp vpnv4 all
Underlay :ospf/Mpls
Vrf : To segregate customer routes
CE-PE routing
RD: 64 bit value to maintain route uniqueness
RT : Import/Export
MP-BGp to carry 96 bit vpnv4 route
VPN label to send the packet to the correct vrf
==========

```
R1(config)#do sh ip bgp vpnv4 all
BGP table version is 13, local router ID is 1.1.1.1
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
Route Distinguisher: 1:100 (default for vrf RED)
 *>  10.1.1.0/24      172.16.1.6               0             0 65100 i
 *>  192.168.0.0      172.16.1.6               0             0 65100 i
 *>i 192.168.2.0      5.5.5.5                  0    100      0 65100 i
Route Distinguisher: 1:110 (default for vrf GREEN)
 *>  10.0.0.0/24      172.18.1.8         3584000         32768 ?
 *>i 10.0.2.0/24      5.5.5.5            3584000    100      0 ?
 *>  10.1.1.0/24      172.18.1.8         3584000         32768 ?
 *>  172.18.1.0/24    0.0.0.0                  0         32768 ?
 *>i 172.59.1.0/24    5.5.5.5                  0    100      0 ?
```

```
R5#sh ip bgp vpnv4 all
BGP table version is 15, local router ID is 5.5.5.5
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
Route Distinguisher: 1:100 (default for vrf RED)
 *>i 10.1.1.0/24      1.1.1.1                  0    100      0 65100 i
```

```
 *>i 192.168.0.0      1.1.1.1                0    100      0 65100 i
 *>  192.168.2.0      172.57.1.7               0           0 65100 i
Route Distinguisher: 1:110 (default for vrf GREEN)
 *>i 10.0.0.0/24      1.1.1.1           3584000    100      0 ?
 *>  10.0.2.0/24      172.59.1.9          3584000         32768 ?
 *>i 10.1.1.0/24      1.1.1.1           3584000    100      0 ?
 *>i 172.18.1.0/24    1.1.1.1                0    100      0 ?
 *>  172.59.1.0/24    0.0.0.0                0         32768 ?
```

==========