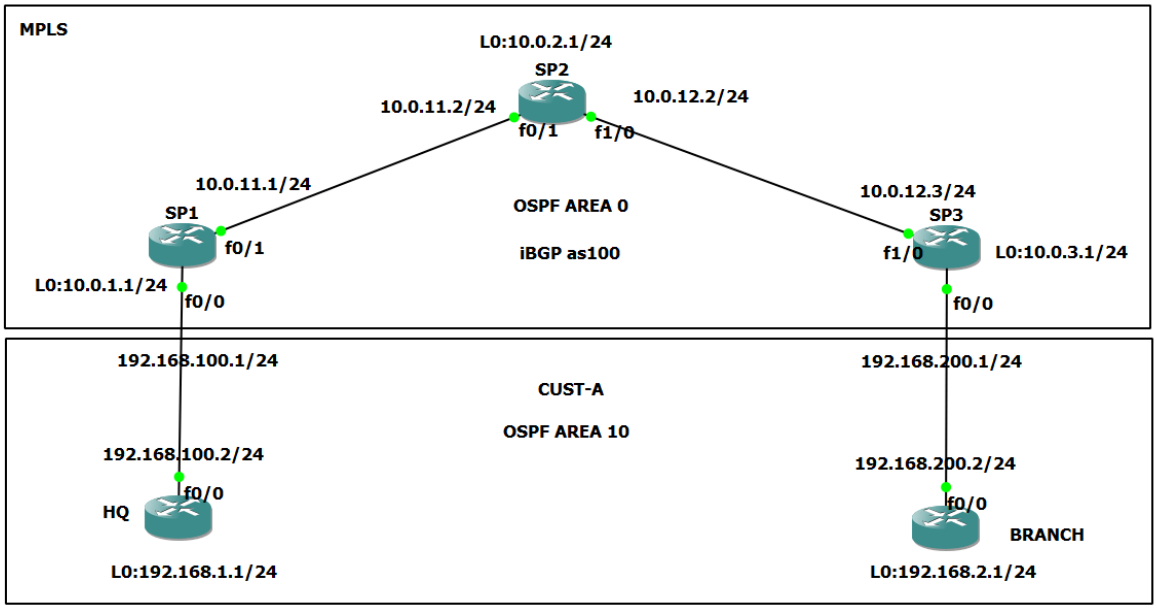
Practical 10- Implementing MPLS VPNs

Here is the Topology on which we did the experiment



Step 1: Router Config

SP1

SP1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
SP1(config)#int Loopback 0
SP1(config-if)#ip
SP1(config-if)#ip address 10.0.1.1 255.255.255.0
SP1(config-if)#no shut
SP1(config-if)#ex
SP1(config)#int fa 0/1
SP1(config-if)#ip add 10.0.11.1 255.255.255.0
SP1(config-if)#no shut
SP1(config-if)#ex

```
SP1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
SP1(config)#int Loopback 0
SP1(config-if)#ip
*Mar  1 00:03:38.735: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up
SP1(config-if)#ip address 10.0.1.1 255.255.255.0
SP1(config-if)#no shut
SP1(config-if)#ex
SP1(config)#int fa 0/1
SP1(config-if)#ip add 10.0.11.1 255.255.255.0
SP1(config-if)#no shut
SP1(config-if)#ex
SP1(config)#
*Mar  1 00:05:11.067: %LINK-3-UPDOWN: Interface FastEthernet0/1, changed state to up
*Mar  1 00:05:12.067: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
SP1(config)#int fa 0/0
SP1(config-if)#ip add 192.168.100.1 255.255.255.0
SP1(config-if)#no shut
SP1(config-if)#ex
*Mar  1 00:05:49.595: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar  1 00:05:50.595: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
SP1(config-if)#ex
```

SP2

SP2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
SP2(config)#int Loopback 0
SP2(config-if)#ip address
SP2(config-if)#ip address 10.0.2.1 255.255.255.0
SP2(config-if)#no shut
SP2(config-if)#ex
SP2(config)#int fa1/0
SP2(config-if)#ip add 10.0.12.2 255.255.255.0
SP2(config-if)#no shut
SP2(config-if)#ex

```
SP2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
SP2(config)#int Loopback 0
SP2(config-if)#ip address
*Mar  1 00:05:21.547: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up
SP2(config-if)#ip address 10.0.2.1 255.255.255.0
SP2(config-if)#no shut
SP2(config-if)#ex
SP2(config)#int fa1/0
SP2(config-if)#ip add 10.0.12.2 255.255.255.0
SP2(config-if)#no shut
SP2(config-if)#ex
SP2(config)#
*Mar  1 00:06:54.531: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
*Mar  1 00:06:55.531: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
SP2(config)#int fa 0/1
SP2(config-if)#ip add 10.0.11.2 255.255.255.0
SP2(config-if)#no shut
SP2(config-if)#ex
SP2(config)#
*Mar  1 00:07:43.987: %LINK-3-UPDOWN: Interface FastEthernet0/1, changed state to up
*Mar  1 00:07:44.987: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
```

SP3

SP3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
SP3(config)#int Loopback 0
SP3(config-if)#ip ad
SP3(config-if)#ip add 10.0.3.1 255.255.255.0
SP3(config-if)#no shut
SP3(config-if)#ex
SP3(config)#int fa 1/0
SP3(config-if)#ip add 10.0.12.3 255.255.255.0
SP3(config-if)#no shut
SP3(config-if)#ex

```
SP3#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
SP3(config)#int Loopback 0
SP3(config-if)#ip ad
*Mar  1 00:07:24.471: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up
SP3(config-if)#ip add 10.0.3.1 255.255.255.0
SP3(config-if)#no shut
SP3(config-if)#ex
SP3(config)#int fa 1/0
SP3(config-if)#ip add 10.0.12.3 255.255.255.0
SP3(config-if)#no shut
SP3(config-if)#ex
SP3(config)#
*Mar  1 00:08:38.007: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
*Mar  1 00:08:39.007: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
SP3(config)#int fa 0/0
SP3(config-if)#ip add 192.168.200.1 255.255.255.0
SP3(config-if)#no shut
SP3(config-if)#ex
```

HQ

HQ#conf t
Enter configuration commands, one per line. End with CNTL/Z.
HQ(config)#int Loopback 0
HQ(config-if)#ip add
HQ(config-if)#ip add 192.168.1.1 255.255.255.0
HQ(config-if)#no shut
HQ(config-if)#ex
HQ(config)#int fa0/0
HQ(config-if)#ip add 192.168.100.2 255.255.255.0
HQ(config-if)#no shut
HQ(config-if)#ex

```
HQ#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
HQ(config)#int Loopback 0
HQ(config-if)#ip add
*Mar  1 00:08:26.751: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up
HQ(config-if)#ip add 192.168.1.1 255.255.255.0
HQ(config-if)#no shut
HQ(config-if)#ex
HQ(config)#int fa0/0
HQ(config-if)#ip add 192.168.100.2 255.255.255.0
HQ(config-if)#no shut
HQ(config-if)#
*Mar  1 00:09:45.027: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar  1 00:09:46.027: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
HQ(config-if)#ex
```

BRANCH

BRANCH#conf t
BRANCH(config)#int Loopback 0
BRANCH(config-if)#ip add
BRANCH(config-if)#ip add 192.168.2.1 255.255.255.0
BRANCH(config-if)#no shut
BRANCH(config-if)#ex
BRANCH(config)#int fa0/0
BRANCH(config-if)#ip add 192.168.200.2 255.255.255.0
BRANCH(config-if)#no shut
BRANCH(config-if)#ex

```
BRANCH#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
BRANCH(config)#int Loopback 0
BRANCH(config-if)#ip add
*Mar  1 00:09:31.999: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0,
 changed state to up
BRANCH(config-if)#ip add 192.168.2.1 255.255.255.0
BRANCH(config-if)#no shut
BRANCH(config-if)#ex
BRANCH(config)#int fa0/0
BRANCH(config-if)#ip add 192.168.200.2 255.255.255.0
BRANCH(config-if)#no shut
BRANCH(config-if)#ex
BRANCH(config)#
*Mar  1 00:11:17.219: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar  1 00:11:18.219: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
```

Step 2: Ospf Configuration

SP1

SP1(config)#router ospf 1
SP1(config-if)#network 10.0.1.0 0.0.0.255 area 0
SP1(config-if)#network 10.0.11.0 0.0.0.255 area 0
SP1(config-if)#ex

```
SP1(config)#router ospf 1
SP1(config-router)#network 10.0.1.0 0.0.0.255 area 0
SP1(config-router)#network 10.0.11.0 0.0.0.255 area 0
SP1(config-router)#ex
```

SP2

SP2(config)#router ospf 1
SP2(config-if)#network 10.0.2.0 0.0.0.255 area 0
SP2(config-if)#network 10.0.11.0 0.0.0.255 area 0
SP2(config-if)#network 10.0.12.0 0.0.0.255 area 0
SP2(config-if)#ex

```
SP2(config)#router ospf 1
SP2(config-router)#network 10.0.2.0 0.0.0.255 area 0
SP2(config-router)#network 10.0.11.0 0.0.0.255 area 0
SP2(config-router)#network 10.0.
*Mar  1 00:20:42.139: %OSPF-5-ADJCHG: Process 1, Nbr 10.0.1.1 on FastEthernet0/1 from LOADING to FULL, Loading Done
SP2(config-router)#network 10.0.12.0 0.0.0.255 area 0
SP2(config-router)#ex
```

SP3

SP3(config)#router ospf 1
SP3(config-if)#network 10.0.3.0 0.0.0.255 area 0
SP3(config-if)#network 10.0.12.0 0.0.0.255 area 0
SP3(config-if)#ex

```
SP3(config)#router ospf 1
SP3(config-router)#network 10.0.3.0 0.0.0.255 area 0
SP3(config-router)#network 10.0.12.0 0.0.0.255 area 0
SP3(config-router)#ex
```

For Checking the config

SP2(config)#do show ip ospf neighbor

```
SP2(config)#do show ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface
10.0.3.1          1   FULL/BDR        00:00:33    10.0.12.3       FastEthernet1/0
10.0.1.1          1   FULL/DR         00:00:31    10.0.11.1       FastEthernet0/1
```

Step 3: Do the MPLS config

SP1

SP1(config)#mpls ldp
SP1(config-if)#mpls ldp router-id loopback 0 force
SP1(config)#int fa 0/1
SP1(config-if)#mpls ip
SP1(config-if)#no shut
SP1(config-if)#ex

```
SP1(config)#mpls ldp router-id loopback 0 force
SP1(config)#int fa 0/1
SP1(config-if)#mpls ip
SP1(config-if)#no shut
SP1(config-if)#exit
```

SP2

SP2(config)#mpls ldp router-id loopback 0
SP2(config)#int fa 0/1
SP2(config-if)#mpls ip
SP2(config-if)#no shut
SP2(config-if)#ex
SP2(config)#mpls ldp router-id loopback 0
SP2(config)#int fa 1/0
SP2(config-if)#mpls ip
SP2(config-if)#no shut
SP2(config-if)#ex

```
SP2(config)#mpls ldp router-id loopback 0
SP2(config)#int fa 0/1
SP2(config-if)#mpls ip
SP2(config-if)#no shut
SP2(config-if)#ex
SP2(config)#mpls ldp router-id loopback 0
SP2(config)#int fa 1/0
SP2(config-if)#mpls ip
SP2(config-if)#no shut
SP2(config-if)#ex
```

SP3

SP3(config)#mpls ldp router-id loopback 0 force
SP3(config)#int fa 1/0
SP3(config-if)#mpls ip
SP3(config-if)#no shut

SP3(config-if)#no shut
SP3(config-if)#ex

```
SP3(config)#mpls ldp router-id loopback 0 force
SP3(config)#int fa 1/0
SP3(config-if)#mpls ip
SP3(config-if)#no shut
*Mar  1 00:56:42.935: %LDP-5-NBRCHG: LDP Neighbor 10.0.2.1:0 (1) is UP
SP3(config-if)#no shut
SP3(config-if)#ex
```

SP2(config)#do sh mpls ldp neighbor

```
SP2(config)#do show mpls ldp neighbor
    Peer LDP Ident: 10.0.1.1:0; Local LDP Ident 10.0.2.1:0
        TCP connection: 10.0.1.1.646 - 10.0.2.1.63488
        State: Oper; Msgs sent/rcvd: 12/13; Downstream
        Up time: 00:04:00
        LDP discovery sources:
          FastEthernet0/1, Src IP addr: 10.0.11.1
        Addresses bound to peer LDP Ident:
          192.168.100.1   10.0.11.1       10.0.1.1
    Peer LDP Ident: 10.0.3.1:0; Local LDP Ident 10.0.2.1:0
        TCP connection: 10.0.3.1.18941 - 10.0.2.1.646
        State: Oper; Msgs sent/rcvd: 9/10; Downstream
        Up time: 00:00:55
        LDP discovery sources:
          FastEthernet1/0, Src IP addr: 10.0.12.3
        Addresses bound to peer LDP Ident:
          192.168.200.1   10.0.12.3       10.0.3.1
```

Step 4: Config the vrf CUST-A

SP1

SP1(config)#ip vrf CUST-A
SP1(config-vrf)#rd 100:1
SP1(config-vrf)#route-target export 1:100
SP1(config-vrf)#route-target import 1:100
SP1(config-vrf)#no shut
SP1(config-vrf)#ex

```
SP1(config)#ip vrf CUST-A
SP1(config-vrf)#rd 100:1
SP1(config-vrf)#route-target export 1:100
SP1(config-vrf)#route-target import 1:100
SP1(config-vrf)#no shut
                   ^
% Invalid input detected at '^' marker.

SP1(config-vrf)#exit
```

SP3

SP3(config)#ip vrf CUST-A
SP3(config-vrf)#rd 100:1
SP3(config-vrf)#route-target export 1:100
SP3(config-vrf)#route-target import 1:100

SP3(config-vrf)#no shut
SP3(config-vrf)#ex
SP3(config)#int fa0/0
SP3(config-if)#ip vrf forwarding CUST-A
SP3(config-if)#ip address 192.168.200.1 255.255.255.0
SP3(config-if)#no shut SP3(config-if)#ex

```
SP3(config)#ip vrf CUST-A
SP3(config-vrf)#rd 100:1
SP3(config-vrf)#woute-target export 1:100
                 ^
% Invalid input detected at '^' marker.

SP3(config-vrf)#route-target export 1:100
SP3(config-vrf)#route-target import 1:100
SP3(config-vrf)#!
SP3(config-vrf)#exit
SP3(config)#int fa0/0
SP3(config-if)#ip vrf forwarding CUST-A
% Interface FastEthernet0/0 IP address 192.168.200.1 removed due to enabling VRF CUST-A
SP3(config-if)#ip add 192.168.200.1 255.255.255.0
SP3(config-if)#no shut
SP3(config-if)#exit
```

For Checking the vrf

SP1(config)#do ping vrf CUST-A 192.168.100.2

```
SP1(config)#do ping vrf CUST-A 192.168.100.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.100.2, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 20/26/32 ms
```

Step 5: Customer routing

HQ

HQ(config)#router ospf 1
HQ(config-router)#log-adjacency-changes
HQ(config-router)#network 192.168.1.0 0.0.0.255 area 10
HQ(config-router)#network 192.168.100.0 0.0.0.255 area 10
HQ(config-router)#exit

```
HQ(config)#router ospf 1
HQ(config-router)#log
HQ(config-router)#log-adjacency-changes
HQ(config-router)#net
HQ(config-router)#network 192.168.1.0 0.0.0.255 area 10
HQ(config-router)#network 192.168.100.0 0.0.0.255 area 10
HQ(config-router)#exit
HQ(config)#
```

BRANCH

BRANCH(config)#router ospf 1
BRANCH(config-router)#log-adjacency-changes
BRANCH(config-router)#network 192.168.2.0 0.0.0.255 area 10
BRANCH(config-router)#network 192.168.200.0 0.0.0.255 area 10
BRANCH(config-router)#exit

```
BRANCH(config)#router ospf 1
BRANCH(config-router)#log
BRANCH(config-router)#log-adjacency-changes
BRANCH(config-router)#net
BRANCH(config-router)#network 192.168.2.0 0.0.0.255 area 10
BRANCH(config-router)#network 192.168.200.0 0.0.0.255 area 10
BRANCH(config-router)#exit
```

SP1

SP1(config)#router ospf 10 VRF CUST-A
SP1config-router)#network 192.168.100.0 0.0.0.255 area 10
SP1(config-router)#exit

```
SP1(config)#router ospf 10 vrf CUST-A
SP1(config-router)#net
SP1(config-router)#network 192.168.100.0 0.0.0.255 area 10
```

SP3

SP3(config)#router ospf 10 VRF CUST-A
SP3(config-router)#network 192.168.200.0 0.0.0.255 area 10
SP3(config-router)#exit

```
SP3(config)#router ospf 10 vrf CUST-A
SP3(config-router)#network 192.168.200.0 0.0.0.255 area 10
SP3(config-router)#exi
*Feb 21 01:25:53.023: %OSPF-5-ADJCHG: Process 10, Nbr 192.168.2.1 on FastEthernet0/0 from LOADING to FULL, Loading Done
SP3(config-router)#exit
```

SP1(config)#do sh ip ospf neighbor

```
SP1(config)#do sh ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface
10.0.2.1          1   FULL/DR         00:00:39    10.0.11.2       GigabitEthernet5/0
192.168.1.1       1   FULL/DR         00:00:32    192.168.100.2   FastEthernet0/0
SP1(config)#do sh ip route vrf CUST-A

Routing Table: CUST-A
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
       + - replicated route, % - next hop override
```

```
Gateway of last resort is not set

      192.168.1.0/32 is subnetted, 1 subnets
O        192.168.1.1 [110/2] via 192.168.100.2, 00:01:43, FastEthernet0/0
      192.168.100.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.100.0/24 is directly connected, FastEthernet0/0
L        192.168.100.1/32 is directly connected, FastEthernet0/0
```

Step 6: BGP

SP1(config)#router bgp 100
SP1(config-router)#neighbor 10.0.3.1 remote-as 100
SP1(config-router)#neighbor 10.0.3.1 update-source Loopback 0
SP1(config-router)#exit
SP1(config-if)#do sh ip bgp summary

```
SP1(config)#router bgp 100
SP1(config-router)#neighbor 10.0.3.1 remote-as 100
SP1(config-router)#neighbor 10.0.3.1 update-source loopback 0
SP1(config-router)#exit
SP1(config)#
*Feb 21 01:30:33.727: %BGP-5-ADJCHANGE: neighbor 10.0.3.1 Up
SP1(config)#
SP1(config)#
SP1(config)#
SP1(config)#do sh ip bgp sum
SP1(config)#do sh ip bgp summary
BGP router identifier 10.0.1.1, local AS number 100
BGP table version is 1, main routing table version 1

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
10.0.3.1        4          100       4       4        1    0    0 00:00:27        0
```

SP3

SP3(config)#router bgp 100
SP3(config-router)#neighbor 10.0.1.1 remote-as 100
SP3(config-router)#neighbor 10.0.1.1 update-source Loopback 0
SP3(config-router)#exit
SP3(config-if)#do sh ip bgp summary

```
SP3(config)#router bgp 100
SP3(config-router)#neighbor 10.0.1.1 remote
SP3(config-router)#neighbor 10.0.1.1 remote-as 100
SP3(config-router)#nei
SP3(config-router)#neighbor
*Feb 21 01:30:33.839: %BGP-5-ADJCHANGE: neighbor 10.0.1.1 Up
SP3(config-router)#neighbor 10.0.1.1 up
SP3(config-router)#neighbor 10.0.1.1 update-source loo
SP3(config-router)#neighbor 10.0.1.1 update-source loopback 0
SP3(config-router)#exit
```

SP1

SP1(config)#router bgp 100
SP1(config-router)#address-family vpnv4
SP1(config-router)#neighbor 10.0.3.1 activate
SP1(config-router)#exit

```
SP1(config)#router bgp 100
SP1(config-router)#add
SP1(config-router)#address-family v
SP1(config-router)#address-family vpnv4
SP1(config-router-af)#neigh
SP1(config-router-af)#neighbor 10.0.3.1 ac
SP1(config-router-af)#neighbor 10.0.3.1 activate
SP1(config-router-af)#neighbor 10.0.3.1 act
*Feb 21 01:31:53.511: %BGP-5-NBR_RESET: Neighbor 10.0.3.1 reset (Capability changed)
*Feb 21 01:31:53.519: %BGP-5-ADJCHANGE: neighbor 10.0.3.1 Down Capability changed
*Feb 21 01:31:53.523: %BGP_SESSION-5-ADJCHANGE: neighbor 10.0.3.1 IPv4 Unicast topology base removed from session  Capability changed
```

SP1(config)#do sh ip bp summary

```
SP1(config)#do sh ip bgp summary
BGP router identifier 10.0.1.1, local AS number 100
BGP table version is 1, main routing table version 1

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
10.0.3.1        4          100       4       4        1    0    0 00:00:27        0
```

SP3(config)#router bgp 100
SP3(config-router)#address-family vpnv4
SP3(config-router)#neighbor 10.0.1.1 activate
SP3(config-router)#exit

```
SP3(config)#router bgp 100
SP3(config-router)#ad
SP3(config-router)#address-family vp
SP3(config-router)#address-family vpnv4
SP3(config-router-af)#nei
SP3(config-router-af)#neighbor 10.0.1.1 ac
SP3(config-router-af)#neighbor 10.0.1.1 activate
```

SP1
SP1(config)#router ospf 10 vrf CUST-A
SP1(config-router)#redistribute bgp 100 subnets
SP1(config)#router bgp 100
SP1(config-router)#address-family vpnv4 vrf CUST-A
SP1(config-router)#redistribute ospf 10 vrf CUST-A
SP1(config-router)#exit
SP1(config-router)#exit-address-family

```
SP1(config)#router ospf 10 vrf CUST-A
SP1(config-router)#red
SP1(config-router)#redistribute bgp 100 su
SP1(config-router)#redistribute bgp 100 subnets
SP1(config-router)#exit
SP1(config)#router bgp 100
SP1(config-router)#addre
SP1(config-router)#address-family ipv4 vrf CUST-A
SP1(config-router-af)#redis
SP1(config-router-af)#redistribute os
SP1(config-router-af)#redistribute ospf 10 vrf CUST-A
SP1(config-router-af)#ext
*Feb 21 01:39:17.403: %BGP-4-VPNV4NH_MASK: Nexthop 10.0.1.1 may not be reachable from neigbor 10.0.3.1 - not /32 mask
SP1(config-router-af)#exit
SP1(config-router-af)#exit-address-family
```

SP3

SP3(config)#router ospf 10 vrf CUST-A
SP3(config-router)#redistribute bgp 100 subnets
SP3(config)#router bgp 100
SP3(config-router)#address-family vpnv4 vrf CUST-A
SP3(config-router)#redistribute ospf 10 vrf CUST-A
SP3(config-router)#exit
SP3(config-router)#exit-address-family

```
SP3(config)#router ospf 10 vrf CUST-A
SP3(config-router)#redis
SP3(config-router)#redistribute bgp 100 sub
SP3(config-router)#redistribute bgp 100 subnets
SP3(config-router)#exit
SP3(config)#router bgp 100
SP3(config-router)#adr
SP3(config-router)#add
SP3(config-router)#address-family ipv4 vrf CUST-A
SP3(config-router-af)#redis
SP3(config-router-af)#redistribute ospf 10 vrf CUST-A
SP3(config-router-af)#exit
SP3(config-router-af)#exit-address-family
SP3(config-router)#
```

SP3(config)#do sh ip bgp vpnv4 all

```
SP3(config)#do sh ip bgp vpnv4 all
BGP table version is 5, local router ID is 10.0.3.1
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: 100:1 (default for vrf CUST-A)
 *>i 192.168.1.1/32   10.0.1.1                 2    100      0 ?
 *>i 192.168.100.0    10.0.1.1                 0    100      0 ?
```

SP1(config)#do sh ip route vrf CUST-A

```
SP1(config)#do sh ip route vrf CUST-A

Routing Table: CUST-A
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
       + - replicated route, % - next hop override

Gateway of last resort is not set

      192.168.1.0/32 is subnetted, 1 subnets
O        192.168.1.1 [110/2] via 192.168.100.2, 00:26:55, FastEthernet0/0
      192.168.100.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.100.0/24 is directly connected, FastEthernet0/0
L        192.168.100.1/32 is directly connected, FastEthernet0/0
```

SP1(config)#do sh ip route

```
SP1(config)#do 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
       + - replicated route, % - next hop override

Gateway of last resort is not set

      10.0.0.0/8 is variably subnetted, 6 subnets, 2 masks
C        10.0.1.1/32 is directly connected, Loopback0
O        10.0.2.1/32 [110/2] via 10.0.11.2, 00:47:01, GigabitEthernet5/0
O        10.0.3.1/32 [110/3] via 10.0.11.2, 00:45:57, GigabitEthernet5/0
C        10.0.11.0/24 is directly connected, GigabitEthernet5/0
L        10.0.11.1/32 is directly connected, GigabitEthernet5/0
O        10.0.12.0/24 [110/2] via 10.0.11.2, 00:47:01, GigabitEthernet5/0
```