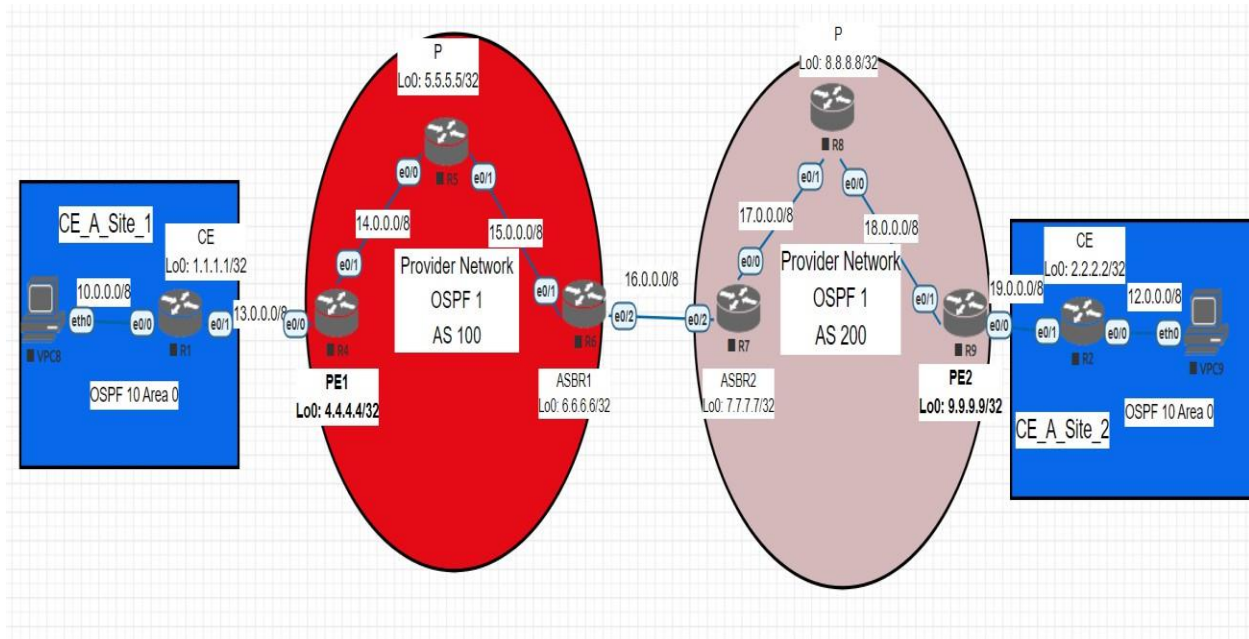


Lab 1

Inter AS MPLS VPN Using Option A



Task 1:

Connect the above network, and assign ip addresses as depicted in the topology

Task 2:

Configure OSPF as IGP in the provider networks (AS100 & AS200)

!R4

Router ospf 1

Router-id 4.4.4.4

Network 4.4.4.4 0.0.0.0 area 0

Network 14.0.0.4 0.0.0.0 area 0

!R5

Router ospf 1

Router-id 5.5.5.5

Network 5.5.5.5 0.0.0.0 area 0

Network 14.0.0.5 0.0.0.0 area 0

Network 15.0.0.5 0.0.0.0 area 0

!R6

Router ospf 1

Router-id 6.6.6.6

Network 6.6.6.6 0.0.0.0 area 0

Network 15.0.0.6 0.0.0.0 area 0

!R7

Router ospf 1

Router-id 7.7.7.7

Network 7.7.7.7 0.0.0.0 area 0

Network 17.0.0.7 0.0.0.0 area 0

!R8

Router ospf 1

Router-id 8.8.8.8

Network 8.8.8.8 0.0.0.0 area 0

Network 17.0.0.8 0.0.0.0 area 0

Network 18.0.0.8 0.0.0.0 area 0

!R9

Router ospf 1

Router-id 9.9.9.9

Network 9.9.9.9 0.0.0.0 area 0

Network 18.0.0.9 0.0.0.0 area 0

Task 3:

Enable MPLS IP in the provider networks (AS 100 & AS 200)

!R4/R9

Mpls ip

Mpls ldp router-id lo0

Int e0/1

Mpls ip

!R5/R8

Mpls ip

Mpls ldp router-id lo0

Int e0/0

Mpls ip

Int e0/1

Mpls ip

!R6

Mpls ip

Mpls ldp router-id lo0

Int e0/1

Mpls ip

!R7

Mpls ip

Mpls ldp router-id lo0

Int e0/0

Mpls ip

Task 4:

Configure BGP & MP-BGP between R4 & R6, R7 & R9

!R4

Router bgp 100

Neighbor 6.6.6.6 remote-as 100

Neighbor 6.6.6.6 update-source lo0

Address-family vpnv4 unicast

Neighbor 6.6.6.6 activate

Neighbor 6.6.6.6 send-community extended

!R6

Router bgp 100

Neighbor 4.4.4.4 remote-as 100

Neighbor 4.4.4.4 update-source lo0

Address-family vpnv4 unicast

Neighbor 4.4.4.4 activate

Neighbor 4.4.4.4 send-community extended

!R7

Router bgp 200

Neighbor 9.9.9.9 remote-as 200

Neighbor 9.9.9.9 update-source lo0

Address-family vpnv4 unicast

Neighbor 9.9.9.9 activate

Neighbor 9.9.9.9 send-community extended

!R9

Router bgp 200

Neighbor 7.7.7.7 remote-as 200

Neighbor 7.7.7.7 update-source lo0

Address-family vpnv4 unicast

Neighbor 7.7.7.7 activate

Neighbor 7.7.7.7 send-community extended

Task 5:

Configure ip vrf on R4 & R9, RD & RT should be 100:1 and RD & RT for 200:1, and assign the customer facing interface to the VRF.

```
!R4
```

```
Ip vrf A
```

```
Rd 100:1
```

```
Route-target both 100:1
```

```
!
```

```
Interface e0/0
```

```
Ip vrf forwarding A
```

```
Ip address 13.0.0.4 255.0.0.0
```

```
!
```

```
!R9
```

```
Ip vrf A
```

```
Rd 200:1
```

```
Route-target both 200:1
```

```
!
```

```
Interface e0/0
```

```
Ip vrf forwarding A
```

```
Ip address 19.0.0.9 255.0.0.0
```

```
!
```

Task 6:

Configure OSPF as a PE-CE routing protocol between R4-R1 & R9-R2

!R4

Router ospf 10 vrf A

Network 13.0.0.4 0.0.0.0 area 0

!R1

Router ospf 1

Router-id 1.1.1.1

Network 1.1.1.1 0.0.0.0 area 0

Network 13.0.0.1 0.0.0.0 area 0

Network 10.0.0.1 0.0.0.0 area 0

!R9

Router ospf 10 vrf A

Network 19.0.0.9 0.0.0.0 area 0

!R2

Router ospf 1

Router-id 2.2.2.2

Network 2.2.2.2 0.0.0.0 area 0

Network 19.0.0.2 0.0.0.0 area 0

Network 12.0.0.2 0.0.0.0 area 0

Task 7:

Configure VRF AS456 on R6 & AS789 on R7

RD & RT for VRFAS456 is 100:1

RD & RT for VRFAS789 is 200:1

Then assign the interface R6-R7 to be belonging to VRF AS456 on R6 & to VRF AS789 on R7

!R6

Ip vrf AS456

Rd 100:1

Route-target both 100:1

Int e0/2

Ip vrf forwarding AS456

Ip address 16.0.0.6 255.0.0.0

!

!R7

Ip vrf AS789

Rd 200:1

Route-target both 200:1

Int e0/2

Ip vrf forwarding AS789

Ip address 16.0.0.7 255.0.0.0

!

Task 8:

Configure EIGRP as a routing protocol between R6 & R7 on the VRF

!R6

router eigrp 456

address-family ipv4 vrf AS456 autonomous-system 100

network 16.0.0.0

no auto-summary

!R7

router eigrp 789

address-family ipv4 vrf AS789 autonomous-system 100

network 16.0.0.0

no auto-summary

Task 9:

Configure redistribution between the OSPF on R6-R7 & BGP on R6 & R7

!R6

Router eigrp 456

Address-family ipv4 vrf AS456 autonomous-system 100

Redistribute bgp 100 metric 1 1 1 1 1

!

Router bgp 100

Address-family ipv4 vrf AS456

Redistribute eigrp 100

!R7

Router eigrp 789

Address-family ipv4 vrf AS789 autonomous-system 100

Redistribute bgp 200 metric 1 1 1 1 1

!

Router bgp 200

Address-family ipv4 vrf AS789

Redistribute eigrp 100

Task 10:

Configure redistribution between the PE-CE routing protocol and BGP on R4 & R9

!R4

Router ospf 10 vrf A

Redistribute bgp 100 subnets

!

Router bgp 100

Address-family ipv4 vrf A

Redistribute ospf 10 vrf A match internal external 1 external 2

!R9

Router ospf 10 vrf A

Redistribute bgp 200 subnets

!

Router bgp 200

Address-family ipv4 vrf A

Redistribute ospf 10 vrf A match internal external 1 external 2

Lab 2

Inter AS MPLS VPN Using Option B

Follow Lab 1, we want to change the setup from Inter AS Option A to Inter AS Option B, by doing the following Tasks

Task 1:

Remove the VRF created on R6 & R7, assign the link between R6 & R7 to global router

!R6

Default interface e0/2

Int e0/2

No shut

Ip address 16.0.0.6 255.0.0.0

!

No ip vrf AS456

!R7

Default interface e0/2

Int e0/2

No shut

Ip address 16.0.0.7 255.0.0.0

!

No ip vrf AS789

Task 2:

On R4 & R9, change the VRF so that

R4 RD → 100:1

R4 RT export → 100:1

R4 RT import → 200:1

R9 RD → 200:1

R9 RT export → 200:1

R9 RT import → 100:1

!R4

Ip vrf A

Route-target export 100:1

Route-target import 200:1

!

!R9

Ip vrf A

Route-target export 200:1

Route-target import 100:1

Task 3:

Configure MP-eBGP between R6 & R7, disable default route target filter, enable next hop self

!R6

Router bgp 100

No bgp default route-target filter

Neighbor 16.0.0.7 remote-as 200

Address-family vpnv4 unicast

Neighbor 16.0.0.7 activate

Neighbor 16.0.0.7 send-community both

Neighbor 4.4.4.4 next-hop-self

!R7

Router bgp 200

No bgp default route-target filter

Neighbor 16.0.0.6 remote-as 100

Address-family vpnv4 unicast

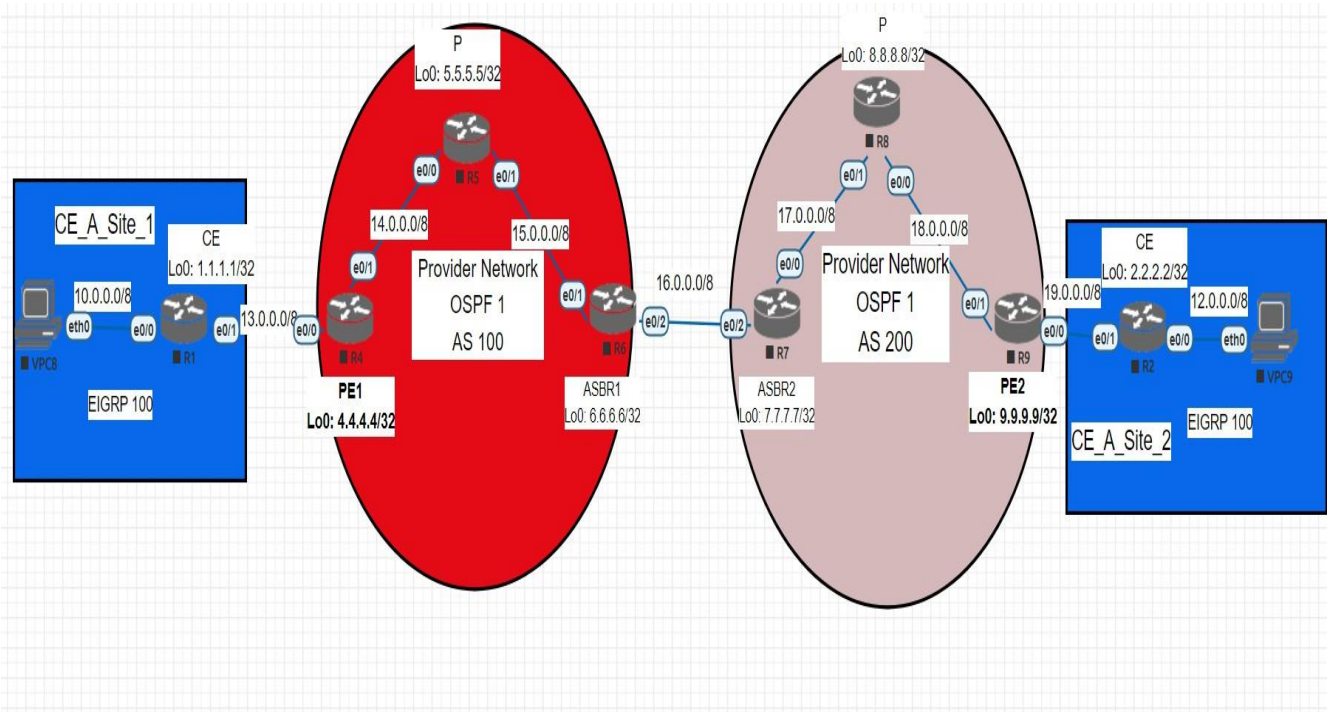
Neighbor 16.0.0.6 activate

Neighbor 16.0.0.6 send-community both

Neighbor 9.9.9.9 next-hop-self

Lab 3

Inter AS MPLS VPN Using Option C



Task 1:

Connect the network as shown and assign ip addresses as depicted

Task 2:

Configure OSPF as IGP on AS 100 & AS 200

!R4

Router ospf 1

Router-id 4.4.4.4

Net 4.4.4.4 0.0.0.0 area 0

Net 14.0.0.4 0.0.0.0 area 0

!R5

Router ospf 1

Router-id 5.5.5.5

Net 5.5.5.5 0.0.0.0 area 0

Net 14.0.0.5 0.0.0.0 area 0

Net 15.0.0.5 0.0.0.0 area 0

!R6

Router ospf 1

Router-id 6.6.6.6

Net 6.6.6.6 0.0.0.0 area 0

Net 15.0.0.6 0.0.0.0 area 0

R7

Router ospf 1

Router-id 7.7.7.7

Net 7.7.7.7 0.0.0.0 area 0

Net 17.0.0.7 0.0.0.0 area 0

!R8

Router ospf 1

Router-id 8.8.8.8

Net 8.8.8.8 0.0.0.0 area 0

Net 17.0.0.8 0.0.0.0 area 0

Net 18.0.0.8 0.0.0.0 area 0

!R9

Router ospf 1

Router-id 9.9.9.9

Net 9.9.9.9 0.0.0.0 area 0

Net 18.0.0.9 0.0.0.0 area 0

Task 3:

Configure eBGP between R6&R7

!R6

Router bgp 100

Neighbor 16.0.0.7 remote-as 200

!R7

Router bgp 200

Neighbor 16.0.0.6 remote-as 100

Task 4:

Redistribute PEs loopback interfaces (4.4.4.4 & 9.9.9.9) on R6&R7 from Bgp to OSPF and Vice Versa. Also configure ebgp to send mpls labels

!R6

Access-list 4 permit 4.0.0.0 0.255.255.255

Access-list 9 permit 9.0.0.0 0.255.255.255

!

Route-map o-t-b permit 10

Match ip address 4

!

Route-map b-t-o permit 10

Match ip address 9

!

Router ospf 1

Redistribute bgp 100 subnets route-map b-t-o

!

Router bgp 100

Neighbor 16.0.0.7 send-label

Redistribute ospf 1 route-map o-t-b match internal

!R7

Access-list 4 permit 4.0.0.0 0.255.255.255

Access-list 9 permit 9.0.0.0 0.255.255.255

!

```
Route-map o-t-b permit 10
Match ip address 9
!
Route-map b-t-o permit 10
Match ip address 4
!
Router ospf 1
Redistribute bgp 200 subnets route-map b-t-o
!
Router bgp 200
Neighbor 16.0.0.6 send-label
Redistribute ospf 1 route-map o-t-b match internal
```

Task 5:

Configure MP-ebgp between R4 & R9

```
!R4
Router bgp 100
Neighbor 9.9.9.9 remote-as 200
Neighbor 9.9.9.9 update-source lo0
Neighbor 9.9.9.9 ebgp-multihop
Address-family vpnv4
Neighbor 9.9.9.9 activate
Neighbor 9.9.9.9 send-community extended
```

```
!R9
Router bgp 200
Neighbor 4.4.4.4 remote-as 100
Neighbor 4.4.4.4 update-source lo0
Neighbor 4.4.4.4 ebgp-multihop
Address-family vpnv4
Neighbor 4.4.4.4 activate
Neighbor 4.4.4.4 send-community extended
```

Task 6:

Configure VRF A on R4 & R9 according to the following parameters and assign interfaces to the VRF

!R4 → RD 100:1, RT export 100:1, RT import 200:1

!R9 → RD 200:1, RT export 200:1, RT import 100:1

```
!R4
Ip vrf A
Rd 100:1
Route-target export 100:1
Route-target import 200:1
!
Interface e0/0
Ip vrf forwarding A
Ip address 13.0.0.4 255.0.0.0
```

```
!R9
Ip vrf A
Rd 200:1
Route-target export 200:1
Route-target import 100:1
!
Interface e0/0
Ip vrf forwarding A
Ip address 19.0.0.9 255.0.0.0
```

Task 7:

Configure EIGRP 100 as PE-CE routing protocol

```
!R4
Router eigrp 456
Address-family ipv4 vrf A autonomous-system 100
Network 13.0.0.0
Redistribute bgp 100 metric 1 1 1 1 1
No auto-summary
!
Router bgp 100
Address-family ipv4 vrf A
Redistribute eigrp 100
```

```
!R1
Router eigrp 100
```

```
Network 1.0.0.0
Network 10.0.0.0
Network 13.0.0.0
No auto-summary
```

```
!R9
Router eigrp 789
Address-family ipv4 vrf A autonomous-system 100
Network 19.0.0.0
Redistribute bgp 200 metric 1 1 1 1 1
No auto-summary
!
Router bgp 200
Address-family ipv4 vrf A
Redistribute eigrp 100
```

```
!R2
Router eigrp 100
Network 2.0.0.0
Network 12.0.0.0
Network 19.0.0.0
No auto-summary
```

Task 8:

Enable MPLS IP on the Routers interfaces of both AS 100 & 200

!R4/R6/R9

Mpls ip

Mpls ldp router-id lo0

!

Int e0/1 Mpls ip

!R5/R8

Mpls ip

Mpls ldp router-id lo0

!

Int e0/0 Mpls ip Int e0/1 Mpls ip

!R7

Mpls ip

Mpls ldp router-id lo0

!

Int e0/0

Mpls ip

