MPLS VPN Configuration

By : Haydar Fadel

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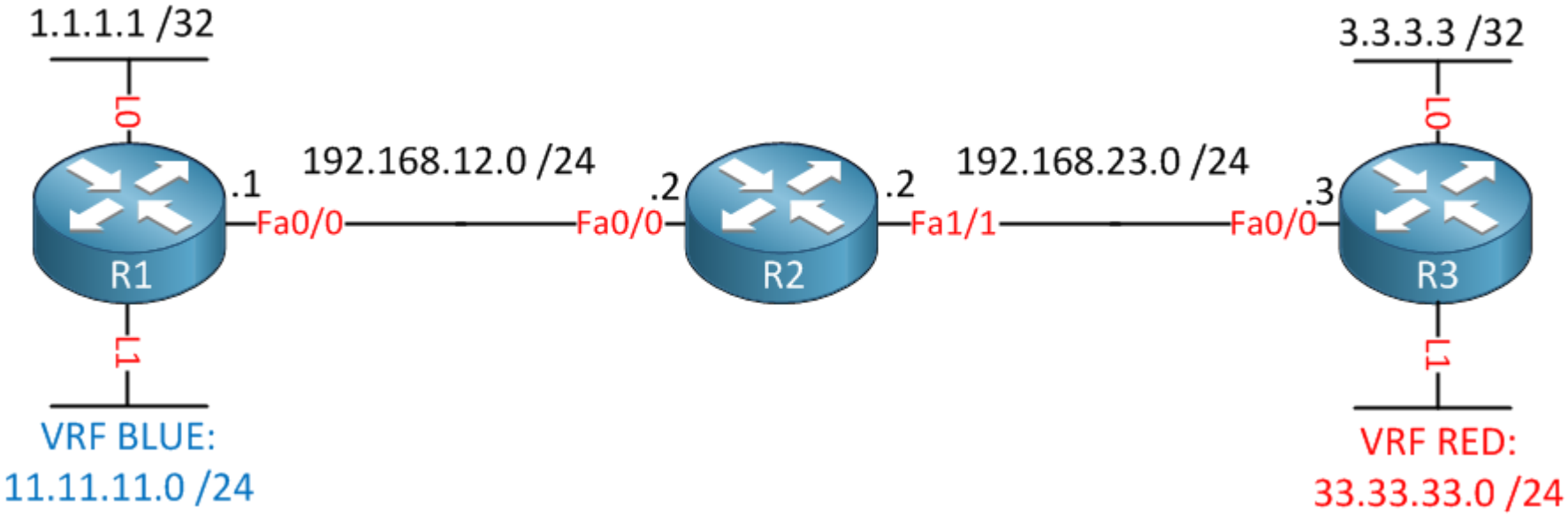
Understanding and Configuring MPLS VPN Configuration on Cisco IOS

MPLS VPN Configuration

- In this article I'm going to walk you through the configuration of a small MPLS VPN network using MP-BGP (Multi-Protocol Border Gateway Protocol) and only two VRFs. I will be using the following topology for this:



- Above you see 3 routers connected to each other.
- R1 and R3 each have two loopback interfaces.
- The loopback 0 interface will be used to establish a BGP neighbor adjacency, the loopback 1 interfaces will be in two different VRFs called blue and red.

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- First we'll configure OSPF so that R1 and R3 can reach each others loopback 0 interface:

```
R1(confg)#router ospf 1
R1(confg-router)#network 192.168.12.1 0.0.0.0 area 0
R1(confg-router)#network 1.1.1.1 0.0.0.0 area 0

R2(confg)#router ospf 1
R2(confg-router)#network 192.168.12.2 0.0.0.0 area 0
R2(confg-router)#network 192.168.23.2 0.0.0.0 area 0


R3(confg)#router ospf 1
R3(confg-router)#network 192.168.23.3 0.0.0.0 area 0
R3(confg-router)#network 3.3.3.3 0.0.0.0 area 0
```

Note : Make sure you configure a /32 network mask on the loopback 0 interfaces.
If you don't, you'll run into issues with MPLS because OSPF by default will always advertise a loopback interface as /32.

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- We'll continue by configuring MPLS on the interfaces of all routers:

```
R1(confg)#interface fastEthernet 0/0
R1(confg-if)#mpls ip

R2(confg)#interface fastEthernet 0/0
R2(confg-if)#mpls ip
R2(confg)#interface fastEthernet 1/0
R2(confg-if)#mpls ip

R3(confg)#interface fastEthernet 0/0
R3(confg-if)#mpls ip
```

```
R1#show mpls forwarding-table
Local Outgoing Prefx Bytes tag Outgoing
Next Hop
tag tag or VC or Tunnel Id switched
interface
16 17  3.3.3.3/32  0   Fa0/0
192.168.12.2
17 Pop tag 192.168.23.0/24 0 Fa0/0
192.168.12.2
```

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- With MPLS running and labels being advertised, we can continue and create the two VRFs:

```
R1(confg)#ip vrf BLUE
R1(confg-vrf)#rd 100:1
R1(confg-vrf)#route-target export 100:1
R1(confg-vrf)#route-target import 100:3
```

- VRF Blue will be created on R1. We will use RD (Route Distinguisher) 100:1 for VRF blue and 100:3 for VRF red.
- Now we can create a new loopback and add it to the VRF:

```
R1(confg)#interface loopback1
R1(confg-if)#ip vrf forwarding BLUE
R1(confg-if)#ip address 11.11.11.11 255.255.255.0
```

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- Loopback 1 has an IP address and is added to VRF blue. Now let's do the same thing on R3:

```
R3(confg)#ip vrf RED
R3(confg-vrf)#rd 100:3
R3(confg-vrf)#route-target export 100:3
R3(confg-vrf)#route-target import 100:1

R3(confg)#interface loopback 1
R3(confg-if)#ip vrf forwarding RED
R3(confg-if)#ip address 33.33.33.33 255.255.255.0
```

On R3 we'll create VRF red and use 100:3 as the RD.

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- Now we can configure BGP on both routers:

```
R1(confg)#router bgp 13
R1(confg-router)#neighbor 3.3.3.3 remote-as 13
R1(confg-router)#neighbor 3.3.3.3 update-source loopback0
R1(confg-router)#address-family vpnv4
R1(confg-router-af)#neighbor 3.3.3.3 activate
R1(confg-router-af)#neighbor 3.3.3.3 send-community extended
R1(confg-router-af)#exit
R1(confg-router)#address-family ipv4 unicast vrf BLUE
R1(confg-router-af)#redistribute connected
```

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```
R3(confg)#router bgp 13
R3(confg-router)#neighbor 1.1.1.1 remote-as 13
R3(confg-router)#neighbor 1.1.1.1 update-source loopback 0
R3(confg-router)#address-family vpnv4
R3(confg-router-af)#neighbor 1.1.1.1 activate
R3(confg-router-af)#neighbor 1.1.1.1 send-community extended
R3(confg-router-af)#exit
R3(confg-router)#address-family ipv4 unicast vrf RED
R3(confg-router-af)#redistribute connected
```

- Above we configured a couple of things for BGP:
- First we need to establish a BGP neighbor adjacency, I did this between the loopback 0 interfaces of R1 and R3.
- Secondly we need to enable the VPNv4 address family on both routers and ensure that they send the extended format communities to each other.
- Last but not least, redistribute the loopback 1 interfaces into the VRF on both routers.

MPLS LDP Filtering Configuration

- For all networks a label has been generated by LDP.
- Now let's configure filtering so that we only generate labels for the loopback 0 interfaces.
- This is how you do it:

```
R1(confg)#access-list 1 permit 1.1.1.1 0.0.0.0
R1(confg)#no mpls ldp advertise-labels
R1(confg)#mpls ldp advertise-labels for 1

R2(confg)#access-list 1 permit 2.2.2.2 0.0.0.0
R2(confg)#no mpls ldp advertise-labels
R2(confg)#mpls ldp advertise-labels for 1

R3(confg)#access-list 1 permit 3.3.3.3 0.0.0.0
R3(confg)#no mpls ldp advertise-labels
R3(confg)#mpls ldp advertise-labels for 1
```

MPLS LDP Filtering Configuration

- First use no mpls ldp advertise-labels to disable the advertisement of all labels.
- Secondly use the mpls ldp advertise-labels for command and refer to an access-list or prefix-list to choose what networks should have a label.

- Be careful, if you forget to use the no mpls ldp advertise-labels command you will discover that LDP is STILL advertising a label for each network…

```
R1#show mpls forwarding-table
Local Outgoing Prefx Bytes tag Outgoing
Next Hop
tag tag or VC or Tunnel Id switched
interface
16 Pop tag 2.2.2.2/32 0 Fa0/0
192.168.12.2
17 Untagged 33.33.33.33/32 0 Fa0/0
192.168.12.2
18 Untagged 3.3.3.3/32 0 Fa0/0
192.168.12.2
19 Untagged 22.22.22.22/32 0 Fa0/0
192.168.12.2
20 Untagged 192.168.23.0/24 0 Fa0/0
192.168.12.2
```