VRF-Lite

CCNP Lab 6

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VRF-Lite Lab 6

Purpose

There were two main purposes of this lab. The first one was to learn how VRF works. The second one was to learn how to implement VRF-lite in a topology.

Background Information

Virtual Private Networks, also known as VPNs, area group of devices that share a routing table. VPNs permit multiple customers to split bandwidth across one ISP (Internet Service Provider). A VPN routing table is pretty much a VPN routing and forwarding table (VRF). VRF-lite is a feature only in layer 3 switches that permits an ISP to support multiple VPNs with overlapping IP addresses to share interfaces by creating separate routing tables that do not have access to one another. VRFs are similar to VLANs, in that you can split interfaces, but VRF only works in layer 3. Many companies use VRF to secure information by using VRFs. This enables two companies to have the same ISP, but can keep their information private.

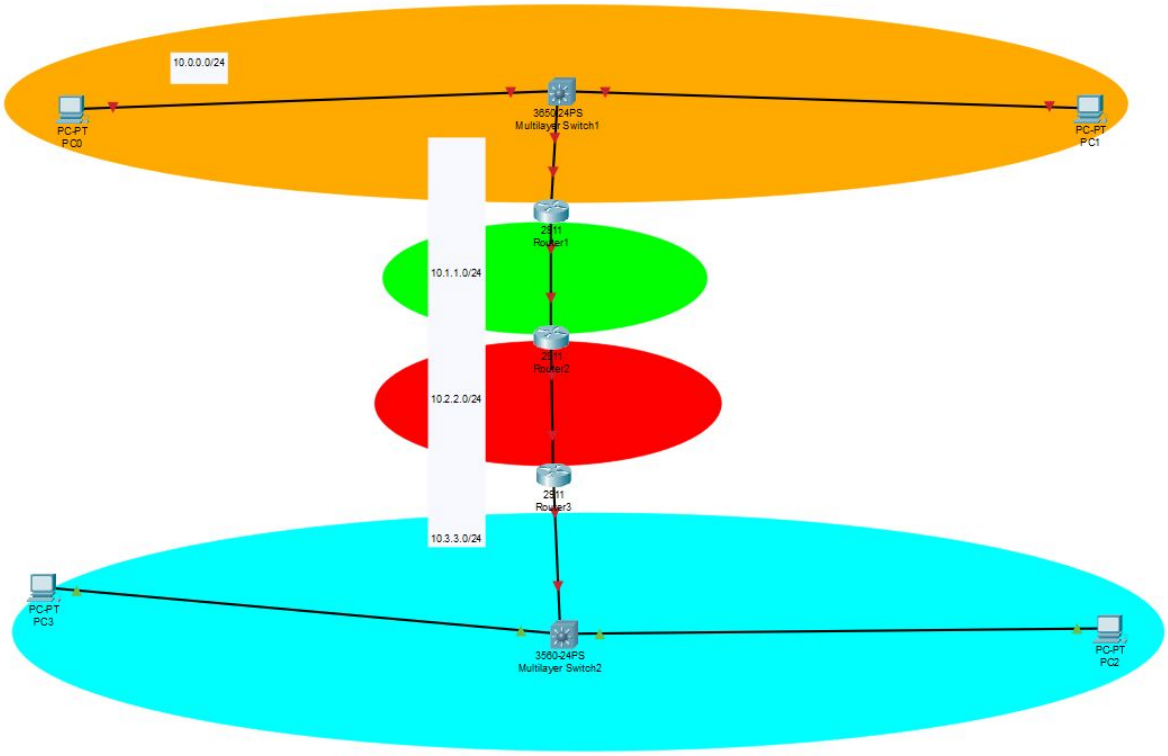
Lab Summary

In this lab, we separated one network into two distinct VRFs called Expedia and Trivago. Three routers were used to transmit traffic. Two switches were used to separate traffic into the specific VRFs they were supposed to go to. The PCs in VRF Expedia and Trivago could not communicate with each other, however PCs within their own VRFs could, showing the successful implementation of VRF lite.

Lab Commands

ip routing	Enables a multilayer switch to route and become a router
router ospf [process-id]	Enables OSPF process on router/multilayer switch for IPv4
network [network address] [wildcard mask] [area-id]	Creates the ospf network in designated area for IPv4
ipv6 router ospf [process-id]	Enables OSPF process on router/multilayer switch for IPv6
ipv6 ospf [process-id] area [area-id]	Group's the router's interface into an OSPF area for IPv6, so that it can start building its topology
show ip route	Generates the routing table for IPv4
show ip ospf neighbors	Shows the adjacencies and neighbors that each device has from OSPF - IPv4
ping [ip-address]	Shows the connectivity between the device and another one - works for IPv4 and IPv6
ip address [address]	Sets up the IPv4 address in an interface
ip vrf [name]	Configures the vrf on the switch/router
ping ip vrf [vrf name]	Pings interfaces assigned to vrfs
ip vrf forwarding [vrf name]	Implements vrf on a cisco device

Network Diagram



Configurations

Router 1 Configuration:

R1# show run

```
hostname R1
ip vrf Expedia
ip vrf Trivago
interface Embedded-Service-Engine0/0
 no ip address
 shutdown
interface GigabitEthernet0/0
 no ip address
 duplex auto
 speed auto
interface GigabitEthernet0/0.10
 description Expedia
 encapsulation dot1Q 10
 ip vrf forwarding Expedia
```

```
 ip address 10.0.0.4 255.255.255.0
interface GigabitEthernet0/0.20
 description Trivago
 encapsulation dot1Q 20
 ip vrf forwarding Trivago
 ip address 10.0.0.4 255.255.255.0
interface GigabitEthernet0/1
 no ip address
 duplex auto
 speed auto
interface GigabitEthernet0/1.10
 description Expedia
 encapsulation dot1Q 10
 ip vrf forwarding Expedia
 ip address 10.1.1.1 255.255.255.0
interface GigabitEthernet0/1.20
 description Trivago
 encapsulation dot1Q 20
 ip vrf forwarding Trivago
 ip address 10.1.1.1 255.255.255.0
router ospf 1 vrf Expedia
 router-id 1.1.1.2
 network 10.0.0.0 0.0.0.255 area 0
 network 10.1.1.0 0.0.0.255 area 0
router ospf 2 vrf Trivago
 router-id 1.1.1.3
 network 10.0.0.0 0.0.0.255 area 0
 network 10.1.1.0 0.0.0.255 area 0
end
```

Router 2 Configuration:

R2# show run

```
hostname R2
ip vrf Expedia
ip vrf Trivago
interface Embedded-Service-Engine0/0
 no ip address
 shutdown
interface GigabitEthernet0/0
 no ip address
 duplex auto
 speed auto
interface GigabitEthernet0/0.10
 description Expedia
 encapsulation dot1Q 10
 ip vrf forwarding Expedia
 ip address 10.1.1.2 255.255.255.0
interface GigabitEthernet0/0.20
 description Trivago
```

```
 encapsulation dot1Q 20
 ip vrf forwarding Trivago
 ip address 10.1.1.2 255.255.255.0
interface GigabitEthernet0/1
 no ip address
 duplex auto
 speed auto
interface GigabitEthernet0/1.10
 description Expedia
 encapsulation dot1Q 10
 ip vrf forwarding Expedia
 ip address 10.2.2.1 255.255.255.0
interface GigabitEthernet0/1.20
 description Trivago
 encapsulation dot1Q 20
 ip vrf forwarding Trivago
 ip address 10.2.2.1 255.255.255.0
interface Serial0/0/0
 no ip address
 shutdown
 clock rate 2000000
interface Serial0/0/1
 no ip address
 shutdown
 clock rate 2000000
interface GigabitEthernet0/1/0
 no ip address
 shutdown
 duplex auto
 speed auto
router ospf 1 vrf Expedia
 router-id 2.2.2.2
 network 10.1.1.0 0.0.0.255 area 0
 network 10.2.2.0 0.0.0.255 area 0
router ospf 2 vrf Trivago
 router-id 2.2.2.3
 network 10.1.1.0 0.0.0.255 area 0
 network 10.2.2.0 0.0.0.255 area 0
end
```

Router 3 Configuration:

R3# show run

```
hostname R3
ip vrf Expedia
ip vrf Trivago
interface Embedded-Service-Engine0/0
 no ip address
 shutdown
interface GigabitEthernet0/0
```

```
 no ip address
 duplex auto
 speed auto
interface GigabitEthernet0/0.10
 description Expedia
 encapsulation dot1Q 10
 ip vrf forwarding Expedia
 ip address 10.2.2.2 255.255.255.0
interface GigabitEthernet0/0.20
 description Trivago
 encapsulation dot1Q 20
 ip vrf forwarding Trivago
 ip address 10.2.2.2 255.255.255.0
interface GigabitEthernet0/1
 no ip address
 duplex auto
 speed auto
interface GigabitEthernet0/1.10
 description Expedia
 encapsulation dot1Q 10
 ip vrf forwarding Expedia
 ip address 10.3.3.4 255.255.255.0
interface GigabitEthernet0/1.20
 description Trivago
 encapsulation dot1Q 20
 ip vrf forwarding Trivago
 ip address 10.3.3.4 255.255.255.0
interface Serial0/0/0
 no ip address
 shutdown
 clock rate 2000000
interface Serial0/0/1
 no ip address
 shutdown
 clock rate 2000000
interface GigabitEthernet0/1/0
 no ip address
 shutdown
 duplex auto
 speed auto
router ospf 1 vrf Expedia
 router-id 3.3.3.2
 network 10.2.2.0 0.0.0.255 area 0
 network 10.3.3.0 0.0.0.255 area 0
router ospf 2 vrf Trivago
 router-id 3.3.3.3
 network 10.2.2.0 0.0.0.255 area 0
 network 10.3.3.0 0.0.0.255 area 0
end
```

Multilayer Switch 1 Configuration:

S1# show run

```
hostname S1
ip vrf Expedia
ip vrf Trivago
vlan 10,20
interface Loopback0
 ip vrf forwarding Trivago
 ip address 10.0.1.1 255.255.255.0
interface FastEthernet1/0/1
 switchport access vlan 10
 ip vrf forwarding Expedia
interface FastEthernet1/0/2
 switchport access vlan 20
 ip vrf forwarding Trivago
interface FastEthernet1/0/3
 switchport trunk encapsulation dot1q
 switchport trunk allowed vlan 10,20
 switchport mode trunk
interface Vlan10
 ip vrf forwarding Expedia
 ip address 10.0.0.5 255.255.255.0
interface Vlan20
 ip vrf forwarding Trivago
 ip address 10.0.0.6 255.255.255.0
router ospf 1 vrf Expedia
 router-id 0.0.0.2
 network 10.0.0.0 0.0.0.255 area 0
 network 10.0.1.0 0.0.0.255 area 0
router ospf 2 vrf Trivago
 router-id 0.0.0.3
 network 10.0.0.0 0.0.0.255 area 0
 network 10.0.1.0 0.0.0.255 area 0
end
```

Multilayer Switch 2 Configuration:

S2# show run

```
hostname S2
ip routing
ip vrf Expedia
ip vrf Trivago
vlan 10
 name Expedia
vlan 20
 name Trivago
interface Loopback1
 ip vrf forwarding Expedia
```

```
 ip address 10.3.4.1 255.255.255.0
interface FastEthernet1/0/1
 switchport access vlan 20
 ip vrf forwarding Trivago
interface FastEthernet1/0/2
 switchport access vlan 10
 ip vrf forwarding Expedia
interface FastEthernet1/0/3
 switchport trunk encapsulation dot1q
 switchport trunk allowed vlan 10,20
 switchport mode trunk
interface Vlan10
 ip vrf forwarding Expedia
 ip address 10.3.3.5 255.255.255.0
interface Vlan20
 ip vrf forwarding Trivago
 ip address 10.3.3.6 255.255.255.0
router ospf 1 vrf Expedia
 router-id 3.3.3.4
 network 10.3.2.0 0.0.0.255 area 0
 network 10.3.3.0 0.0.0.255 area 0
 network 10.3.4.0 0.0.0.255 area 0
router ospf 2 vrf Trivago
 router-id 3.3.3.5
 network 10.3.2.0 0.0.0.255 area 0
 network 10.3.3.0 0.0.0.255 area 0
 network 10.3.4.0 0.0.0.255 area 0
end
```

Problems

VRF-Lite wasn't very hard of a lab, it was just very tedious. There are so many ip addresses that our biggest problem was tracking all of them, and knowing which one goes where. Other than that, it only took a couple days to get the lab done.

Conclusion

In conclusion, we set up VRF-lite on a basic topology to model what VRF could be used for in real life. We made two VRFs one called Expedia and the other called Trivago. The VRF-lite implementation allowed for only the

computers in Expedia to ping other computers in Expedia, and only the Trivago computers to ping other computers in Trivago.