VRF-Lite

# CCNP Lab 6

## Axel Li

## 23 January 2019

# Purpose

The purpose of this lab was to develop an understanding of VRF Lite and how it functions. Our task was to configure two separate VRF instances, named Expedia and Trivago respectively, along a chain of a switch, three routers, then another switch. For each switch, two computers were connected, one for each VRF. To complete the lab, we had to demonstrate that corresponding computers could ping each other across the network but could not ping devices in the other VRF.

# Background

Virtual Forwarding and Routing (VRF) is a technology that allows routers to have multiple independent routing tables at the same time. This allows for improved network functionality as network paths can be logically separated without multiple physical routers. In addition, the same IP addresses can be used across the routing instances because they are independent of each other. VRF can be considered to be layer 3 equivalents of VLANs.

VRF Lite originally evolved as the use of VRFs without Multi-Protocol Layer Switching (MPLS), and operates in a peer-based fashion, with adjacent routers sharing relevant information. While this is easy to set up on small and medium scale networks, VRF Lite does not scale well for large networks as each router must have every VRF instance. Nevertheless, it is still useful and provides network administrators another tool to control and manage networks.

# Summary

My partner and I started off by researching how to configure VRF Lite. We then created a table of IP addresses for each VRF on each interface of each device and made a corresponding topology diagram for reference. We then wrote an initial configuration in a separate text file, copied it several times for each device, and then made changes to the configuration for aspects different between each device such as IP address. Since we only had two computers to work with, two of the computers in the topology were substituted with loopback interfaces. We then pasted the configurations into the routers and switches, and troubleshooted any problems we encountered.

# Commands

The key commands used in this lab for the routers were:

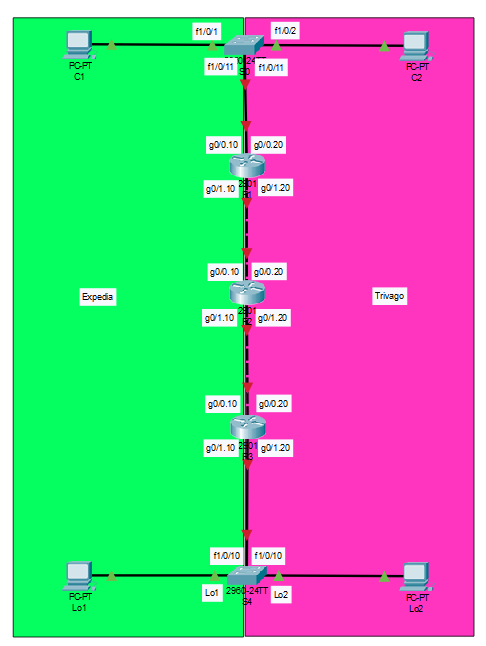
Ip vrf [vrf name] - creates a VRF with the specified name

Ip vrf forwarding [vrf name] - associates the VRF with the corresponding interface

Router ospf [process-id] vrf [vrf name] – associates the routing process with the VRF

# Tables and Diagrams

Topology Diagram:



Key:

C - computers

S - layer 3 switches

R - routers (ospf)

L - loopbacks

1 - Expedia

2 - Trivago

|  |  |  |
| --- | --- | --- |
| **VLAN** | **VLAN Name** | **Associated VRF Name** |
| 10 | Expedia | Expedia |
| 20 | Trivago | Trivago |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Device** | **Interface** | **VLAN / Encapsulation** | **IPv4 Address** | **Subnet Mask** | **VRF** |
| C1 | N/A | 10 | 10.1.0.1 | 255.255.255.0 | Expedia |
| C2 | N/A | 20 | 10.2.0.1 | 255.255.255.0 | Trivago |
| S0 | f1/0/1 | 10 | 10.1.0.05 | 255.255.255.0 | Expedia |
| f1/0/2 | 20 | 10.2.0.05 | 255.255.255.0 | Trivago |
| f1/0/11 | 10 | 10.1.0.05 | 255.255.255.0 | Expedia |
| f1/0/11 | 20 | 10.2.0.05 | 255.255.255.0 | Trivago |
| R1 | g0/0.10 | 10 | 10.1.0.10 | 255.255.255.0 | Expedia |
| g0/0.20 | 20 | 10.2.0.10 | 255.255.255.0 | Trivago |
| g0/1.10 | 10 | 10.0.1.10 | 255.255.255.0 | Expedia |
| g0/1.20 | 20 | 10.0.1.10 | 255.255.255.0 | Trivago |
| R2 | g0/0.10 | 10 | 10.0.1.20 | 255.255.255.0 | Expedia |
| g0/0.20 | 20 | 10.0.1.20 | 255.255.255.0 | Trivago |
| g0/1.10 | 10 | 10.0.2.20 | 255.255.255.0 | Expedia |
| g0/1.20 | 20 | 10.0.2.20 | 255.255.255.0 | Trivago |
| R3 | g0/0.10 | 10 | 10.0.2.30 | 255.255.255.0 | Expedia |
| g0/0.20 | 20 | 10.0.2.30 | 255.255.255.0 | Trivago |
| g0/1.10 | 10 | 10.1.3.30 | 255.255.255.0 | Expedia |
| g0/1.20 | 20 | 10.2.3.30 | 255.255.255.0 | Trivago |
| S4 | f1/0/10 | 10 | 10.1.3.45 | 255.255.255.0 | Expedia |
| f1/0/10 | 20 | 10.2.3.45 | 255.255.255.0 | Trivago |
| lo1 | 10 | 10.1.4.1 | 255.255.255.0 | Expedia |
| lo2 | 20 | 10.2.4.1 | 255.255.255.0 | Trivago |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Connection** | **Interface** | **VLAN / Encapsulation** | **IPv4 Address** | **Subnet Mask** | **VRF** |
| C1 - S0 | N/A | 10 | 10.1.0.1 | 255.255.255.0 | Expedia |
| f1/0/1 | 10.1.0.05 |
| C2 - S0 | N/A | 20 | 10.2.0.1 | 255.255.255.0 | Trivago |
| f1/0/2 | 10.2.0.05 |
| S0 - R1 | f1/0/11 | 10 | 10.1.0.05 | 255.255.255.0 | Expedia |
| g0/0.10 | 10.1.0.10 |
| f1/0/11 | 20 | 10.2.0.05 | 255.255.255.0 | Trivago |
| g0/0.20 | 10.2.0.10 |
| R1 - R2 | g0/1.10 | 10 | 10.0.1.10 | 255.255.255.0 | Expedia |
| g0/0.10 | 10.0.1.20 |
| g0/1.20 | 20 | 10.0.1.10 | 255.255.255.0 | Trivago |
| g0/0.20 | 10.0.1.20 |
| R2 - R3 | g0/1.10 | 10 | 10.0.2.20 | 255.255.255.0 | Expedia |
| g0/0.10 | 10.0.2.30 |
| g0/1.20 | 20 | 10.0.2.20 | 255.255.255.0 | Trivago |
| g0/0.20 | 10.0.2.30 |
| R3 - S4 | g0/1.10 | 10 | 10.1.3.30 | 255.255.255.0 | Expedia |
| f1/0/10 | 10.1.3.45 |
| g0/1.20 | 20 | 10.2.3.30 | 255.255.255.0 | Trivago |
| f1/0/10 | 10.2.3.45 |
| S4 - L1 | lo1 | 10 | 10.1.4.1 | 255.255.255.0 | Expedia |
| S4 - L2 | lo2 | 20 | 10.2.4.1 | 255.255.255.0 | Trivago |

|  |  |  |
| --- | --- | --- |
| **Router** | **OSPF Router ID** | **VRF** |
| S0 | 0.0.1.1 | Expedia |
| 0.0.2.2 | Trivago |
| R1 | 1.1.1.1 | Expedia |
| 1.1.2.2 | Trivago |
| R2 | 2.2.1.1 | Expedia |
| 2.2.2.2 | Trivago |
| R3 | 3.3.1.1 | Expedia |
| 3.3.2.2 | Trivago |
| S4 | 4.4.1.1 | Expedia |
| 4.4.2.2 | Trivago |

# Configurations

**S0# show run**

Current configuration : 4446 bytes

Last configuration change at 01:12:43 UTC Mon Mar 1 1993

version 12.2

no service pad

service timestamps debug uptime

service timestamps log uptime

no service password-encryption

hostname S0

ip routing

ip vrf Expedia

ip vrf Trivago

no ip domain-lookup

vlan 10

name Expedia

vlan 20

name Trivago

interface FastEthernet1/0/1

switchport access vlan 10

switchport mode access

ip vrf forwarding Expedia

interface FastEthernet1/0/2

switchport access vlan 20

switchport mode access

ip vrf forwarding Trivago

interface FastEthernet1/0/11

switchport trunk encapsulation dot1q

switchport trunk allowed vlan 10,20

switchport mode trunk

interface Vlan10

ip vrf forwarding Expedia

ip address 10.1.0.5 255.255.255.0

interface Vlan20

ip vrf forwarding Trivago

ip address 10.2.0.5 255.255.255.0

router ospf 1 vrf Expedia

router-id 0.0.1.1

network 10.1.0.0 0.0.0.255 area 0

router ospf 2 vrf Trivago

router-id 0.0.2.2

network 10.2.0.0 0.0.0.255 area 0

line con 0

line vty 5 15

end

**S0# show ip int brief**

Interface              IP-Address OK? Method Status                Protocol

Vlan10                 10.1.0.5 YES manual up                    up

Vlan20                 10.2.0.5 YES manual up                    up

FastEthernet1/0/1      unassigned YES unset  up up

FastEthernet1/0/2      unassigned YES unset  up up

FastEthernet1/0/11     unassigned YES unset  up up

**S0# show ip route vrf Expedia**

Routing Table: Expedia

Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 6 subnets, 2 masks

O        10.0.1.0/24 [110/2] via 10.1.0.10, 00:32:16, Vlan10

O        10.0.2.0/24 [110/3] via 10.1.0.10, 00:30:42, Vlan10

C        10.1.0.0/24 is directly connected, Vlan10

L        10.1.0.5/32 is directly connected, Vlan10

O        10.1.3.0/24 [110/4] via 10.1.0.10, 00:30:42, Vlan10

O        10.1.4.1/32 [110/5] via 10.1.0.10, 00:19:38, Vlan10

**S0# show ip route vrf Trivago**

Routing Table: Trivago

Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 6 subnets, 2 masks

O        10.0.1.0/24 [110/2] via 10.2.0.10, 00:42:27, Vlan20

O        10.0.2.0/24 [110/3] via 10.2.0.10, 00:42:27, Vlan20

C        10.2.0.0/24 is directly connected, Vlan20

L        10.2.0.5/32 is directly connected, Vlan20

O        10.2.3.0/24 [110/4] via 10.2.0.10, 00:42:27, Vlan20

O        10.2.4.1/32 [110/5] via 10.2.0.10, 00:19:52, Vlan20

**S0# show ip ospf neigh**

Neighbor ID     Pri State      Dead Time Address      Interface

1.1.2.2           1 FULL/DR  00:00:38 10.2.0.10       Vlan20

1.1.1.1           1 FULL/DR  00:00:36 10.1.0.10       Vlan10

**S0# show vrf ipv4 int**

Interface              VRF       Protocol Address

Vl10                   Expedia       up 10.1.0.5

Fa1/0/1                Expedia       up unassigned

Vl20                   Trivago       up 10.2.0.5

Fa1/0/2                Trivago       up unassigned

**S0# show vlan**

VLAN Name                             Status Ports

---- -------------------------------- --------- -------------------------------

1    default                          active Fa1/0/3, Fa1/0/4, Fa1/0/5

                                               Fa1/0/6, Fa1/0/7, Fa1/0/8

                                               Fa1/0/9, Fa1/0/10, Fa1/0/12

                                               Fa1/0/13, Fa1/0/14, Fa1/0/15

                                               Fa1/0/16, Fa1/0/17, Fa1/0/18

                                               Fa1/0/19, Fa1/0/20, Fa1/0/21

                                               Fa1/0/22, Fa1/0/23, Fa1/0/24

                                               Gi1/0/1, Gi1/0/2, Gi1/1/1

                                               Gi1/1/2

10   Expedia                          active Fa1/0/1

20   Trivago                          active Fa1/0/2

**S4# show run**

Building configuration...

Current configuration : 2165 bytes

Last configuration change at 04:24:39 UTC Mon Mar 1 1993

version 12.2

no service pad

service timestamps debug datetime msec

service timestamps log datetime msec

no service password-encryption

hostname S4

ip routing

ip vrf Expedia

ip vrf Trivago

no ip domain-lookup

interface Loopback1

ip vrf forwarding Expedia

ip address 10.1.4.1 255.255.255.0

interface Loopback2

ip vrf forwarding Trivago

ip address 10.2.4.1 255.255.255.0

interface FastEthernet1/0/10

switchport trunk encapsulation dot1q

switchport trunk allowed vlan 10,20

switchport mode trunk

interface Vlan10

ip vrf forwarding Expedia

ip address 10.1.3.45 255.255.255.0

interface Vlan20

ip vrf forwarding Trivago

ip address 10.2.3.45 255.255.255.0

router ospf 1 vrf Expedia

router-id 4.4.1.1

network 10.1.3.0 0.0.0.255 area 0

network 10.1.4.0 0.0.0.255 area 0

router ospf 2 vrf Trivago

router-id 4.4.2.2

network 10.2.3.0 0.0.0.255 area 0

network 10.2.4.0 0.0.0.255 area 0

line con 0

line vty 5 15

end

**S4# show ip int brief**

Interface              IP-Address OK? Method Status                Protocol

Vlan10                 10.1.3.45 YES manual up                    up

Vlan20                 10.2.3.45 YES manual up                    up

FastEthernet1/0/10     unassigned YES unset  up up

Loopback1              10.1.4.1 YES manual up                    up

Loopback2              10.2.4.1 YES manual up                    up

**S4# show ip route vrf Expedia**

Routing Table: Expedia

Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks

O        10.0.1.0/24 [110/3] via 10.1.3.30, 00:50:07, Vlan10

O        10.0.2.0/24 [110/2] via 10.1.3.30, 00:50:07, Vlan10

O        10.1.0.0/24 [110/4] via 10.1.3.30, 00:50:07, Vlan10

C        10.1.3.0/24 is directly connected, Vlan10

L        10.1.3.45/32 is directly connected, Vlan10

C        10.1.4.0/24 is directly connected, Loopback1

L        10.1.4.1/32 is directly connected, Loopback1

**S4# show ip route vrf Trivago**

Routing Table: Trivago

Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks

O        10.0.1.0/24 [110/3] via 10.2.3.30, 00:50:36, Vlan20

O        10.0.2.0/24 [110/2] via 10.2.3.30, 00:50:36, Vlan20

O        10.2.0.0/24 [110/4] via 10.2.3.30, 00:50:36, Vlan20

C        10.2.3.0/24 is directly connected, Vlan20

L        10.2.3.45/32 is directly connected, Vlan20

C        10.2.4.0/24 is directly connected, Loopback2

L        10.2.4.1/32 is directly connected, Loopback2

**S4# show ip ospf neigh**

Neighbor ID     Pri State      Dead Time Address      Interface

3.3.2.2           1 FULL/BDR  00:00:35 10.2.3.30       Vlan20

3.3.1.1           1 FULL/BDR  00:00:38 10.1.3.30       Vlan10

**S4# show vrf ipv4 int**

Interface              VRF       Protocol Address

Vl10                   Expedia       up 10.1.3.45

Lo1                    Expedia       up 10.1.4.1

Vl20                   Trivago       up 10.2.3.45

Lo2                    Trivago       up 10.2.4.1

**R1# show run**

Building configuration...

Current configuration : 2280 bytes

Last configuration change at 21:57:02 UTC Tue Jan 15 2019

version 15.2

service timestamps debug datetime msec

service timestamps log datetime msec

no service password-encryption

hostname R1

ip vrf Expedia

ip vrf Trivago

no ip domain lookup

interface GigabitEthernet0/0

no ip address

duplex auto

speed auto

interface GigabitEthernet0/0.10

encapsulation dot1Q 10

ip vrf forwarding Expedia

ip address 10.1.0.10 255.255.255.0

interface GigabitEthernet0/0.20

encapsulation dot1Q 20

ip vrf forwarding Trivago

ip address 10.2.0.10 255.255.255.0

interface GigabitEthernet0/1

no ip address

duplex auto

speed auto

interface GigabitEthernet0/1.10

encapsulation dot1Q 10

ip vrf forwarding Expedia

ip address 10.0.1.10 255.255.255.0

interface GigabitEthernet0/1.20

encapsulation dot1Q 20

ip vrf forwarding Trivago

ip address 10.0.1.10 255.255.255.0

router ospf 1 vrf Expedia

router-id 1.1.1.1

network 10.0.1.0 0.0.0.255 area 0

network 10.1.0.0 0.0.0.255 area 0

router ospf 2 vrf Trivago

router-id 1.1.2.2

network 10.0.1.0 0.0.0.255 area 0

network 10.2.0.0 0.0.0.255 area 0

line con 0

line aux 0

line 2

no activation-character

no exec

transport preferred none

transport output lat pad telnet rlogin lapb-ta mop udptn v120 ssh

stopbits 1

line vty 0 4

login

transport input all

scheduler allocate 20000 1000

end

**R1# show ip int brief**

Interface                  IP-Address OK? Method Status                Protocol

GigabitEthernet0/0         unassigned YES unset up                    up

GigabitEthernet0/0.10      10.1.0.10 YES manual up                    up

GigabitEthernet0/0.20      10.2.0.10 YES manual up                    up

GigabitEthernet0/1         unassigned YES unset up                    up

GigabitEthernet0/1.10      10.0.1.10 YES manual up                    up

GigabitEthernet0/1.20      10.0.1.10 YES manual up                    up

**R1# show ip route vrf Expedia**

Routing Table: Expedia

Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks

C        10.0.1.0/24 is directly connected, GigabitEthernet0/1.10

L        10.0.1.10/32 is directly connected, GigabitEthernet0/1.10

O        10.0.2.0/24 [110/2] via 10.0.1.20, 00:23:54, GigabitEthernet0/1.10

C        10.1.0.0/24 is directly connected, GigabitEthernet0/0.10

L        10.1.0.10/32 is directly connected, GigabitEthernet0/0.10

O        10.1.3.0/24 [110/3] via 10.0.1.20, 00:23:26, GigabitEthernet0/1.10

O        10.1.4.1/32 [110/4] via 10.0.1.20, 00:23:16, GigabitEthernet0/1.10

**R1# show ip route vrf Trivago**

Routing Table: Trivago

Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks

C        10.0.1.0/24 is directly connected, GigabitEthernet0/1.20

L        10.0.1.10/32 is directly connected, GigabitEthernet0/1.20

O        10.0.2.0/24 [110/2] via 10.0.1.20, 00:24:08, GigabitEthernet0/1.20

C        10.2.0.0/24 is directly connected, GigabitEthernet0/0.20

L        10.2.0.10/32 is directly connected, GigabitEthernet0/0.20

O        10.2.3.0/24 [110/3] via 10.0.1.20, 00:23:40, GigabitEthernet0/1.20

O        10.2.4.1/32 [110/4] via 10.0.1.20, 00:23:30, GigabitEthernet0/1.20

**R1# show ip ospf neigh**

Neighbor ID     Pri State      Dead Time Address      Interface

2.2.2.2           1 FULL/DR  00:00:33 10.0.1.20       GigabitEthernet0/1.20

0.0.2.2           1 FULL/BDR  00:00:38 10.2.0.5        GigabitEthernet0/0.20

2.2.1.1           1 FULL/DR  00:00:31 10.0.1.20       GigabitEthernet0/1.10

0.0.1.1

**R1# show vrf ipv4 int**

Interface              VRF       Protocol Address

Gi0/0.10               Expedia       up 10.1.0.10

Gi0/1.10               Expedia       up 10.0.1.10

Gi0/0.20               Trivago       up 10.2.0.10

Gi0/1.20               Trivago       up 10.0.1.10

**R2# show run**

Building configuration...

Current configuration : 2584 bytes

Last configuration change at 21:00:19 UTC Tue Jan 15 2019

version 15.2

service timestamps debug datetime msec

service timestamps log datetime msec

no service password-encryption

hostname R2

ip vrf Expedia

ip vrf Trivago

interface GigabitEthernet0/0

no ip address

ip broadcast-address 0.0.0.0

duplex auto

speed auto

interface GigabitEthernet0/0.10

encapsulation dot1Q 10

ip vrf forwarding Expedia

ip address 10.0.1.20 255.255.255.0

ip broadcast-address 10.0.1.0

interface GigabitEthernet0/0.20

encapsulation dot1Q 20

ip vrf forwarding Trivago

ip address 10.0.1.20 255.255.255.0

ip broadcast-address 10.0.1.0

interface GigabitEthernet0/1

no ip address

ip broadcast-address 0.0.0.0

duplex auto

speed auto

interface GigabitEthernet0/1.10

encapsulation dot1Q 10

ip vrf forwarding Expedia

ip address 10.0.2.20 255.255.255.0

ip broadcast-address 10.0.2.0

interface GigabitEthernet0/1.20

encapsulation dot1Q 20

ip vrf forwarding Trivago

ip address 10.0.2.20 255.255.255.0

ip broadcast-address 10.0.2.0

router ospf 1 vrf Expedia

router-id 2.2.1.1

network 10.0.1.0 0.0.0.255 area 0

network 10.0.2.0 0.0.0.255 area 0

router ospf 2 vrf Trivago

router-id 2.2.2.2

network 10.0.1.0 0.0.0.255 area 0

network 10.0.2.0 0.0.0.255 area 0

line con 0

line aux 0

line 2

no activation-character

no exec

transport preferred none

transport output lat pad telnet rlogin lapb-ta mop udptn v120 ssh

stopbits 1

line vty 0 4

login

transport input all

scheduler allocate 20000 1000

end

**R2# show ip int brief**

Interface                  IP-Address OK? Method Status                Protocol

GigabitEthernet0/0         unassigned YES unset up                    up

GigabitEthernet0/0.10      10.0.1.20 YES manual up                    up

GigabitEthernet0/0.20      10.0.1.20 YES manual up                    up

GigabitEthernet0/1         unassigned YES unset up                    up

GigabitEthernet0/1.10      10.0.2.20 YES manual up                    up

GigabitEthernet0/1.20      10.0.2.20 YES manual up                    up

**R2# show ip route vrf Expedia**

Routing Table: Expedia

Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks

C        10.0.1.0/24 is directly connected, GigabitEthernet0/0.10

L        10.0.1.20/32 is directly connected, GigabitEthernet0/0.10

C        10.0.2.0/24 is directly connected, GigabitEthernet0/1.10

L        10.0.2.20/32 is directly connected, GigabitEthernet0/1.10

O        10.1.0.0/24 [110/2] via 10.0.1.10, 00:06:50, GigabitEthernet0/0.10

O        10.1.3.0/24 [110/2] via 10.0.2.30, 00:05:38, GigabitEthernet0/1.10

O        10.1.4.1/32 [110/3] via 10.0.2.30, 00:05:28, GigabitEthernet0/1.10

**R2# show ip route vrf Trivago**

Routing Table: Trivago

Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks

C        10.0.1.0/24 is directly connected, GigabitEthernet0/0.20

L        10.0.1.20/32 is directly connected, GigabitEthernet0/0.20

C        10.0.2.0/24 is directly connected, GigabitEthernet0/1.20

L        10.0.2.20/32 is directly connected, GigabitEthernet0/1.20

O        10.2.0.0/24 [110/2] via 10.0.1.10, 00:06:34, GigabitEthernet0/0.20

O        10.2.3.0/24 [110/2] via 10.0.2.30, 00:05:22, GigabitEthernet0/1.20

O        10.2.4.1/32 [110/3] via 10.0.2.30, 00:05:12, GigabitEthernet0/1.20

**R2# show ip ospf neigh**

Neighbor ID     Pri State      Dead Time Address      Interface

3.3.2.2           1 FULL/DR  00:00:34 10.0.2.30       GigabitEthernet0/1.20

1.1.2.2           1 FULL/BDR  00:00:36 10.0.1.10       GigabitEthernet0/0.20

3.3.1.1           1 FULL/DR  00:00:35 10.0.2.30       GigabitEthernet0/1.10

1.1.1.1           1 FULL/BDR  00:00:35 10.0.1.10       GigabitEthernet0/0.10

**R2# show vrf ipv4 int**

Interface              VRF       Protocol Address

Gi0/0.10               Expedia       up 10.0.1.20

Gi0/1.10               Expedia       up 10.0.2.20

Gi0/0.20               Trivago       up 10.0.1.20

Gi0/1.20               Trivago       up 10.0.2.20

**R3# show run**

Building configuration...

Current configuration : 2280 bytes

Last configuration change at 20:56:53 UTC Tue Jan 15 2019

version 15.2

service timestamps debug datetime msec

service timestamps log datetime msec

no service password-encryption

hostname R3

ip vrf Expedia

ip vrf Trivago

no ip domain lookup

interface GigabitEthernet0/0

no ip address

duplex auto

speed auto

interface GigabitEthernet0/0.10

encapsulation dot1Q 10

ip vrf forwarding Expedia

ip address 10.0.2.30 255.255.255.0

interface GigabitEthernet0/0.20

encapsulation dot1Q 20

ip vrf forwarding Trivago

ip address 10.0.2.30 255.255.255.0

interface GigabitEthernet0/1

no ip address

duplex auto

speed auto

interface GigabitEthernet0/1.10

encapsulation dot1Q 10

ip vrf forwarding Expedia

ip address 10.1.3.30 255.255.255.0

interface GigabitEthernet0/1.20

encapsulation dot1Q 20

ip vrf forwarding Trivago

ip address 10.2.3.30 255.255.255.0

router ospf 1 vrf Expedia

router-id 3.3.1.1

network 10.0.2.0 0.0.0.255 area 0

network 10.1.3.0 0.0.0.255 area 0

router ospf 2 vrf Trivago

router-id 3.3.2.2

network 10.0.2.0 0.0.0.255 area 0

network 10.2.3.0 0.0.0.255 area 0

line con 0

line aux 0

line 2

no activation-character

no exec

transport preferred none

transport output lat pad telnet rlogin lapb-ta mop udptn v120 ssh

stopbits 1

line vty 0 4

login

transport input all

scheduler allocate 20000 1000

end

**R3# show ip int brief**

Interface                  IP-Address OK? Method Status                Protocol

Embedded-Service-Engine0/0 unassigned      YES unset administratively down down

GigabitEthernet0/0         unassigned YES unset up                    up

GigabitEthernet0/0.10      10.0.2.30 YES manual up                    up

GigabitEthernet0/0.20      10.0.2.30 YES manual up                    up

GigabitEthernet0/1         unassigned YES unset up                    up

GigabitEthernet0/1.10      10.1.3.30 YES manual up                    up

GigabitEthernet0/1.20      10.2.3.30 YES manual up                    up

Serial0/0/0                unassigned YES unset administratively down down

Serial0/0/1                unassigned YES unset administratively down down

GigabitEthernet0/1/0       unassigned YES unset administratively down down

**R3# show ip route vrf Expedia**

Routing Table: Expedia

Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks

O        10.0.1.0/24 [110/2] via 10.0.2.20, 00:02:56, GigabitEthernet0/0.10

C        10.0.2.0/24 is directly connected, GigabitEthernet0/0.10

L        10.0.2.30/32 is directly connected, GigabitEthernet0/0.10

O        10.1.0.0/24 [110/3] via 10.0.2.20, 00:02:56, GigabitEthernet0/0.10

C        10.1.3.0/24 is directly connected, GigabitEthernet0/1.10

L        10.1.3.30/32 is directly connected, GigabitEthernet0/1.10

O        10.1.4.1/32 [110/2] via 10.1.3.45, 00:02:28, GigabitEthernet0/1.10

**R3# show ip route vrf Trivago**

Routing Table: Trivago

Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks

O        10.0.1.0/24 [110/2] via 10.0.2.20, 00:02:39, GigabitEthernet0/0.20

C        10.0.2.0/24 is directly connected, GigabitEthernet0/0.20

L        10.0.2.30/32 is directly connected, GigabitEthernet0/0.20

O        10.2.0.0/24 [110/3] via 10.0.2.20, 00:02:39, GigabitEthernet0/0.20

C        10.2.3.0/24 is directly connected, GigabitEthernet0/1.20

L        10.2.3.30/32 is directly connected, GigabitEthernet0/1.20

O        10.2.4.1/32 [110/2] via 10.2.3.45, 00:02:11, GigabitEthernet0/1.20

**R3# show ip ospf neigh**

Neighbor ID     Pri State      Dead Time Address      Interface

4.4.2.2           1 FULL/DR  00:00:35 10.2.3.45       GigabitEthernet0/1.20

2.2.2.2           1 FULL/BDR  00:00:36 10.0.2.20       GigabitEthernet0/0.20

4.4.1.1           1 FULL/DR  00:00:37 10.1.3.45       GigabitEthernet0/1.10

2.2.1.1           1 FULL/BDR  00:00:34 10.0.2.20       GigabitEthernet0/0.10

**R3# show vrf ipv4 int**

Interface              VRF       Protocol Address

Gi0/0.10               Expedia       up 10.0.2.30

Gi0/1.10               Expedia       up 10.1.3.30

Gi0/0.20               Trivago       up 10.0.2.30

Gi0/1.20               Trivago       up 10.2.3.30

# Problems

When going through this lab, we encountered a handful of minor problems that were relatively easy to resolve. For starters, when configuring OSPF we did not realize that the OSPF processes for different VRF’s cannot have the same process ID on a single device. This makes sense as VRF only separates routing tables, not routing protocols, and the OSPF process ID is still needed to differentiate between the two processes. When we first pasted the configurations into the routers and switches, we quickly realized the problem and it was easily solved soon after. Another mistake we made was forgetting to configure the OSPF processes on the layer 3 switches. This was a simple oversight, and though we were confused at first as to why the network was not fully connected, we were able to fix it quickly once we checked the routing tables on the devices.

Since we created a configuration in a separate text file and copied it several times for each of the routers and switches, we had some problems with the IP addresses that were different between devices. It turned out that when changing the numbers in a copied configuration there would occasionally be small mistakes, though this was an easy (though tedious) problem to troubleshoot once we pasted the configurations into the routers.

# Conclusion

This lab was a useful start for understanding the concepts and uses of VRF Lite and VRF. While we only created a basic setup of VRF Lite on a small network, the lab was useful for understanding how VRF Lite could be applied to networks in real life to provide more control over the network for network administrators.