Introduction:

Virtual Routing Forwarding (VRF) is used to logically separate networks while still using the same underlying infrastructure/hardware. This lab featured a scenario where 2 companies used the same 4 routers to route traffic between remote branches, however, to comply with security policies, the companies cannot talk to each other despite using the same hardware. These 2 companies in this scenario are logically isolated and will not be able to contact each other through the infrastructure they share.

Background Information:

Graphical Networking Simulator-3 (GNS3) is a network emulator released in 2008. It allows for users to use a hybrid of both virtual and physical networking devices to simulate highly complex networks. It has the ability to simulate Cisco IOS's due to Dynamips which makes it hyper realistic. Because of this GNS3 is used by many large corporations and is popular for networking professionals to prepare for networking exams.

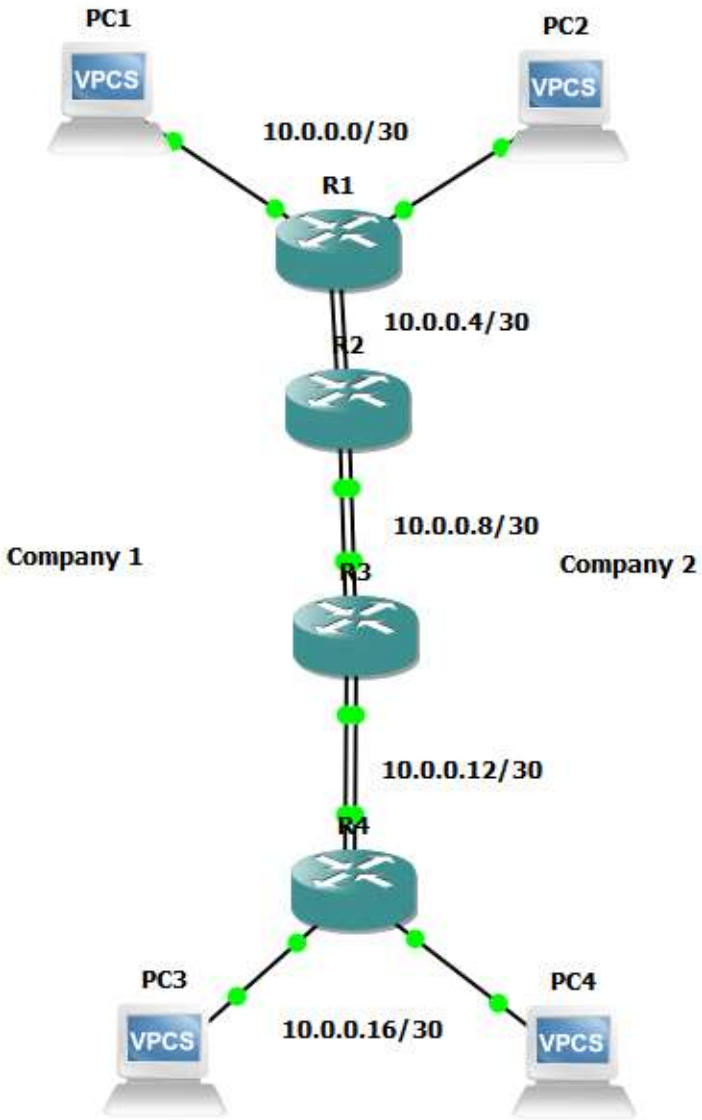
VRF allows for routers to be separated into multiple separate virtual routers. It is similar to Virtual Router Redundancy Protocol (VRRF) which creates a virtual router using two pyhsical routers to create redundancy. However, VRF is the opposite and uses one physical router to host multiple virtual routers. This is done by allowing multiple routing tables to co-exist on the router at the same instance. Only one VRF router can be set on each interface which isolates the VRFs on the router, blocking them from being able to talk to each other. Because of this virtual separation, the same IP addresses can be used on different VRFs on a router as they act on separate routing tables.

Lab summary:

In this lab we first had to download GNS3 along with the Cisco c7200 router IOS for GNS3. Once done, we set up the c7200 IOS into GNS3, we need to set up 4 ports for the routers. Much like how Packet Tracer work, we set up the topology below, all odd numbered interfaces for Company 1 and even for Company 2. We then create VRF on each router for Company 1 and 2 and apply it to the correct

interface before we add IP addresses on those interfaces. OSPF for each VRF is configured as we need a routing network to communicate between the networks. Finally we set up addresses on the PCs, PC1 and 2 being 10.0.0.1 and PC 3 and 4 being 10.0.0.18. Ensure that all ports are not shut down and now PC1 and ping PC3 but not PC 2 and 4.

Topology:


PC1
VPCS
PC2
VPCS
10.0.0.0/30
R1
10.0.0.4/30
R2
10.0.0.8/30
Company 1
Company 2
R3
10.0.0.12/30
R4
PC3
VPCS
10.0.0.16/30
PC4
VPCS

Note: Both VRF for Company 1 and Company 2 share the same IP addresses

Problems:

I had to do this lab twice as GNS3 routers and PCs turn off when closing the application. This means that without a “copy run start” command on the routers, and a “save” command on the PCs, all your IPs set on the PCs and configurations on your routers will be wiped upon exiting. However, this was because I’ve never used GNS3 and despite these mishaps, GNS3 was very straight forward and easy to use.

Conclusion:

Overall, this lab was very simple and straightforward. Being our first lab this year using a emulator it was a new experience to learn about what GNS3 is and how it can be used. Using the same IP addresses for 2 different interfaces was surely interesting. This was our last lab of the year, and despite being simple and straightforward, it still brought a lot of new things for us to learn about.

Lab Configurations:

R1:

```
Building configuration...

Current configuration : 1454 bytes

upgrade fpd auto
version 15.2
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption


hostname R1

boot-start-marker
boot-end-marker

no aaa new-model
```

```
no ip icmp rate-limit unreachable

ip vrf comp1

ip vrf comp2

no ip domain lookup
ip cef
no ipv6 cef

multilink bundle-name authenticated


redundancy

ip tcp synwait-time 5

interface FastEthernet0/0
ip vrf forwarding comp1
ip address 10.0.0.2 255.255.255.252
duplex half

interface GigabitEthernet1/0
ip vrf forwarding comp1
ip address 10.0.0.5 255.255.255.252
negotiation auto

interface GigabitEthernet2/0
ip vrf forwarding comp2
ip address 10.0.0.2 255.255.255.252
negotiation auto

interface GigabitEthernet3/0
ip vrf forwarding comp2
ip address 10.0.0.5 255.255.255.252
negotiation auto

router ospf 1 vrf comp1
network 10.0.0.0 0.0.0.3 area 0
network 10.0.0.4 0.0.0.3 area 0

router ospf 2 vrf comp2
network 10.0.0.0 0.0.0.3 area 0
network 10.0.0.4 0.0.0.3 area 0

ip forward-protocol nd
no ip http server
no ip http secure-server
```

```
no cdp log mismatch duplex

control-plane


mgcp profile default

gatekeeper
shutdown

line con 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line aux 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line vty 0 4
login
transport input all

end
```

R2:

```
Building configuration...

Current configuration : 1454 bytes

upgrade fpd auto
version 15.2
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption

hostname R2

boot-start-marker
boot-end-marker

no aaa new-model
no ip icmp rate-limit unreachable

ip vrf comp1

ip vrf comp2
```

```
no ip domain lookup
ip cef
no ipv6 cef

multilink bundle-name authenticated

redundancy

ip tcp synwait-time 5

interface FastEthernet0/0
ip vrf forwarding comp1
ip address 10.0.0.6 255.255.255.252
duplex half

interface GigabitEthernet1/0
ip vrf forwarding comp1
ip address 10.0.0.9 255.255.255.252
negotiation auto

interface GigabitEthernet2/0
ip vrf forwarding comp2
ip address 10.0.0.6 255.255.255.252
negotiation auto

interface GigabitEthernet3/0
ip vrf forwarding comp2
ip address 10.0.0.9 255.255.255.252
negotiation auto

router ospf 1 vrf comp1
network 10.0.0.4 0.0.0.3 area 0
network 10.0.0.8 0.0.0.3 area 0

router ospf 2 vrf comp2
network 10.0.0.4 0.0.0.3 area 0
network 10.0.0.8 0.0.0.3 area 0

ip forward-protocol nd
no ip http server
no ip http secure-server

no cdp log mismatch duplex

control-plane

mgcp profile default
```

```
gatekeeper
shutdown

line con 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line aux 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line vty 0 4
login
transport input all

end
```

R4:

```
Building configuration...

Current configuration : 1460 bytes

upgrade fpd auto
version 15.2
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption

hostname R4

boot-start-marker
boot-end-marker

no aaa new-model
no ip icmp rate-limit unreachable

ip vrf comp1

ip vrf comp2

no ip domain lookup
ip cef
no ipv6 cef

multilink bundle-name authenticated
```

```
redundancy

ip tcp synwait-time 5

interface FastEthernet0/0
ip vrf forwarding comp1
ip address 10.0.0.10 255.255.255.252
duplex half

interface GigabitEthernet1/0
ip vrf forwarding comp1
ip address 10.0.0.13 255.255.255.252
negotiation auto

interface GigabitEthernet2/0
ip vrf forwarding comp2
ip address 10.0.0.10 255.255.255.252
negotiation auto

interface GigabitEthernet3/0
ip vrf forwarding comp2
ip address 10.0.0.13 255.255.255.252
negotiation auto

router ospf 1 vrf comp1
network 10.0.0.8 0.0.0.3 area 0
network 10.0.0.12 0.0.0.3 area 0

router ospf 2 vrf comp2
network 10.0.0.8 0.0.0.3 area 0
network 10.0.0.12 0.0.0.3 area 0

ip forward-protocol nd
no ip http server
no ip http secure-server


no cdp log mismatch duplex

control-plane

mgcp profile default

gatekeeper
shutdown

line con 0
exec-timeout 0 0
privilege level 15
```

```
logging synchronous
stopbits 1
line aux 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line vty 0 4
login
transport input all

end
```

R5:

```
Building configuration...

Current configuration : 1462 bytes

upgrade fpd auto
version 15.2
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption

hostname R5

boot-start-marker
boot-end-marker

no aaa new-model
no ip icmp rate-limit unreachable

ip vrf comp1

ip vrf comp2

no ip domain lookup
ip cef
no ipv6 cef

multilink bundle-name authenticated

redundancy

ip tcp synwait-time 5

interface FastEthernet0/0
ip vrf forwarding comp1
```

```
ip address 10.0.0.14 255.255.255.252
duplex half

interface GigabitEthernet1/0
ip vrf forwarding comp1
ip address 10.0.0.17 255.255.255.252
negotiation auto

interface GigabitEthernet2/0
ip vrf forwarding comp2
ip address 10.0.0.14 255.255.255.252
negotiation auto

interface GigabitEthernet3/0
ip vrf forwarding comp2
ip address 10.0.0.17 255.255.255.252
negotiation auto

router ospf 1 vrf comp1
network 10.0.0.12 0.0.0.3 area 0
network 10.0.0.16 0.0.0.3 area 0

router ospf 2 vrf comp2
network 10.0.0.12 0.0.0.3 area 0
network 10.0.0.16 0.0.0.3 area 0

ip forward-protocol nd
no ip http server
no ip http secure-server

no cdp log mismatch duplex

control-plane

mgcp profile default

gatekeeper
shutdown


line con 0
exec-timeout 0 0
privilege level 15
logging synchronous
stopbits 1
line aux 0
exec-timeout 0 0
privilege level 15
logging synchronous
```

```
stopbits 1
line vty 0 4
login
transport input all

end
```