Cisco IOS VRF-Lite

Network Topology

VLAN 100
Company A: EIGRP 100
LAN: 192.168.100.0 /24

HQ_DC_SW1

VLAN 200
Company A: EIGRP 100
LAN: 192.168.200.0 /24

Gi0/0   Gi0/1

e0   .2 Gi0/2   e0

Company_A_Accounting_Server

.1 Gi0/2   Gi0/2.100
Gi0/2.200

Company_B_Accounting_Server

HQ_DC

Multi-VRF: EIGRP 1

Gi0/0   Gi0/1

172.16.0.0 /30
VRF: COMPANYA

.2   .2

172.16.0.0 /30
VRF: COMPANYB

Gi0/0   Gi0/1

CompanyA .1   .1 **CompanyB**

Gi0/3   .1   .1   Gi0/3

Company A: EIGRP AS 100
LAN: 192.168.10.0 /24

e7   e7

Company B: EIGRP AS 100
LAN: 192.168.20.0 /24

CompanyA_SW1

CompanyB_SW1

e0   e0

e0   .10   .20   e0

PC1   PC2
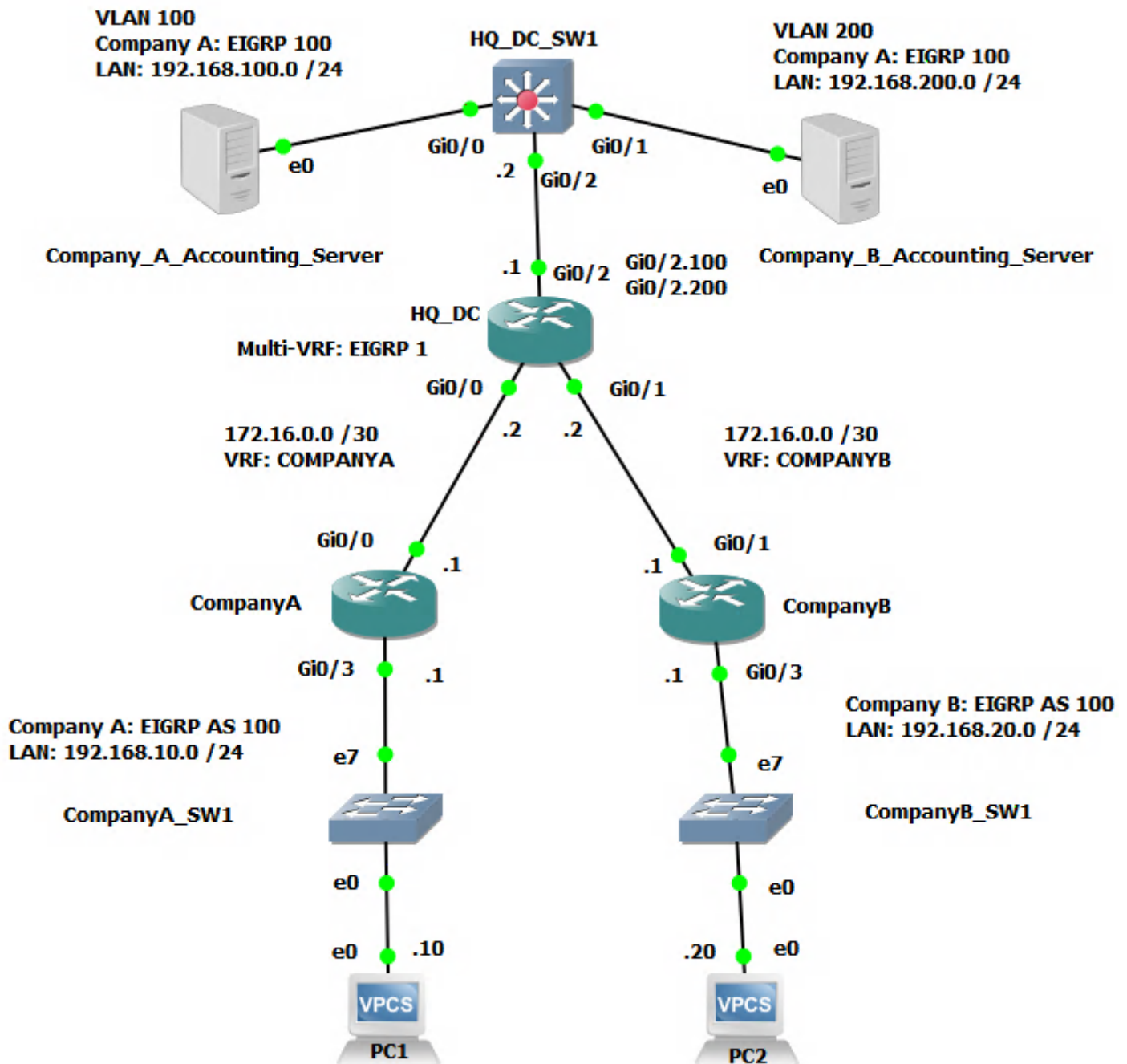
Difference Between VRF and VRF-Lite Explained

VRF (Virtual Routing and Forwarding) and VRF-Lite (also known as Multi-VRF CE or MVPN) are both technologies used in networking to create multiple virtual routing and forwarding instances within a

single physical router.

The main difference between the two is in the scope of their implementation. VRF is typically used in service provider networks, where it allows for multiple customers to share the same physical infrastructure while still maintaining separate and isolated routing domains. VRF-Lite, on the other hand, is typically used in enterprise networks, where it allows for multiple logical networks to be created within a single physical network infrastructure.

In summary, VRF is used for service provider networks, and VRF-Lite is used for enterprise networks.

Scenario

Company A has just completed an M&A process and acquired Company B. As part of the post acquisition integration process the decision was made to move Company B's IT equipment into the datacenter hosting facility used by Company A. However, there are some critical elements in Company B such as network addressing and routing that cannot be immediately changed and must stay in place. It is a must, at least in the near to medium term to keep the Company B Accounting and Finance systems separate and secured from other parts of the overall company network while still providing the necessary access to authorized users and their computers. Additionally it was discovered that Company B uses the same network subnet as Company B for the uplink to the Company B main router. This has further complicated the plan to consolidate the topology to just one main router (HQ_DC). However, you have a plan to use VRF-Lite and some VLAN architecture to solve these challenges.

Configuration

These configuration steps will demonstrate the configuration for both Company A and Company B for completeness. Obviously in the scenario much of Company A's infrastructure configuration would already be done.

CompanyA Router

CompanyA>enable
CompanyA#configure terminal
CompanyA(config)#interface gigabitEthernet 0/3
CompanyA(config-if)#ip address 192.168.10.1 255.255.255.0
CompanyA(config-if)#no shutdown
CompanyA(config-if)#interface gigabitEthernet 0/0
CompanyA(config-if)#ip address 172.16.0.1 255.255.255.252
CompanyA(config-if)#no shutdown
CompanyA(config-if)#exit
CompanyA(config)#router eigrp 100
CompanyA(config-router)#network 0.0.0.0 0.0.0.0
CompanyA(config-router)#no auto-summary
CompanyA(config-router)#end

CompanyB Router

CompanyB>enable
CompanyB#configure terminal
CompanyA(config)#interface gigabitEthernet 0/3
CompanyA(config-if)#ip address 192.168.20.1 255.255.255.0
CompanyA(config-if)#no shutdown
CompanyA(config-if)#interface gigabitEthernet 0/0
CompanyA(config-if)#ip address 172.16.0.1 255.255.255.252
CompanyA(config-if)#no shutdown
CompanyA(config-if)#exit
CompanyA(config)#router eigrp 100
CompanyA(config-router)#network 0.0.0.0 0.0.0.0
CompanyA(config-router)#no auto-summary
CompanyA(config-router)#end

HQ_DC Router

HQ_DC>enable
HQ_DC#configure terminal
HQ_DC(config)#ip vrf COMPANYA
HQ_DC(config-vrf)#exit
HQ_DC(config)#ip vrf COMPANYB
HQ_DC(config-vrf)#exit
HQ_DC(config)#interface gigabitEthernet 0/0
HQ_DC(config-if)#ip address 172.16.0.2 255.255.255.252
HQ_DC(config-if)#description COMPANYA main circuit
HQ_DC(config-if)#ip vrf forwarding COMPANYA
HQ_DC(config-if)#exit
HQ_DC(config)#interface gigabitEthernet 0/1
HQ_DC(config-if)#ip address 172.16.0.2 255.255.255.252
HQ_DC(config-if)#description COMPANYB main circuit
HQ_DC(config-if)#ip vrf forwarding COMPANYB
HQ_DC(config-if)#exit
HQ_DC(config)#interface gigabitEthernet 0/2
HQ_DC(config-if)#no shutdown
HQ_DC(config-if)#interface gigabitEthernet 0/2.100
HQ_DC(config-subif)#description COMPANYA dc circuit
HQ_DC(config-subif)#encapsulation dot1q 100
HQ_DC(config-subif)#ip vrf forwarding COMPANYA
HQ_DC(config-subif)#ip address 192.168.100.1 255.255.255.0
HQ_DC(config-if)#interface gigabitEthernet 0/2.200
HQ_DC(config-subif)#description COMPANYB dc circuit
HQ_DC(config-subif)#encapsulation dot1q 200
HQ_DC(config-subif)#ip vrf forwarding COMPANYB
HQ_DC(config-subif)#ip address 192.168.200.1 255.255.255.0

```
HQ_DC(config-subif)#exit
HQ_DC(config)#router eigrp 1
HQ_DC(config-router)#address-family ipv4 vrf COMPANYA
HQ_DC(config-router-af)#network 0.0.0.0 0.0.0.0
HQ_DC(config-router-af)#autonomous-system 100
HQ_DC(config-router-af)#no auto-summary
HQ_DC(config-router-af)#exit
HQ_DC(config-router)#address-family ipv4 vrf COMPANYB
HQ_DC(config-router-af)#network 0.0.0.0 0.0.0.0
HQ_DC(config-router-af)#autonomous-system 100
HQ_DC(config-router-af)#no auto-summary
```

HQ_DC_SW1 Switch

```
HQ_DC_SW1>enable
HQ_DC_SW1#configure terminal
HQ_DC_SW1(config)#vlan 100
HQ_DC_SW1(config-vlan)#name COMPANYA
HQ_DC_SW1)config-vlan)#exit
HQ_DC_SW1(config)#vlan 200
HQ_DC_SW1(config-vlan)#name COMPANYB
HQ_DC_SW1)config-vlan)#exit
HQ_DC_SW1(config)#interface gigabitEthernet 0/2
HQ_DC_SW1(config-if)#switchport trunk encapsulation dot1q
HQ_DC_SW1(config-if)#switchport mode trunk
HQ_DC_SW1(config-if)#switchport trunk allowed vlan 100,200
HQ_DC_SW1(config-if)#interface gigabitEthernet 0/0
HQ_DC_SW1(config-if)#switchport access vlan 100
HQ_DC_SW1(config-if)#interface gigabitEthernet 0/1
HQ_DC_SW1(config-if)#switchport access vlan 200
HQ_DC_SW1(config-if)#exit
HQ_DC_SW1(config)#interface vlan 100
HQ_DC_SW1(config-if)#ip address 192.168.100.2 255.255.255.0
HQ_DC_SW1(config-if)#exit
HQ_DC_SW1(config)#interface vlan 200
HQ_DC_SW1(config-if)#ip address 192.168.200.2 255.255.255.0
```

PCs and Servers

```
PC1>ip 192.168.10.10/24 192.168.10.1

PC2>ip 192.168.20.20/24 192.168.20.1

COMPA_ACCT> ip address 192.168.100.10/24 192.168.100.1

COMPB_ACCT> ip address 192.168.200.20/24 192.168.200.1
```

Test and Verify Connectivity and Configuration

```
PC1> ping 192.168.100.10

84 bytes from 192.168.100.10 icmp_seq=1 ttl=62 time=10.992 ms
84 bytes from 192.168.100.10 icmp_seq=2 ttl=62 time=6.683 ms
84 bytes from 192.168.100.10 icmp_seq=3 ttl=62 time=7.569 ms
84 bytes from 192.168.100.10 icmp_seq=4 ttl=62 time=5.802 ms
84 bytes from 192.168.100.10 icmp_seq=5 ttl=62 time=6.069 ms

PC1> ping 192.168.100.1

84 bytes from 192.168.100.1 icmp_seq=1 ttl=254 time=2.703 ms
84 bytes from 192.168.100.1 icmp_seq=2 ttl=254 time=3.131 ms
84 bytes from 192.168.100.1 icmp_seq=3 ttl=254 time=2.851 ms
84 bytes from 192.168.100.1 icmp_seq=4 ttl=254 time=2.457 ms
84 bytes from 192.168.100.1 icmp_seq=5 ttl=254 time=2.197 ms

PC1> ping 172.16.0.2

84 bytes from 172.16.0.2 icmp_seq=1 ttl=254 time=2.307 ms
84 bytes from 172.16.0.2 icmp_seq=2 ttl=254 time=2.476 ms
84 bytes from 172.16.0.2 icmp_seq=3 ttl=254 time=1.934 ms
84 bytes from 172.16.0.2 icmp_seq=4 ttl=254 time=2.141 ms
84 bytes from 172.16.0.2 icmp_seq=5 ttl=254 time=2.991 ms

PC1> ping 192.168.200.20

*192.168.10.1 icmp_seq=1 ttl=255 time=2.403 ms (ICMP type:3, code:1, Destination host unreachable)
*192.168.10.1 icmp_seq=2 ttl=255 time=3.572 ms (ICMP type:3, code:1, Destination host unreachable)
*192.168.10.1 icmp_seq=3 ttl=255 time=1.716 ms (ICMP type:3, code:1, Destination host unreachable)
*192.168.10.1 icmp_seq=4 ttl=255 time=1.753 ms (ICMP type:3, code:1, Destination host unreachable)
*192.168.10.1 icmp_seq=5 ttl=255 time=1.545 ms (ICMP type:3, code:1, Destination host unreachable)
```

```
PC2> ping 192.168.200.20

84 bytes from 192.168.200.20 icmp_seq=1 ttl=62 time=15.713 ms
84 bytes from 192.168.200.20 icmp_seq=2 ttl=62 time=4.785 ms
84 bytes from 192.168.200.20 icmp_seq=3 ttl=62 time=6.044 ms
84 bytes from 192.168.200.20 icmp_seq=4 ttl=62 time=6.784 ms
84 bytes from 192.168.200.20 icmp_seq=5 ttl=62 time=7.372 ms

PC2> ping 192.168.200.1

84 bytes from 192.168.200.1 icmp_seq=1 ttl=254 time=3.006 ms
84 bytes from 192.168.200.1 icmp_seq=2 ttl=254 time=2.604 ms
84 bytes from 192.168.200.1 icmp_seq=3 ttl=254 time=2.932 ms
84 bytes from 192.168.200.1 icmp_seq=4 ttl=254 time=2.541 ms
84 bytes from 192.168.200.1 icmp_seq=5 ttl=254 time=2.969 ms

PC2> ping 172.16.0.2

84 bytes from 172.16.0.2 icmp_seq=1 ttl=254 time=2.753 ms
84 bytes from 172.16.0.2 icmp_seq=2 ttl=254 time=3.233 ms
84 bytes from 172.16.0.2 icmp_seq=3 ttl=254 time=1.966 ms
84 bytes from 172.16.0.2 icmp_seq=4 ttl=254 time=2.107 ms
84 bytes from 172.16.0.2 icmp_seq=5 ttl=254 time=3.848 ms

PC2> ping 192.168.100.10

*192.168.20.1 icmp_seq=1 ttl=255 time=2.076 ms (ICMP type:3, code:1, Destination host unreachable)
*192.168.20.1 icmp_seq=2 ttl=255 time=1.780 ms (ICMP type:3, code:1, Destination host unreachable)
*192.168.20.1 icmp_seq=3 ttl=255 time=1.346 ms (ICMP type:3, code:1, Destination host unreachable)
*192.168.20.1 icmp_seq=4 ttl=255 time=1.890 ms (ICMP type:3, code:1, Destination host unreachable)
*192.168.20.1 icmp_seq=5 ttl=255 time=1.450 ms (ICMP type:3, code:1, Destination host unreachable)
```

```
HQ_DC#show ip route vrf COMPANYA

Routing Table: COMPANYA
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
       a - application route
       + - replicated route, % - next hop override, p - overrides from PfR

Gateway of last resort is not set

      172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C        172.16.0.0/30 is directly connected, GigabitEthernet0/0
L        172.16.0.2/32 is directly connected, GigabitEthernet0/0
D     192.168.10.0/24 [90/3072] via 172.16.0.1, 01:52:21, GigabitEthernet0/0
      192.168.100.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.100.0/24 is directly connected, GigabitEthernet0/2.100
L        192.168.100.1/32 is directly connected, GigabitEthernet0/2.100
```

```
HQ_DC#show ip route vrf COMPANYB

Routing Table: COMPANYB
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
       a - application route
       + - replicated route, % - next hop override, p - overrides from PfR

Gateway of last resort is not set

      172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C        172.16.0.0/30 is directly connected, GigabitEthernet0/1
L        172.16.0.2/32 is directly connected, GigabitEthernet0/1
D     192.168.20.0/24 [90/3072] via 172.16.0.1, 01:51:50, GigabitEthernet0/1
      192.168.200.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.200.0/24 is directly connected, GigabitEthernet0/2.200
L        192.168.200.1/32 is directly connected, GigabitEthernet0/2.200
```

```
HQ_DC#show ip eigrp vrf COMPANYA topology
EIGRP-IPv4 Topology Table for AS(100)/ID(192.168.100.1) VRF(COMPANYA)
Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - reply Status, s - sia Status

P 192.168.10.0/24, 1 successors, FD is 3072
        via 172.16.0.1 (3072/2816), GigabitEthernet0/0
P 192.168.100.0/24, 1 successors, FD is 2816
        via Connected, GigabitEthernet0/2.100
P 172.16.0.0/30, 1 successors, FD is 2816
        via Connected, GigabitEthernet0/0
```

```
HQ_DC#show ip eigrp vrf COMPANYB topology
EIGRP-IPv4 Topology Table for AS(100)/ID(192.168.200.1) VRF(COMPANYB)
Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - reply Status, s - sia Status

P 192.168.200.0/24, 1 successors, FD is 2816
        via Connected, GigabitEthernet0/2.200
P 172.16.0.0/30, 1 successors, FD is 2816
        via Connected, GigabitEthernet0/1
P 192.168.20.0/24, 1 successors, FD is 3072
        via 172.16.0.1 (3072/2816), GigabitEthernet0/1
```

```
HQ_DC#show ip vrf
  Name                             Default RD          Interfaces
  COMPANYA                         <not set>           Gi0/0
                                                       Gi0/2.100
  COMPANYB                         <not set>           Gi0/1
                                                       Gi0/2.200
HQ_DC#
```

```
COMPA_ACCT> ping 192.168.10.10

84 bytes from 192.168.10.10 icmp_seq=1 ttl=62 time=11.254 ms
84 bytes from 192.168.10.10 icmp_seq=2 ttl=62 time=5.145 ms
84 bytes from 192.168.10.10 icmp_seq=3 ttl=62 time=4.210 ms
84 bytes from 192.168.10.10 icmp_seq=4 ttl=62 time=6.916 ms
84 bytes from 192.168.10.10 icmp_seq=5 ttl=62 time=6.736 ms

COMPA_ACCT> ping 172.16.0.1

84 bytes from 172.16.0.1 icmp_seq=1 ttl=254 time=3.521 ms
84 bytes from 172.16.0.1 icmp_seq=2 ttl=254 time=13.726 ms
84 bytes from 172.16.0.1 icmp_seq=3 ttl=254 time=6.878 ms
84 bytes from 172.16.0.1 icmp_seq=4 ttl=254 time=6.207 ms
84 bytes from 172.16.0.1 icmp_seq=5 ttl=254 time=6.053 ms

COMPA_ACCT> ping 192.168.10.1

84 bytes from 192.168.10.1 icmp_seq=1 ttl=254 time=6.113 ms
84 bytes from 192.168.10.1 icmp_seq=2 ttl=254 time=5.688 ms
84 bytes from 192.168.10.1 icmp_seq=3 ttl=254 time=7.262 ms
84 bytes from 192.168.10.1 icmp_seq=4 ttl=254 time=6.544 ms
84 bytes from 192.168.10.1 icmp_seq=5 ttl=254 time=5.198 ms

COMPA_ACCT> ping 192.168.20.20

*192.168.100.1 icmp_seq=1 ttl=255 time=4.218 ms (ICMP type:3, code:1, Destination host unreachable)
*192.168.100.1 icmp_seq=2 ttl=255 time=4.237 ms (ICMP type:3, code:1, Destination host unreachable)
*192.168.100.1 icmp_seq=3 ttl=255 time=6.483 ms (ICMP type:3, code:1, Destination host unreachable)
*192.168.100.1 icmp_seq=4 ttl=255 time=6.701 ms (ICMP type:3, code:1, Destination host unreachable)
*192.168.100.1 icmp_seq=5 ttl=255 time=5.098 ms (ICMP type:3, code:1, Destination host unreachable)
```

```
COMPB_ACCT> ping 192.168.20.20

84 bytes from 192.168.20.20 icmp_seq=1 ttl=62 time=10.967 ms
84 bytes from 192.168.20.20 icmp_seq=2 ttl=62 time=4.728 ms
84 bytes from 192.168.20.20 icmp_seq=3 ttl=62 time=4.524 ms
84 bytes from 192.168.20.20 icmp_seq=4 ttl=62 time=5.250 ms
84 bytes from 192.168.20.20 icmp_seq=5 ttl=62 time=5.098 ms

COMPB_ACCT> ping 172.16.0.1

84 bytes from 172.16.0.1 icmp_seq=1 ttl=254 time=5.460 ms
84 bytes from 172.16.0.1 icmp_seq=2 ttl=254 time=11.652 ms
84 bytes from 172.16.0.1 icmp_seq=3 ttl=254 time=4.597 ms
84 bytes from 172.16.0.1 icmp_seq=4 ttl=254 time=4.148 ms
84 bytes from 172.16.0.1 icmp_seq=5 ttl=254 time=11.461 ms

COMPB_ACCT> ping 192.168.20.1

84 bytes from 192.168.20.1 icmp_seq=1 ttl=254 time=4.811 ms
84 bytes from 192.168.20.1 icmp_seq=2 ttl=254 time=4.064 ms
84 bytes from 192.168.20.1 icmp_seq=3 ttl=254 time=9.118 ms
84 bytes from 192.168.20.1 icmp_seq=4 ttl=254 time=6.014 ms
84 bytes from 192.168.20.1 icmp_seq=5 ttl=254 time=5.941 ms

COMPB_ACCT> ping 192.168.10.10

*192.168.200.1 icmp_seq=1 ttl=255 time=3.254 ms (ICMP type:3, code:1, Destination host unreachable)
*192.168.200.1 icmp_seq=2 ttl=255 time=3.348 ms (ICMP type:3, code:1, Destination host unreachable)
*192.168.200.1 icmp_seq=3 ttl=255 time=4.524 ms (ICMP type:3, code:1, Destination host unreachable)
*192.168.200.1 icmp_seq=4 ttl=255 time=5.931 ms (ICMP type:3, code:1, Destination host unreachable)
*192.168.200.1 icmp_seq=5 ttl=255 time=6.131 ms (ICMP type:3, code:1, Destination host unreachable)
```

GNS3 File

[vrf2.gns3](vrf2.gns3)

Revision #4
Created 20 January 2023 17:54:27 by Glen Taylor
Updated 24 January 2023 22:45:52 by Glen Taylor