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VRF-Lite

Cisco CCNP

**Purpose:**

The purpose of this lab is to utilize VRF-Lite to separate data flow between 4 routers and 2 computers.

**Background information on lab concepts:**

A VRF is a virtual routing table, and each new VRF is an extra routing table. Generally, only routers support VRFs and not all layer 3 devices. VRF- lite allowed for various VRFs to connect from one router to another regardless of names and configuration. VRFs can be used to separate customer traffic, and this is particularly useful when service providers and multi-tenanted data centers. VRF-lite is normally VRF without MPLS and MPBGP (We can call VRF Lite a subset of VRF). VRF lite can be called a way of virtualizing network elements and various Security zones inside Data Center. You can simply exclude a guest VLAN with a default gateway to the internet from the corporate LAN by not providing a switched virtual interface (interface Vlan on Cisco) on the visitor VLAN.

Assume you require a second guest VLAN and you must transport traffic between the two guest VLANs and the Internet without compromising the corporate LAN.

This is a use case for VRF lite. Create a VRF for the corporate LAN and a VRF for the guest LAN on each layer 3 switch or router. The VLANs are assigned to the appropriate VRFs. There are now two independent routing tables between which no traffic can travel (unless you specifically configure that).

**Lab Summary:**

Configure 4 routers with 2 computers to connect through two independent VRFs. One VRF should not be able to ping the other interfaces on a different VRF, making sure the data flow is separated. Each of the router is configured with a unique ip address which is put on to either VRF A or VRF B. VRF A routers can only communicate with one another and vice versa with VRF B.

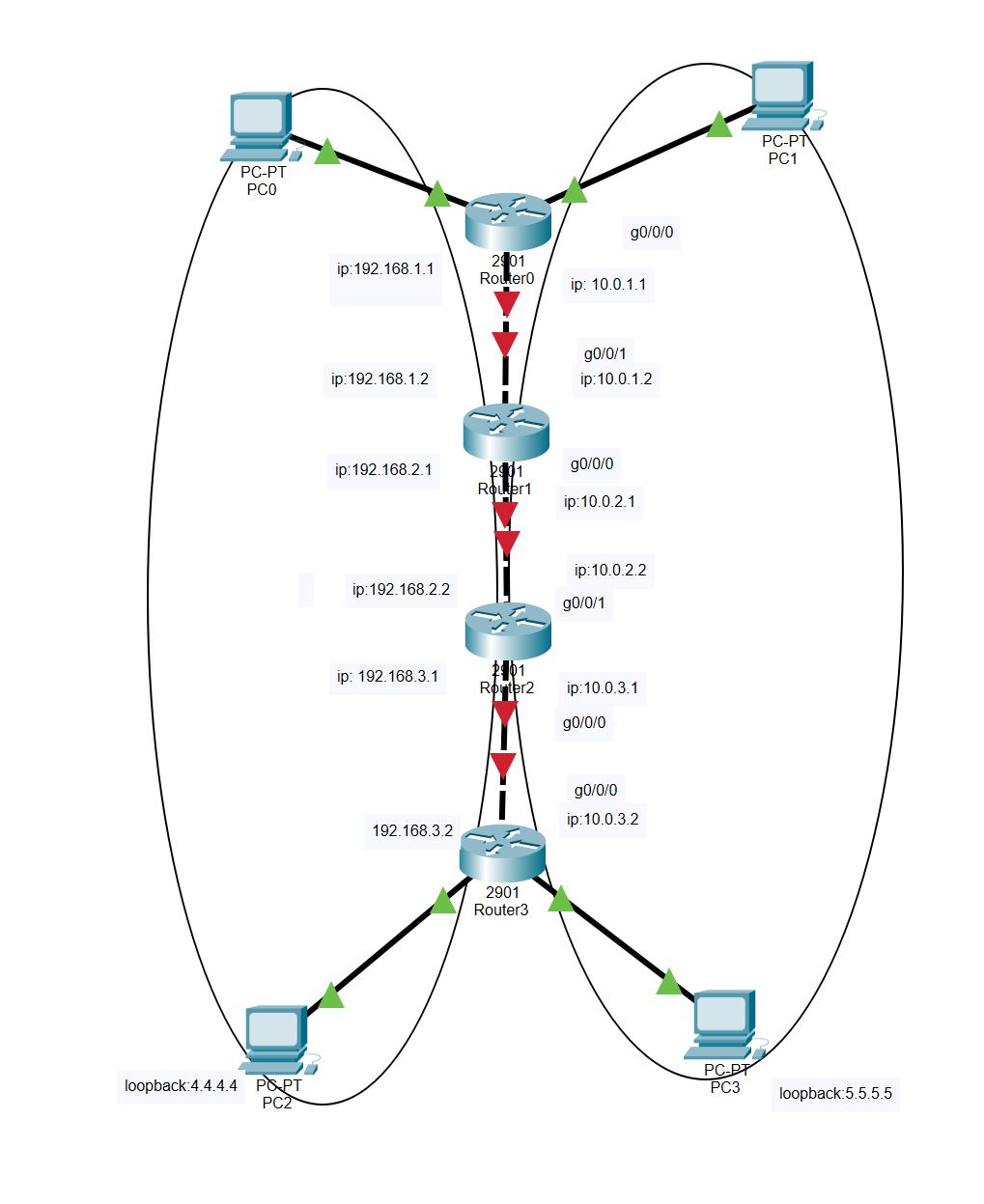
**Lab Commands**:

ip vrf [name]

ip vrf forwarding [vrf name]

show ip vrf

**Network Diagram with IP’s:**



**Configurations:**

**R1:**  
**Config:**

Building configuration...

Current configuration : 4831 bytes

Last configuration change at 16:32:26 UTC Tue May 10 2022

version 15.5

service timestamps debug datetime msec

service timestamps log datetime msec

platform punt-keepalive disable-kernel-core

hostname R1

boot-start-marker

boot-end-marker

vrf definition Mgmt-intf

address-family ipv4

exit-address-family

address-family ipv6

exit-address-family

no aaa new-model

ip vrf A

description A VRF

ip vrf B

description B VRF

ip vrf Computer

ip vrf utdown

login on-success log

ipv6 unicast-routing

subscriber templating

vtp domain cisco

vtp mode transparent

multilink bundle-name authenticated

crypto pki trustpoint TP-self-signed-2270144787

enrollment selfsigned

subject-name cn=IOS-Self-Signed-Certificate-2270144787

revocation-check none

rsakeypair TP-self-signed-2270144787

crypto pki trustpoint TP-self-signed-859896477

enrollment selfsigned

subject-name cn=IOS-Self-Signed-Certificate-859896477

revocation-check none

rsakeypair TP-self-signed-859896477

crypto pki trustpoint TP-self-signed-4144679456

enrollment selfsigned

subject-name cn=IOS-Self-Signed-Certificate-4144679456

revocation-check none

rsakeypair TP-self-signed-4144679456

crypto pki certificate chain TP-self-signed-2270144787

certificate self-signed 01

30820330 30820218 A0030201 02020101 300D0609 2A864886 F70D0101 05050030

31312F30 2D060355 04031326 494F532D 53656C66 2D536967 6E65642D 43657274

69666963 6174652D 32323730 31343437 3837301E 170D3232 30353033 31353534

34365A17 0D333030 31303130 30303030 305A3031 312F302D 06035504 03132649

4F532D53 656C662D 5369676E 65642D43 65727469 66696361 74652D32 32373031

34343738 37308201 22300D06 092A8648 86F70D01 01010500 0382010F 00308201

0A028201 0100AE72 BC754415 8F66494D B662A08F F874C18B 0634BEFC 4E2B1A15

837C8EC4 8A133894 1A1B3B3B AC36EDD1 3F237202 12CC7B10 4857BB80 31741D41

536CB20C 5480ACFA 19EE599E 918C109F 27F6F3DE 0AB9FFCE 570BDC55 5F387BBB

8EF54BA9 B6494EA4 2936980A 405D01C5 DB4857C2 9508895B E8DA4B95 EE8C2386

CEB808D9 14610305 7144193D 3124CA73 E7557FDD B8371812 BB557A05 11C3B426

E4FD8F59 6E5E0EAF 4004F7A6 589835A4 C39F8212 720E2EFB 374CF242 09DD463B

4FD2E17F 93BAAD7B EA63B1A1 80CED293 C01697BD 79F15B04 355633B3 CE5BCA57

28AFA09A 348BDAC9 A1FF323D 660D3E09 57834F6B 3669938E C62A43B3 8F051A46

341C96D6 B0230203 010001A3 53305130 0F060355 1D130101 FF040530 030101FF

301F0603 551D2304 18301680 148219F0 AF1EEEEC F78B5323 8FB7FFFA F88124F5

F0301D06 03551D0E 04160414 8219F0AF 1EEEECF7 8B53238F B7FFFAF8 8124F5F0

300D0609 2A864886 F70D0101 05050003 82010100 561E8EAA 2CCF9B8F A380CD4C

FB98DD5A B3D46A0D B10BF58B 9DF0847A 6BCAD329 A9A9EA35 7F40FB21 F2E2AE07

7C9ECE8C D832DF8C EB837127 DCF175C1 406AA499 4A9146AA E2C2596F 47862EF2

EB1F9AA9 97B7B3F7 ED29BFD2 6F2A0B66 2D2873DC 1FF202CD B2EFC79E 95833CD3

28219E5C A325CAFF ED5F284B 98D17389 C8C2DA2B 0E2FA506 C30F566F E461DDC4

9F6B57D1 C5C53D21 30E1A87C 6AE28965 FEA6FFBD 29D0B962 B6770E27 761B6D07

74F6F9B1 1DEF647F 62AC18F7 07900A11 C02603D5 14BD4EAB E64914E2 7020ECCA

7B2E445A F1280F6C 3DB78AB4 1DCABD83 4FD2A84A 484C4AF2 80273823 086FA52E

E5CF8CD7 21B7D945 51E33034 92FBA975 2D6558D0

quit

crypto pki certificate chain TP-self-signed-859896477

crypto pki certificate chain TP-self-signed-4144679456

license udi pid ISR4321/K9 sn FDO21442B21

spanning-tree extend system-id

redundancy

mode none

vlan internal allocation policy ascending

vlan 10,20

interface GigabitEthernet0/0/0

description R3

no ip address

negotiation auto

interface GigabitEthernet0/0/0.1

encapsulation dot1Q 1 native

ip vrf forwarding A

ip address 192.168.1.1 255.255.255.252

interface GigabitEthernet0/0/0.2

encapsulation dot1Q 2

ip vrf forwarding B

ip address 10.0.1.1 255.255.255.252

interface GigabitEthernet0/0/1

no ip address

negotiation auto

interface GigabitEthernet0/0/1.1

interface Serial0/1/0

no ip address

shutdown

interface Serial0/1/1

no ip address

shutdown

interface GigabitEthernet0/2/0

ip vrf forwarding A

ip address 192.168.7.2 255.255.255.252

negotiation auto

interface GigabitEthernet0/2/1

ip vrf forwarding B

ip address 10.0.8.2 255.255.255.252

negotiation auto

interface GigabitEthernet0

vrf forwarding Mgmt-intf

no ip address

shutdown

negotiation auto

interface Vlan1

no ip address

shutdown

router ospf 2 vrf B

router-id 1.4.6.8

network 10.0.1.0 0.0.0.3 area 0

network 10.0.8.0 0.0.0.3 area 0

router ospf 1 vrf A

network 192.168.1.0 0.0.0.3 area 0

network 192.168.7.0 0.0.0.3 area 0

ip forward-protocol nd

no ip http server

no ip http secure-server

ip tftp source-interface GigabitEthernet0

control-plane

line con 0

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

end

**R2:**

**Config:**

hostname R2

boot-start-marker

boot-end-marker

vrf definition Mgmt-intf

address-family ipv4

exit-address-family

address-family ipv6

exit-address-family

no aaa new-model

ip vrf A

description A VRF

ip vrf B

description B VRF

login on-success log

subscriber templating

ipv6 unicast-routing

multilink bundle-name authenticated

crypto pki trustpoint TP-self-signed-2270144787

enrollment selfsigned

subject-name cn=IOS-Self-Signed-Certificate-2270144787

revocation-check none

rsakeypair TP-self-signed-2270144787

crypto pki trustpoint TP-self-signed-4144679456

enrollment selfsigned

subject-name cn=IOS-Self-Signed-Certificate-4144679456

revocation-check none

rsakeypair TP-self-signed-4144679456

crypto pki trustpoint TP-self-signed-859896477

enrollment selfsigned

subject-name cn=IOS-Self-Signed-Certificate-859896477

revocation-check none

rsakeypair TP-self-signed-859896477

crypto pki certificate chain TP-self-signed-2270144787

certificate self-signed 01

30820330 30820218 A0030201 02020101 300D0609 2A864886 F70D0101 05050030

31312F30 2D060355 04031326 494F532D 53656C66 2D536967 6E65642D 43657274

69666963 6174652D 32323730 31343437 3837301E 170D3232 30353130 31353332

34325A17 0D333030 31303130 30303030 305A3031 312F302D 06035504 03132649

4F532D53 656C662D 5369676E 65642D43 65727469 66696361 74652D32 32373031

34343738 37308201 22300D06 092A8648 86F70D01 01010500 0382010F 00308201

0A028201 0100B224 179E1781 D8B1D229 985AD9FA 95D26DB7 55CC8E08 2A328AB0

1A885D51 EC6763CE 7796517A 3667CF46 5547B246 63CCBFB1 E6C039F2 0AD6E60B

5E2E4500 07AFE026 1EF98F25 87023373 CC9B9F57 88A6CAE7 22125E78 781DD8DE

F9615A1F 166B7052 517C6491 082BA6D7 0401927C 4326119E C8FC1DC4 8E7A6CC6

2CB26CA7 8D9E24A2 6FAB6786 1656E467 408D8318 7CAA59DB 19AC8B3D 3069F2B7

67B5A7D2 FDCB4460 04A1EE05 D910E510 1819350F 707EBECC A45B3AC6 DE8F3FEB

AFDC17F5 84C7D712 B984AE65 DC2B8A6D CAF8BDF3 B7853E84 FBC758B8 D019E8B7

38E3E0A3 B1D64A18 49D6369A 824F20F2 9A67A788 9FBEFA2C 398E1005 1E26C353

FF6FFFAC 224B0203 010001A3 53305130 0F060355 1D130101 FF040530 030101FF

301F0603 551D2304 18301680 14E1266F 6F242F22 0ED543D0 4677A405 BC6EEBAF

3C301D06 03551D0E 04160414 E1266F6F 242F220E D543D046 77A405BC 6EEBAF3C

300D0609 2A864886 F70D0101 05050003 82010100 1033F5C0 96AA26ED D1082679

D8C22B75 FF7DC409 C11A92F1 2877D875 EB00E9F0 59506EEC BB7E552A 0B27D0C9

9A311926 0F592ED6 04827F24 7E714AF7 83C94A29 24B8CDEC 74B39BB6 673EE5C0

7E99095D 7B8ABDA9 EE7AF536 FEACF45D DA54AE5C EAC420B4 7901305A 9A76AA07

4BEA71D7 4614F599 4E54F609 6A37DF87 2103E502 236AC81D B1E7333C 39005EC6

E7790E1B AC40B5A7 EC88A36E EEFDEAE4 9E7E5BE9 E5C11246 4204978B 420230F6

8020FCB4 499AFD8F 39D16D45 1758131B D3427593 CC576C09 29B010BF 77B77985

AFFA08C6 DADE5669 0E842009 40519DF5 14F95161 57461693 A5DF16B5 F333EE3B

8CDE9748 D8E20EE2 8BD9E05B B19D5C6F 9842ACFC

quit

crypto pki certificate chain TP-self-signed-4144679456

crypto pki certificate chain TP-self-signed-859896477

license udi pid ISR4321/K9 sn FLM24060912

no license smart enable

diagnostic bootup level minimal

spanning-tree extend system-id

redundancy

mode none

interface GigabitEthernet0/0/0

description R2

no ip address

negotiation auto

interface GigabitEthernet0/0/0.1

encapsulation dot1Q 1 native

ip vrf forwarding A

ip address 192.168.2.1 255.255.255.252

interface GigabitEthernet0/0/0.2

encapsulation dot1Q 2

ip vrf forwarding B

ip address 10.0.2.1 255.255.255.252

interface GigabitEthernet0/0/1

no ip address

negotiation auto

interface GigabitEthernet0/0/1.1

encapsulation dot1Q 1 native

ip vrf forwarding A

ip address 192.168.1.2 255.255.255.252

interface GigabitEthernet0/0/1.2

encapsulation dot1Q 2

ip vrf forwarding B

ip address 10.0.1.2 255.255.255.252

interface GigabitEthernet0/2/0

no ip address

shutdown

negotiation auto

interface GigabitEthernet0/2/1

no ip address

shutdown

negotiation auto

interface GigabitEthernet0

vrf forwarding Mgmt-intf

no ip address

shutdown

negotiation auto

router ospf 1 vrf A

router-id 4.5.4.9

network 192.168.1.0 0.0.0.3 area 0

network 192.168.2.0 0.0.0.3 area 0

default-information originate

router ospf 2 vrf B

router-id 1.6.9.8

network 10.0.1.0 0.0.0.3 area 0

network 10.0.2.0 0.0.0.3 area 0

default-information originate

ip forward-protocol nd

ip http server

ip http authentication local

ip http secure-server

ip tftp source-interface GigabitEthernet0

control-plane

line con 0

transport input none

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

end

**R3:**

**Config:**

Building configuration...

Current configuration : 4671 bytes

Last configuration change at 16:06:12 UTC Tue May 10 2022

version 16.9

service timestamps debug datetime msec

service timestamps log datetime msec

platform qfp utilization monitor load 80

platform punt-keepalive disable-kernel-core

hostname R3

boot-start-marker

boot-end-marker

vrf definition Mgmt-intf

address-family ipv4

exit-address-family

address-family ipv6

exit-address-family

no aaa new-model

ip vrf A

description A VRF

ip vrf B

description B VRF

login on-success log

subscriber templating

ipv6 unicast-routing

multilink bundle-name authenticated

crypto pki trustpoint TP-self-signed-4144679456

enrollment selfsigned

subject-name cn=IOS-Self-Signed-Certificate-4144679456

revocation-check none

rsakeypair TP-self-signed-4144679456

crypto pki trustpoint TP-self-signed-859896477

enrollment selfsigned

subject-name cn=IOS-Self-Signed-Certificate-859896477

revocation-check none

rsakeypair TP-self-signed-859896477

crypto pki certificate chain TP-self-signed-4144679456

certificate self-signed 01

30820330 30820218 A0030201 02020101 300D0609 2A864886 F70D0101 05050030

31312F30 2D060355 04031326 494F532D 53656C66 2D536967 6E65642D 43657274

69666963 6174652D 34313434 36373934 3536301E 170D3232 30353130 31353530

31315A17 0D333030 31303130 30303030 305A3031 312F302D 06035504 03132649

4F532D53 656C662D 5369676E 65642D43 65727469 66696361 74652D34 31343436

37393435 36308201 22300D06 092A8648 86F70D01 01010500 0382010F 00308201

0A028201 0100A836 37ABCB1A 4CEAE292 30A69D8F 73B3CC4C 5BF3D9EA 3173CE6C

8E8514C2 10C0E68E 9623ED6D 7ED6E62F 0D7C28A4 6EF821FE CF95D075 594794F1

6B170CF4 37B0A0DB EA9C0C04 3CBA6DF7 19E5CF14 03FBCDC3 67E49BBE 73170F23

DB036573 E521C404 BEE652AE B4C2E644 FDA28883 410B01A2 9BF670AB 0084284A

D0DAAE3D D0D6C286 5BE9C14E 8D816F6E 3B636104 51762547 C332CC32 01BBD247

9E17F48B BE7B1468 26712002 67EDA3FE 738B1511 48536F03 E2216CCC 3D8343FE

FBC55155 306FD69C 9453A544 359767DC 93E4505F CE72CC75 DBAB6E4A 1CEA60DE

DEA00BAF 49991CA9 47D4EEE3 F74B0138 0E5BE694 900F0E9D 17DA8D90 2109BCF8

306CED81 EB270203 010001A3 53305130 0F060355 1D130101 FF040530 030101FF

301F0603 551D2304 18301680 14646679 7E68D363 F7260010 82C942BE 2D6E6564

C3301D06 03551D0E 04160414 6466797E 68D363F7 26001082 C942BE2D 6E6564C3

300D0609 2A864886 F70D0101 05050003 82010100 3D10138C 8B007CAA 679DDD44

D5C05AD6 3391761D 7832DAFF 077721F1 1B91A021 C5DE9176 DF52FAF5 134AD0FA

61C556E1 59C2C304 5A4F0607 551D0BB7 D8F3C11D 1EC29E3A 1D8958DC EB1FC0B5

6F2B819E C6A95DBF C921B0C5 EA973226 BBC5C416 C58A62EA CB09DC2E 8026B460

F13BD5D2 CBABF817 D3F9AE8A 209B7D73 9DFD1CED 2496CB32 49997BA8 BEDD5D0A

C2F464B5 26D7A8E3 CED77822 CD7832D5 4050A1BE 24ABF541 91D15377 A9DA4A74

58E81B8C 68ECDEED 7DD9EBE7 1D4A8FB7 5C049A43 252DDAC9 010A0A32 0E21DBBA

8773DF2E 44810443 D969105B 548BBA2D 33D4C7B3 65E49CC2 3747DF53 7D099C6A

34585542 75366988 448D60B0 66B0E503 2F45F402

quit

crypto pki certificate chain TP-self-signed-859896477

license udi pid ISR4321/K9 sn FLM2408005M

no license smart enable

diagnostic bootup level minimal

spanning-tree extend system-id

redundancy

mode none

interface GigabitEthernet0/0/0

description R3

no ip address

negotiation auto

interface GigabitEthernet0/0/0.1

encapsulation dot1Q 1 native

ip vrf forwarding A

ip address 192.168.3.1 255.255.255.252

interface GigabitEthernet0/0/0.2

encapsulation dot1Q 2

ip vrf forwarding B

ip address 10.0.3.1 255.255.255.252

interface GigabitEthernet0/0/1

no ip address

negotiation auto

interface GigabitEthernet0/0/1.1

encapsulation dot1Q 1 native

ip vrf forwarding A

ip address 192.168.2.2 255.255.255.252

interface GigabitEthernet0/0/1.2

encapsulation dot1Q 2

ip vrf forwarding B

ip address 10.0.2.2 255.255.255.252

interface GigabitEthernet0/2/0

no ip address

shutdown

negotiation auto

interface GigabitEthernet0/2/1

no ip address

shutdown

negotiation auto

interface GigabitEthernet0

vrf forwarding Mgmt-intf

no ip address

shutdown

negotiation auto

router ospf 1 vrf A

router-id 4.7.7.2

network 192.168.2.0 0.0.0.3 area 0

network 192.168.3.0 0.0.0.3 area 0

default-information originate

router ospf 2 vrf B

router-id 1.3.8.2

network 10.0.2.0 0.0.0.3 area 0

network 10.0.3.0 0.0.0.3 area 0

default-information originate

ip forward-protocol nd

ip http server

ip http authentication local

ip http secure-server

ip tftp source-interface GigabitEthernet0

control-plane

line con 0

transport input none

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

end

**R4:**

**Config:**

hostname R4

boot-start-marker

boot-end-marker

vrf definition Mgmt-intf

address-family ipv4

exit-address-family

address-family ipv6

exit-address-family

no aaa new-model

ip vrf A

ip vrf B

subscriber templating

multilink bundle-name authenticated

license udi pid ISR4321/K9 sn FDO214421BU

spanning-tree extend system-id

redundancy

mode none

vlan internal allocation policy ascending

interface Loopback0

ip vrf forwarding A

ip address 4.4.4.4 255.255.255.255

interface Loopback1

ip vrf forwarding B

ip address 5.5.5.5 255.255.255.255

interface GigabitEthernet0/0/0

no ip address

negotiation auto

interface GigabitEthernet0/0/1

no ip address

negotiation auto

interface GigabitEthernet0/0/1.1

encapsulation dot1Q 1 native

ip vrf forwarding A

ip address 192.168.3.2 255.255.255.252

interface GigabitEthernet0/0/1.2

encapsulation dot1Q 2

ip vrf forwarding B

ip address 10.0.3.2 255.255.255.252

interface Serial0/1/0

no ip address

shutdown

interface Serial0/1/1

no ip address

shutdown

interface Service-Engine0/2/0

no ip address

shutdown

interface GigabitEthernet0

vrf forwarding Mgmt-intf

no ip address

shutdown

negotiation auto

interface Vlan1

no ip address

shutdown

router ospf 1 vrf A

router-id 3.4.4.4

network 4.4.4.4 0.0.0.0 area 0

network 192.168.3.0 0.0.0.3 area 0

default-information originate

router ospf 2 vrf B

router-id 4.1.4.4

network 5.5.5.5 0.0.0.0 area 0

network 10.0.3.0 0.0.0.3 area 0

default-information originate

ip forward-protocol nd

no ip http server

no ip http secure-server

ip tftp source-interface GigabitEthernet0

control-plane

line con 0

stopbits 1

line aux 0

stopbits 1

line vty 0 4

login

end

**Ip routes:**

R1#ping vrf A 192.168.3.2

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.3.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R1#ping vrf A 4.4.4.4

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 4.4.4.4, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R1#ping vrf A 5.5.5.5

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 5.5.5.5, timeout is 2 seconds:

.....

Success rate is 0 percent (0/5)

R1#ping vrf B 5.5.5.5

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 5.5.5.5, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R1#ping VRF B 10.0.3.2

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.0.3.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

**Problems:**

Something we messed up in the beginning was choose a router with no extra interfaces. This didn’t allow us to have enough interfaces to connect two pcs. Another problem we ran into was setting up the sub interfaces with all of the individual Ip addresses. Some of our VRF’s got mixed up and our ping VRF commands were not working. We also had a hard time making sure to apply the ip vrf forwarding command to all the interfaces and we also needed to make sure that we put all of the ip addresses on the opsf vrf.

**Conclusion:**

We set up 4 routers with 8 sub interfaces to split up the data between two sides using VRF-Lite. One VRF is named VRF A and the other is VRF B. The routers on one VRF are unable to connect with interface with a different VRF. This allows to split up the data regardless of using the same router.