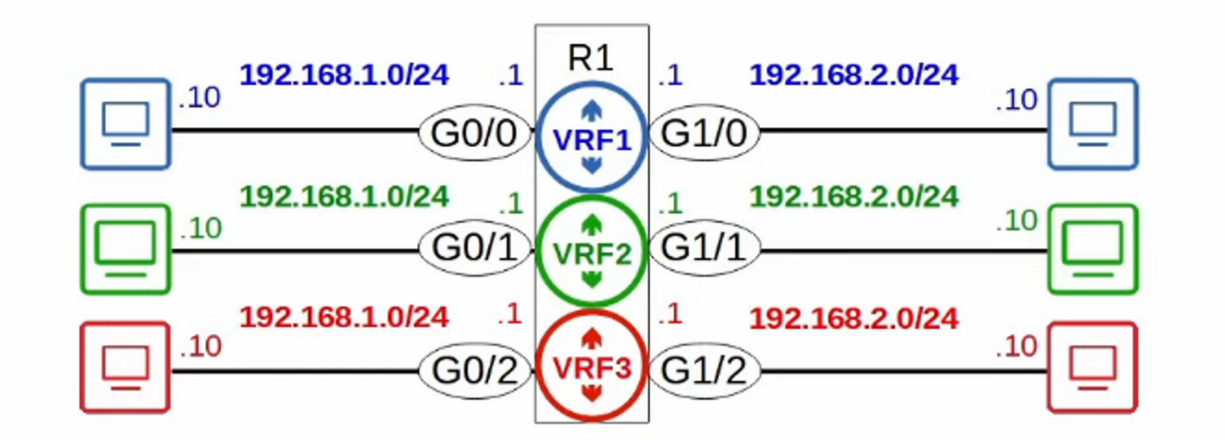
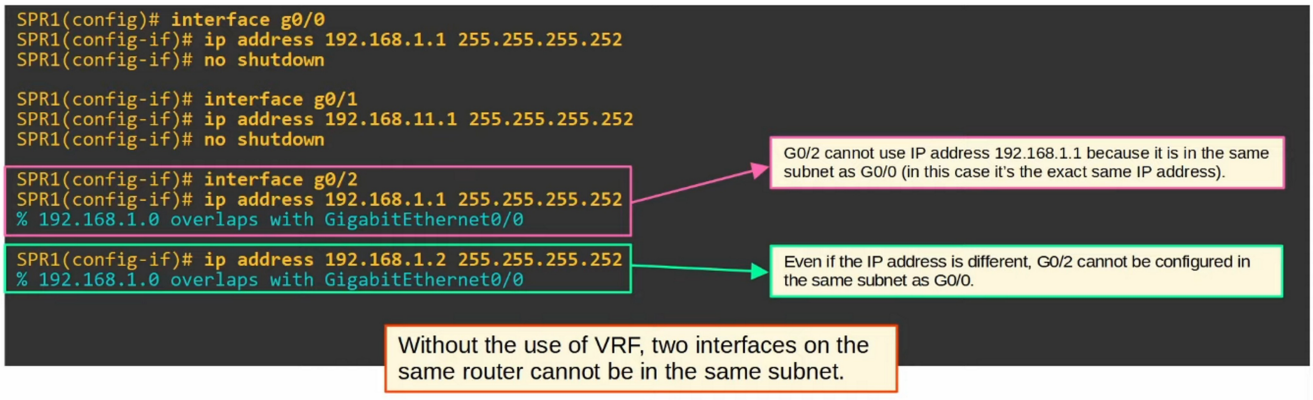
Tuesday, December 16, 2025 5:26 PM

INTRO TO VRF



- **VIRTUAL ROUTING AND FORWARDING (VRF) is used to DIVIDE a SINGLE ROUTER into MULTIPLE VIRTUAL ROUTERS**
  - Similar to how VLANs are used to divide a SINGLE SWITCH (LAN) into MULTIPLE VIRTUAL SWITCHES (VLANs)
- It does this by allowing a ROUTER to build MULTIPLE SEPARATE ROUTING TABLES
  - INTERFACES (LAYER 3 only) and ROUTERS are configured to be in a specific VRF (aka *VRF INSTANCE*)
  - ROUTER INTERFACES, SVIs and ROUTED PORTS on MULTILAYER SWITCHES can be configured in a VRF
- TRAFFIC in one VRF cannot be forwarded out of an INTERFACE in another VRF
  - As an exception, VRF LEAKING can be configured to allow traffic to pass BETWEEN VRFs
- VRF is commonly used to facilitate MPLS (Multiple Protocol Label Switching)
  - The kind of VRF we are talking about is VRF-Lite (VRF without MPLS)
- VRF is commonly used by SERVICE PROVIDERS to allow ONE DEVICE to carry traffic from MULTIPLE CUSTOMERS
  - Each CUSTOMER'S TRAFFIC is isolated from the OUTSIDE
  - CUSTOMER IP ADDRESSES can overlap without issue

VRF CONFIGURATION

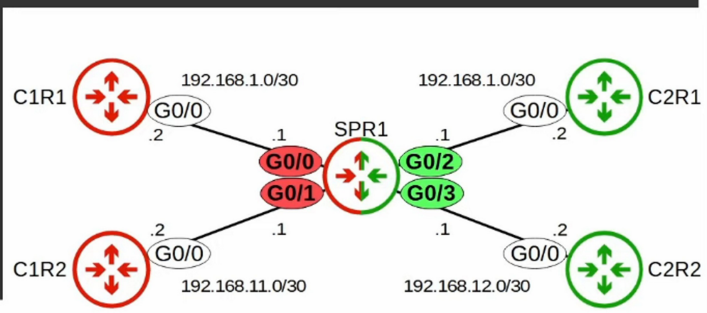


Creation and Configuration of VRFs

```
SPR1(config)# ip vrf CUSTOMER1
SPR1(config-vrf)# ip vrf CUSTOMER2
SPR1(config-vrf)# do show ip vrf
  Name                              Default RD          Interfaces
  CUSTOMER1                         <not set>
  CUSTOMER2                         <not set>

SPR1(config-vrf)# interface g0/0
SPR1(config-if)# ip vrf forwarding CUSTOMER1
% Interface GigabitEthernet0/0 IPv4 disabled and address(es) removed due to enabling VRF CUSTOMER1
SPR1(config-if)# ip address 192.168.1.1 255.255.255.252

SPR1(config-if)# interface g0/1
SPR1(config-if)# ip vrf forwarding CUSTOMER1
% Interface GigabitEthernet0/1 IPv4 disabled and address(es) removed due to enabling VRF CUSTOMER1
SPR1(config-if)# ip address 192.168.11.1 255.255.255.252

SPR1(config-if)# interface g0/2
SPR1(config-if)# ip vrf forwarding CUSTOMER2
SPR1(config-if)# ip address 192.168.1.1 255.255.255.252
SPR1(config-if)# no shutdown
SPR1(config-if)# interface g0/3
SPR1(config-if)# ip vrf forwarding CUSTOMER2
SPR1(config-if)# ip address 192.168.12.1 255.255.255.252
SPR1(config-if)# no shutdown
SPR1(config-if)# do show ip vrf
  Name                 Default RD            Interfaces
  CUSTOMER1            <not set>             Gi0/0
                                             Gi0/1
  CUSTOMER2            <not set>             Gi0/2
                                             Gi0/3
```

1. Create VRFs:
SPR1(config)# **ip vrf** *name*
2. Assign interfaces to VRFs:
SPR1(config-if)# **ip vrf forwarding** *name*

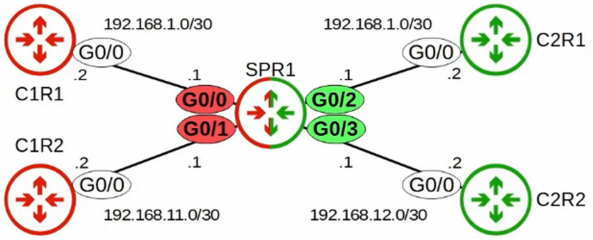
If an interface has an IP address configured, the IP address will be removed when you assign the interface to a VRF.



How to show ip route for VRFs

```
SPR1# show ip route
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

SPR1# show ip route vrf CUSTOMER1

Routing Table: CUSTOMER1
!output omitted

      192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.1.0/30 is directly connected, GigabitEthernet0/0
L        192.168.1.1/32 is directly connected, GigabitEthernet0/0
      192.168.11.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.11.0/30 is directly connected, GigabitEthernet0/1
L        192.168.11.1/32 is directly connected, GigabitEthernet0/1

SPR1# show ip route vrf CUSTOMER2

Routing Table: CUSTOMER2
!output omitted

      192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.1.0/30 is directly connected, GigabitEthernet0/2
L        192.168.1.1/32 is directly connected, GigabitEthernet0/2
      192.168.12.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.12.0/30 is directly connected, GigabitEthernet0/3
L        192.168.12.1/32 is directly connected, GigabitEthernet0/3
```

show ip route displays the *global routing table.*
*All of SPR1's interfaces are configured in VRFs, so nothing displays here.
*You can have a mix of interfaces using and not using VRFs.



ping other VRFs

```
SPR1# ping 192.168.1.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.1, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)

SPR1# ping vrf CUSTOMER1 192.168.1.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

SPR1# ping vrf CUSTOMER1 192.168.11.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.11.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

SPR1# ping vrf CUSTOMER1 192.168.12.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.12.1, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)

SPR1# ping vrf CUSTOMER2 192.168.1.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

SPR1# ping vrf CUSTOMER2 192.168.12.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.12.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

C1R1

C2R1