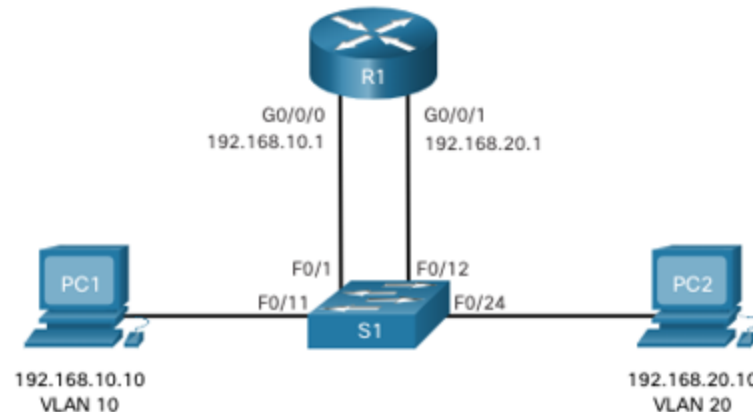# Inter-VLAN Routing

Inter-VLAN Routing

- Process of forwarding network traffic from one VLAN to another VLAN.

- **3 options:**
  - 1️⃣ **Legacy Inter-VLAN Routing**: Legacy. Does not scale well.
  - 2️⃣ ⭐ **Router-on-a-Stick (RoaS)**: Acceptable for small to medium-sized network.
  - 3️⃣ ⭐ **Inter-VLAN Routing on a Layer 3 Switch**: Most scalable solution for medium to large organizations.

1 Legacy Inter-VLAN Routing

- Using a **Router** requiring **1 physical interface per VLAN**.

- **Limitation:** Routers have a limited number of interfaces.

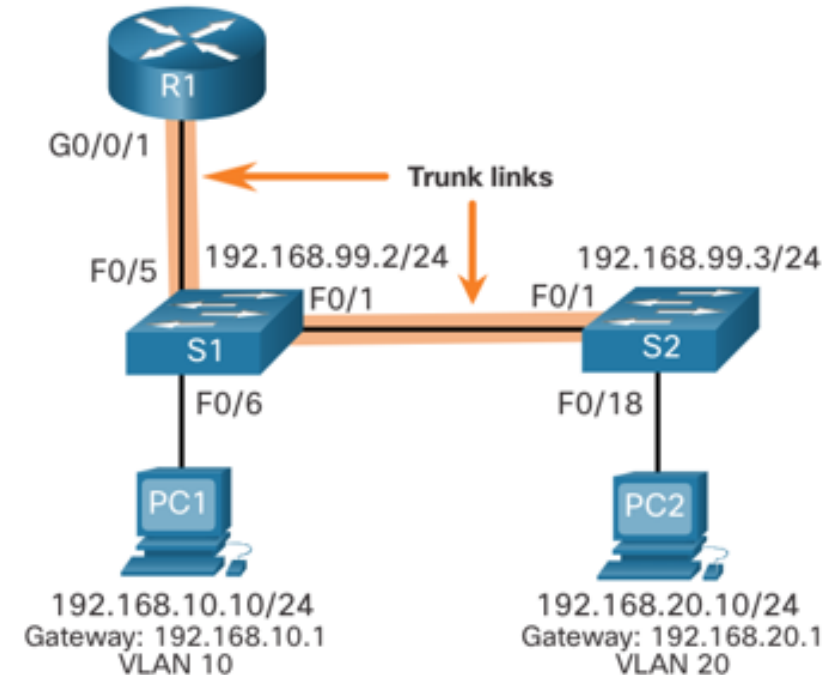⚠️ **No longer implemented!!! Explanation purposes only!!!**

2 ⭐ Router-on-a-Stick Inter-VLAN Routing (RoaS)

- **Only requires 1 physical interface** to route traffic between multiple VLANs.

- Router (trunk port) > Link > Switch (trunk port)

- Using **software-based subinterfaces** to identify routable VLANs.
  - Each subinterface configured for each VLAN.

- **Limitation:** does not scale beyond 50 VLANs.

2 RoaS Configuration (S1/S2)

```
S2(config)# vlan 10
S2(config-vlan)# name LAN10
S2(config-vlan)# vlan 20
S2(config-vlan)# name LAN20
S2(config-vlan)# vlan 99
S2(config-vlan)# name Management
S2(config-vlan)# interface vlan 99
S2(config-if)# ip add 192.168.99.3 255.255.255.0
S2(config-if)# no shutdown
S2(config-if)# exit
S2(config)# ip default-gateway 192.168.99.1
S2(config)# interface f0/18
S2(config-if)# switchport mode access
S2(config-if)# switchport access vlan 20
S2(config-if)# no shutdown
```


R1

G0/0/1

Trunk links

F0/5   192.168.99.2/24   192.168.99.3/24
        F0/1   F0/1
S1   S2
F0/6   F0/18

PC1   PC2

192.168.10.10/24   192.168.20.10/24
Gateway: 192.168.10.1   Gateway: 192.168.20.1
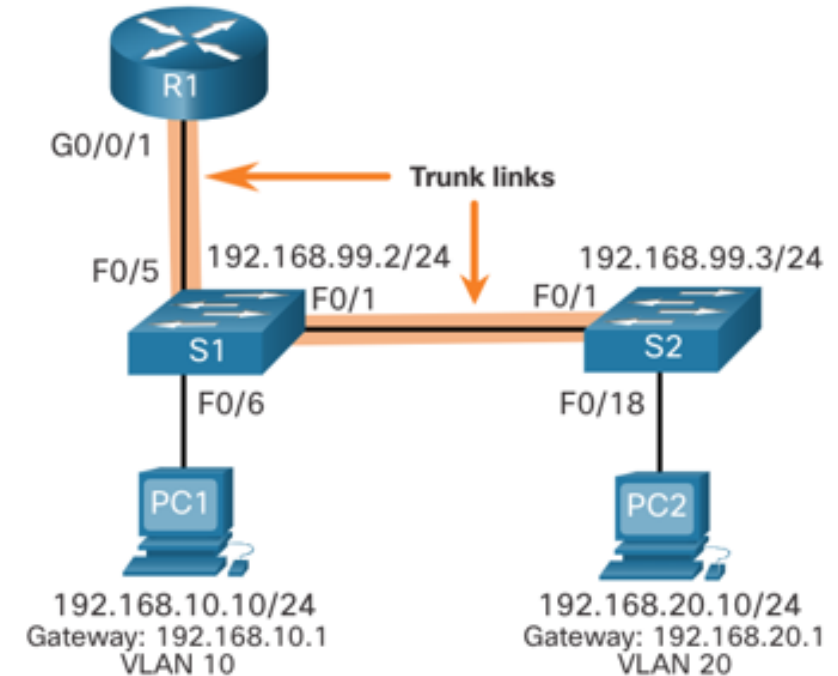VLAN 10   VLAN 20

2 RoaS Configuration (R1)

```
R1(config)# interface g0/0/1.10
R1(config-subif)# description Default gw for VLAN 10
R1(config-subif)# encapsulation dot1q 10
R1(config-subif)# ip add 192.168.10.1 255.255.255.0

R1(config-subif)# interface g0/0/1.20
R1(config-subif)# description Default gw for VLAN 20
R1(config-subif)# encapsulation dot1q 20
R1(config-subif)# ip add 192.168.20.1 255.255.255.0

R1(config-subif)# interface g0/0/1.99
R1(config-subif)# description Default gw for VLAN 99
R1(config-subif)# encapsulation dot1q 99
R1(config-subif)# ip add 192.168.99.1 255.255.255.0

R1(config-subif)# interface g0/0/1
R1(config-if)# description Trunk link to S1
R1(config-if)# no shutdown
```


R1

G0/0/1

Trunk links

F0/5   192.168.99.2/24   192.168.99.3/24
                F0/1   F0/1
S1   S2
F0/6   F0/18

PC1   PC2

192.168.10.10/24   192.168.20.10/24
Gateway: 192.168.10.1   Gateway: 192.168.20.1
VLAN 10   VLAN 20

3️⃣ ⭐ Inter-VLAN Routing on a Layer 3 Switch

- Modern method that uses **Layer 3 / Multilayer Switches** and SVIs.

- SVI created for each VLAN ➡️ `interface vlan 10`

- Convert a Layer 2 switchport to a Layer 3 interface (**routed port**).

- **Advantages:**
  - 🚄 Much faster than RoaS.
  - No need for external links from the switch to the router.
  - Not limited to 1 link ➡️ EtherChannels as trunk links between switches
  - Latency much lower.
  - **More commonly deployed in a Campus LAN than router.**

- **Disavantage:** 💵 Layer 3 Switches are more expensive.

3 L3 Switch Routing Config

```
D1(config)# vlan 10
D1(config-vlan)# name LAN10
D1(config-vlan)# vlan 20
D1(config-vlan)# name LAN20
D1(config-vlan)# interface vlan 10
D1(config-if)# description Default gw for 192.168.10.0/24
D1(config-if)# ip add 192.168.10.1 255.255.255.0
D1(config-if)# no shutdown
D1(config-if)# interface vlan 20
D1(config-if)# description Default gw for 192.168.20.0/24
D1(config-if)# ip add 192.168.20.1 255.255.255.0
D1(config-if)# no shutdown
D1(config-if)# interface GigabitEthernet1/0/6
D1(config-if)# description Access port to PC1
D1(config-if)# switchport mode access
D1(config-if)# switchport access vlan 10
D1(config-if)# interface GigabitEthernet1/0/18
D1(config-if)# description Access port to PC2
D1(config-if)# switchport mode access
D1(config-if)# switchport access vlan 20
D1(config-if)# exit
D1(config)# ip routing
```


D1

G1/0/6
(VLAN 10)

G1/0/18
(VLAN 20)

PC1

192.168.10.10/24
Gateway: 192.168.10.1

PC2

192.168.20.10/24
Gateway: 192.168.20.1