# Lab SU-5a – Configuring Per-Interface Inter-VLAN Routing
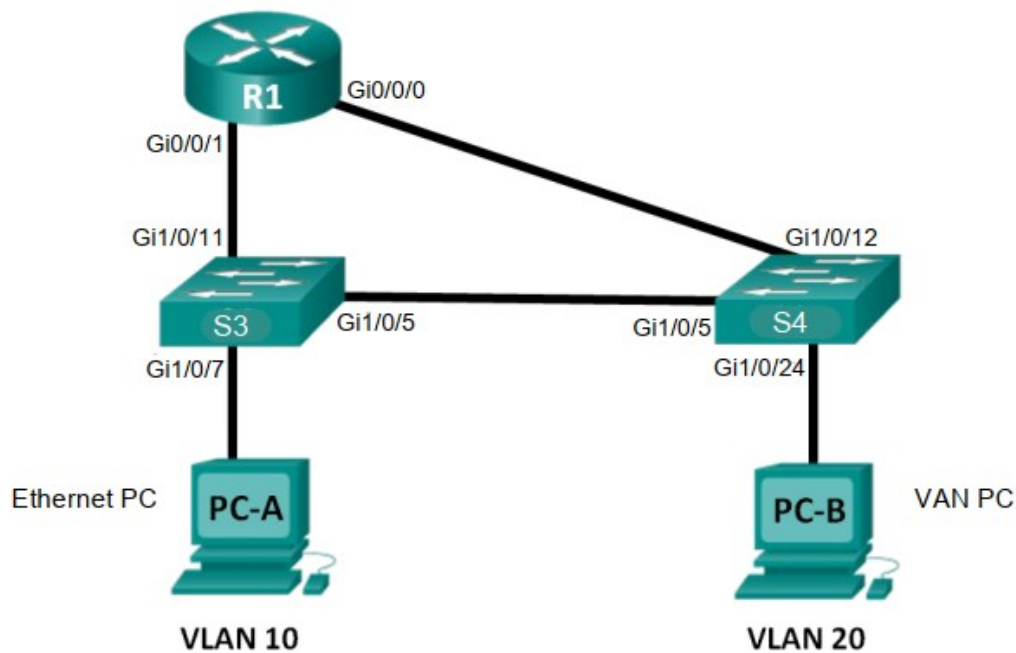
## Topology Diagram



| Device | Interface | IP Address | Subnet Mask | Default Gateway |
|--------|-----------|------------|-------------|-----------------|
| R1 | Gi0/0/0 | 192.168.20.1 | 255.255.255.0 | N/A |
| | Gi0/0/1 | 192.168.10.1 | 255.255.255.0 | N/A |
| S3 | VLAN 10 | 192.168.10.11 | 255.255.255.0 | 192.168.10.1 |
| S4 | VLAN 10 | 192.168.10.12 | 255.255.255.0 | 192.168.10.1 |
| PC-A | NIC | 192.168.10.3 | 255.255.255.0 | 192.168.10.1 |
| PC-B | NIC | 192.168.20.3 | 255.255.255.0 | 192.168.20.1 |

Switch$conf t

Switch(config)#hostname S3

**Step 1: Configure VLANs on S3.**

a. On S3, create VLAN 10. Assign Student as the VLAN name.

b. Create VLAN 20. Assign Faculty-Admin as the VLAN name.

c. Configure Gi1/0/5 as a trunk port.

d. Assign Gi1/0/7 and Gi1/0/11 to VLAN 10 and configure both Gi1/0/7 and Gi1/0/11 as access ports.

e. Assign an IP address to VLAN 10 and enable it. Refer to the Addressing Table.

**Step 2: Configure VLANs on S4.**

a. On S4, create VLAN 10. Assign Student as the VLAN name.

b. Create VLAN 20. Assign Faculty-Admin as the VLAN name.

c. Configure Gi1/0/5 as a trunk port.

d. Assign Gi1/0/12 and Gi1/0/24 to VLAN 20 and configure both Gi1/0/12 and Gi1/0/24 as access ports.

e. Assign an IP address to VLAN 10 and enable it. Refer to the Addressing Table

In order for the switch to deliver packets to devices on VLANs outside the management VLAN, it must send this packet to a **default gateway** router. The configuration tables above nominate the **default gateway** to be configured on each switch. Note that the **default gateway** must be an IP address in the same subnet as the management VLAN IP address as the **default gateway** must be directly reachable.

**Step 3: Configure Router R1**
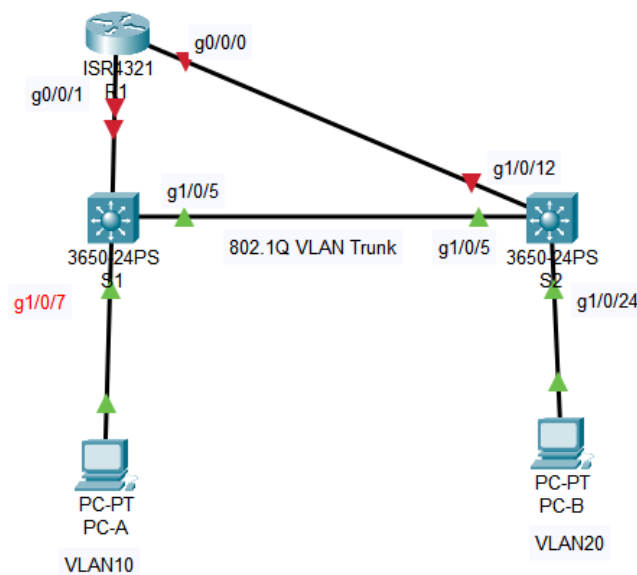
**S3 - Configure Switches with VLANs and Trunking**

1. **Create VLAN 10 and assign the name "Student":**

   S3(config)# vlan 10

   S3(config-vlan)# name Student

   S3(config-vlan)# exit

2. **Create VLAN 20 and assign the name "Faculty-Admin":**

   S3(config)# vlan 20

   S3(config-vlan)# name Faculty-Admin

   S3(config-vlan)# exit

3. **Configure Gi1/0/5 as a trunk port:**

   S3(config)# interface GigabitEthernet1/0/5

   S3(config-if)# switchport mode trunk

   S3(config-if)# exit

4. **Assign Gi1/0/7 and Gi1/0/11 to VLAN 10 and configure them as access ports:**

   S3(config)# interface GigabitEthernet1/0/7

   S3(config-if)# switchport mode access

   S3(config-if)# switchport access vlan 10

   S3(config-if)# exit


   S3(config)# interface GigabitEthernet1/0/11

   S3(config-if)# switchport mode access

   S3(config-if)# switchport access vlan 10

   S3(config-if)# exit

5. **Assign an IP address to VLAN 10 and enable it (refer to your Addressing Table for the specific IP address):**

   S3(config)# interface vlan 10

   S3(config-if)# ip address 172.168.10.11 255.255.255.0

   S3(config-if)# no shutdown

   S3(config-if)# exit

6. **Set the default gateway:**

> S3(config)# ip default-gateway 192.168.10.1
>
> S3(config)# exit

1. **Show VLAN information:**

> S3# show vlan brief

2. **Show interface status:**

> S3# show interfaces status

3. **Show trunk ports:**

> S3# show interfaces trunk

4. **Show IP interface brief:**

> S3# show ip interface brief

5. **Show running configuration:**

> S3# show running-config

To disable DNS lookup on switch S3, you can use the no ip domain-lookup command in global configuration mode. Here are the steps:

1. Enter global configuration mode:

> S3# configure terminal

2. Disable DNS lookup:

> S3(config)# no ip domain-lookup

3. Exit configuration mode:

> S3(config)# exit

**S4- configure VLANs :**

1. **Create VLAN 10 and assign the name "Student":**

> S4# configure terminal
>
> S4(config)# vlan 10
>
> S4(config-vlan)# name Student
>
> S4(config-vlan)# exit

2. **Create VLAN 20 and assign the name "Faculty-Admin":**

S4(config)# vlan 20

S4(config-vlan)# name Faculty-Admin

S4(config-vlan)# exit

3. **Configure Gi1/0/5 as a trunk port:**

   S4(config)# interface GigabitEthernet1/0/5

   S4(config-if)# switchport mode trunk

   S4(config-if)# exit

4. **Assign Gi1/0/12 and Gi1/0/24 to VLAN 20 and configure them as access ports:**

   S4(config)# interface GigabitEthernet1/0/12

   S4(config-if)# switchport mode access

   S4(config-if)# switchport access vlan 20

   S4(config-if)# exit


   S4(config)# interface GigabitEthernet1/0/24

   S4(config-if)# switchport mode access

   S4(config-if)# switchport access vlan 20

   S4(config-if)# exit

5. **Assign an IP address to VLAN 10 and enable it:**

   S4(config)# interface vlan 10

   S4(config-if)# ip address 192.168.10.12 255.255.255.0

   S4(config-if)# no shutdown

   S4(config-if)# exit

6. **Set the default gateway:**

   S4(config)# ip default-gateway 192.168.10.1

   S4(config)# exit

**Configuration for Router R1:**

1. **Enter global configuration mode:**

   R1# configure terminal

2. **Configure the IP address on interface Gi0/0/0 (connected to S4 Gi1/0/12):**

R1(config)# interface GigabitEthernet0/0/0

R1(config-if)# ip address 192.168.20.1 255.255.255.0
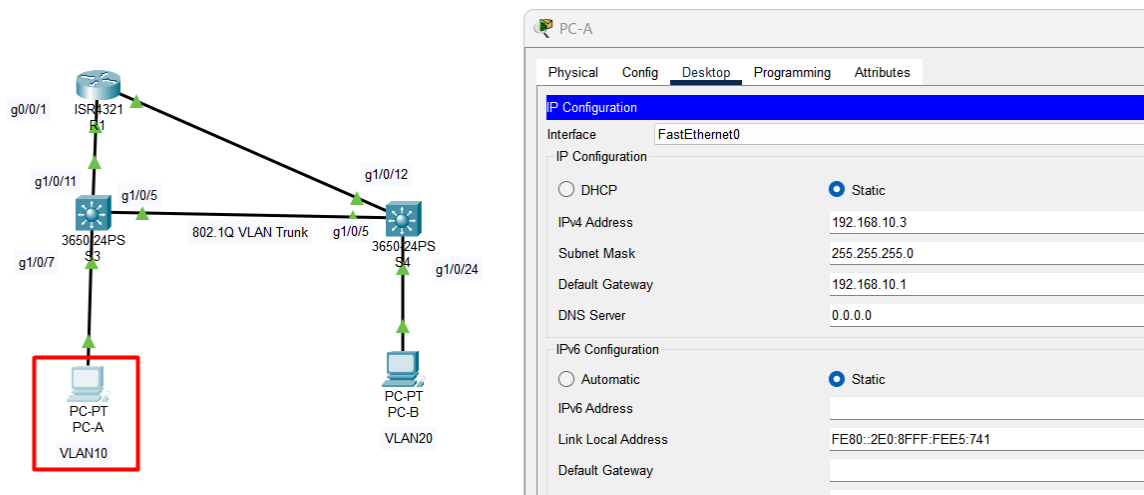
R1(config-if)# no shutdown

R1(config-if)# exit

3. **Configure the IP address on interface Gi0/0/1 (connected to S3 Gi1/0/11):**

R1(config)# interface GigabitEthernet0/0/1

R1(config-if)# ip address 192.168.10.1 255.255.255.0

R1(config-if)# no shutdown

R1(config-if)# exit

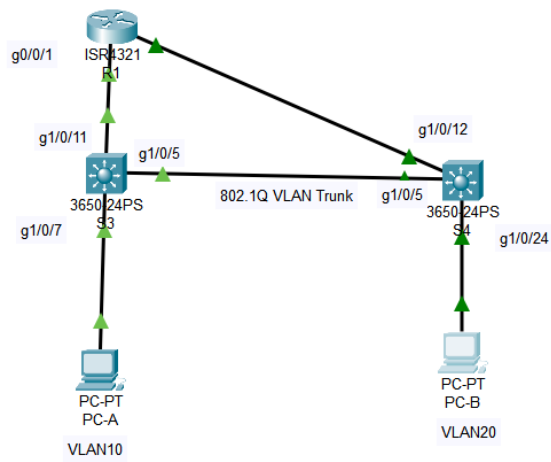4. **Save the configuration:**

R1(config)# end

R1# write memory

## Lab SU-5b – Configuring 802.1Q Trunk-Based Inter-VLAN Routing

**Topology Diagram**
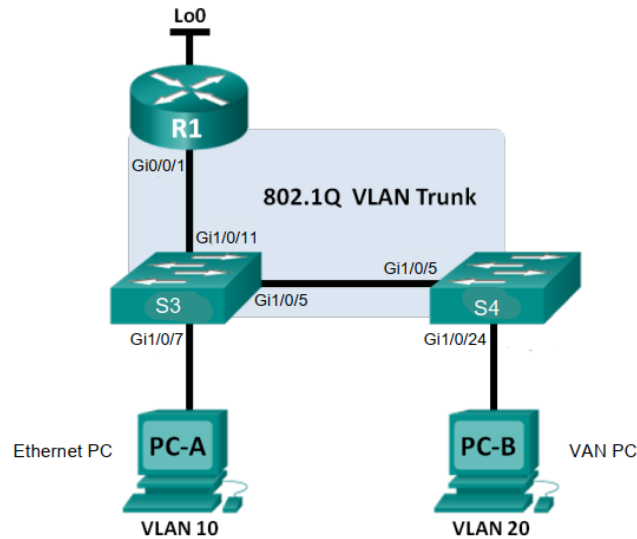


## Addressing Table

| Device | Interface | IP Address | Subnet Mask | Default Gateway |
|--------|-----------|------------|-------------|-----------------|
| R1 | Gi0/0/1.99 | 192.168.1.1 | 255.255.255.0 | N/A |
| | Gi0/0/1.10 | 192.168.10.1 | 255.255.255.0 | N/A |
| | Gi0/0/1.20 | 192.168.20.1 | 255.255.255.0 | N/A |
| | Lo0 | 209.165.200.225 | 255.255.255.224 | N/A |
| S3 | VLAN 99 | 192.168.1.11 | 255.255.255.0 | 192.168.1.1 |
| S4 | VLAN 99 | 192.168.1.12 | 255.255.255.0 | 192.168.1.1 |
| PC-A | NIC | 192.168.10.3 | 255.255.255.0 | 192.168.10.1 |
| PC-B | NIC | 192.168.20.3 | 255.255.255.0 | 192.168.20.1 |

## Switch Port Assignment Specifications

| Ports | Assignment | Network |
|-------|------------|---------|
| S3 Gi1/0/5 | 802.1Q Trunk | N/A |
| S4 Gi1/0/5 | 802.1Q Trunk | N/A |
| S3 Gi1/0/11 | 802.1Q Trunk | N/A |
| S3 Gi1/0/7 | VLAN 10 – Students | 192.168.10.0/24 |
| S4 Gi1/0/24 | VLAN 20 – Faculty | 192.168.20.0/24 |

**Reconfigure the Management VLAN for each switch**

In Lab SU-5a, we shared the Management VLAN with the Student VLAN as our router only had two Ethernet ports. Having a separate Management VLAN would require a router with three ports to provide full connectivity. This approach scales poorly, if we have 50 VLANs, we need a router with 50 ports to connect them together. The **router-on-a-stick** approach overcomes this limitation.

As we can now support more VLANs, we will move the switch management VLAN from **VLAN10** to **VLAN99** following the steps below:

a. Remove **interface VLAN10** IP address configuration on both switches

> S3# configure terminal
>
> S3(config)# interface vlan 10
>
> S3(config-if)# no ip address
>
> S3(config-if)# exit
>
>
> S4# configure terminal
>
> S4(config)# interface vlan 10
>
> S4(config-if)# no ip address
>
> S4(config-if)# exit

b. Remove **interface VLAN10** from both switches using the **no interface vlan** command

> S3(config)# no interface vlan 10
>
> S4(config)# no interface vlan 10

c. Configure **VLAN99** on both switches. The name of this VLAN should be **Management**

> S3(config)# vlan 99
>
> S3(config-vlan)# name Management
>
> S3(config-vlan)# exit
>
>
> S4(config)# vlan 99
>
> S4(config-vlan)# name Management
>
> S4(config-vlan)# exit

d. Configure **interface VLAN99** with the IP address settings specified on the addressing table

> S3(config)# interface vlan 99
>
> S3(config-if)# ip address 192.168.1.11 255.255.255.0
>
> S3(config-if)# no shutdown
>
> S3(config-if)# exit
>
>
> S4(config)# interface vlan 99
>
> S4(config-if)# ip address 192.168.1.12 255.255.255.0
>
> S4(config-if)# no shutdown
>
> S4(config-if)# exit

**Set the default gateway for VLAN 99**

> S3(config)# ip default-gateway 192.168.10.1
>
> S3(config)# exit
>
> S4(config)# ip default-gateway 192.168.10.1
>
> S4(config)# exit

e. Confirm that the two switches can successfully ping each other via the configured trunk link. Do not proceed if this does not function.

> S3# ping 192.168.1.12
>
> S4# ping 192.168.1.11

**Configuration for Router R1:**

The router-on-a-stick approach is a great solution to overcome the limitation of having a router with a limited number of Ethernet ports. By using subinterfaces (Gi0/0/1.99, Gi0/0/1.10, Gi0/0/1.20,..) on a **single physical interface**, you can manage multiple VLANs without needing a separate physical port for each VLAN.

Benefits of **Router-on-a-Stick:**

1. Scalability: You can handle multiple VLANs with just one physical interface on the router, making it easier to scale your network.

2. Cost-Effective: Reduces the need for additional hardware, saving costs on purchasing routers with multiple ports.

3. Simplified Management: Easier to manage and configure as all VLANs are handled through subinterfaces on a single physical interface

**Here is to configure the R1 based on the addressing table:**

1. **Enter global configuration mode:**

   R1# configure terminal

2. **Configure subinterface Gi0/0/1.99 with IP address 192.168.1.1/24:**

   R1(config)# interface GigabitEthernet0/0/1.99

   R1(config-subif)# encapsulation dot1Q 99

   R1(config-subif)# ip address 192.168.1.1 255.255.255.0

   R1(config-subif)# exit

3. **Configure subinterface Gi0/0/1.10 with IP address 192.168.10.1/24:**

   R1(config)# interface GigabitEthernet0/0/1.10

   R1(config-subif)# encapsulation dot1Q 10

   R1(config-subif)# ip address 192.168.10.1 255.255.255.0

   R1(config-subif)# exit

4. **Configure subinterface Gi0/0/1.20 with IP address 192.168.20.1/24:**

   R1(config)# interface GigabitEthernet0/0/1.20

   R1(config-subif)# encapsulation dot1Q 20

   R1(config-subif)# ip address 192.168.20.1 255.255.255.0

   R1(config-subif)# exit

5. **Save the configuration:**

   R1(config)# end

   R1# write memory

**Configure the loopback interface on the router**

The Lo0 interface refers to a **loopback interface** on Router R1. A loopback interface is a virtual interface that is always up and can be used for various purposes, such as router identification, testing, and management. It is not tied to any physical interface and is often used for routing protocols and network management.

   R1(config)# interface Loopback0

R1(config-if)# ip address 209.165.200.255 255.255.255.224

R1(config-if)# exit

R1(config)# end

R1# write memory

On the router we can create a number of virtual interfaces (called **lo0**, **lo1**, **lo2**, etc).Virtual interfaces are used in lab environments to simulate a subnet or a remote device. In this lab it will provide another network address directly reachable by the router for connectivity testing purposes

**Clear device configurations**

1. **Clear the VLAN database:**

   S3# delete vlan.dat

   S3# reload

   S4# delete vlan.dat

   S4# reload

   When prompted to confirm the reload, type yes.

2. **Erase the startup configuration:**

   S3# write erase

   S3# reload

   S4# write erase

   S4# reload

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