# Lab SU-6a – Troubleshooting Inter-VLAN Routing
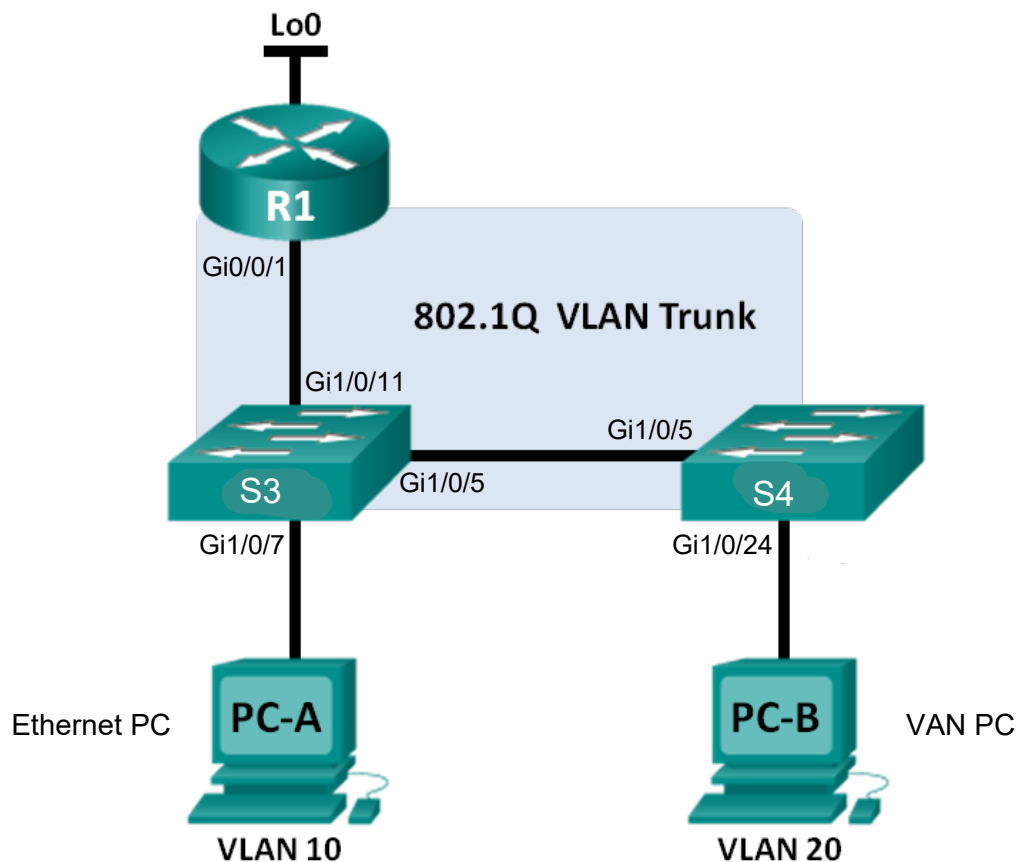
## Topology Diagram



## Switch Port Assignment Specifications

| Ports | Assignment | Network |
|---|---|---|
| S3 G1/0/11 | 802.1Q Trunk | N/A |
| S4 G1/0/5 | 802.1Q Trunk | N/A |
| S3 G1/0/5 | 802.1Q Trunk | N/A |
| S3 Gi1/0/7 | VLAN 10 – R&D | 192.168.10.0/24 |
| S4 Gi1/0/24 | VLAN 20 – Engineering | 192.168.20.0/24 |

## Addressing Table

| Device | Interface | IP Address | Subnet Mask | Default Gateway |
|--------|-----------|------------|-------------|-----------------|
| R1 | Gi0/0/1.1 | 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 1 | 192.168.1.11 | 255.255.255.0 | 192.168.1.1 |
| S4 | VLAN 1 | 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 |

## Objectives

**Part 1: Build the Network and Load Device Configurations**

**Part 2: Troubleshoot the Inter-VLAN Routing Configuration**

**Part 3: Verify VLAN Configuration, Port Assignment, and Trunking**

**Part 4: Test Layer 3 Connectivity**

## Background / Scenario

The network has been designed and configured to support three VLANs. Inter-VLAN routing is provided by an external router using an 802.1Q trunk, also known as router-on-a-stick. Routing to a remote web server, which is simulated by Lo0, is also provided by R1. However, it is not working as designed, and user complaints have not given much insight into the source of the problems.

In this lab, you must first define what is not working as expected, and then analyze the existing configurations to determine and correct the source of the problems. This lab is complete when you can demonstrate IP connectivity between each of the user VLANs and the external web server network, and between the switch management VLAN and the web server network.

**Note**: Make sure that the routers and switches have been erased and have no startup configurations. If you are unsure, contact your instructor.

## Required Resources

- 1 Router
- 2 Switches
- Ethernet cables as shown in the topology
- 2 PCs (when working on-campus)

# Part 1: Build the Network and Load Device Configurations

In Part 1, you will set up the network topology and configure the PC hosts and network devices.

## Step 1: Cable the network as shown in the topology.

Shutdown interface Gi1/0/6 on both switches as we will be using only one switch interconnection in this lab.

Use the **show ip interface brief** command to verify your devices are interconnected as shown in the Topology Diagram.

## Step 2: (On-campus task) Configure PC hosts.

Refer to the Addressing Table for PC host address information.

## Step 3: Load router and switch configurations.

Load the following configurations into the appropriate router or switch. For your convenience, a plain text copy of these configurations is available on Canvas. In order to load configuration, you need to first put the router/switch into configuration (`conf t`) mode and then paste the text into your terminal application (PuTTY or other) window. When complete, you should confirm the commands were executed by running: `sh run`.

**Router R1 Configuration:**

```
hostname R1
!
no ip domain lookup
!
interface loopback0
 ip address 209.165.200.225 255.255.255.224
!
interface GigabitEthernet0/0/1
 no ip address
!
interface GigabitEthernet0/0/1.1
 encapsulation dot1q 11
 ip address 192.168.1.1 255.255.255.0
!
interface GigabitEthernet0/0/1.10
 encapsulation dot1q 10
 ip address 192.168.11.1 255.255.255.0
!
interface GigabitEthernet0/0/1.20
 encapsulation dot1q 20
 ip address 192.168.20.1 255.255.255.0
!
end
```

**Switch S3 Configuration:**

```
hostname S3
!
no ip domain-lookup
!
vlan 10
 name R&D
 exit
!
interface GigabitEthernet1/0/5
 switchport mode access
!
interface GigabitEthernet1/0/11
 switchport mode trunk
!
interface vlan1
 ip address 192.168.1.11 255.255.255.0
!
ip default-gateway 192.168.1.1
!
end
```

**Switch S4 Configuration:**

```
hostname S4
!
no ip domain-lookup
!
vlan 20
 name Engineering
 exit
!
interface GigabitEthernet1/0/5
 switchport mode trunk
!
interface GigabitEthernet1/0/24
 switchport access vlan 10
 switchport mode access
!
interface vlan1
 ip address 192.168.1.12 255.255.255.0
!
ip default-gateway 192.168.1.1
!
end
```

## Part 2: Troubleshoot the Inter-VLAN Routing Configuration

In Part 2, you will verify the inter-VLAN routing configuration.

a. On R1, enter the **show ip route** command to view the routing table.

Which networks are listed? 209.165.200.0

Are there any networks missing in the routing table? If so, which networks?
192.168.1.0, 192.168.1.1,192.168.20.0

What is one possible reason that a route would be missing from the routing table?
gi0/0/1 isnt up

b. On R1, issue the **show ip interface brief** command.

Based on the output, are there any interface issues on the router? If so, what commands would resolve the issues?
192.168.1.0, 192.168.1.1,192.168.20.0 are all adminstratively down

int GigabitEthernet0/0/1

no shutdown

end

c. On R1, re-issue the **show ip route** command.

Verify that all networks are available in the routing table. If not, continue to troubleshoot until all networks are present.

## Part 3: Verify VLAN Configuration, Port Assignment, and Trunking

In Part 3, you will verify that the correct VLANs exist on both switches and that trunking is properly configured.

### Step 1: Verify VLAN configuration and port assignments.

a. On S3, enter the **show vlan brief** command to view the VLAN database.

Which VLANs are listed? Ignore VLANs 1002 to 1005.
vlan 1, vlan 10

Are there any VLANs numbers or names missing in the output? If so, list them.
vlan 20-Engineering

Are the access ports assigned to the correct VLANs? If not, list the missing or incorrect assignments.
No, vlan 10 is missiing gi1/0/7

If required, what commands would resolve the VLAN issues?
int gi1/0/7

switchport access vlan 10

end

b. On S3, re-issue the **show vlan brief** command to verify configuration.

c. On S4, enter the **show vlan brief** command to view the VLAN database.

Which VLANs are listed? Ignore VLANs 1002 to 1005.
vlan 10, vlan 20

Are there any VLANs numbers or names missing in the output? If so, list them.

vlan 10 is missng R&D name

Are the access ports assigned to the correct VLANs? If not, list the missing or incorrect assignments.

no it should have been connected to vlan 20

If required, what commands would resolve the VLAN issues?

int Gi1/0/7

switchport access vlan 20

end

d.   On S4, re-issue the **show vlan brief** command to verify any configuration changes.

**Step 2:   Verify trunking interfaces.**

a.   On S3, enter the **show interface trunk** command to view the trunking interfaces.

Which ports are in trunking mode? gi1/0/11

Are there any ports missing in the output? If so, list them. gi1/0/5

If required, what commands would resolve the port trunking issues?

int gi1/0/5

switchport mode trunk

b.   On S3, re-issue the **show interface trunk** command to verify any configuration changes.

c.   On S4, enter the **show interface trunk** command to view the trunking interfaces.

Which ports are in trunking mode? gi1/0/5

Are there any ports missing in the output? If so, list them. none

If required, what commands would resolve the port trunking issues?

# Part 4:   Test Layer 3 Connectivity

Now that you have corrected multiple configuration issues, let's test connectivity.

a.   Connectivity scenarios:

From PC-A, would it possible to ping the default gateway for VLAN 10? yes

From PC-A, would it possible to ping PC-B? yes

From PC-A, would it possible to ping Lo0? yes

From PC-A, would it possible to ping S3? yes

From PC-A, would it possible to ping S4? yes

b.   Connectivity tests from R1:

Use the extended options of the ping command to test connectivity between the different networks connected to the router.

Ping S3 in VLAN 1 sourcing the ping from the router interface connected to VLAN 10

```
R1# ping 192.168.1.11 source gigabitEthernet 0/0/1.10
```

Ping S3 in VLAN 1 sourcing the ping from the router interface connected to VLAN 20

R1# **ping 192.168.1.11 source gigabitEthernet 0/0/1.20**

Ping S3 in VLAN 1 sourcing the ping from the Loopback0 interface in the router

R1# **ping 192.168.1.11 source Loopback 0**

Ping S4 from interfaces **Gi0/0/1.10**, **Gi0/0/1.20** and **Lo0** on the router using similar commands.

You can also run ping tests in the other direction, i.e. ping all IP addresses configured on active router interfaces and sub-interfaces from the switches.

If any of the above tests are unsuccessful, list some of the issues that could still be preventing successful pings to the switches.

ping lag
_____

_____

c.   On-campus tests:

From PC-A, is it possible to ping the default gateway for VLAN 10? yes_____

From PC-A, is it possible to ping PC-B? yes_____

From PC-A, is it possible to ping Lo0?  yes_____

If the answer is **no** to any of these questions, troubleshoot the configurations and correct the error.

From PC-A, is it possible to ping S3? yes_____

From PC-A, is it possible to ping S4? yes_____

List some of the issues that could still be preventing successful pings to the switches.

network lag
_____

_____

One way to help resolve where the error is occurring is to do a **tracert** from PC-A to S3.

```
C:\Users\User1> tracert 192.168.1.11
Tracing route to 192.168.1.11 over a maximum of 30 hops
  1    <1 ms    <1 ms    <1 ms   192.168.10.1
  2     *        *        *       Request timed out.
  3     *        *        *       Request timed out.
<output omitted>
```

This output shows that the request from PC-A is reaching the default gateway on R1 Gi1/0/1.10, but the packet stops at the router.

d.   You have already verified the routing table entries for R1, now execute the **show run | section interface** command to verify VLAN configuration. List any configuration errors.

gi0/0/1 shutdown
_____

_____

What commands would resolve any issues found?

int gi0/0/1
_____

no shutdown
_____

e.   Connectivity tests from R1:

Repeat the ping tests from R1 to the switches, sourcing the ping from **Gi0/0/1.10**, **Gi0/0/1.20** and **Lo0** interface.

f.  On-campus test:

Verify that pings from PC-A now reach both S3 and S4.

From PC-A, is it possible to ping S3? _yes_____

From PC-A, is it possible to ping S4? _yes_____