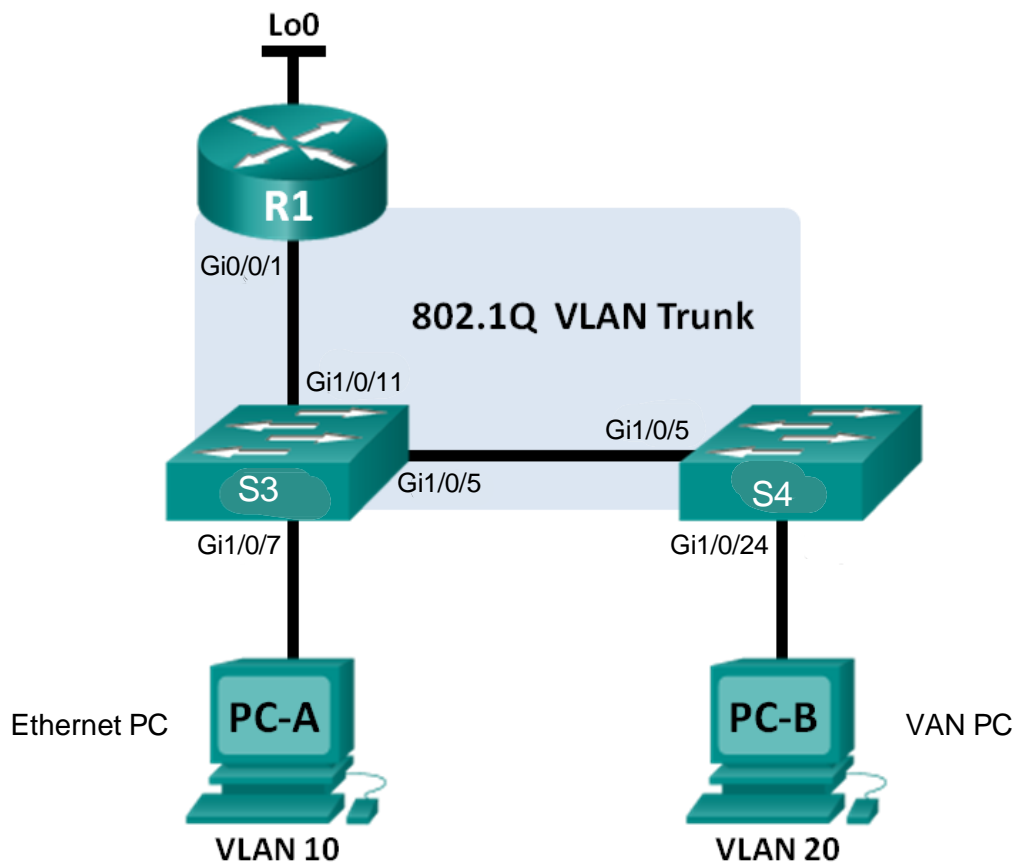


Lab SU-6a – Troubleshooting Inter-VLAN Routing

Topology Diagram



Switch Port Assignment Specifications

Ports	Assignment	Network
S3 Gi1/0/11	802.1Q Trunk	N/A
S4 Gi1/0/5	802.1Q Trunk	N/A
S3 Gi1/0/5	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.

```
Switch> enable
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface Gi1/0/6
Switch(config-if)# shutdown

%LINK-5-CHANGED: Interface GigabitEthernet1/0/6, changed state to administratively down
Switch(config-if)# exit
Switch(config)# exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console

Switch#
```

```
Switch> ena
Switch# config t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface Gi1/0/6
                        ^
% Invalid input detected at '^' marker.

Switch(config)# interface Gi1/0/6
Switch(config-if)# shutdown

%LINK-5-CHANGED: Interface GigabitEthernet1/0/6, changed state to administratively down
Switch(config-if)# exit
Switch(config)# exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console

Switch#
```

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

```
Switch# show ip interface brief
```

Interface	IP-Address	OK?	Method	Status	Protocol
GigabitEthernet1/0/1	unassigned	YES	unset	down	down
GigabitEthernet1/0/2	unassigned	YES	unset	down	down
GigabitEthernet1/0/3	unassigned	YES	unset	down	down
GigabitEthernet1/0/4	unassigned	YES	unset	down	down
GigabitEthernet1/0/5	unassigned	YES	unset	up	up
GigabitEthernet1/0/6	unassigned	YES	unset	administratively down	down
GigabitEthernet1/0/7	unassigned	YES	unset	down	down
GigabitEthernet1/0/8	unassigned	YES	unset	down	down
GigabitEthernet1/0/9	unassigned	YES	unset	down	down
GigabitEthernet1/0/10	unassigned	YES	unset	down	down
GigabitEthernet1/0/11	unassigned	YES	unset	down	down
GigabitEthernet1/0/12	unassigned	YES	unset	down	down
GigabitEthernet1/0/13	unassigned	YES	unset	down	down
GigabitEthernet1/0/14	unassigned	YES	unset	down	down
GigabitEthernet1/0/15	unassigned	YES	unset	down	down
GigabitEthernet1/0/16	unassigned	YES	unset	down	down
GigabitEthernet1/0/17	unassigned	YES	unset	down	down
GigabitEthernet1/0/18	unassigned	YES	unset	down	down
GigabitEthernet1/0/19	unassigned	YES	unset	down	down
GigabitEthernet1/0/20	unassigned	YES	unset	down	down
GigabitEthernet1/0/21	unassigned	YES	unset	down	down
GigabitEthernet1/0/22	unassigned	YES	unset	down	down
GigabitEthernet1/0/23	unassigned	YES	unset	down	down
GigabitEthernet1/0/24	unassigned	YES	unset	up	up
GigabitEthernet1/1/1	unassigned	YES	unset	down	down
GigabitEthernet1/1/2	unassigned	YES	unset	down	down
GigabitEthernet1/1/3	unassigned	YES	unset	down	down
GigabitEthernet1/1/4	unassigned	YES	unset	down	down
Vlan1	unassigned	YES	unset	administratively down	down

```
Switch#
```

```
Switch# show ip interface brief
Interface                IP-Address    OK? Method Status        Protocol
GigabitEthernet1/0/1    unassigned    YES unset  down          down
GigabitEthernet1/0/2    unassigned    YES unset  down          down
GigabitEthernet1/0/3    unassigned    YES unset  down          down
GigabitEthernet1/0/4    unassigned    YES unset  down          down
GigabitEthernet1/0/5    unassigned    YES unset  up            up
GigabitEthernet1/0/6    unassigned    YES unset  administratively down down
GigabitEthernet1/0/7    unassigned    YES unset  up            up
GigabitEthernet1/0/8    unassigned    YES unset  down          down
GigabitEthernet1/0/9    unassigned    YES unset  down          down
GigabitEthernet1/0/10   unassigned    YES unset  down          down
GigabitEthernet1/0/11   unassigned    YES unset  down          down
GigabitEthernet1/0/12   unassigned    YES unset  down          down
GigabitEthernet1/0/13   unassigned    YES unset  down          down
GigabitEthernet1/0/14   unassigned    YES unset  down          down
GigabitEthernet1/0/15   unassigned    YES unset  down          down
GigabitEthernet1/0/16   unassigned    YES unset  down          down
GigabitEthernet1/0/17   unassigned    YES unset  down          down
GigabitEthernet1/0/18   unassigned    YES unset  down          down
GigabitEthernet1/0/19   unassigned    YES unset  down          down
GigabitEthernet1/0/20   unassigned    YES unset  down          down
GigabitEthernet1/0/21   unassigned    YES unset  down          down
GigabitEthernet1/0/22   unassigned    YES unset  down          down
GigabitEthernet1/0/23   unassigned    YES unset  down          down
GigabitEthernet1/0/24   unassigned    YES unset  down          down
GigabitEthernet1/1/1    unassigned    YES unset  down          down
GigabitEthernet1/1/2    unassigned    YES unset  down          down
GigabitEthernet1/1/3    unassigned    YES unset  down          down
GigabitEthernet1/1/4    unassigned    YES unset  down          down
Vlan1                    unassigned    YES unset  administratively down down
Switch#
```

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? => Networks are listed include 209.165.200.0/24, 209.165.200.224/27, and 209.165.200.225/332

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

=> Networks missing in the routing table are 192.168.1.1, 192.168.11.1, and 192.168.20.1

What is one possible reason that a route would be missing from the routing table?

=> One possible reason that a route would be missing from the routing table is GigabitEthernet0/0/1.

- 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?

=> Based on the output, the interface GigabitEthernet0/0/1 is administratively down

=> Solution:

R1# config t

R1 (config)# interface Gi0/0/1

R1 (config-if)# no shutdown

- 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.

=> VLANs are listed including VLAN 1 and VLAN 10

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

=> Yes, there is a VLAN missing in the output which is VLAN 20 – Engineering.

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

=> No, the access ports are not assigned to the correct VLANs.

=> Gi1/0/7 is the access port for VLAN 10 and Gi1/0/24 is the access port for VLAN 20

If required, what commands would resolve the VLAN issues?

=> Interface Gi1/0/7

=> Switchport mode access

=> Switchport access vlan 10

=> Exit

=> Interface Gi1/0/24

=> Switchport mode access

⇒ Switchport access vlan 20

- 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.

⇒ VLANs listed are VLAN 1, VLAN 10, and VLAN 20.

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

⇒ Yes, VLAN 10 is missing R&D name

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

⇒ No, Switch3 must have VLAN 20 and assign port to VLAN 20

If required, what commands would resolve the VLAN issues?

⇒ interface Gi1/0/7

=> Switchport mode access

=> Switchport access vlan 20

- 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? => Port for trunking mode is Gi1/0/11

Are there any ports missing in the output? If so, list them. => Yes, the missing port is Gi1/0/5

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

⇒ Config t

⇒ Interface 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? => The port in the trunking mode is Gi1/0/5

Are there any ports missing in the output? If so, list them. => No

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

⇒ No

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?

⇒ Y e s

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.

⇒ The issue that could still be preventing successful pings to the switches is ping lag

c. On-campus tests:

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

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

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

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? _____

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

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

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.

⇒ Interface Gi0/0/1 is shutdown

What commands would resolve any issues found?

⇒ config t

⇒ Interface 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?

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