Lab - Troubleshoot Inter-VLAN Routing (Instructor Version)

**Instructor Note**: Red font color or gray highlights indicate text that appears in the instructor copy only.

# Topology



# Addressing Table

| Device | Interface | IP Address | Subnet Mask | Default Gateway |
| --- | --- | --- | --- | --- |
| R1 | G0/0/1.3 | 10.3.0.1 | 255.255.255.0 | N/A |
| R1 | G0/0/1.4 | 10.4.0.1 | 255.255.255.0 | N/A |
| R1 | G0/0/1.13 | 10.13.0.1 | 255.255.255.0 | N/A |
| S1 | VLAN 3 | 10.3.0.11 | 255.255.255.0 | 10.3.0.1 |
| S2 | VLAN 3 | 10.3.0.12 | 255.255.255.0 | 10.3.0.1 |
| PC-A | NIC | 10.4.0.50 | 255.255.255.0 | 10.4.0.1 |
| PC-B | NIC | 10.13.0.50 | 255.255.255.0 | 10.13.0.1 |

# VLAN Table

|  |  |  |
| --- | --- | --- |
| VLAN | Name | Interface Assigned |
| 3 | Management | S1: VLAN 3  S2: VLAN 3 |
| 4 | Operations | S1: F0/6 |
| 7 | ParkingLot | S1: F0/2-4, F0/7-24, G0/1-2  S2: F0/2-17, F0/19-24, G0/1-2 |
| 8 | Native | N/A |
| 13 | Maintenance | S2: F0/18 |

# Objectives

Part 1: Evaluate Network Operation

Part 2: Gather information, create an action plan, and implement corrections

# Background / Scenario

**Instructor Note**: Preconfiguration scripts for all the devices are documented below. Cut and paste or otherwise use these to pre-configure the equipment for the student.

**Router R1**

enable

configure terminal

hostname R1

no ip domain lookup

enable secret class

line con 0

password cisco

login

logging synch

line vty 0 4

password cisco

login

service password-encryption

banner motd $ Authorized Users Only! $

interface g0/0/1

no shut

interface g0/0/1.3

encap dot1q 3

ip add 10.3.0.1 255.255.255.0

interface g0/0/1.4

encap dot1q 4 native

ip address 10.4.0.1 255.255.255.0

interface g0/0/1.8

! encap dot1q 8 native

encap dot1q 8

interface g0/0/1.13

encap dot1q 13

ip address 10.13.0.1 255.255.255.0

end

**Switch S1**

enable

config terminal

hostname S1

no ip domain-lookup

enable secret class

line con 0

password cisco

login

logging synch

line vty 0 15

password cisco

login

service password-encryption

banner motd $ Authorized Users Only! $

vlan 3

name Management

vlan 4

name Operations

vlan 7

name ParkingLot

vlan 8

name Native

!vlan 13

! name Maintenance

interface vlan 3

ip address 10.3.0.11 255.255.255.0

no shut

exit

ip default-gateway 10.3.0.1

interface range f0/2-4, f0/7-24, G0/1-2

switchport mode access

switchport access vlan 7

shutdown

interface f0/1

switchport mode trunk

! switchport trunk native vlan 8

! switchport trunk allowed vlan add 3

switchport trunk allowed vlan 4,8,13

no shutdown

interface f0/6

switchport mode access

switchport access vlan 4

no shutdown

interface f0/5

switchport mode access

! default interface fa0/5

! switchport mode trunk

switchport trunk native vlan 8

! switchport trunk allowed vlan 3,4,8,13

switchport access vlan 3

no shut

end

**Switch S2**

enable

config terminal

hostname S2

no ip domain-lookup

enable secret class

line con 0

password cisco

login

logging synch

line vty 0 15

password cisco

login

service password-encryption

banner motd $ Authorized Users Only! $

vlan 3

name Management

vlan 4

name Operations

vlan 7

name ParkingLot

vlan 8

name Native

vlan 13

name Maintenance

interface vlan 3

ip address 10.3.0.12 255.255.255.0

no shut

interface range f0/2-17, f0/19-24, G0/1-2

switchport mode access

switchport access vlan 7

shutdown

interface f0/18

switchport mode access

switchport access vlan 13

interface f0/1

switchport mode trunk

switchport trunk native vlan 8

switchport trunk allowed vlan 4,8

! switchport trunk allowed vlan add 3,13

ip default-gateway 10.3.0.1

end

Your instructor has preconfigured all the network equipment and has included intentional errors that are keeping the inter-VLAN routing from working. Your task is to evaluate the network and identify and correct the configuration errors to restore full connectivity. You may find errors with the configurations which are not directly related to inter-VLAN routing that impact the ability of the network devices to perform this function.

**Note:** The design approach used in this lab is to assess your ability to configure and troubleshoot inter-VLAN routing only. This design may not reflect networking best practices.

**Note**: The router used with CCNA hands-on labs it the Cisco 4221 with Cisco IOS XE Release 16.9.4 (universalk9 image). The switches used in the labs are Cisco Catalyst 2960s with Cisco IOS Release 15.2(2) (lanbasek9 image). Other routers, switches, and Cisco IOS versions can be used. Depending on the model and Cisco IOS version, the commands available and the output produced might vary from what is shown in the labs. Refer to the Router Interface Summary Table at the end of the lab for the correct interface identifiers.

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

**Instructor Note**: Refer to the Instructor Lab Manual for the procedures to initialize and reload devices

# Required Resources

* 1 Router (Cisco 4221 with Cisco IOS XE Release 16.9.4 universal image or comparable)
* 2 Switches (Cisco 2960 with Cisco IOS Release 15.2(2) lanbasek9 image or comparable)
* 2 PCs (Windows with a terminal emulation program, such as Tera Term)
* Console cables to configure the Cisco IOS devices via the console ports
* Ethernet cables as shown in the topology

# Instructions

## Evaluate Network Operation.

**Note**: You may need to disable the Windows Firewall on PC–A and PC–B.

**Requirement**:

* No VLAN 7 trunk traffic because there is no devices in VLAN 7.
* VLAN 8 is the native VLAN.
* All trunks are static.
* End to end connectivity

Use Ping to test the following criteria and record the results in the table below.

| From | To | Ping Results |
| --- | --- | --- |
| R1 | S1 VLAN 3 (10.3.0.11) | Unsuccessful |
| R1 | S2 VLAN 3 (10.3.0.12) | Unsuccessful |
| R1 | PC-A (10.4.0.50) | Unsuccessful |
| R1 | PC-B (10.13.0.50) | Unsuccessful |
| S1 | S2 VLAN 3 (10.3.0.12) | Unsuccessful |
| S1 | PC-A (10.4.0.50) | Unsuccessful |
| S1 | PC-B (10.13.0.50) | Unsuccessful |
| S2 | PC-A (10.4.0.50) | Unsuccessful |
| S2 | PC-B (10.13.0.50) | Unsuccessful |

## Gather information, create an action plan, and implement corrections.

* + - 1. For each criterion that is not met, gather information by examining the running configuration and routing tables and develop a hypothesis for what is causing the malfunction.
      2. Create an action plan that you think will fix the issue. Develop a list of all the commands you intend to issue to fix the issue, and a list of all the commands you need to revert the configuration, should your action plan fail to correct the issue.

**Hint**: If you need to reset a switchport to default configuration, use the command **default interface** *interface name*.

As an example for F0/10:

S1(config)# **default interface f0/10**

* + - 1. Execute your action plans one at a time for each criterion that fails and record the fix actions.

Type your answers here.

**Router R1:**

configure terminal

interface g0/0/1.8

encapsulation dot1q 8 native

exit

**Switch S1:**

configure terminal

default interface f0/5

interface f0/5

switchport mode trunk

switchport trunk native vlan 8

switchport trunk allowed vlan 3,4,8,13

interface f0/1

switchport trunk allowed vlan add 3,13

switchport trunk native vlan 8

vlan 13

name Maintenance

exit

**Switch S2:**

configure terminal

interface f0/1

switchport trunk allowed vlan add 3,13

exit

End of document

# Device Configuration - Final

# Router R1

R1# **show run**

Building configuration...

Current configuration : 1612 bytes

!

version 16.9

service timestamps debug datetime msec

service timestamps log datetime msec

service password-encryption

platform qfp utilization monitor load 80

no platform punt-keepalive disable-kernel-core

!

hostname R1

!

boot-start-marker

boot-end-marker

!

!

enable secret class

!

no aaa new-model

!

no ip domain lookup

!

login on-success log

!

subscriber templating

!

multilink bundle-name authenticated

!

no license smart enable

diagnostic bootup level minimal

!

spanning-tree extend system-id

!

redundancy

mode none

!

interface GigabitEthernet0/0/0

no ip address

negotiation auto

!

interface GigabitEthernet0/0/1

no ip address

negotiation auto

!

interface GigabitEthernet0/0/1.3

encapsulation dot1Q 3

ip address 10.3.0.1 255.255.255.0

!

interface GigabitEthernet0/0/1.4

encapsulation dot1Q 4

ip address 10.4.0.1 255.255.255.0

!

interface GigabitEthernet0/0/1.8

encapsulation dot1Q 8 native

!

interface GigabitEthernet0/0/1.13

encapsulation dot1Q 13

ip address 10.13.0.1 255.255.255.0

!

interface Serial0/1/0

no ip address

!

interface Serial0/1/1

no ip address

!

ip forward-protocol nd

no ip http server

ip http secure-server

!

control-plane

!

banner motd ^C Authorized Users Only! ^C

!

line con 0

password cisco

logging synchronous

login

transport input none

stopbits 1

line aux 0

stopbits 1

line vty 0 4

password cisco

login

!

end

# Switch S1

S1# **show run**

Building configuration...

Current configuration : 3240 bytes

!

version 15.2

no service pad

service timestamps debug datetime msec

service timestamps log datetime msec

service password-encryption

!

hostname S1

!

boot-start-marker

boot-end-marker

!

enable secret class

!

no aaa new-model

system mtu routing 1500

!

no ip domain-lookup

!

spanning-tree mode pvst

spanning-tree extend system-id

!

vlan internal allocation policy ascending

!

interface FastEthernet0/1

switchport trunk native vlan 8

switchport trunk allowed vlan 3,4,8,13

switchport mode trunk

!

interface FastEthernet0/2

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/3

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/4

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/5

switchport trunk native vlan 8

switchport trunk allowed vlan 3,4,8,13

switchport mode trunk

!

interface FastEthernet0/6

switchport access vlan 4

switchport mode access

!

interface FastEthernet0/7

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/8

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/9

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/10

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/11

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/12

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/13

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/14

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/15

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/16

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/17

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/18

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/19

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/20

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/21

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/22

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/23

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/24

switchport access vlan 7

switchport mode access

shutdown

!

interface GigabitEthernet0/1

switchport access vlan 7

switchport mode access

shutdown

!

interface GigabitEthernet0/2

switchport access vlan 7

switchport mode access

shutdown

!

interface Vlan1

no ip address

!

interface Vlan3

ip address 10.3.0.11 255.255.255.0

!

ip default-gateway 10.3.0.1

ip http server

ip http secure-server

!

banner motd ^C Authorized Users Only! ^C

!

line con 0

password cisco

logging synchronous

login

line vty 0 4

password cisco

login

line vty 5 15

password cisco

login

!

vlan 3

name Management

vlan 4

name Operations

vlan 7

name ParkingLot

vlan 8

name Native

vlan 13

name Maintenance

end

# Switch S2

Building configuration...

Current configuration : 3180 bytes

!

version 15.2

no service pad

service timestamps debug datetime msec

service timestamps log datetime msec

service password-encryption

!

hostname S2

!

boot-start-marker

boot-end-marker

!

enable secret class

!

no aaa new-model

system mtu routing 1500

!

!

no ip domain-lookup

!

spanning-tree mode pvst

spanning-tree extend system-id

!

vlan internal allocation policy ascending

!

interface FastEthernet0/1

switchport trunk native vlan 8

switchport trunk allowed vlan 3,4,8,13

switchport mode trunk

!

interface FastEthernet0/2

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/3

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/4

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/5

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/6

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/7

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/8

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/9

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/10

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/11

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/12

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/13

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/14

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/15

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/16

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/17

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/18

switchport access vlan 3

switchport mode access

!

interface FastEthernet0/19

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/20

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/21

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/22

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/23

switchport access vlan 7

switchport mode access

shutdown

!

interface FastEthernet0/24

switchport access vlan 7

switchport mode access

shutdown

!

interface GigabitEthernet0/1

switchport access vlan 7

switchport mode access

shutdown

!

interface GigabitEthernet0/2

switchport access vlan 7

switchport mode access

shutdown

!

interface Vlan1

no ip address

!

interface Vlan3

ip address 10.3.0.12 255.255.255.0

!

ip default-gateway 10.3.0.1

ip http server

ip http secure-server

!

banner motd ^C Authorized Users Only! ^C

!

line con 0

password cisco

logging synchronous

login

line vty 0 4

password cisco

login

line vty 5 15

password cisco

login

!

vlan 3

name Management

vlan 4

name Operations

vlan 7

name ParkingLot

vlan 8

name Native

vlan 13

name Maintenance

end