

CCNA SRWE

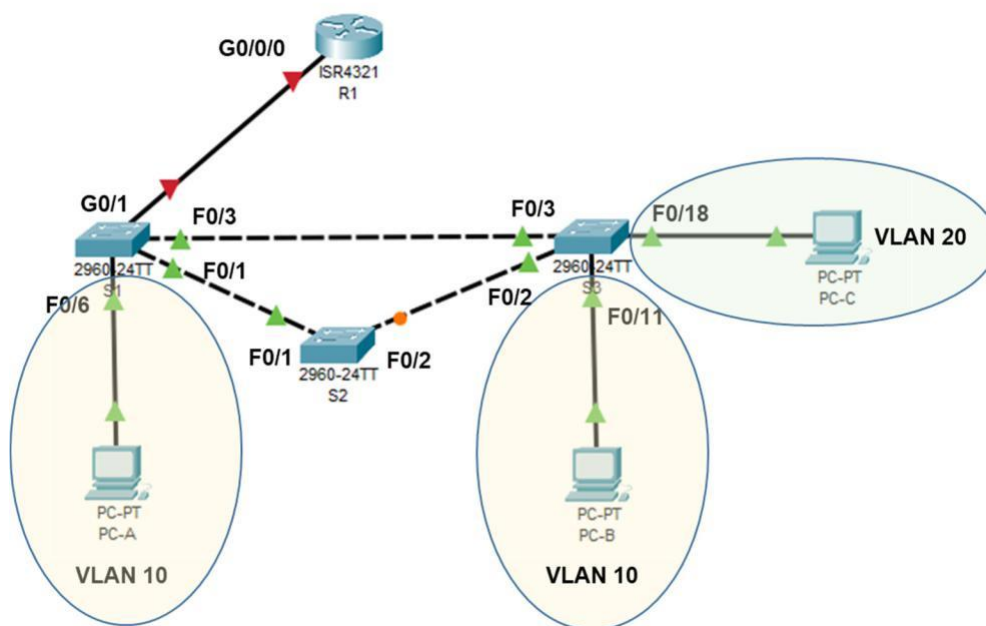
Lab 1

Instruction

Deadline: 29.1.2021

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## VLANs and 802.1Q Trunks Inter-VLAN-Routing



NP Course NP Chapter 8

SRWE Modules 1 - 4:

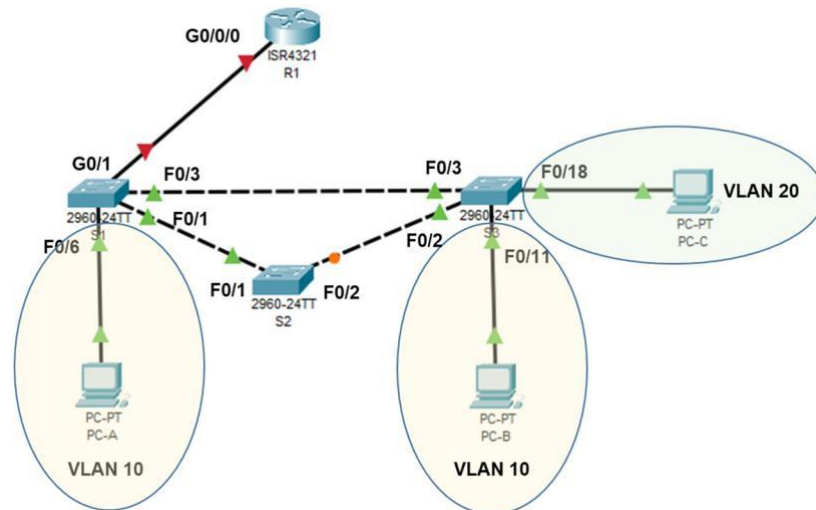
Switching Concepts, VLANs, and InterVLAN Routing Exam

### Answers and Solutions

Write your answers in **red color**. You may use the comment capabilities of the free Adobe reader.

## Task 1 – VLAN Database and Switch Access Ports

### Packet Tracer Topology





### Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	G0/0/0	192.168.99.1	255.255.255.0	N/A
	G0/0/0.10	192.168.10.1	255.255.255.0	N/A
	G0/0/0.20	192.168.20.1	255.255.255.0	N/A
S1	VLAN 99	192.168.99.11	255.255.255.0	192.168.99.1
S2	VLAN 99	192.168.99.12	255.255.255.0	192.168.99.1
S3	VLAN 99	192.168.99.13	255.255.255.0	192.168.99.1
PC-A	NIC	192.168.10.10	255.255.255.0	192.168.10.1
PC-B	NIC	192.168.10.11	255.255.255.0	192.168.10.1
PC-C	NIC	192.168.20.20	255.255.255.0	192.168.20.1

### Part 1: Set Up Network Topology and Initialize Devices

#### Step 1: Build topology in Packet Tracer.

**COVID-19 Version:** Build topology in **Packet Tracer**. Use and re-label the following devices:

- Build the network with ISR4321 router, 2960 switches, and PCs in Packet Tracer. Rename the devices.
- Cable the network according to the topology with straight-through TP cables  and cross-over cables .
- We will use the CLI window of the network devices directly for configurations.
- Configure IP address, net mask and default gateway for PC-A, PC-B, and PC-C.

**Step 2: Configure some basic settings for switches S1 and S2.**

Double-click network devices and use the CLI window. When network device is booting up, skip any automatic configuration.

For Switch S1, S2, and S3, perform the following tasks:

- a. Disable DNS lookup.
- b. Configure device name
- c. Assign **class** as the privileged EXEC encrypted password.
- a) Assign **cisco** as the console password, enable login, configure **logging synchronous** to prevent console messages from interrupting.
- d. Configure password encryption
- e. Save your running configuration in the startup configuration.

**Step 3: Verify the S1 switch management interface (Switched Virtual Interface (SVI))**

- a. **Switch Management Interface:** Cisco switches can be configured with a special IP address known as **Switched Virtual Interface (SVI)**. The SVI or management address can be used for remote access to the switch to display or configure settings. If the VLAN 1 SVI is assigned an IP address, by default, all ports in VLAN 1 have access to the SVI management IP address. The SVI may be moved to any VLAN number.

Only the switch's **Switched Virtual Interface (SVI)** may be accessed by IP connectivity. The SVI will need a MAC address in the local subnet and broadcast domain.

Record the MAC address of the **SVI** for VLAN 1 (**show interface vlan1**):

00d0.bce9.6deb

Examine the IP properties of the SVI VLAN 1 (**show ip interface vlan1**), and record the status of line and protocol:

line protocol is up

- b. Examine the default properties of the FastEthernet interface (**show interface f0/6**) used by PC-A. Did the switch need the IOS command **no shutdown** for switched interfaces to be up? **no**

Record speed and duplex setting of the interface: **Full-duplex, 100Mb/s**

- c. Examine the initial VLAN settings of the switch (IOS command **show vlan brief**). What is the default name of VLAN 1? **default**

Which switch ports are in VLAN 1?

Fa0/1, Fa0/2, Fa0/3, Fa0/4, Fa0/5, Fa0/6, Fa0/7, Fa0/8, Fa0/9, Fa0/10, Fa0/11, Fa0/12, Fa0/13, Fa0/14, Fa0/15, Fa0/16, Fa0/17, Fa0/18, Fa0/19, Fa0/20, Fa0/21, Fa0/22, Fa0/23, Fa0/24, Gig0/1, Gig0/2



## Part 2: Create VLANs and Assign Switch Ports

### VLAN Assignment Specifications

Switch	Assignment
S1	VLAN 10, VLAN 20, VLAN 99
S2	VLAN 10, VLAN 20, VLAN 99
S3	VLAN 10, VLAN 20, VLAN 99

VLAN	Name
VLAN 10	Student
VLAN 20	Faculty
VLAN 99	Management

#### Step 1: Create VLANs on the switches

- Create all VLANs 10, 20, and 99 on S1 according to the VLAN assignment list. Example configuration for VLAN10:  

```
S1(config)# vlan 10
S1(config-vlan)# name Student
. . .
```
- List your VLAN database on **S1 (show vlan brief)**.  
Which VLANs are available on switch S1?  
  
**Vlan1,Vlan10,vlan20,vlan99,vlan1002,vlan1003,**  
**vlan1004,vlan1005**
- Create all VLANs (**10,20,99**) on all switches **S2** and **S3** and ensure, all VLANs are created.

#### Step 2: Assign VLANs to Switch Access Ports

- To assign a switch port to a VLAN, the following example commands are required:  

```
S1(config)# int f0/6
S1(config-if)# switchport mode access
S1(config-if)# switchport access vlan
10
. . .
```
- Assign the **Student VLAN 10** to the correct interfaces on **S1 and S3**.
- Assign the **Faculty VLAN 20** to the correct interface on **S3**.
- Generate a switch IP address for the **Management VLAN 99** (virtual interface VLAN 99) on all switches S1, S2, and S3 according to the Addressing Table  
**Note:** Notice that the **VLAN 99 protocol** is in the down state even though you entered the **no shutdown** command. The interface is down because no switch ports are assigned to VLAN 99.
- Check your interfaces (IOS command **show ip interface brief**) on switch **S3**.  
Record the status of VLAN 99:**up**
- Configure the **default gateway** for each switch S1, S2, and S3 according to the Addressing Table.

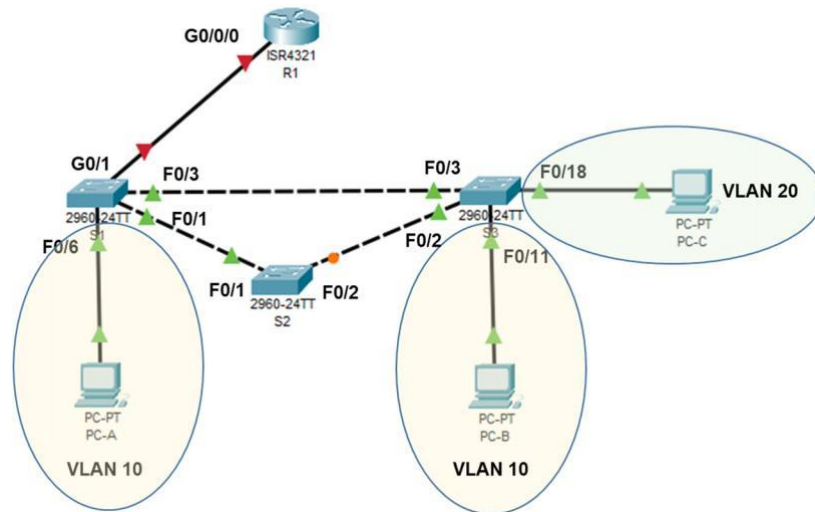
### Step 3: Test Connectivity

a. From switch S1 can you ping switch S3 (y/n)? **yes**

b. From switch S1 can you ping switch S2 (y/n)? **yes**

## Task 2 – IEEE 802.1Q Trunks

### Packet Tracer Topology



Continue with the topology and Addressing Table of Task 1.

### Part 1: Configure 802.1Q Trunks

#### Step 1: 802.1Q Trunks between switches S1, S2, and S3

The **Dynamic Trunking Protocol (DTP)** is active by default on a 2960 switch. DTP might be a security leak and should not be used. For that reason, the **switchport mode trunk** command is used to manually configure a port as a trunk with encapsulation 802.1q.

- For switch S1, change the switch port mode on interface f0/3 to force trunking on both switches S1, and S3.
- Issue the **show interfaces trunk** command to view the trunk mode on S3.

Which Encapsulation is used on the trunk links? **802.1q**

Which VLANs are allowed on the trunk? **1-1005**

What is the native VLAN on your trunk? **1**

**Note:** By default, all VLANs known in a switch are allowed on a trunk.

#### Step 2: Test Connectivity again

- From switch S1 can you ping switch S3 (y/n)? **no**
- Explain, why this does not work:

**Because ports are disable**





**Step 3: 802.1Q Trunks between switches S1, S2, and S3**

Cisco uses a proprietary protocol known as the **Dynamic Trunking Protocol (DTP)** on its switches. Some ports automatically negotiate to trunking.

A good practice is to configure either access ports or trunk ports, to change the native VLAN and to switch- off all unused ports.

We assign the native VLAN to VLAN 99, which will be transmitted over trunks by un-tagged Ethernet frames.

- a. For switch S1, change the switch port mode on interface f0/1 and f0/3 to enforce trunking.

Example code:

```
S1 (config) # interface f0/1
S1 (config-if) # switchport mode trunk
S1 (config-if) # switchport trunk native vlan 99
S1 (config-if) # switchport trunk allowed vlan
10,20,99
```

Perform these steps on **both switches S1 and S2**.

- b. Issue the **show interfaces trunk** command to view the trunk mode on S2.

Which Encapsulation is used on the trunk link S1-S2? **802.1q**

Which VLANs are allowed on the trunk S1-S2? **Vlan 10,20,99**

What is the native VLAN on your trunk S1-S2? **vlan 99**

- c. Change the switch port mode on all other trunk ports as well (switch S1 port F0/3, switch S2 F0/2, and switch S3 port F0/2 and F0/3) to enforce trunking.

**Step 4: Test Connectivity**

- a. Check connectivity (ping) from S3 IP address to S2 IP address. Connectivity (y/n)? **yes**
- b. Check connectivity (ping) from S3 IP address to S1 IP address. Connectivity (y/n)? **yes**
- c. Check connectivity (ping) from PC-A to PC-B, both connected to VLAN 10. Connectivity (y/n)? **Note: Remove errors, if a. – c. are not working. yes**
- d. Check connectivity (ping) from PC-A (VLAN 10) to PC-C (VLAN 20), Connectivity (y/n)? **no**

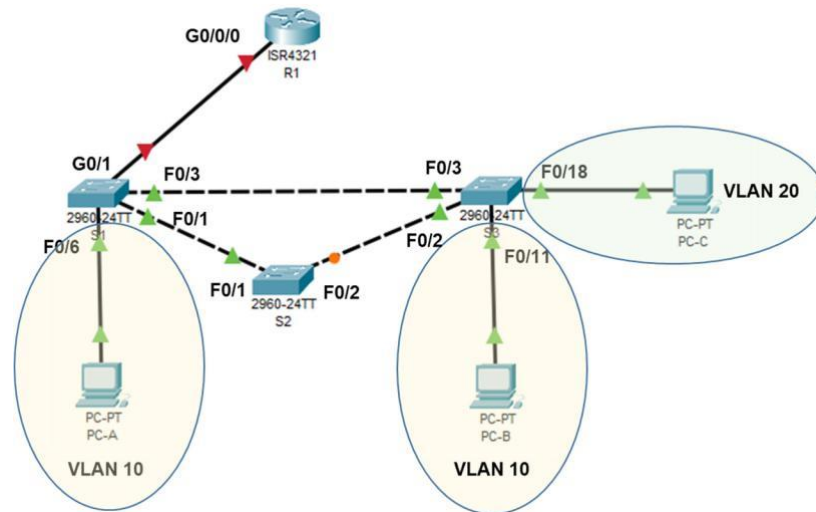
Explain, why PC-A cannot ping PC-C.

**The host is not reachable**



## Task 3 – Inter-VLAN-Routing

### Packet Tracer Topology



We continue with the Topology and Addressing Table of Task 1.

### Part 2: Basic Configuration of Router R1

#### Step 1: Configure basic settings of Router R1.

- Disable DNS lookup.
- Configure the device name as shown in the topology.
- Assign **class** as the privileged EXEC encrypted password.
- Assign **cisco** as the console password, enable login
- Configure **logging synchronous** to prevent console messages from interrupting.
- Configure password encryption
- Copy the running configuration to the startup configuration.

### Part 3: Configure 802.1Q Trunk-Based Inter-VLAN Routing

#### Step 1: 802.1Q Trunk from Switch S1 to Router R1

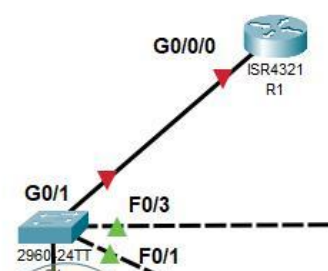
Interface G0/1 of switch S1 will be used as trunk port to router R1, with VLAN 99 as the native VLAN.

- Create a trunk on interface G0/1 of switch S1 with native VLAN 99, and allow all VLANs 10,20, and 99 to be transmitted over the trunk.
- Issue the **show interfaces trunk** command to view the trunk mode on S1.

Which Encapsulation is used on the trunk link at interface G0/1?

802.1q

Which VLANs are allowed on the trunk? 10,20,99



What is the native VLAN on your trunk? **Vlan 99**

**Step 2: Router Interfaces for all VLANs.**

- Configure the native VLAN 99 gateway IP address, which will be assigned to the interface G0/0/0 directly.
- For each non-native VLAN, create a sub-interface on R1 G0/0/0.ID, using the VLAN number as the sub-interface ID.

Example code:

```
R1(config)# interface g0/0/0.10
R1(config-subif)# encapsulation dot1Q 10
R1(config-subif)# ip address 192.168.10.1
255.255.255.0
. . .
```

- Finally, switch on the physical interface G0/0/0.

**Step 3: Display Device Information**

Use the **show ip route** command on the router to answer the following questions.

- Record the subnets, which are routed at R1.

```
Physical  Config  CLI  Attributes
IOS Command Line Interface

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0.10, changed state to up
R1(config-subif)#encapsulation dot1Q 10
R1(config-subif)#ip address 192.168.10.1 255.255.255.0
R1(config-subif)#exit
R1(config)#
R1(config)#end
R1#
%SYS-5-CONFIG_I: Configured from console by console
R1#
R1#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

    192.168.10.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.10.0/24 is directly connected, GigabitEthernet0/0/0.10
L       192.168.10.1/32 is directly connected, GigabitEthernet0/0/0.10
    192.168.99.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.99.0/24 is directly connected, GigabitEthernet0/0/0
L       192.168.99.1/32 is directly connected, GigabitEthernet0/0/0

R1#show route static
^
% Invalid input detected at '^' marker.

R1#
```

- What code is used in the routing table to indicate a directly connected network?  
**C**
- How many networks are directly connected to router R1? **2**
- How many static routing paths are assigned by the administrator? **No static route**

**Step 4: Test Connectivity between VLANs**

- a. Can switch S1 ping its default gateway? **yes**
- b. Can switch S2 ping its default gateway? **yes**
- c. Can switch S3 ping its default gateway? **yes**
- d. Can PC-A ping its default gateway? **yes**
- e. Can PC-A ping switch S3? **yes**
- f. Can PC-A ping PC-C? **yes**

**Note:** Remove errors, if a. – f. are not working.

## Reflection

- a. What are the advantages of trunk-based or router-on-a-stick inter-VLAN routing?

router on a stick allows for one interface to route to other multiple vlans unlike the legacy inter vlan method and this requires one port per vlan

- a. Which advantages are given by VLANs for Broadcast Domains

reduces traffic

- b. Which security advances do you gain by using VLANs?

Separate various network segment

## Checkout

When you successfully finished this Lab, record your solution.

1. Write your answers in red color into this PDF-File and save it as **SRWE-Lab1-Result.pdf**.
2. Save your final Packet Tracer file **SRWE-Lab1-PT.pkt**
3. Record the running configuration of switch S1 and router R1 (**show run**) in one text file **SRWE-Lab1-S1-R1.txt**
4. Upload these 3 files as requested in 1.-3. in Ilias. **Do NOT upload a ZIP-file or any other format.**

