

Experiment No: 8

Experiment Name: Creating and Testing VLANs (Virtual LANs) and Inter-VLANs in a Switched Network.

Objectives:

- To understand the concept and purpose of **Virtual LANs (VLANs)** in network segmentation.
- To learn how to **create, configure, and assign VLANs** on network switches.
- To demonstrate how VLANs help in **improving network performance and security** by isolating broadcast domains.
- To configure **Inter-VLAN communication** using a router or Layer-3 switch, enabling communication between different VLANs.
- To test and verify **connectivity within the same VLAN** and **across different VLANs** using network commands (e.g., ping, traceroute).
- To analyze and verify the impact of VLAN and Inter-VLAN configuration on **traffic flow and network management**.

1. What is VLAN?

- Virtual Local Area Network (logical grouping of devices)
- Segments a switch into multiple broadcast domains
- Provides security & reduces network congestion

2. VLAN Creation Steps

- Enter switch configuration mode
- Create VLANs (`vlan 10, vlan 20, etc.`)
- Assign ports to VLANs (`switchport access vlan 10`)
- Verify using `show vlan brief`

3. Inter-VLAN Communication

- Needed for communication between different VLANs
- Achieved using:
 - **Router-on-a-stick** (Router + sub-interfaces)
 - **Layer 3 Switch** (SVI – Switch Virtual Interface)

4. Testing VLANs

- Use `ping` to test connectivity within same VLAN

- Devices in different VLANs cannot communicate without Inter-VLAN routing
- After configuring Inter-VLAN:
 - Test ping across VLANs
 - Check routing table (show ip route)

5. Benefits

- Improved security
- Better network management
- Optimized traffic flow

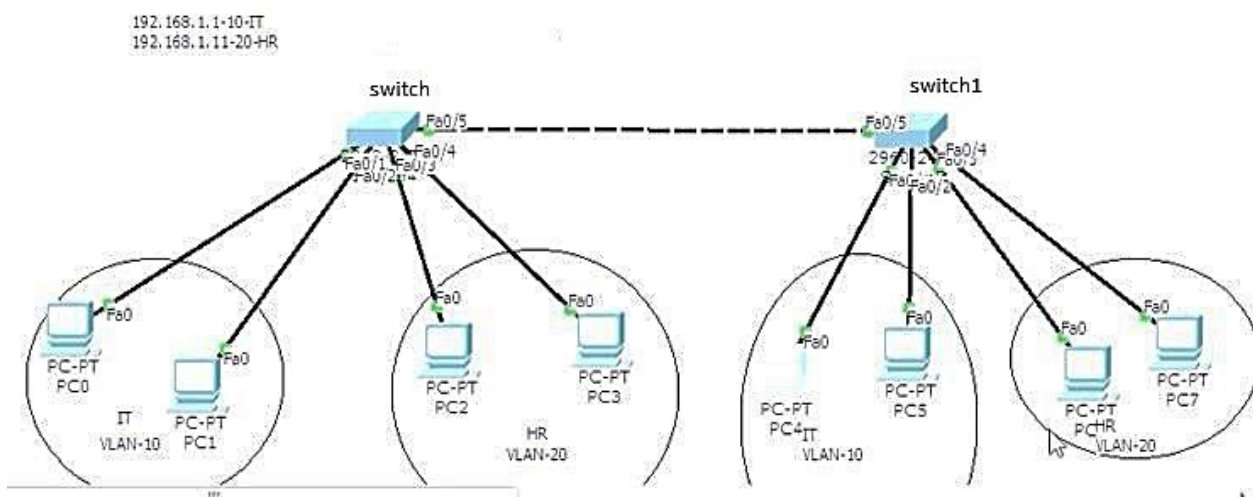
Summary:

Case	Works for Inter-VLAN Routing?	Comment
All VLANs use same network (e.g. 192.168.1.0/24)	✗ No	Router cannot route same subnet
Each VLAN has its own subnet	✓ Yes	Correct and standard way

1. VLAN setup with multiple PCs

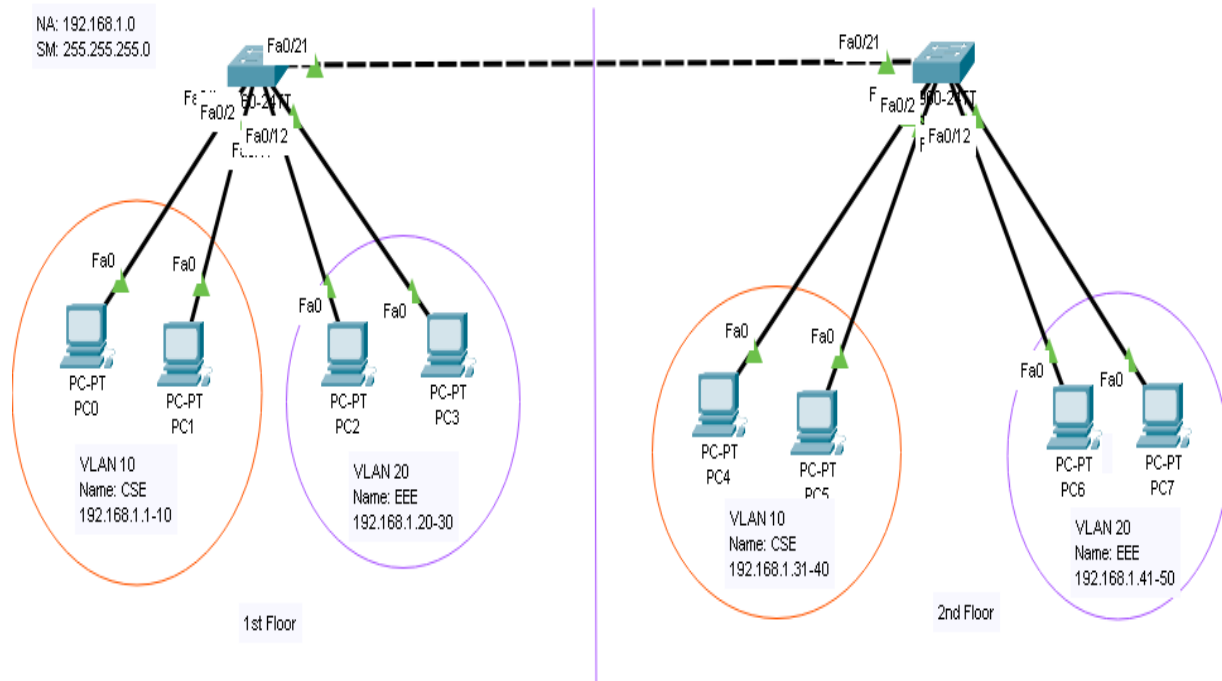
VLAN (Multiple PCs in VLAN 10 & VLAN 20)

Scenario-1:



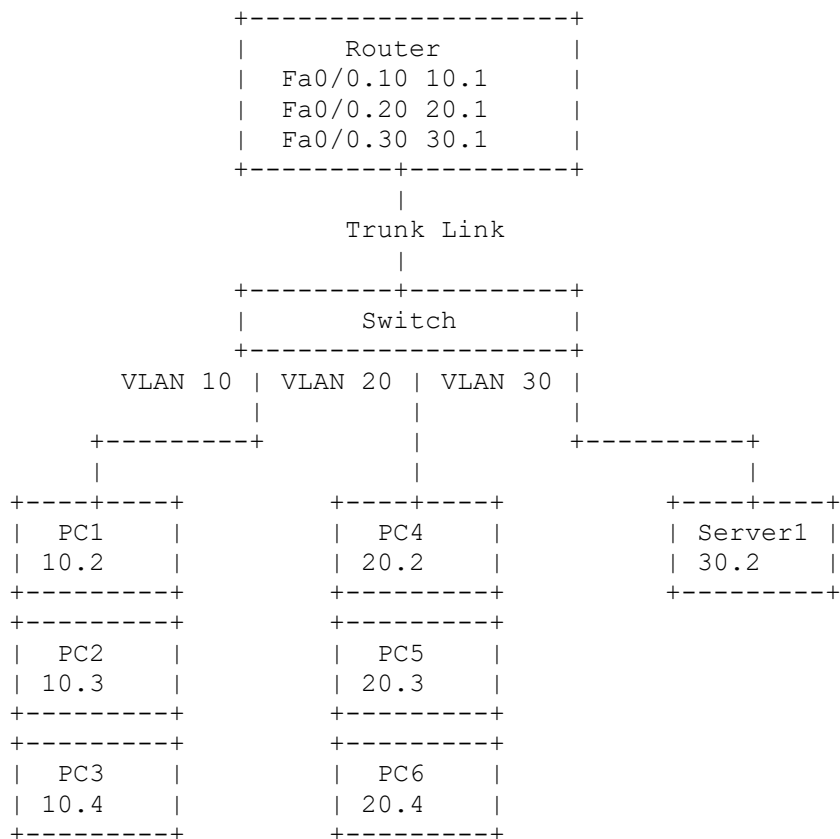
switch	Switch1
<pre> switch(config)#vlan 10 switch(config)#name IT switch(config)#vlan 20 switch(config)#name HR switch#show vlan brief switch(config)#interface fastethernet0/1 switch(config-if)#switchport access vlan 10 switch(config-if)#exit //switch(config)#interface range fastethernet0/1-2 switch(config)#interface fastethernet0/2 switch(config-if)#switchport access vlan 10 switch(config-if)#exit switch(config)#interface fastethernet0/3 switch(config-if)#switchport access vlan 20 switch(config-if)#exit switch(config)#interface fastethernet0/4 switch(config-if)#switchport access vlan 20 switch(config-if)#exit switch#show vlan brief </pre>	<pre> switch(config)#vlan 10 switch(config)#name IT switch(config)#vlan 20 switch(config)#name HR switch#show vlan brief switch1(config)#interface range fastethernet0/1-4 switch1(config-if)#switchport access vlan 10 switch1(config-if)#exit switch1(config)#interface fastethernet0/2 switch1(config-if)#switchport access vlan 10 switch1(config-if)#exit switch1(config)#interface fastethernet0/3 switch1(config-if)#switchport access vlan 20 switch1(config-if)#exit switch1(config)#interface fastethernet0/4 switch1(config-if)#switchport access vlan 20 switch1(config-if)#exit switch1#show vlan brief </pre>
<pre> switch(config)#interface fastethernet0/5 switch1(config-if)#switchport mode trunk </pre>	<pre> Switch1(config)#interface fastethernet0/5 switch1(config-if)#switchport mode trunk </pre>

Lab Task-1: VLAN



2. Inter-VLAN routing with multiple PCs

Scenario-2: Network Diagram



- VLAN 10 → Sales Dept (PC1, PC2, PC3) →NA: 192.168.10.0
- VLAN 20 → HR Dept (PC4, PC5, PC6) →NA: 192.168.20.0
- VLAN 30 → Server Dept (Server1) →NA: 192.168.30.0

Cisco CLI – VLAN Creation & Port Assignment

```
Switch> enable
Switch# configure terminal

! Create VLANs
Switch(config)# vlan 10
Switch(config-vlan)# name Sales
Switch(config)# vlan 20
Switch(config-vlan)# name HR
Switch(config)# vlan 30
Switch(config-vlan)# name Server

! Assign ports to VLAN 10 (Sales)
Switch(config)# interface range fa0/1 - 3
```

```

Switch(config-if-range)# switchport mode access
Switch(config-if-range)# switchport access vlan 10
Switch(config-if-range)# exit

! Assign ports to VLAN 20 (HR)
Switch(config)# interface range fa0/4 - 6
Switch(config-if-range)# switchport mode access
Switch(config-if-range)# switchport access vlan 20
Switch(config-if-range)# exit

! Assign port to VLAN 30 (Server)
Switch(config)# interface fa0/7
Switch(config-if)# switchport mode access
Switch(config-if)# switchport access vlan 30
Switch(config-if)# exit

Switch# show vlan brief

```

Inter-VLAN Routing (Router-on-a-Stick)

Router Sub-Interfaces Configuration:

```

Router> enable
Router# configure terminal

! Main interface
Router(config)# interface fa0/0
Router(config-if)# no shutdown

! VLAN 10 - Sales
Router(config)# interface fa0/0.10
Router(config-subif)# encapsulation dot1Q 10
Router(config-subif)# ip address 192.168.10.1 255.255.255.0
Router(config-subif)# exit

! VLAN 20 - HR
Router(config)# interface fa0/0.20
Router(config-subif)# encapsulation dot1Q 20
Router(config-subif)# ip address 192.168.20.1 255.255.255.0
Router(config-subif)# exit

! VLAN 30 - Server
Router(config)# interface fa0/0.30
Router(config-subif)# encapsulation dot1Q 30
Router(config-subif)# ip address 192.168.30.1 255.255.255.0
Router(config-subif)# exit

Router# show ip route
Router# ping 192.168.20.2      (Ping from VLAN 10 PC to VLAN 20 PC)
Router# ping 192.168.30.2      (Ping from VLANs to Server)

```

In this setup:

- **Within VLAN:** PCs can communicate (e.g., PC1 ↔ PC2 ↔ PC3 in VLAN 10).
- **Across VLANs:** Without Inter-VLAN, no communication. With Router-on-a-Stick, Sales ↔ HR ↔ Server communication works.

Lab Task-2: Inter-VLAN

