LAB 7: Configuration of Switch, VLAN configuration and Inter-VLAN Routing

OBJECTIVES

1. To understand the concept of Virtual Local Area Networks (VLANs) and their role in network segmentation.

2. To configure VLANs on a Cisco Switch and assign specific ports to different VLANs.

3. To implement Inter-VLAN routing using the "Router-on-a-Stick" method to enable communication between different VLANs.

THEORY

1. VLAN (Virtual Local Area Network)

A VLAN is a logical grouping of devices in the same broadcast domain.

Operation: It partitions a physical switch into multiple logical networks. Devices in one VLAN cannot communicate directly with devices in another VLAN without a Layer 3 device (Router).

Application: Used to improve network security, reduce broadcast traffic, and organize networks by department rather than physical location.

2. Trunking (802.1Q)

Trunking is a method used to carry traffic for multiple VLANs over a single physical link between a switch and a router (or another switch).

Operation: It uses the IEEE 802.1Q standard to insert a "tag" into the Ethernet frame header, identifying which VLAN the frame belongs to.

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

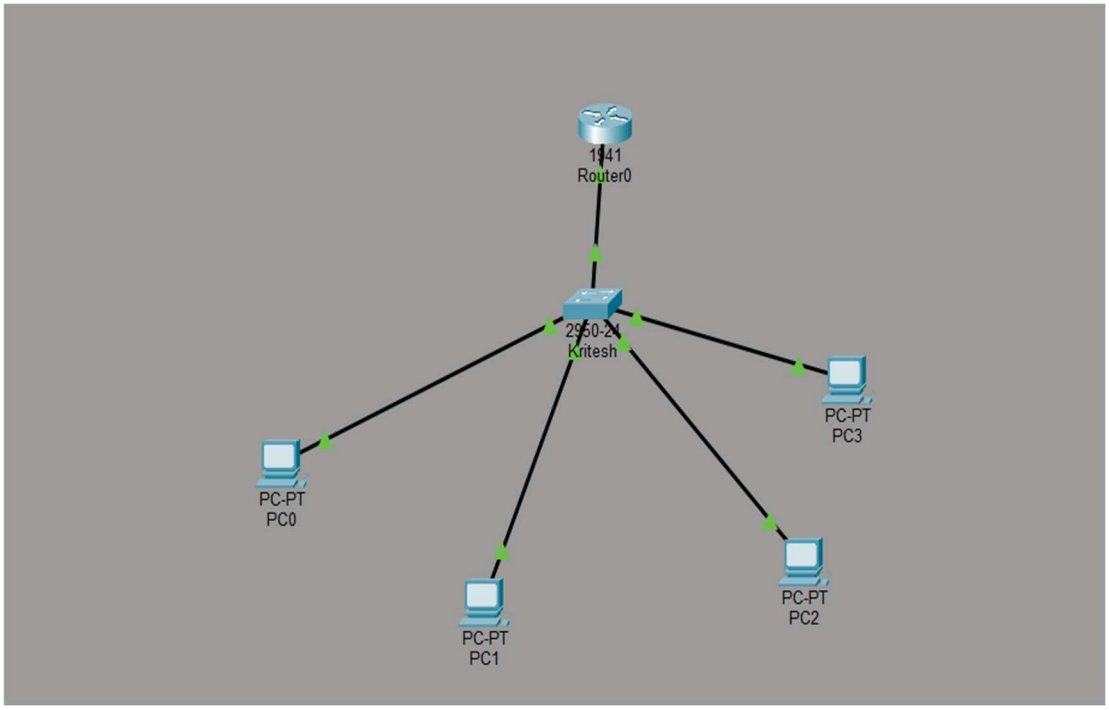
Since VLANs are separate broadcast domains, a router is required to forward traffic between them.

Operation: A single physical interface on the router is divided into multiple virtual "sub-interfaces." Each sub-interface is assigned an IP address that serves as the Default Gateway for a specific VLAN.

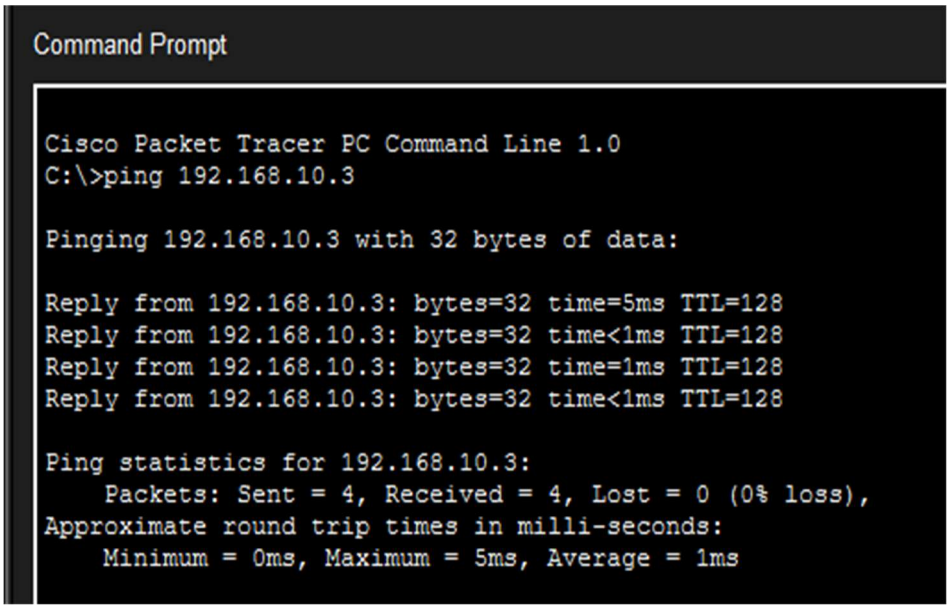
NETWORK TOPOLOGY

A topology was created using Router0 (1941) connected to a Switch (2950-24 named "Kritesh").

The Switch connects four PCs. PC0 and PC1 are assigned to VLAN 10 (Name: computer). PC2 and PC3 are assigned to VLAN 20 (Name: Electronics). The connection between the Switch and Router0 is configured as a Trunk link.



Testing connection:



Configuration Table:

IP Configuration Table

Device	Interface	IP Address	Subnet Mask	Default Gateway	VLAN
Router0	Gig0/0	N/A	N/A	N/A	N/A
Router0	Gig0/0.10	192.168.10.1	255.255.255.0	N/A	10
Router0	Gig0/0.20	192.168.20.1	255.255.255.0	N/A	20
PC0	FastEthernet0	192.168.10.2	255.255.255.0	192.168.10.1	10
PC1	FastEthernet0	192.168.10.3	255.255.255.0	192.168.10.1	10
PC2	FastEthernet0	192.168.20.2	255.255.255.0	192.168.20.1	20
PC3	FastEthernet0	192.168.20.3	255.255.255.0	192.168.20.1	20

CONFIGURATION

1. Switch Configuration Commands (VLANs and Ports)

```
Switch(config)# hostname Kritesh
Kritesh(config)# vlan 10
Kritesh(config-vlan)# name computer
Kritesh(config-vlan)# exit
Kritesh(config)# vlan 20
Kritesh(config-vlan)# name Electronics
Kritesh(config-vlan)# exit
```

Assigning Ports to VLANs:

```
Kritesh(config)# interface range fa0/2-3
Kritesh(config-if-range)# switchport mode access
Kritesh(config-if-range)# switchport access vlan 10
Kritesh(config-if-range)# exit
Kritesh(config)# interface range fa0/4-5
```

```
Kritesh(config-if-range)# switchport mode access
Kritesh(config-if-range)# switchport access vlan 20
Kritesh(config-if-range)# exit
```

Configuring Trunk Link to Router:

```
Kritesh(config)# interface fa0/1
Kritesh(config-if)# switchport mode trunk
```

2. Router Configuration Commands (Inter-VLAN Routing)

Configuring Sub-interface for VLAN 10:

```
Router0(config)# interface g0/0.10
Router0(config-subif)# encapsulation dot1q 10
Router0(config-subif)# ip address 192.168.10.1 255.255.255.0
```

Configuring Sub-interface for VLAN 20:

```
Router0(config)# interface g0/0.20
Router0(config-subif)# encapsulation dot1q 20
Router0(config-subif)# ip address 192.168.20.1 255.255.255.0
```

RESULT

The VLANs were successfully created on the switch, and ports were assigned correctly. This was verified using the show vlan brief command, which displayed "computer" on VLAN 10 and "Electronics" on VLAN 20.

```
Switch>enable
Switch#show vlan brief

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    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
10   computer                         active    Fa0/2, Fa0/3
20   Electronics                      active    Fa0/4, Fa0/5
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
Switch#
```

Fig: Verification of VLAN configuration on Switch

DISCUSSION AND CONCLUSION

During the lab session, we implemented VLANs to segment the network into logical groups ("computer" and "Electronics"). We observed that devices in different VLANs could not communicate initially. By configuring Inter-VLAN routing using the Router-on-a-Stick method with 802.1Q encapsulation, we enabled communication between the two networks.

Hence the lab was completed with a proper knowledge and implementation of VLAN configuration and Inter-VLAN routing using Cisco Packet Tracer.