

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

OBJECTIVES :

- To create and configure multiple VLANs on a network switch.
- To configure trunking and assign switch ports to appropriate VLANs.
- To implement and verify Inter-VLAN Routing using a router.

THEORY :

1) Switch Configuration :

A switch is a Layer 2 networking device that connects multiple devices within a Local Area Network (LAN). It forwards data frames based on MAC addresses, enabling efficient and collision-free communication. Proper switch configuration involves enabling interfaces, assigning ports to VLANs, and managing traffic flow, which improves network performance and organization.

2) Virtual Local Area Network (VLAN) :

A VLAN (Virtual Local Area Network) is a logical segmentation of a network within a switch. VLANs group devices logically rather than physically, reducing broadcast traffic, improving security, and simplifying network management. Each VLAN functions as an independent broadcast domain.

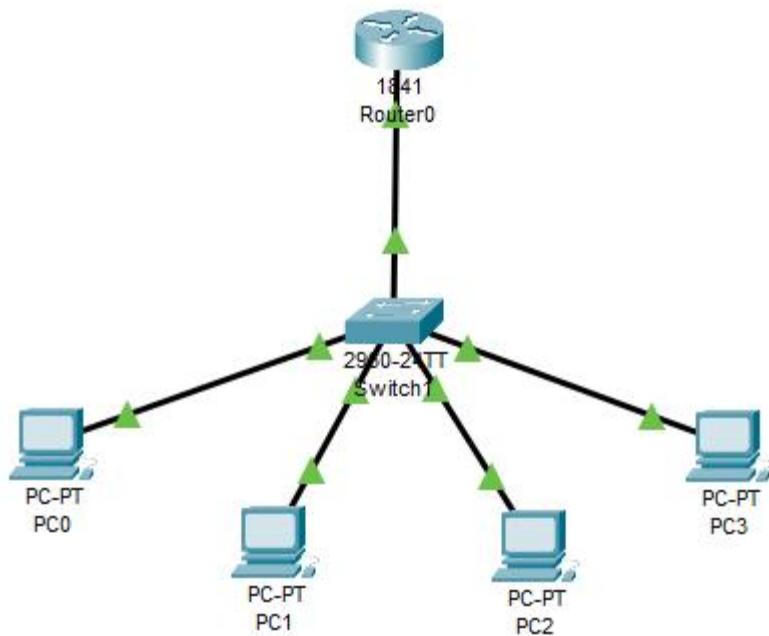
3) VLAN Configuration :

VLAN configuration involves creating VLANs with unique VLAN IDs and names, then assigning switch ports to specific VLANs in access mode. Devices in the same VLAN can communicate directly, while communication between different VLANs requires a Layer 3 device.

4) Inter-VLAN Routing :

Inter-VLAN routing allows communication between different VLANs using a Layer 3 device such as a router. This experiment uses the **Router-on-a-Stick** method, where a single router interface is divided into multiple sub-interfaces, each configured for a specific VLAN using IEEE 802.1Q encapsulation.

Network Topology :



Observation :

A screenshot of a Windows-style Command Prompt window titled "PC0". The window has tabs at the top: Physical, Config, Desktop (which is selected), Programming, and Attributes. The main area shows the output of a ping command:

```
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.10.3

Pinging 192.168.10.3 with 32 bytes of data:

Reply from 192.168.10.3: bytes=32 time=1ms TTL=128
Reply from 192.168.10.3: bytes=32 time<1ms TTL=128
Reply from 192.168.10.3: bytes=32 time=1ms TTL=128
Reply from 192.168.10.3: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.10.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>
```

Fig: Ping in same LAN

```

PC1

Physical Config Desktop Programming Attributes

Command Prompt X

Pinging 192.168.20.3 with 32 bytes of data:

Request timed out.
Reply from 192.168.20.3: bytes=32 time<1ms TTL=127
Reply from 192.168.20.3: bytes=32 time=3ms TTL=127
Reply from 192.168.20.3: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.20.3:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 3ms, Average = 1ms

C:\>ping 192.168.20.3

Pinging 192.168.20.3 with 32 bytes of data:

Reply from 192.168.20.3: bytes=32 time=1ms TTL=127
Reply from 192.168.20.3: bytes=32 time=3ms TTL=127
Reply from 192.168.20.3: bytes=32 time<1ms TTL=127
Reply from 192.168.20.3: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.20.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 3ms, Average = 1ms

C:\>

```

Fig: Ping in Different LAN

Configuration :

VLAN and IP Addressing Scheme :

VLAN	Name	Network	Gateway
10	Computer	192.168.10.0/24	192.168.10.1
20	Electronics	192.168.20.0/24	192.168.20.1

Device	IPv4 address	Subnet Mask	Default Gateway
PC0	192.168.10.2	255.255.255.0	192.168.10.1
PC1	192.168.10.3	255.255.255.0	192.168.10.1
PC2	192.168.20.2	255.255.255.0	192.168.20.1
PC3	192.168.20.3	255.255.255.0	192.168.20.1

Commands :

Switch Configuration :

1. Create VLANS

```
Switch(config)# vlan 10  
Switch(config-vlan)# name Computer  
# exit
```

```
Switch(config)# vlan 20  
Switch(config-vlan)# name Electronics  
# exit
```

2. Assign port to VLANS

```
Switch(config)# interface range fa0/1-2  
# switchport mode access  
# switchport access vlan 10  
# exit
```

```
# interface range fa0/3-4  
# switchport mode access  
# switchport access vlan 20  
# exit
```

3. Configure Trunk Port (Switch-Router)

```
Switch(config)# interface fa0/5  
# switchport mode trunk  
# exit
```

Verification Switch :

```
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, Gig0/1		Gig0/2
10 Computer	active	Fa0/1, Fa0/2
20 Electronics	active	Fa0/3, Fa0/4
1002 fddi-default	active	
1003 token-ring-default	active	
1004 fddinet-default	active	
1005 trnet-default	active	

Router Configuration (Inter-VLAN Routing) :

```
Router(config)# interface GigabitEthernet 0/0.10
          # encapsulation dot1Q 10
          # ip address 192.168.10.1 255.255.255.0
          # exit
```

```
Router(config)# interface GigabitEthernet 0/0.20
          # encapsulation dot1Q 20
          # ip address 192.168.20.1 255.255.255.0
          # exit
```

RESULT :

The switch was successfully configured with multiple VLANs, and ports were correctly assigned. A trunk link was established between the switch and router. Inter-VLAN routing using router sub-interfaces enabled successful communication both within the same VLAN.

and between different VLANs.

DISCUSSION :

VLAN implementation logically separated the network into multiple broadcast domains, reducing unnecessary broadcast traffic and enhancing network performance. Port assignments ensured proper device grouping, while the trunk link enabled VLAN traffic to pass between the switch and router. Inter-VLAN routing allowed secure and controlled communication between VLANs without compromising segmentation. Verification commands confirmed correct VLAN and routing configurations.

CONCLUSION :

The objectives of configuring VLANs, trunking, and enabling Inter-VLAN routing using the Router-on-a-Stick method were successfully achieved. The experiment demonstrated efficient network segmentation and reliable communication between different VLANs.