

LAB 7 — Switch Configuration, VLAN & Inter-VLAN Routing

➤ Objectives:

1. To create VLANs and assign ports to different departments/networks.
2. To enable communication between VLANs using Router-on-a-Stick Inter-VLAN Routing.

➤ Software Requirement:

- Cisco Packet Tracer (any recent version)
- Windows/Linux PC

➤ Theory:

Switch Configuration:

Switch configuration involves creating VLANs and assigning switch ports to the correct VLAN IDs. Each port connected to a device is set as an access port so the device belongs to a specific network. A trunk port is configured to connect the switch to a router for inter-VLAN communication. Proper configuration ensures devices communicate only within their VLAN unless routing is enabled.

VLAN (Virtual Local Area Network):

A VLAN divides a single physical network switch into multiple logical networks. Devices in the same VLAN can communicate directly, while devices in different VLANs are isolated. This improves security and reduces unnecessary broadcast traffic. It also helps organize the network by grouping devices based on department instead of location.

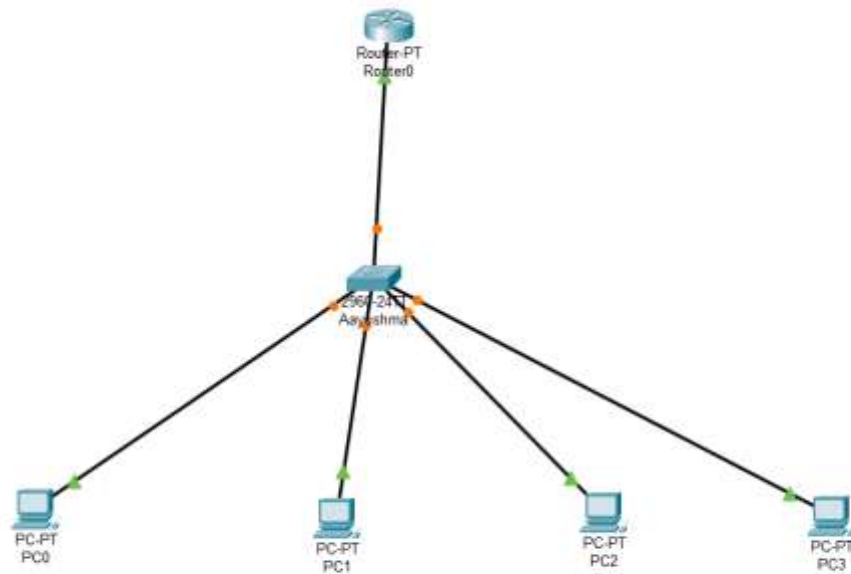
Inter-VLAN Routing:

Each VLAN acts as a separate IP network, so devices in different VLANs cannot communicate by default. A router or Layer-3 switch is required to connect these networks. The router uses the default gateway of each VLAN to forward packets between them. This process is called Inter-VLAN Routing and allows communication across VLANs

➤ Network Topology:

Router → Switch → PCs (PC1 & PC2 in VLAN 10, PC3 & PC4 in VLAN 20)

Figure:



Configuration:

VLAN and IP Addressing Scheme

| VLAN ID | VLAN Name | Network Address | Gateway |
|---------|-------------|-----------------|--------------|
| 10 | Computer | 192.168.10.0/24 | 192.168.10.1 |
| 20 | Electronics | 192.168.20.0/24 | 192.168.20.1 |

Device IP Configuration

| 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:

1.Switch Configuration Commands:

Create VLANs

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

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

Assign Ports to VLANs

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

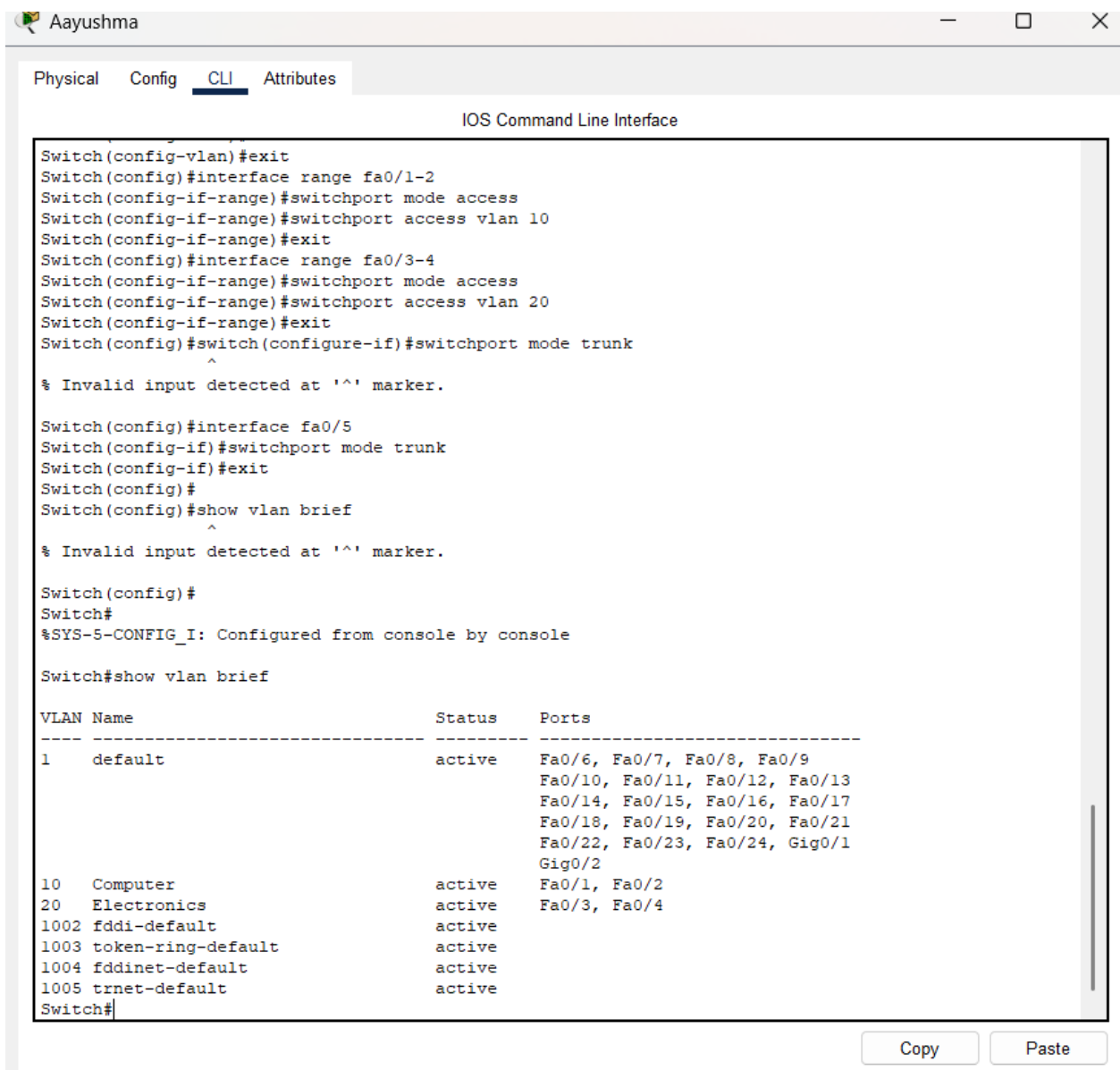
```
Switch(config)# interface range fa0/3-4
Switch(config-if-range)# switchport mode access
Switch(config-if-range)# switchport access vlan 20
Switch(config-if-range)# exit
```

Configure Trunk Port (Switch to Router)

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

Verification

Switch# show vlan brief



The screenshot shows a network switch CLI window titled "Aayushma". The window has tabs for "Physical", "Config", "CLI", and "Attributes". The "CLI" tab is selected, and the title bar indicates "IOS Command Line Interface". The CLI shows the following commands and output:

```
Switch(config-vlan)#exit
Switch(config)#interface range fa0/1-2
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 10
Switch(config-if-range)#exit
Switch(config)#interface range fa0/3-4
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 20
Switch(config-if-range)#exit
Switch(config)#switch(configure-if)#switchport mode trunk
Switch(config)#^
% Invalid input detected at '^' marker.
Switch(config)#interface fa0/5
Switch(config-if)#switchport mode trunk
Switch(config-if)#exit
Switch(config)#^
% Invalid input detected at '^' marker.
Switch(config)#
Switch#
%SYS-5-CONFIG_I: Configured from console by console

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 | |

Switch#

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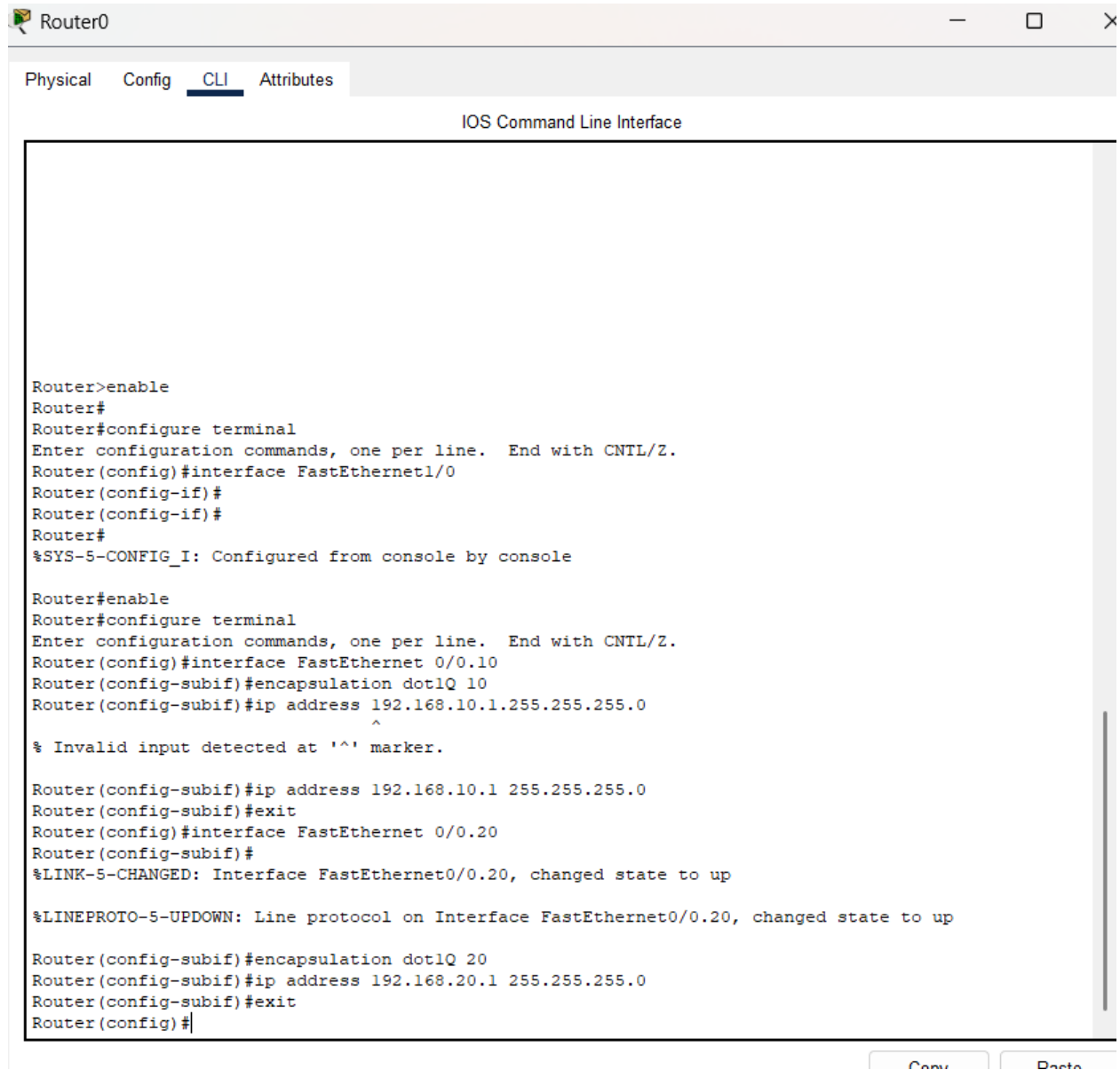
2.Router Configuration Commands

Configure Sub-Interfaces for VLANs:

```
Router(config)# interface FastEthernet0/0.10
Router(config-subif)# encapsulation dot1Q 10
```

```
Router(config-subif)# ip address 192.168.10.1 255.255.255.0
Router(config-subif)# exit
```

```
Router(config)# interface FastEthernet0/0.20
Router(config-subif)# encapsulation dot1Q 20
Router(config-subif)# ip address 192.168.20.1 255.255.255.0
Router(config-subif)# exit
```



```
Router0
Physical Config CLI Attributes
IOS Command Line Interface

Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet1/0
Router(config-if)#
Router(config-if)#
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet 0/0.10
Router(config-subif)#encapsulation dot1Q 10
Router(config-subif)#ip address 192.168.10.1.255.255.255.0
^
% Invalid input detected at '^' marker.

Router(config-subif)#ip address 192.168.10.1 255.255.255.0
Router(config-subif)#exit
Router(config)#interface FastEthernet 0/0.20
Router(config-subif)#
%LINK-5-CHANGED: Interface FastEthernet0/0.20, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.20, changed state to up

Router(config-subif)#encapsulation dot1Q 20
Router(config-subif)#ip address 192.168.20.1 255.255.255.0
Router(config-subif)#exit
Router(config)#
```

Router Verification

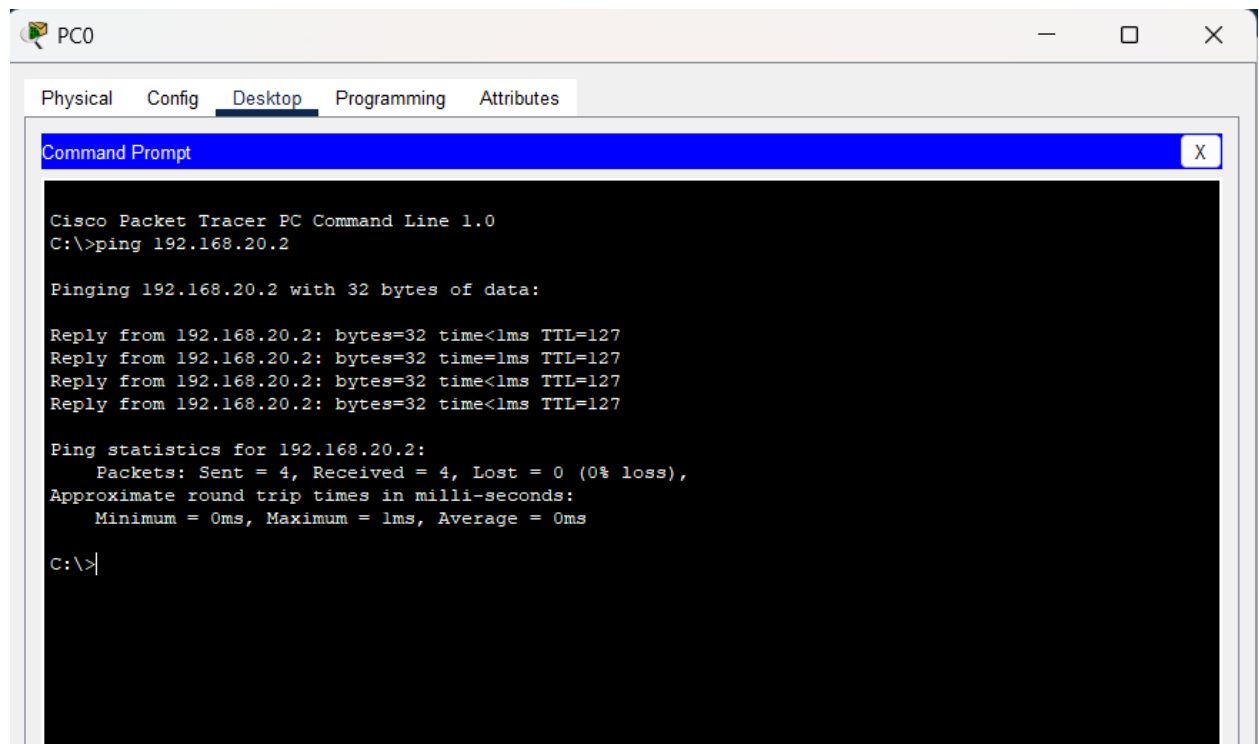
Router# show ip interface brief

```
Router>enable
Router# show ip interface brief
Interface                IP-Address      OK? Method Status        Protocol
FastEthernet0/0          unassigned      YES unset  up            up
FastEthernet0/0.10       192.168.10.1    YES manual  up            up
FastEthernet0/0.20       192.168.20.1    YES manual  up            up
FastEthernet1/0          unassigned      YES unset  administratively down down
Serial2/0                unassigned      YES unset  administratively down down
Serial3/0                unassigned      YES unset  administratively down down
FastEthernet4/0          unassigned      YES manual  down          down
FastEthernet5/0          unassigned      YES unset  administratively down down
Router#
```

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➤ Pinging (Testing):

Ping PC0-PC2:



➤ **Result:**

First, we created two VLANs and assigned different PCs to separate networks successfully. Then, we configured trunking and router sub interfaces to enable communication between VLANs. After that, we tested connectivity using ping and received replies between different VLAN devices. Finally, we verified that inter-VLAN routing was working correctly across the network.

➤ **Discussion:**

Initially, we noticed that devices in different VLANs could not communicate because they were logically separated. Then, we configured the trunk port so that multiple VLAN traffic could pass through a single link. Afterwards, we set router sub interfaces and provided gateway addresses for each VLAN. Moreover, we observed that the router worked as an intermediary device to forward packets between networks. In addition, we used verification commands and ping tests to ensure proper communication. Therefore, we understood the importance of routing in connecting logically separated networks.

➤ **Conclusion:**

In conclusion, we successfully divided a network into multiple VLANs for better organization. Furthermore, we enabled communication between them using inter-VLAN routing. Overall, we gained clear knowledge about switching and routing operations. Hence, this lab helped us understand how large networks manage departments separately yet communicate efficiently.