



FAKULTI TEKNOLOGI KEJURUTERAAN ELEKTRIK DAN ELEKTRONIK

ASSIGNMENT

BVI 1222 NETWORK, SWITCHING AND ROUTING

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1.0 INTRODUCTION

This project aims to design a simple, yet functional network infrastructure for a small organization, such as a university department, office and home using Cisco Packet Tracer. The network is intended to support 20 devices, including workstations, printers, and network devices like routers and switches, while ensuring reliable connectivity, scalability, and security.

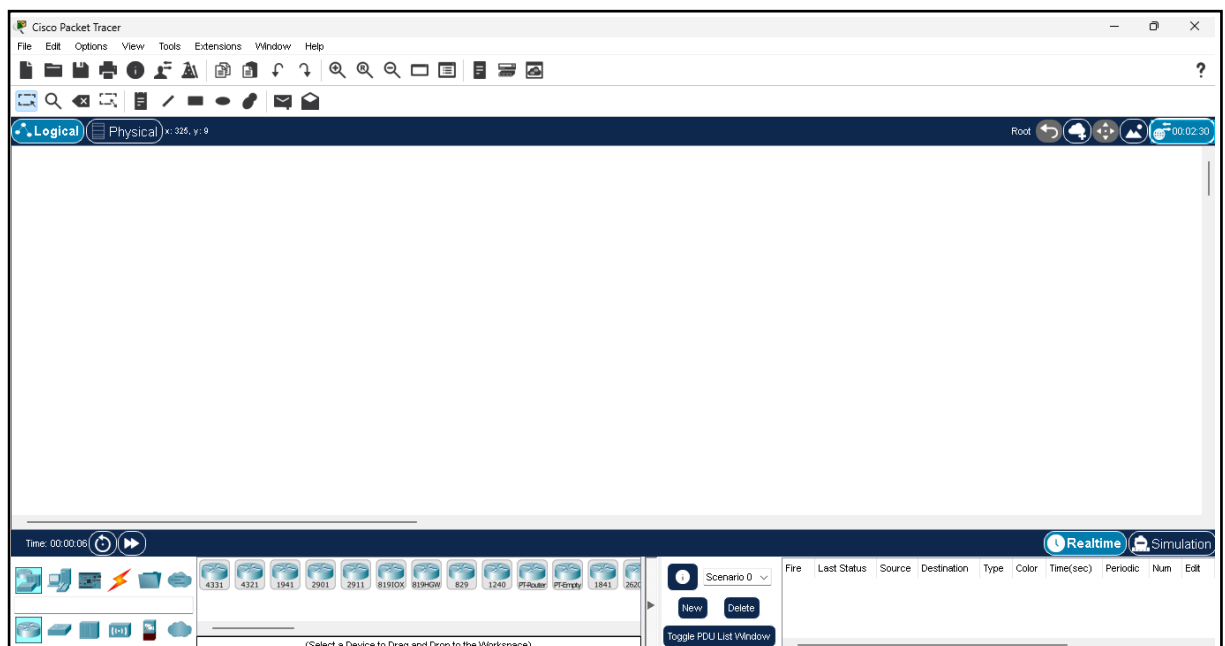
2.0 OBJECTIVE

- To develop skill in using Cisco Packet Tracer for network simulation and design
- To design a functional and efficient network system using Cisco Packet Tracer
- To simulate and manage up to 20 devices within a single network environment

3.0 PROCEDURE

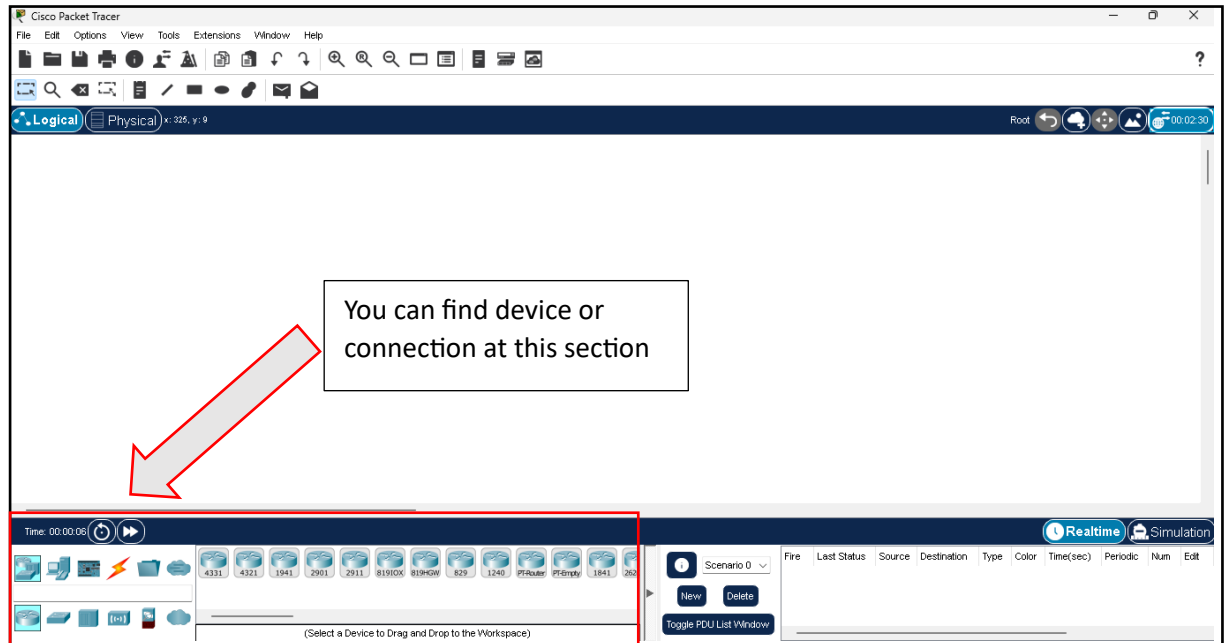
Step 1: Set Up the Simulation Environment

Launch Cisco Packet Tracer software and create a new workspace for the project.

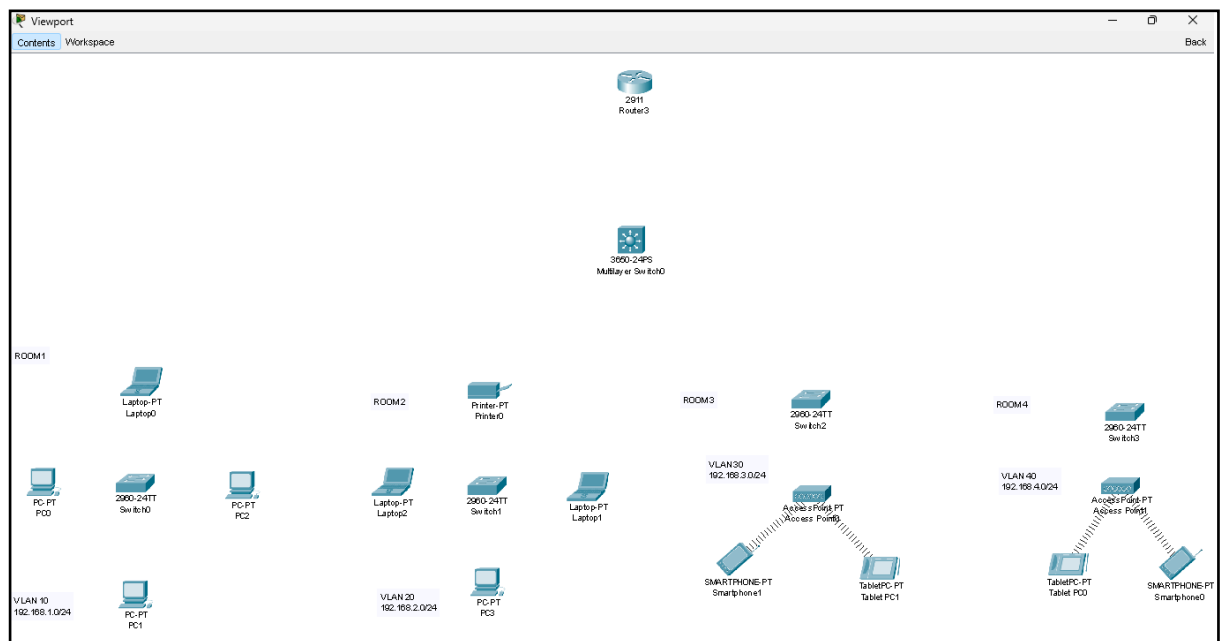


Step 2: Add Devices Want to Use

- I. Drag and drop required devices (routers, switches, PCs, etc.) into the workspace.

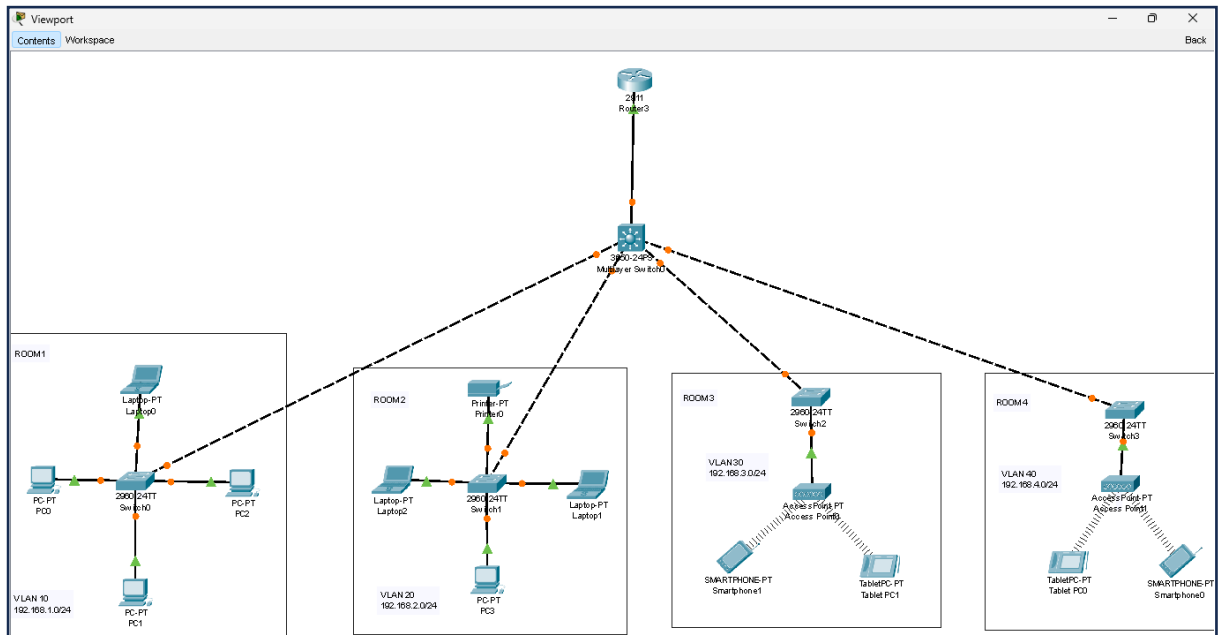


- II. Organize your device you want to use neatly and orderly



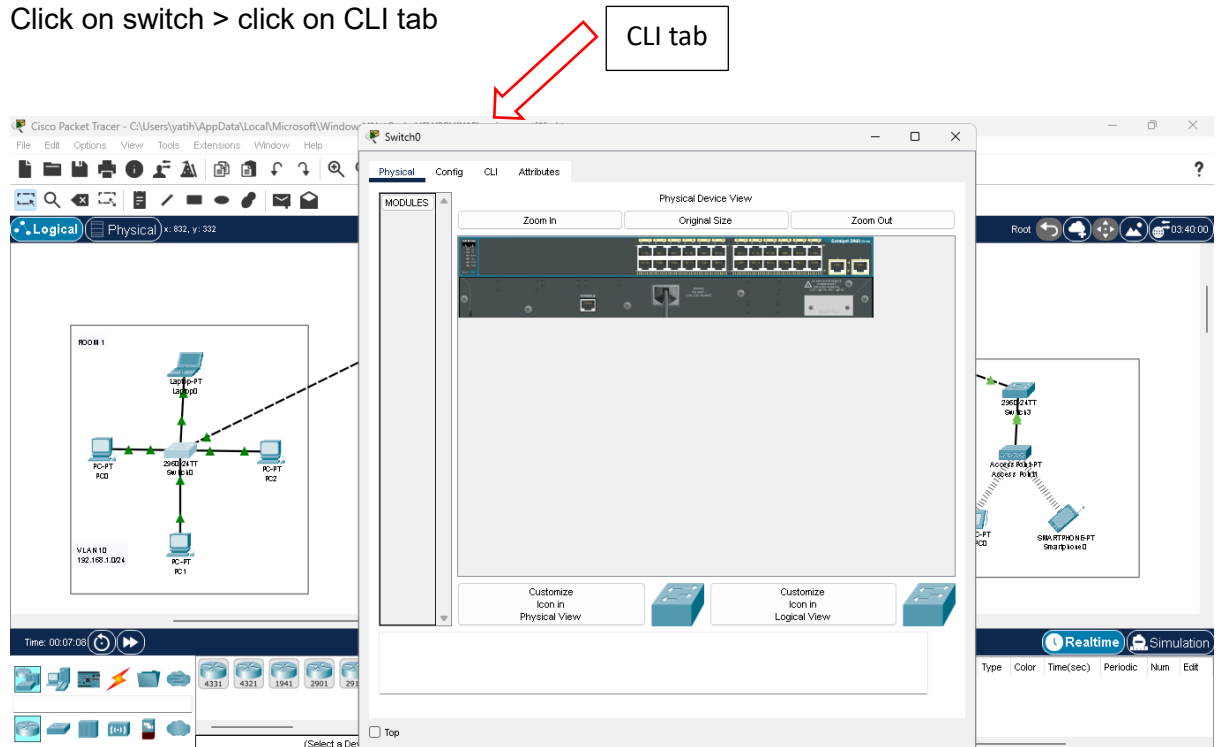
Step 3: Connect Devices

Use appropriate cables (e.g., copper straight-through or crossover) to connect devices and please make sure physical connectivity by checking link lights and testing connections.



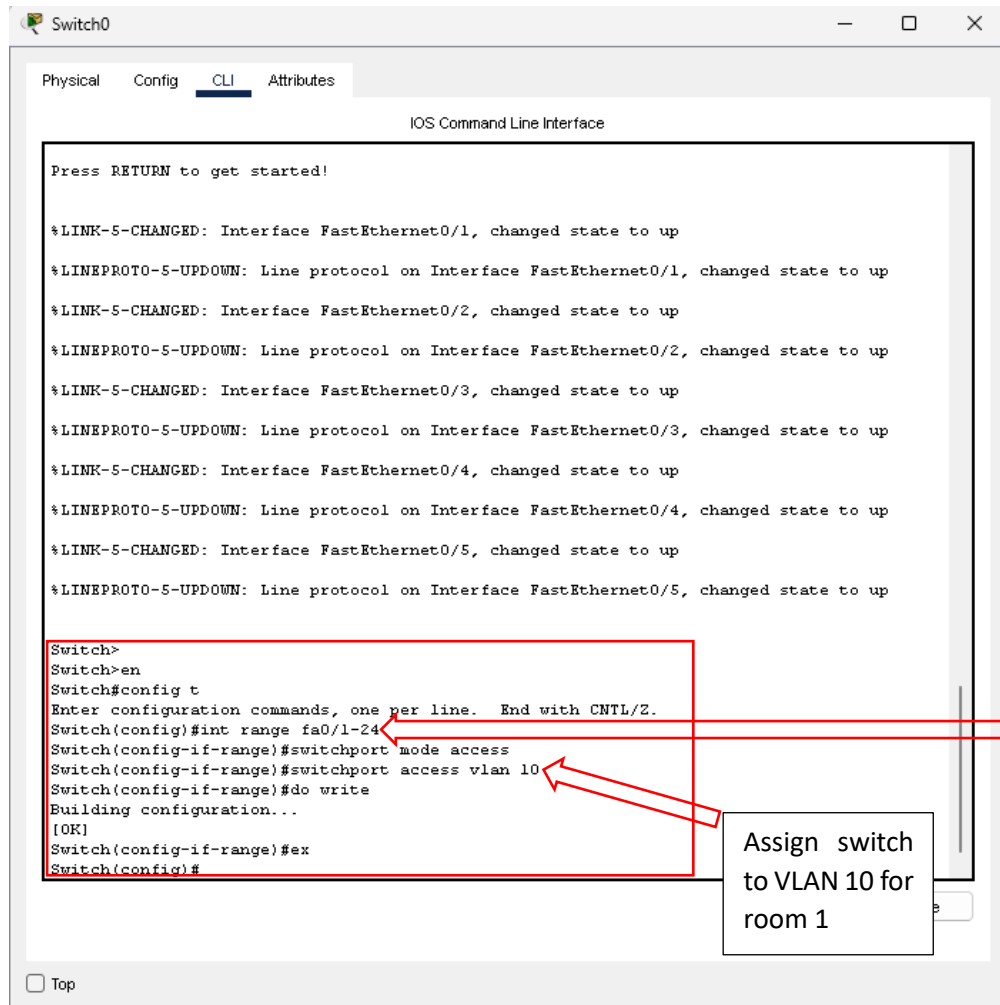
Step 4: Configure Devices Switch

Click on switch > click on CLI tab



Type instruction for vlan configuration :

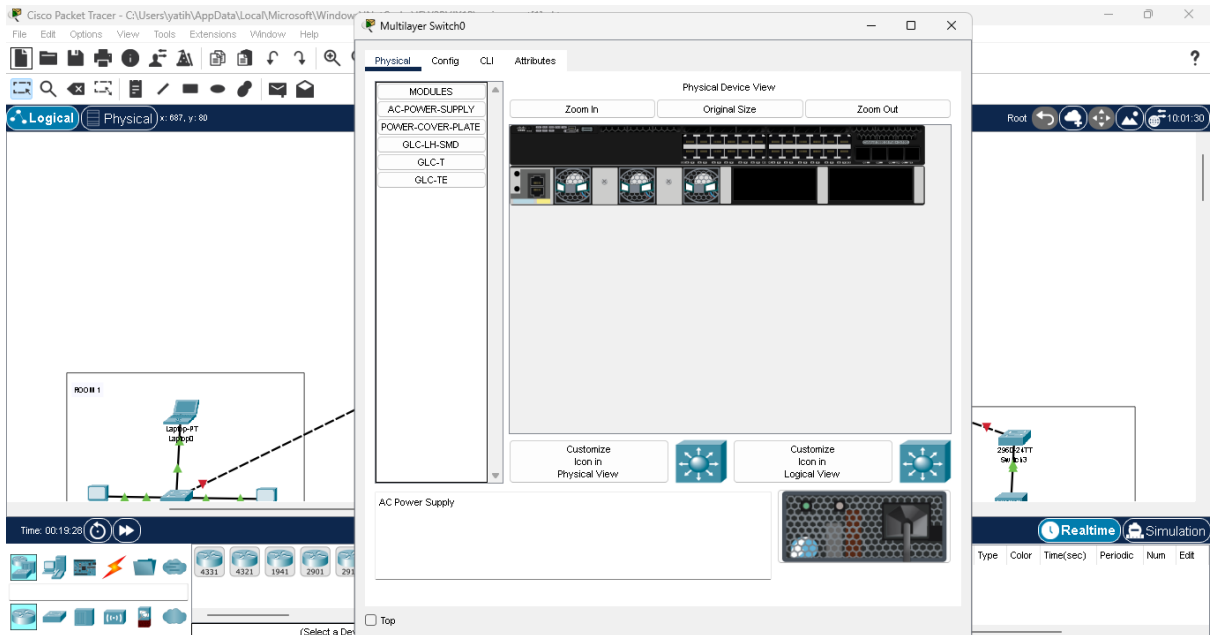
Enter > en > config t > int range fa0/1-24 > switchport mode access > switch access vlan 10 > do write



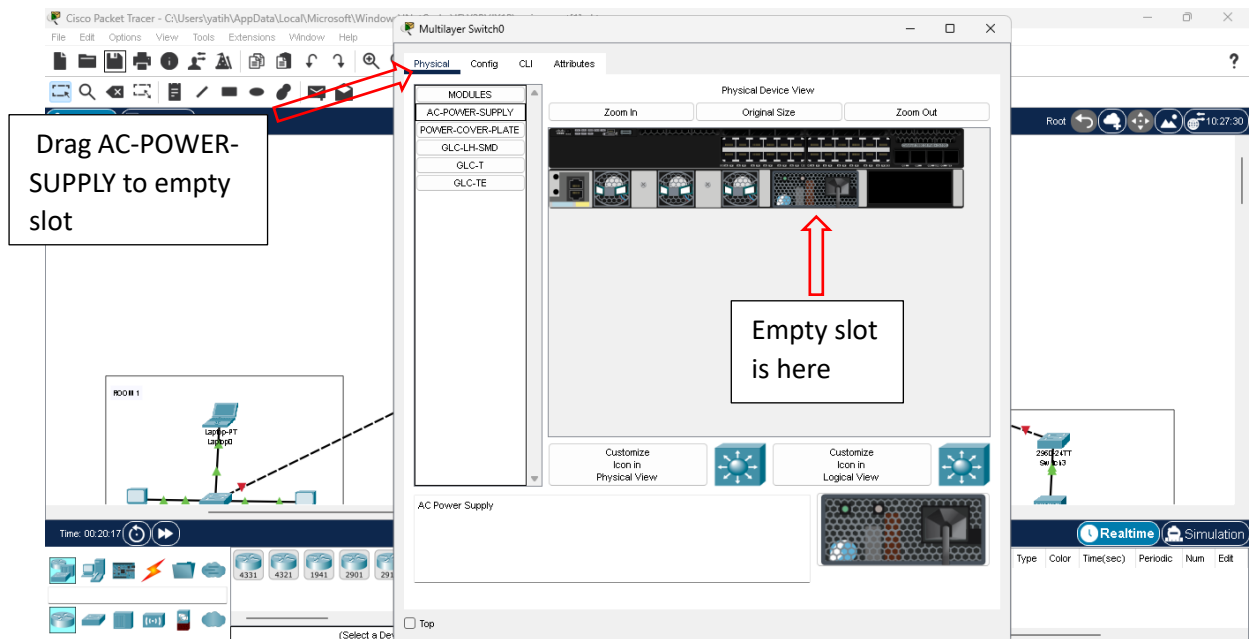
Do the same command configuring vlan to all switch on every room. Assigned vlan on room 2 is **VLAN 20**, room 3 is **VLAN 30** and room 4 is **VLAN 40**.

Step 5: Configure Devices Main Switch

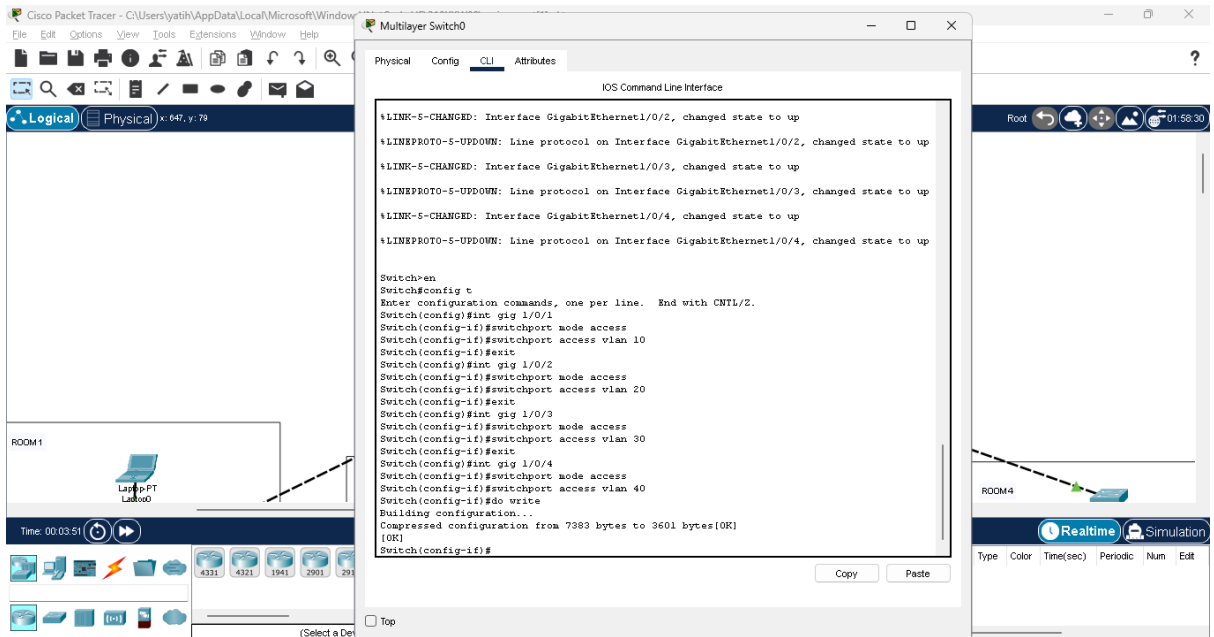
I. Click main switch and turn on the main switch for enabling to open the CLI tab



II. Drag the AC-POWER-SUPPLY to main switch

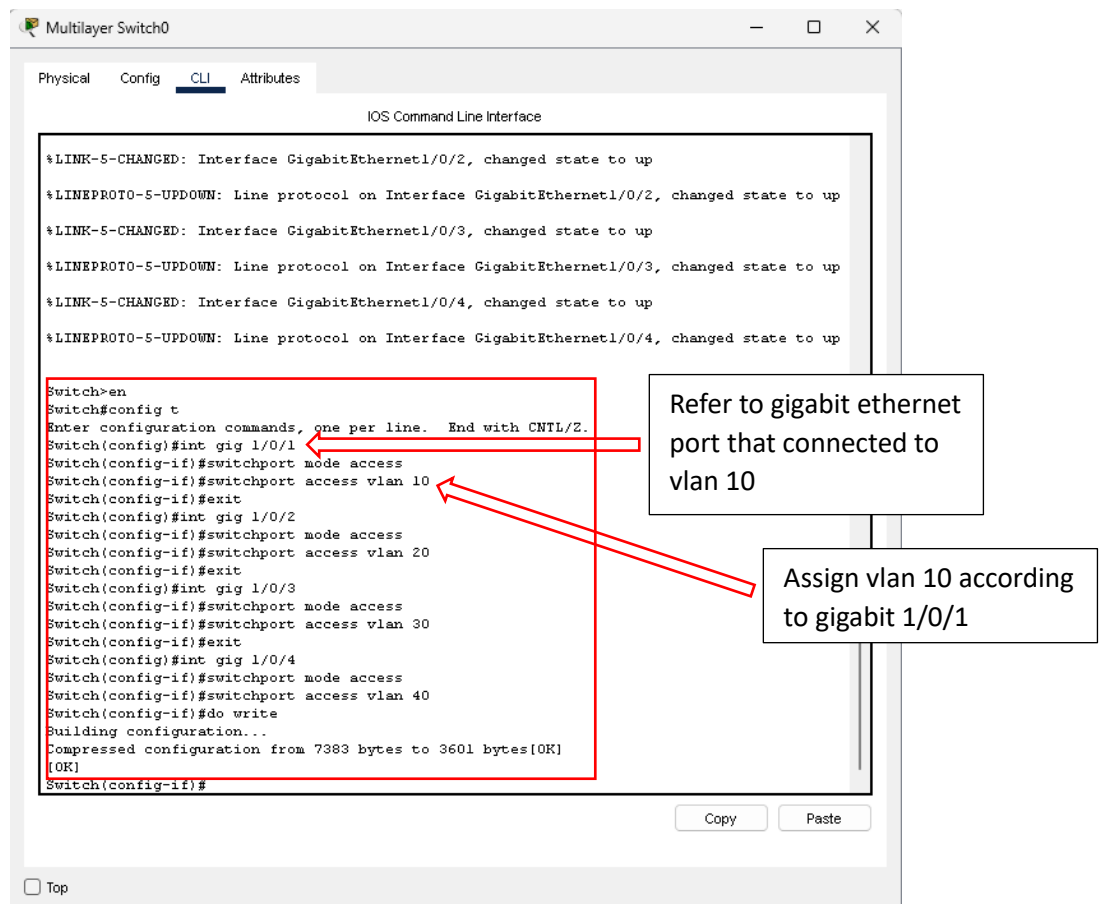


III. Click CLI tab to command the main switch



Type instruction for configuring vlan main switch:

Enter > en > config t > int gig 1/0/1 > switchport mode access > switchport access vlan 10 > exit



Do the same instruction for **VLAN 20**, **VLAN 30** and **VLAN 4** following their gigabit ethernet port on main switch

- IV. Configure a switch port (gigabitEthernet 1/0/5) as a trunk port to allow multiple VLANs to communicate across the network

Type instruction for configuration trunk port:

En > config t > int gig 1/0/5 > switchport mode trunk > exit > do write

```
Multilayer Switch0
Physical Config CLI Attributes
IOS Command Line Interface

%LINK-5-CHANGED: Interface GigabitEthernet1/0/4, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/4, changed state to up

Switch>en
Switch#config t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#int gig 1/0/1
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 10
Switch(config-if)#exit
Switch(config)#int gig 1/0/2
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 20
Switch(config-if)#exit
Switch(config)#int gig 1/0/3
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 30
Switch(config-if)#exit
Switch(config)#int gig 1/0/4
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 40
Switch(config-if)#do write
Building configuration...
Compressed configuration from 7383 bytes to 3601 bytes[OK]
[OK]
Switch(config-if)#exit
Switch(config)#int gig 1/0/5
Switch(config-if)#switchport mode trunk
Switch(config-if)#exit
Switch(config)#do write
Building configuration...
Compressed configuration from 7383 bytes to 3601 bytes[OK]
[OK]
Switch(config)#
```

Assign according to gig port connected to router

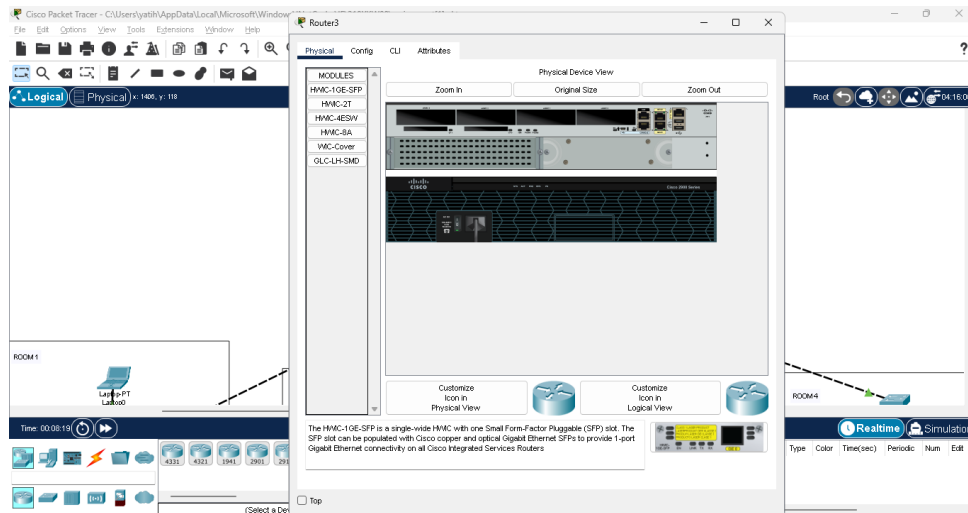
Configure the interface as a trunk port

Top

Step 6: Configure a Subinterface on a Router

Subinterface is use to enable inter-VLAN routing, allowing the communication between device in the diffrent VLANs.

I. Click router > click CLI tab



Type instruction for subinterface router:

```
Enter > en > config t > int gig 0/0.10 > encapsulation dot1q 10 > ip address  
192.168.1.0 255.255.255.0 > exit
```

Router3

Physical Config CLI Attributes

IOS Command Line Interface

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.10, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.20, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.30, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.40, changed state to up

Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int gig 0/0.10
Router(config-subif)#encapsulation dot1q 10
Router(config-subif)#ip address 192.168.1.1 255.255.255.0
Router(config-subif)#exit
Router(config)#int gig 0/0.20
Router(config-subif)#encapsulation dot1q 20
Router(config-subif)#ip address 192.168.2.1 255.255.255.0
Router(config-subif)#exit
Router(config)#int gig 0/0.30
Router(config-subif)#encapsulation dot1q 30
Router(config-subif)#ip address 192.168.3.1 255.255.255.0
Router(config-subif)#exit
Router(config)#int gig 0/0.40
Router(config-subif)#encapsulation dot1q 40
Router(config-subif)#ip address 192.168.4.1 255.255.255.0
Router(config-subif)#exit
Router(config)#do write
Building configuration...
[OK]
Router(config)#
```

Configuration for subinterface of gigabitEthernet 0/0 and associated with VLAN 10

Defines the 802.1Q VLAN tagging protocol for the trunk

Assign ip address and subnet mask to subinterface

Step 7: Configure IP Address Intermittent Routing on Router (DHCP)

Use the same CLI according the step 6

Type instruction for configuration IP Address:

Enter > en > config t > service dhcp > ip dhcp pool room1-pool > network 192.168.1.0 255.255.255.0 > default-router 192.168.1.1 > dns server 192.168.1.1 > exit > do write

```
Router(config)#service dhcp
Router(config)#ip dhcp pool room1-pool
Router(dhcp-config)#network 192.168.1.0 255.255.255.0
Router(dhcp-config)#default-router 192.168.1.1
Router(dhcp-config)#dns-server 192.168.1.1
Router(dhcp-config)#exit
Router(config)#ip dhcp pool room2-pool
Router(dhcp-config)#network 192.168.2.0 255.255.255.0
Router(dhcp-config)#default-router 192.168.2.1
Router(dhcp-config)#dns-server 192.168.2.1
Router(dhcp-config)#exit
Router(config)#ip dhcp pool room3-pool
Router(dhcp-config)#network 192.168.3.0 255.255.255.0
Router(dhcp-config)#default-router 192.168.3.1
Router(dhcp-config)#dns-server 192.168.3.1
Router(dhcp-config)#exit
Router(config)#ip dhcp pool room4-pool
Router(dhcp-config)#network 192.168.4.0 255.255.255.0
Router(dhcp-config)#default-router 192.168.4.1
Router(dhcp-config)#dns-server 192.168.4.1
Router(dhcp-config)#exit
Router(config)#do write
Building configuration...
[OK]
Router(config)#
```

Enable DHCP service on router

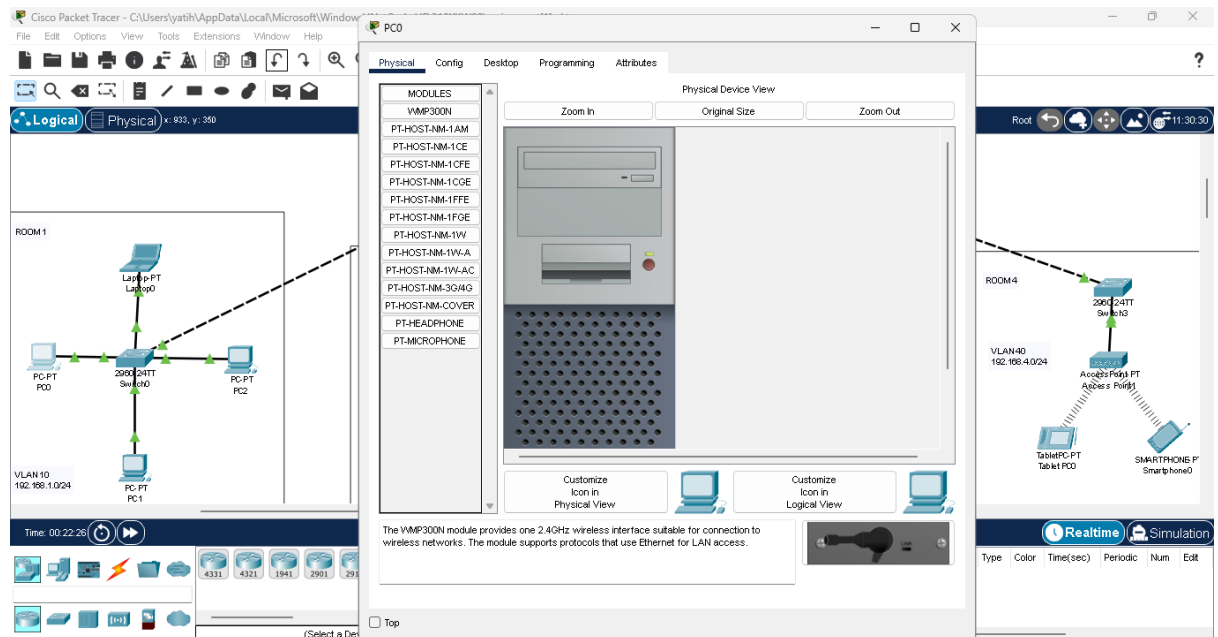
Creates a DHCP pool name

Assign ip address range for network address also assign default gateway and dns server

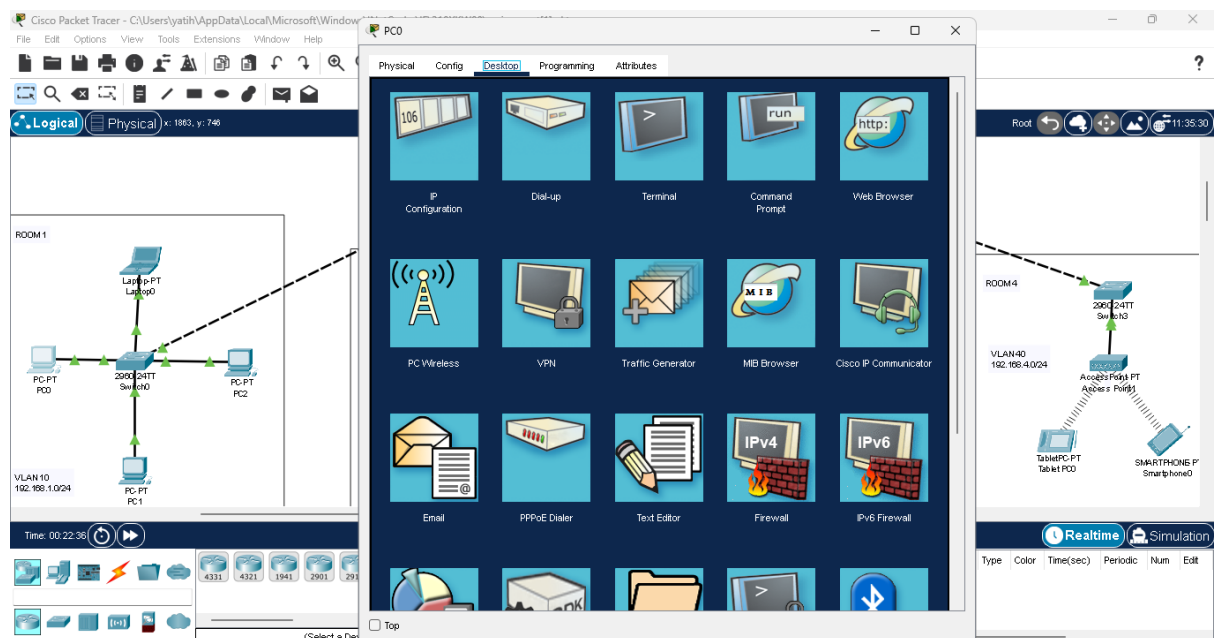
Step 8: Change Settings IP configuration On Device

PC and laptop IP Configuration

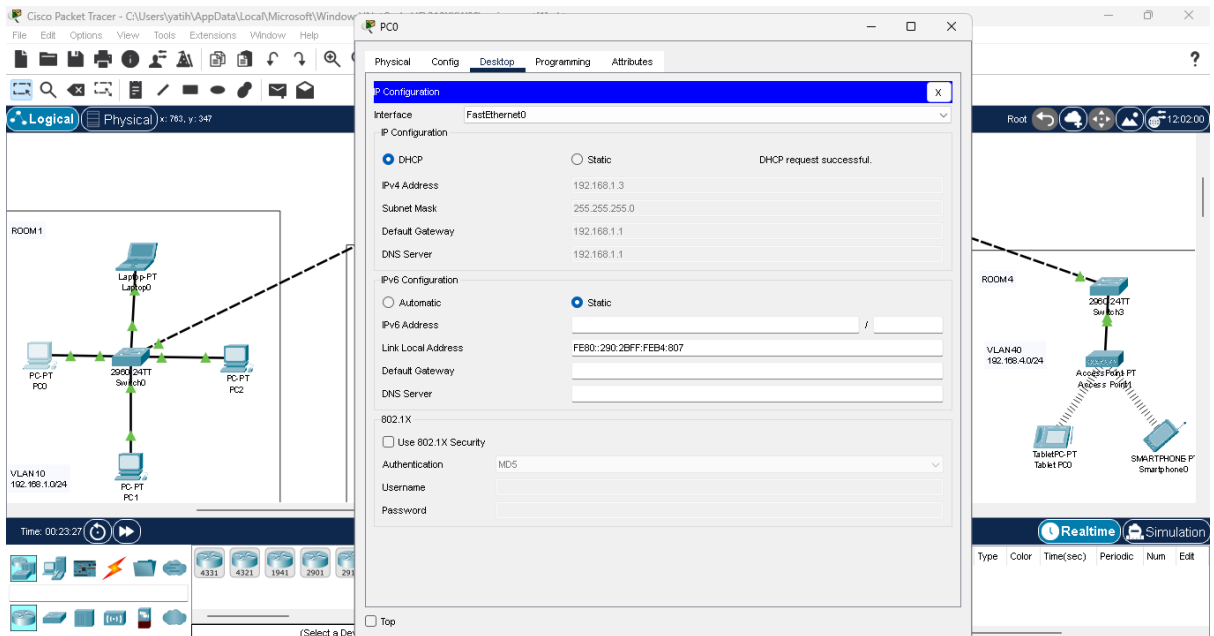
I. Click PC > click desktop tab



II. Open IP configuration

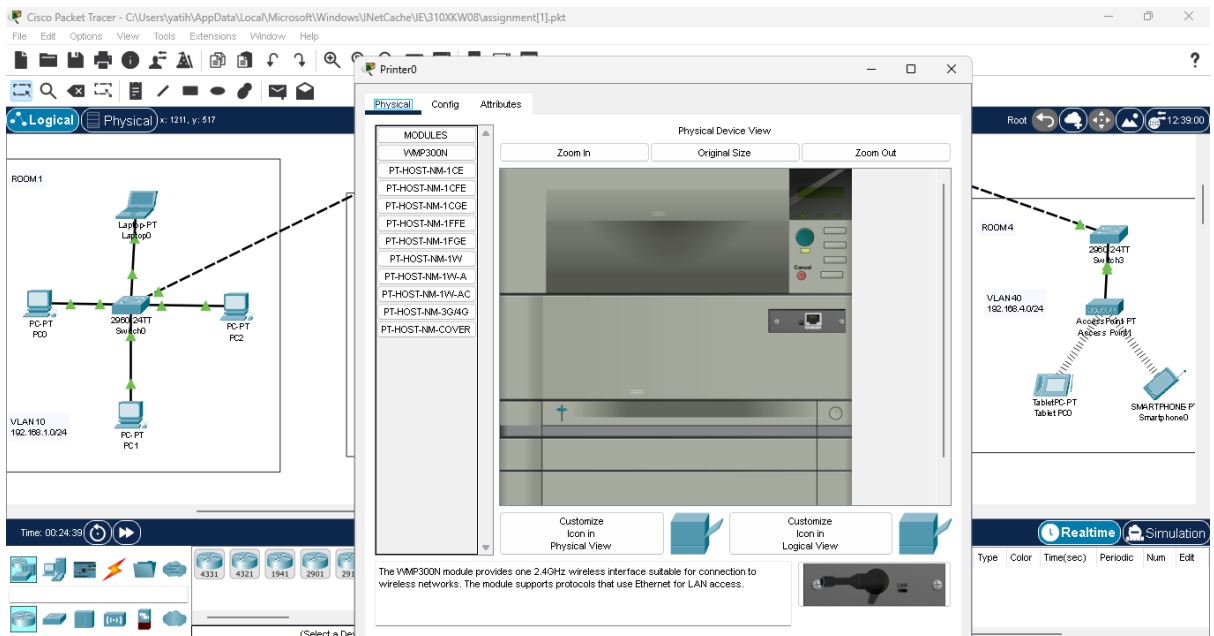


III. Select the DHCP on IP configuration to requesting IP Address

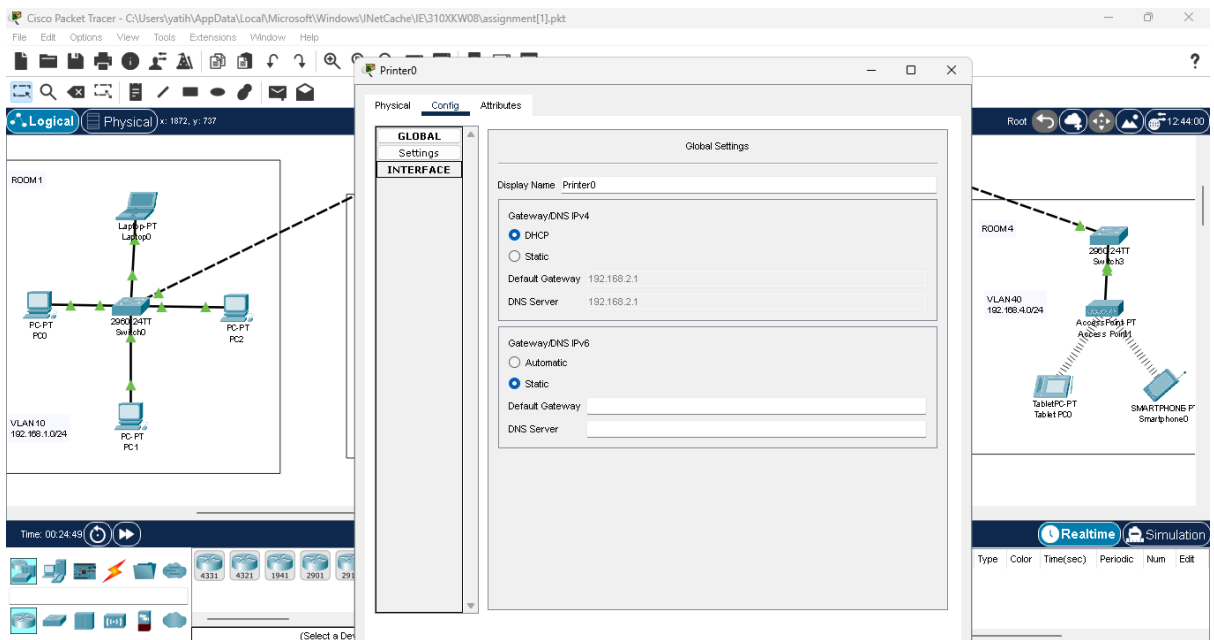


Printer IP Configuration

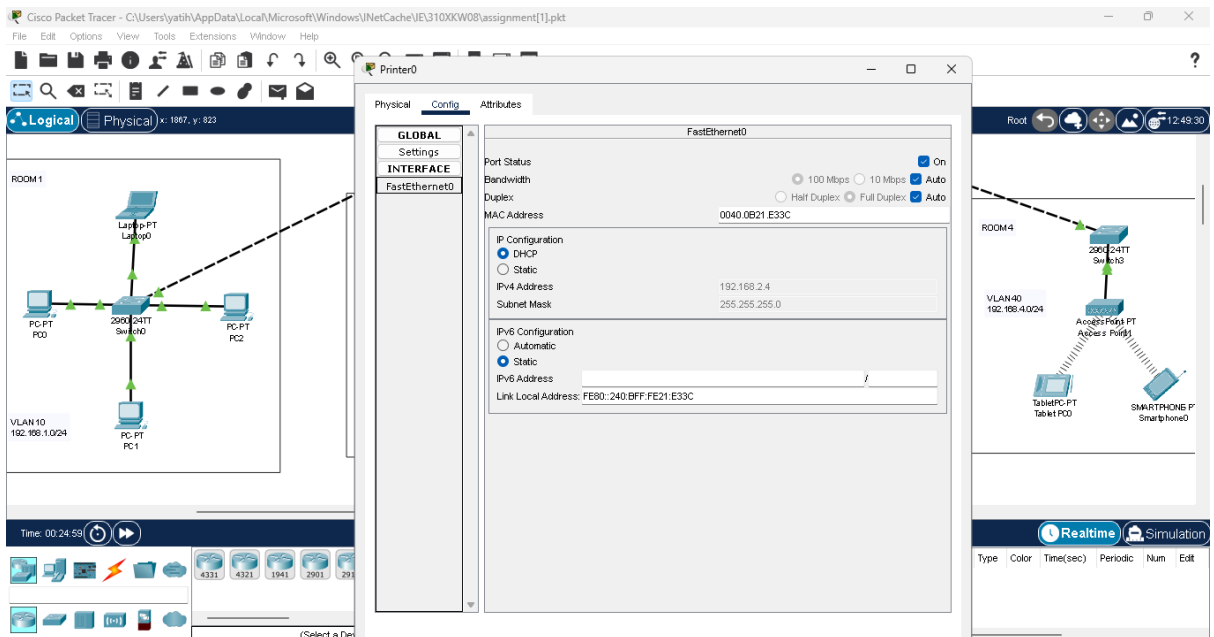
I. Click on the printer > click config



II. Drop down interface



III. Click FastEthernet0 > select DHCP for IP Configuration



- I. Click on the tablet or smartphone > click config > drop down interface > click wireless0 > select DHCP for IP Configuration



The screenshot displays the Cisco Packet Tracer interface. On the left, a network topology is shown in the 'Physical' tab. A Multi-layer Switch (R10) is connected to a 2950 Switch (Switch2) and an Access Point (Access Point1). The Access Point is connected to a Laptop (Laptop1). The PC command prompt on the right shows a successful ping to 192.168.4.2.

Network Topology:

- Multi-layer Switch (R10):** Connected to 2950 Switch (Switch2) and Access Point (Access Point1).
- 2950 Switch (Switch2):** Connected to Multi-layer Switch (R10) and Access Point (Access Point1).
- Access Point (Access Point1):** Connected to 2950 Switch (Switch2) and Laptop (Laptop1).
- Laptop (Laptop1):** Connected to Access Point (Access Point1).

PC Command Prompt:

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.4.2

Pinging 192.168.4.2 with 32 bytes of data:

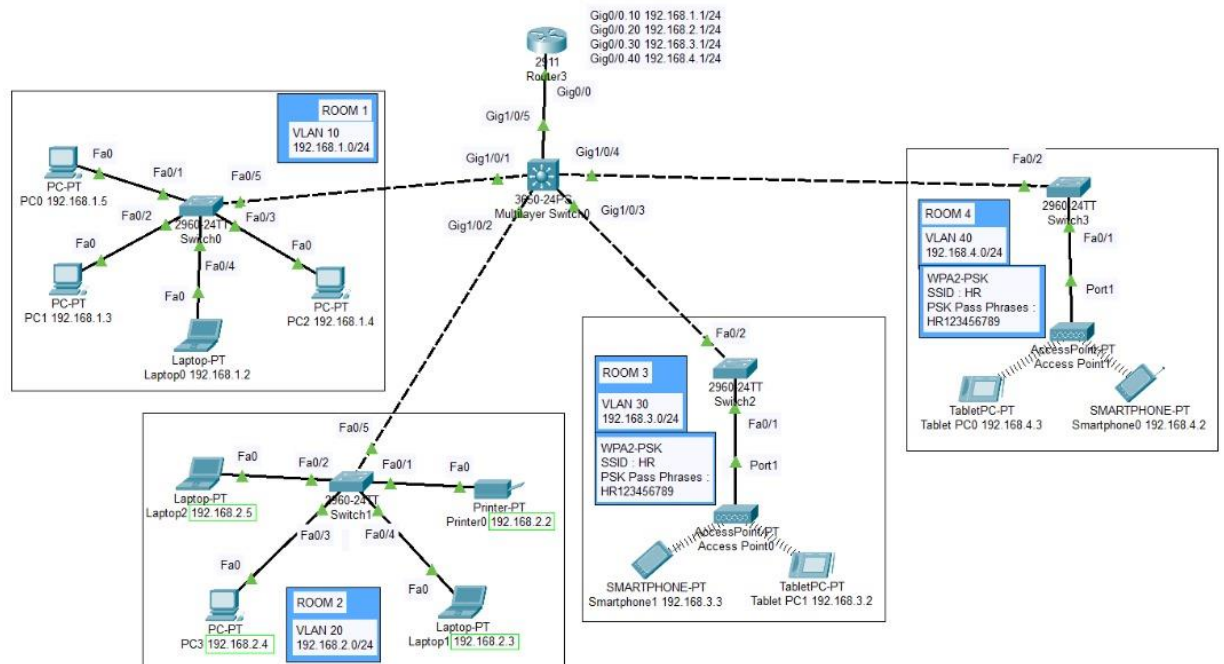
Request timed out.
Reply from 192.168.4.2: bytes=32 time=1ms TTL=127
Reply from 192.168.4.2: bytes=32 time=1ms TTL=127
Reply from 192.168.4.2: bytes=32 time=1ms TTL=127

Ping statistics for 192.168.4.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 11ms, Maximum = 16ms, Average = 13ms

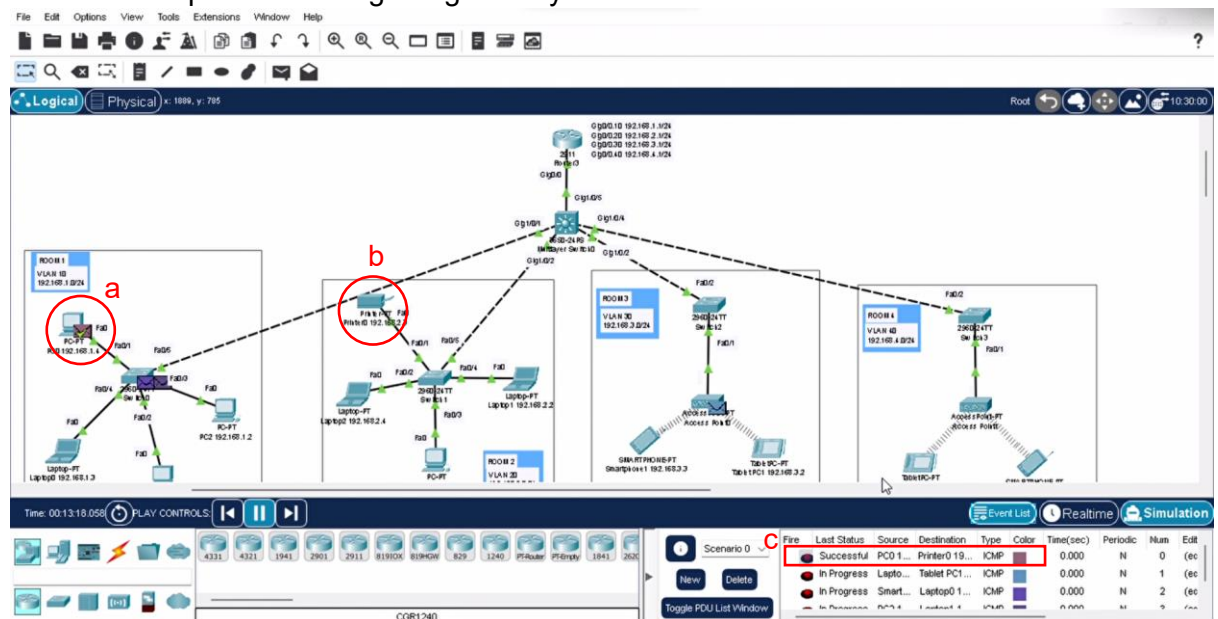
C:\>
```

4.0 Result And Discussion

Below is the finalization of the system that have 4 room connect to the main switch and goes to the router



Simulation of packet sending trough the system :



PC0 (192.168.1.1) in ROOM 1 sends a packet to Printer (192.168.1.73) in ROOM 2 which is from a to b. The packet first goes to the router in ROOM 1, which acts as the gateway. From there, the router forwards the packet to the core switch, which performs inter-VLAN routing to identify the correct VLAN and destination. The core switch then routes the packet to the router in ROOM 2. Finally, the router delivers the packet to the printer via the local switch in ROOM 2. The simulation confirms that the communication was successful. The result can be referred on the c mark above.

5.0 Conclusion

The network design and simulation using Cisco Packet Tracer successfully achieved the objectives of creating a functional, efficient, and scalable network infrastructure for a small organization. By implementing VLAN configurations, inter-VLAN routing, and DHCP services, we ensured reliable connectivity and efficient resource management. The successful packet communication between devices in different VLANs demonstrated the network's functionality. This project enhanced our practical skills in network design, device configuration, and troubleshooting within a simulated environment.

6.0 Link Video

<https://youtu.be/UwPxqqppkNM?si=73q3BoOJsMXX3A9E>