

Week Two: Assignment 1: Packet Tracer - Build a Switch and Router Network

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CLOUD AND NETWORK SECURITY S2-2025

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CS-CNS09-25020

Week Two: Assignment 1

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Introduction

In this lab, I set out to apply and reinforce my knowledge of essential Cisco IOS commands through a hands-on network configuration exercise. My objective was to cable network equipment according to a given topology, configure routers and switches to match the addressing table, and verify connectivity across the network. This lab challenged me to rely on my understanding rather than step-by-step instructions, pushing me to troubleshoot and configure the devices independently.

I worked with Cisco 4221 routers running IOS XE Release 16.9.4 and Catalyst 2960 switches with IOS Release 15.2(2). Before beginning, I ensured that all devices were erased and initialized with no startup configurations. I also configured the Switch Database Manager (SDM) to support both IPv4 and IPv6 by applying the dual-ipv4-and-ipv6 template—an essential step for enabling advanced routing capabilities.

Once the devices were configured, I tested for end-to-end connectivity and used IOS commands to retrieve device information and answer analysis questions. This lab not only tested my technical skills but also strengthened my confidence in configuring, managing, and verifying Cisco-based networks in a realistic, self-guided environment.

Part 1: Set Up Topology and Initialize devices

Step 1: Cable the network as shown in the topology.

a. Attach the devices shown in the topology diagram, and cable, as necessary.

b. Power on all the devices in the topology

Topology

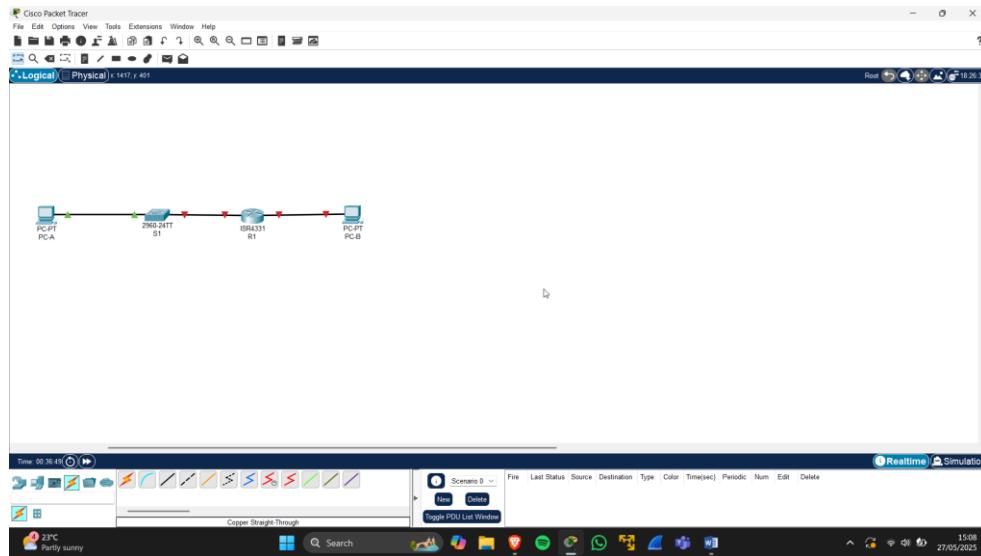


Figure 1: Evidence of topology setup

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Step 2: Initialize and reload the router and switch.

If configuration files were previously saved on the router and switch, initialize and reload these devices back to their default configurations.

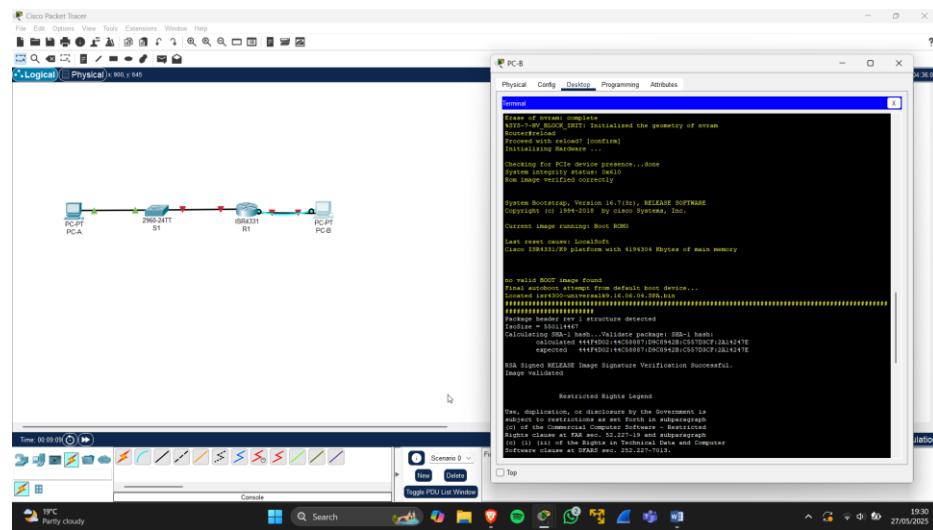


Figure 2: Initialized on PC-B

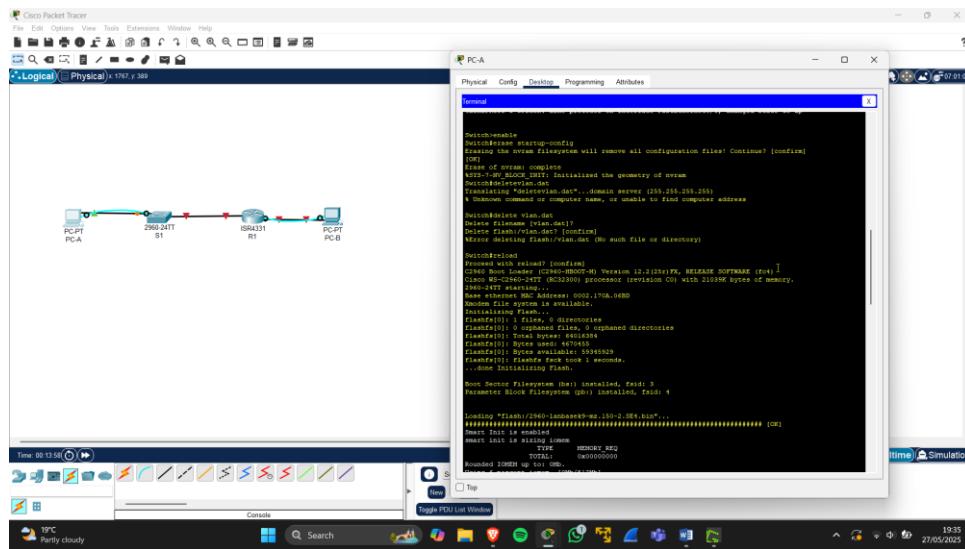


Figure 3: Initialized on PC-A

Part 2: Configure Devices and Verify Connectivity

Step 1: Assign static IP information to the PC interfaces.

Addressing Table

Device	Interface	IP Address / Prefix	Default Gateway
R1	G0/0/0	192.168.0.1 /24 2001:db8:acad::1/64 fe80::1	N/A
	G0/0/1	192.168.1.1 /24 2001:db8:acad:1::1/64 fe80::1	N/A
	S1	VLAN 1	192.168.1.2 /24
PC-A	NIC	192.168.1.3 /24 2001:db8:acad:1::3/64	192.168.1.1 fe80::1
PC-B	NIC	192.168.0.3 /24 2001:db8:acad:3::3/64	192.168.0.1 fe80::1

- a. Configure the IP address, subnet mask, and default gateway settings on PC-A.

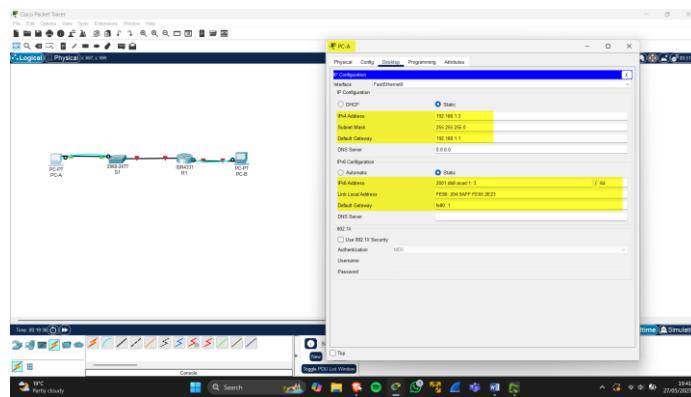


Figure 5: Evidence of configuration on PC-A

- b. Configure the IP address, subnet mask, and default gateway settings on PC-B.

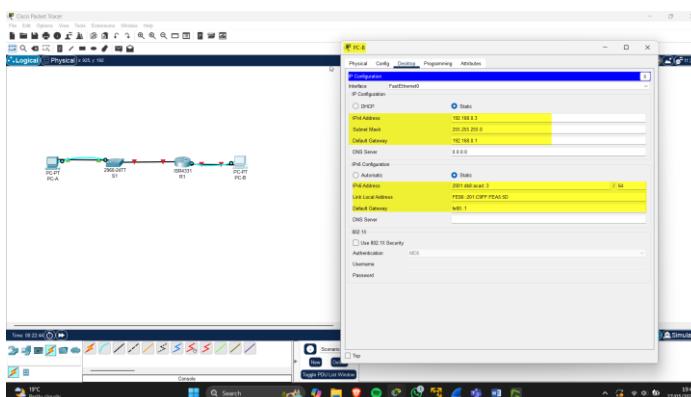


Figure 6: Evidence of configuration on PC-B

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- c. Ping PC-B from a command prompt window on PC-A.

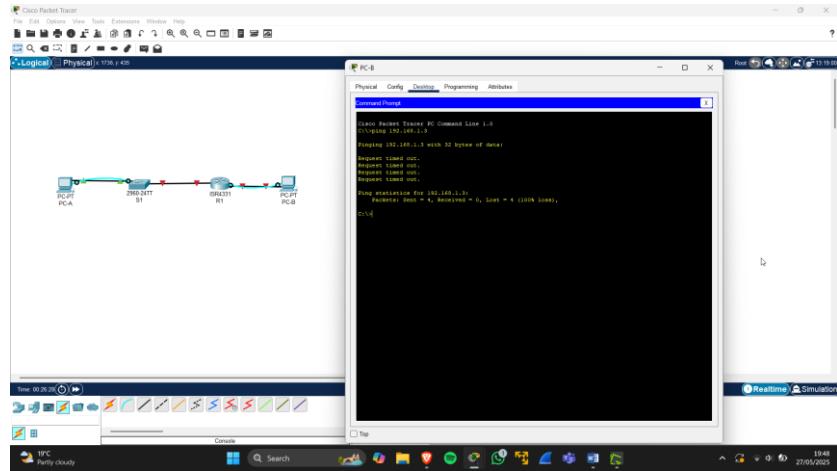


Figure 7: Evidence of pinging PC-A from PC-B

Note: If pings are not successful, the Windows Firewall may need to be turned off.

Question: Why were the pings not successful?

Since the router interfaces acting as default gateways are not yet configured, traffic between subnets cannot be routed.

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Step 2: Configure the router.

- Console into the router and enable privileged EXEC mode. Open configuration window

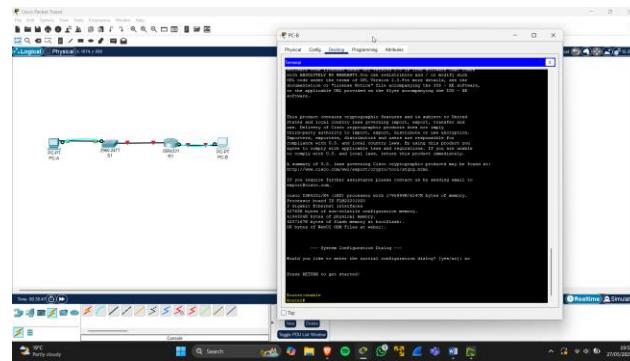


Figure 8: Entering EXEC mode

- Enter configuration mode.

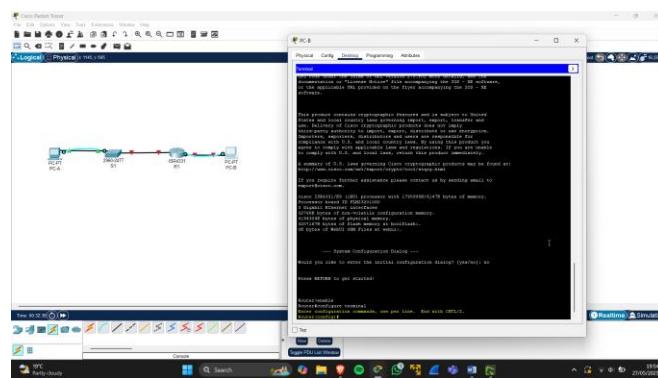


Figure 9: Configuration mode

- Assign a device name to the router.

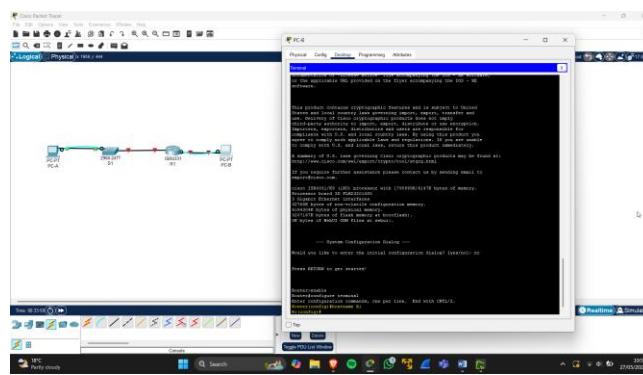


Figure 10: Assigned R1 to the router

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- d. Disable DNS lookup to prevent the router from attempting to translate incorrectly entered commands as though they were host names.

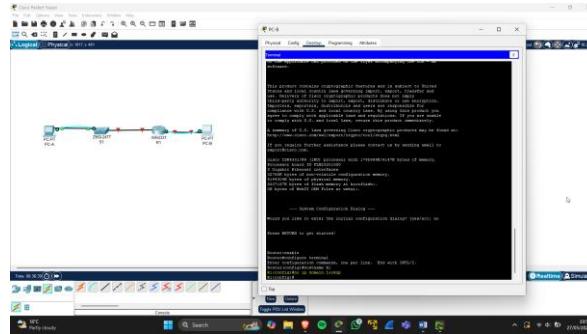


Figure 11: Disabled DNS Lookup

- e. Assign class as the privileged EXEC encrypted password.

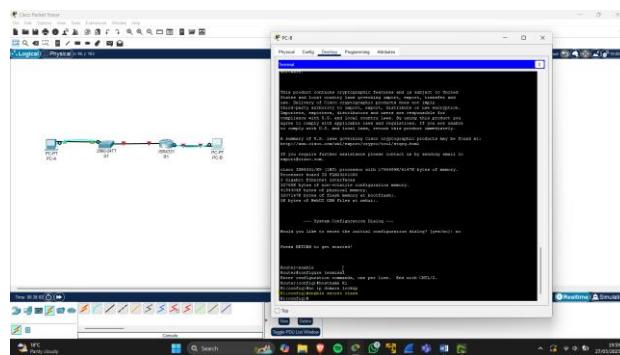


Figure 12: Password class encrypted

- f. Assign cisco as the console password and enable login.

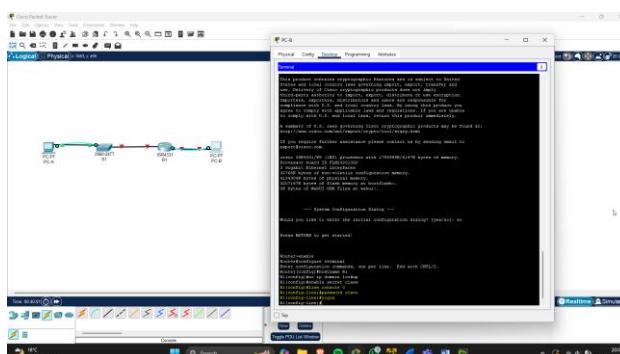


Figure 13: Cisco assigned as console password

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- g. Assign cisco as the VTY password and enable login.

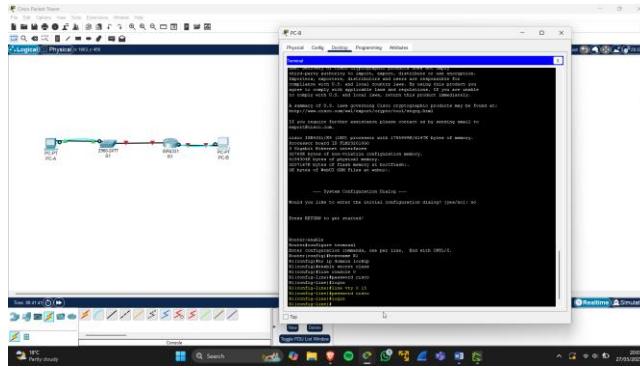


Figure 14: Cisco assigned as VTY password

- h. Encrypt the plaintext passwords.

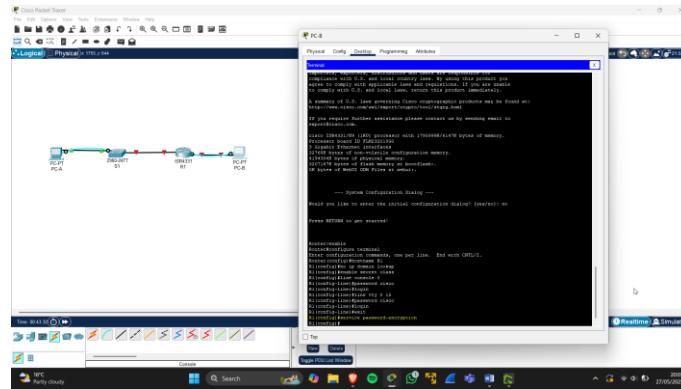


Figure 15: Plaintext passwords encrypted

- i. Create a banner that warns anyone accessing the device that unauthorized access is prohibited

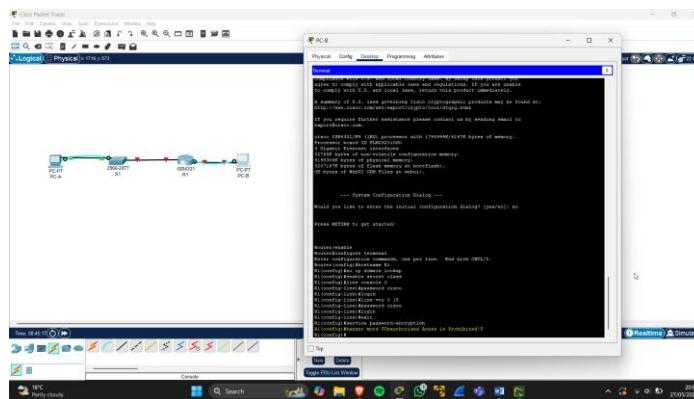


Figure 15: Banner set “Unauthorized access is prohibited!”

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- j. Configure and activate both interfaces on the router.

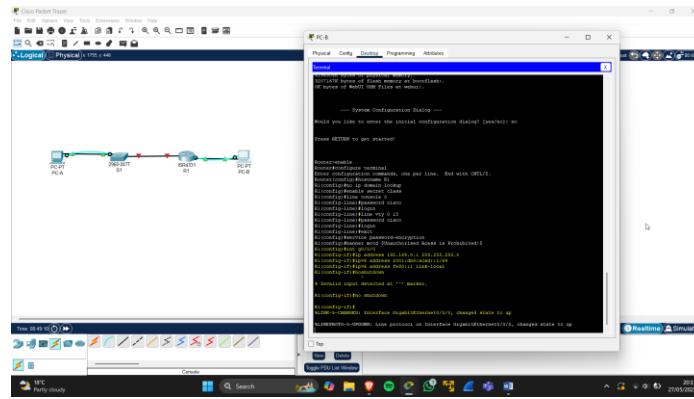


Figure 16: interface g0/0/0 configured

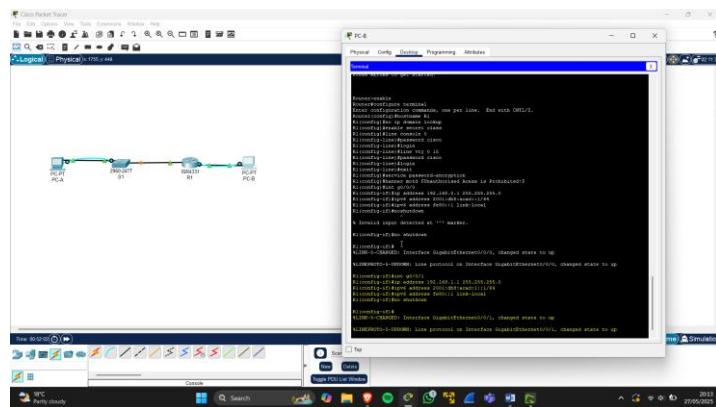


Figure 17: interface g0/0/1 configured

- k. Configure an interface description for each interface indicating which device is connected to it.

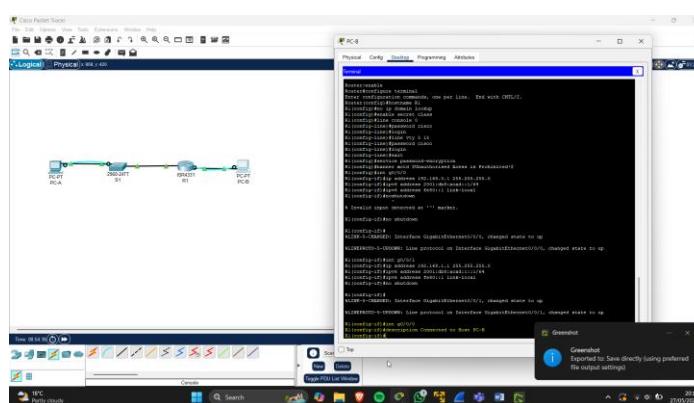


Figure 18: g0/0/0 description set

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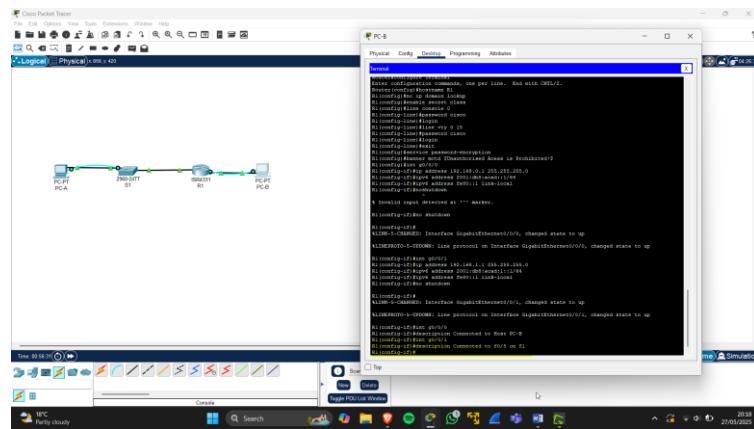


Figure 19: g0/0/1 description set

- I. To enable IPv6 routing, enter the command `ipv6 unicast-routing`.

```
R1 (config) # ipv6 unicast-routing
```

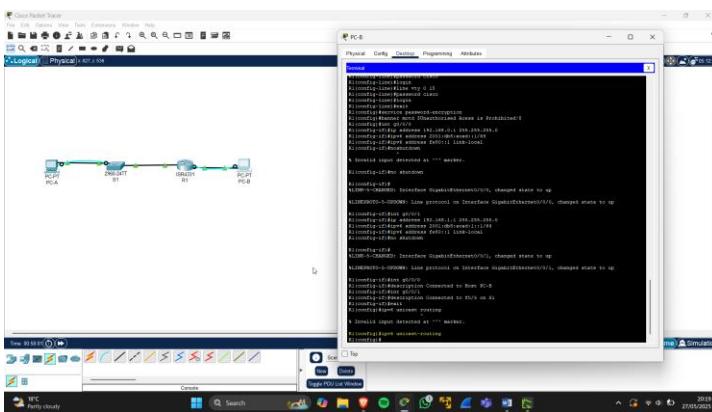


Figure 20: ipv6 unicast-routing set

- m. Save the running configuration to the startup configuration file.

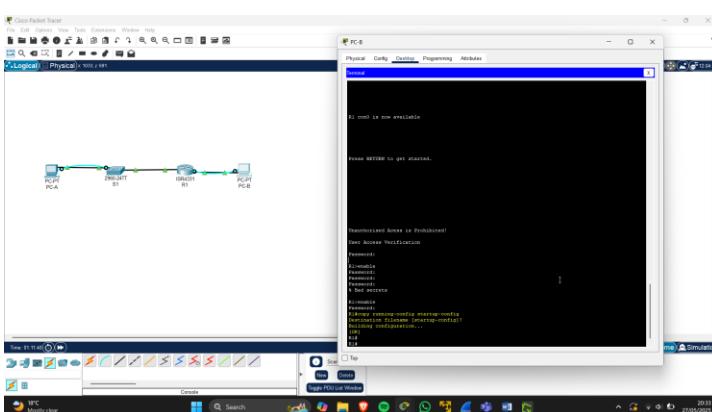


Figure 21: Saved config file

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n. Set the clock on the router.

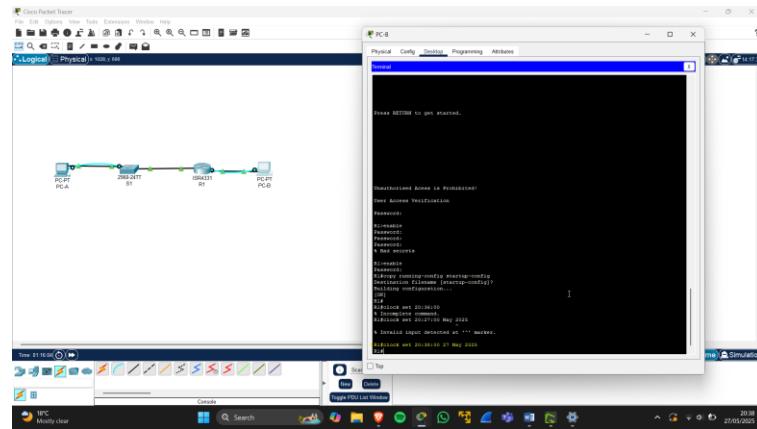


Figure 22: clock and date set

Note: Use the question mark (?) to help with the correct sequence of parameters needed to execute this command. Close configuration window

o. Ping PC-B from a command prompt window on PC-A.

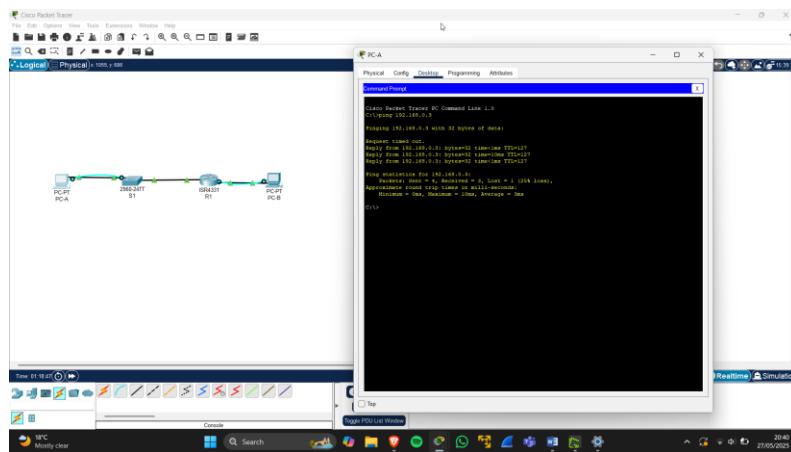


Figure 23: Pinged PC-B from PC-A

Note: If pings are not successful, the Windows Firewall may need to be turned off.

Question: Were the pings successful? Explain.

Yes. They were successful however, the first ping failed due to ARP process. The router is routing the ping traffic across the two subnets.

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Step 3: Configure the switch

In this step, you will configure the hostname, the VLAN 1 interface and its default gateway. Open configuration window

- Console into the switch and enable privileged EXEC mode.

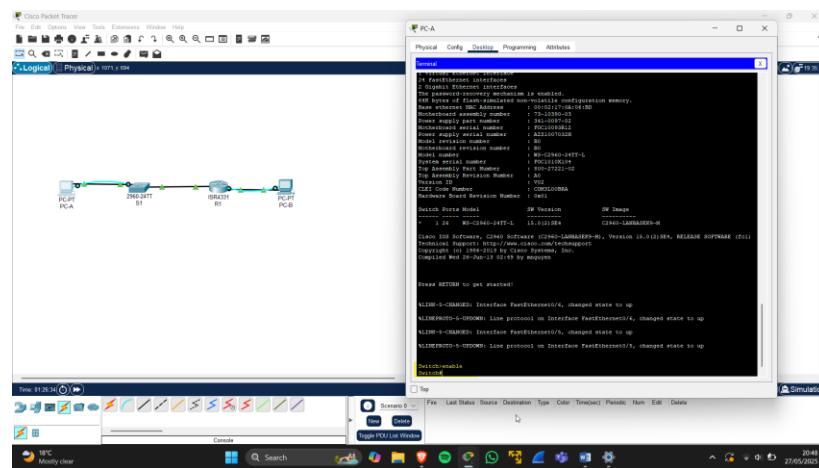


Figure 24: EXEC mode enabled

- Enter configuration mode.

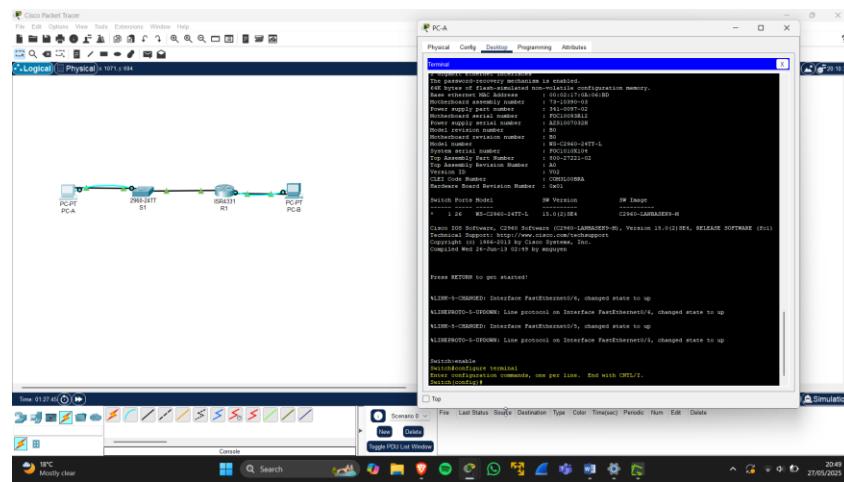


Figure 25: Global configuration mode

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- c. Assign a device name to the switch.

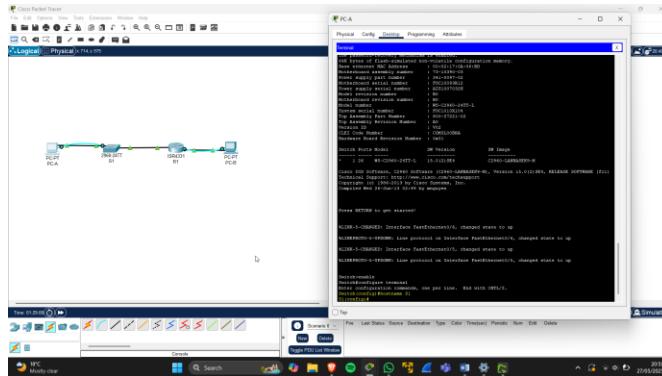


Figure 26: hostname configured to S1

- d. Disable DNS lookup to prevent the router from attempting to translate incorrectly entered commands as though they were host names.

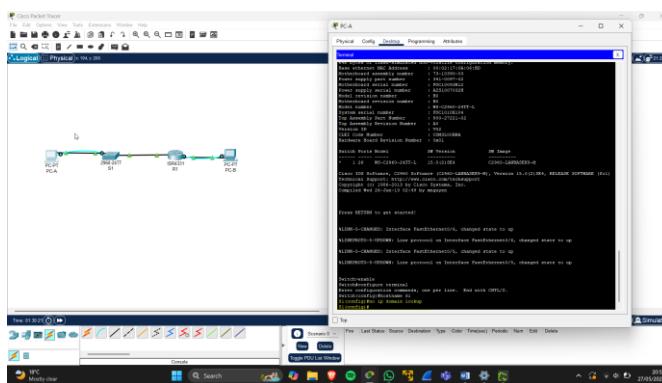


Figure 27: DNS lookup disabled

- e. Configure and activate the VLAN interface on the switch S1.

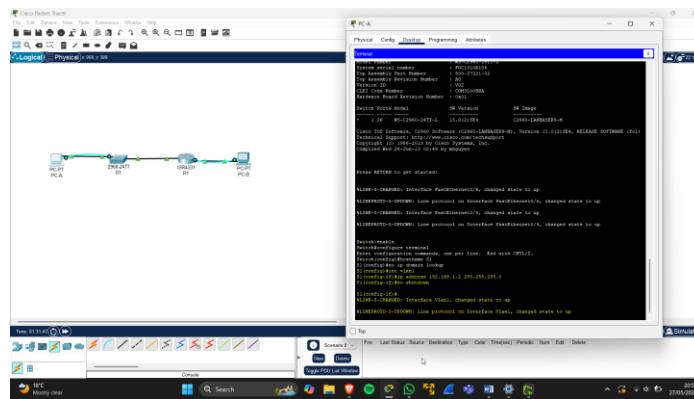


Figure 28: VLAN activated and configured

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- f. Configure the default gateway for the switch S1.

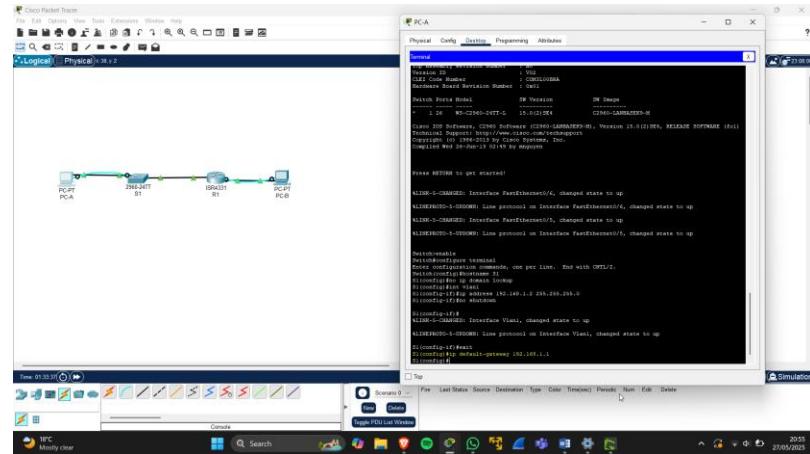


Figure 29: Default gateway configured

- g. Save the running configuration to the startup configuration file.

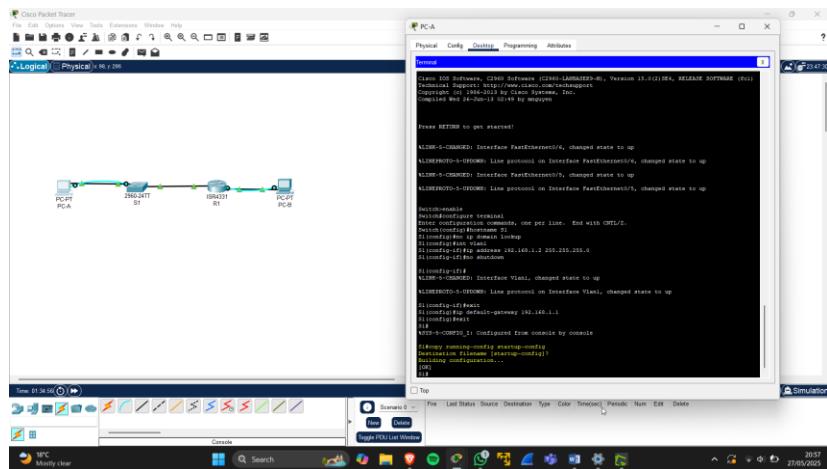
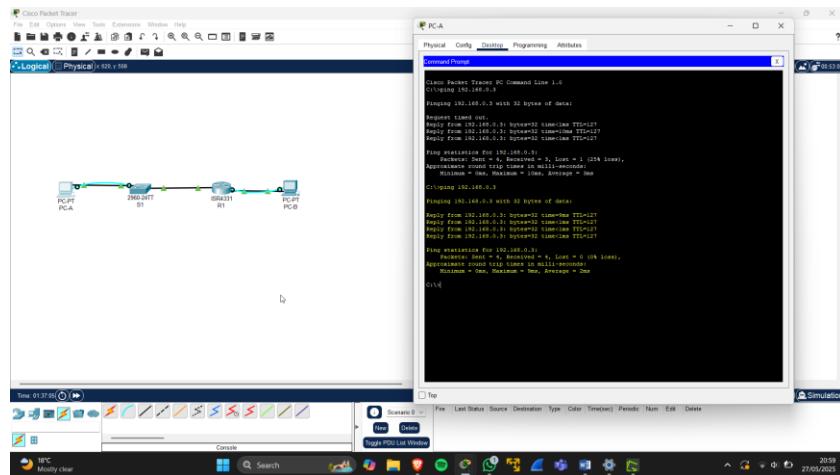


Figure 30: Running config saved to startup config

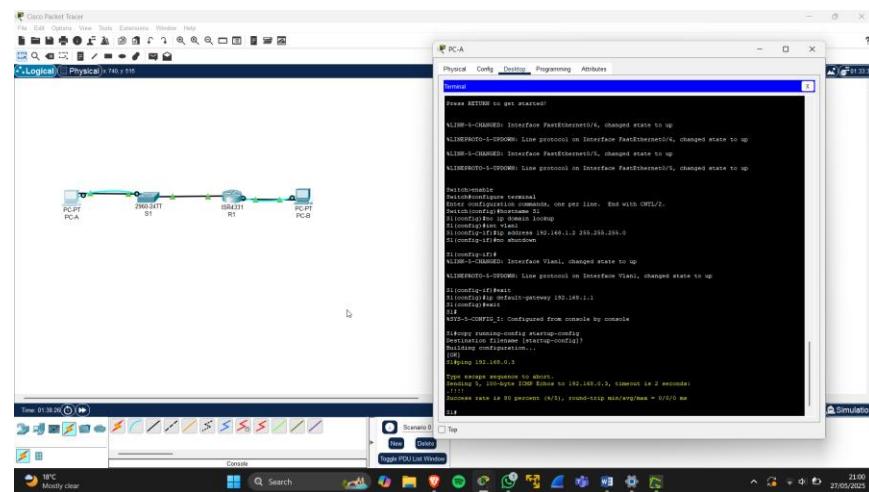
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Step 4: Verify connectivity end-to-end connectivity.

- From PC-A, ping PC-B.



- From S1, ping PC-B.



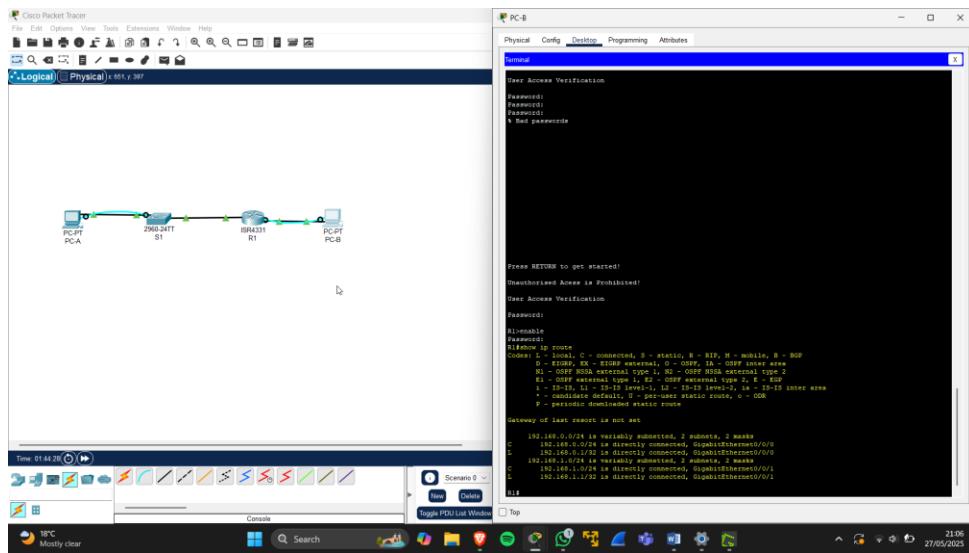
All the pings are successful!

Part 3: Display Device Information

In Part 3, you will use show commands to retrieve interface and routing information from the router and switch.

Step 1: Display the routing table on the router.

- Use the show ip route command on the router R1 to answer the following questions.



Questions:

What code is used in the routing table to indicate a directly connected network?

C - Connected

How many route entries are coded with a C code in the routing table?

Two Subnets

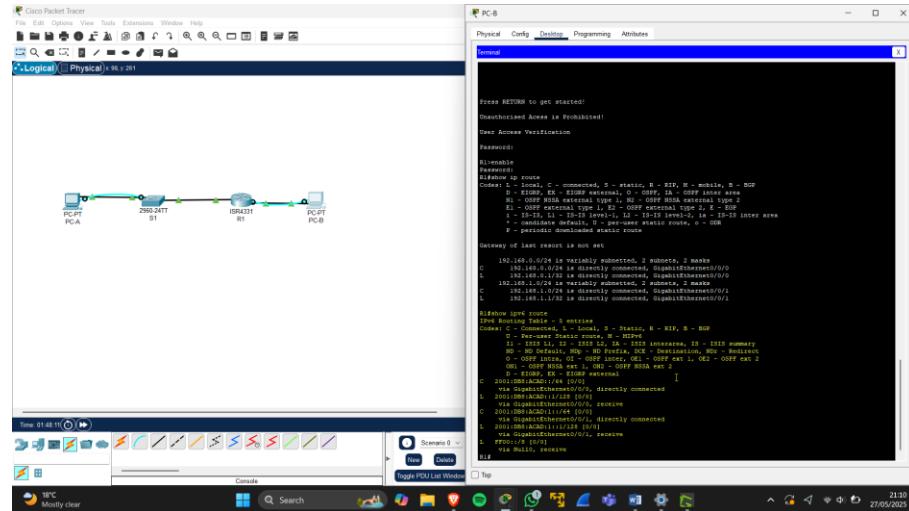
What interface types are associated to the C coded routes?

GigabitEthernet 0/0/0

GigabitEthernet 0/0/1

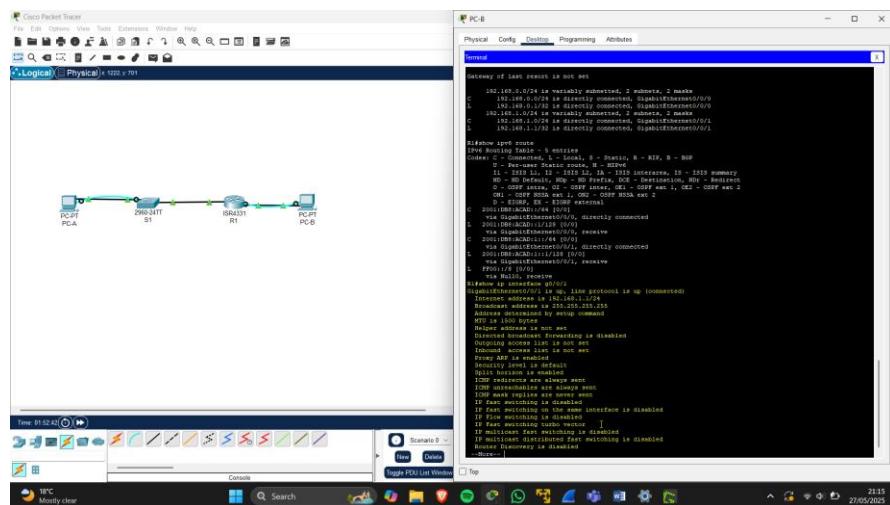
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- b. Use the show ipv6 route command on router R1 to display the IPv6 routes.



Step 2: Display interface information on the router R1.

- a. Use the show ip interface g0/0/1 to answer the following questions.



Questions:

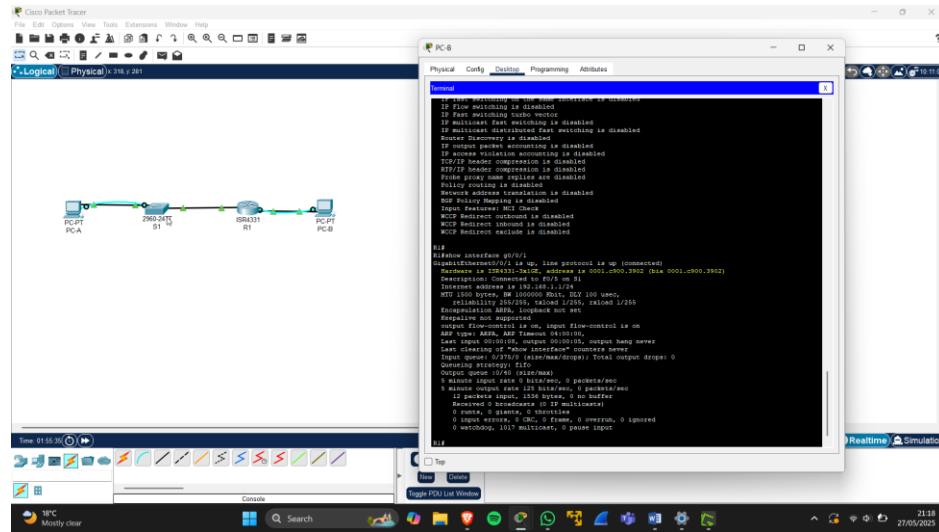
What is the operational status of the G0/0/1 interface?

GigabitEthernet0/0/1 is up, line protocol is up

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What is the Media Access Control (MAC) address of the G0/1 interface?

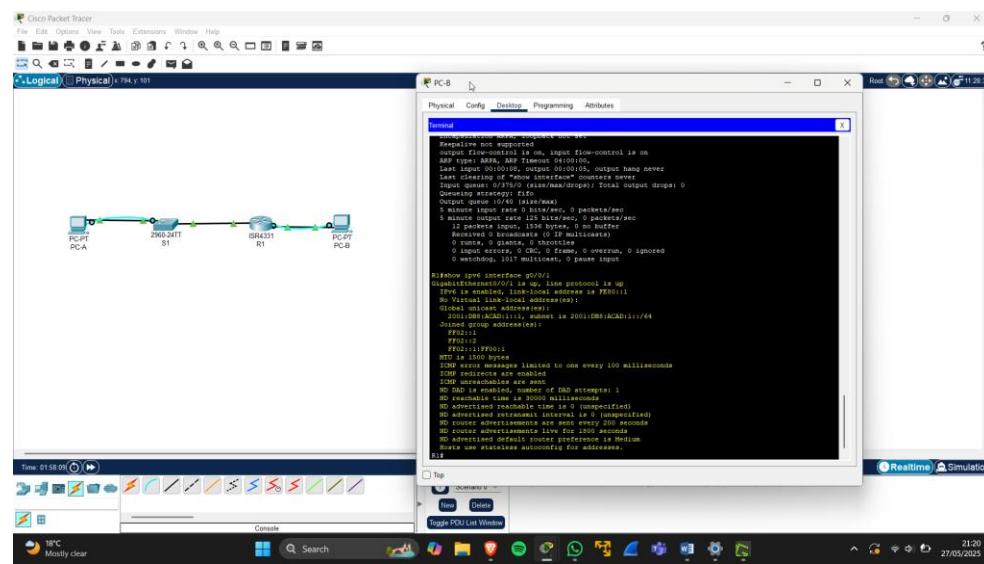
0001.c900.3902



How is the Internet address displayed in this command?

Internet address is 192.168.1.1/24.

- b. For the IPv6 information, enter the show ipv6 interface command.



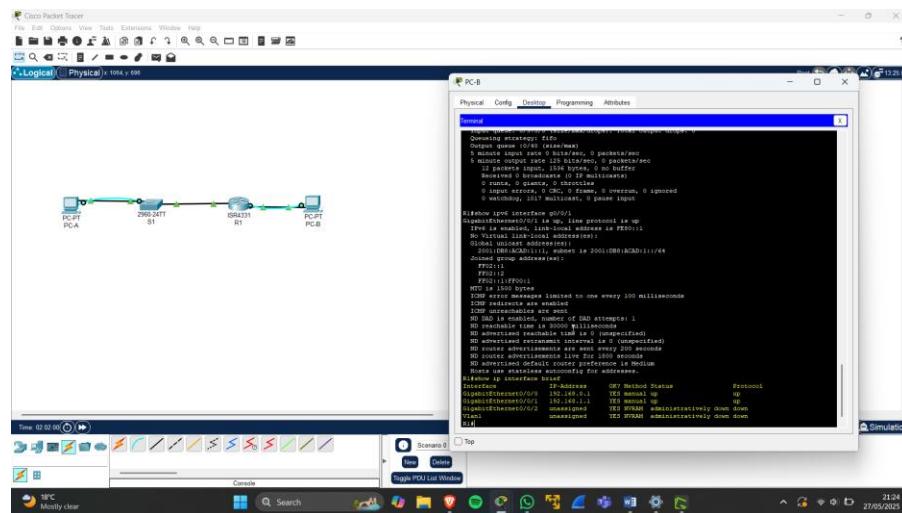
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Step 3: Display a summary list of the interfaces on the router and switch

There are several commands that can be used to verify an interface configuration. One of the most useful of these is the show ip interface brief command. The command output displays a summary list of the interfaces on the device and provides immediate feedback to the status of each interface.

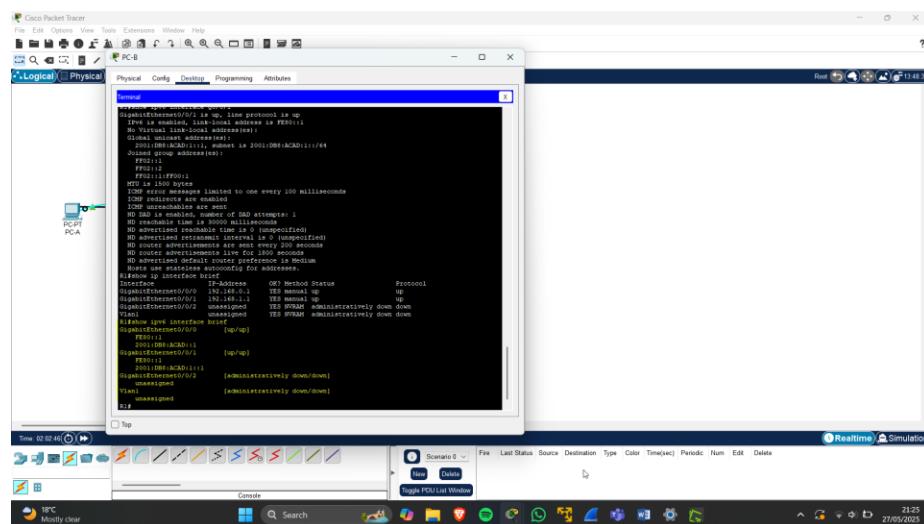
- Enter the show ip interface brief command on the router

R1# show ip interface brief



- To see the IPv6 interface information, enter the show ipv6 interface brief command on R1.

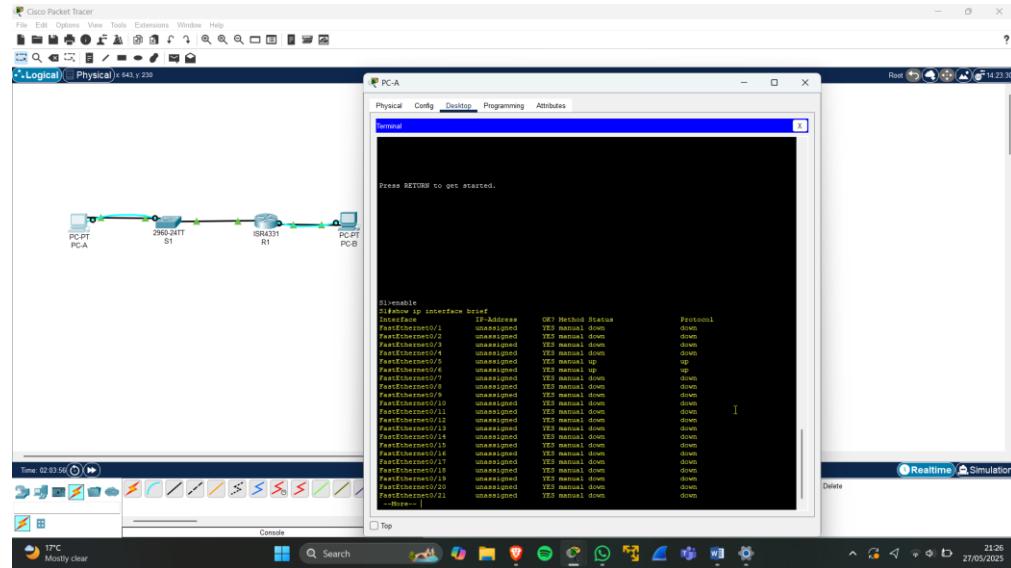
R1# show ipv6 interface brief



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- c. Enter the show ip interface brief command on the switch S1.

```
S1# show ip interface brief
```



Reflection Questions

1. If the G0/0/1 interface showed that it was administratively down, what interface configuration command would you use to turn the interface up?

R1 (config-if) # no shutdown

2. What would happen if you had incorrectly configured interface G0/0/1 on the router with an IP address of 192.168.1.2?

PC-A can't ping PC-B because they're on different networks, and that means a router (the default gateway) needs to handle the communication between them. PC-A is set up to use 192.168.1.1 as its gateway, but that IP isn't actually assigned to any device in the network. So, when PC-A tries to send packets out of its network, they have nowhere to go—they just get lost.

Conclusion

Completing this lab gave me a valuable opportunity to apply my theoretical understanding of IOS commands in a hands-on environment. From cabling the devices and assigning IP addresses to configuring interfaces and verifying connectivity, I was able to simulate the setup of a functional network from the ground up. Testing my configurations and troubleshooting connectivity issues without relying heavily on prior examples helped reinforce my problem-solving skills and deepened my confidence in navigating Cisco IOS.

One of the key lessons I learned is the importance of verifying every step—whether it's checking interface statuses, confirming IP assignments, or ensuring the correct SDM template is applied. I also realized how crucial it is to have a properly configured default gateway for routing traffic between different networks. Small misconfigurations can lead to major connectivity issues, and knowing how to systematically diagnose and resolve them is a critical skill in real-world networking.

Overall, this lab helped solidify my understanding of network setup, Layer 2 and Layer 3 device configuration, and the importance of attention to detail in networking tasks. It was a practical, challenging, and rewarding experience that sharpened both my technical abilities and my confidence.