Skill Development Course II

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Aim: Campus Network Analysis

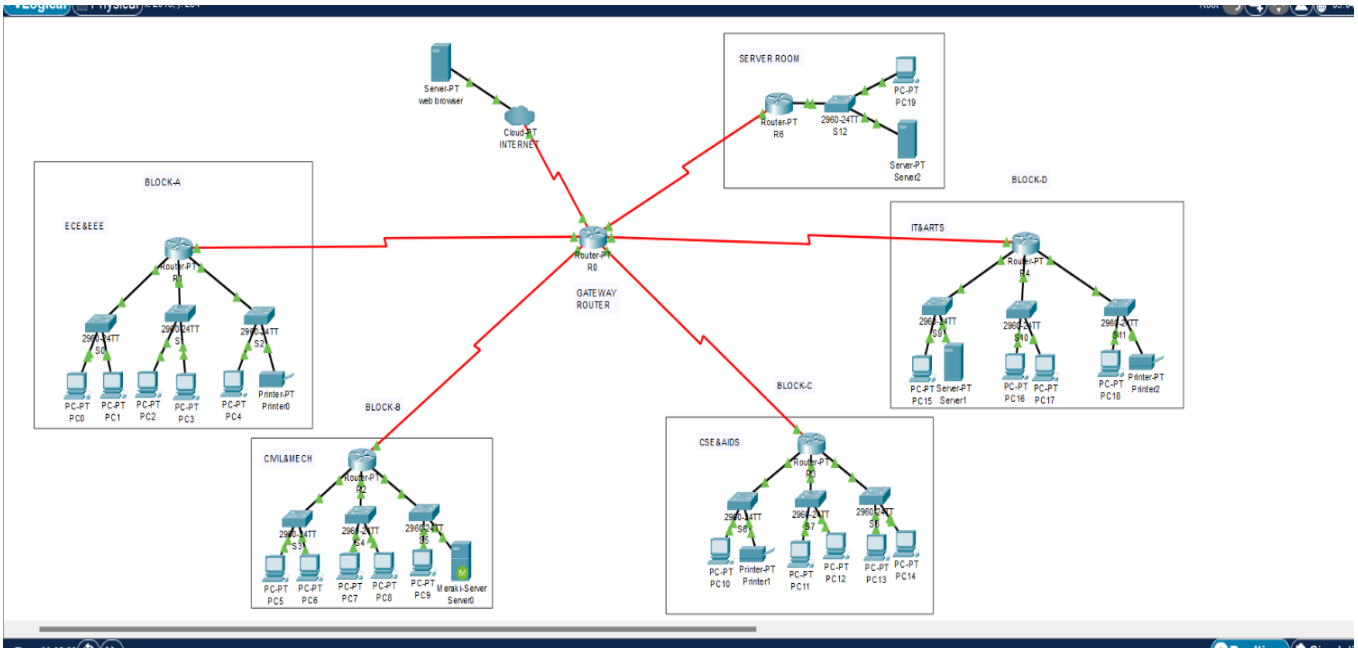
Problem Statement: Choose a university or college campus and conduct an analysis of its existing network topology, including the layout, devices, and connections.

Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R0	Serial0/0	192.160.1.1	255.255.255.0	N/A
	Serial1/0	192.161.1.1	255.255.255.0	N/A
	Serial2/0	192.162.1.1	255.255.255.0	N/A
	Serial3/0	192.163.1.1	255.255.255.0	N/A
	Serial4/0	192.170.10.1	255.255.255.0	N/A
R1	Serial0/0	192.160.1.2	255.255.255.0	N/A
	Fastethernet3/0	192.168.1.1	255.255.255.0	N/A
	Fastethernet4/0	192.168.2.1	255.255.255.0	N/A
	Fastethernet5/0	192.168.3.1	255.255.255.0	N/A
R2	Serial0/0	192.161.1.2	255.255.255.0	N/A
	Fastethernet3/0	192.168.4.1	255.255.255.0	N/A
	Fastethernet4/0	192.168.5.1	255.255.255.0	N/A
	Fastethernet5/0	192.168.6.1	255.255.255.0	N/A
R3	Serial0/0	192.162.1.2	255.255.255.0	N/A
	Fastethernet3/0	192.168.7.1	255.255.255.0	N/A
	Fastethernet4/0	192.168.8.1	255.255.255.0	N/A
	Fastethernet5/0	192.168.9.1	255.255.255.0	N/A
R4	Serial0/0	192.163.1.2	255.255.255.0	N/A
	Fastethernet3/0	192.168.10.1	255.255.255.0	N/A
	Fastethernet4/0	192.168.11.1	255.255.255.0	N/A
	Fastethernet5/0	192.168.12.1	255.255.255.0	N/A
R5	Serial0/0	192.170.10.2	255.255.255.0	N/A
	Fastethernet1/0	192.180.10.1	255.255.255.0	N/A

Device	Interface	IP Address	Subnet Mask	Default Gateway
PC0	Fastethernet0	192.168.1.2	255.255.255.0	192.168.1.1
PC1	Fastethernet0	192.168.1.3	255.255.255.0	192.168.1.1
PC2	Fastethernet0	192.168.2.2	255.255.255.0	192.168.2.1
PC3	Fastethernet0	192.168.2.3	255.255.255.0	192.168.2.1
PC4	Fastethernet0	192.168.3.2	255.255.255.0	192.168.3.1
PC5	Fastethernet0	192.168.4.2	255.255.255.0	192.168.4.1
PC6	Fastethernet0	192.168.4.3	255.255.255.0	192.168.4.1
PC7	Fastethernet0	192.168.5.2	255.255.255.0	192.168.5.1
PC8	Fastethernet0	192.168.5.3	255.255.255.0	192.168.5.1
PC9	Fastethernet0	192.168.6.2	255.255.255.0	192.168.6.1
PC10	Fastethernet0	192.168.7.2	255.255.255.0	192.168.7.1
PC11	Fastethernet0	192.168.8.2	255.255.255.0	192.168.8.1
PC12	Fastethernet0	192.168.8.3	255.255.255.0	192.168.8.1
PC13	Fastethernet0	192.168.9.2	255.255.255.0	192.168.9.1
PC14	Fastethernet0	192.168.9.3	255.255.255.0	192.168.9.1
PC15	Fastethernet0	192.168.10.2	255.255.255.0	192.168.10.1
PC16	Fastethernet0	192.168.11.2	255.255.255.0	192.168.11.1
PC17	Fastethernet0	192.168.11.3	255.255.255.0	192.168.11.1
PC18	Fastethernet0	192.168.12.2	255.255.255.0	192.168.12.1
PC19	Fastethernet0	192.170.10.2	255.255.255.0	192.180.10.1
Printer0	Fastethernet0	192.168.3.3	255.255.255.0	192.168.3.1
Printer1	Fastethernet0	192.168.1.2	255.255.255.0	192.168.7.1
Printer2	Fastethernet0	192.168.7.3	255.255.255.0	192.168.12.1
Server0	Fastethernet0	192.168.6.3	255.255.255.0	192.168.6.1
Server1	Fastethernet0	192.168.10.3	255.255.255.0	192.168.10.1
Server2	Fastethernet0	192.170.10.3	255.255.255.0	192.180.10.1

Campus Network Topology



Objectives

Part A: Set Up the Campus Network Topology

Part B: Configure the Router and end devices

Part C: Verify connectivity between the blocks

Background / Scenario

In this lab, we will build a simple campus network topology with a default gateway router connected to four blocks (4 LANs), each block consists of three switches that are further connected to end devices. We will also configure the devices to match the addressing table. After the configurations have been saved, we will verify configurations by testing for network connectivity. IP addressing is done to the PCs and routers to enable communication between the devices. Use the ping utility to verify connectivity.

Note: Make sure that the routers have been erased and have no startup configurations.

Required Resources

• 6 Routers (Cisco PT-router with Cisco IOS XE Release 16.9.4 universal image or comparable)

• 13 Switches (Cisco 2960 with Cisco IOS Release 15.2(2) lanbasek9 image or comparable)

• 20 PCs (Windows with a terminal emulation program, such as Tera Term)

• 3 Printers(Cisco printer)

• Servers(Cisco Server)

• Serial DTE cables to configure the Cisco IOS devices via the serial ports

• Ethernet cables as shown in the topology

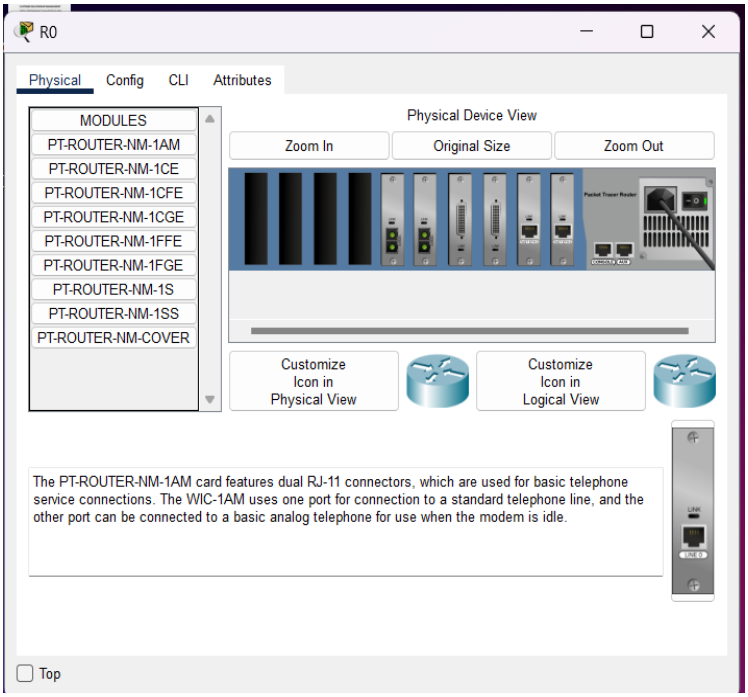
Part A: Set Up the Campus Network Topology

In part A, we will set up the network topology by adding the network devices to the workspace. The arrangement of the devices are done according to the above Campus Network Topology.

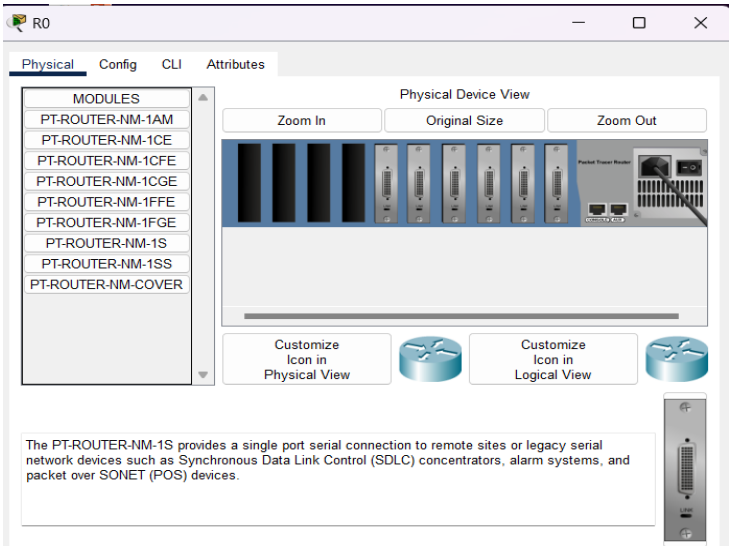
Step 1: Setting up the router devices on the Packet Tracer Logical workspace.

a. From the network component box, click on the Routers and drag-and-drop a PT-Router icon. According to the topology we need 6 PT-Router on the workspace therefore we follow the same way as done for the first router.

b. Change the display names of all the routers. As per the given topology the R0 is connected to six other routers through a serial connection. Therefore we are configuring the serial ports of the R0.

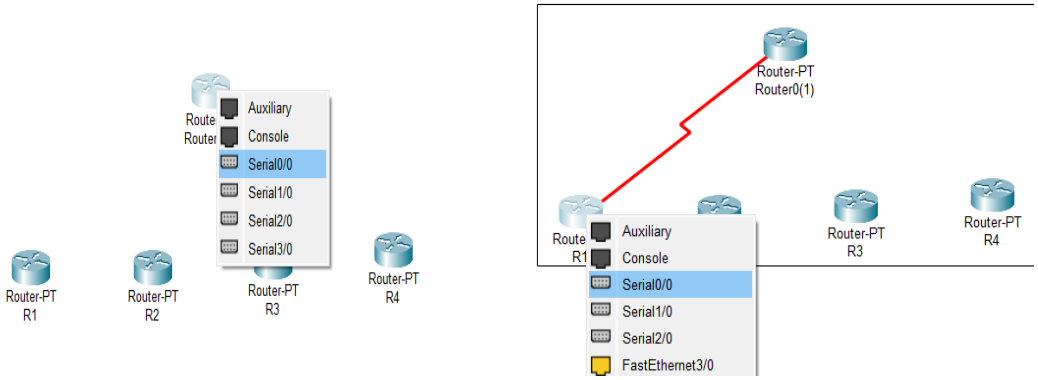


c. Click on R0 icon on the workspace and select the physical mode and turn off the router. Now remove all the modules and add six modules of PT-ROUTER-NM-1S.



d. Close the window and configure the remaining routers as per the topology by following the same steps.

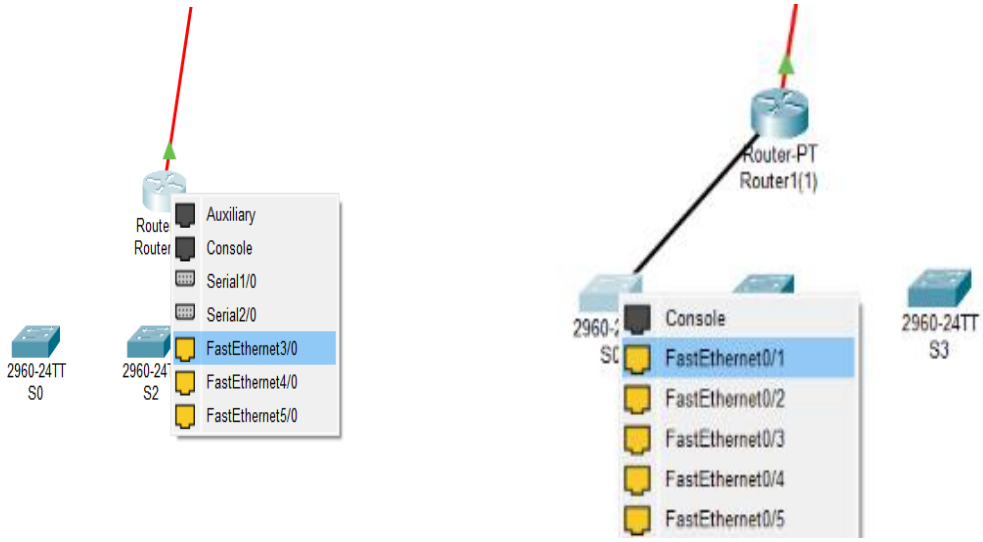
e. Click on Connections, then click on Serial DTE, then on R0, and select Serial0/0. After this, click on R1 and select Serial0/0. The link status LED should show up in green, indicating that the link is up after switching on the interface.



Step 2: Setting up the switch devices on the Packet Tracer Logical workspace.

a. According to the topology there are five routers each connected to a network of three switches differentiated by blocks. In block-A R1 is connected to three switches through a FastEthernet connections.

b. Click on Connections, then click on Copper Straight-through, then on R1, and select Fastethernet3/0. After this, click on S1 and select Fastethernet0/0. The link status LED should show up in green, indicating that the link is up after switching on the interface.



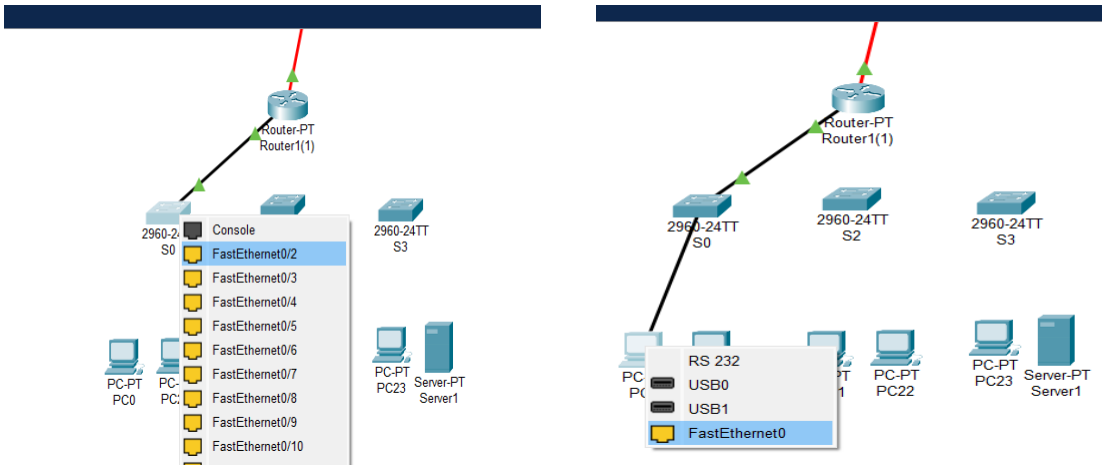
c. The same way S2 and S3 are connected to R1 through Copper Straight-Through cable.For all remaining blocks follow the same steps connecting according to the given topology.

Step 3: Setting up the end devices on the Packet Tracer Logical workspace.

a. In the given topology the switches of each block is further connected to end devices through Fastethernet interfaces.

b. For connecting end devices to the switches we use Copper Straight-Through cable connecting to the Fastethernet interfaces.

c. Click on Connections, then click on Copper Straight-through, then on S1, and select Fastethernet0. After this, click on PC0 and select Fastethernet0. The link status LED should show up in green, indicating that the link is up after switching on the interface.



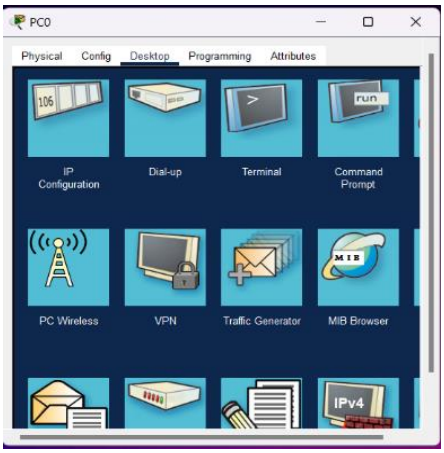
d. In the same way all the end devices are connected to the switches in all the blocks.

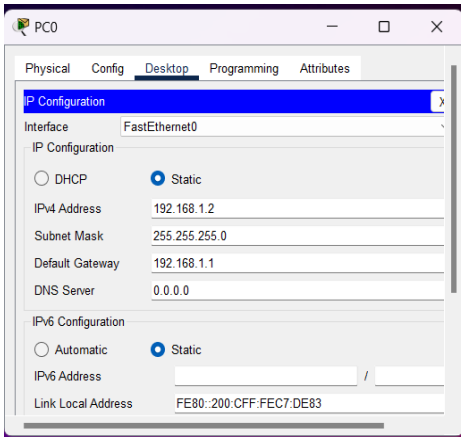
Part B: Configure the Router and end devices

In part B, we will set up the network topology and configure the basic settings, such as the interface IP addresses on routers and end devices. If configuration files were previously saved on the routers and end devices, initialize and reload these devices back to their default configurations.

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

a. Click on the PC0 icon on the Packet Tracer Logical workspace and select the Desktop tab and then the IP Configuration icon.



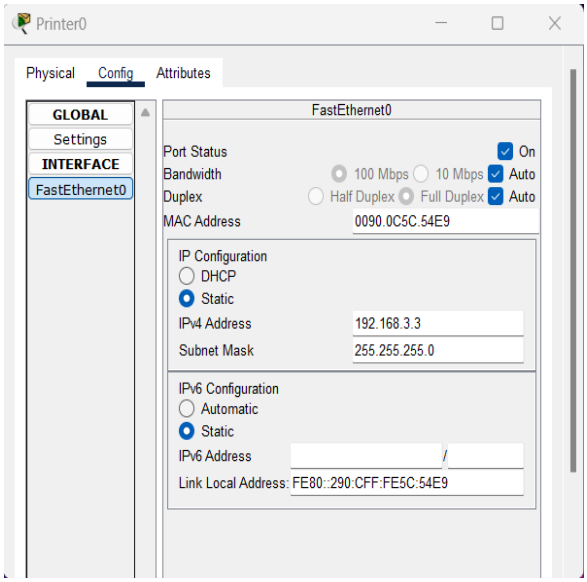


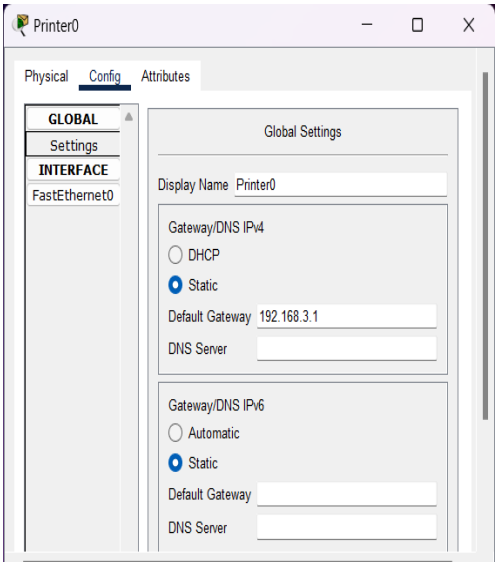
b. In the IP Configuration window, select the static radio button as shown in the figure and enter an IP address and subnet mask. In this topology, the default gateway is needed so enter the addresses according to the addressing table.

c. Close the window, open other PCs, and assign an IP address to it in the same way. Make sure they are given according to the addressing table.

Step 2: Assign static IP information to the printer interfaces.

a. Click on the Printer0 icon on the Packet Tracer Logical workspace and go to the config mode and select the fastethernet0 interface.





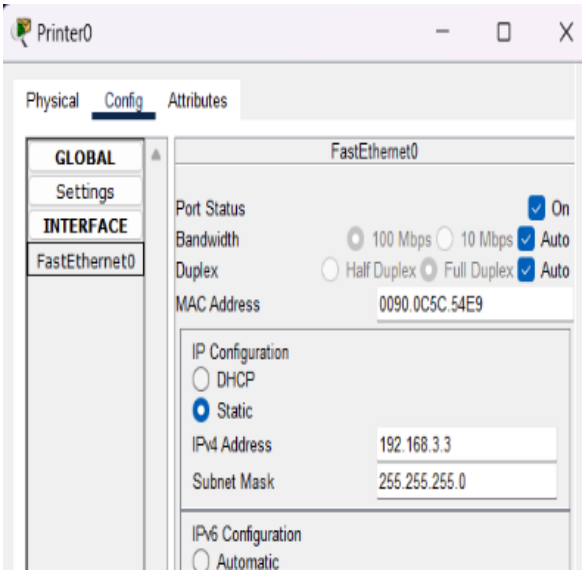
b. In the IP Configuration, select the static radio button as shown in the figure and enter an IP address and subnet mask. Go to the Global settings and assign the default gateway address according to the addressing table.

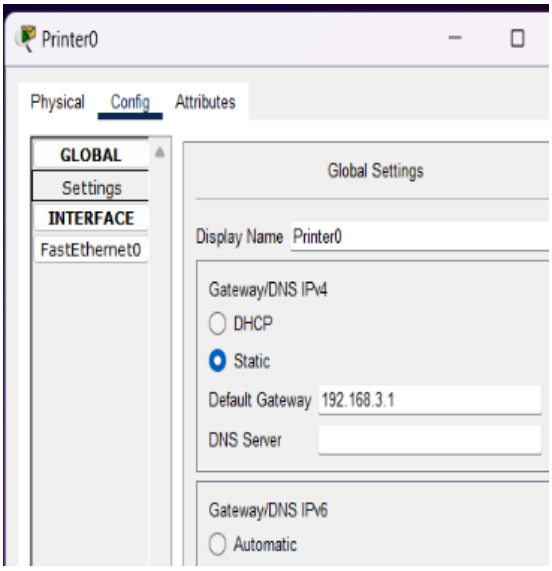
c. Close the window, open other Printers, and assign an IP address to it in the same way. Make sure they are given according to the addressing table.

Step 3: Assign static IP information to the server interfaces.

a. Click on the Server0 icon on the Packet Tracer Logical workspace and go to the config mode and select the fastethernet0 interface.

b. In the IP Configuration, select the static radio button as shown in the figure and enter an IP address and subnet mask. Now go to the Global settings and assign the default gateway address according to the addressing table.



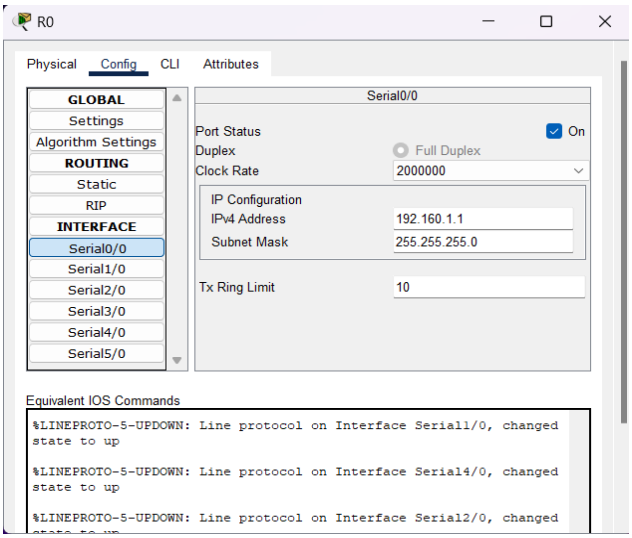


c. Close the window, open other Servers, and assign an IP address to it in the same way. Make sure they are given according to the addressing table.

Step 4: Assign static IP information to the Router interfaces.

a. Click on the R0 icon on the Packet Tracer Logical workspace and go to the config mode and select the Serial0/0 interface.

b. In the IP Configuration enter an IP address and subnet mask for the serial0/0 connection according to the addressing table.The IP address of serial0/0 interface acts as the default IP address for the end devices connected to it.



c.Now select the other interfaces of Router0 and assign the ip addresses in the same way as given above.

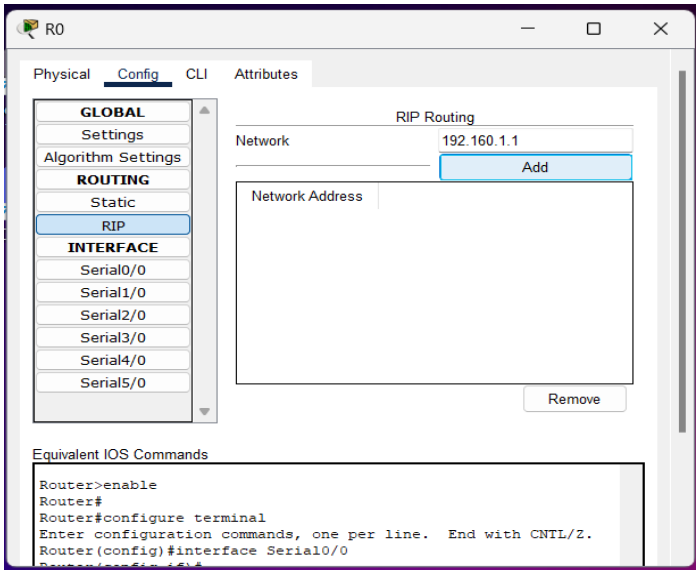
d.After assigning the ip addresses to all the interfaces, close the window and follow the same procedure for the remaining routers based on the given topology and assign the ip addreses according to the addressing table.

Step 5: Configure RIP routing protocol to the Routers.

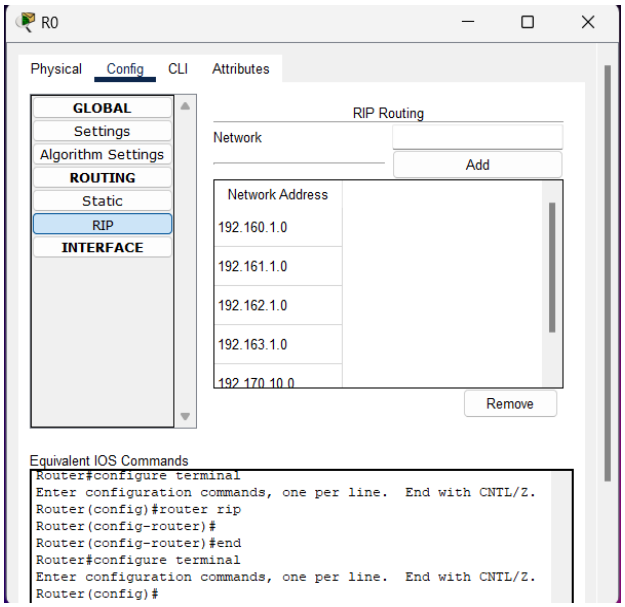
a.Click on the R0 icon and access the routers configuration mode.

b.Enable RIP by turning on the RIP routing protocol. This tells the router to start using RIP to share routing information with other routers.

c. Specify the Networks to the router which are directly connected to it. These are the networks that the router will share with other routers using RIP.



d. Save the configuration after making changes. This ensures that your changes persist even after the router is restarted.



e.After saving the configuration,close the window and follow the same steps as done for R0 with the remaining routers configuring RIP routing protocol.

Part C: Verify connectivity between the blocks

Step 1: Refresh the Packet Tracer Logical workspace

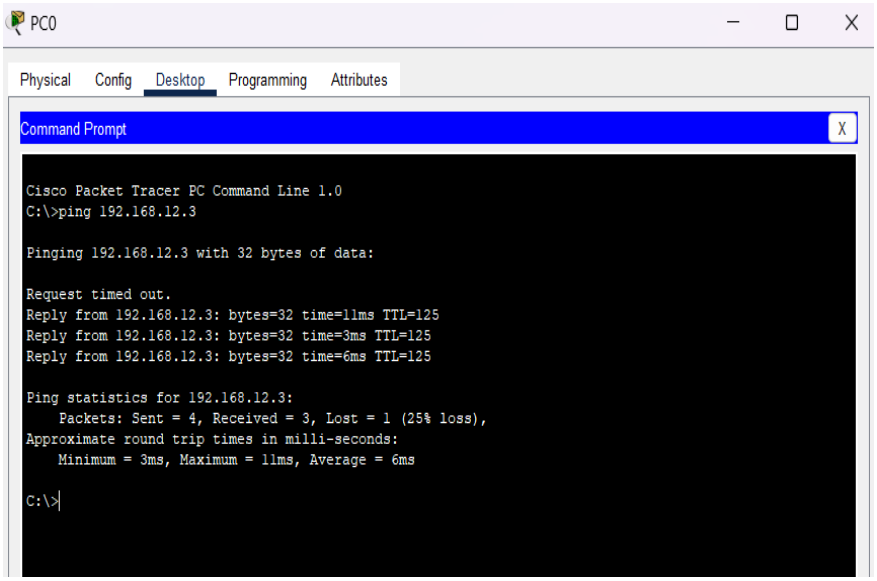
a. Verify that the IP addresses, subnet masks, and default gateways are correctly configured on the devices.

b. Ensure that cables are properly connected and interfaces are up. A loose or disconnected cable can cause connectivity issues.

Step 2:Check the connectivity using ping and traceroute commands.

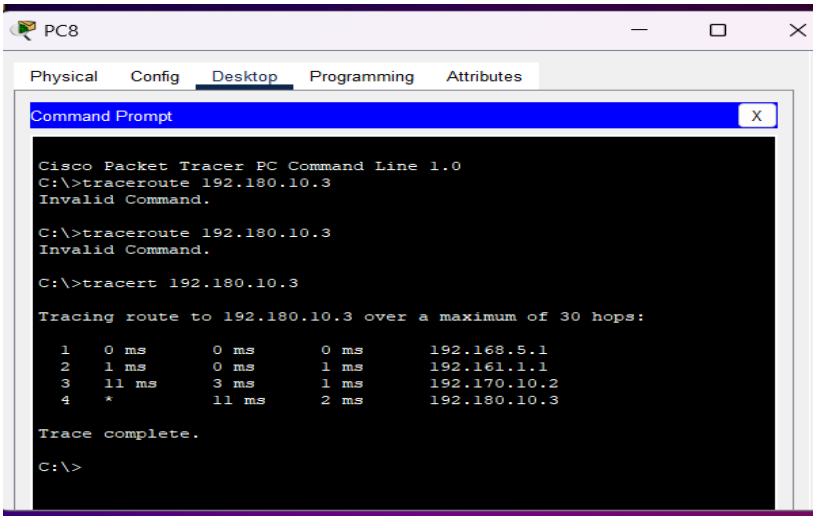
a. Ping command:

Click on the PC0 on the Packet Tracer Logical workspace and then select the Desktop tab.Click on the Command Prompt icon. In the CLI, use the ping command to test connectivity between devices PC0 and Printer2 with the IP address of Printer2 that is 192.168.12.3.



b. Traceroute command:

Use the tracert command to trace the route that packets take from one device to another. Let the device be PC8 and the other device is Server2.



Conclusion

In our analysis of the network topology of campus, we have gained valuable insights into the structure, devices, and connections that form the backbone of their communication infrastructure.We noted the integration of network management tools that streamline monitoring, troubleshooting, and maintenance. After examining network topology, we concluded the well-organized setup with different layers for smooth communication. Devices are smartly placed in key spots.