

Assignment 3 – Router Configuration

Module Code: ICT 2213

Module Name: Computer Networking

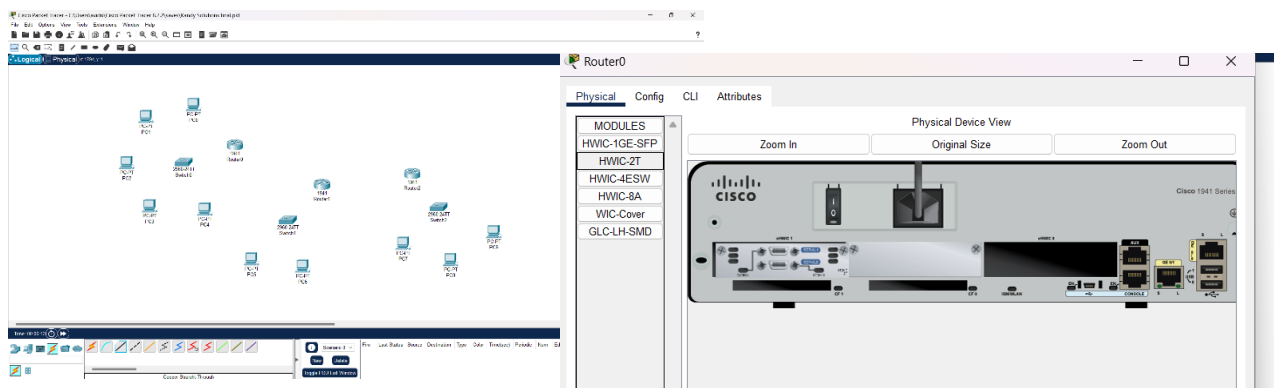
Full Name: Avidu Dasun Sankalpa Witharana

Registration Number: 000041

Add Devices

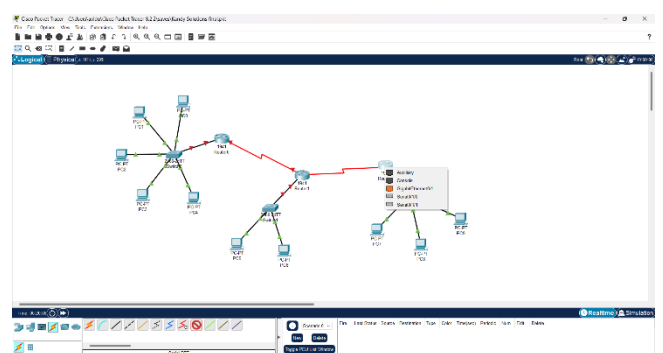
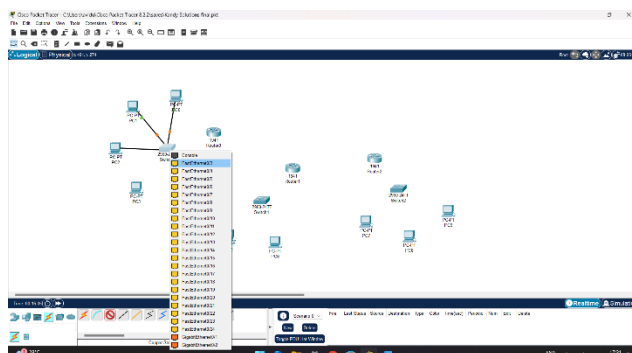
The first step in designing the network was to place all necessary devices into the workspace. Using Cisco Packet Tracer, I added:

- **3 Routers (Router0, Router1, Router2):** These will interconnect the departments and route traffic.
- **3 Switches (Switch0, Switch1, Switch2):** These connect the devices within each department.
- **10 PCs:** Distributed as:
 - 5 PCs for the IT department.
 - 2 PCs for the HR department.
 - 3 PCs for the Accounting department.
- **Serial DTE Interfaces:** These were used to connect the routers for inter-router communication.



Connecting Devices

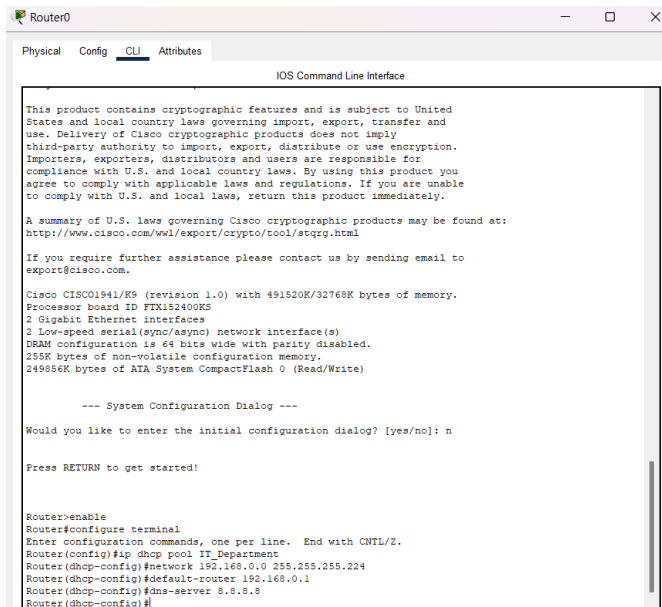
- **Connecting PCs to Switches:**
Each department's PCs were connected to its respective switch using straight-through cables.
- **Connecting Switches to Routers:**
Each switch was connected to its router using straight-through cables via the GigabitEthernet 0/0 ports.
- **Interconnecting Routers:**
Serial DTE cables were used to connect:
 - Router0 to Router1 on Serial0/1/0.
 - Router1 to Router2 on Serial0/1/1.



Configuring DHCP on Routers

To assign IP addresses dynamically to the PCs in each department:

1. **Router0:** A DHCP pool was created for the IT department. The network range was set to 192.168.0.0/27, with a default gateway of 192.168.0.1.



The screenshot shows the CLI of Router0. It displays the system configuration dialog, which is skipped by pressing 'n'. The configuration commands entered are: `Router>enable`, `Router#configure terminal`, `Router(config)#ip dhcp pool IT_Department`, `Router(dhcp-config)#network 192.168.0.0 255.255.255.224`, `Router(dhcp-config)#default-router 192.168.0.1`, and `Router(dhcp-config)#dns-server 8.8.8.8`.

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

This product contains cryptographic features and is subject to United
States and local country laws governing import, export, transfer and
use. Delivery of Cisco cryptographic products does not imply
third-party authority to import, export, distribute or use encryption.
Importers, exporters, distributors and users are responsible for
compliance with U.S. and local country laws. By using this product you
agree to comply with applicable laws and regulations. If you are unable
to comply with U.S. and local laws, return this product immediately.

A summary of U.S. laws governing Cisco cryptographic products may be found at:
http://www.cisco.com/wml/export/crypto/tool/stqrg.html

If you require further assistance please contact us by sending email to
export@cisco.com.

Cisco CISCO1941/K9 (revision 1.0) with 491520K/32768K bytes of memory.
Processor board ID FTX15240085
2 Gigabit Ethernet interfaces
2 Low-speed serial(sync/async) network interface(s)
DRAM configuration is 64 bits wide with parity disabled.
255K bytes of non-volatile configuration memory.
249856K bytes of ATA System CompactFlash 0 (Read/Write)

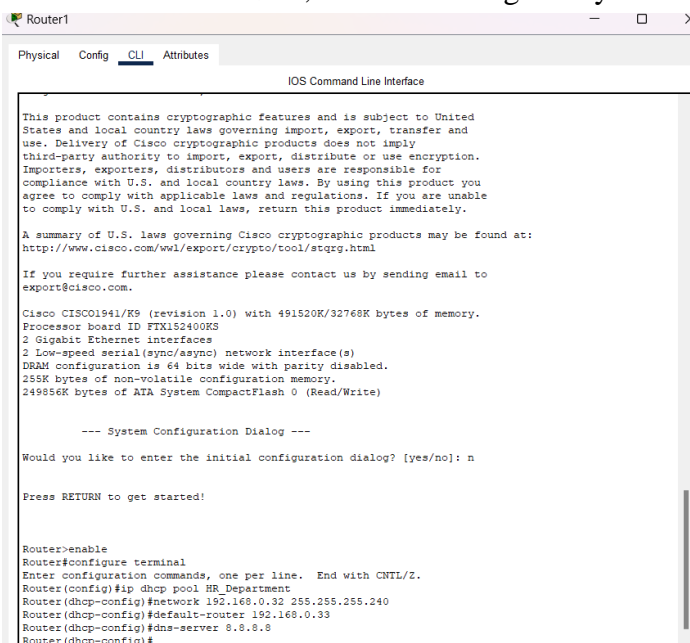
--- System Configuration Dialog ---

Would you like to enter the initial configuration dialog? [yes/no]: n

Press RETURN to get started!

Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip dhcp pool IT_Department
Router(dhcp-config)#network 192.168.0.0 255.255.255.224
Router(dhcp-config)#default-router 192.168.0.1
Router(dhcp-config)#dns-server 8.8.8.8
Router(dhcp-config)#
```

2. **Router1:** A DHCP pool was configured for the HR department. The network range was 192.168.0.32/28, with a default gateway of 192.168.0.33.



The screenshot shows the CLI of Router1. It displays the system configuration dialog, which is skipped by pressing 'n'. The configuration commands entered are: `Router>enable`, `Router#configure terminal`, `Router(config)#ip dhcp pool HR_Department`, `Router(dhcp-config)#network 192.168.0.32 255.255.255.240`, `Router(dhcp-config)#default-router 192.168.0.33`, and `Router(dhcp-config)#dns-server 8.8.8.8`.

```
Router1
Physical Config CLI Attributes
IOS Command Line Interface

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Cisco CISCO1941/K9 (revision 1.0) with 491520K/32768K bytes of memory.
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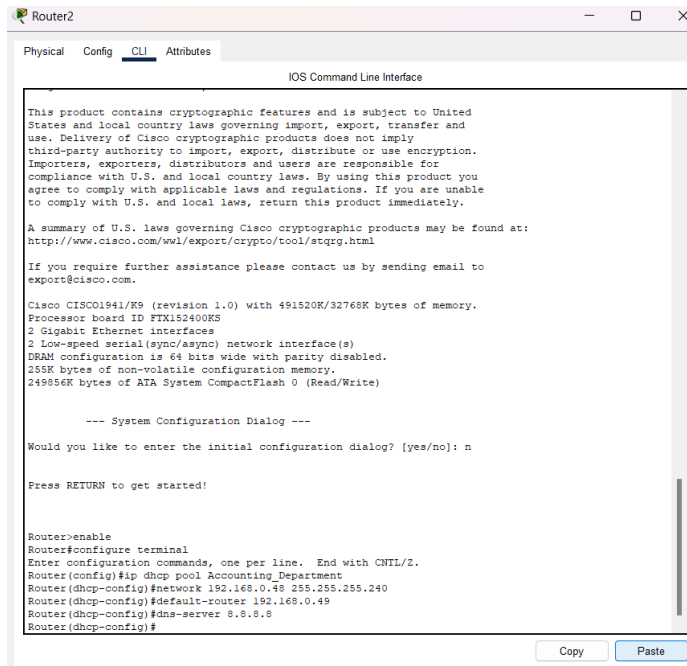
--- System Configuration Dialog ---

Would you like to enter the initial configuration dialog? [yes/no]: n

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Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip dhcp pool HR_Department
Router(dhcp-config)#network 192.168.0.32 255.255.255.240
Router(dhcp-config)#default-router 192.168.0.33
Router(dhcp-config)#dns-server 8.8.8.8
Router(dhcp-config)#
```

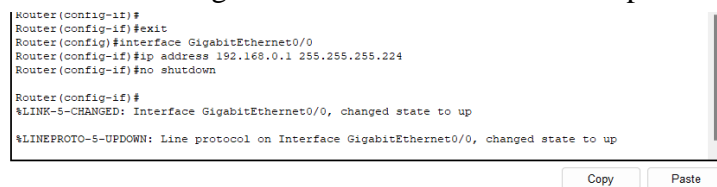
3. **Router2:** A DHCP pool was set up for the Accounting department, using the range 192.168.0.48/28 and the default gateway 192.168.0.49.



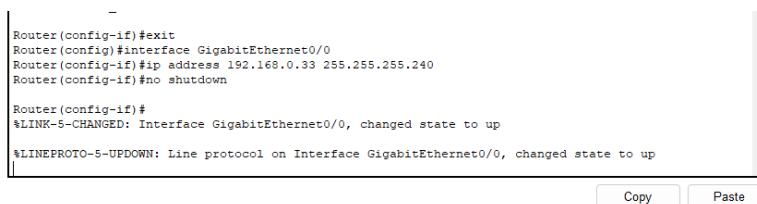
Configuring IP Addresses

Each router interface was assigned an IP address corresponding to its connected network. For example:

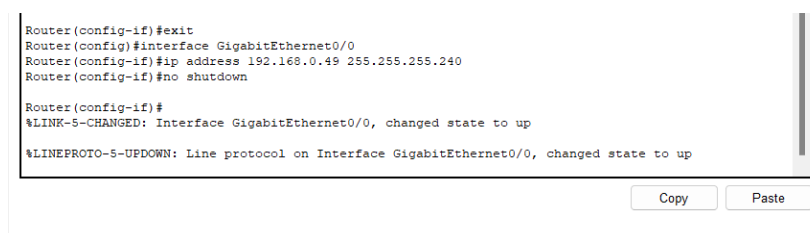
- Router0 was assigned 192.168.0.1 for the IT department.



- Router1 was assigned 192.168.0.33 for HR.



- Router2 was assigned 192.168.0.49 for Accounting. Additionally, the serial interfaces of the routers were configured with IPs in the 10.0.0.0/30 range for inter-router communication.



Configuring Serial Interfaces

1. Router0:

- Accessed the CLI and entered configuration mode.
- Configured the Serial0/1/0 interface with:
 - **IP Address:** 10.0.0.1
 - **Subnet Mask:** 255.255.255.252
 - **Clock Rate:** 64000 (as Router0 is the DCE).
 - Brought the interface up using `no shutdown`.

```
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial0/1/0
Router(config-if)#ip address 10.0.0.1 255.255.255.252
Router(config-if)#clock rate 64000
This command applies only to DCE interfaces
Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
Router(config-if)#
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0, changed state to up
```

2. Router1:

- Configured two serial interfaces:
 - **Serial0/1/0:** Connected to Router0 with IP 10.0.0.2 (same subnet as Router0).
 - **Serial0/1/1:** Connected to Router2 with IP 10.0.0.5 and clock rate 64000.

```
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial0/1/0
Router(config-if)#ip address 10.0.0.2 255.255.255.252
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0, changed state to up

Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial0/1/1
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial0/1/1
Router(config-if)#ip address 10.0.0.5 255.255.255.252
Router(config-if)#clock rate 64000
This command applies only to DCE interfaces
Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/1/1, changed state to down
Router(config-if)#
```

3. Router2:

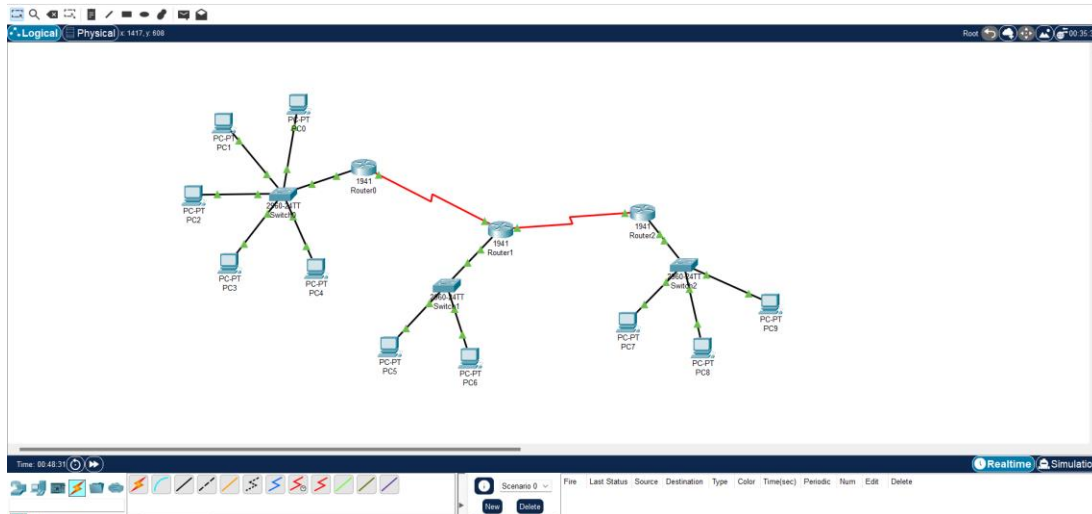
- Configured Serial0/1/0 with:
 - **IP Address:** 10.0.0.6 (same subnet as Router1's Serial0/1/1).
 - Brought the interface up with `no shutdown`.

```

Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial0/1/0
Router(config-if)#ip address 10.0.0.6 255.255.255.252
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up

```



Enabling Routing with RIP

RIP (Routing Information Protocol) was enabled on all three routers to ensure they could exchange routing information:

- Each router was configured to advertise its connected networks using the `network` command.
- RIP version 2 was used to support subnet information.

```

%LINEPROTO-5-UPDOWN: Line protocol on interface Serial0/1/0, changed state to up

Router(config-if)#exit
Router(config)#router rip
Router(config-router)#version 2
Router(config-router)#network 192.168.0.0
Router(config-router)#network 10.0.0.0
Router(config-router)#no auto-summary
Router(config-router)#

```

Configuring Switches

Each switch was configured to enable communication between connected devices:

- All necessary ports were activated using the `interface range` command.
- A banner with my student ID was added to each switch for identification.

Switch0 (IT Department):

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#banner motd "Switch0 - Student ID: 000041"
Switch(config)#interface range fastethernet 0/1-5
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#no shutdown
Switch(config-if-range)#
```

Switch1 (HR Department):

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#banner motd "Switch1 - Student ID: 000041"
Switch(config)#interface range fastethernet 0/1-2
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#no shutdown
Switch(config-if-range)#
```

Switch2 (Accounting Department):

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#banner motd "Switch2 - Student ID: 000041"
Switch(config)#interface range fastethernet 0/1-3
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#no shutdown
Switch(config-if-range)#
Switch(config-if-range)#
```

Testing and Verifying Connections

After completing the configuration, I tested the network:

1. **IP Address Verification:**

Each PC was verified to ensure it had received an IP address via DHCP.

- Used the `ipconfig` command on each PC to check its IP address, subnet mask, and gateway.

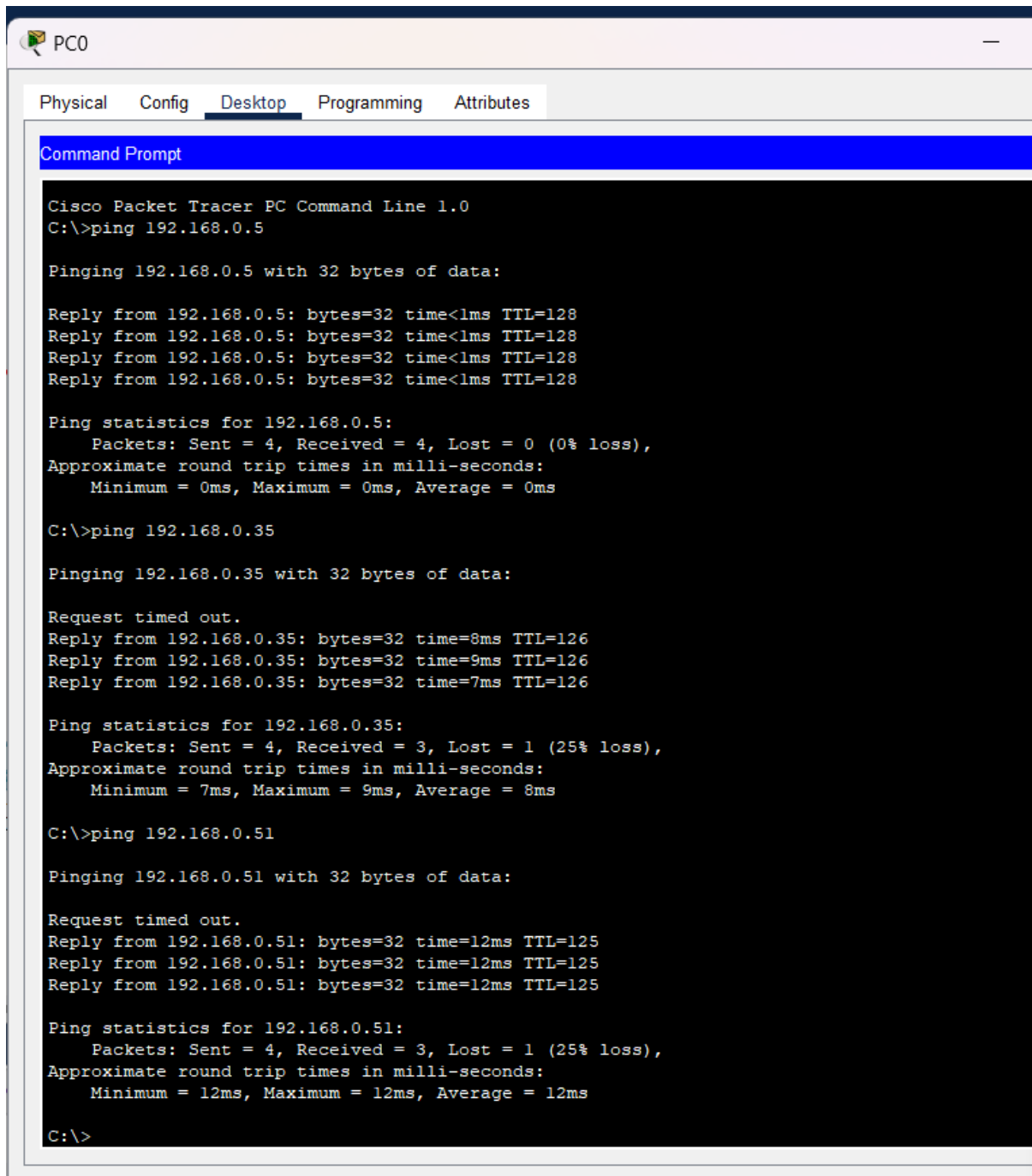
2. **Ping Tests:**

- I successfully pinged PCs within the same department to confirm local communication.
- Cross-department ping tests were performed to confirm that routers were properly routing traffic.

3. **Route Verification:**

- The `show ip route` command was run on each router to ensure RIP was propagating the correct routes.

Ping Tests:



```
PC0
Physical Config Desktop Programming Attributes
Command Prompt

Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.0.5

Pinging 192.168.0.5 with 32 bytes of data:

Reply from 192.168.0.5: bytes=32 time<1ms TTL=128
Reply from 192.168.0.5: bytes=32 time<1ms TTL=128
Reply from 192.168.0.5: bytes=32 time<1ms TTL=128
Reply from 192.168.0.5: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.0.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.0.35

Pinging 192.168.0.35 with 32 bytes of data:

Request timed out.
Reply from 192.168.0.35: bytes=32 time=8ms TTL=126
Reply from 192.168.0.35: bytes=32 time=9ms TTL=126
Reply from 192.168.0.35: bytes=32 time=7ms TTL=126

Ping statistics for 192.168.0.35:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 7ms, Maximum = 9ms, Average = 8ms

C:\>ping 192.168.0.51

Pinging 192.168.0.51 with 32 bytes of data:

Request timed out.
Reply from 192.168.0.51: bytes=32 time=12ms TTL=125
Reply from 192.168.0.51: bytes=32 time=12ms TTL=125
Reply from 192.168.0.51: bytes=32 time=12ms TTL=125

Ping statistics for 192.168.0.51:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 12ms, Maximum = 12ms, Average = 12ms

C:\>
```


Check RIP Configuration:

```
Router>show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

    10.0.0.0/8 is variably subnetted, 3 subnets, 2 masks
C       10.0.0.0/30 is directly connected, Serial0/1/0
L       10.0.0.1/32 is directly connected, Serial0/1/0
R       10.0.0.4/30 [120/1] via 10.0.0.2, 00:00:10, Serial0/1/0
    192.168.0.0/24 is variably subnetted, 4 subnets, 3 masks
C       192.168.0.0/27 is directly connected, GigabitEthernet0/0
L       192.168.0.1/32 is directly connected, GigabitEthernet0/0
R       192.168.0.32/28 [120/1] via 10.0.0.2, 00:00:10, Serial0/1/0
R       192.168.0.48/28 [120/2] via 10.0.0.2, 00:00:10, Serial0/1/0

Router>
```

REFERENCES

1. **Cisco Systems, Inc.**, "Configuring the Serial Interface," [Online]. Available: <https://www.cisco.com/c/en/us/td/docs/routers/access/800M/software/800MSCG/serconf.html>. [Accessed: 25-Dec-2024].
2. **GeeksforGeeks**, "Designing a Serial Port Configuration using Cisco Packet Tracer," [Online]. Available: <https://www.geeksforgeeks.org/designing-a-serial-port-configuration-using-cisco-packet-tracer/>. [Accessed: 25-Dec-2024].
3. **PacketTracerLab**, "Serial connection explanation and configuration in packet tracer," [Online]. Available: <https://www.packettracerlab.com/serial-connection-explanation-and-configuration-in-packet-tracer/>. [Accessed: 25-Dec-2024].
4. **Cisco Community**, "Packet Tracer 7.0 - router serial interface IP's," [Online]. Available: <https://community.cisco.com/t5/switching/packet-tracer-7-0-router-serial-interface-ip-s/td-p/2957548>. [Accessed: 26-Dec-2024].
5. **Cisco Learning Network**, "Serial connection not up," [Online]. Available: <https://learningnetwork.cisco.com/s/question/0D53i00000KsnQ8CAJ/serial-connection-not-up>. [Accessed: 26-Dec-2024].