Assignment 3 – Router Configuration

Module Code: ICT 2213

Module Name: Computer Networking

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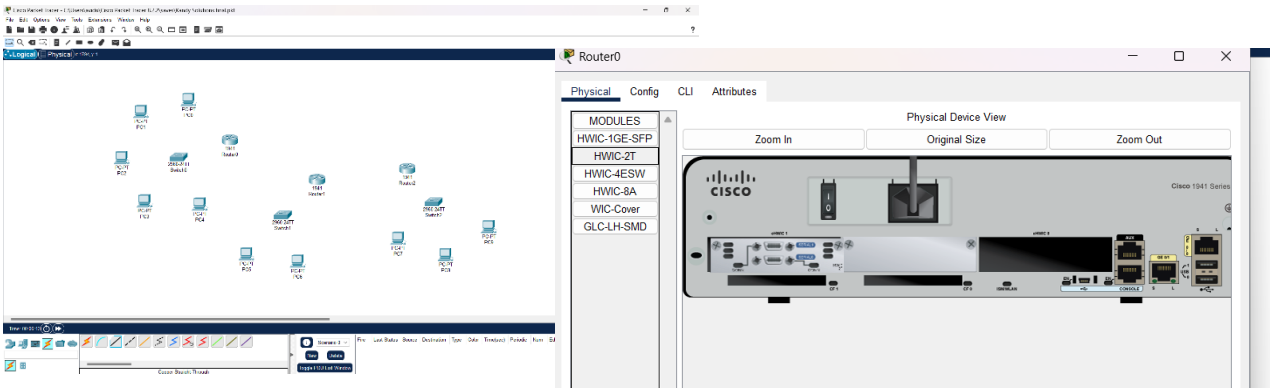
Registration Number: 000041

Add Devices

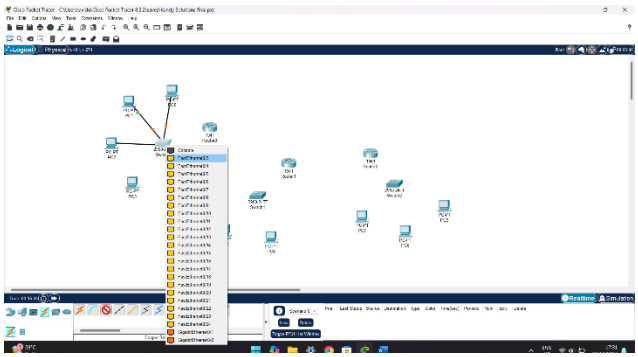
The first step in designing the network was to place all necessary devices into the workspace. Using Cisco Packet Tracer, I added:

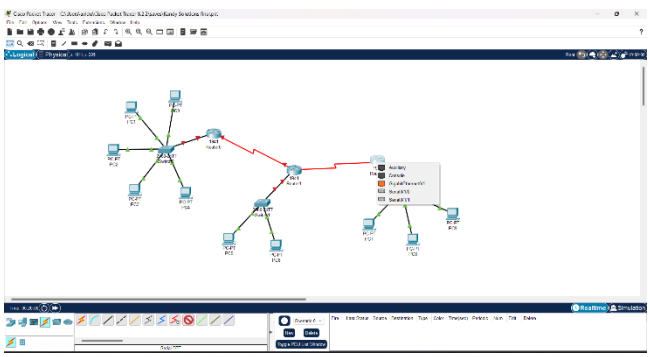
- **3 Routers (Router0, Router1, Router2):** These will interconnect the departments and route traffic.
- **3 Switches (Switch0, Switch1, Switch2):** These connect the devices within each department.
- **10 PCs:** Distributed as:
  - 5 PCs for the IT department.
  - 2 PCs for the HR department.
  - 3 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`.

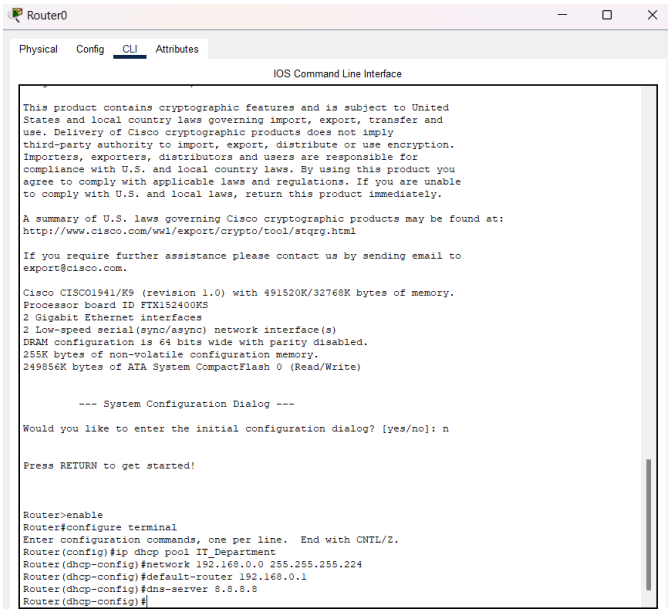




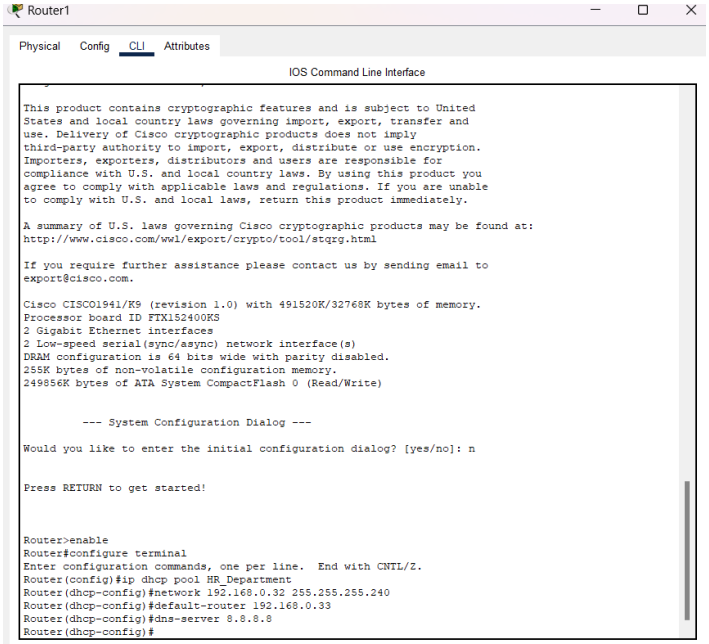
Configuring DHCP on Routers

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

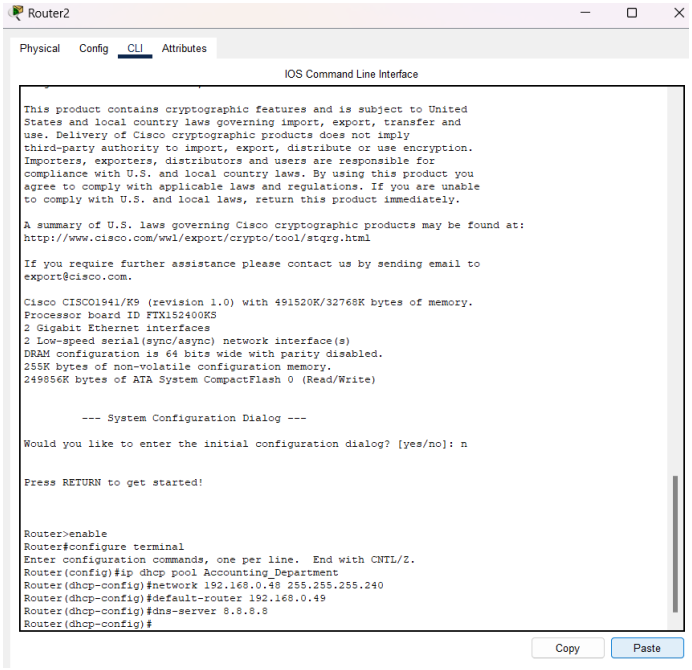
1. **Router0:** A DHCP pool was created for the IT department. The network range was set to `192.168.0.0/27`, with a default gateway of `192.168.0.1`.



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`.



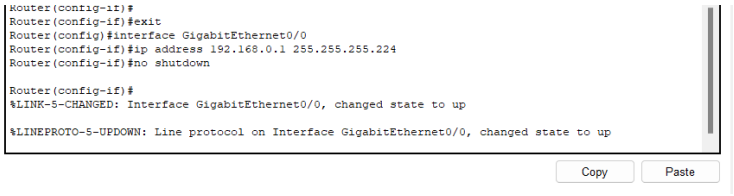
3. **Router2:** A DHCP pool was set up for the Accounting department, using the range `192.168.0.48/28` and the default gateway `192.168.0.49`.



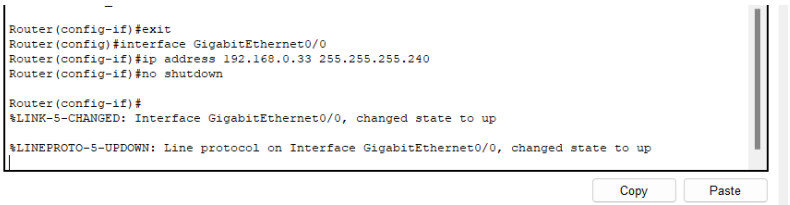
Configuring IP Addresses

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

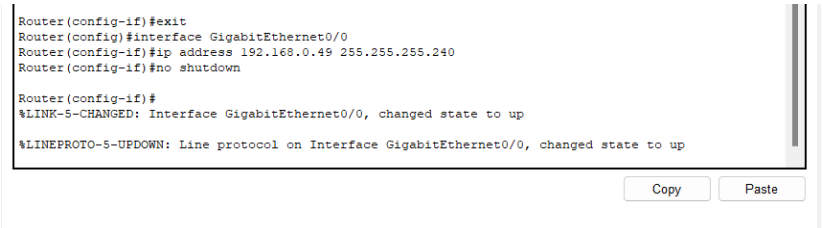
- `Router0` was assigned `192.168.0.1` for the IT department.



- `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`.

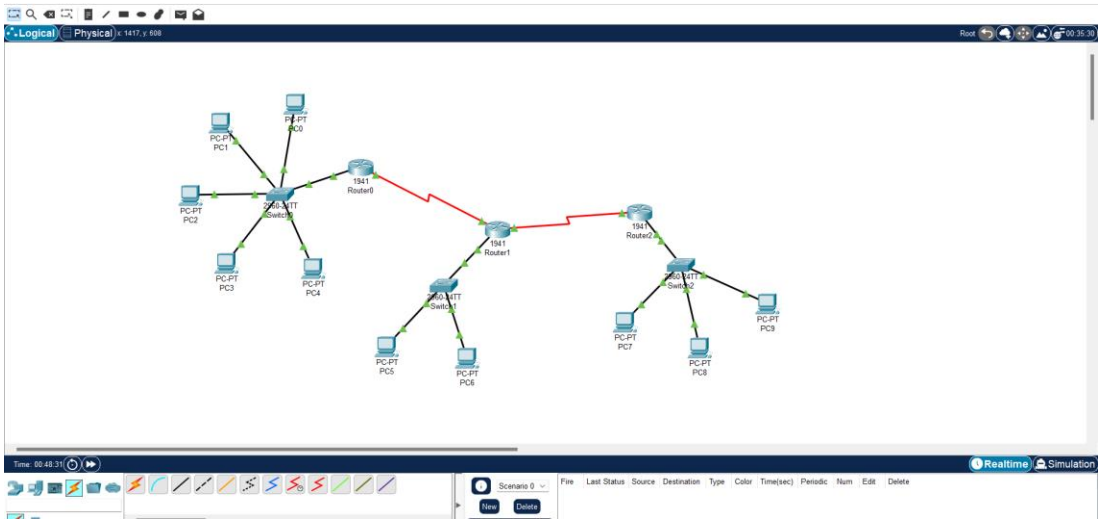
```
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial0/1/0
Router(config-if)#ip address 10.0.0.1 255.255.255.252
Router(config-if)#clock rate 64000
This command applies only to DCE interfaces
Router(config-if)#no shutdown

%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 Serial0/1/0
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)#
```

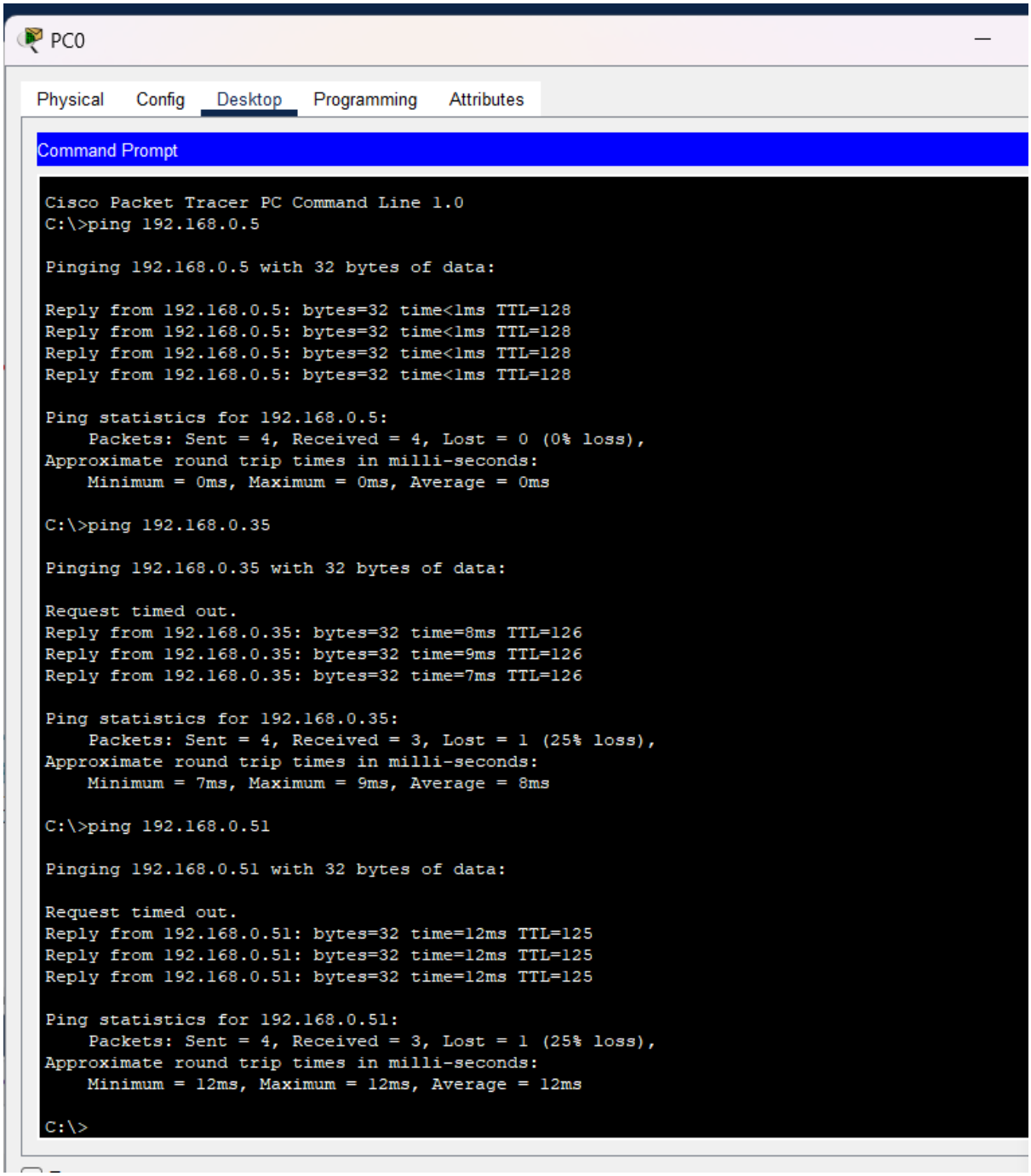
Testing and Verifying Connections

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:



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

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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].
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