Practical 1: Basic LAN Configuration

Practical Title: Create a LAN with switches, routers, and PCs, Assign IP addresses and verify connectivity using ping

Aim: To design and configure a basic Local Area Network (LAN) using Cisco Packet Tracer and to verify network connectivity.

Objective:

- To understand the basic functions of switches and routers.
- To design a simple network topology using Cisco Packet Tracer.
- To manually assign IP addresses to PCs and router interfaces.
- To verify end-to-end connectivity using the ping command.

Theory: A **switch** is a networking device that connects multiple devices within a LAN. It operates at Layer 2 (Data Link Layer) of the OSI model and uses MAC addresses to forward data packets to the correct destination port. A **router** connects multiple networks and operates at Layer 3 (Network Layer). Its primary function is to determine the best path for data to travel between different networks. It also serves as a **default gateway**, allowing devices within a LAN to access external networks.

A **straight-through cable** is used to connect different devices (e.g., PC to Switch), while a **crossover cable** connects similar devices (e.g., Switch to Switch).

Steps:

1. **Create the Network Topology:**
    - Open Cisco Packet Tracer.
    - Drag and drop 2 PCs, 1 Switch (2960), and 1 Router (1841) from the device menu to the workspace.
    - Use the "Connections" tool (the lightning bolt icon) and select the copper straightthrough cable.
    - Connect PC0 to the Switch, and PC1 to the Switch.
    - Connect the Switch to the Router. The topology should look like this:

2. **Assign IP Addresses:**
    - **PC0:**
        - Click on PC0 > **Desktop** > **IP Configuration**.
        - Enter **IP Address:** 192.168.1.2
        - Enter **Subnet Mask:** 255.255.255.0
        - Enter **Default Gateway:** 192.168.1.1
    - **PC1:**
        - Click on PC1 > **Desktop** > **IP Configuration**.
        - Enter **IP Address:** 192.168.1.3
        - Enter **Subnet Mask:** 255.255.255.0
        - Enter **Default Gateway:** 192.168.1.1
    - **Router:**
        - Click on the Router > **CLI** tab.

Enter the following commands:

```
Router>en
Router#conf t
Router(config)#interface fastethernet 0/0
Router(config-if)#ip address 192.168.1.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#exit
Router#show ip interface brief
```

3. **Verify Connectivity:**
    - Click on PC0 > **Desktop** > **Command Prompt**.
    - Type ping 192.168.1.3 to check connectivity to PC1. A successful ping will show Reply from 192.168.1.3.
    - Type ping 192.168.1.1 to check connectivity to the router. A successful ping will show Reply from 192.168.1.1.

Conclusion: In this practical, a basic LAN was successfully created using Cisco Packet Tracer. IP addresses were assigned to all devices, and connectivity was verified using the ping command, confirming that the network is functioning correctly.

Viva / Oral Questions:

1. What is the difference between a switch and a router?
2. What is the function of a default gateway? What happens if you don't assign one?
3. Explain the purpose of the ping command.
4. When do you use a straight-through cable versus a crossover cable?
5. What layer of the OSI model does a router operate on?

CLI COMMANDS

```
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#ip address 10.10.10.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console show ip interface brief
Interface IP-Address OK? Method Status Protocol
FastEthernet0/0 10.10.10.1 YES manual up up
```

VERIFY CONNECTIVITY:

```
Cisco Packet Tracer PC Command Line 1.0
C:\>PING 10.10.10.3

Pinging 10.10.10.3 with 32 bytes of data:

Reply from 10.10.10.3: bytes=32 time=3ms TTL=128
Reply from 10.10.10.3: bytes=32 time<1ms TTL=128
Reply from 10.10.10.3: bytes=32 time<1ms TTL=128 Reply from 10.10.10.3: bytes=32 time<1ms TTL=128

Ping statistics for 10.10.10.3:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 3ms, Average = 0ms

C:\>ping 10.10.10.1

Pinging 10.10.10.1 with 32 bytes of data:

Reply from 10.10.10.1: bytes=32 time<1ms TTL=255
Reply from 10.10.10.1: bytes=32 time<1ms TTL=255
Reply from 10.10.10.1: bytes=32 time<1ms TTL=255 Reply from 10.10.10.1: bytes=32 time<1ms TTL=255

Ping statistics for 10.10.10.1:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 10.10.10.2
```

Pinging 10.10.10.2 with 32 bytes of data:

Reply from 10.10.10.2: bytes=32 time=10ms TTL=128
Reply from 10.10.10.2: bytes=32 time=6ms TTL=128
Reply from 10.10.10.2: bytes=32 time<1ms TTL=128 Reply from 10.10.10.2: bytes=32 time<1ms TTL=128

Ping statistics for 10.10.10.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 10ms, Average = 4ms