Experiment No: 4
Experiment Name: Simulation of Bus, Star, and Ring Network Topologies; Comparative Study of Hub, Switch, and Router; and Basic Router Configuration Using Cisco Packet Tracer.

Part-1: Simulation of Bus, Star, and Ring Network Topologies

Objectives:

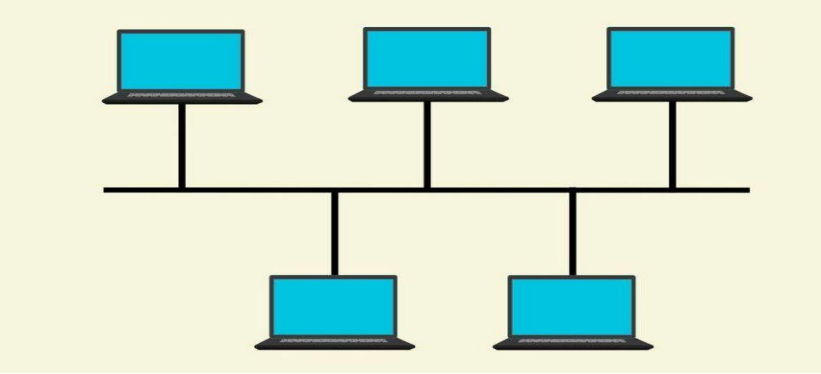
- Understand the structure and functionality of different network topologies.
- Simulate Bus, Star, and Ring topologies using Cisco Packet Tracer.
- Analyze advantages and limitations of each.

1. Introduction to Network Topologies

- **Definition**: The layout pattern of interconnections of various elements (links, nodes, etc.)
- **Types**:
  - **Bus**: All nodes connected to a single communication line.
  - **Star**: All nodes connected to a central device (hub or switch).
  - **Ring**: Each node connects to exactly two other nodes, forming a circle.

2. Bus Topology

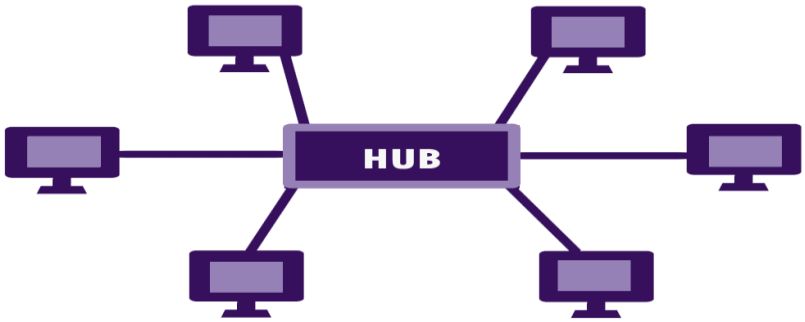
- **Diagram & Simulation in Packet Tracer**:
  - Use PCs, coaxial cable, and terminators.
  - Use "Add Simple PDU" to test communication.



- **Pros**:
  - Easy to implement, cost-effective.
- **Cons**:
  - Poor scalability, difficult to troubleshoot.

3. Star Topology

- **Simulation**:
  - Connect PCs to a switch/hub using straight-through cables.



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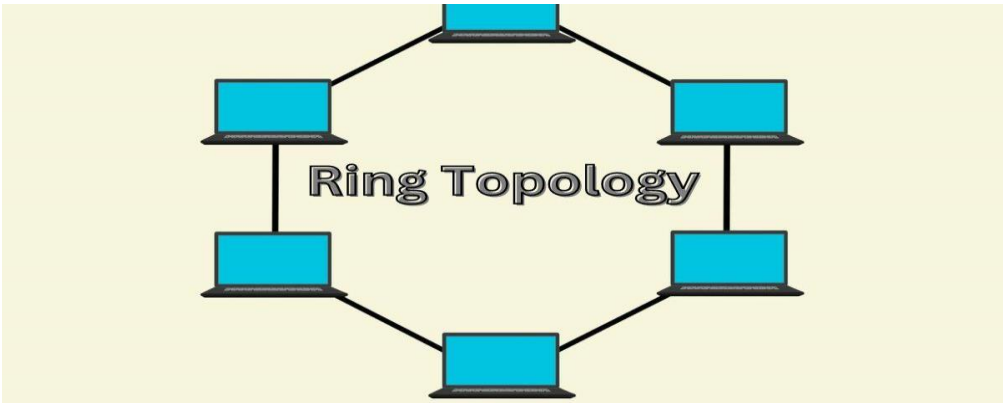
- **Pros**:
  - Easy to manage, scalable.
- **Cons**:
  - Failure of central device = network down.

4. Ring Topology

- **Simulation**:
  - Connect PCs in a circle using serial or copper cross-over cables.



- **Pros**:
  - Efficient for data transfer in one direction.
- **Cons**:
  - A single break disrupts the network.

5. Comparative Table

Feature	Bus	Star	Ring
Cost	Low	Medium	High
Scalability	Poor	High	Moderate
Failure Impact	High	Medium	High
Performance	Poor with load	Good	Good

- **Simulation of Bus, Star, and Ring , Mesh and Hybrid Network Topologies in Cisco Packet Tracer:**

Part-2: Comparative Study of Hub, Switch, and Router

Objectives:

- Understand the functionality of hub, switch, and router.
- Analyze differences in behavior and application.

1. Hub

- **Definition**: A basic networking device that broadcasts data to all ports.
- **Features**:
  - Layer 1 device.
  - No intelligence.
  - Increases collision domain.

2. Switch

- **Definition**: Forwards data only to the destination port.
- **Features**:
  - Operates at Layer 2.
  - Uses MAC addresses.
  - Reduces collision domain.

3. Router

- **Definition**: Routes data between different networks.
- **Features**:
  - Layer 3 device.
  - Uses IP addresses.
  - Connects LAN to WAN.

4. Simulation in Packet Tracer

- Create a network with hub, switch, and router.
- Send ping requests and analyze packet movement.

5. Comparative Table

Feature	Hub	Switch	Router
OSI Layer	1	2	3
Intelligence	No	Medium	High
Traffic Handling	Broadcast	Unicast/Broadcast	Route/IP based
Cost	Low	Medium	High

- **Comparative Study of Hub, Switch, and Router in Cisco Packet Tracer:** Design and Test the differences of the different component used in the networks

Part-3: Basic Router Configuration Using Cisco Packet Tracer

Objectives:

- Learn to configure routers using CLI.
- Establish communication between different networks.

Lecture Content:

1. Network Design

- Two or three networks connected via a router.
- Use PCs, switches, and a router.

2. Assigning IP Addresses

- Assign static IPs to PCs.
- Configure router interfaces.

3. Router CLI Configuration

Example:

```
Router> enable
Router# configure terminal
Router(config)# interface gig0/0
Router(config-if)# ip address 192.168.1.1 255.255.255.0
Router(config-if)# no shutdown
Router(config-if)# exit
Router(config)# interface gig0/1
Router(config-if)# ip address 192.168.2.1 255.255.255.0
Router(config-if)# no shutdown
Router(config-if)# exit
Router(config)# exit
Router# copy running-config startup-config
```

4. PC Configuration

- Set IP: 192.168.1.2
- Subnet: 255.255.255.0
- Gateway: 192.168.1.1

5. Testing

- Use ping to test communication.
- Use simulation mode to analyze data flow.

6. Troubleshooting Tips

- Interface not enabled? Use no shutdown.
- Wrong subnet? Check mask.
- No route? Verify interface IPs.

Basic Router Configuration

■ Basic Router Configuration in Cisco Packet Tracer:

1. After Boot:

```
Continue with configuration dialog? [yes/no]: no
```

2. Initial or Executive Mode:

```
Router>
```

3. Switch to Hash or Privileged Executive Mode:

```
Router> enable
Router#
```

4. See the Running Configuration and Start-up Configurations:

```
Router# show running-config
Router# show startup-config
Router# WR
Router# COPY RUnning-config STartup-config
```

5. Switch to Fully Administrative or Global Configuration Mode:

```
Router# configure terminal
Router(config)#
```

6. Change the Hostname:

```
Router(config)# Hostname BAUET
BAUET(config)#
```

7. Give Enable Password:

```
BAUET(config)# enable password cisco
BAUET(config)# enable secret cisco
```

8. Give Console Line Password:

```
BAUET(config)# line console 0
BAUET(config-line)# password class
BAUET(config-line)# login
```

1. Give VTY Line Password:

```
BAUET(config)# line VTY 0 4
BAUET(config-line)# password class
BAUET(config-line)# login
BAUET(config-line)# transport input telnet(for telnet)
BAUET(config-line)# transport input ssh(for ssh)
BAUET(config-line)# transport input all(for all)
```

9. Configure the Interfaces (FastEthernet or GigabitEthernet or VLAN):

```
BAUET(config)# interface fastEthernet 0/0
BAUET(config-if)# ip address 192.168.10.1 255.255.255.0
BAUET(config-if)# no shutdown
BAUET(config-if)# description LAN-BAUET

BAUET(config)# interface gigabitEthernet 0/0
BAUET(config-if)# ip address 192.168.10.1 255.255.255.0
BAUET(config-if)# no shutdown
BAUET(config-if)# description LAN-BAUET

BAUET(config)# interface VLAN 1
BAUET(config-if)# ip address 192.168.10.1 255.255.255.0
BAUET(config-if)# no shutdown
BAUET(config-if)# description VLAN
```

10. Make All the Password Encrypted:

```
BAUET(config)# service password-encryption
```

11. Provide the Banner Message:

```
BAUET(config)# banner motd #Authoized Access Only!!#
```

12. Enable IPv6 Packets:

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

13. Create Username and Password:

```
BAUET(config)#  username bauet password cisco
```

14. Making back-up of the running configurations:

```
BAUET# copy running-config startup-config
```