# K. R. MANGALAM UNIVERSITY
## THE COMPLETE WORLD OF EDUCATION

# Computer Networks Lab

# (ENS304)

## K. R. Mangalam University

FOR

**Bachelor of Technology**

**in**

**Computer Science and Engineering**

**SUBMITTED BY**

**Priyanshu Tomar (2301010162)**

**Course Faculty :-Mr. Mohammad Aijaz**

School of Engineering & Technology

K. R. MANGALAM UNIVERSITY

Sohna, Haryana 122103, India

# Assignment 1: Basic Network Topologies Using Switches and Hubs

**Experiment Objectives:**

In this experiment, students will create three small LAN designs in Cisco Packet Tracer to understand how network topology influences connectivity, fault tolerance, and performance. Students will configure end devices with IPv4 addressing and verify communication using ICMP.

**Learning Outcomes:**

- Create small networks in Packet Tracer using different topologies
- Assign IP addresses correctly and test connectivity
- Identify failure points in different physical layouts
- Compare topology behavior using simulation results

**Concepts Used:**

- Star / Hub-based / Loop (ring-like) layouts
- IPv4 addressing and subnetting
- ICMP ping
- Packet Tracer Simulation Mode

**Task 1: Star Topology (Switch)**
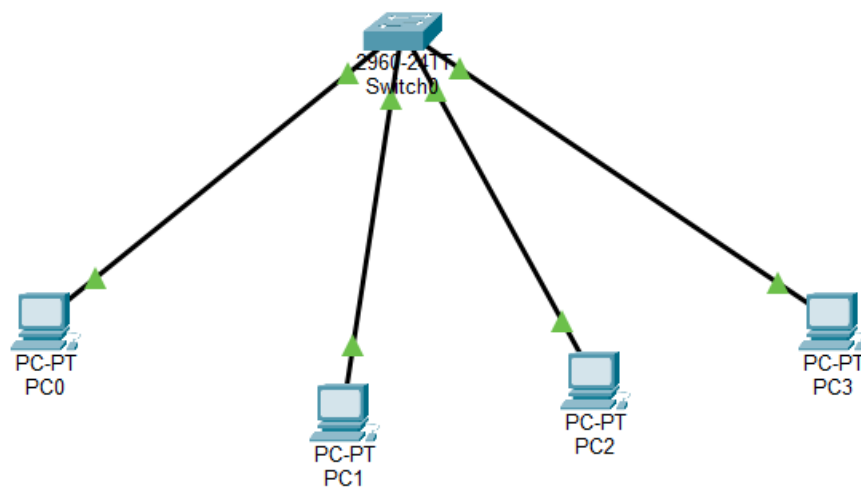
## Configuration:-

- 1 Switch (2960)
- 4 PCs connected to switch
- IP addresses assigned:

| PC | IP Address | Subnet Mask |
|----|-----------|-------------|
| PC0 | 10.10.10.1 | 255.0.0.0 |
| PC1 | 10.10.10.2 | 255.0.0.0 |
| PC2 | 10.10.10.3 | 255.0.0.0 |
| PC3 | 10.10.10.4 | 255.0.0.0 |

### PC0

Physical   Config   Desktop   Programming   Attributes

IP Configuration                                              X

Interface        FastEthernet0

**IP Configuration**

- ○ DHCP              ● Static
- IPv4 Address        10.10.10.1
- Subnet Mask         255.0.0.0
- Default Gateway     0.0.0.0
- DNS Server          0.0.0.0

### PC1

Physical   Config   Desktop   Programming   Attributes

IP Configuration                                              X

Interface        FastEthernet0

**IP Configuration**

- ○ DHCP              ● Static
- IPv4 Address        10.10.10.2
- Subnet Mask         255.0.0.0
- Default Gateway     0.0.0.0
- DNS Server          0.0.0.0

### PC2

Physical   Config   Desktop   Programming   Attributes

IP Configuration                                              X

Interface        FastEthernet0

**IP Configuration**

- ○ DHCP              ● Static
- IPv4 Address        10.10.10.3
- Subnet Mask         255.0.0.0
- Default Gateway     0.0.0.0
- DNS Server          0.0.0.0

IPv6 Configuration
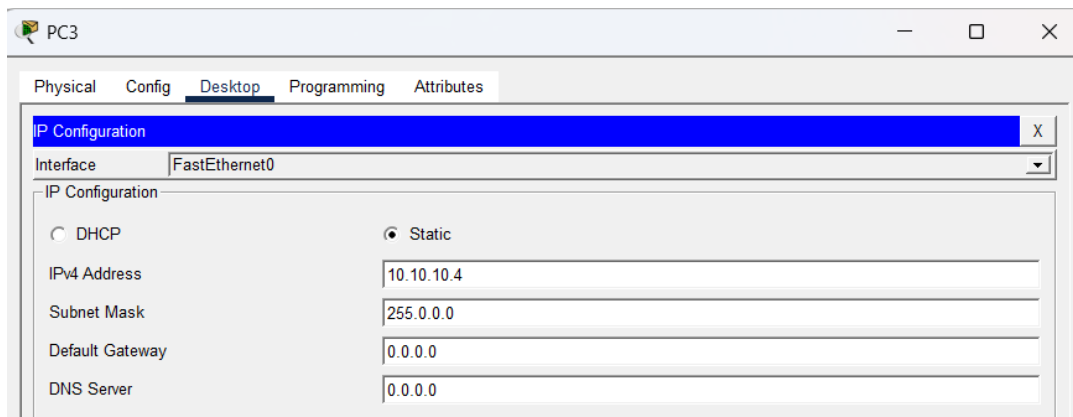
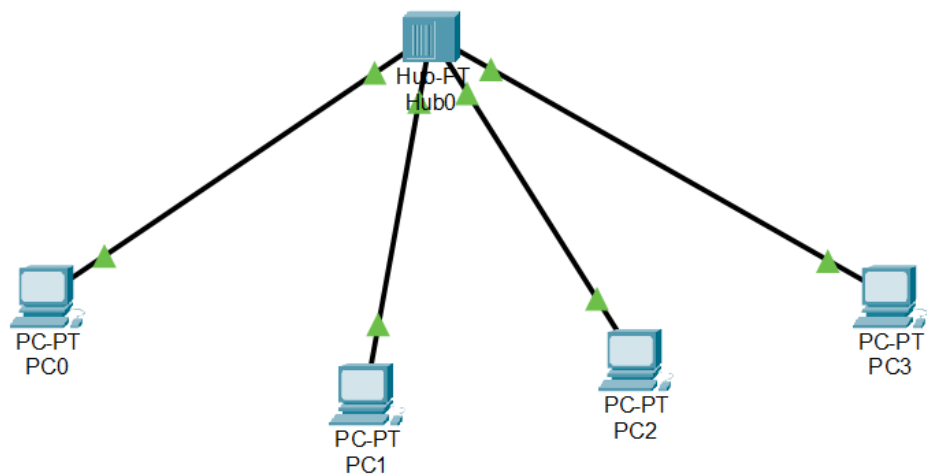**Testing:**

PC0 pinged PC1, PC2, and PC3.
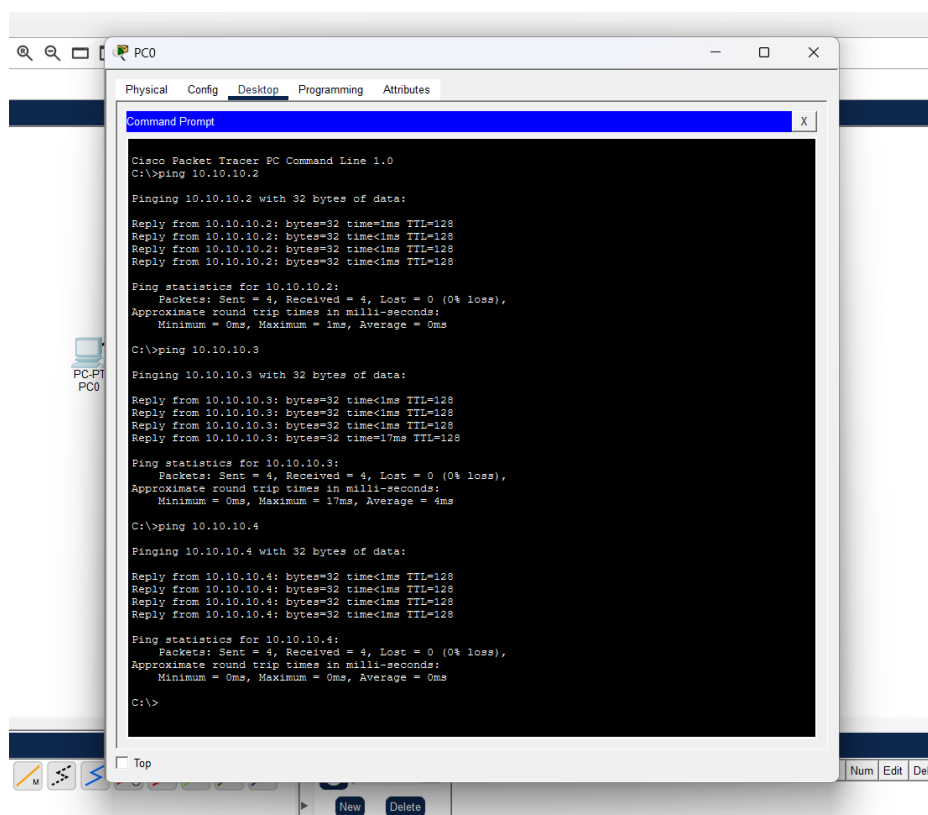


**Result:**

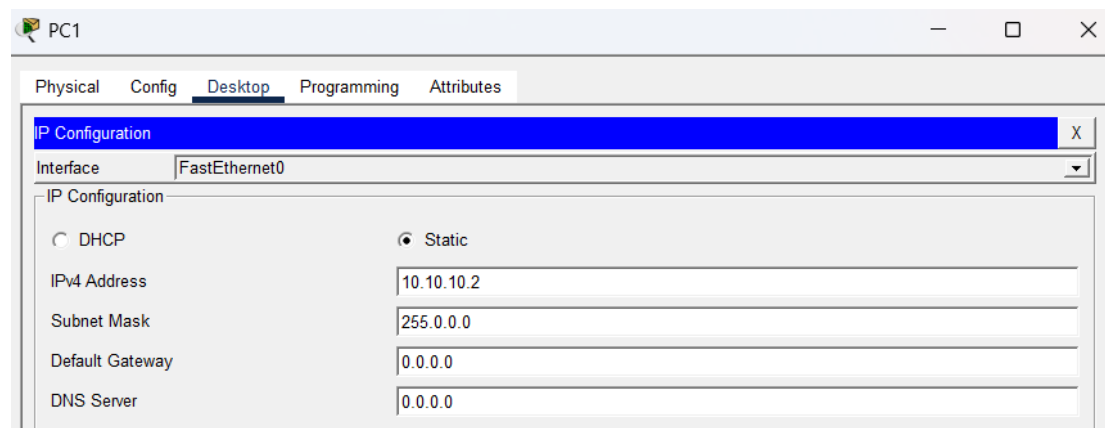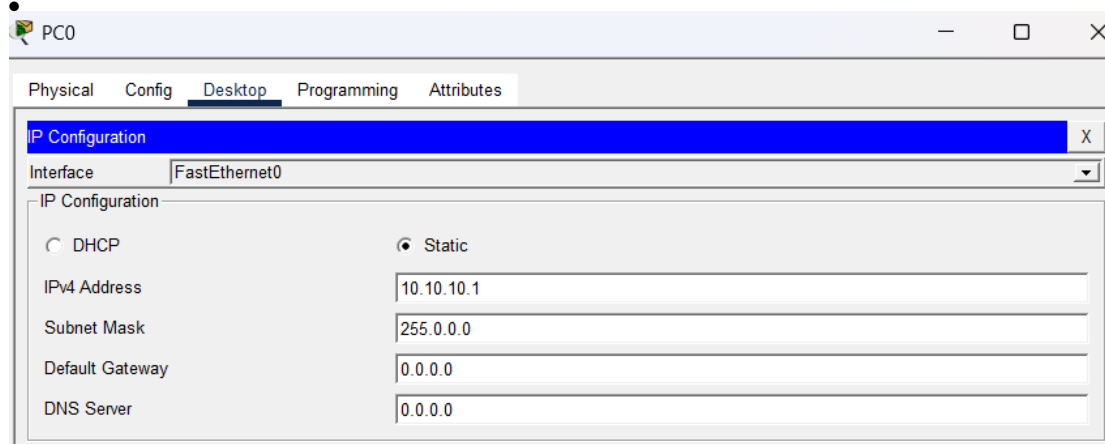All pings were successful.

**Observation:**

- Switch forwarded frames only to the correct destination port.
- No unnecessary traffic was generated.
- No collisions occurred.
- If one cable fails, only that PC disconnects.
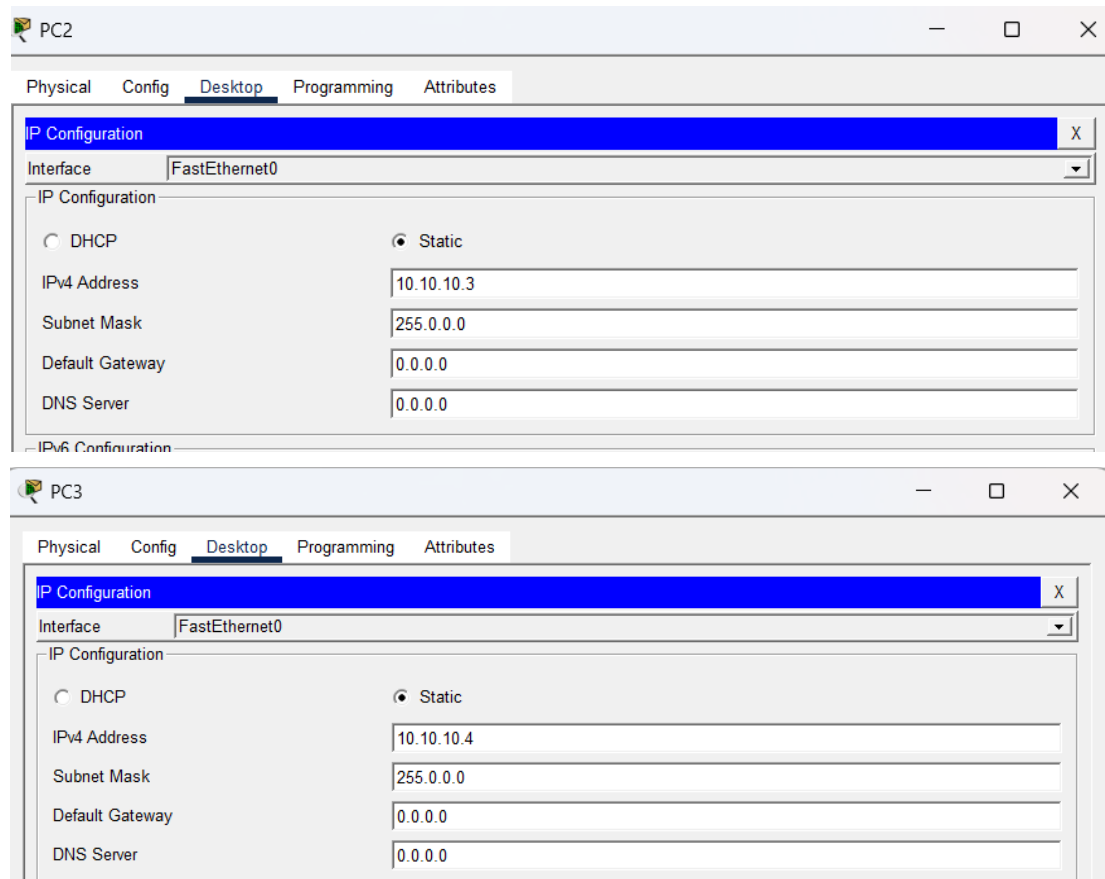- Performance was high.
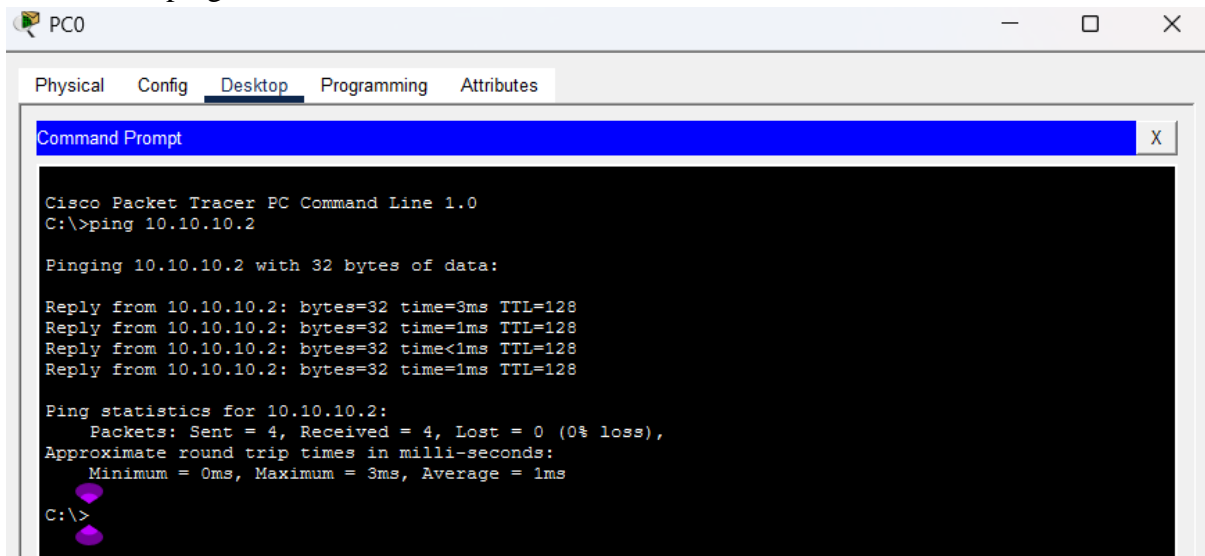
**Task 2: Bus-like Topology (Hub)**



**Configuration:**

- Switch replaced with Hub.
- Same IP addressing scheme used.



| PC0 | | — □ ✕ |
|---|---|---|

Physical    Config    Desktop    Programming    Attributes

**IP Configuration**      X

| Interface | FastEthernet0 | ▼ |
|---|---|---|

IP Configuration

   ○ DHCP      ● Static

| IPv4 Address | 10.10.10.1 |
|---|---|
| Subnet Mask | 255.0.0.0 |
| Default Gateway | 0.0.0.0 |
| DNS Server | 0.0.0.0 |

| PC1 | | — □ ✕ |
|---|---|---|

Physical    Config    Desktop    Programming    Attributes

**IP Configuration**      X

| Interface | FastEthernet0 | ▼ |
|---|---|---|

IP Configuration

   ○ DHCP      ● Static

| IPv4 Address | 10.10.10.2 |
|---|---|
| Subnet Mask | 255.0.0.0 |
| Default Gateway | 0.0.0.0 |
| DNS Server | 0.0.0.0 |

**Testing:**

- PC0 pinged PC1.



- PC0 pinged PC2.

- PC0 pinged PC3

```
C:\>ping 10.10.10.4

Pinging 10.10.10.4 with 32 bytes of data:

Reply from 10.10.10.4: bytes=32 time<1ms TTL=128
Reply from 10.10.10.4: bytes=32 time<1ms TTL=128
Reply from 10.10.10.4: bytes=32 time=1ms TTL=128
Reply from 10.10.10.4: bytes=32 time<1ms TTL=128

Ping statistics for 10.10.10.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

- **Simultaneous pings were tested.**
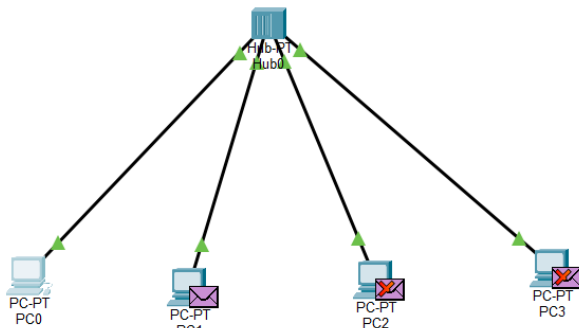


Figure 1:- SEND
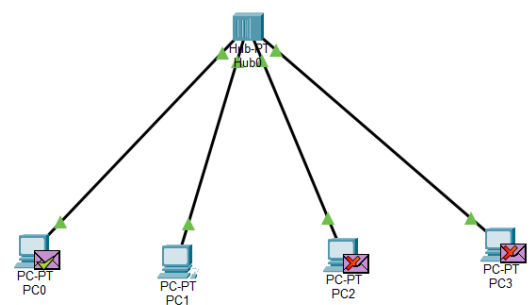


Figure 2:- RECEIVED
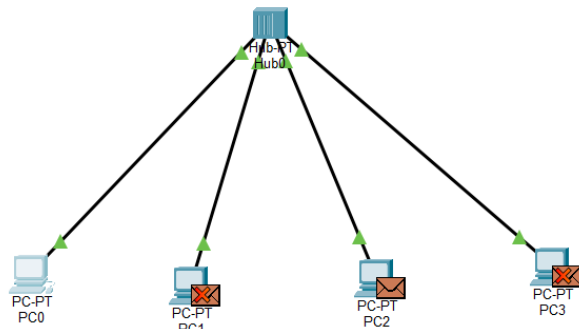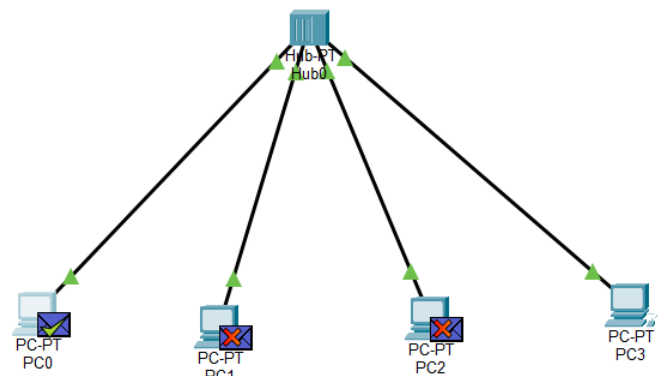


Figure 3:- SEND
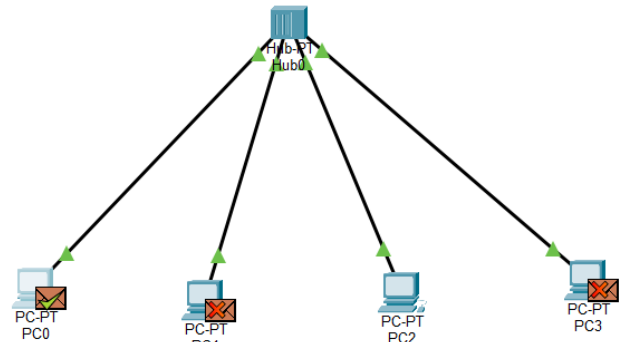


Figure 4:- RECEIVED
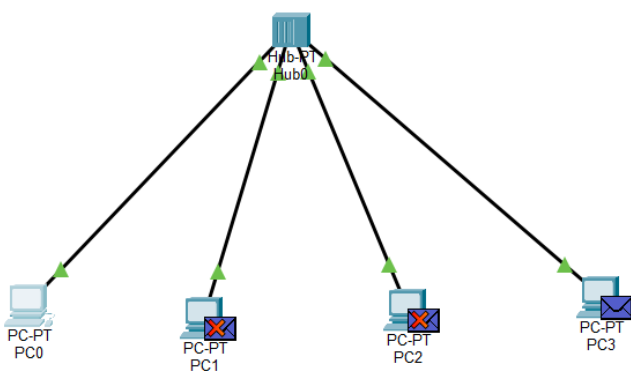


Figure 5:- SEND



Figure 6:- RECEIVED
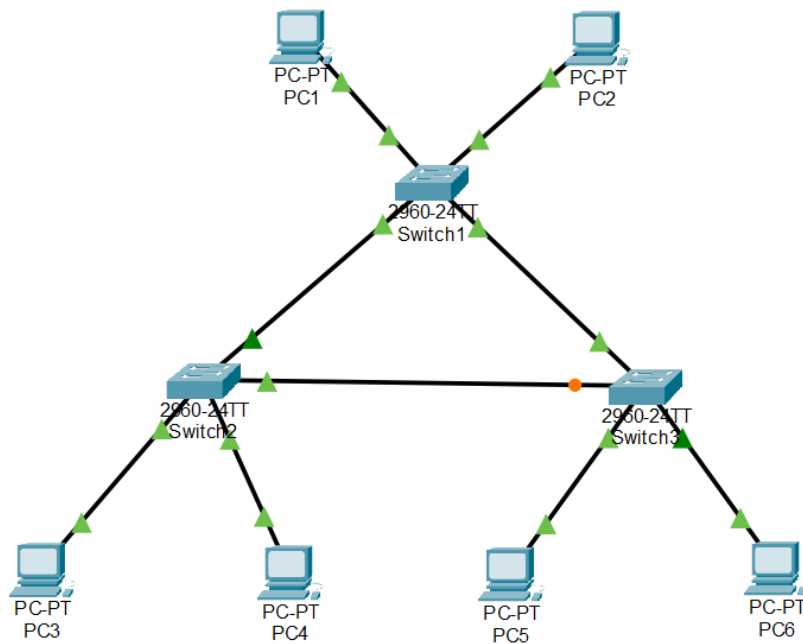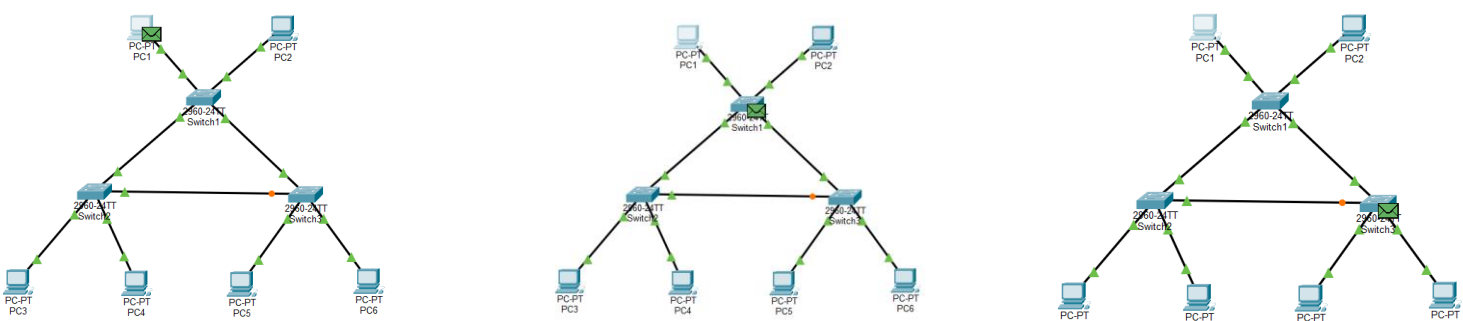
- Simulation Mode was used to observe packet flow.

**Result:**

All pings were successful.

**Observation:**

- Hub broadcasted packets to all ports.
- All PCs received each frame.
- Collision chances were high.
- Performance was lower compared to switch.
- Entire network shared one collision domain.

**Task 3: Ring-like Topology (Loop)**



**Configuration:**

- 3 switches connected in a loop (triangle).
- 2 PCs connected to each switch.
- All PCs assigned IPs in same subnet.

| PC | IP Address | Subnet Mask |
|----|-----------|-------------|
| PC1 | 10.10.10.1 | 255.0.0.0 |
| PC2 | 10.10.10.2 | 255.0.0.0 |
| PC3 | 10.10.10.3 | 255.0.0.0 |
| PC4 | 10.10.10.4 | 255.0.0.0 |
| PC5 | 10.10.10.5 | 255.0.0.0 |
| PC6 | 10.10.10.6 | 255.0.0.0 |

**Testing:**

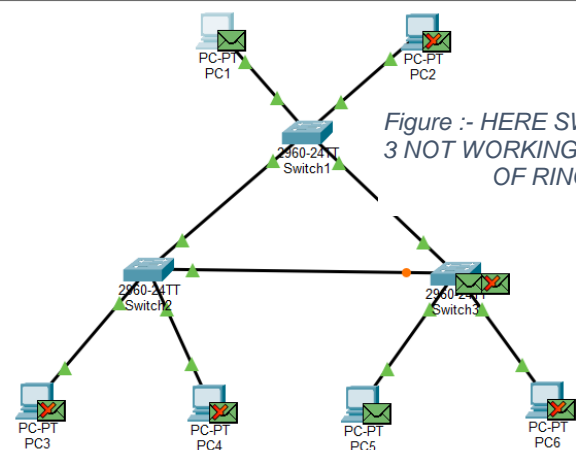PC1 pinged PC5 (across different switches).







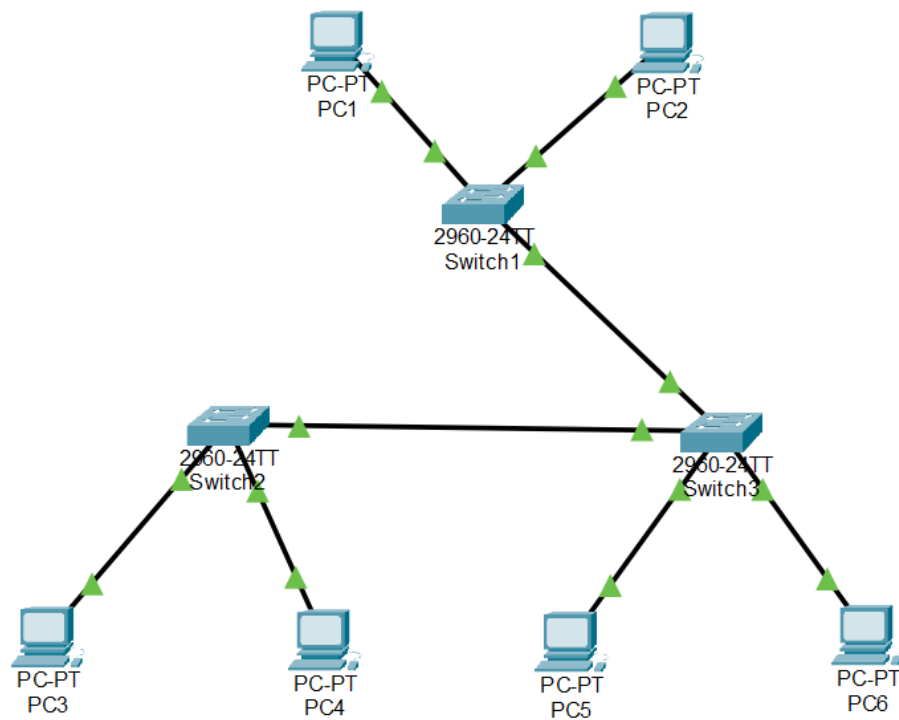*Figure :- HERE SWITCH 2 TO 3 NOT WORKING (BECAUSE OF RING)*

**Result**

Ping was successful.

**Observation**

- One link was automatically blocked by Spanning Tree Protocol.
- Packet traveled through active path only.
- Loop was prevented.
- Network remained stable.
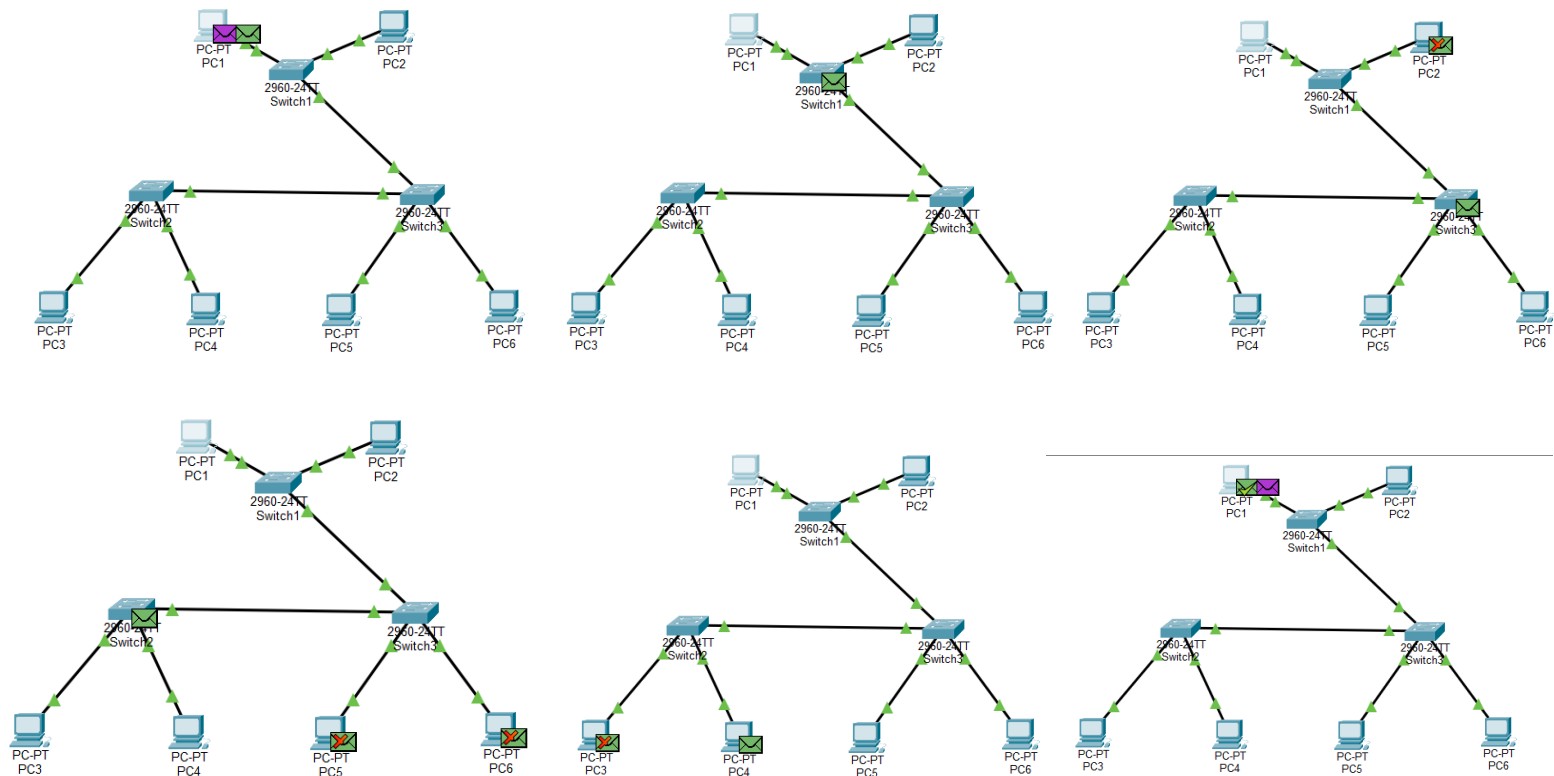- Redundant path existed.

**Task 4: Failure Test**



**Procedure**

- One active (green) link in the ring topology was disconnected.
- Waited for STP recalculation (about 30 seconds).
- Ping test was performed again.

**Test:-** PC 1 PINGED PC2



**Result**

Ping remained successful.

**Observation**

- Previously blocked port transitioned to forwarding state.
- Communication continued through alternate path.
- Network did not fail.
- Ring topology provided fault tolerance.

**Final Comparison**

| Feature | Star (Switch) | Hub (Bus-like) | Ring-like |
|---|---|---|---|
| Performance | High | Low | Medium-High |
| Collision | No | Yes | No |
| Fault Tolerance | Low | Low | High |
| Broadcast Traffic | Low | High | Controlled |
| Redundancy | No | No | Yes |