



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.

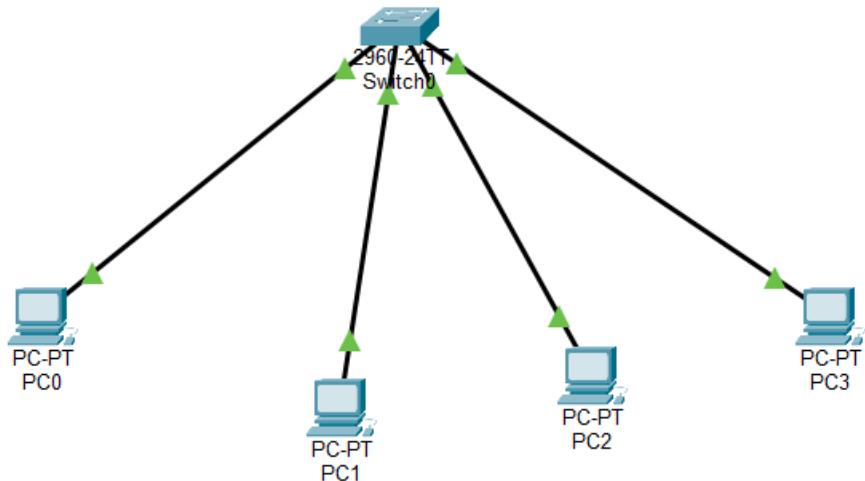
Learning Outcomes:

- 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)

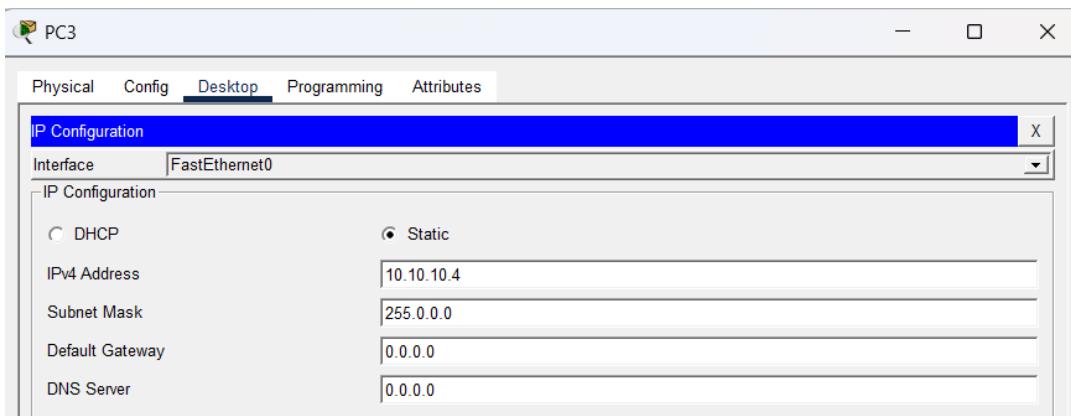


Configuration:-

- 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

The image displays three separate windows, each representing a different PC (PC0, PC1, and PC2) within a network configuration application. Each window has a tab bar at the top with 'Physical', 'Config', 'Desktop' (which is selected), 'Programming', and 'Attributes'. Below this is a blue header bar labeled 'IP Configuration'. A dropdown menu under 'Interface' shows 'FastEthernet0'. The main area is titled 'IP Configuration' and contains five fields: 'IPv4 Address' (set to 10.10.10.1 for PC0, 10.10.10.2 for PC1, and 10.10.10.3 for PC2), 'Subnet Mask' (set to 255.0.0.0 for all), 'Default Gateway' (set to 0.0.0.0 for all), and 'DNS Server' (set to 0.0.0.0 for all). There are also radio buttons for 'DHCP' and 'Static', with 'Static' being selected for all three PCs.



Testing:

PC0 pinged PC1, PC2, and PC3.

```

Cisco Packet Tracer PC Command Line 1.0
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<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 = 1ms, Average = 0ms

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<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
Reply from 10.10.10.3: bytes=32 time=17ms 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 = 17ms, Average = 4ms

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

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 = 0ms, Average = 0ms

C:\>

```

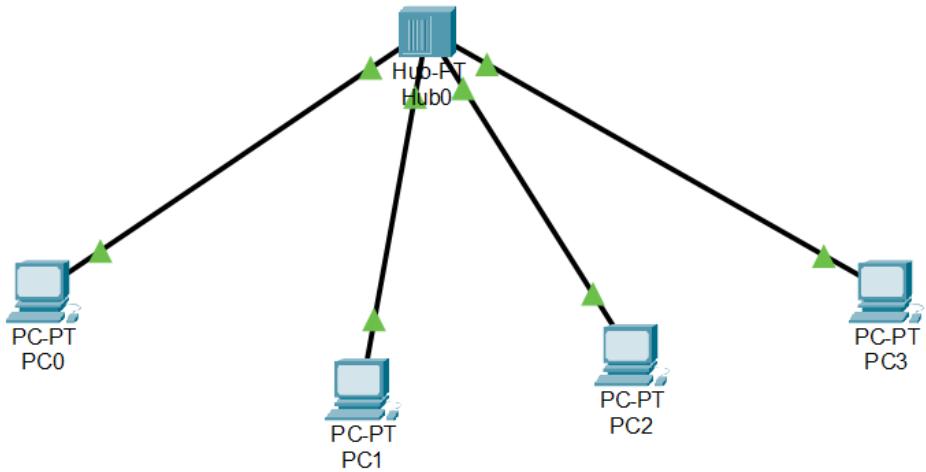
Result:

All pings were successful.

Observation:

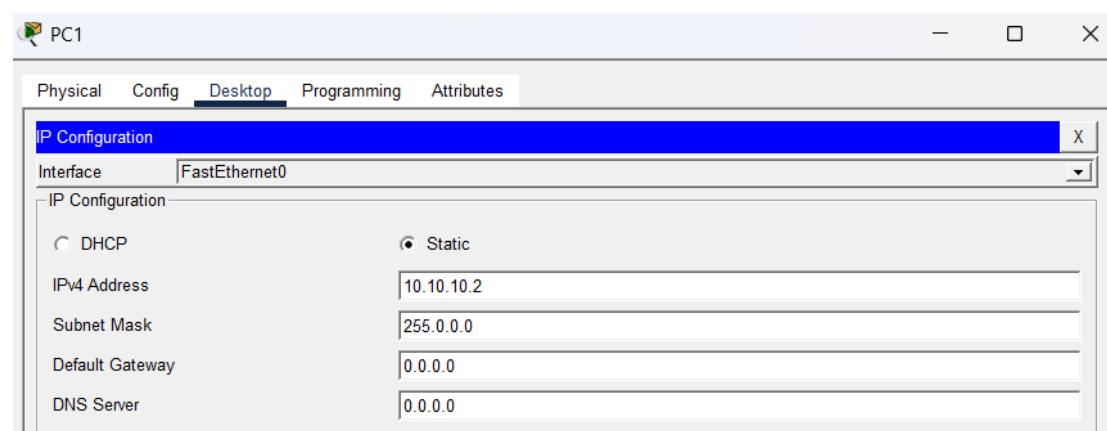
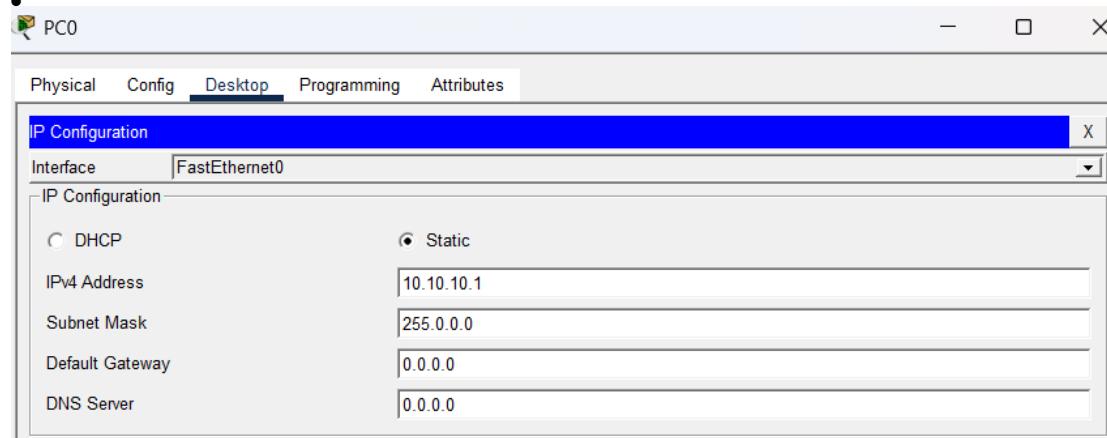
- Switch forwarded frames only to the correct destination port.
- No unnecessary traffic was generated.
- No collisions occurred.
- If one cable fails, only that PC disconnects.
- Performance was high.

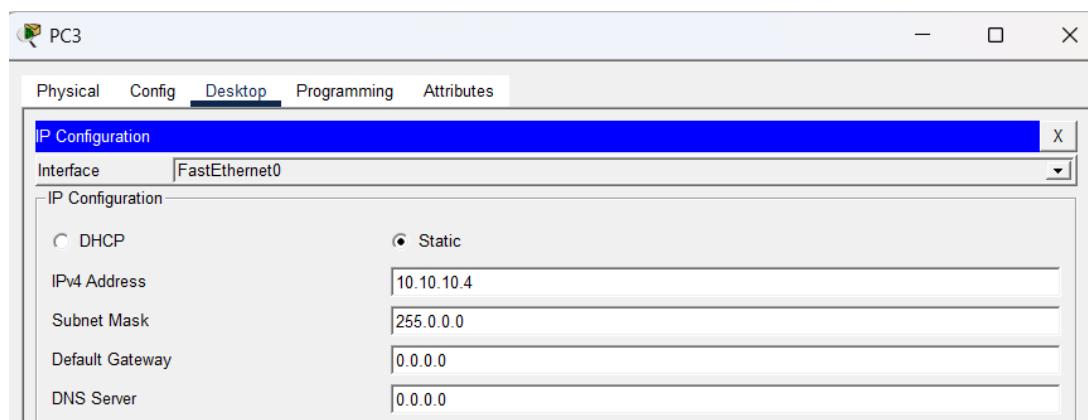
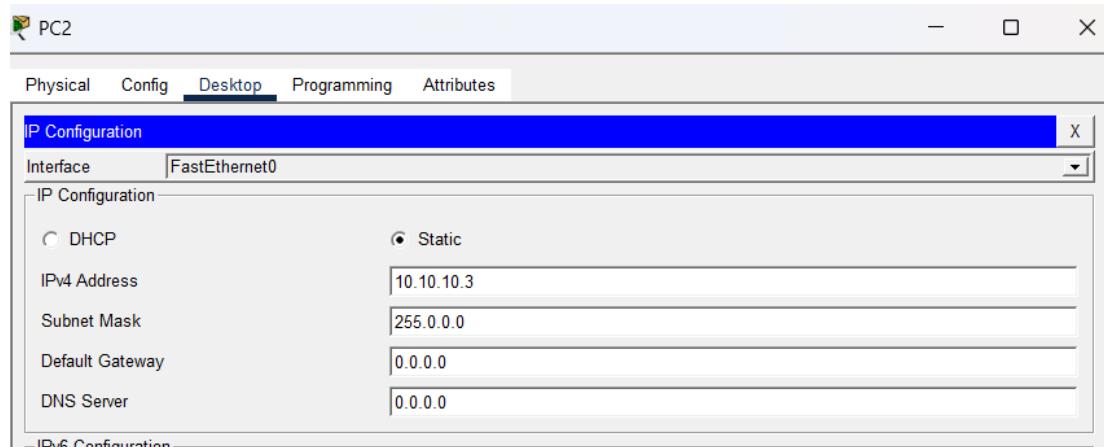
Task 2: Bus-like Topology (Hub)



Configuration:

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





Testing:

- PC0 pinged PC1.

```
Cisco Packet Tracer PC Command Line 1.0
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=3ms 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
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 = 3ms, Average = 1ms

C:\>
```

- PC0 pinged PC2.

```
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<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
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 = 1ms, Average = 0ms
```

- 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.

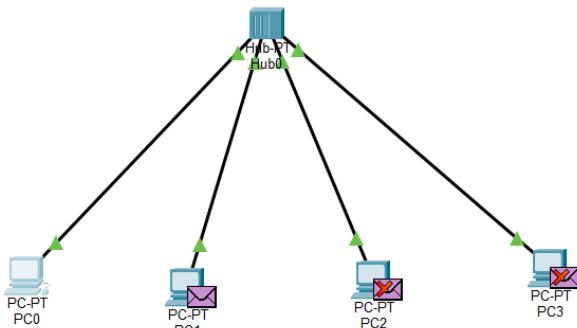


Figure 1:- SEND

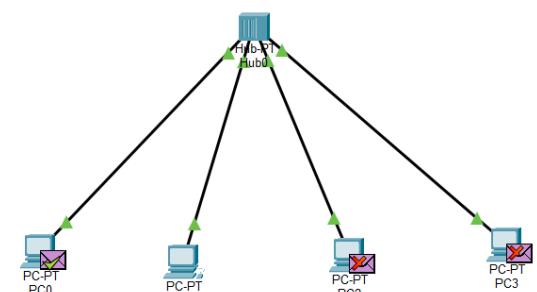


Figure 2:- RECEIVED

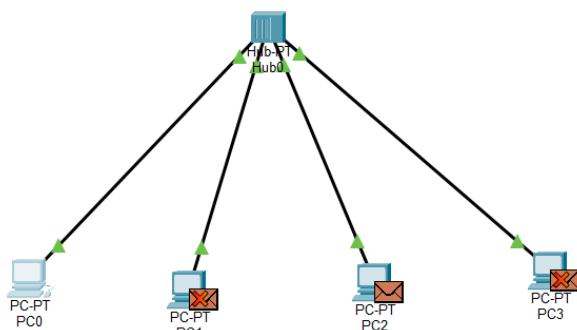


Figure 3:- SEND

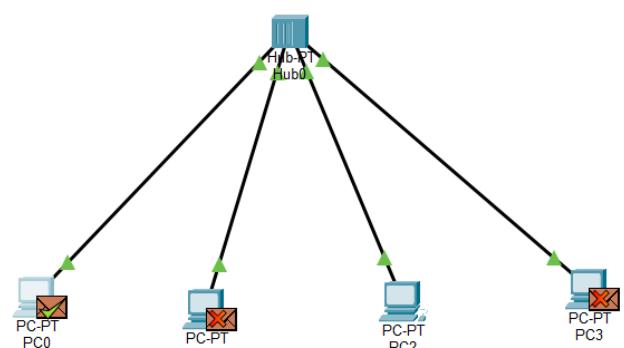


Figure 4:- RECEIVED

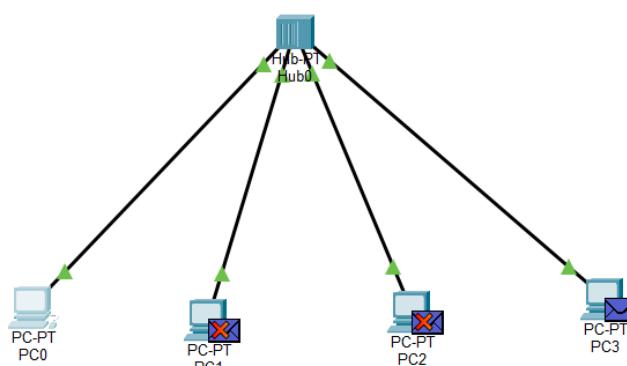


Figure 5:- SEND

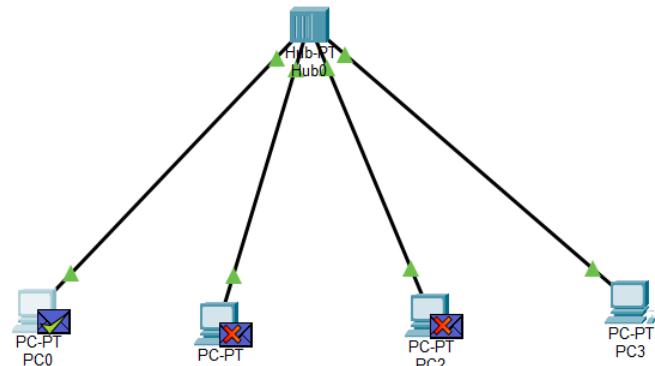


Figure 6:- RECEIVED

- Simulation Mode was used to observe packet flow.

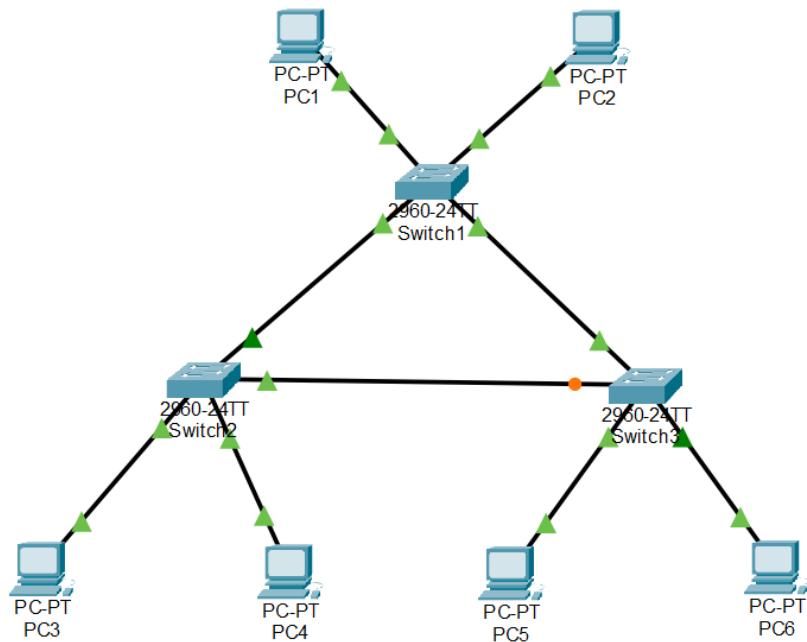
Result:

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)



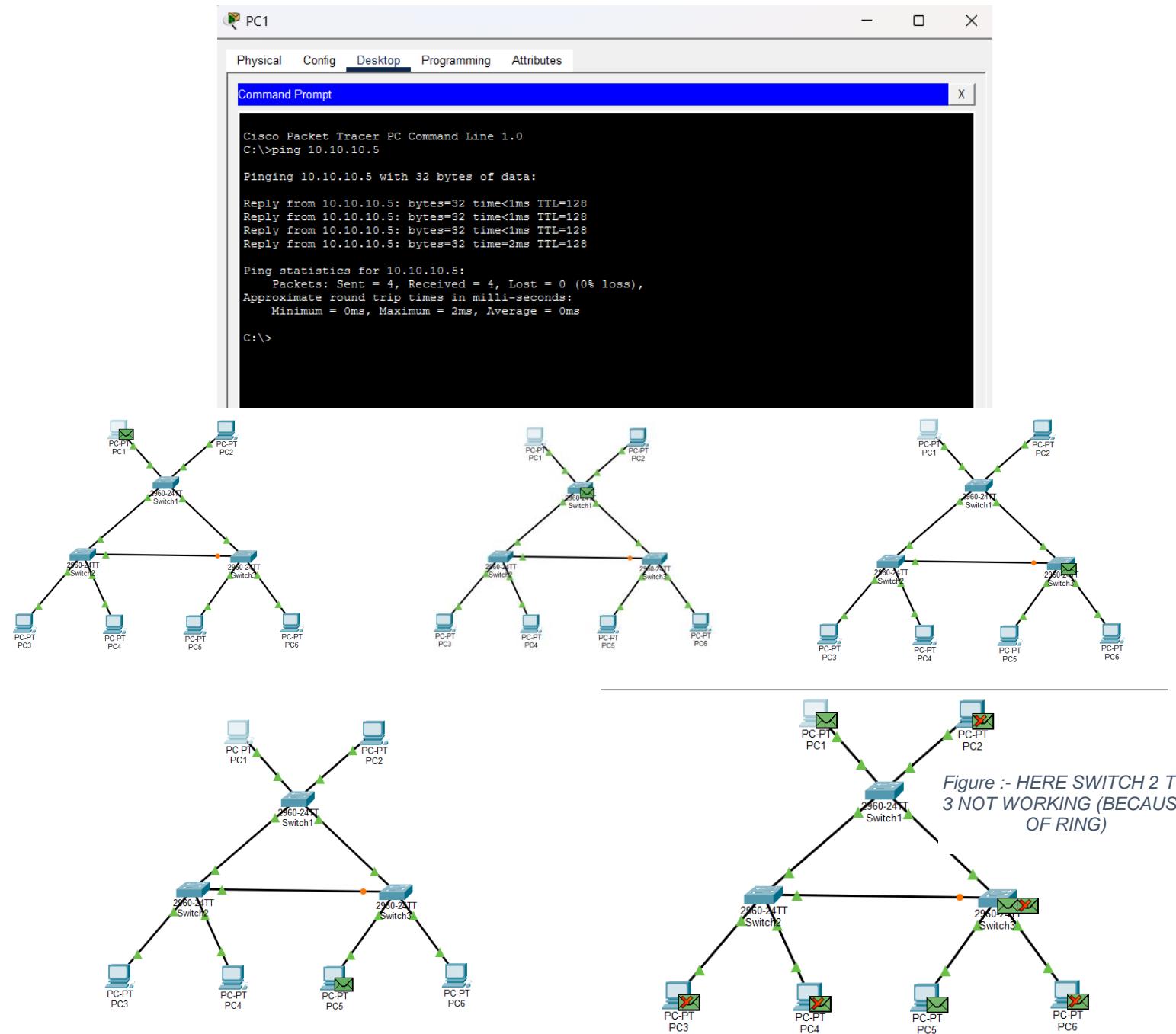
Configuration:

- 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).



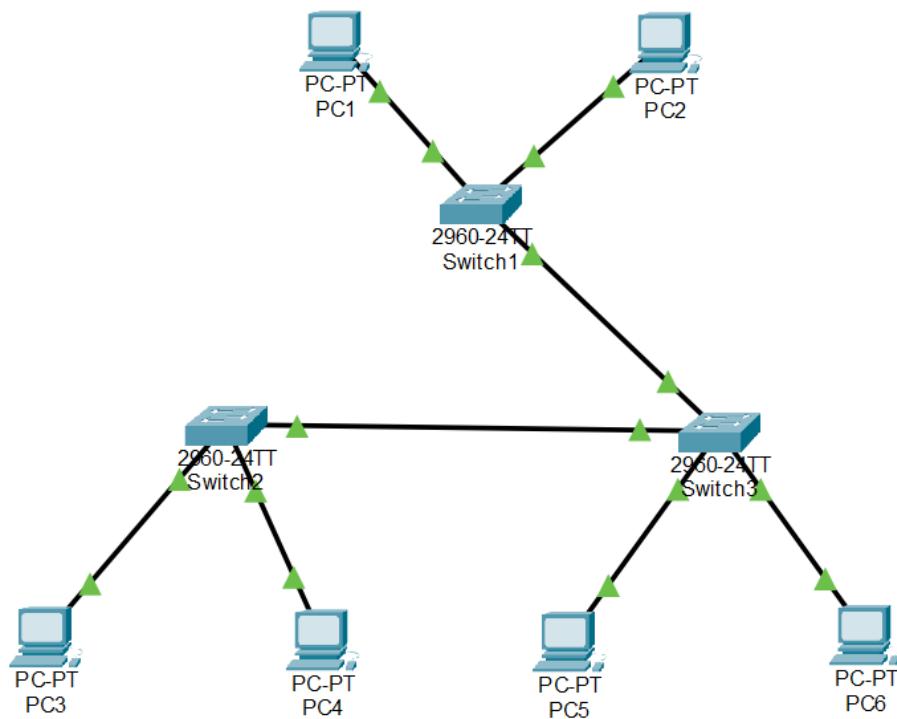
Result

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.

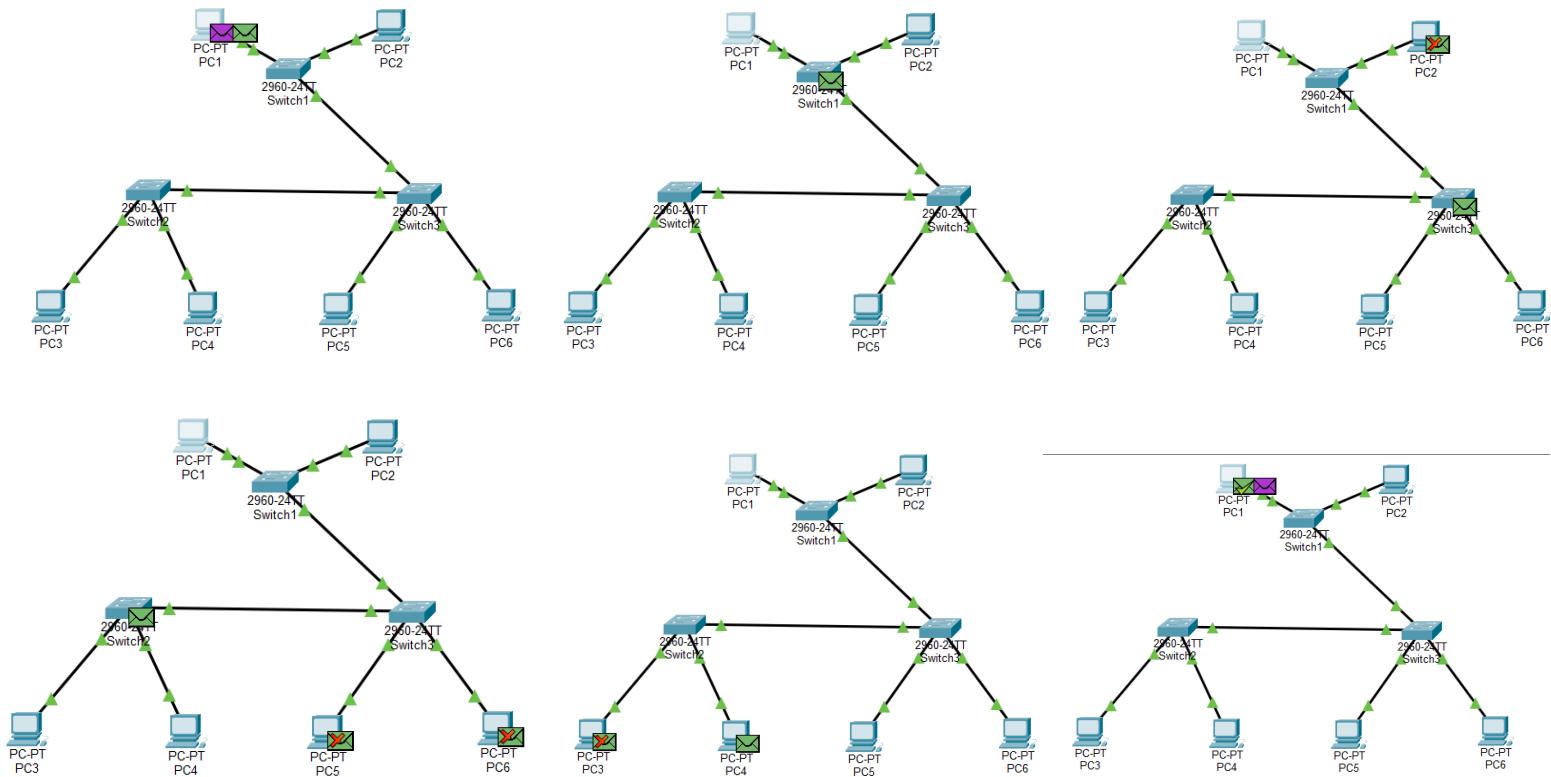
Task 4: Failure Test



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.

A screenshot of the Cisco Packet Tracer software interface. The window title is "PC1". The tab bar at the top has "Physical", "Config", "Desktop" (which is selected), "Programming", and "Attributes". Below the tabs is a "Command Prompt" window with a blue header bar containing the text "Command Prompt" and a close button "X". The main area of the window shows the output of a ping command:

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.10.10.5

Pinging 10.10.10.5 with 32 bytes of data:

Reply from 10.10.10.5: bytes=32 time=12ms TTL=128
Reply from 10.10.10.5: bytes=32 time=6ms TTL=128
Reply from 10.10.10.5: bytes=32 time=6ms TTL=128
Reply from 10.10.10.5: bytes=32 time=6ms TTL=128

Ping statistics for 10.10.10.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 6ms, Maximum = 12ms, Average = 7ms

C:\>ping 10.10.10.4

Pinging 10.10.10.4 with 32 bytes of data:
```

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