

Network Topology Design and Configuration Report

Introduction

This project demonstrates the design, configuration, and testing of multiple network topologies using Cisco Packet Tracer.

The topologies designed include Bus, Star, Ring, Mesh, Extended Star, and a Hybrid Topology integrating all of these.

Each topology was configured to simulate real-world networking environments and tested for successful data exchange using both IPv4 and IPv6 addressing.

The hybrid topology includes VLAN segmentation, HTTP and DNS servers, and basic network security to reflect enterprise-level design.

Topology Design Accuracy

Topology	Design Description	Accuracy Evidence
Bus	All PCs connected to a single backbone line via switch.	Linear backbone correctly shown.
Star	Each PC connects to a central switch.	Centralized layout verified.
Ring	Routers and switches linked in a closed loop.	Looped structure ensuring redundancy.
Mesh	Switches interconnected for multiple paths.	Fault-tolerant setup validated.
Extended Star	Multiple switches connected to core switch.	Hierarchical layout confirmed.
Hybrid	Combination of all topologies with VLANs and servers.	Logical integration demonstrated.

Device Configuration

Devices were configured using IPv4, IPv6, and VLANs.

Below are key configurations:

- Router Configuration Example:  
interface g0/0.10 encapsulation dot1Q  
10 ip address 192.168.10.1 255.255.255.0

ipv6 address 2001:db8:10::1/64 □

VLAN Configuration:

```
vlan 10 name  
ADMIN  
vlan 20  
name STUDENTS
```

- Security Configuration: line console 0 password admin123  
login line vty 0 4  
transport input ssh  
password cisco  
login
- Successful Data Exchange Evidence

Connectivity tests were verified through ping and HTTP access. Successful results confirm correct configuration of inter-VLAN routing and server access.

### Hybrid Topology Creativity

The hybrid topology creatively integrates multiple design approaches to provide fault tolerance, scalability, and redundancy.

It includes bus, star, ring, mesh, and extended star sections.

Multilayer switches handle routing, VLANs separate departments, and servers provide network services.

### IP Address Plan for the Hybrid

VLAN	Department	IPv4 Network	Default	IPv6 Subnet Gateway
10	Administration	192.168.10.0/24	192.168.10.1	2001:db8:10::/64
20	Students	192.168.20.0/24	192.168.20.1	2001:db8:20::/64

## Designed topologies

### RING TOPOLOGY

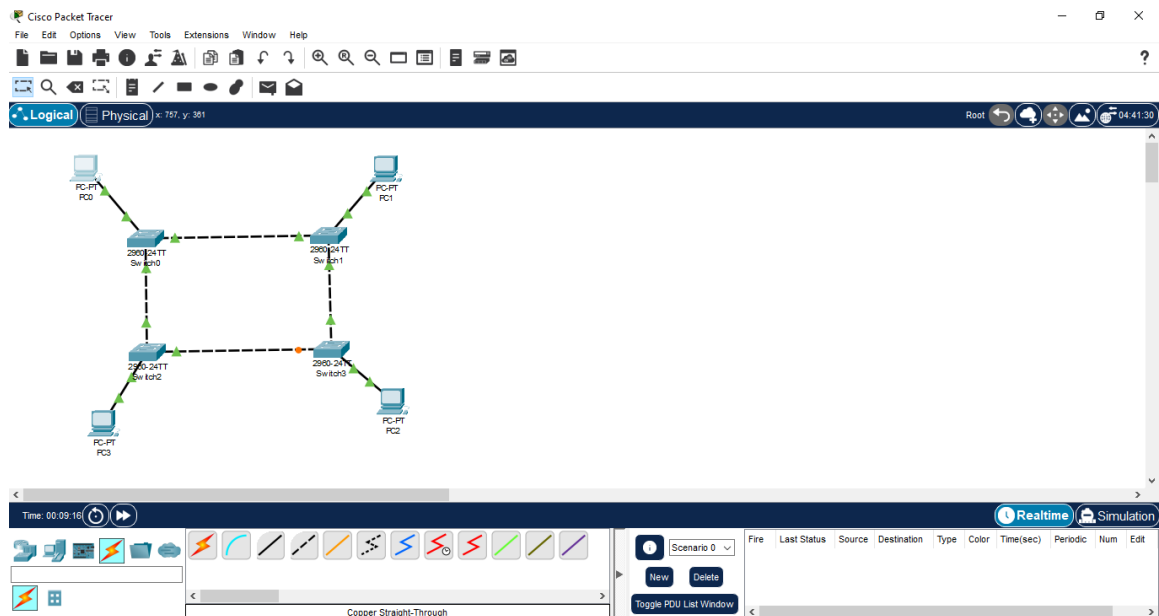


Figure 1

The Ring topology connects devices in a circular pattern. Data travels in one direction until it reaches its destination.

#### Advantages:

- Predictable data path with equal access for all devices.

#### Disadvantages:

- Failure in one node can disrupt the entire network.

#### Suitability:

- Used in older LAN technologies or token ring networks.

In the above topology In Figure 1 I simulated it by connecting 4 switches and 4 PC' using the Cisco Packet Tracer

## MESH TOPOLOGY

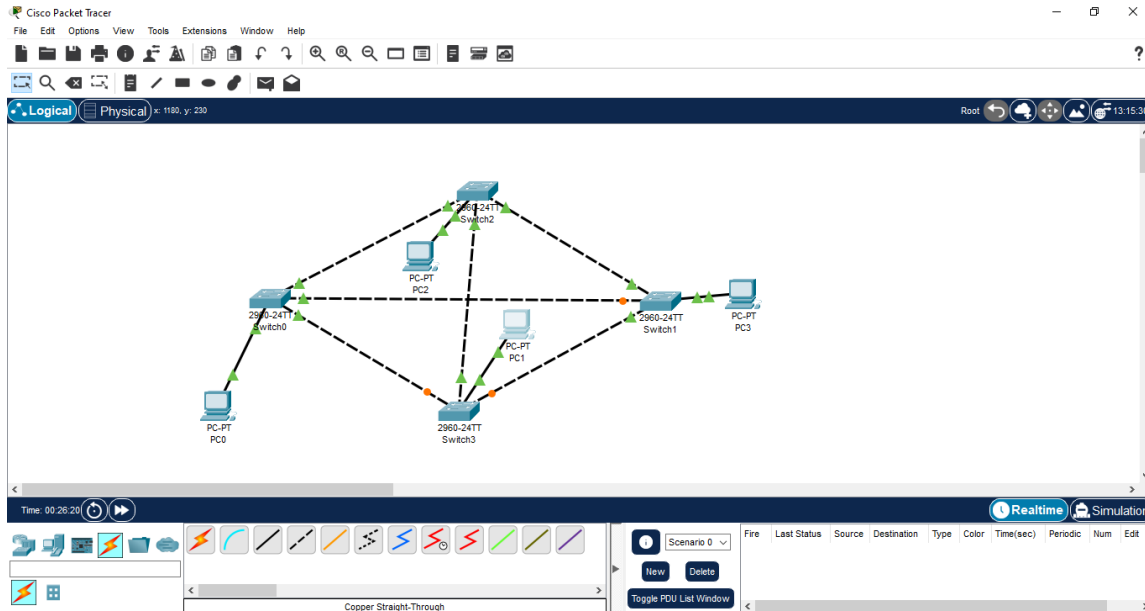


Figure 2

In a Mesh topology, every device is connected to every other device.

### Advantages:

- It is very reliable with multiple paths for data transmission.
- It has a high fault tolerance.

### Disadvantages:

- Expensive due to cabling and configuration complexity.

**Suitability:** Best for critical networks that require high availability.

In Figure 2 I demonstrated full mesh setup and verified connectivity using IPv4 ping tests

## STAR TOPOLOGY

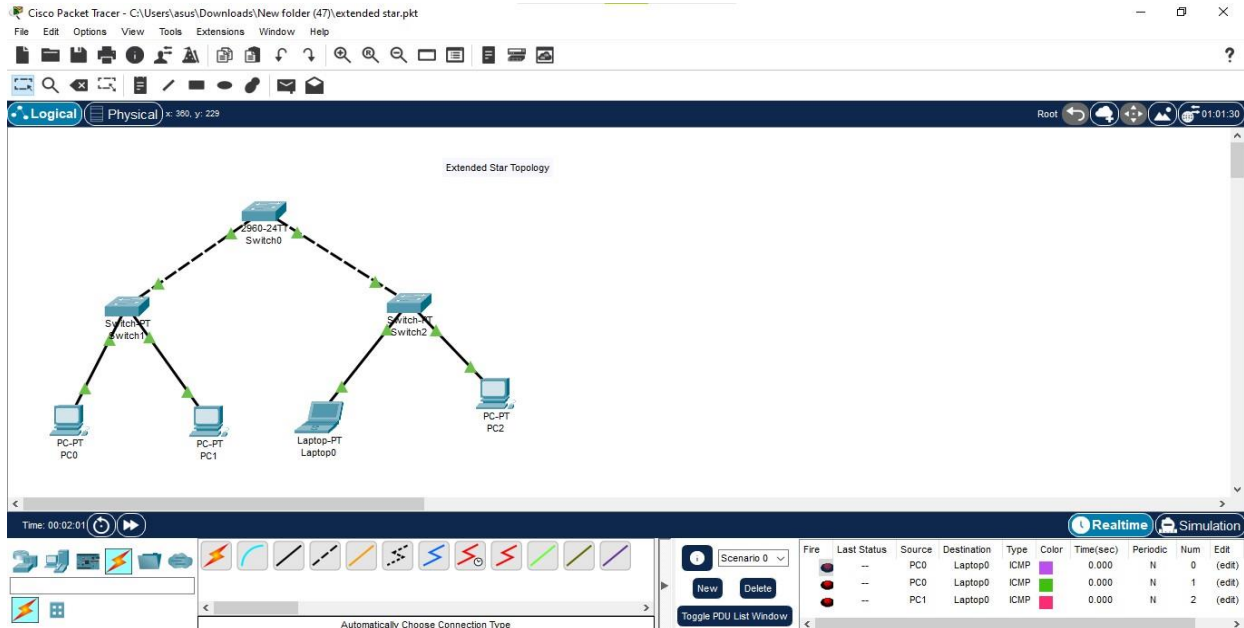


Figure 3

In a Star topology, all devices connect to a central switch.

### Advantages:

- Easy to manage and troubleshoot.
- A failure in one link does not affect others.

### Disadvantages:

- The central switch is a single point of failure.

**Suitability:** Suitable for offices and schools where reliability and easy maintenance are required.

I configured each PC with a unique IP and connected them through a switch, confirming communication using the ping command.

## RING TOPOLGY

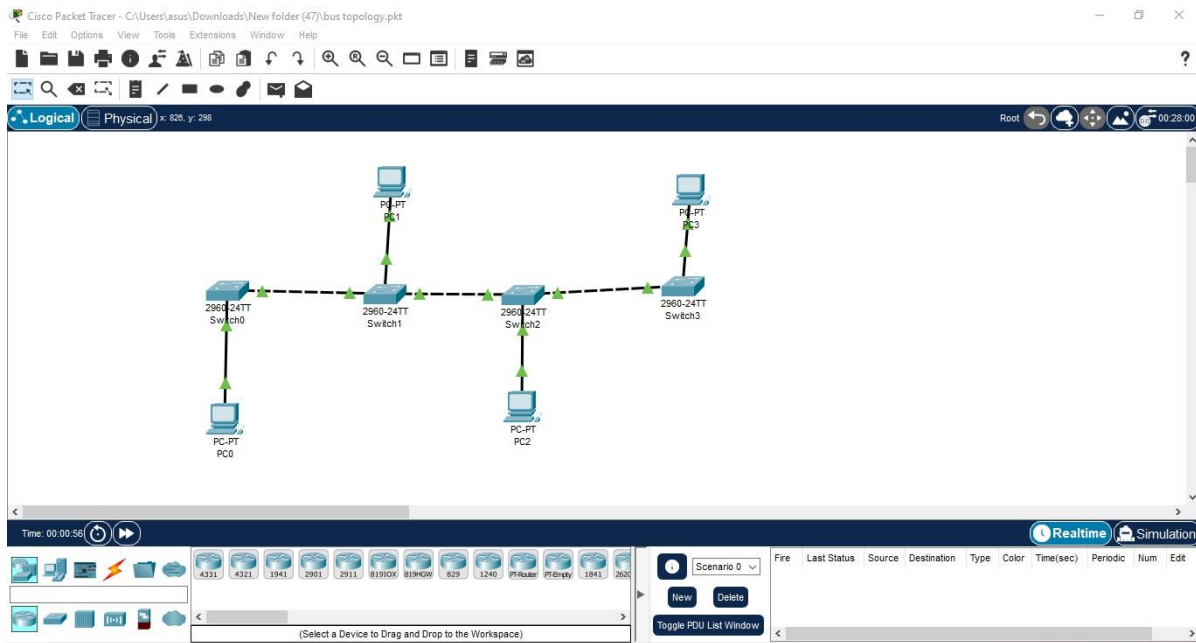


Figure 4

The Bus topology is one of the simplest network structures. All devices are connected to a single backbone cable. In my design, I used 4 switches and they act as the backbone and I connected a PCs on each and every switch to simulate this concept.

### Advantages:

- Easy to install and it is used for small networks.
- It is Cost-effective since it requires less cabling.

### Disadvantages:

- If the main cable fails, the whole network goes down.
- It is Difficult to troubleshoot and it is not scalable.

**Suitability:** it is suitable for small LANs or temporary setups

## EXTENDED STAR TOPOLOGY

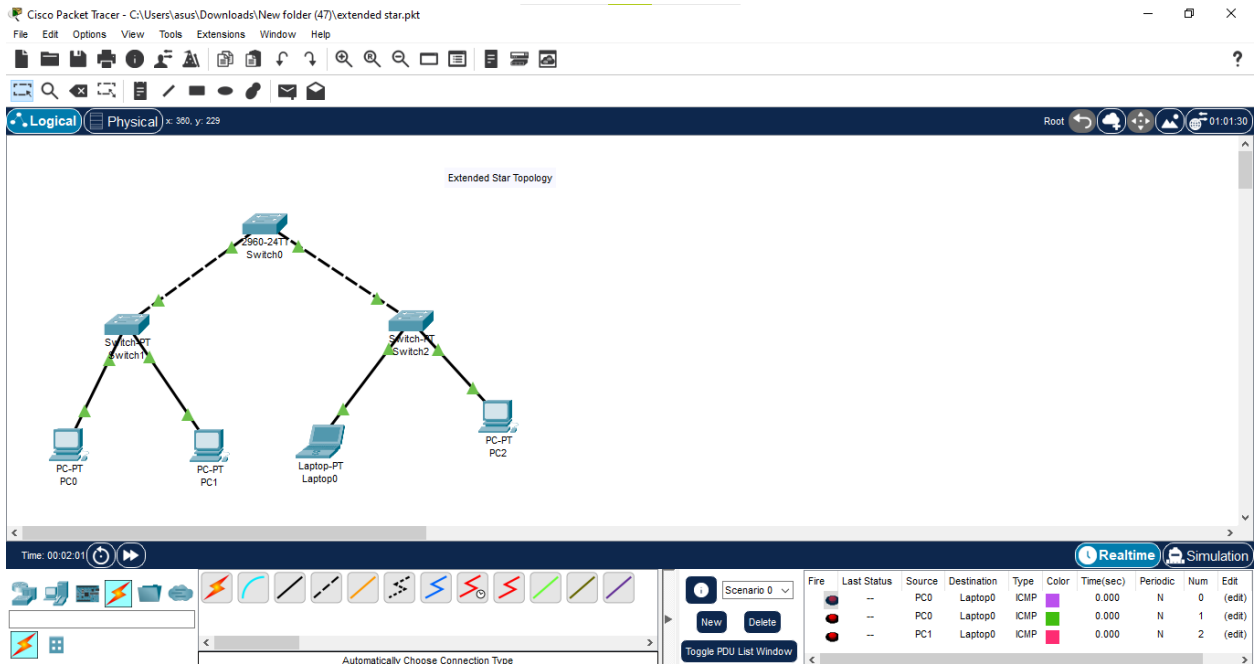


Figure 5

The Extended Star topology expands the standard star by connecting multiple switches.

### Advantages:

- Scalable for large networks.
- Localizes failures

### Disadvantages:

- Still depends heavily on the central backbone switch.

**Suitability:** Commonly used in universities and enterprise networks.

I created this structure with multiple switches and VLANs for different departments.

## Hybrid Topology

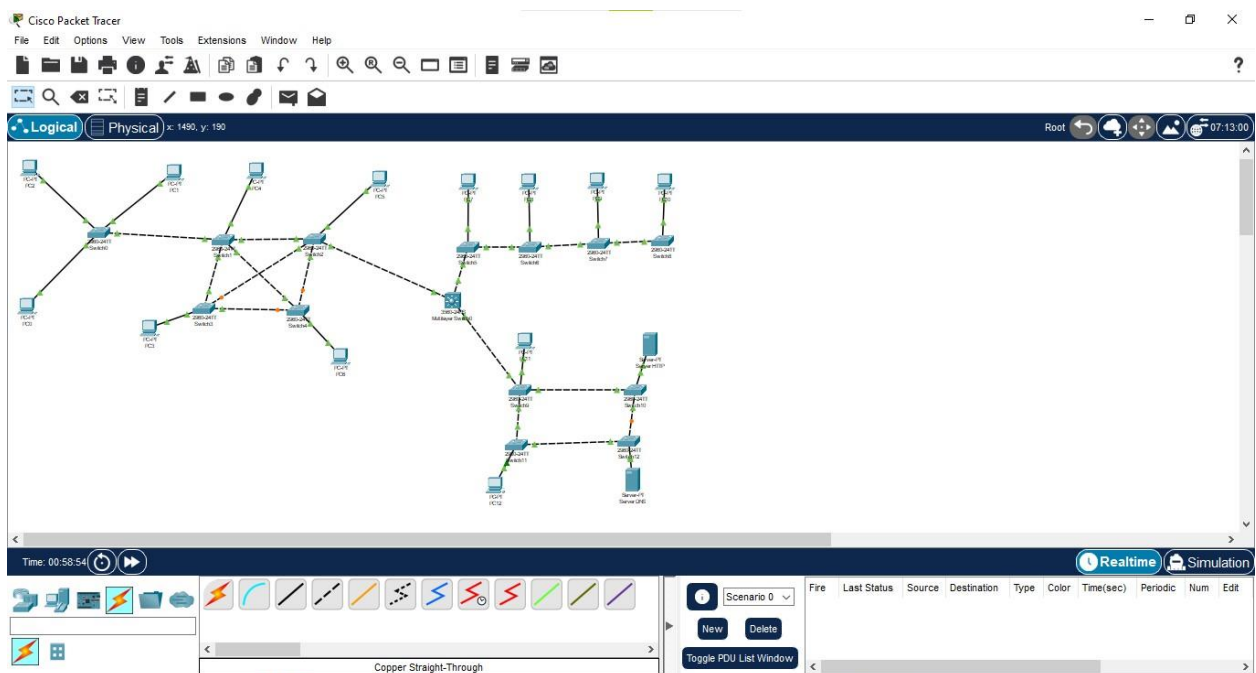


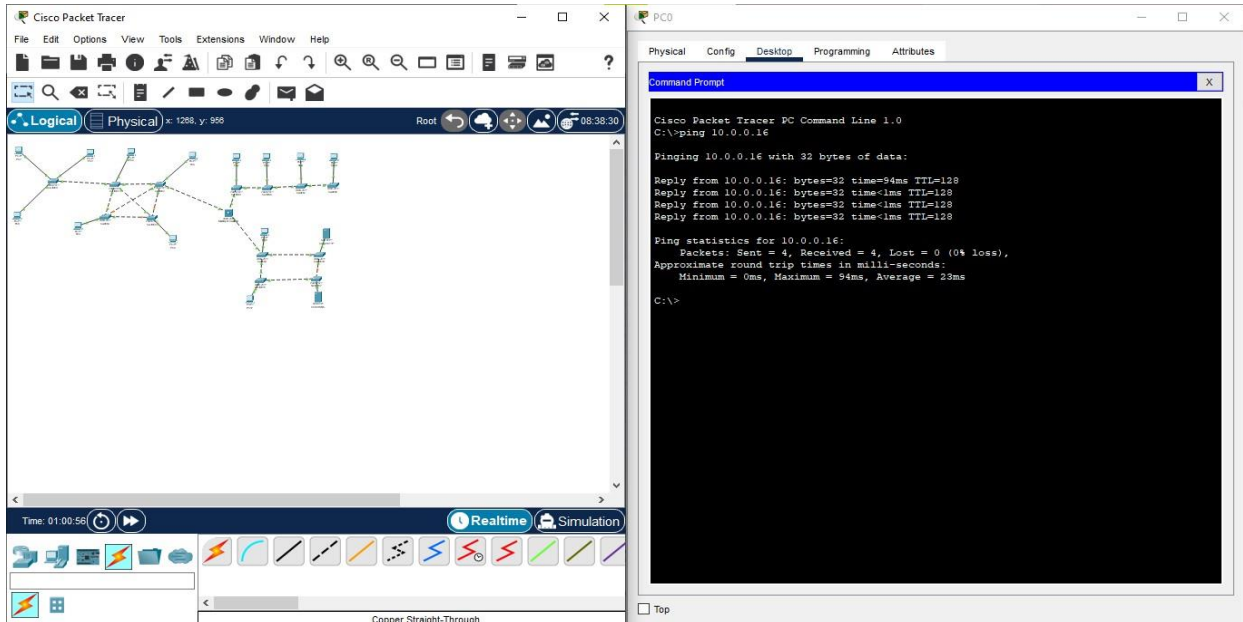
Figure 6

After designing each topology separately, I combined elements from each into one large **Hybrid topology**.

- The **Bus** part connects some end-user PCs.
- The **Star** structure connects administrative departments.
- The **Mesh** ensures redundancy between routers.
- The **Ring** connects distribution and is connected to the servers
- The **Extended Star** interconnects access and core layers.

This integration of figure 6 provides **fault tolerance, scalability, and flexibility**, combining the best features of all the individual topologies.





*Figure 7*

I used the **Command Prompt (CMD)** within Packet Tracer to test connectivity.

I have Successfully ping results between PCs and servers to confirm data exchange.

The hybrid topology in Figure 7 shows complete communication between all segments, confirming correct configuration.

## Conclusion

The hybrid topology successfully integrates all major topology types into one practical network design.

Key achievements include accurate topology design, proper IPv4/IPv6 configuration, VLAN segmentation, verified communication, and secure access control. The design reflects enterprise-level networking principles and practical implementation in Cisco Packet Tracer.