

## **Tutorial - Network Topologies and Operating Systems**

### **1. The nodes in Mesh Topology are connected via**

- a. Multipoint link
- b. Single link
- c. Point-to-point link**
- d. Hybrid link

### **2. Which topology requires a central controller?**

- a. Mesh Topology
- b. Bus Topology
- c. Bus Topology
- d. Star Topology**

### **3. Which of the following could be more reliable?**

- a. Mesh Topology**
- b. Bus Topology
- c. Bus Topology
- d. Star Topology

### **4. Define network topology and its types.**

Network topology refers to the arrangement or layout of computers, cables, and other devices connected in a network. It shows how devices are linked and how data flows between them.

#### **Types of Network Topology**

**Bus Topology:** All devices are connected to a single central cable called the bus or backbone.

**Advantages:** Easy to install and cost-effective for small networks.

**Disadvantages:** If the main cable fails, the entire network goes down.

**Star Topology:** All devices are connected to a central device like a hub or switch.

**Advantages:** Easy to manage and expand; failure of one device doesn't affect others.

**Disadvantages:** If the central hub fails, the whole network stops.

### Ring Topology:

Each device is connected to exactly two other devices, forming a circular path.

**Advantages:** Data flows in one direction, reducing data collisions.

**Disadvantages:** Failure of one device can disrupt the entire network.

### Mesh Topology:

Every device is connected to every other device in the network.

**Advantages:** Very reliable and provides high redundancy.

**Disadvantages:** Expensive and complex to set up due to many connections.

**Tree Topology:** It combines multiple star networks connected to a central bus backbone.

**Advantages:** Supports easy expansion and better network management.

**Disadvantages:** If the backbone cable fails, the entire network is affected.

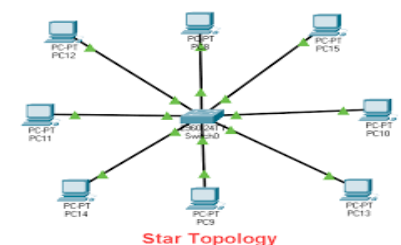
**Hybrid topology:** It is a combination of two or more different topologies (e.g., Star + Bus).

**Advantages:** Flexible and can be customized for specific needs.

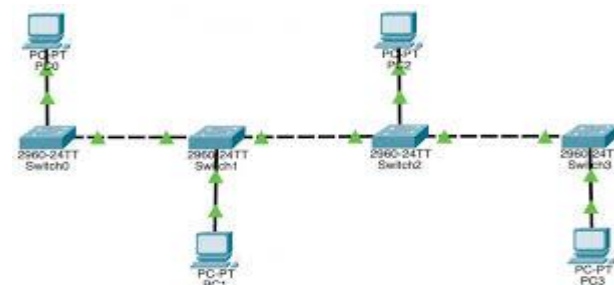
**Disadvantages:** Complex to design and maintain.

**5. Define the following including its advantages and disadvantages. Also draw related diagrams:**

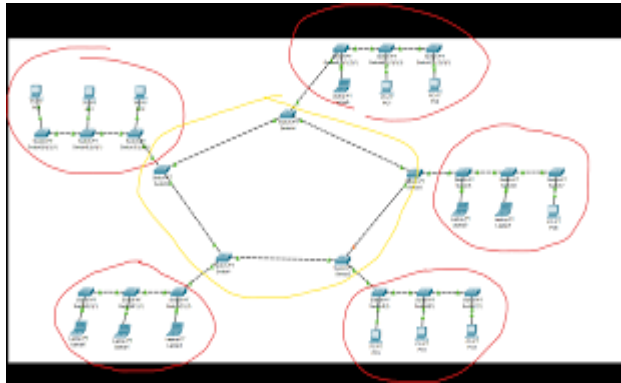
#### a. Star topology



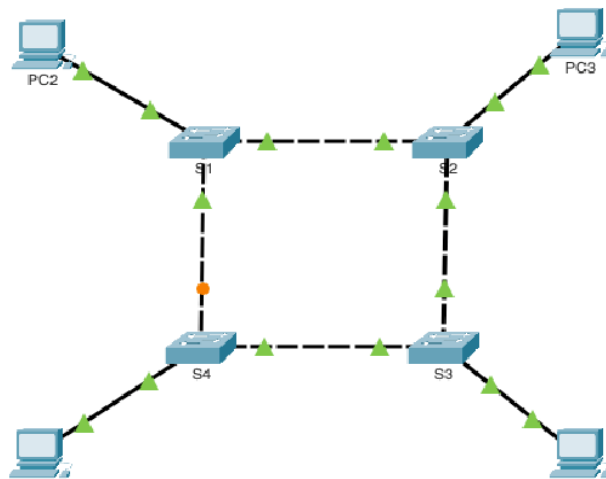
#### b. Bus topology



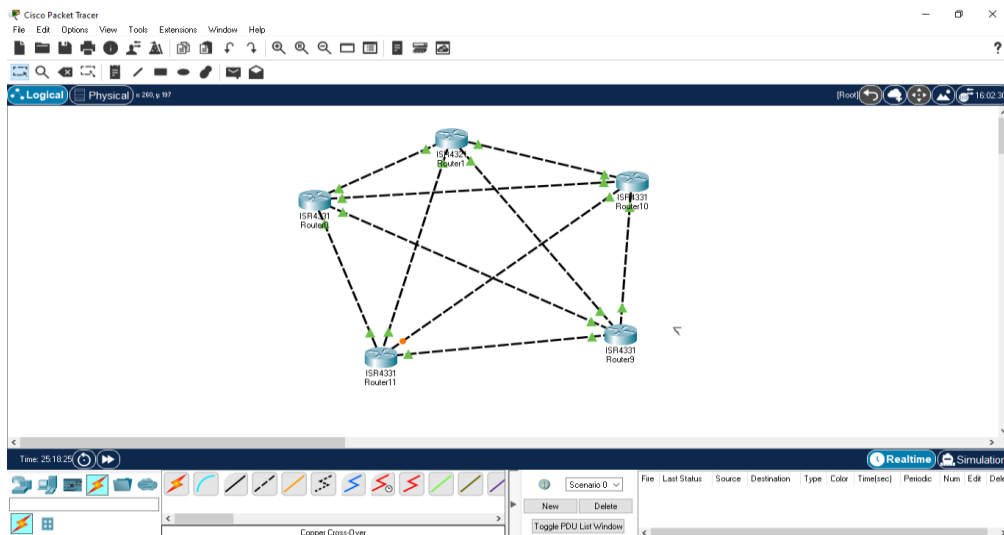
### c. Hybrid topology



### d. Ring topology



### e. Mesh topology



## **6. What do you understand by Media types? Explain with its types.**

Media types refer to the physical pathways or channels through which data is transmitted from one device to another in a computer network. In simple terms, it is the medium that carries data signals between networked devices.

### **Types of Transmission Media**

Transmission media are mainly divided into two categories:

#### **1. Guided Media (Wired Media)**

Guided media use cables or physical wires to transmit data. Signals travel through a specific path.

Types of Guided Media:

##### **a) Twisted Pair Cable:**

Consists of pairs of insulated copper wires twisted together.

Commonly used in telephone lines and LAN connections.

Advantages: Cheap, easy to install.

Disadvantages: Limited distance and lower data speed.

Example: Ethernet cables (Cat5, Cat6).

#### **2. Coaxial Cable**

Has a central copper conductor surrounded by insulation, metallic shield, and outer cover.

Advantages: Better protection against interference and higher bandwidth than twisted pair.

Disadvantages: Thicker and more expensive.

Example: Used in cable TV networks.

#### **3. Fiber Optic Cable:**

Uses light signals to transmit data through glass or plastic fibers.

Advantages: Very high speed, long distance, and secure data transmission.

Disadvantages: Expensive and difficult to install.

Example: Used in backbone internet connections.

#### **4. Unguided Media (Wireless Media)**

Unguided media use electromagnetic waves to transmit data through air or space, without physical cables.

### **Types of Unguided Media**

### **a) Radio Waves**

Used for wireless communication like FM radio, Wi-Fi, and Bluetooth.

**Advantages:** Can cover large areas and penetrate buildings.

**Disadvantages:** Affected by interference and signal noise.

### **b) Microwaves**

Transmit data between two antennas in a straight line (line of sight).

**Advantages:** High data rate and suitable for long-distance communication.

**Disadvantages:** Affected by weather conditions.

Example: Used in satellite and cellular networks.

### **c) Infrared Waves**

Used for short-range communication like TV remotes and wireless keyboards.

**Advantages:** Simple and secure.

**Disadvantages:** Cannot pass through obstacles.

## **7. Why is HUB called a dumb device and SWITCH called smart?**

### **Hub (Dumb Device)**

A Hub simply broadcasts data to all devices connected to it, whether they need it or not.

It does not identify which computer the data is meant for.

This creates unnecessary traffic and makes the network slower.

It operates at the Physical Layer (Layer 1) of the OSI model.

**Example:** If computer A sends a message to computer B, the hub sends that message to all computers, not just B. That's why a Hub is called "dumb" it doesn't make decisions or filter data.

### **Switch (Smart Device)**

A Switch can identify each device connected to it by using their MAC addresses.

It sends data only to the specific device that needs it.

This reduces network congestion and improves performance.

It operates at the Data Link Layer (Layer 2) of the OSI model.

**Example:** If computer A sends a message to computer B, the switch sends the message only to B, not to everyone else.

**8.** A recently established business called ABC Solutions is housed in a three-story building in Anamnagar. As the business grows, more computing equipment is needed to efficiently carry out its activities. Let's say ABC Company hires you as a network engineer. The business wants you to create a topology that will work best for them. The business also intends to build up its own server. In total, the office has 12 PCs, 3 printers, and 1 server. Now, as a network engineer, you must design a topology suitable for ABC Solutions so that the business may carry out its duties without difficulty.

