Assignment-1

CS-307 Computer Networks

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Network Topologies

In Computer Networks when we connect different networking devices. We use to connect them in a certain manner which we called Topologies. In Computer Networks different types of Topologies are used some of them are given below:

Mesh Topology:

In this type of Topology, Networks are interconnected with each other. This topology provides fault tolerance – if a wire, hub, switch, or other component fails, data can travel along an alternate path.

No. of Cables:

$n(n-1)/2$

No. of Ports:

$n(n-1)$

Advantages:

Reliability:

Mesh topology is highly reliable. Because the devices are interconnected so it one cable become faulty. The packets can go on an alternate path.

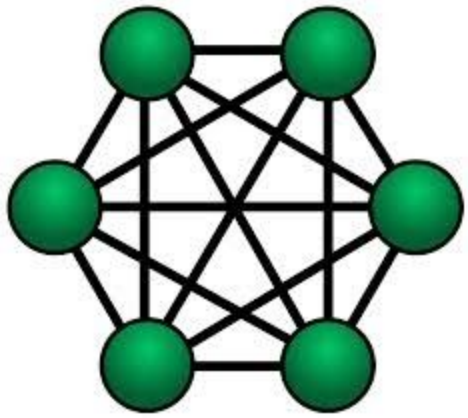
Security:

Mesh Topology is highly secure. The nodes are connected in such a manner that one device didn't the activity of other devices.

Disadvantages:

Costly:

Mesh Topology is very costly due to the interconnected nature of nodes



Examples

Smart Home Control and Monitoring:

You can have multiple sensors installed for different purposes at your home. For example, a fire sensor in the kitchen and fireplace is really handy in the event of a fire. Temperature sensors can perform climate control for you.

Smart Agriculture Control and Monitoring

With the invention of powerful and accurate environment monitoring sensors, the same idea can be implemented in the agriculture field to automate it. This will not only give you insights but also help in improving the yield of plants.

Star Topology:

In this type of Topology, the device is connected to a single **Hub** forming a Star shape. Each workstation has a cable that goes from its network interface card (NIC) of the device to a Hub. Most popular and most widely used LAN technology Ethernet operates in Star or Star-Bus topology.

No. of Cables:

n

No. of Ports:

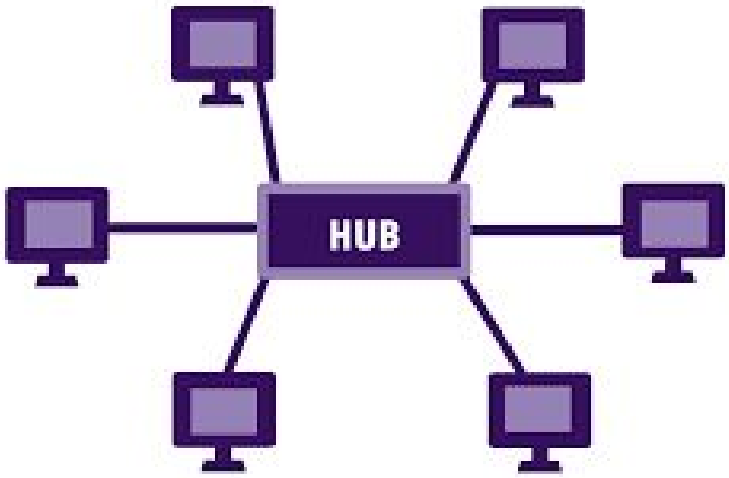
n

Advantages:

1. Easy to install and wire.
2. No disruptions to the network when connecting or removing devices.
3. Easy to detect faults and to remove parts.

Disadvantages:

1. Requires more cable
2. If the connecting network device hub fails, nodes attached are disabled and cannot participate in computer network communication.
3. Expensive



Examples:

LAN:

One of the best practical use of Star topology is LAN. In LAN as we know that each device is connected to a Hub(Router etc) through a LAN cable. And Thus forming a Star like Shape.

Wi-Fi:

Another great example is that of Wi-Fi just like LAN in wifi each device is connected to a network hub. But this time it's not through LAN cable but wirelessly. Wifi uses the same concept used by the LAN. But it has some disadvantages. Like Signals issue etc.

Bus Topology:

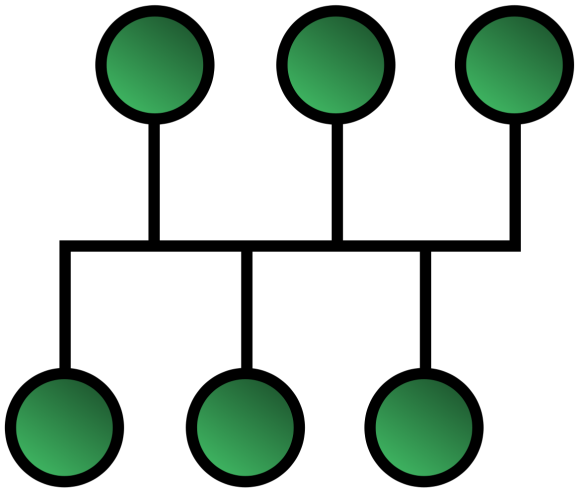
A bus topology consists of a main run of cable with a terminator at each end. All nodes like workstations, printers, laptops, servers, etc., are connected to the linear cable. The terminator is used to absorb the signal when the signal reaches the end, preventing signal bounce.

Advantages of Bus Topology

- Easy to connect a computer or peripheral to a linear bus.
- Requires less cable length than a star topology.

Disadvantages of Bus Topology

- Entire network shuts down if there is a break in the main cable.
- Terminators are required at both ends of the backbone cable.
- Difficult to identify the problem if the entire network shuts down.
- Not meant to be used as a stand-alone solution.



Example

10base2 Ethernet:

10base2 Ethernet over coax is a classic example of bus topology and was predominant during the mid to late 1980s. It is rarely used nowadays except were interfacing with legacy systems.

Ring Topology:

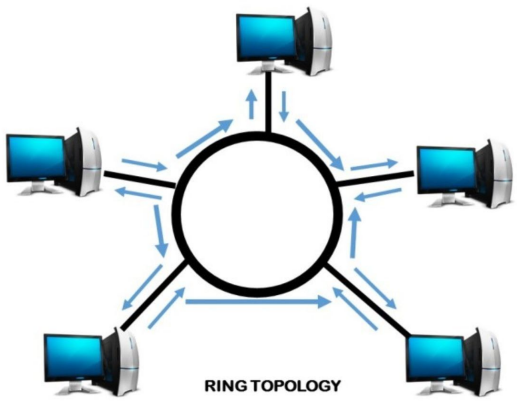
ing topology, also known as Ring network, is a type of network topology where each node is exactly connected to two other nodes, forward and backward, thus forming a single continuous path for signal transmission. They can be unidirectional or bidirectional.

Advantages:

- Reduced chances of data collision.
- Equal access to the resources

Disadvantages:

- a data packet must pass through all the nodes.
- if a node goes down the entire network goes down.



Example:

In wide-area networks (WAN) and metropolitan area networks (MAN), a ring topology is used to as the topology for the backbone (sometimes called a city ring) to connect the customers. In that case, the ring is used in both directions to have two distinctive paths to the public switch.

Tree Topology:

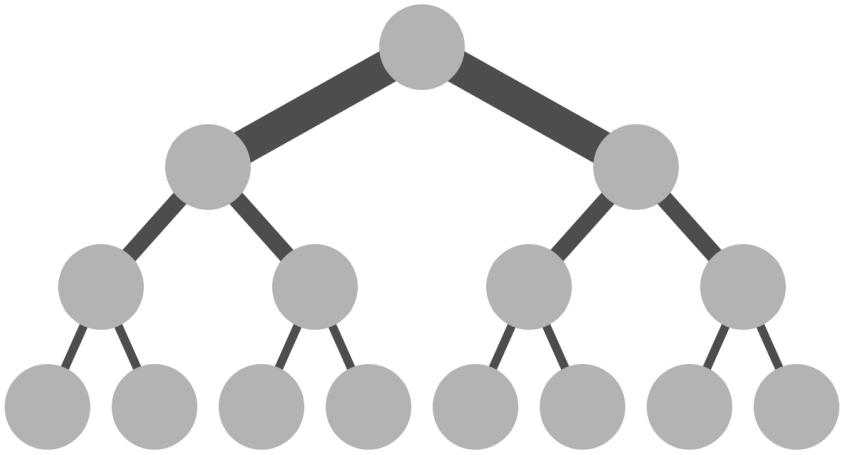
A tree topology is a combination of a star network topology and a bus topology. In tree topology, nodes of the underlying bus network topology are replaced with a complete star topology.

Advantages:

- Provides high scalability
- Other nodes in a network are not affected
- Easy maintenance and Fault identification

Disadvantages:

- Large cabling is required as compared to star and bus topology.
- On the failure of a hub, the entire network fails.
- Tree network is very difficult to configure than other network topologies.



Hybrid Topology:

A hybrid topology is a kind of combination of principles of two or more different networking topologies. It involves a mixture of tree topology, bus topology, ring topology, and mesh topology. The choice and usage of hybrid topology depend on its requirements and deployments such as the number of servers, location, and the performance of the desired network.

Advantages:

- Fault detection and troubleshooting are easy.
- Easy to increase the size of the network by adding new components
- Can be designed according to the requirements

Disadvantages:

- Complexity of Design
- Costly Hub
- Costly Infrastructure