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Data Communication CS601 Lecture No 3

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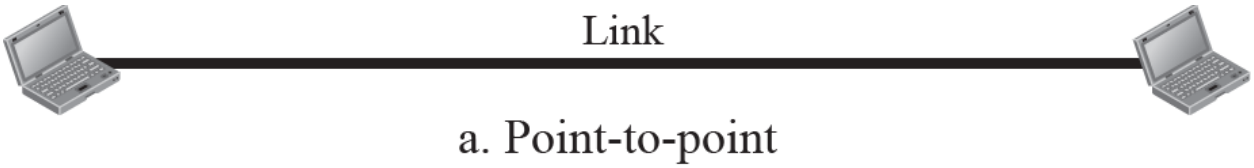
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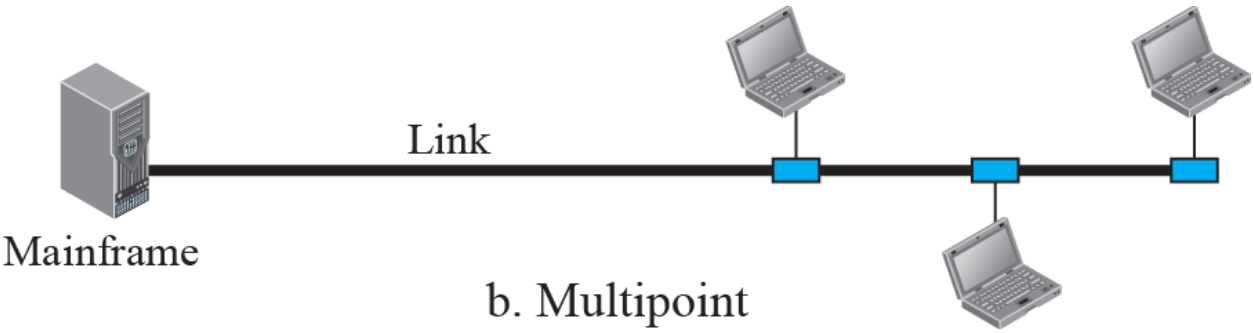
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Physical Network Attributes

- **Link**
- **Type of Connection**
  - ✓ **Point-to-Point**
  - ✓ **Multipoint**



a. Point-to-point



b. Multipoint

Physical Topologies

- **Physical Layout of Network**
- **Links + Nodes = Topology**
- **Physical Topologies:**
  - ✓ **Mesh**

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- ✓ **Star**
- ✓ **Bus**
- ✓ **Ring**

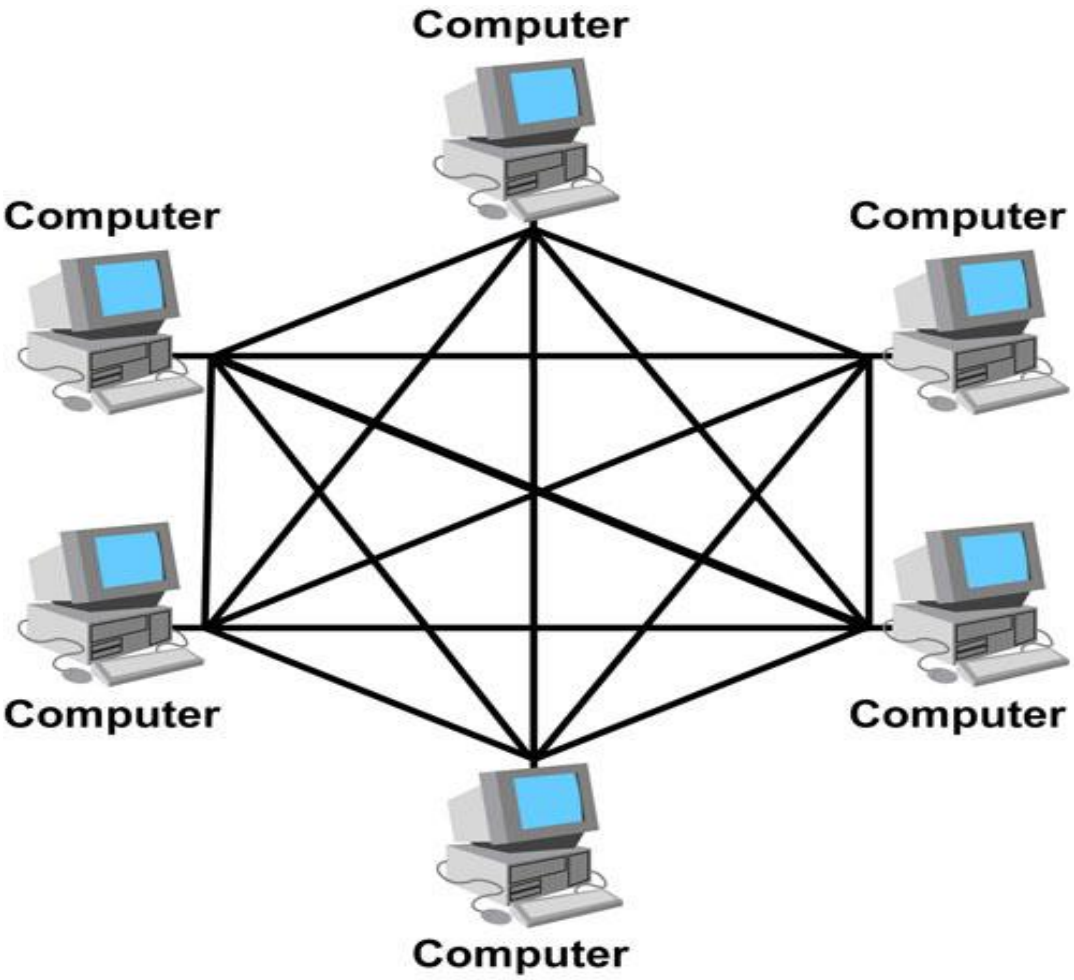
Mesh topology

In a mesh topology, every device has a dedicated point-to-point link to every other device. The term dedicated means that the link carries traffic only between the two devices it connects. A fully connected mesh network therefore has [n (n-1) / 2] physical channels to link it devices.

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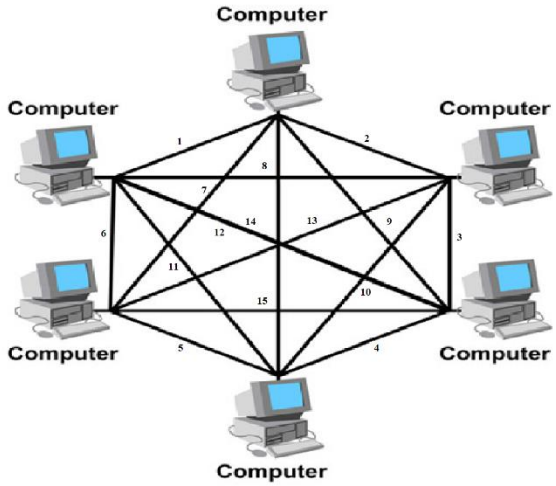
A fully connected mesh network therefore has [n (n-1) / 2] physical channels to link it devices.

n (n-1) / 2

6 (6-1) / 2

6 (5) / 2

30 / 2 = 15 Links



A mesh offers several advantages over other network topologies:

1. The use of dedicated links guarantees that each connection can carry its data load, thus eliminating the traffic problems that can occur when links must be shared by multiple devices.

2. A mesh topology is robust; if one link becomes unusable, it does not affect the entire system.

3. Security where every message sent travels along a dedicated line, only the intended recipient sees it.

4. Point-to-point links make fault identification and fault isolation easy.

The main disadvantages of a mesh topology are:

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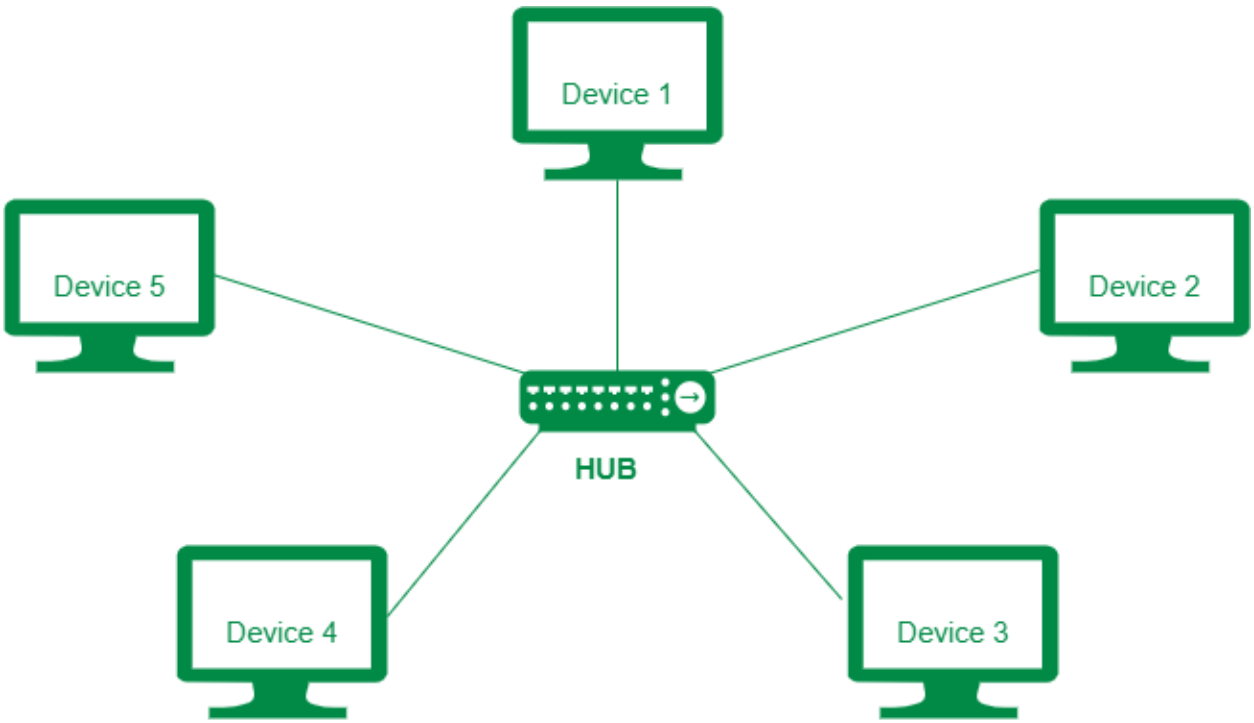
1. Difficult installation and reconfiguration because every device must be connected to every other device.

2. The bulk of the wiring can be greater than the available space can accommodate.

3. The hardware required to connect each link can be expensive.

Star Topology

In a star topology, each device has a dedicated point-to-point link only to a central controller, usually called a hub. The devices are not linked to each other. Unlike a mesh topology, a star topology does not allow direct traffic between devices.



Star Topology

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The advantages of star topology are:

1. Less expensive than a mesh topology.

2. Easy to install.

3. Robustness. If one link fails, only that link is affected.

4. Easy fault identification and fault isolation. As long as the hub is working, it can be used to monitor link problems and bypass defective links.

The disadvantages of the star topology are:

1. Any fault occur to the central controller will drop down the entire network.

2. Although the star needs less cabling than mesh, it still needs more cables than ring and tree topology.

Bus Topology

The preceding examples all describe point-to-point configurations A bus topology on the other hand, is multipoint. One long cable act as a backbone to link all the devices in the network

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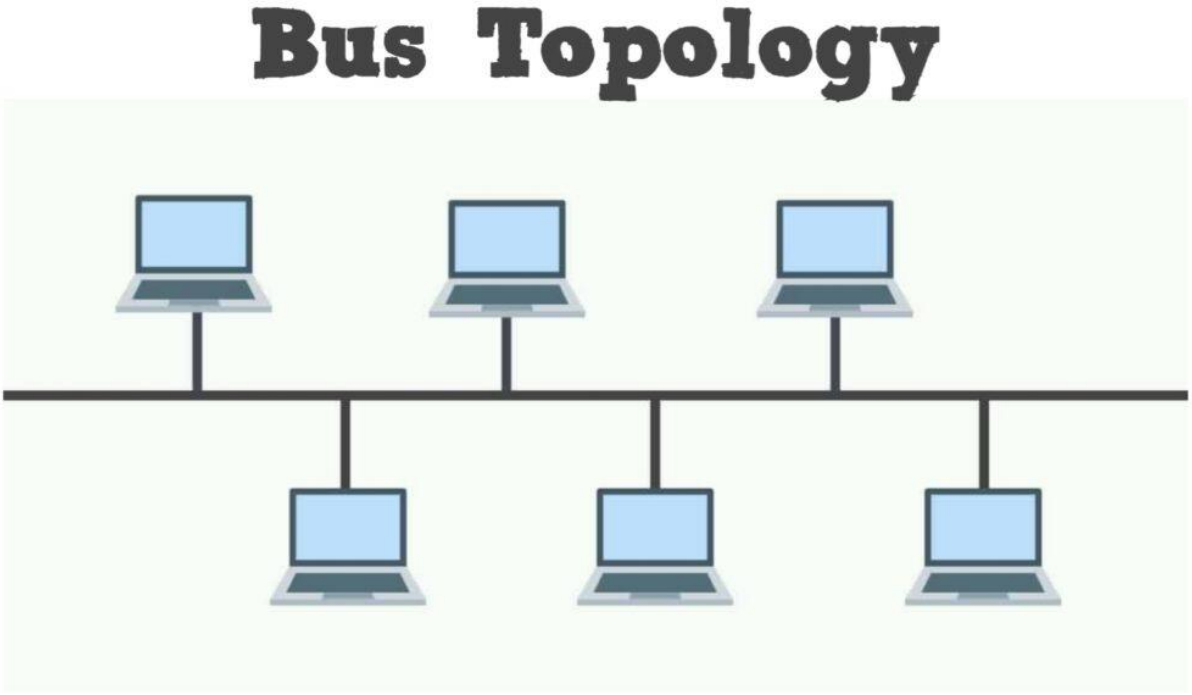




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The advantages of a bus topology are:

1. Ease of installation.

2. Backbone cable can be laid along the most efficient path, then connected to the nodes by drop lines of various lengths.

3. Use less cabling than mesh, star, and tree topologies. Terminator Terminator Tap Tap 11

While the disadvantages are:

1. Difficult reconfiguration and fault isolation.

2. A fault or break in the bus cable stops all transmission, even between devices on the same side of the problem. The damaged area reflects signals back in the direction of origin, creating noise in both directions.

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3. Adding new devices may therefore require modification or replacement of the backbone.

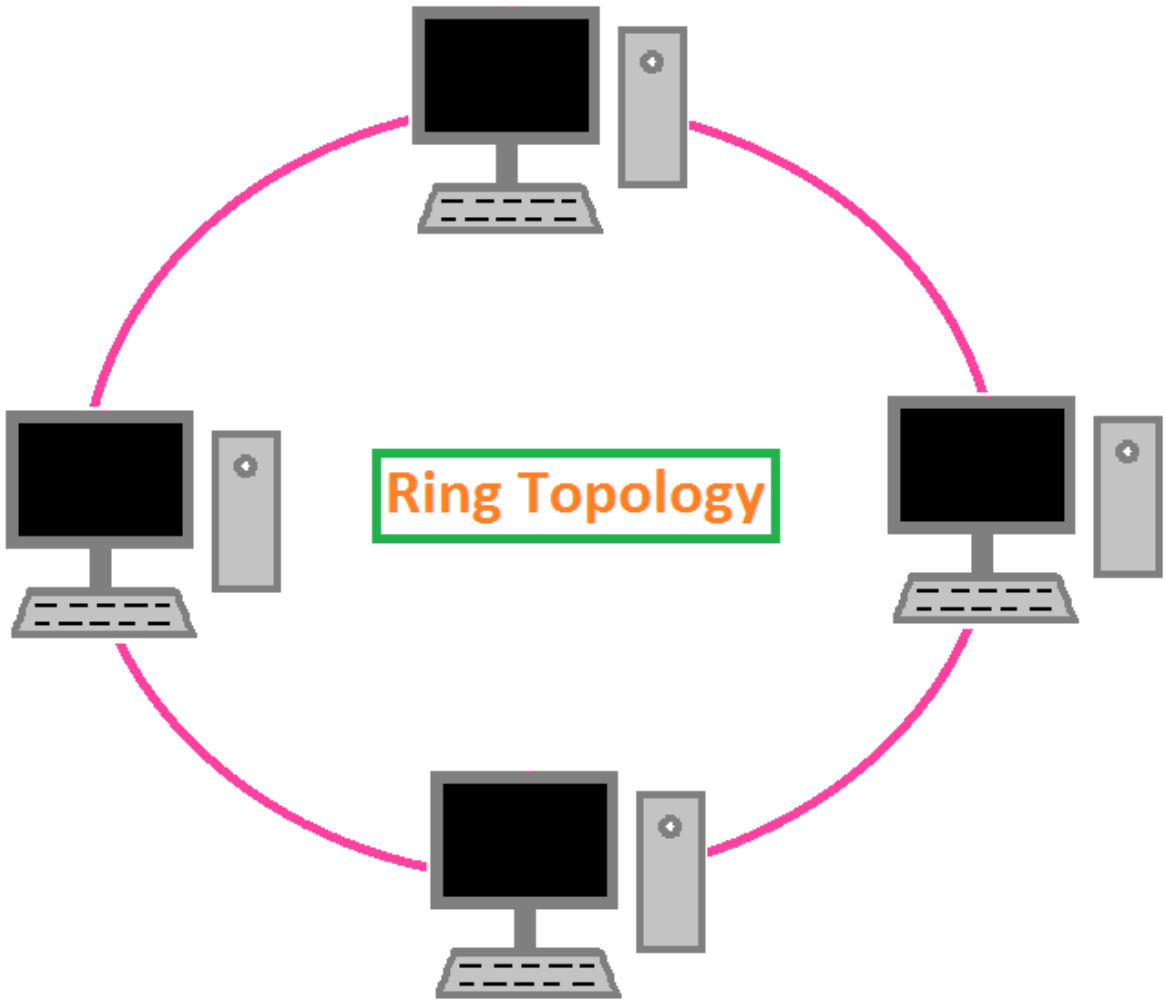
Ring Topology

In a ring topology, each device has a dedicated point-to-point line configuration only with the two devices on either side of it. A signal is passed along the ring in one direction, from device to device, until it reaches its destination. Each device in the ring incorporates a repeater.

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The advantages of ring topology are:

1. Relatively easy to install and reconfigure.

2. Addition or deletion of a device requires moving only two connections.

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3. Fault isolation is simplified.

The disadvantage of the ring topology is that a break in the ring (such as a disabled station) can disable the entire network, and it is one way data flow.