

جامعة الحمدازية  
كلية التربية  
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# *Physical Structures*

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# Physical Structures

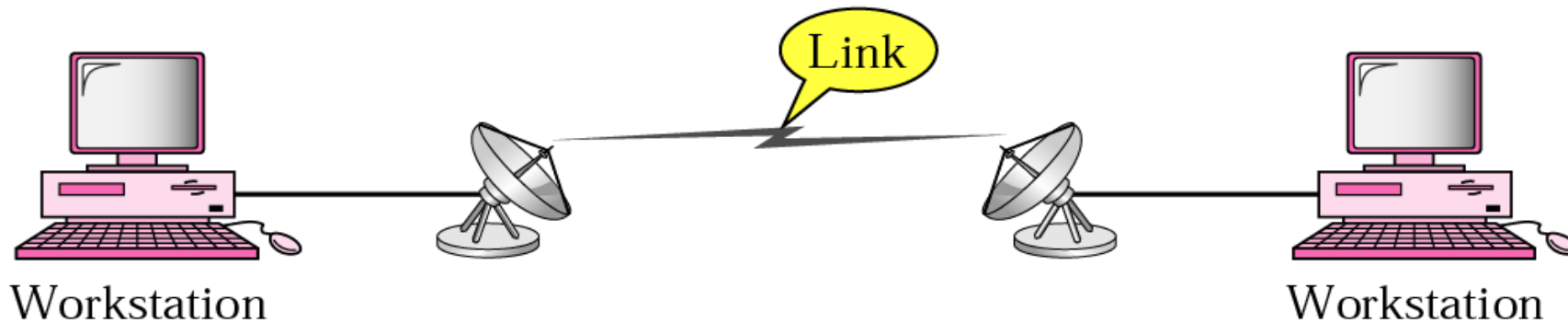
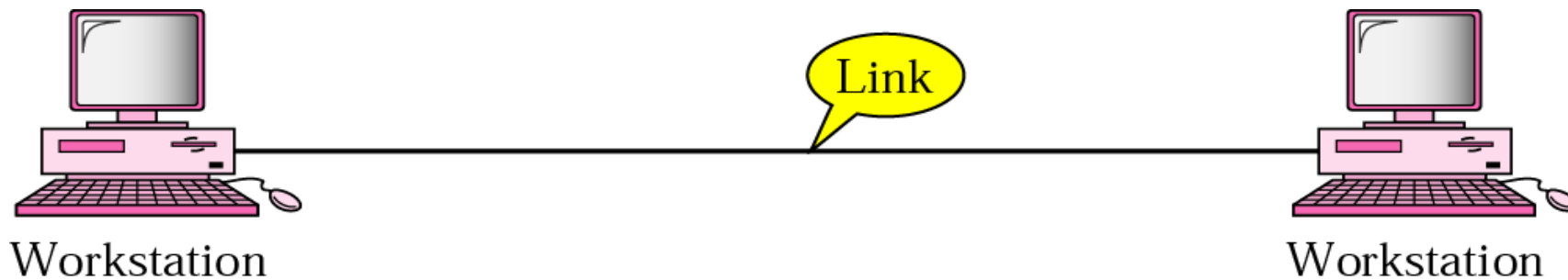
## *1-Type of Connection*

A network is two or more devices connected through links. A **link** is a communications pathway that transfers data from one device to another.

There are two possible types of connections: **point-to-point** and **multipoint**.

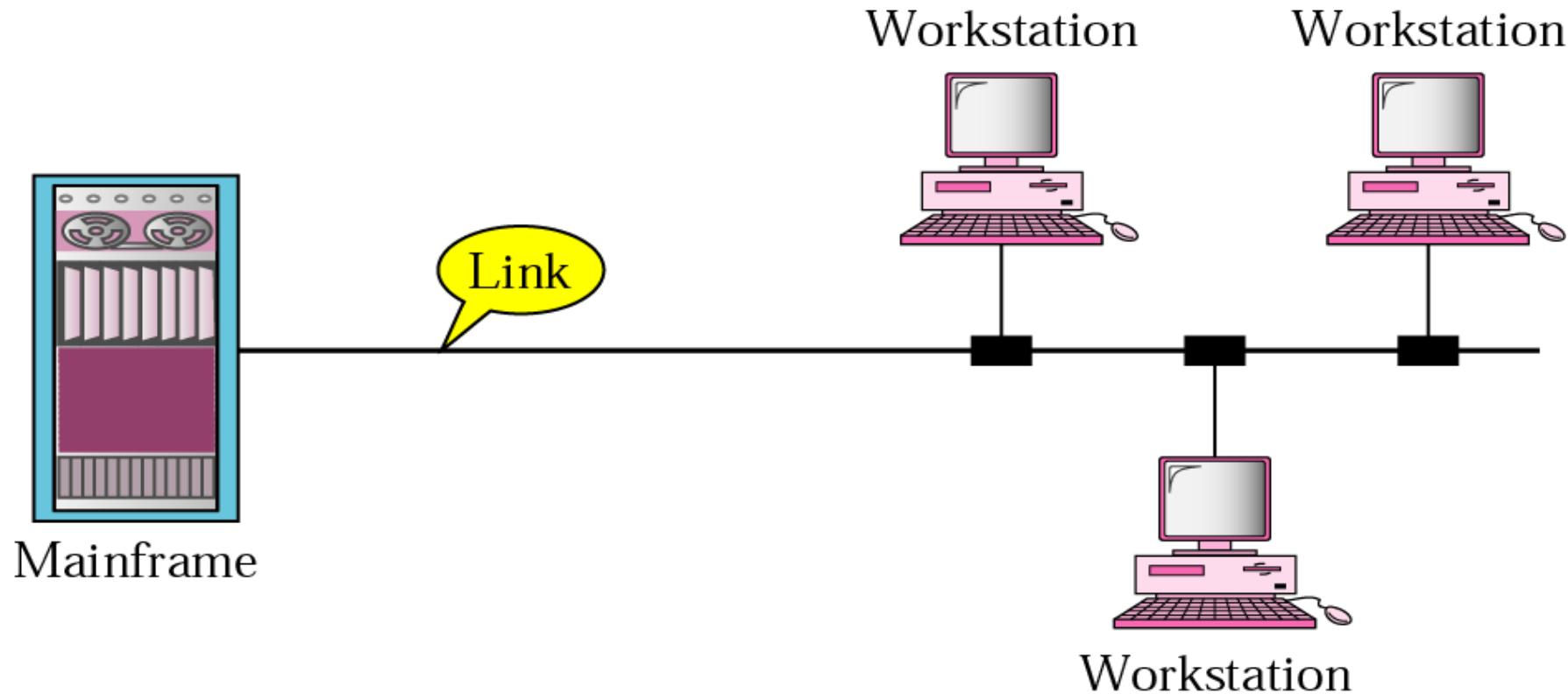
## Point-to-Point

A point-to-point connection provides a **dedicated** link between two devices. Such as point-to-point connection between the remote control and the television's control system.



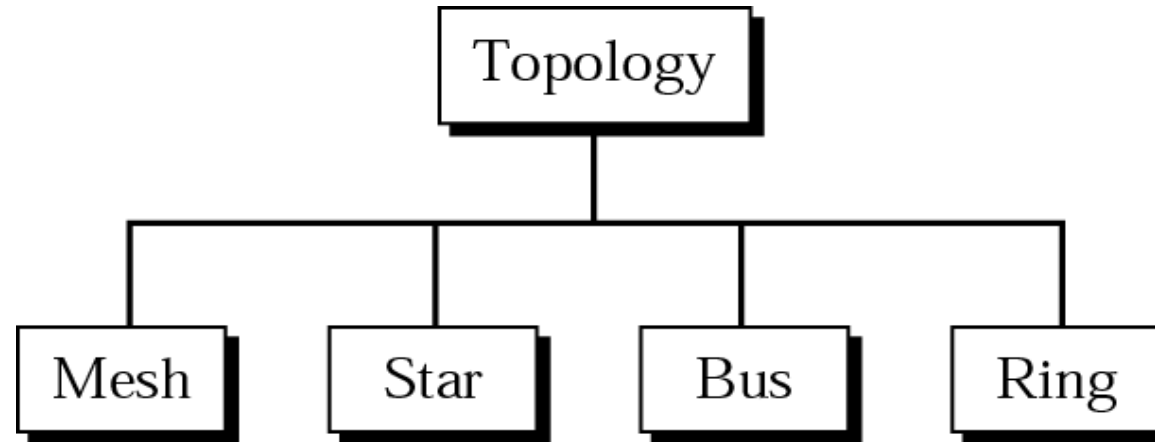
## Multipoint

A multipoint (also called multidrop) connection is one in which more than two specific devices **share** a single link.



## *2- Physical Topology*

There are four basic topologies possible:



## Mesh

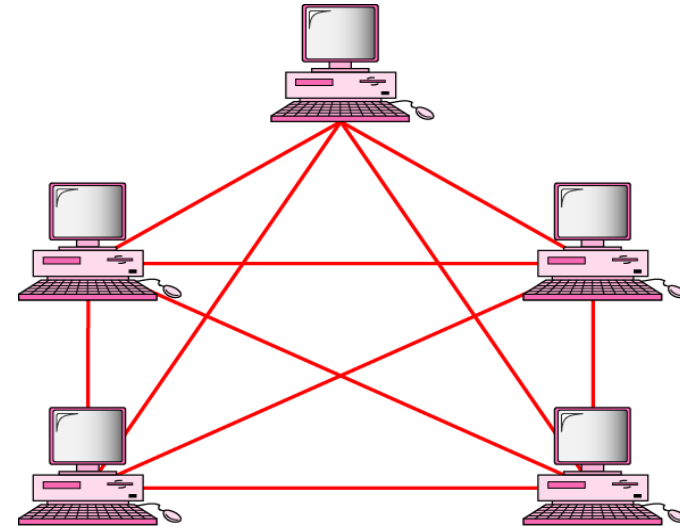
In a mesh topology, every device has a dedicated point-to-point link to every other device. The term *dedicated* means that the link carries traffic only between the two devices it connects.

However, if each physical link allows communication in both directions, we can divide the number of links by 2.

$$\text{Number of Links} = n(n-1) / 2$$

Every device on the network must have  $n - 1$  or

$$\text{Number of links for each device} = n-1$$



## Mesh advantages

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

**Second**, a mesh topology is **powerful**. If one link becomes unusable, it does not breakdown the entire system (use another path).

**Third**, there is the advantage of **privacy or security**. When every message travels along a dedicated line, only the intended recipient sees it. Physical boundaries prevent other users from gaining access to messages.

## Disadvantages

**Firstly**, because every device must be connected to every other device, installation and reconnection are difficult, it is **expensive** the hardware required to connect each link (I/O ports and cable) can be prohibitively expensive.

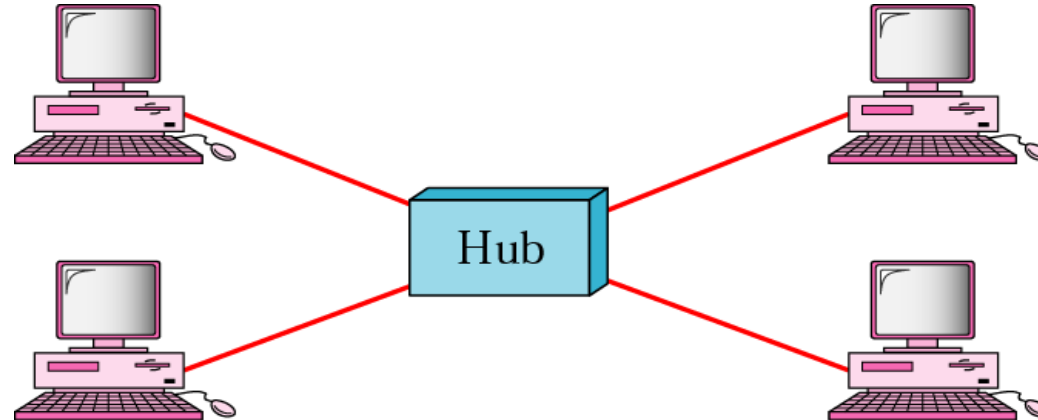
**Secondly**, the sheer bulk of the wiring can be greater than the available space.

**Application:** One practical example of a mesh topology is the connection of telephone regional offices in which each regional office needs to be connected to every other regional office.



## Star Topology

In a star topology, each device has a dedicated point-to-point link only to a central controller, usually called a **hub or switch**. It does not allow direct traffic between devices.



The controller acts as an exchange: If one device wants to send data to another, it sends the data to the controller, which then relays the data to the other connected device.

**Hub:** to distribute and management of data.

## Advantages:

**First**, A star topology is less expensive than a mesh topology. In a star, each device needs only one link and one I/O port to connect it to any number of others. This factor also makes it **easy to install and reconfigure**.

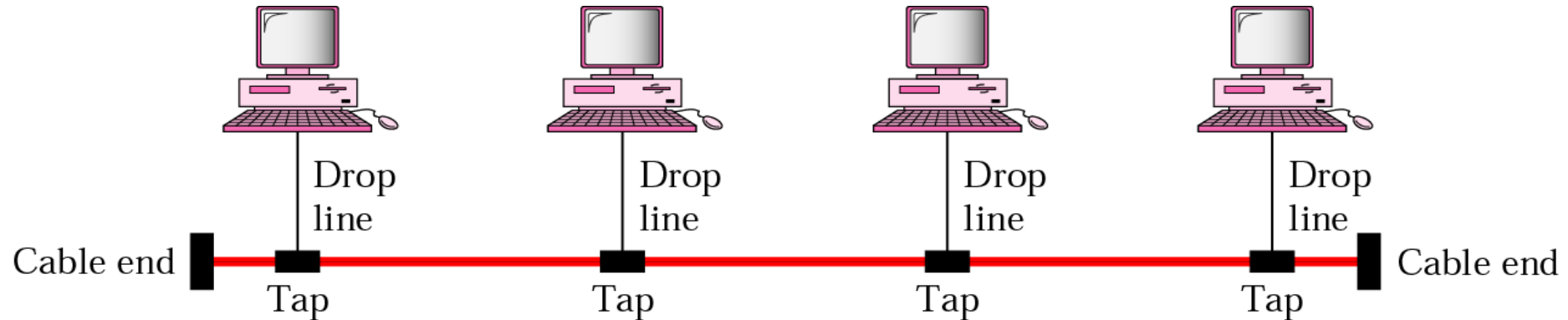
**Second**, far less cabling.

**Third**, advantages include **robustness**. If one link fails, only that link is affected. All other links remain active.

One **big disadvantage** of a star topology is the dependency of the whole topology on one single point, the hub. If the hub goes down, the whole system is dead.

## Bus Topology

One long cable acts as a **backbone (main cable)** to link all the devices in a network.



Nodes are connected to the bus cable by **drop lines** and **taps**.

A **drop line** is a **connection** running between the device and the main cable.

A **tap** is a **connector** that either splices into the main cable to create a contact with the metallic core. Such as T-Connector.

## Advantages of a bus topology

Include **easy for installation** and **cheaper** than mesh or star topologies.

## Disadvantages

Include **difficult reconnection**.

It can therefore be **difficult to add new devices**.

**Signal reflection at the taps can cause degradation in quality.**

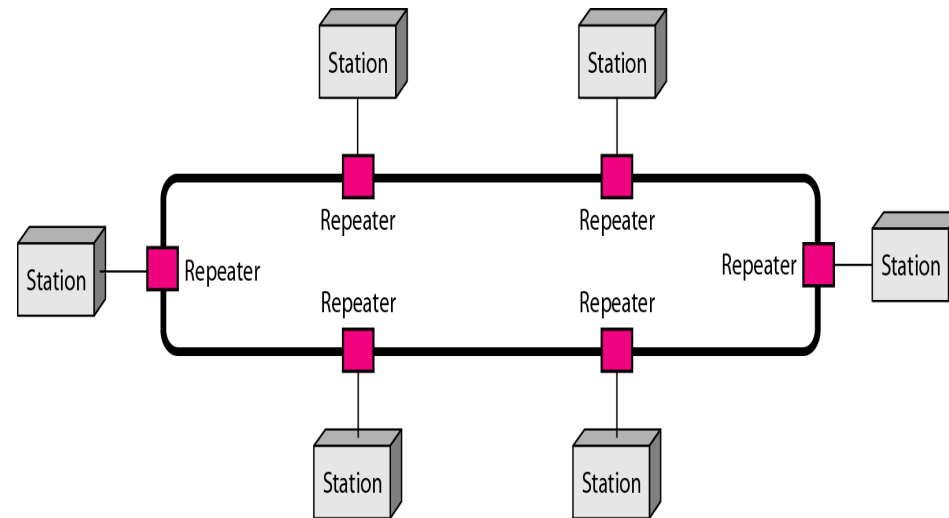
This degradation can be controlled by limiting the number and spacing of devices connected to a given length of cable.

**A fault or break in the bus cable stops all transmission**

## Ring Topology

In a ring topology, each device has a dedicated point-to-point connection with only 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. When a device receives a signal intended for another device, its repeater regenerates the bits and passes them along.



Note: the repeater can indicate the direction of the signal.



## Advantages:

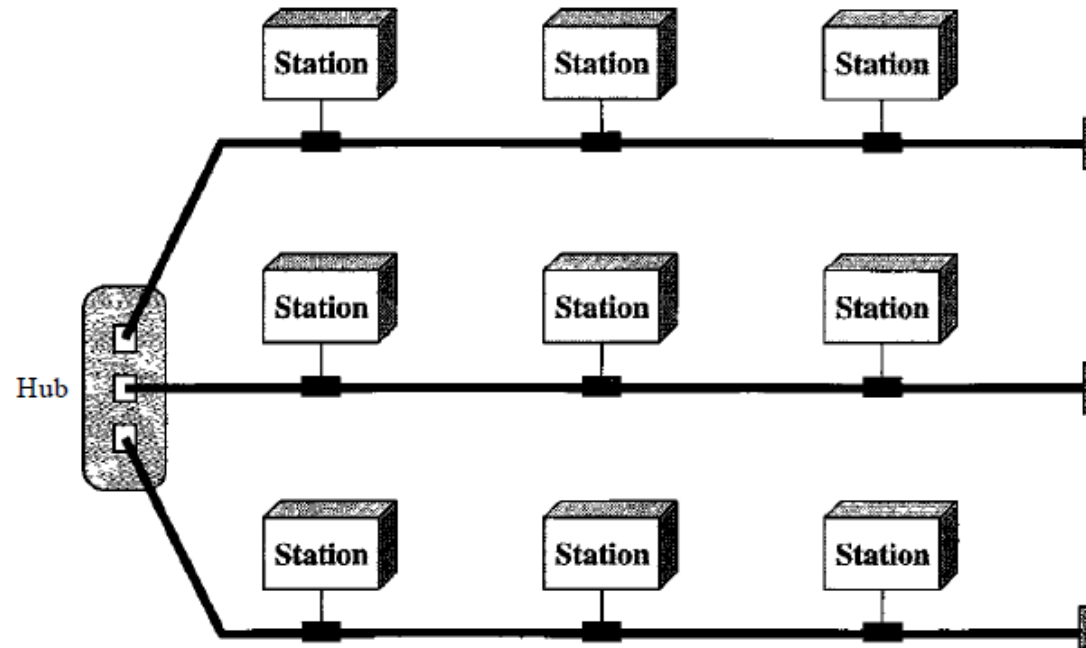
- A ring is relatively easy to install and reconfigure.

## Disadvantages:

- A signal is circulating at all times. Need long time to send data between PC1 to PC5 because the cable is long.
- Unidirectional traffic. In a simple ring, a break in the ring (such as a disabled station) can disable the entire network.
- Unsecure because the data will pass through other computers.

## Hybrid Topology

A network can be hybrid. For example, we can have a **main star topology** with each branch connecting several stations in a **bus topology** as shown below.



*a star backbone with three bus networks*