

Computers I

4.5 Network Physical Structures

We have said that a network is a two or more devices connected together and that a path is set up for communication to be reached between the two. Now we will discuss the physical connections for Networks.

There are two possible connection types when it comes to Networks

Point-to-point or Multipoint

Point-to-point connections – provides a dedicated link or between two devices.

The entire capacity of the link is reserved for transmission between those two devices.

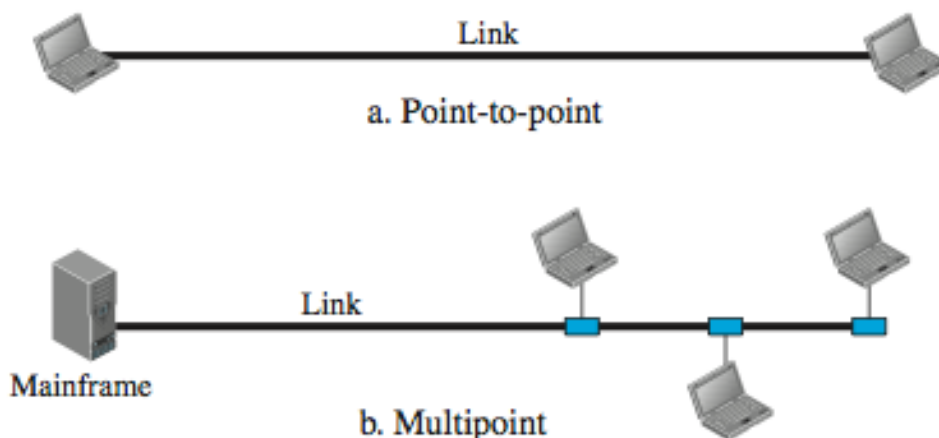
Most point-to-point connections use an actual length of wire or cable to connect the two ends, but microwave or satellite links, are also possible.

Changing the T.V with a remote is a point-to-point connection between the remote control and the television.

Multipoint connections – more than two devices are sharing a link

The entire capacity of the link is either shared spatially or temporally.

This means either every computer shares a specific space of the link or each computer shares the link for a specific time when being used.



Networks all have a physical topology.

Physical Topology – the way a network is laid out physically.

Two or more devices connect to a link

Two or more links form a topology.

A linking device in a network is called a **node**.

There are four basic types of topologies available.

1. Mesh – every device has a dedicated point-to-point link to every other device.

In a mesh topology, each physical link carries information only between the two devices that it connects.

If it is a duplex connection, you only need half the physical links, since each link travels both ways.

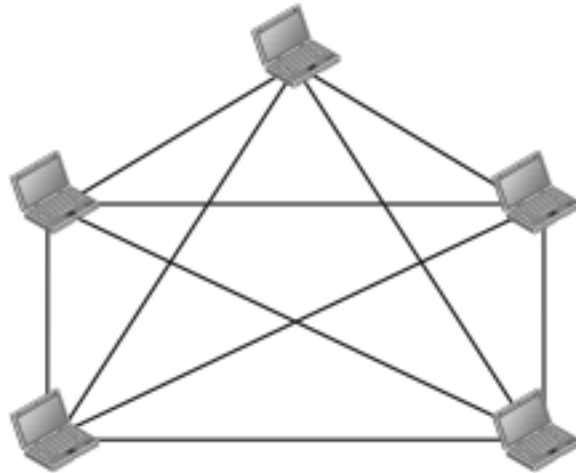
Advantages of a Mesh topology

- Avoid traffic since each link can carry its own data and none are being shared
- If one link breaks, the rest of the network is still functional
- Privacy since only the dedicated device receives the message.
- Easy to detect a problem in the network by discovering which device is having problems and examining the link that connects to it.

Disadvantages of a Mesh topology

- A lot of cables are needed
- Too many cables too much cost
- Too many cables not enough physical space

$n = 5$
10 links.



2. Star – each device is connected to a hub through a dedicated point-to-point link.

The devices are not directly linked to each other.

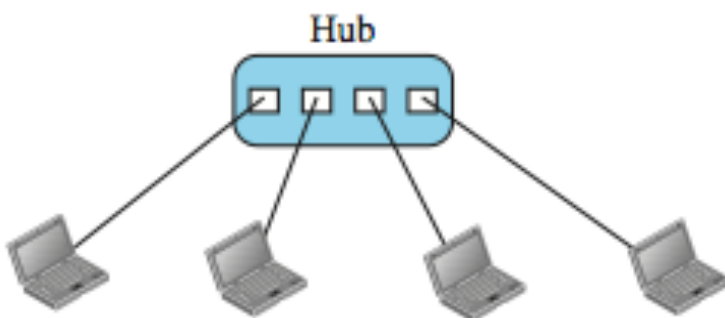
If one device wants to send data to another, it sends it first to the hub, which then forwards the data to the other connected device.

Advantages of a Star topology

- Less expensive than mesh
- Easy to install, easy to configure
- If one link fails the network can still function

Disadvantages of a Star topology

- Everything depends on the hub





3. Bus – Multipoint connection. One long cable acts as a backbone; other devices are connected through a drop line and a tap in the link.

Drop line – a connection running between a device and a main cable.

Tap – a physical device that punctures the cable and connects to it.

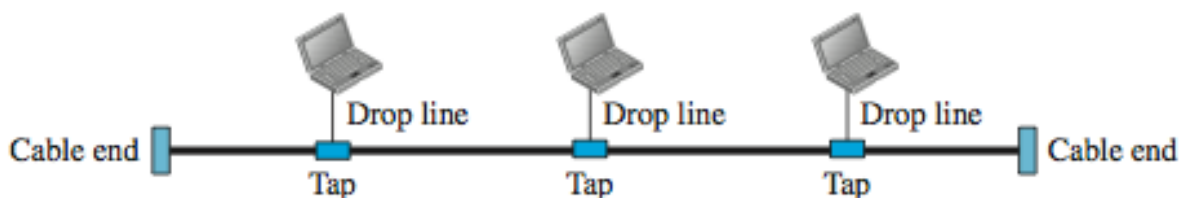
The longer the cable and the more taps it has the weaker the signal becomes. Taps should be a short distance from each other.

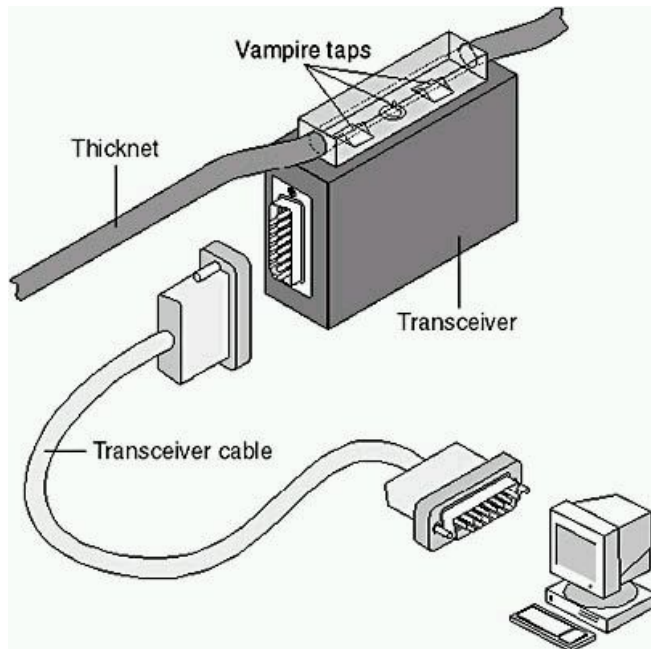
Advantages of a Bus topology

- Easy to install
- Minimal Cable

Disadvantages of a Bus topology

- Difficult reconnection
- Difficult to find the problem
- Difficult to add new devices
- Break stops all transmission of data





4. Ring – devices in a ring topology 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 the destination is reach.

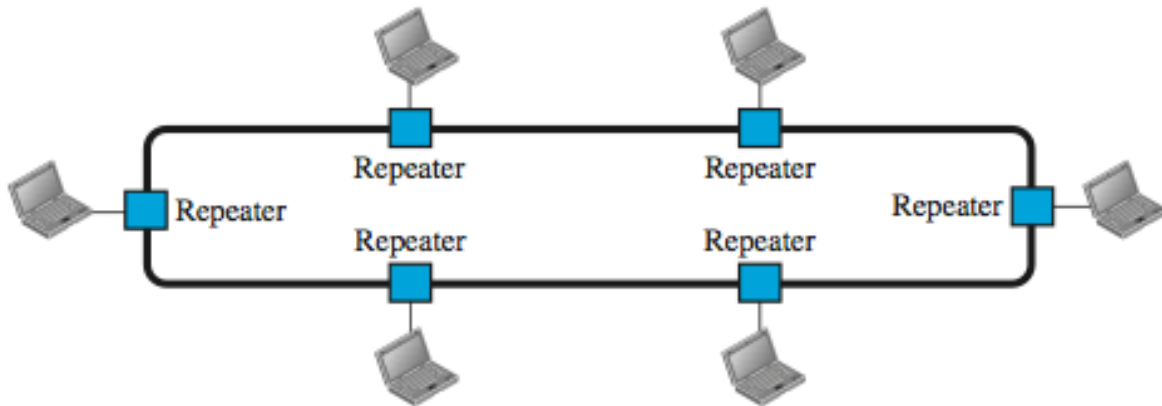
Each device has a repeater that passes the data received that is intended for another device along.

Advantages of a Ring topology

- Easy to install
- Easy to reconfigure
- Easy to detect a problem

Disadvantages of a Ring topology

- Break means the whole system is dead



4.5.1 LAN

Now that we know about the physical structures of a network we need to cover the types of network we can find today.

LAN – Local Area Network

- Privately owned
- Can be a network in a home, office, building or campus.

4.5.2 WAN

WAN – Wide Area Network

- Can be a network spanning a town, state, or different country.
- WAN is created by the communication companies and leased by an organization

4.6 Protocols

In a previous lesson we mentioned TCP/IP protocol but now we will talk about it with the attention it deserves

TCP/IP stands for Transmission Control Protocol / Internet Protocol

These Protocols are organized in layers that each provides a specific function when sending information through a network such as the Internet.

1. Physical Layer – Concerned with physical aspects
2. Data-Link Layer – Doesn't know the actual destination it just receives the information and passes it along.
3. Network Layer – Concerned with sender to receiver. It creates a connection between the source and destination computer. This layer includes the Internet Protocol, which defines the structure and format of the information.
4. Transport Layer – makes sure the data is sent at a specific rate and sequence. In other words, flow control. This layer includes the TCP aspect of the protocol
5. Application Layer – Deals with the user interface that you need to view the message like outlook for an email. This layer contains protocols such as
 - HTTP – Hypertext Transfer Protocol – how we access the World Wide Web.
 - SMTP – The main protocol use in e-mail services
 - FTP – File Transfer Protocol transferring files between hosts