NETWORK TOPOLOGIES

COMPUTER STUDIES

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Introduction to network topologies

- Topology describes the **arrangement** and **layout** of how computers and other devices are connected to each other in a **computer network**.
- This is a **virtual shape or structure** of a computer network.
- A network topology can be viewed in **two** ways:
  - **Logical topology** – This looks at how actual data passes from one device to another in a network.
  - **Physical topology** – This looks at the physical layout or arrangement of components on the network.
- We have the following network topologies:
  - ✓ **Bus Topology**
  - ✓ **Ring Topology**
  - ✓ **Star Topology**
  - ✓ **Tree Topology**
  - ✓ **Mesh Topology**

Bus network topology

- In this network all devices are connected to a central cable called the backbone.
- In this network the backbone **can carry only one** message at a time.

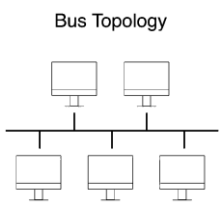
Advantages

- Easy to install, and less costly.

Disadvantages

- A cable break in any section leads to network breakdown.
- Limited number of computers that can be connected to the backbone.
- Difficult in troubleshooting since the fault can be anywhere on the cable.

- **Figure 1** below shows the bus network topology.



Ring network topology

- In a ring network topology, each device has exactly **two** neighbours to communicate with.
- This network is in a form of a **closed loop** as shown in figure 2.
- Each device in has the responsibility of regenerating and retransmitting signals.

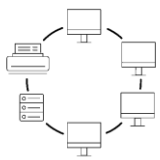
Advantage

- Simple to install, and uses short length cable hence it is less costly.

Disadvantage

- Adding or removing devices is may be difficult and can disrupt the whole network.
- Troubleshooting can be difficult.

- **Figure 2** below shows a ring network topology.



Star network topology

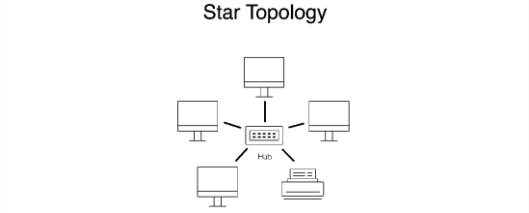
- In this network all devices are connected to a **central hub**.
- Devices in this type of network topology communicates by passing data through the hub.
- A failure in a single cable only affect the device using that cable **not** the entire network.

Advantage

- Easy to configure.
- Centralised management of key network devices.
- Troubleshooting is a bit easy once the point of fault is discovered, which is mostly the wiring closet.

Disadvantage

- It is costly since it requires more cables.
- Time consuming during installation.
- When central hub fail, the entire network is down.
- **Figure 3** below shows a star network topology.



Tree network topology

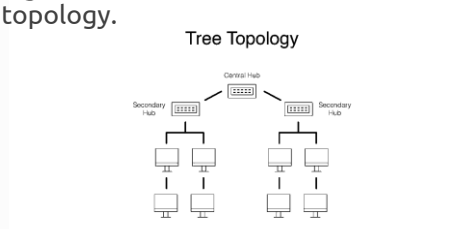
- This topology combines **multiple star topologies onto a bus**.
- Only one hub connects directly to the bus tree, and each hub functions as the root of a tree of devices.

Advantage

- Room for future expansion. (scalability)
- Centralised management of key network devices.
- Troubleshooting is a bit easy once the point of fault is discovered, which is mostly the wiring closet.

Disadvantage

- It is costly since it requires more cables.
- Time consuming during installation.
- When a central hub fail, a section of the entire network is down.
- **Figure 4** below shows a tree network topology.



Mesh network topology

- This is the most common type of network topology used in WANs.
- In this topology there are **many paths** between different location (devices).
- Devices are connected with **redundant** interconnections.

Advantage

- Room for future expansion. (scalability)
- Reliable – network operates even when a node or cable breaks down.

Disadvantage

- It is expensive since it uses many cable to create redundant paths.
- Administration of the network is a bit difficult since the network is complex.
- **Figure 5** below shows a mesh network topology.