Network topologies

Introduction

The topology of a network defines the shape in which the network is connected.

There are two main types of topologies:

Physical
The physical topology defines why it works, such as which port on the router is connected to which port on a switch, and so on.

Logical
The logical topology of a network should be a high-level view of the information flow through semi-generic components in your network. Shows how the network operates and should be your first drawing

Star

The star topology is currently used in networks today, and it's the main topology used to connect edge devices (end users).

All network devices are wired back to a hub or switch.

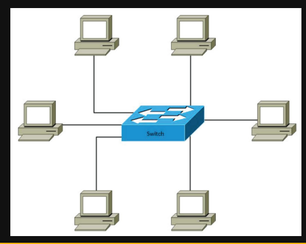
The computers can be next to each other or spread out across an office space, but all communication goes back to a central location.

Pros

- It concentrates the failure and diagnostic points in a central location.
- Can swap out the edge switches all from the same location.

Cons

- If a switch fails, every device connected to the switch is affected.



Ring

Ring topology was used over 25 years ago, and it was called token ring IEEE 802.5.

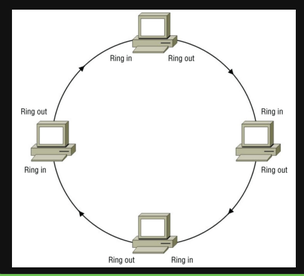
The networked devices would pass a token around the ring; any device that could seize the token could transmit a message around the ring.

Physically the computers had one wire connected, similar to networks today.

The wire consisted of a ring in pair and a ring out pair.

Token ring is now a deprecated technology for LAN connectivity with the IEEE 802.5 specification. (However, it's still used in ICS and WAN)

Token ring is still popular in WAN design because it can be designed to be resilient in the case of a failure.



Mesh

The full mesh is a topology often used in data centers because it allows for redundant connection in the event of a component failure.

Cloud computing uses a lot of mesh type connectivity because a failure should not hinder the customer(s).

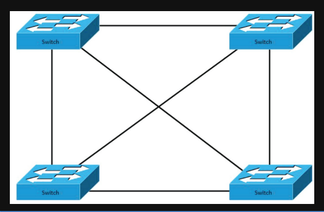
You will not see this used at the edge of a network where end-user computers connect to the network, mainly because it is too costly.

(n(n-1))/2 is used to determine how many connections will be needed for n devices

If you have a failure on any cable or switch, the network will continue to function.

The Internet is not really a full mesh; it is a partial mesh.

- This is due to the costs of running cables to every provider on the Internet.
- When there is a failure on the Internet, it is usually localized to the path to the provider.
- Many providers have their own redundancy internally in their networks and use full meshes internally.



Bus

It established the baseline for nearly all networking concepts and improvements that followed.

The bus topology was common in networks 25 years ago; it is now considered legacy in its design.

The reason it is deprecated is that a failure on the bus would affect all the computers on the bus.

Bus networks are how SCSI, RS-422 (industrial serial), and many other types of technologies work. It is important to understand how they work so that you can diagnose problems in these other technologies.

When a computer wants to communicate on a bus network, it sends the signal out and all other computers see the message. Only the computer it is destined for by its destination MAC address processes the message and responds.

Hybrid

The hybrid topology is more representative of internal networks today.

Hybrid topology design combines multiple topologies for resiliency, load balancing, and connectivity.