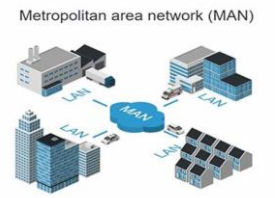
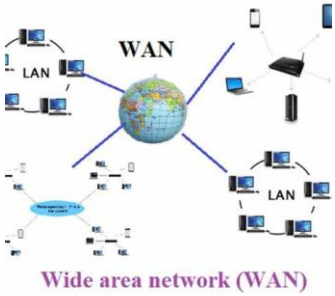
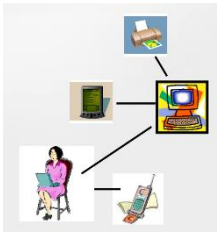
Network

Is a set of computers or other electronic devices that are interconnected with the purpose of sharing resources and/or exchange data. It can be as small as two or as large as billions of network nodes/devices. They can be connected through cables, telephone lines, radio waves, satellites, etc.

Types of Network

Networks can be classified into different types based on geographical coverage area as follows:

Name	Description	Picture
Local Area Network(LAN)	Is a network designed to operate over a small area geographical or physical area like an office, building or group of buildings, etc. Its speed varies from 10mpbs to 1gbps. Its generally used with bus, star and ring topologies.	
Metropolitan Area Network(MAN)	Is a bigger version of LAN, it spans over a larger geographical area such as a town or an entire city. Can be connected using a fiber cable as a communication medium. LANs can be connected to create a MAN. It spans over a geographical area of about 50km. When this network is created for a specific campus, then it is termed as CAN(campus area network)	
Wide Area Network(WAN)	Is the largest spread network. It spans over very large distances such as a country, continent or even the whole globe. Example, the internet Communications can be wired or wireless, telephone lines for wired and satellite links for wireless communication. It connects a huge amount of people.	

Personal Area Network(PAN)	Is a network that is used for communicating among nodes in close proximity of around a few meters within a room	

LAN	MAN	WAN	PAN
It spans over a small area	It spans over an area of about 50km	It spans over an area of about 100km or as big as the globe itself	Its span over a very small area, maybe withing a room
High data rate transfer, low error rate, easily scalable	High speed data connectivity	The error rate is high	Can use wireless or wired communications
Minimum propagation delay	Propagation delay is moderate	Propagation delay is greater	Used to communicate between devices themselves
Easy to design and troubleshoot	Less fault tolerant	Data rate is low	
Equipment and support may be costly and hardware devices may not inter-operate properly	Hard to design and maintain, congestions are more	Its complex to design	

They can be classified by it's functionality:

- Client-server Network
- Peer-to-Peer Network

They can typed based on it's ownership

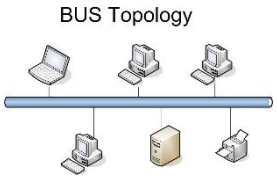
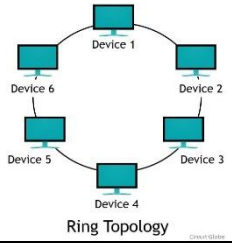
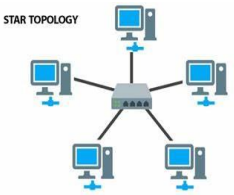
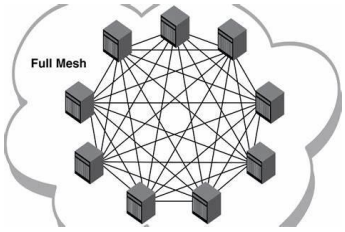
- Private Network
- Public Network

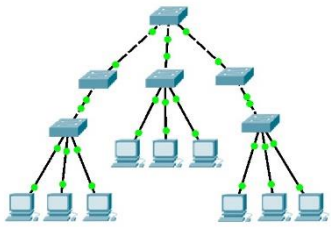
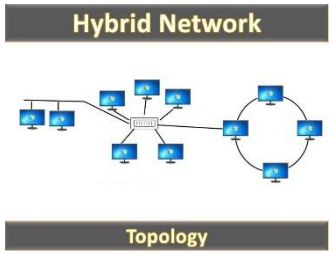
Based on transmission media:

- Bound/Guided Media Network
- Unboud/Unguided Media Network

Network Topology

Refers to the arrangement of different elements in a computer network, such as links, nodes and the interconnections between them. Is a framework that guides the layout and design of a network, influencing its communication and performance characteristics.

Name	Description	Picture
Bus	All devices are connected to a single central cable known as the backbone. It's simple and code effective but has limitations in scalability and fault tolerance	
Ring	Devices are connected in a close loop, with data traveling in one direction. Efficient for managing network traffic but can be disrupted by a single failure	
Star	Each node connects to a central hug or switch. It is easy to install and manage but relies heavily on the central node's functionality.	
Mesh	Every device is connected to every other device, offering multiple paths for data transmission. It's highly reliable but can be complex and expensive to implement	

Tree	Combines elements of bus and star topologies, forming a hierarchical structure. It supports scalable and organized network growth	
Hybrid	Integrates two or more different topologies to form a composite network. It's flexible and adaptable to specific needs but can be complex to design	

Bus	Ring	Star	Mesh	Tree	Hybrid
Cost of cable is less but is used to build small networks	Data transmission is high-speed	Easy to set up	Communication is very fast between nodes	More devices can be attached to a hub thus it decreases the distance that a signal has to travel	Is very flexible
Installation and troubleshooting are well known, there is a lot of documentation and support	Possibility of collision is minimum	Is reliable, if a link fails it will not affect other links	Is a robust topology	Allows a network to get isolated and also prioritize from different computers	It is scalable and expandable
Simple but requires a lot of cabling	Cheap to install and scale	Fault detection and isolation is easy	Fault diagnose is easy. Data is reliable because data is transferred through dedicated channels	Error detection and correction is very easy	It is challenging to design its architecture
If the backbone network fails all network fails	A single node failure can crash the whole network	Is cost effective	Provides security and privacy	When central hub fails entire system fails	Hubs are very expensive in this topology
If traffic is heavy collisions increases this is avoided some protocols are implemented	Troubleshooting is difficult	If the hub at the center fails all topology fails	Installation and configuration is difficult	Cost is high because of the cabling	Requires a lot of cabling and network devices(nodes) so infrastructure cost is high

Security is very low. Adding new devices slows down network	Less secure	Cost of installation is high and performance is is based on a single concentrator	Expensive to implement and maintain	Difficult to scale. Difficult to reconfigure if new devices are added	