Computer Network :

- computer network refers to the connecting of computers and other digital devices together to share resources and exchange information.
- It involves the use of hardware and software technologies that enable communication b/w computers and other devices whether they are located in the same physical location (or) other geographical location.

Need of computer Networks :-

1) communication :

CN allows people to communicate with each other through email, messaging, online chat, video calls and many more.

2) Data sharing :

Users can share the data and files with other users on the network or access the data remotely from other connecting devices.

3) Resource sharing :

Users can share expensive software, printers, scanners and other devices across the network.

4) Data Storage :

Computer networks allow organizations to store large amounts of data in a centralized location which frees up storage space for other tasks.

5) Network Security :

Well built computer networks offer businesses more options for cyber security such as encryption protocols and multifactor authentication.

e) Entertainment:

Computer networks, especially the internet provides access to entertainment like computer games, streaming videos/music and many more.

f) Manufactural agnostic:

computer networks can be configured to be compatable with a variety of devices such as Apple, Android and Microsoft etc.,

Characteristics of Computer Networks:-

1. Fault tolerance:

Fault tolerance is the ability of the computer network to continue working despite failures and it should ensure no loss of service.

For example, If there is a computer network and if there is a problem inside the computer network but still the computer network should work even after failures and thereby there is a no loss of service.

2. Scalability:

It is the ability to grow based on the needs and have good performance even after growth.

for example, if there are ten computers in a network and if again another ten computers are added to the network, this network should work as like the same even after adding the ten computers — Internet

3. Quality of service (QOS):

It is the ability to set the priorities and manage data traffic to reduce data loss and delays etc.,

for example, If a router receives two packets at a time or two data at a time, this router should know to which data it should process first. This is what we call priorities.

4. Security:

It is the ability to prevent unauthorized access, misuse or forgery. Not only prevention, network should also provide confidentiality, integrity and availability.

for example, someone is providing some confidential information to amazon.com on a the data leaves our computer it is not in our hands. Now assume our information is flowing through router three and what an attacker steals this information* from router three, they can misuse or they may involve in the task of forgery.

So it becomes an important task for a computer network to provide confidentiality i.e, the data is converted into a different form, which is understandable only by the sender & the receiver.

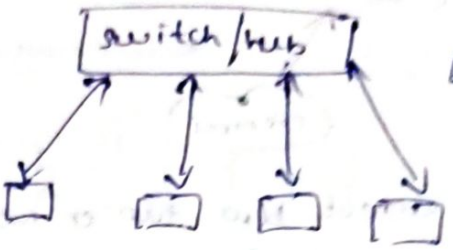
At the same time there should not be ~~only~~ any modification to the data set. this is the network integrity. Whatever the sender is sending, that only the receiver should receive. this property is called integrity. So it becomes the ultimate responsibility of a computer network to provide security.

Classification of computer networks:

computer networks are classified into LAN, MAN and WAN.

1. LAN (Local Area network):

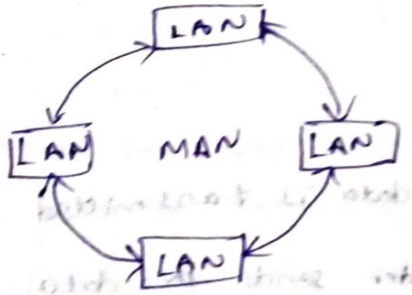
It is a computer network that interconnects computers within a limited area such as schools, Library, residential areas etc.,



wireless LAN eg: wifi:

2. Metropolitan Area Network (MAN):

It is a computer network that interconnects computers in city (metropolitan cities):

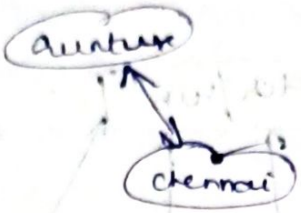


There are two Local area networks connected to each other in a city. The devices involved in this network Metropolitan Area network are switches/hubs for establishing a Local Area network. And to connect two LANs, we need routers or bridges.

3. Wide Area network (WAN):

It is one of the computer networks

It is a telecommunication network that extends over a large geographical area for the primary purpose of computer networking.



In WAN, the connect blw two or more LANs in a country can communicate with each other.

The devices in WAN are all end devices and intermediatery devices and some other also refer WAN as Internet.

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1 Data Flow:

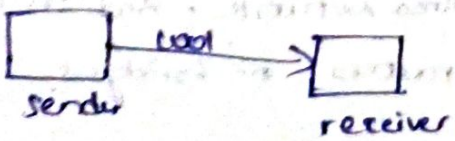
1) simplex
2) Half-duplex
3) Full-duplex

Data flow: The way data is transmitted blw nodes.

1. Simplex: only sender sends the data and the receiver receives the data (always)

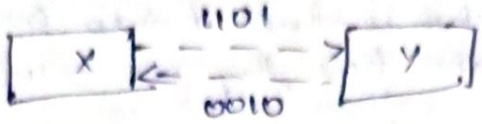
Ex: keyboard -> CPU -> Monitor

↑ Sender (does not receive)



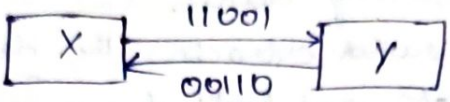
2. Half duplex : Data can be transmitted and received at both ends but not at the same time.

Ex : walkie - talkie



3. Full-duplex : Data can be transmitted and received at both ends simultaneously.

Ex : telecommunication



Network Devices :

1. Modem - modulator/demodulator
2. Hub
3. Switch - identifies - DA
4. Repeater -
5. Router
6. Gateway

1) Modem :

Modem stands for MODULATOR/DEMODULATOR. It refers to a device used for conversion btw analog signals and digital bits. To transmit the data from a sender to a receiver (or) while browsing the internet, the digital data are converted to an analog signal and the medium carries the signal to the receiver.

- There are modems connected to both the sender and receiver nodes.
- At the sender side, modem acts as modulator that converts the digital data to analog signals.
- The modem at the receiver side acts as demodulator that converts analog signals to digital data for the (further) destination node to understand.

2. Hub:

- An Ethernet hub is a network device used to connect different devices through wired data arriving on any of the lines are sent out on all the devices (other)
- The limitation of the hub is that if data from two devices come at the same time, they will collide.

3. Switch:

- A switch is a networking device that plays a central role in local area network.
- Like a hub, a network switch is used to connect multiple computers (or) communicating devices.
- When data arrived, the switch extracts the destination address from the data packets and looks it up in a table to see where to send the packet.
- Thus, it sends signals to only selected devices instead of sending to all.
- It can forward multiple packets at the same time.
- A switch does not forward the signals which are noisy (or) corrupted. It drops such signals and asks the sender to resend them.

4. Repeater:

- Data are carried in the form of signals over the cable. These signals can travel only upto a specified distance (usually about 100 m)
- Signals lose their strength beyond this limit and become weak, in such conditions original signals need to be regenerated
- A repeater is an analog device that works on signals on the cables to which it is connected. The weak signal appearing on the cable is regenerated and put back on the cable by a repeater

5. Router :

- A router is a network device that can receive the data analyze it and transmit it to other networks.
- A router connects a local area network through the internet
- Compared to a hub (or) a switch, a router has advanced capabilities as it can analyze the data being carried over a network, decide or alter how it is packaged and send it to another network of a different type.

for example, Data has been divided into packets of certain size. Suppose this packets are to be carried over a different type of network which cannot handle bigger packets. In such a case, the data is to be repackaged as smaller packets and then sent over the network by a router.

* A router can be wired or wireless. A wireless router will provide wifi across the smartphones & other devices

6. Gate Way :

Gateway is a key access point that acts as a gate for an organization network to the outside world of the internet. Gateway serves as the entry and exit point of a n/w. As all data coming in or going out of a n/w must first pass through the gateway in order to use routing the paths.

- Besides routing the data packets, gateway also maintain information about the host n/ws, internal connections paths and the identified ports of other remote n/ws.

2. Half duplex: Data can be transmitted and received at both ends but not at the same time.

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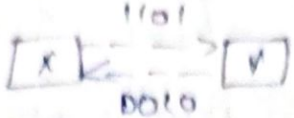

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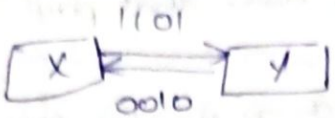

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