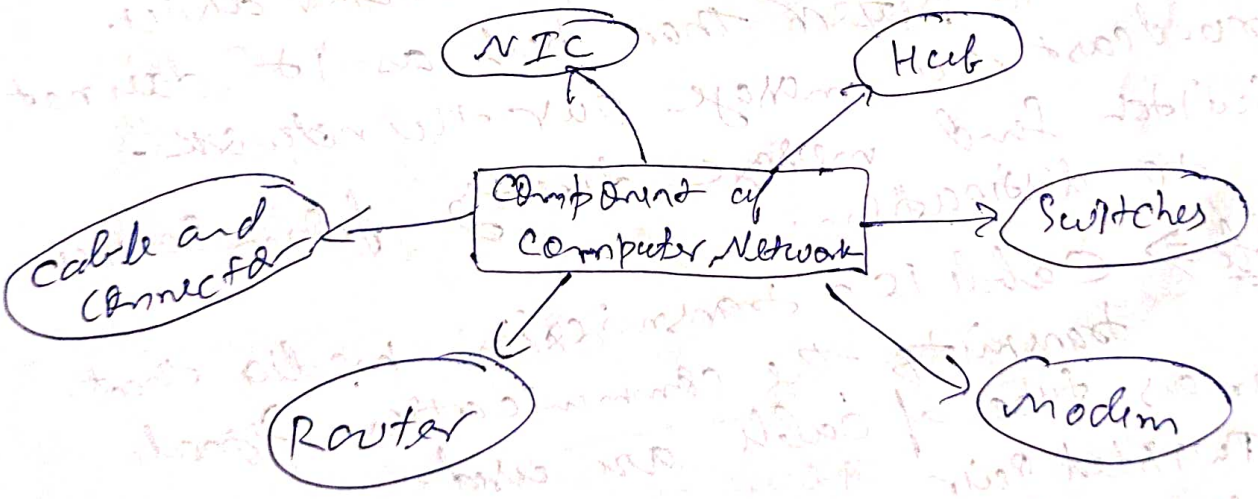
Computer Network ⇒ A computer network is a set of devices connected through links.
A node can be computer, Printer, or any other device capable to sending or receiving the data.
The links connecting the nodes are known as communication channels.
Computer Network uses distributed Processing in which task is divided among several computers.
"Computer Network is a group of computers connected with each other through wires, optical fibers or optical link so that various devices can interact with each other through a network.
* The Aim of the computer network is the sharing of resources among various devices.

Major Components of a computer Network ⇒

① NIC (Network interface card) ⇒



NIC is a device that help the computer to communicate with another device. The network interface card contains the hardware address, the data link layer Protocol use this address to identify the system on the network so that it transfer the data to the correct destination.

There are two type of NIC.

a) Wireless NIC ⇒ All modern laptops use the wireless NIC. In wireless NIC, a connection is made using the antenna that employs the radio wave technology.

b) Wired NIC ⇒ cable use the wired NIC to transfer the data over the medium.

Hub ⇒ Hub is a central device that splits the network connection into multiple devices. When computer requests for information from another computer, it sends the request to the hub. Hub distributes this request to all the interconnected computers.

Switch ⇒ Switch is a networking device that joins all the devices over the network to transfer the data to another device. A switch is better than hub as it does not broadcast the message over the network. Switch send message directly from source to destination.

Cable ⇒ Cable is a transmission media that transmits the communication signal. Various type of cable are used.

(i) Twisted Pair
(ii) Co-axial cable
(iii) Fibre optical

Router ⇒ Router is a device that connects the LAN to the internet. The router is mainly use to connect the internet to multiple computers.

modem ⇒ modem connects the computer to the internet over the existing telephone line. A modem is not integrated with computer motherboard. A modem is a separate part on the PC slot found on the motherboard.

Uses of Computer Network ⇒

a) Resource Sharing.
b) Server-client model (data store in central computer and access by another computer)
c) Communication medium ⇒
d) E-commerce.

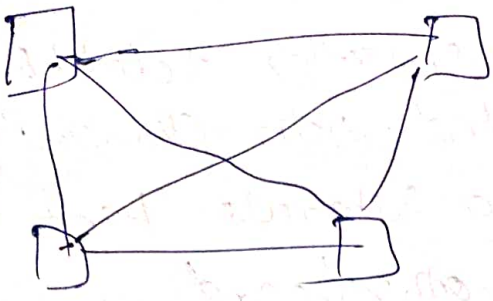
Features of computer Network ⇒

a) communication speed
b) File sharing
c) Back up and Roll Back
d) Hardware and I/O Sharing
e) Security
f) Scalability
g) Reliability

Computer Network Architecture ⇒

a) Peer-to-Peer Network
b) client/server Network.

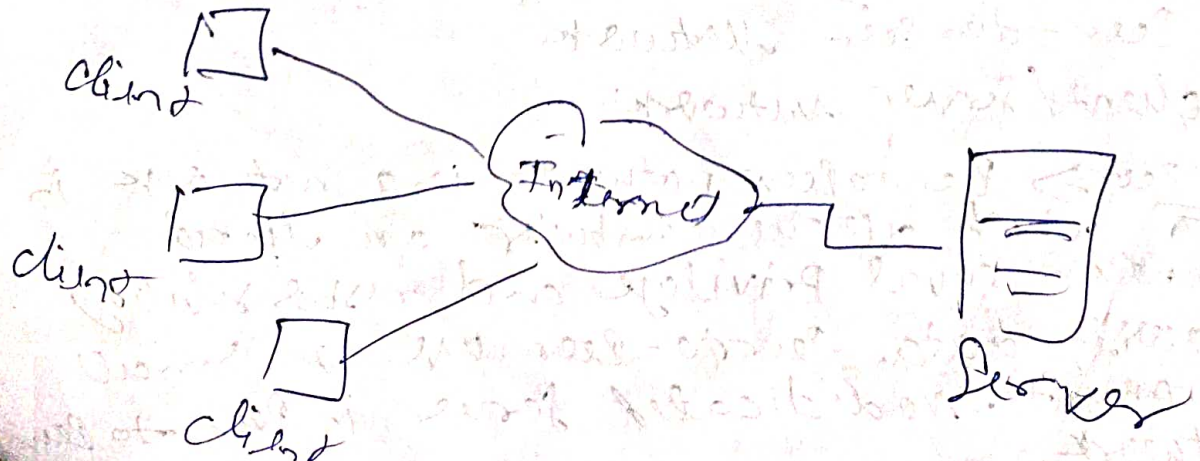
a) Peer to Peer ⇒ Peer to Peer network is a network in which all the computer are linked together with equal privilage and responsibility for processing data. Peer-to-Peer use for small environment. No dedicated server in Peer to Peer Network.



Advantage ⇒ (i) less cost
(ii) If one system is stop call other can not stop (iii) It is easy to set up and maintain.

disadvantage ⇒ (i) It does not have any centralized system. It can not be backup the data. as the data is different-different location,

(ii) Client-Server Network ⇒ client/server network is a ~~model~~ network model designed for the end users called client, to access the resources such as songs, video, from central computer know as server.
A central controller is know as a server while all other computer called client.
A server perform all the major operations such as security and network management
A server is responsible for managing all the resources such as file, printer, etc all client communicated with each other through server.



advantage ⇒ (I) A client/server network contains the centralized system. Therefore backup is easy

(II) A client/server network has a dedicated server that improves the overall performance of the whole system.

(III) Security is better

(IV) It also increase the speed of the sharing resources.

disadvantage ⇒ (I) Expensive

(II) It requires a dedicated network administrator to manage all the resources.

Loops in Pseudo-code ⇒

(I) For ⇒ a counting loop. It takes a group of elements and runs the code with in the loop for each statement.

(II) while ⇒ A loop (iteration that has a condition at the

Type of computer Network ⇒

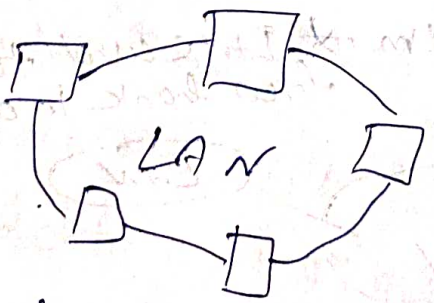
A computer network is a group of computers linked to each other that enables the computer to communicate with another computer and share their resources, data and application.

(I) LAN (Local Area Network)
(II) MAN (Metropolitan Area network)
(III) WAN (wide area Network)
(IV) PAN (Personal area Network)

LAN ⇒

In LAN group of computers connected to each other in a small area such as Building, office etc. * LAN are use to connecting two are more personal computer through a communication medium such as twisted pair, co-axial cable etc

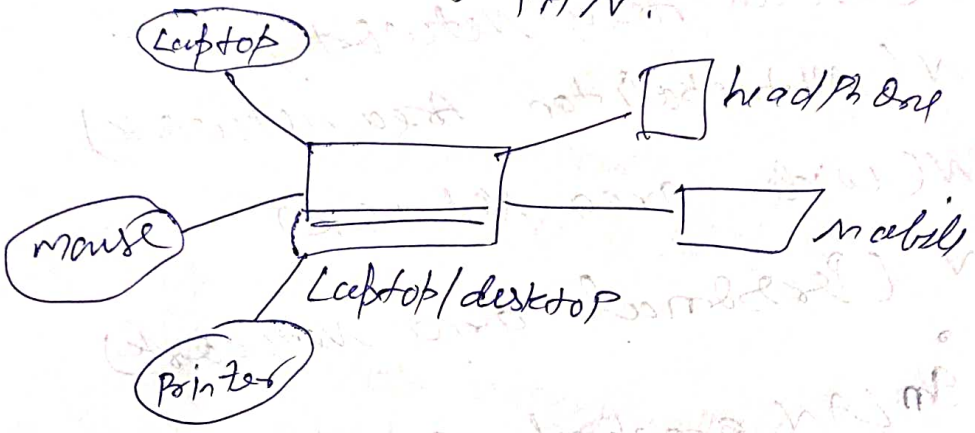
* It is less costly as it is built with inexpensive hardware such as hub, network adapter and ethernet cable.
* Data rate is faster in LAN
* LAN provide high security.



* School, university, * client-server architecture
* speed 1000 mbps.
* Private network

(II) PAN ⇒ PAN is a network arranged with in an individual person, typically with in a range of 10 meters.

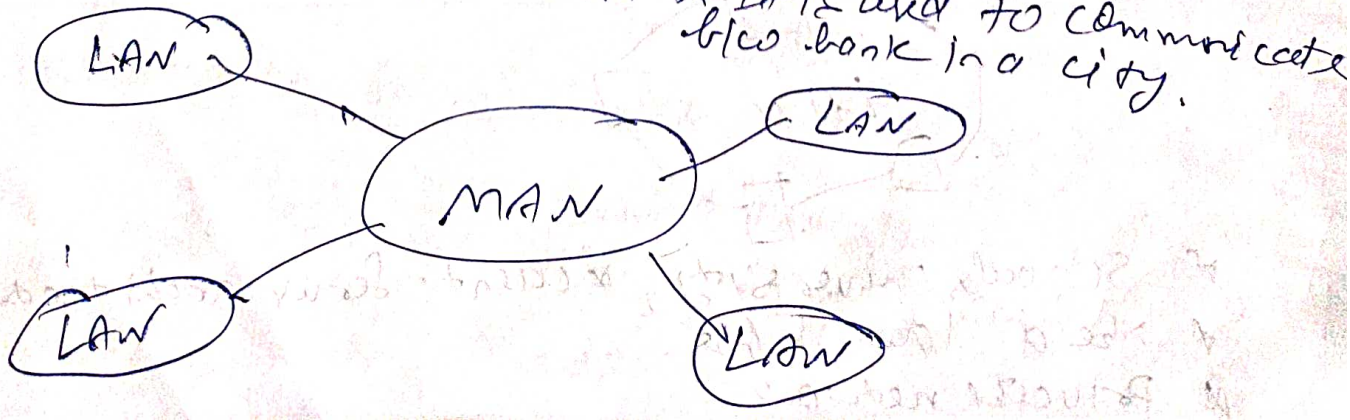
* Personal Area Network is used for connecting the computer devices of personal use is known as PAN.



Two type of PAN ⇒ (I) Wired PAN
(II) Wireless PAN

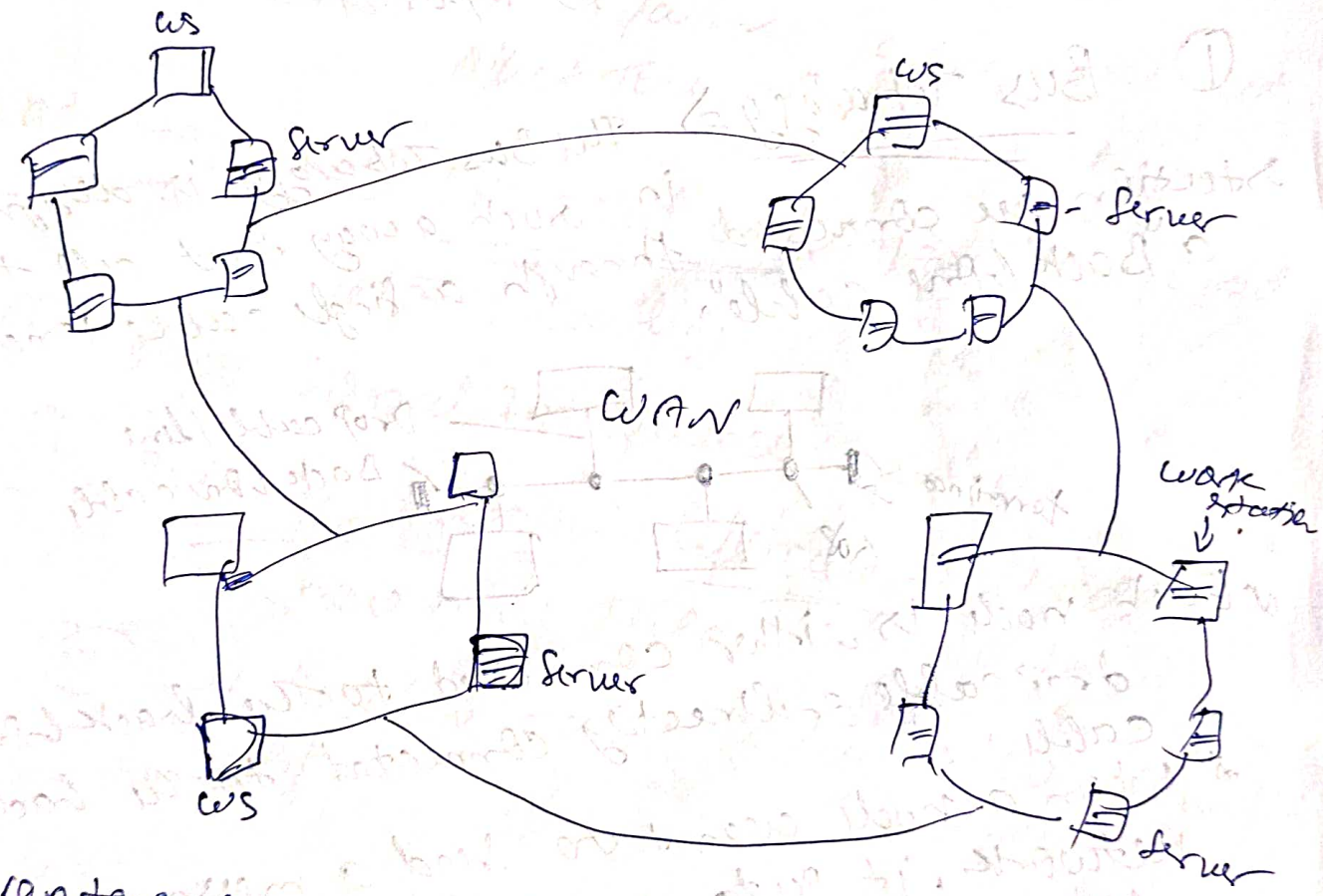
(III) MAN ⇒ A Metropolitan area network is a network that covers a larger geographic area by interconnecting a different LAN to form a large network. In MAN various LAN are connected to each other through telephone exchange line. Speed 44 - 155 mbps.

* Telephone company
* Point to Point connection are used in the MAN.
* wired connection.
* wire / cable / modem * It is used to communicate b/co bank in a city.



(iv) WAN ⇒ A wide area-network that extends over a large geographical area such as states or countries. It is Bigger than LAN.

* WAN is not limited to single location. It cover large area through a telephone line, fiber optic cable or satellite links.
* Internet is the one of the biggest WAN in the world.



advantage of WAN ⇒

(i) Geographical area
(ii) Centralized data
(iii) Get update file
(iv) Exchange message
(v) Sharing of H/W and Resources
(vi) Global [redacted] business
(vii) High bandwidth.

(Corporate Area Network)

CAN = (Campus area network)

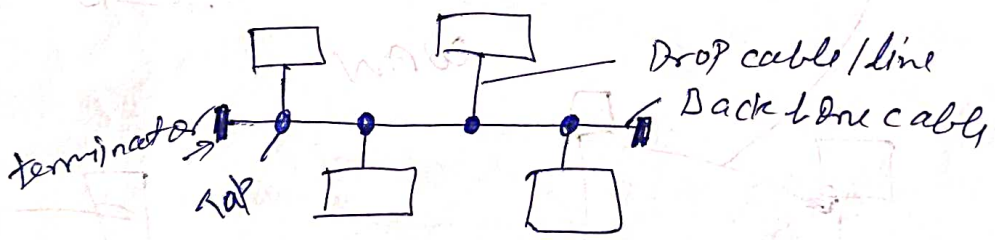
A (Campus AN) can be a network of multiple inter connected LAN in limited area. A CAN is smaller than MAN and WAN

Disadvantage ⇒ (i) Security issue.
(ii) need Firewall and Antivirus s/w
(iii) high setup cost.

Topology ⇒

a) Bus c) Tree d) Star
b) Ring e) mesh f) Hybrid

① Bus Topology ⇒ The Bus Topology is designed in such a way that all the station are connected through a single cable known as a "Backbone cable".



* Each node is either connected to the backbone by drop cable or directly connected to the backbone cable.
* when a node want to send a message over a network, it puts a message over the network. All the station available in the network will recieved the message whether it has been addressed or not.
* Bus topology mainly used in 802.3 (ethernet) and 802.4 standard network.
* The configuration is simple.
* CSMA (carrier Sense multiple Access)

advantage ⇒ (I) Low-cost cable ⇒ direct connected with backbone cable without use of hub so cost is less.

(II) moderate-data-speed ⇒ (I) 1000 mbps (I) co-axial cable or twisted pair cable are used.

(III) Familiar Technology ⇒ all the component are easily available.

(IV) Limited Failure ⇒ A failure is one node not affect the other.

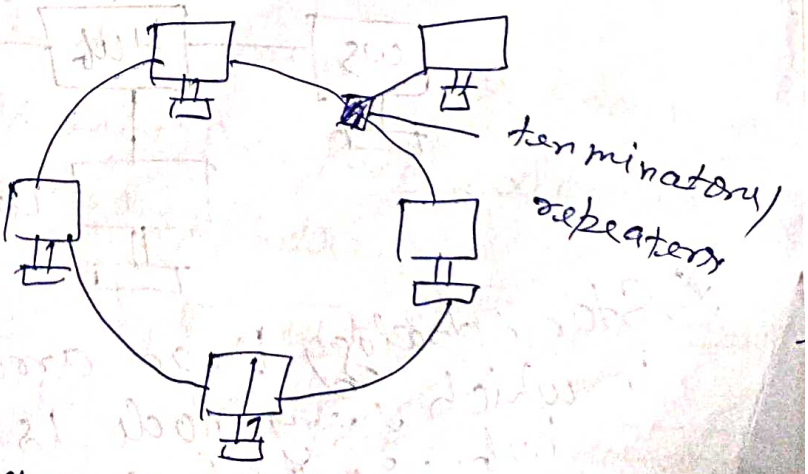
disadvantage ⇒ (I) Extensive cabling ⇒ It required lots of cabling.

(II) Signal Interference.

(III) Reconfiguration difficult ⇒ if add a new node then.

(IV) if Backbone cable is fail all system is fail.

(II) Ring Topology ⇒



(I) Ring Topology is like a bus topology, but with connected ends.

(II) The data flow in one direction

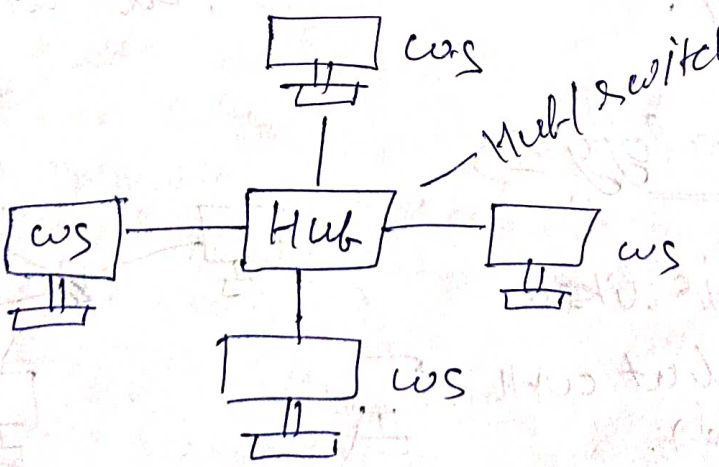
(III) The node that received a message from previous node will retransmit to the next node.

* The data flow in a single loop continuously known as an endless loop.
* The data in a ring topology flow in a clockwise direction.
* The most common access method of the ring topology is token passing.

advantage ⇒ (I) Network management ⇒ Fault device can be removed from the network without bringing the network down.
(II) Product Availability. (All device is easily available)
(III) Cost - low
(IV) Instalation cost
(V) Reliable ⇒ communication is not depend on one system.

disadvantage ⇒ (I) Failure ⇒ if one system fail then network is fail.
(II) Communication delay.
(III) Reconfiguration difficult.

(VI) Star ⇒



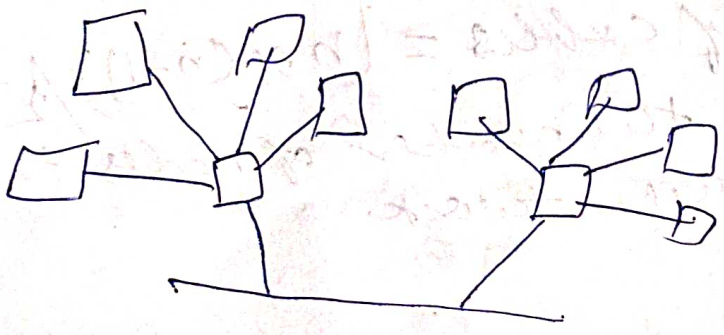
* Star topology is an arrangement of the network in which every node is connected to the central hub, switch or a central computer.

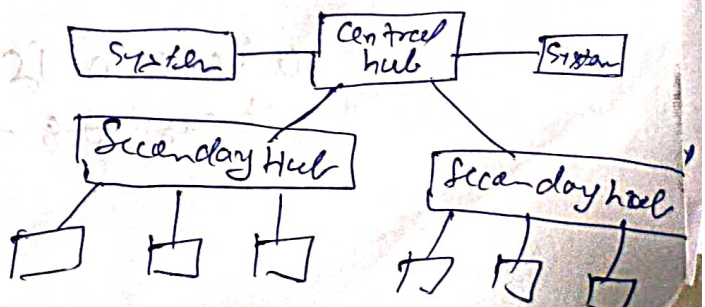
* central computer is known as Server, and the peripheral devices attached to the Server are known as clients.
* Coaxial cable or RJ-45 cable are used to connect the computer.
* Star topology is the most popular topology in the network implementation.

advantage ⇒ (I) Network control
(II) Limited failure
(III) Familiar Technology.
(IV) easily Expandable.
(V) Cost effective
(VI) High data speed (100 mbps)

disadvantage ⇒ (I) central Point of failure.
(II) Cable

Tree ⇒ * Tree topology combine the characteristics of "Bus topology and star topology".
* A Tree topology is a type of structure in which all the computer are connected with each other in hierarchical fashion.
* The top most node in tree topology is known as a root node. * There is only one path exists b/w two node for data transmission.

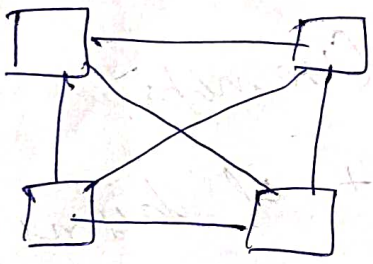




advantage ⇒ (i) Support for broadband transmission
(ii) Easily dependable.
(iii) Easily managable.
(iv) Error detection
(v) Limited failure
(vi) Point-to-Point wiring.

disadvantage ⇒ (i) High cost → cabling
(ii) Failure → central hub/switch
(iii) Reconfiguration difficult.

mesh ⇒ mesh topology is an arrangement of the network in which computer are interconnected with each other through various redundant connection.



* There are multiple path from one to another computer
* It does not contain the switch, hub or any central computer which act as a central point of communication.
* Internet is an example of mesh.
* Mesh Topology is mainly used for WAN Implementation.
* mesh are mainly used for wireless network.
* Mesh topology can be formed by using the formula :-

No. of cables = $(n * (n-1))/2$;

where n is the number of nodes that represent the network.

Type of mesh ⇒

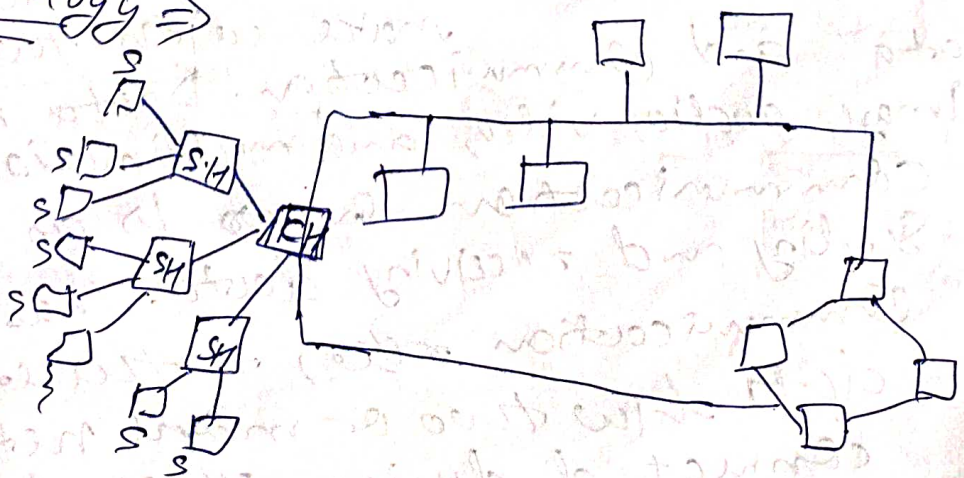
a) Fully mesh Topology ⇒ In a full mesh topology each computer is connected to all the computer available in the network.

b) Partial mesh Topology ⇒ In a partial mesh topology not all but certain computers are connected to those computer with which they communicate frequently.

Advantage ⇒ (I) Reliable.
(II) Fast communication
(III) Easier Reconfiguration

disadvantage ⇒ (I) Cost → cabling is more
(II) management
(III) efficiency ⇒ Redundant connection are high that reduce the efficiency of the network.

Hybrid Topology ⇒



The combination of various different topology is known as Hybrid topology.

* A Hybrid topology is a connection b/w different link and node to transfer the data.

* If similar topology is combine then node called Hybrid topology.

advantage ⇒ (I) Reliable ⇒ if any part failure not effect the other.
(II) Scalable ⇒ size is easily expendable by added new device or topology.
(III) Flexible ⇒ design on the requirement of organization.
(IV) Effective ⇒ strength is maximum and weakness is minimum.

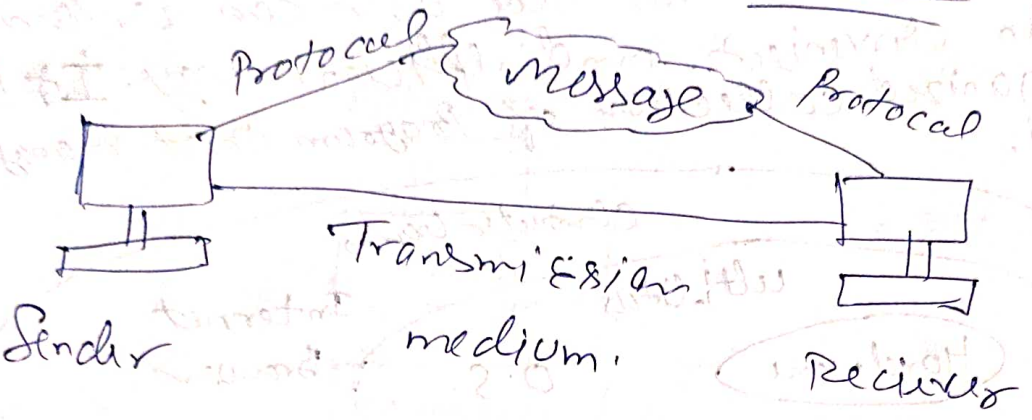
disadvantage ⇒ (I) Complex design
(II) costly Hub
(III) costly Infrastructure.

Transmission mode ⇒ (I) Simplex mode
(II) Half-Duplex
(III) Full-Duplex.

Data communication ⇒ Data Communication is make with two words Data and communication. Data means text, image, audio, video, and multimedia file. Communication is an act of sending and receiving data. Thus data communication refers to the exchange of data b/w two or more networked or connected device. These device

must capable of sending and receiving data over a communication medium.

Component of data communication ⇒



Transmission medium ⇒ It is the path through which the message travels from source and distination.

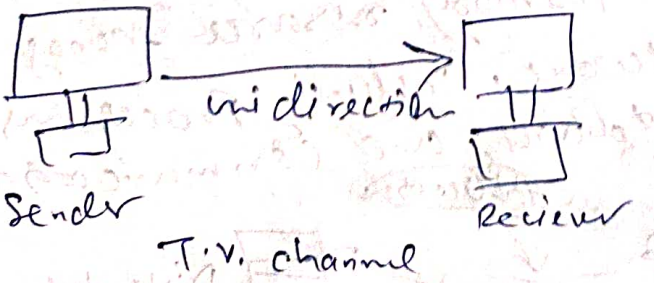
Protocol ⇒ Set of rule.

* It is a set of rule that needs to be followed by the communication parties in order to have successful and reliable data communication.

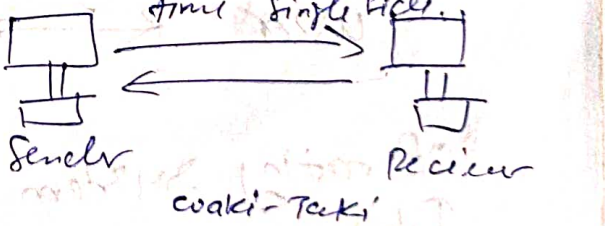
Type of data communication ⇒

(i) Simplex.
(ii) Half-Duplex.
(iii) Full-Duplex.

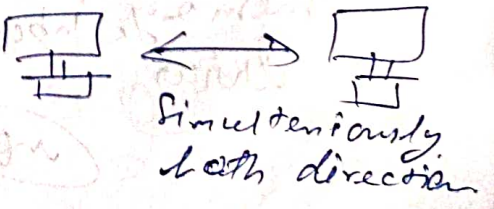
(i)



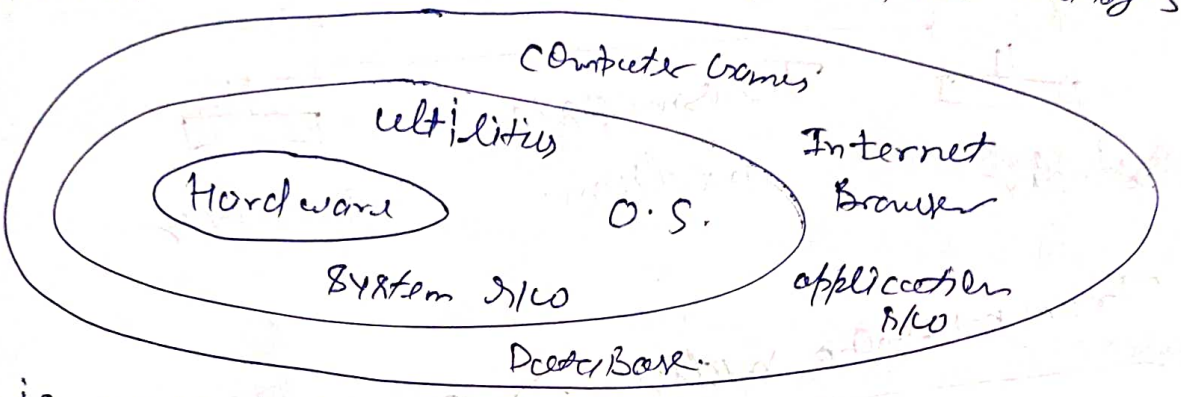
(ii)



(iii)

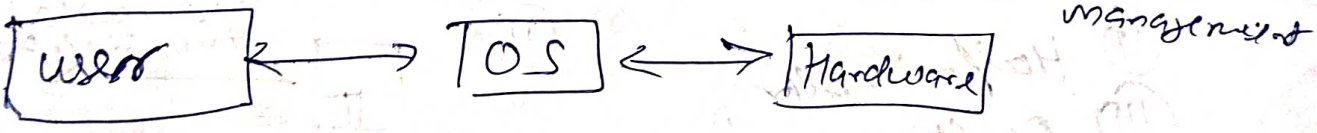


Operating System ⇒ * Operating system can be defined as an Interface b/w user and hardware. It provides an environment to the user so that, the user can perform its task in convenient and efficient way. It is a well-organized collection of program that manages the hardware.

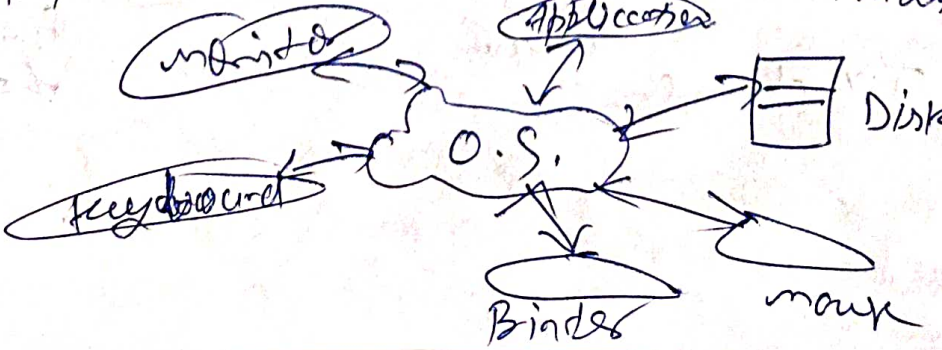


It is responsible for execution of all the processes, Resource allocation, CPU management, File management, and many other tasks.

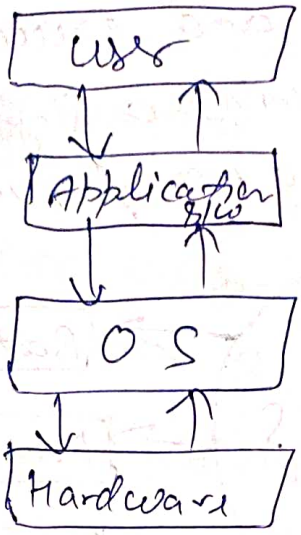
Function / working of OS ⇒
(I) Process management
(II) Process synchronization
(III) memory management
(IV) CPU scheduling
(V) File management
(VI) security
(VII) communication
(VIII) program creation
(IX) control I/O device
(X) Error detection and response
(XI) device management



"Operating system is a primary resource manager. It manages the hardware, including processors, memory, input-output device, and communication device."



* An OS is a system program that serve as an Interface b/w the computing system and end-user.

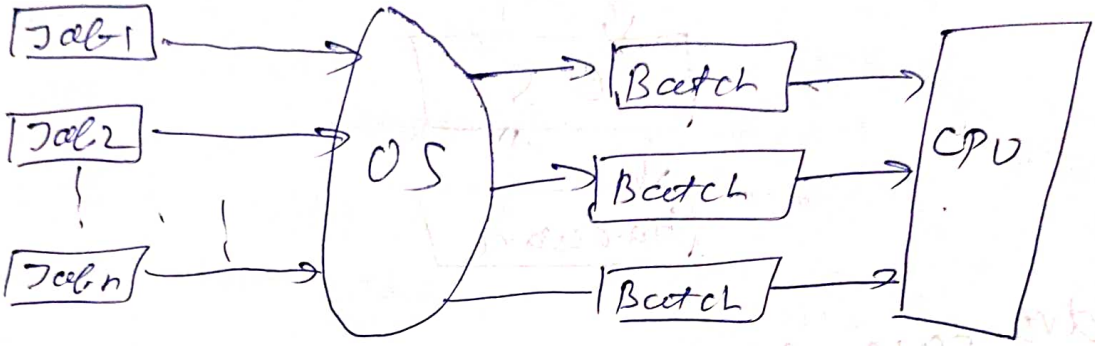


Advantage of OS ⇒ (I) It is helpful to monitor and regulate resources.
(II) It is used to create a interaction b/w the user and computer hardware.
(III) The Performance of the computer system is based on CPU.

Disadvantage ⇒ (I) It allow few task that can run at the same time.
(II) If any error occurs in OS then system is destroye.
(III) The cost of OS is very high.

Type of OS ⇒ (I) Batch OS
(II) Multi Programming OS
(III) Multi Processing OS
(IV) Multitasking OS
(V) Network OS
(VI) Real-Time OS
(VII) Time Sharing
(VIII) Distributed O.S.

① Batch OS ⇒ In 1970, Batch OS was very Popular. In this technique similar type of Job were Batched together and executed in time. People were used to having a single computer which was called a mainframe.



The user did not directly intract with the computer system. for Job execution in a simple batch O.S. The Job was then submitted to the computer Operator, who was usually in the form of Punch card. The Program's output included result and registers and memory dumps in the event of a program error. The output appeared after some time that could take days, hours, minute etc.

Its main role was to transfer control from one Job to another. Job with similar requirments were bocked together and Processed through the Processor to improved Processing Speed. The operator were used in the Program to create batches with similar needs. The compiler run Batch one by one when they become available.

Advantage ⇒ ① This system can easily manage large Job again and again.

(II) The Batch process can be divided into the several stage to increase processing speed.

(III) CPU utilization get improved.

(IV) The use of resident monitor improved computer efficiency as it eliminates CPU time b/w two Jobs. ○ Increase CPU Idle time.

disadvantage ⇒ (I) Batch Processing suffer from starvation (waiting time more)

(II) Non Interactive ⇒ Batch Processing is not suitable the user input. for Job that are dependent on

(III) Multi Programming OS ⇒ Multiprogramming is an extension to Batch OS where the CPU is always kept busy. Each process needs two type of system time: CPU time and I/O time. A multiprogramming OS may run many program on a single processor computer. If one program must wait for I/O transfer in a multiprogramming OS, the other program are ready to use the CPU. As a result, various Job may share CPU time. The primary goal of multiprogramming is to manage the entire system resources. The key component of a multiprogramming system are the file system, command processor, transient area. and I/O control.

advantage ⇒ (I) It provides less response time.

(II) The resource utilization is smartly.

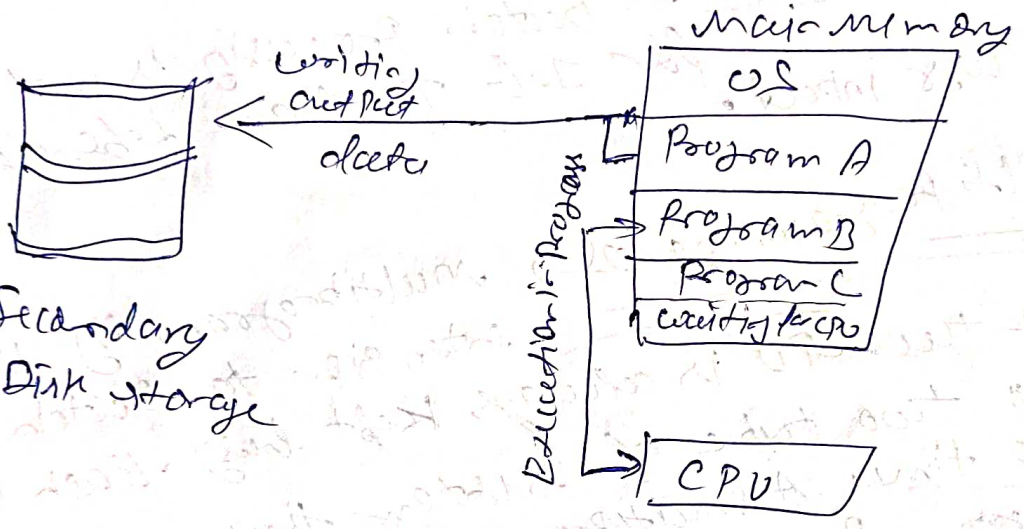
(III) It may helps to run various job in a single application simultaneously.

(IV) It may help to improved CPU utilization and never sets idle. (V) Response time can also be reduced.

disadvantage => (I) "CPU Scheduling" is required.

(II) It is highly complicated.

(III) The harder task is to handle all processes and task.

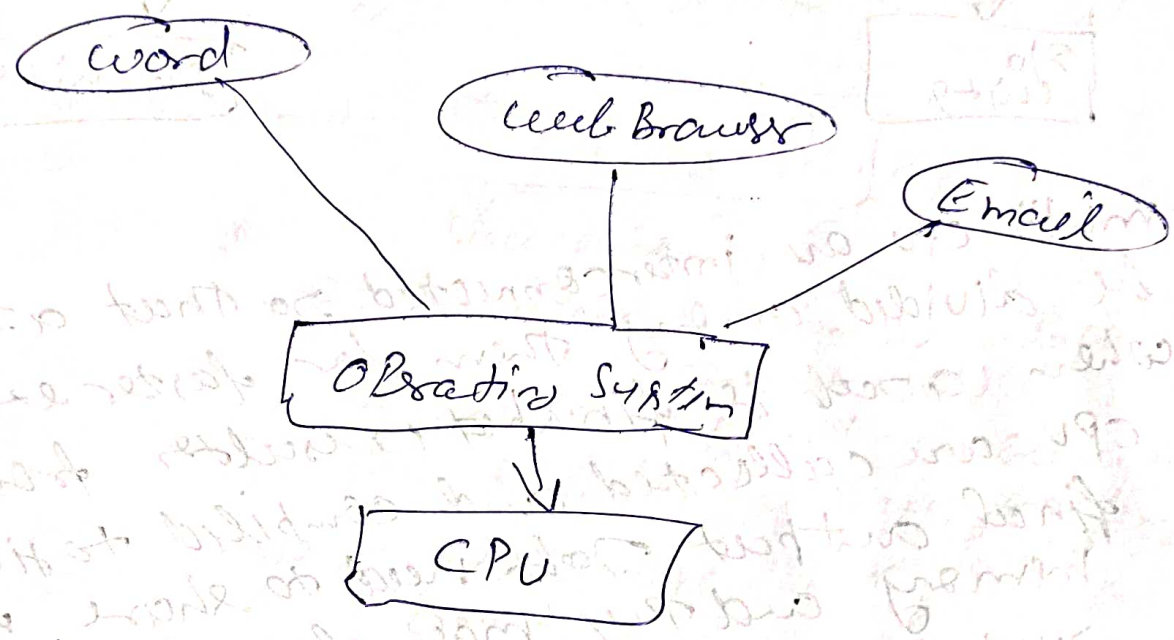


(I) Multitasking OS => A multitasking OS enables the simultaneous operation of two or more Programs. The OS does this by moving each Program into or out of memory one at a time. A Program that has been switched out of memory is temporarily saved on the disk until it is required once more. It allows a user to perform more than one computer task at the same time.

advantage (I) This OS is more suited to supporting multiple user simultaneously.

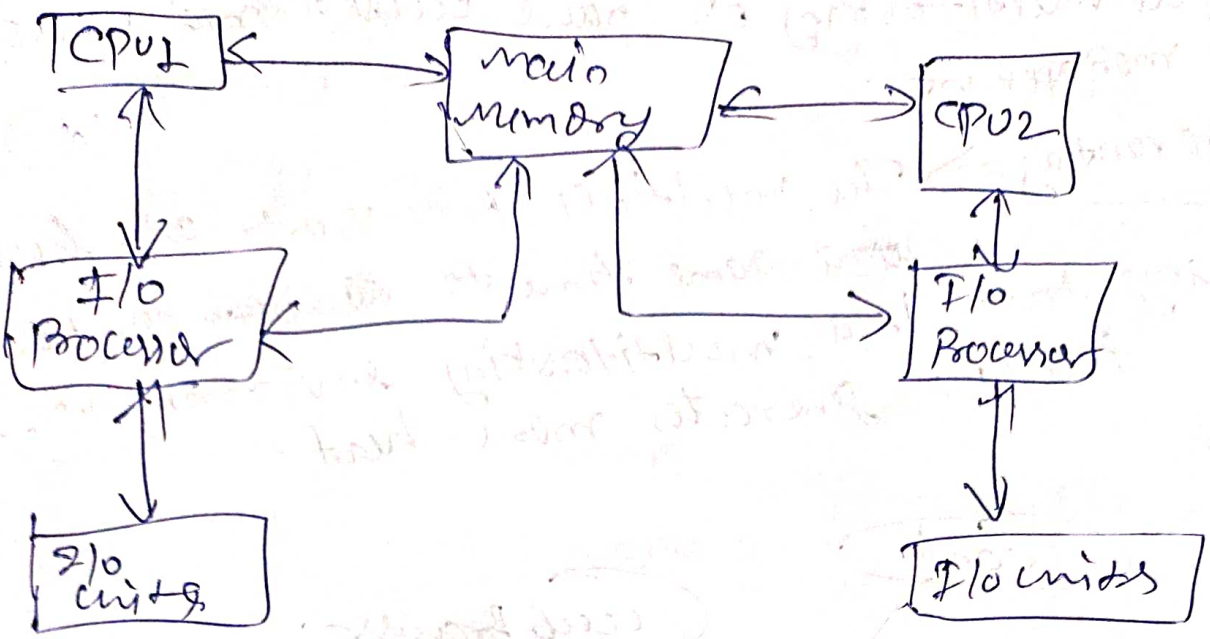
(11) The multitasking OS have well defined memory management.

Disadvantage ⇒ The multiple processors are busier at a same time to complete any task in a multitasking environment, so the CPU generates more heat.



(11) Multiuser OS ⇒ A multiuser OS allow many users to share processing time on a powerful central computer from different terminals. The OS accomplishes this by rapidly switching b/w terminals, each of which receives a limited amount of processor time on the central computer. The OS changes among terminals so quickly that each user seems to have continious access to the central computer. (mainframe, a part of real time slice)

Multiprocessing OS ⇒ In multiprocessing, Parallel computing is achieved. There are more than one processors present in the system which can execute more than one process at the same time. This will increase the throughput of the system. (spreadsheet) (music player)



multi CPU are interconnected so that a job can be divided among them for faster execution. when a job is finished, results from all CPU are collected and compiled to give the final output. Jobs need to share main memory and they may also share other system resources among themselves. multiple CPU can also be used to run multiple job simultaneously.

advantage ⇒ (i) Increase reliability
(ii) Increase throughput
(iii) The economy of scale.

disadvantage ⇒ (i) more complex
(ii) cost high as compare to other.

Type of multiprocessing ⇒

(i) ~~Symmetrical~~ Symmetrical multiprocessing O.S.
(ii) Asymmetrical multiprocessing O.S.

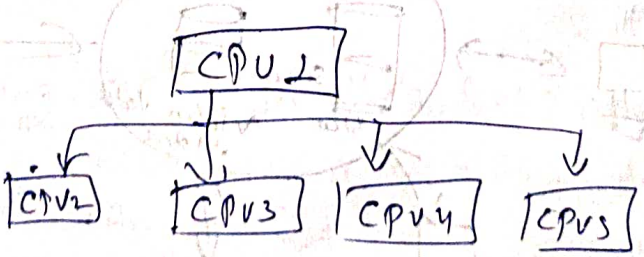
(1) Symmetrical multiprocessing OS ⇒ It is occurs when many processors work together to process programs using the same OS and memory. Each CPU executes the OS operation. when memory is shared it means all processor communicate with each other. CPU scheduling policies are very simple. It is also called "shared - every thing" system. Because the processor share memory, and the I/O bus or device path. not more than 16.

advantage ⇒ (i) Fault tolerant ⇒ if some of the processor are not working then whole system is not stop.

disadvantage ⇒ (i) very difficult to Balance the workload among processors rationally.

(ii) specialized synchronization schemes are necessary for managing multiple processors.

(ii) Asymmetric multiprocessor OS ⇒ In an Asymmetric multiprocessing system, there is a master-slave relationship b/w the processors. One processor act as a master or supervisor processor while other are treated as slave.



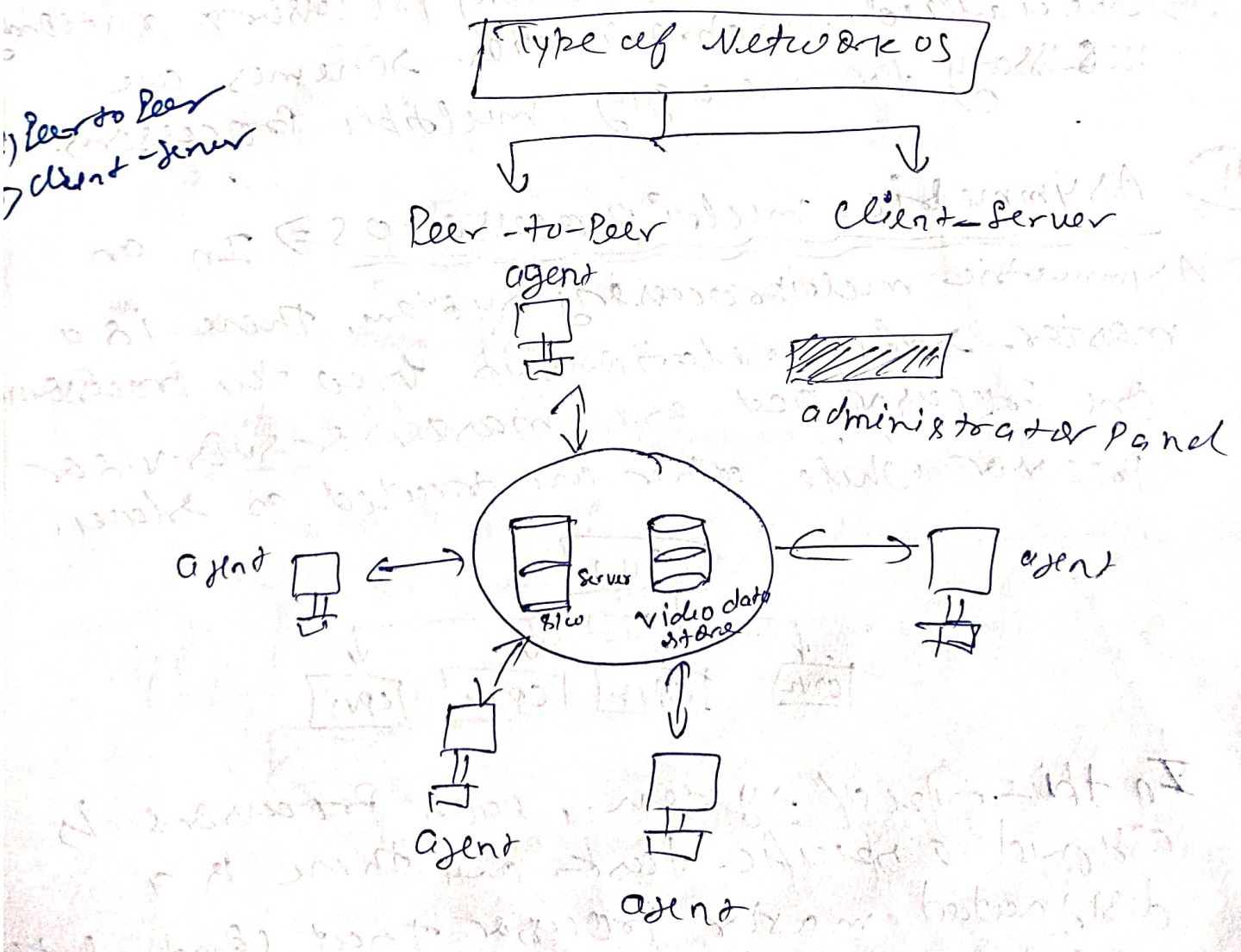
In this type of system, each processors is assigned a specific task and there is a designated master processor that control the activity of other processor.

(I) advantage ⇒ (I) Faster because each Processor have a fixed job.

disadvantage ⇒ (I) Unequally burdened.
it means one is in Process and one is the idle condition.

(II) if the Processo handling a specific work fails, the entire system will go down.

(IV) Network OS ⇒ An OS, which includes s/w and associated Protocol to communicate with other computer via a network conveniently and cost-effectively, is called Network OS.



advantage => (i) Network traffic reduced due to the division b/w client and server.
(ii) Less expensive to set up and maintain.

disadvantage => (i) The failure of any node in a system effect the whole system.
(ii) Security and performance are important issue. So trained Network administrators are required for network administrations.

(v) Real-Time OS => In real-time system, each job carries a certain deadline within which the job is supposed to be completed, otherwise, the huge loss will be there, or even if the result is produced, It will be completely useless.

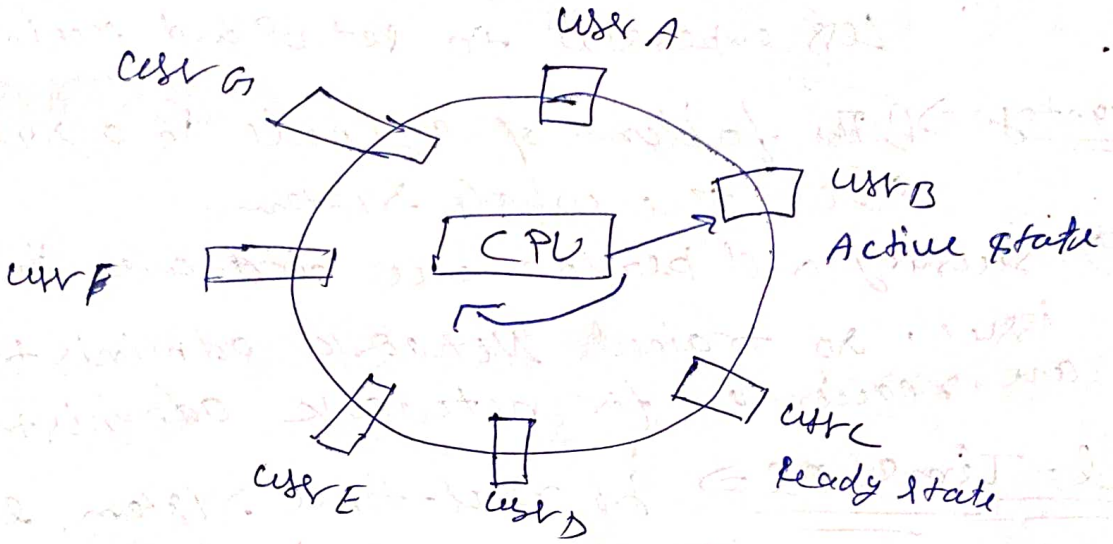
a) Hard Real Time.
b) Soft Real Time.

advantage => (i) Easy to layout, develop and execute real-time application under the real-time OS.
(ii) The maximum utilization of device and systems.

disadvantage => (i) very costly to develop.
(ii) very complex.

(vi) Time-Sharing OS => In this OS, computer resources are allocated in a time-dependent fashion to several programs simultaneously. Thus it helps to provide a large number of user direct access to the main computer. It is a logical extension of multiprogramming. In this the CPU is switched among multiple

Programs given by different users on a scheduled basis.



A Time sharing OS allows many users to be served simultaneously, so sophisticated CPU scheduling schemes and I/O management are required.

advantage ⇒ (I) Provides effective utilization and sharing of resources.

(II) This system reduces CPU idle and response time.

disadvantage ⇒ (I) It is very difficult and expensive to build.

(VIII) Distributed OS ⇒ The Distributed OS is not installed on a single machine. It is divided into parts, and these parts are loaded on different machines. A part of the distributed OS is installed on each machine to make their communication possible. Distributed OS are much more complex, large, and sophisticated than Network OS because they also have to take care of varying Networking Protocols.

advantage ⇒ (i) It Provide sharing of resources.

(ii) Fault-tolerant.

disadvantage ⇒ Protocol overhead can dominate computation cost.

Real-time OS ⇒ Real-time os are used in environment where a large number of events, mostly external to the computer system, must be accepted and processed in a short time or within certain deadline.

a) Hard Real-time OS ⇒ These os guarantee that critical task be completed within a range of time.

(ii) Soft-Real-time ⇒ This os provides some relaxation in the time limit.

(iii) Firm Real-Time OS ⇒ This type of os have to follow deadline as well. In spite of its small impact, missing a deadline can have unintended consequences, including a reduction in the quality of the product.

Function of OS ⇒ An os is a program that acts as a user-computer GUI (Graphical user Interface). os Perform various fn in a device.

(i) Security ⇒ os uses Password Protection to Protect user data and similar other techniques. It also prevents unauthorized access to Programs and user data.

(II) Instruction ⇒ OS establishes a mutual understanding b/w the various instructions given by the user.

(III) Control over System Performance ⇒ Monitors overall system health to help improve performance. records and Response time b/w service requests and system response to having a complete view of the system health.

(IV) Job accounting ⇒ OS keeps track of time and resources used by various task and users, this information can be used to track resource usage for a particular user or group of users.

(V) Error detecting ⇒ The OS constantly monitors the system to detect the errors and avoid the malfunctioning of a computer system.

(VI) Memory management ⇒ OS handles the responsibility of storing any data, system program and user programs in memory.

(VII) File management ⇒ The OS is helpful in making changes in the stored file and in replacing them. It also plays an important role in transferring various file to a device.

(VIII) Process Management ⇒ The Process is the execution of a Program that accomplishes the specified work in that Program. It can be defined as an execution unit where a Program runs.

(IX) Job Priority ⇒ The work of Job Priority is creation and promotion. It determines what action should be done first in a Computer System.

Classification of OS ⇒ O.S can be classified as follow:

a) Multi-user ⇒ In this OS two-or more user to use their Programs at the same time. Some of OS permits hundreds or even Thousands of user simultaneously.

b) Single-user ⇒ Just allow one user to use the Programs at one time.

c) Multiprocessor ⇒ Support opening the same Program more than Just in one CPU.

d) Multitasking ⇒ Allow multiple Programs running at the same time.

e) Single-tasking ⇒ Allow different Part of a single Program running at any one time.

f) Real-time ⇒ Responds to input instantly.

Elements of Command Band OS ⇒

CLI (Command Line Interface). It is an interface for the user that is used to issue commands in successive lines of text or command line to execute the task. It is a platform or medium in which users react to a visible prompt by writing a command and receiving a response from the system, and the user have to be compelled to type command & train of command to execute the task.

Unix OS include a CLI. where as window and Linux include both CLI and a GUI. The user must have good knowledge of using the CLI and complete knowledge of the correct syntax to issue effective commands. Overall CLI uses less memory and executes faster than the GUI.

advantage: ⇒ (I) It Provide fast performance as compare to GUI. user may execute the various job by entering commands in the CLI.

(II) It may be used with a low-resolution low-cost monitor.

(III) Required less memory (RAM)

(IV) Faster the device.

(V) CLI allow device communication.

(vi) CLI can be run on any CPU.

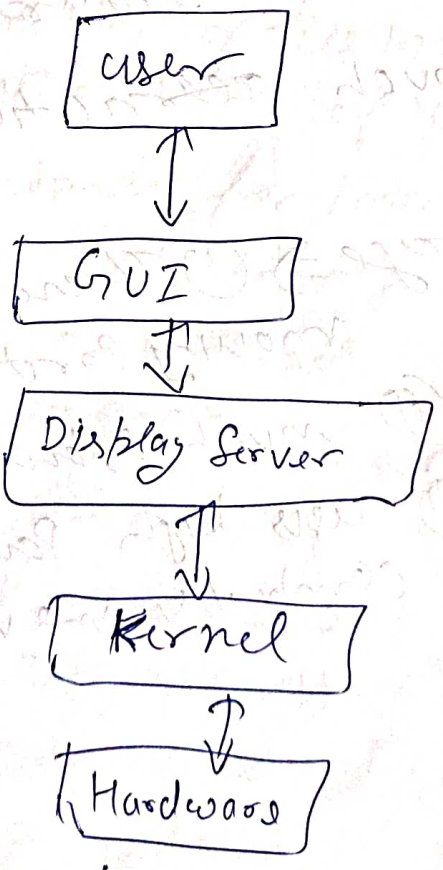
(vii) All OS support CLI - unix, linux and mac. each have their command-line Interface.

Disadvantage => (i) It's difficult to remember all of the CLI's command.

(ii) The mostly commands in CLI may not be undone or reversed. so the user must be very careful to use the command in CLI.

(iii) If user delete a file by accident, it causes difficulties because it may contains crucial information.

GUI (Graphical user Interface) =>



GUI is an Interface that allows users to interact with different electronic devices.

It is a visual representation of communication presented to the user for easy interaction with the machine. The Action in a GUI are usually performed through direct manipulation of graphical element like buttons and icons. Communication can be performed by interacting with these icons rather than usual text-based & command-based communication.

(1) advantage ⇒ (i) It is much easier to use
(ii) It also easy to manage
Several tabs when you use a GUI.
(iii) The use of shortcut key is one of the most important features of a GUI.
(iv) It is much attractive

disadvantage ⇒ (i) There are various moving part in a GUI.
(ii) much slower as CLI.
(iii) uses high Power and Computer memory.