UNIT-1
OPERATING SYSTEM

BASICS OF SOFTWARE :-

SOFTWARE :- Software is a set of Instructions, Data or Programs used to operate computers and execute specific tasks.

There are three types of Software:
(1) SYSTEM SOFTWARE
(2) APPLICATION SOFTWARE
(3) UTILITY SOFTWARE

(1) SYSTEM SOFTWARE :-

⇒ System Software is computer software designed to operate the computer Hardware and to Provide a Platform for running application Software.

⇒ System Software also Provide services to computer users and application Programs.

⇒ Examples of System Software are:- operating System. Device driver and utility Programs.

⇒ Operating System
⇒ Printer Drivers
⇒ Hard disk analyzer.

(2) APPLICATION SOFTWARE :-

Application Software (app for short) is a Programs Designed for end users. Example of an application include a word processor, a spreadsheet, an accounting application, a web browser, an email client a media Player, a file viewer, simulators a console game or a Photo editor.

UTILITY SOFTWARE :-

Utility Software is System software designed to Help analyze, configure, optimize or maintain a computer.

Types of utility software:

⇒ Antivirus & Programs
⇒ file managers
⇒ Disk Cleaners

OPERATING SYSTEMS FOR DESKTOP AND LAPTOP :-

⇒ Popular operating systems for Desktop and Laptop are.
⇒ MS (microsoft) - windows.
⇒ Ubuntu
⇒ mac OS
⇒ Linux
⇒ Solaris
⇒ Chrome OS etc.

OPERATING SYSTEMS FOR MOBILE PHONE AND TABLETS :-

Popular operating systems for mobile Phone and Tablets are :-

⇒ Android
⇒ iOS (Apple)
⇒ Blackberry OS
⇒ windows OS
⇒ symbian OS

OBJECTIVES OF OPERATING SYSTEM :-

⇒ OS allocate resources to Processes (manage resources)
⇒ Operating-System Provide an effective user Interface.
⇒ operating system manage the Input/out Put.
⇒ operating System Provides GUI in the form of menu, Icons, and buttons

designed for end users. Examples of an application include a word processor, a spreadsheet, an accounting application, a web browser, an email client, a media Player, a file viewer, simulators, a console game or a Photo editor.

Utility software:-

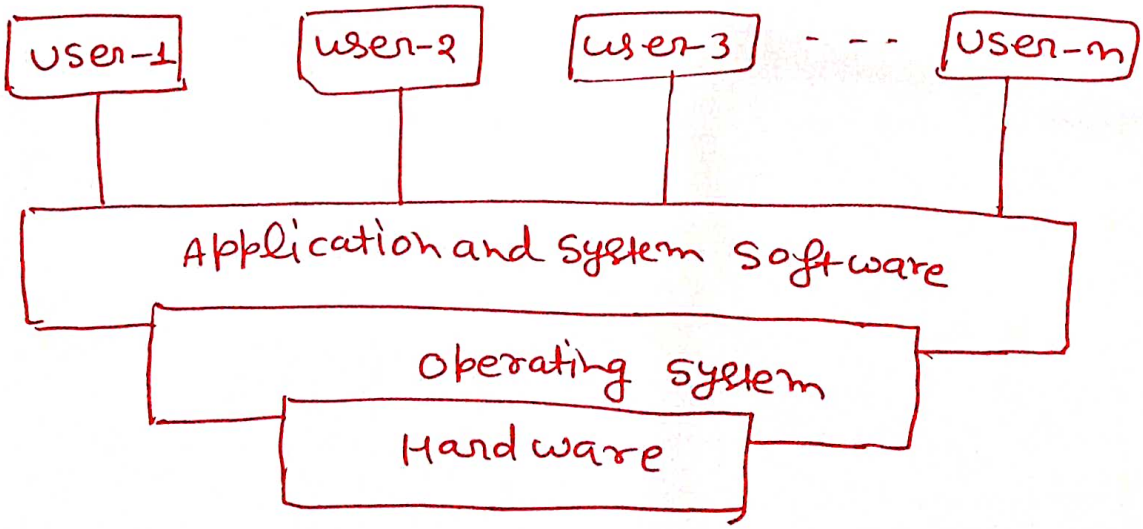
utility software is system software designed to help analyze, configure, optimize or maintain a computer.

Types of utility software:

⇒ Anti virus Programs
⇒ File managers
⇒ Disk Cleaners

INTRODUCTION TO OPERATING SYSTEM:-

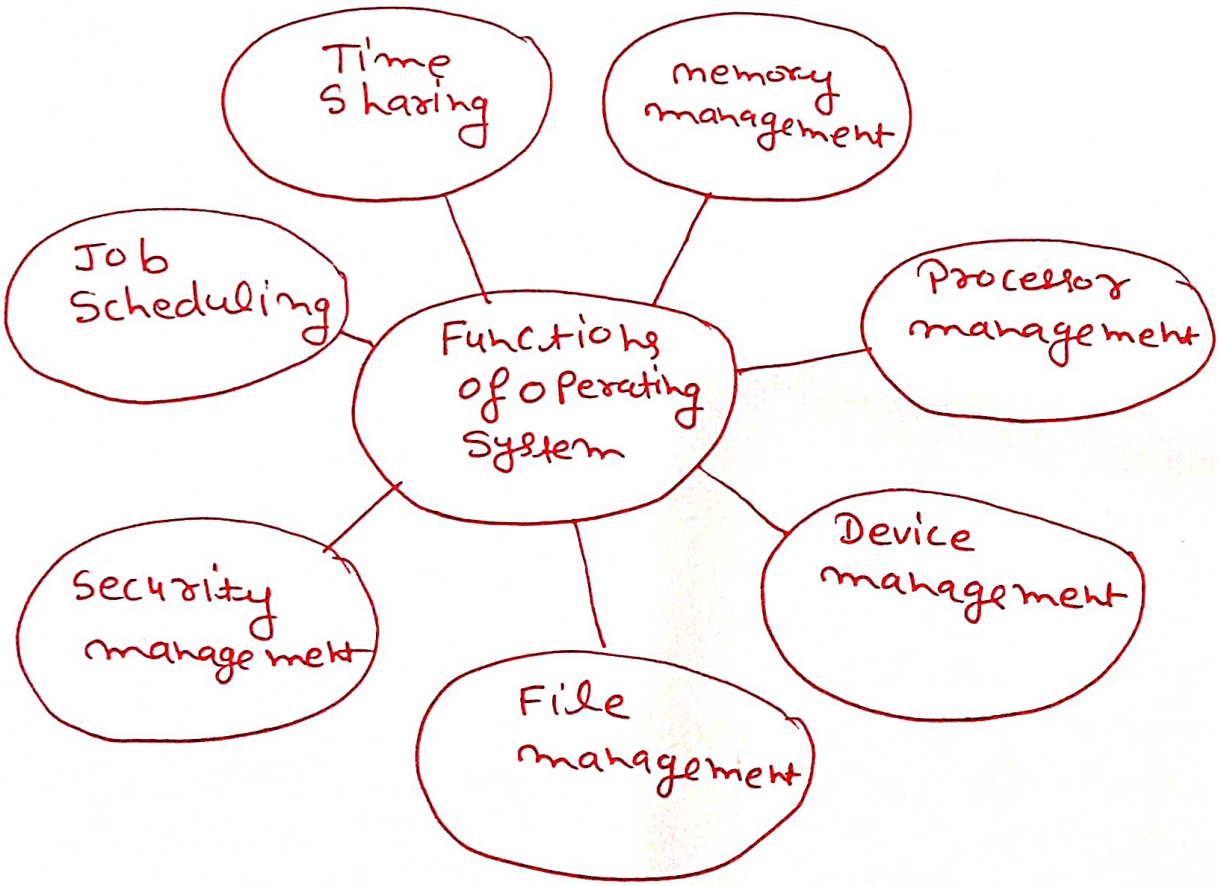
⇒ An operating system is a Program that acts as an interface between the user and the computer hardware and controls the execution of all kinds of Programs.



⇒ An OS (operating system) is a software that controls the internal activities of the computer Hardware and Provides user interface.

FUNCTION OF OPERATING SYSTEM:-

⇒ memory management
⇒ Processor management
⇒ Device management
⇒ File management
⇒ Security management
⇒ Job Scheduling
⇒ Time Sharing



Memory management:- memory management module Performs the task of allocation and De-allocation of memory space to Programs in need of His resources.

Processor management:- The operating system assigns Processors to the different tasks that must be Performed by the computer system.

Device management:- operating System Performs the task of allocation and de-allocation of the Devices.

File management:- operating system manages all the file-related activities such as organization storage, retrieval, naming, sharing, and Protection of files.

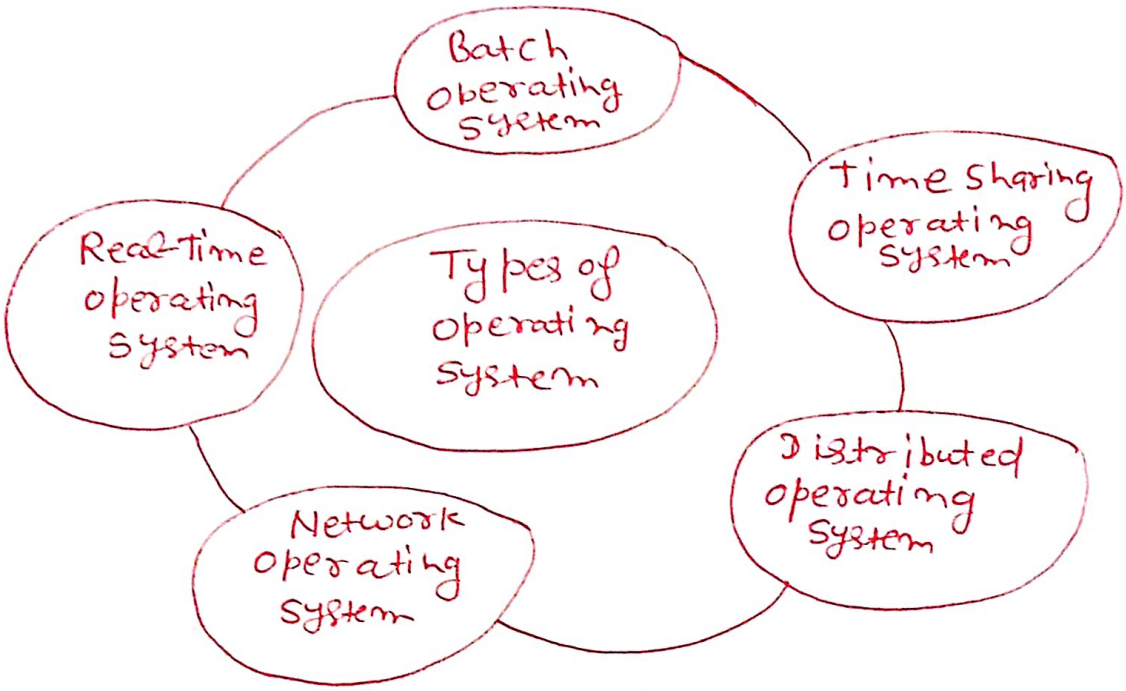
Security management:- Security management function of an operating system helps in implementing mechanisms that secure and Protect the computer system internally as well as externally.

Job Scheduling:- Job Scheduling is the Process of allocating system resources to many different tasks by an operating Syetm. (OS).

Time Sharing:- It co-ordinates and assigns compilers, assemblers, utility programs, and other Software Packages to various users working on Computer Syetem.

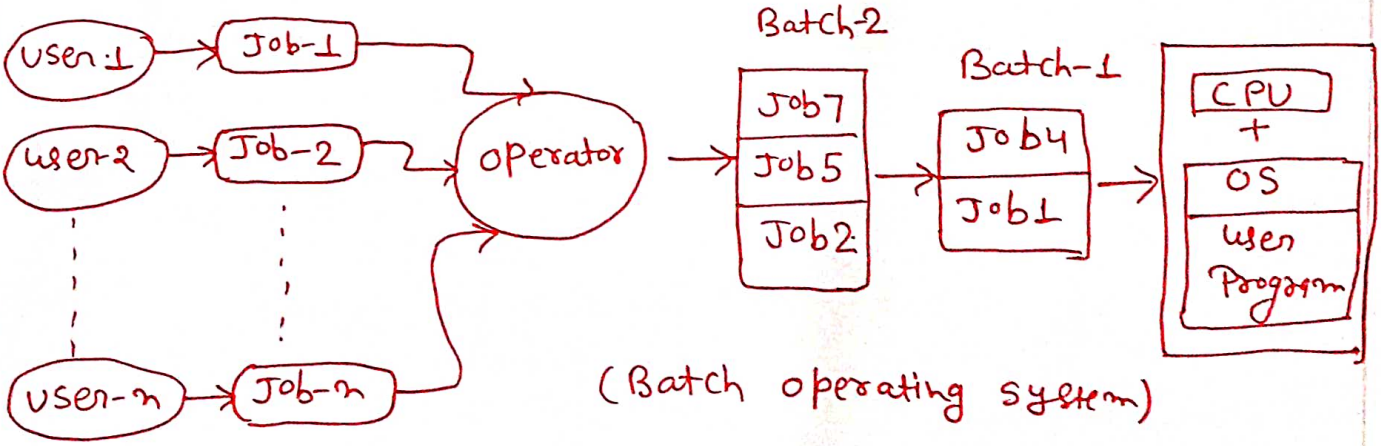
Types of operating system :-

⇒ Batch operating system
⇒ Time-Sharing operating system
⇒ Distributed operating system
⇒ Network operating System
⇒ Real-Time operating system.



Batch operating System :-

In a Batch operating System, the similar Jobs are grouped together into batches with the help of some operator and these batches are executed one by one.



(Batch operating system)

Advantage of Batch operating System:-

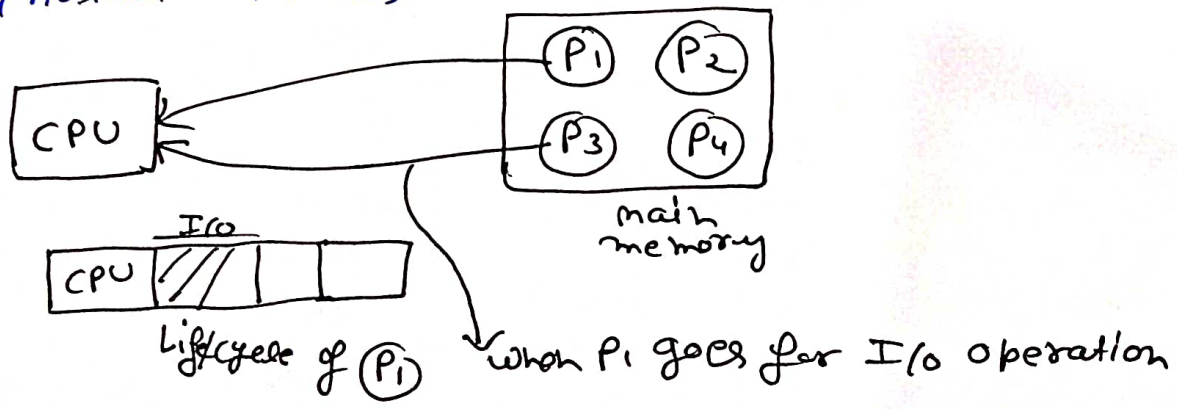
(1) multiple users can share the Batch System.
(2) Less Idle time.
(3) Managing Large work is easy.

Disadvantage of Batch operating System:-

(1) Expert computer with knowledge of Batch operating System needed.
(2) can be expensive.
(3) Debugging is Hard.
(4) other Jobs needs to wait for unknown amount of time if any Job fails.

Multiprogrammed operating System(OS):-

(1) Increased CPU utilization by organizing Jobs(code and data) so that the CPU always has one to execute.
(2) Keeps multiple Jobs in main memory.
(3) generally non-Preemptive.
(4) when a Process does some Input/output task the CPU can start the execution of another Process.



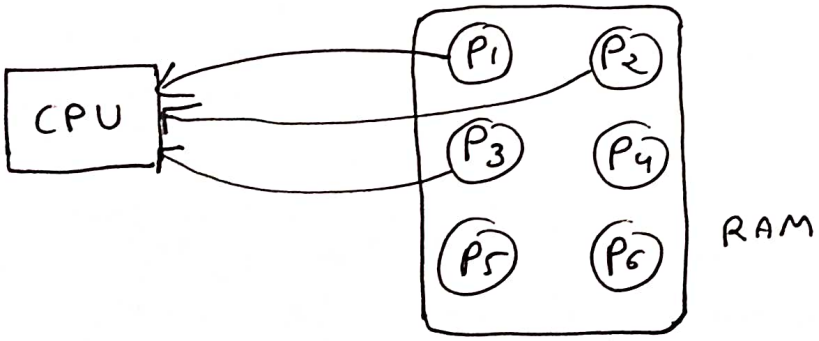
Multitasking operating system (Time-Sharing OS)

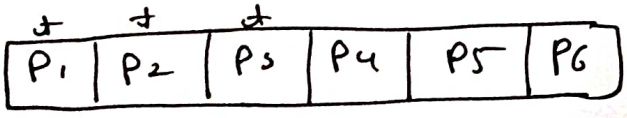
It is logical extension of multiprogramming CPU executes multiple jobs by switching among them typically using a small time execution quantum and the switching occurs so fast that the user feels like interacting with each executing task at same time.

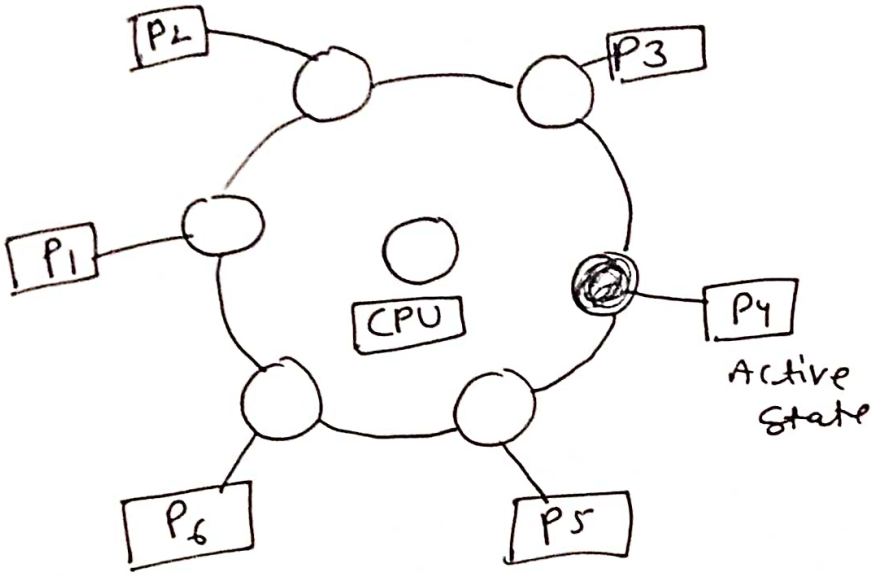
In time-sharing operating system each task is given some time to execute so that all the tasks work smoothly.

each user gets the time of CPU as they use a single system.

These systems are also known as multitasking the task can be from a single user or different users also







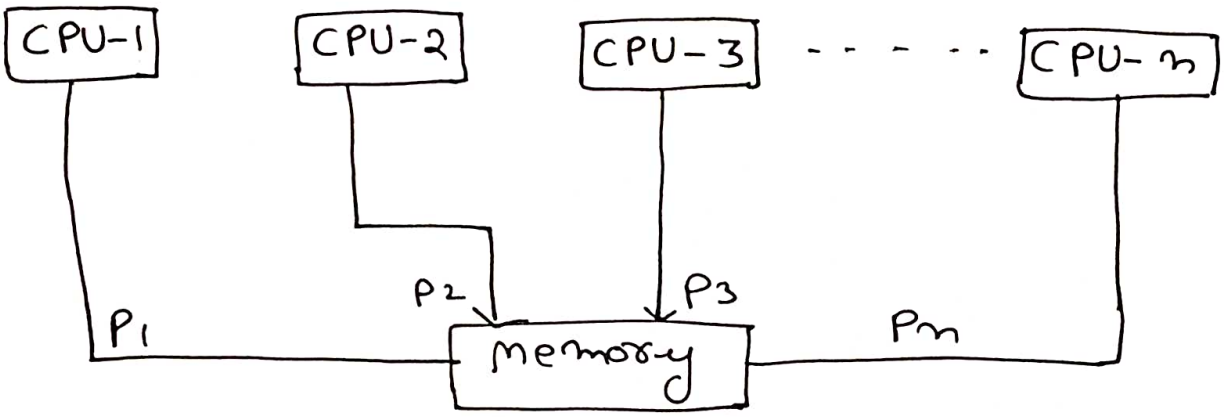
Difference Between multitasking and multiProgramming operating system!.

multiProgramming-OS	multitasking-OS
① Context Switching is used.	① Context Switching and time sharing is used
② CPU utilization is increased.	② CPU utilization and responsiveness.
③ operating system simply switches to and executes another Job when current Job needs to wait.	③ Switching happens when either allowed time expires or their is another reason for current Process to wait.

Multiprocessing operating system:- In multiprocessing more than one processor is present in the system. It allows more than one process to be executed at same-time.

These multiple CPU's shares memory bus, memory and devices.

All these devices are tightly coupled between the processors.

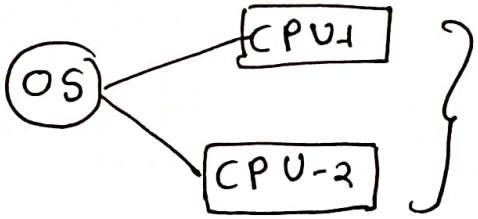


Types of multiprocessing operating system:-

Symmetric operating system:-

one operating system controlls all CPUs where each CPU has equal rights.

All CPUs are in Peer to Peer relationship.



Asymmetric operating system:-

There is a master Processor that gives instruction to all the other Processors.
master- slave relationship.

Advantages of multiProcessing operating system:-

(1) Maximum Through Put
(2) More Reliable
(3) fast Processing
(4) Improved efficiency.

Disadvantages:-

(1) Complicated CPU Scheduling
(2) memory Requirement is more.

Realtime operating system (RTOS):-

In Real time operating systems, 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 then it will be completely useless.

There are two types of Real time-operating System.

(1) Soft real time operating system.
(2) Hard - Real- time - operating system.

Soft real time (OS):-

In Soft real time operating system Less strict time constraint.
Ex multimedia, system, digital audio system,

Hard - real- time operating - System:-

In Hard- real time operating - system very strict time constraint and shortest possible delay is also not acceptable.
Ex ROBOT.

Advantages of Real- time operating system:-

(1) Maximum utilization of devices and systems.
(2) Less - time required in task shifting.
(3) more focus on running application (less focus on application in queue).
(4) Can also be used in embedded systems like in transport and others.

Disadvantages:-

(1) few task run at same time.
(2) Heavy system Resource usage.
(3) Algorithms used are complex.
(4) specific device drivers and interrupts signals are needed.

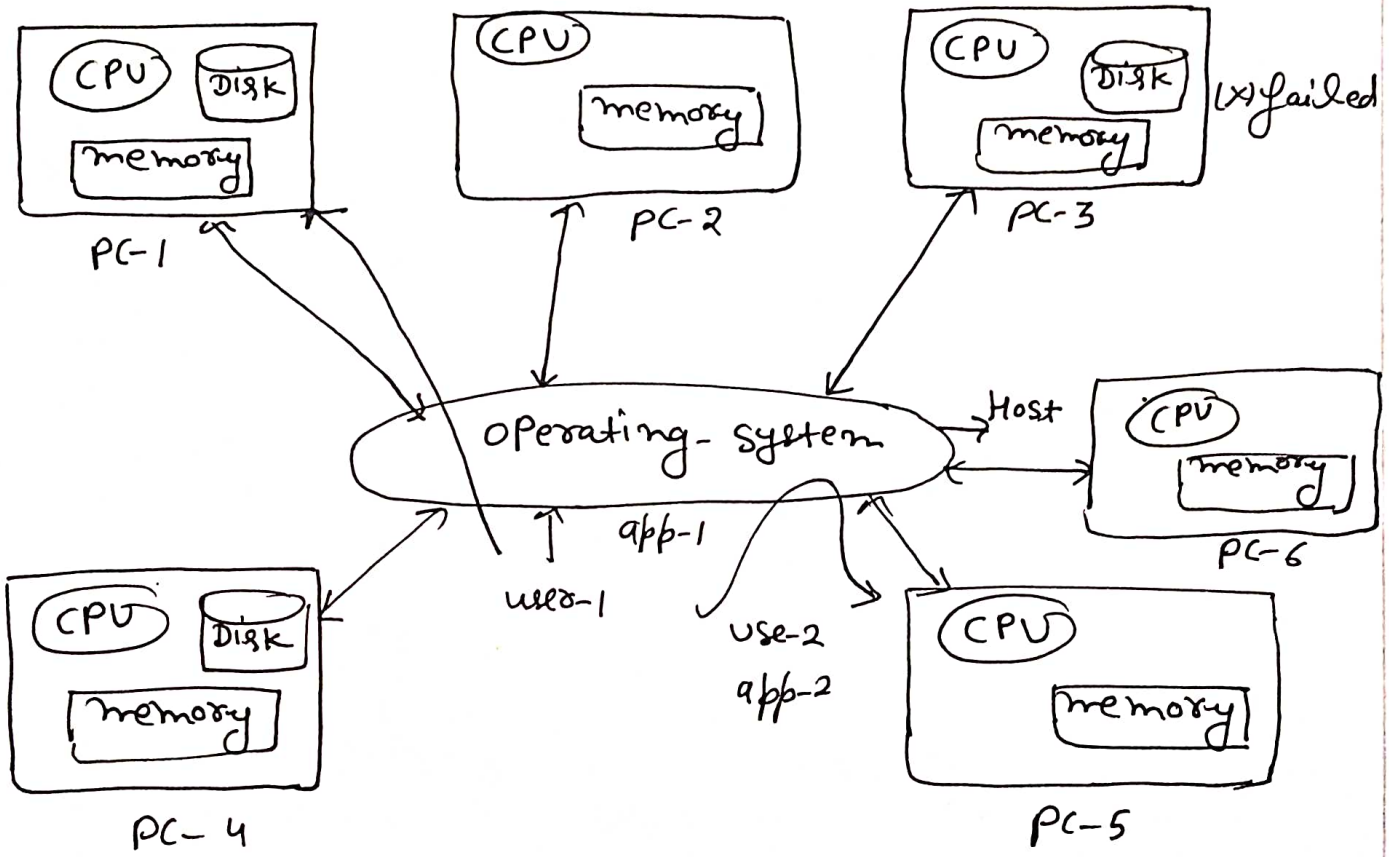
Distributed operating system:-

uses many central Processors to serve multiple realtime applications and users.

connects multiple computers via a single communication channel.

Each computer comes with its own Processor and memory communicate via high-speed buses or telephone lines.

Calso referred as Likely coupled systems.



Advantages of Distributed operating system (OS):-

(1) failure of one node doesn't affect entire system.

(2) fast computation.
(3) less load on host computer.
(4) Easily scalable.

Disadvantages:-

(1) failure of Host or main network will stop communication.
(2) Difficult to implement.

Clustered operating system:-

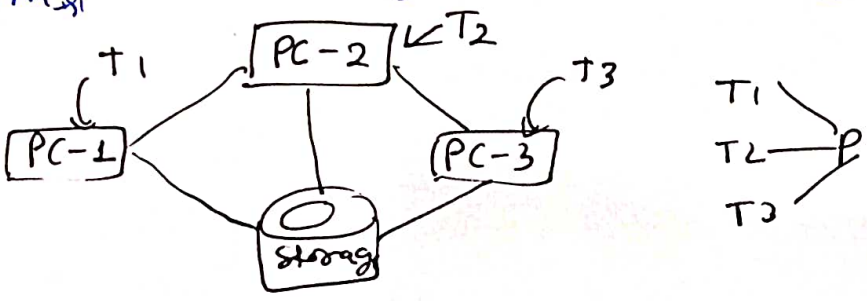
(1) Similar to Parallel system as they also use multiple CPUs.
(2) Difference is that clustered system are made up of two or more independent systems linked together.
(3) Contains independent computer system with shared storage media.
(4) All system work together to complete a task.

Software Cluster:-

Software cluster it allows all the system to work together.

Hardware Cluster:-

Allows all the system Performance disk Sharing among systems.



Advantages of clustered operating system:-

① failure of single node doesn't mean loss of service (High- Availability).
② more cost effective and Cheper.
(3) scalabilit is easy.
(4) Availability and Performance better than single computer systems.

Disadvantages of clustered operating system:-

Requires use of additional servers and Hard-wares thus making difficult maintenance.

Embeded operating system:-

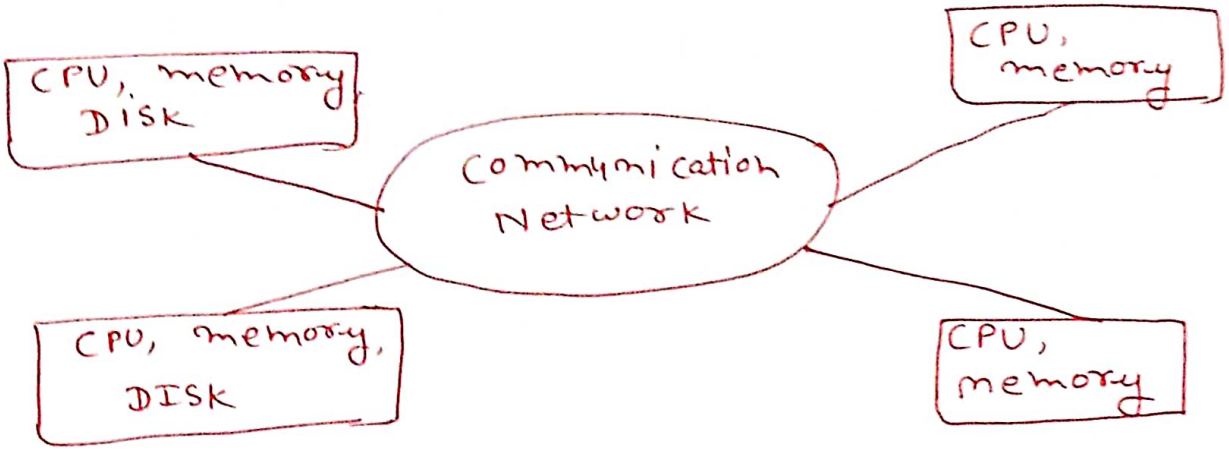
Designed to Perform a specific task for a device that is not a computer. (Car parking system (device) medical equipment (device) Small device.
are designed to be small, resource efficient and dependable.
Hardware is usually quite resource Constrained.

Advantages:-

(1) small size and fast to load.
(2) Cheap
(3) Easy to manage.
(4) more stable and reliable.
(5) Low Power Consumption.

Disadvantages:-

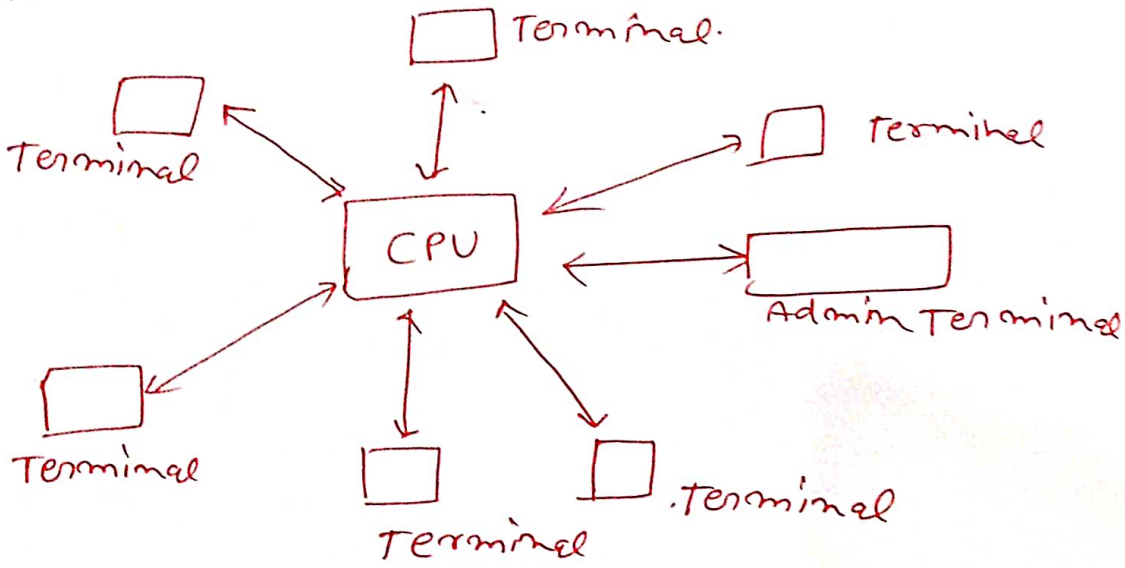
(1) Hard to Trouble Shoot.
(2) limited memory resources.



Network operating System:-

These systems run on a server and Provide the capability to manage data, users, groups, security, applications, and other networking functions.

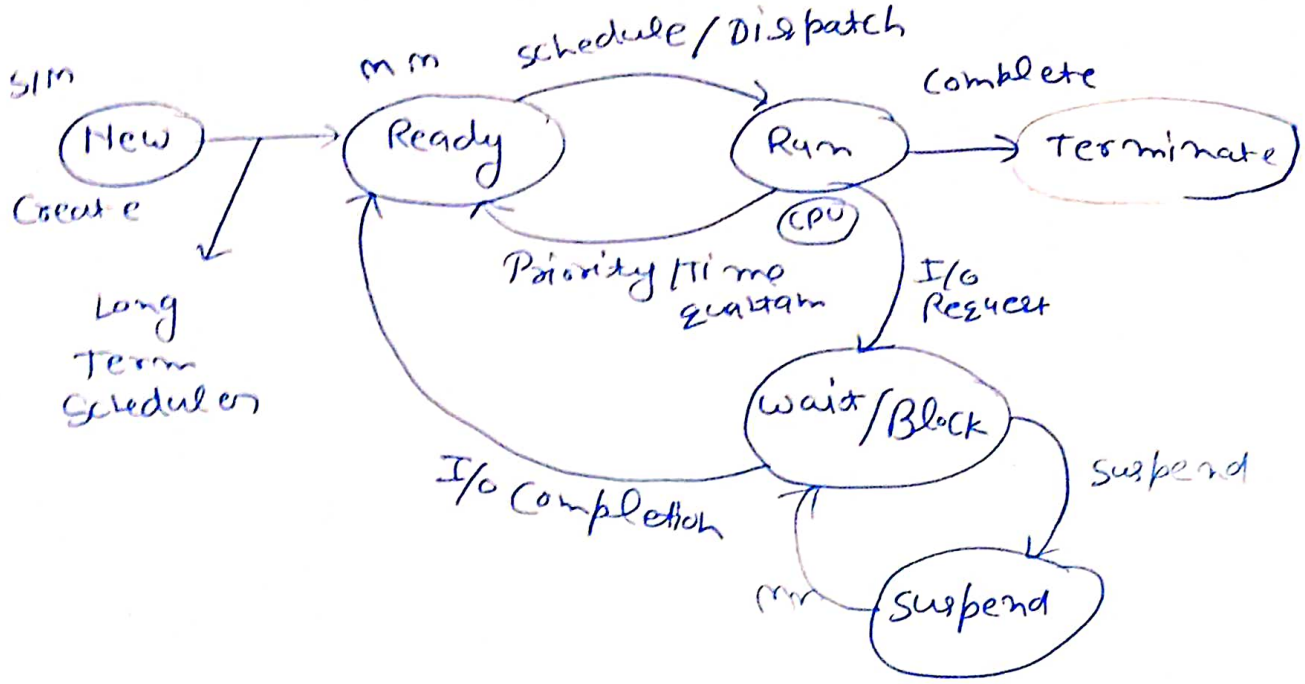
These types of operating systems allow shared access of files, Printers security application and other networking functions over a small Private network.



(Network operating System)

Monika Sharma

Process State Diagram:-



Scheduling is a process ~~will own~~ CPU of determining which process will own CPU for execution while another process is on Hold.

A Process is instance of a computer program that is being executed by one or more many threads.

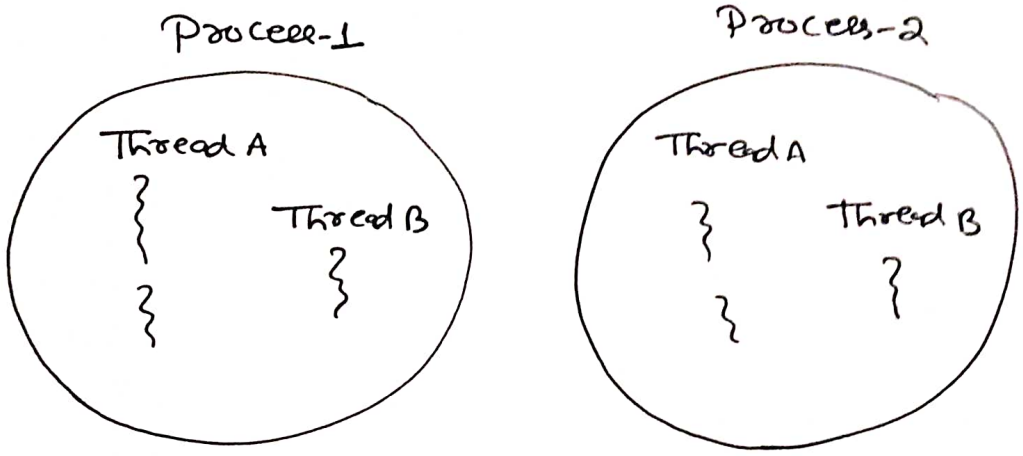
In the operating system, a process is something that is currently under execution. So an active program can be called a process

~~Thread~~ :-

PROCESS :- A Process is the instance of a computer Program that is being executed by one or many threads.

In the operating system, a Process is something that is currently under execution. So an active Program can be called a Process.

for example- when you want to search something on web then you start a browser so this can be a Process.



THREAD :- A Thread is a Path of execution within a Process. A Process can contain multiple threads.

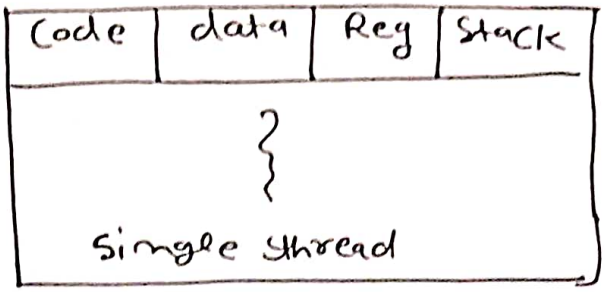
Threads represent a software approach to improving performance of operating system. by reducing the ~~user~~ overhead of Process switching.

A Thread is also called a light weight Process

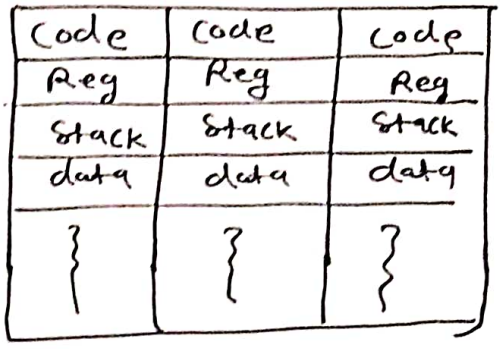
Thread switching does not need to interact wait operating system.

one thread can read, write or change another thread data.

Single and multithreaded Process.



Single threaded Process



multithreaded Process

Role of thread in Remote Procedure call (RPC):-

Remote Procedure call used for interProcesscommunication

Benefits of multithreaded Programming:-

(1) Responsiveness:- Program can continue running even if some parts of it are Blocked, responsiveness to user.

(2) Resource Sharing:- Allows an application to have several different threads of activity within same address space.

(3) Economy:- It is economical to create threads of data and resource Sharing.

(4) utilization of multiProcessor architecture.

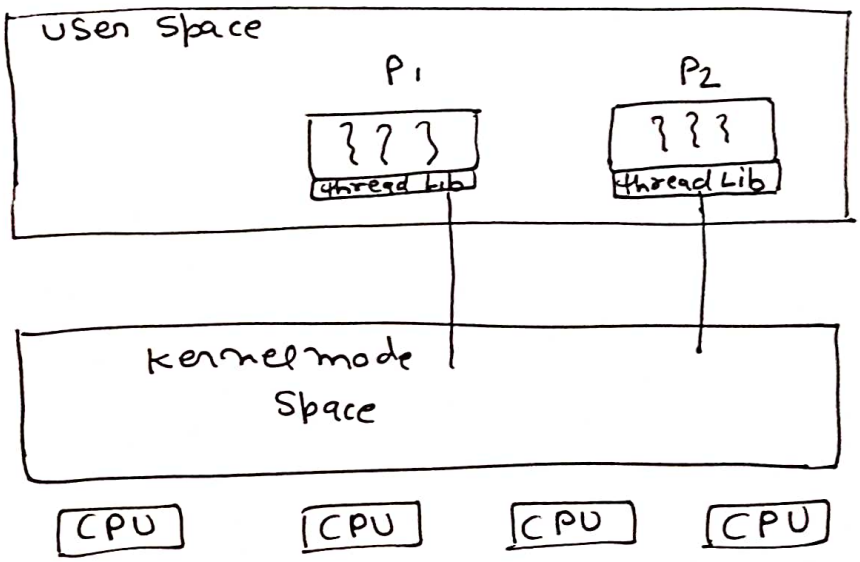
Thread can be made to run in parallel on different Processor. Thus is the concurrency.

Thread are two types!-

(1) User level thread
(2) Kernel level thread

User level thread :- In this case the thread management Kernel is not aware of existence of thread.

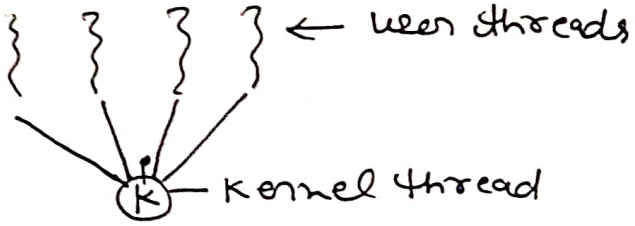
thread library contains codes, for creating, destroying thread, and passing messages data between thread.



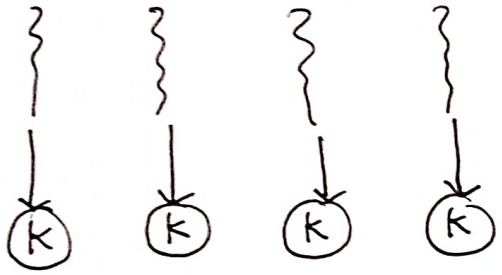
Kernel - level Thread :- In this case thread management is done by kernel. kernel threads are supported directly by operating system.
kernel maintains context information for the process as a whole and for individual threads with in process.

Multithreading models:-

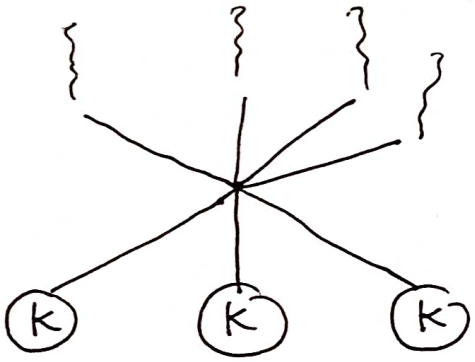
(1) Many-to-one model:- many-to-one model maps many user-level threads to one kernel thread.



(2) One-to-one model:- In one-to-one model maps each user thread to a kernel thread.



(3) Many-to-many model:- In many-to-many level threads to a smaller or equal no of kernel threads.



OPERATING SYSTEM STRUCTURE:-

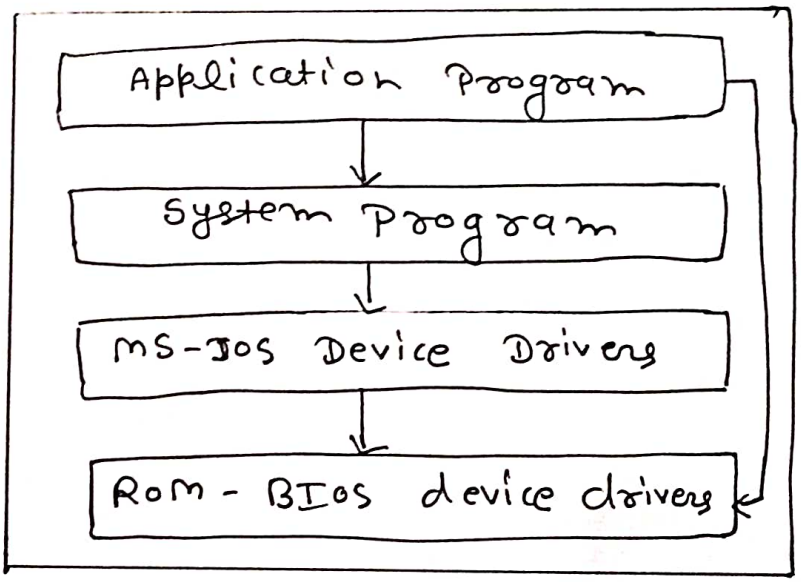
An operating system is a construct that allows the user application Programs to interact with the system Hardware.

Simple Structure:-

In simple structure such operating (system) os do not have well defined structure and are small, simple and limited system. The interface and levels of functionality are not well separated.

⇒ MS-Dos is an example of such operating system (OS).

⇒ In MS-Dos application Programs are able to access the basic I/O routines.



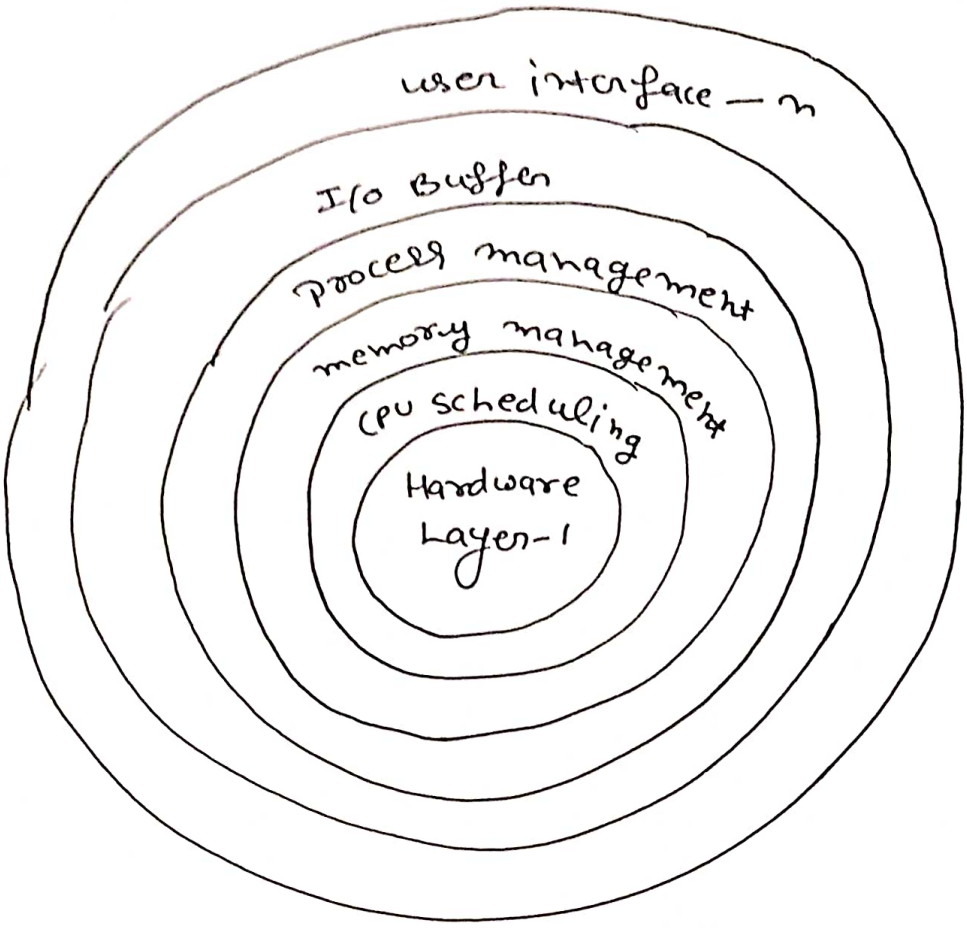
MS-DOS- STRUCTURE

LAYERED-STRUCTURE:-

The Layered structure approach breaks up the operating system into different layers and retains much more control on the system.

⇒ The bottom layer is the hardware.

⇒ The topmost layer is the user interface.



Advantage: It is very easy to perform debugging and system verification.

⇒ Provides modularity and clear interface.

⇒ Supports portability.

⇒ Provides robustness and Preserves Stability.

⇒ Each layer hides implementation details from higher level layers.

Disadvantages:-

⇒ More Layers means more risks for system breakdown.

⇒ Complex exploitation of user-intensive appl.
⇒ operations modes on various applications.
⇒ It requires careful Planning for designing the layers as Higher layer use for functionalities of only the lower layers.

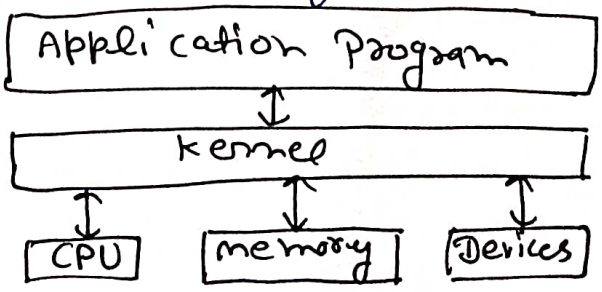
Kernel Structure :-

A kernel Structure is the central module of an operating system. It is the one structure which loads first and remains in the memory. It lies between system Programs and Hardware.

The kernel user system calls to perform all its function like CPU scheduling, memory management etc.
It is also known as command line interpreters.

Main functions of kernel :-

(1) It Provides mechanism for creation and deletion of Processes.
(2) It Provides CPU Scheduling memory management and I/O management.
(3) It Provides mechanism for inter-Process communication.



SYSTEM CALLS:-

A System call is a way for Program to interact with the operating System.

A Computer Program makes a system call when it makes a request to the OS Kernel.

System call are the only entry Point into the kernel system.

It Provides an interface between a Process and operating system to allow user-level Processes to request services of the operating system.

Services Provided by system calls:-

⇒ Process Management
⇒ main memory management
⇒ file System management
⇒ Device handling (I/O)
⇒ Protection
⇒ Networking.

Types of system calls:-

⇒ Process control
⇒ file management
⇒ information maintenance
⇒ Device management
⇒ communication

System calls used for Process management:-

⇒ fork() : To create a new Process.
⇒ exec() : To execute a new Program in a Process.

⇒ wait(): To wait until a created Process completes its execution.

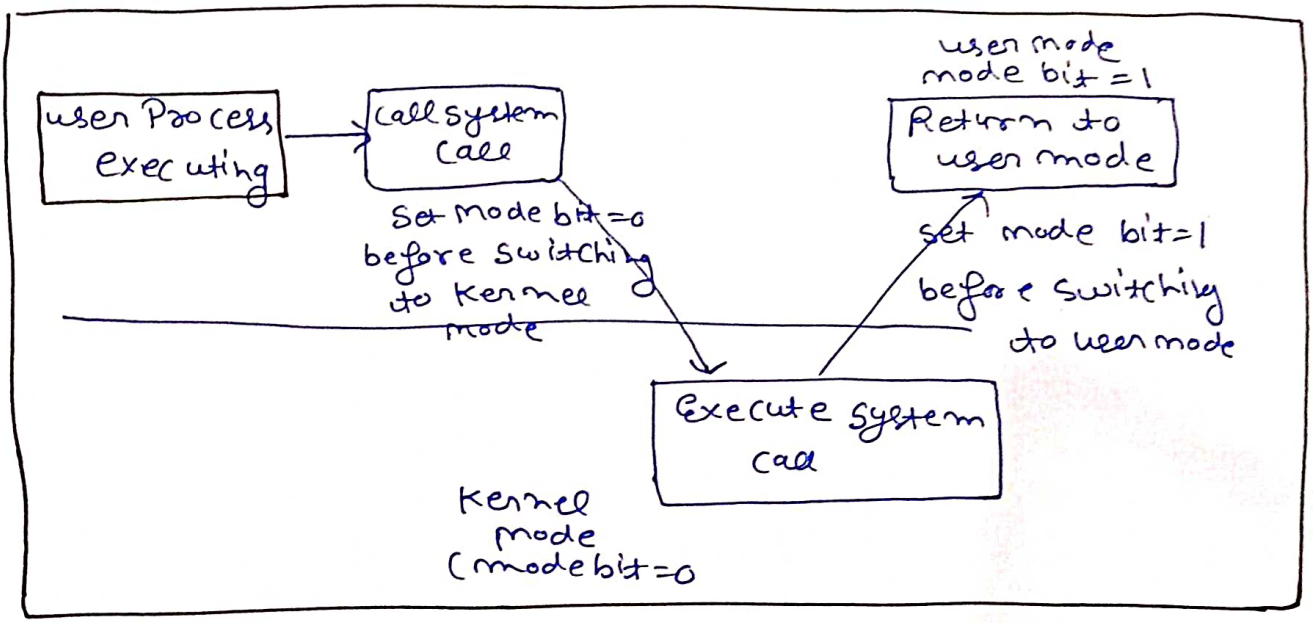
⇒ exit(): To exit form a Process execution.

Dual mode operating system:-

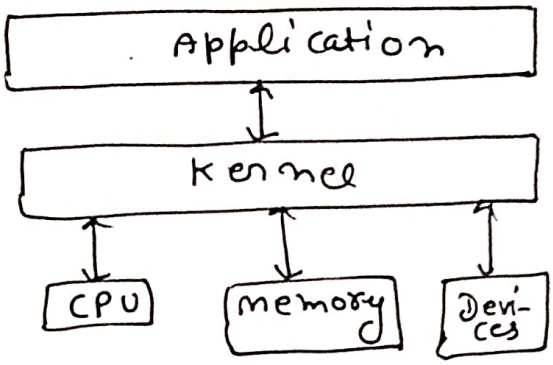
In Dual mode operating system two separate modes are used for working of operating System (OS).

USER MODE:-

When the computer system is run by user application like creating a text document, then the system is in user mode. When user application requests for service form the operating system (OS) or system call then there will be a transition from user to kernel mode to fulfill the requests.



Kernel:



A kernel is a essential Part of operating system. It's layer of the operating System.

Kernel is loaded firstly at the time of booting. Remain in the memory until the computer system is switched off.

Kernal Provid all the essential Services to other Part of operating system and Applications.

Kernal Provid is Responsible for:-

(1) memory management
(2) Process and task management
(3) Disk management

REENTRANT KERNELS:-

In Reentrant kernel many Processes or threads can execute at same time. But without affecting one another. Reentrant kernely modify Local data.

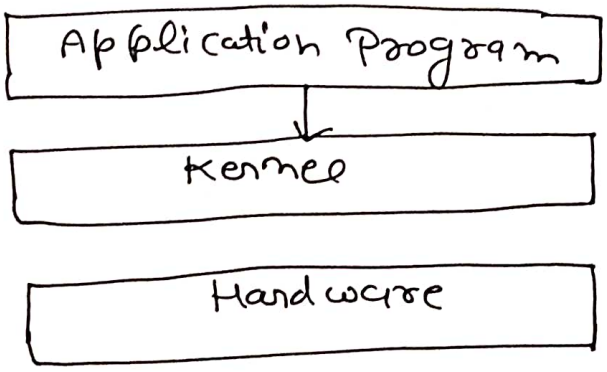
It cannot modify any global data. Executions of Reentrant function do not affect the behaviour of others.

Monolithic Kernel:-

It execute all the operating system code in the same address space to increase the performance of the system

⇒ It consist of different modules, that can be dynamically loaded and unloaded.

⇒ This kernel offer every thing the operating system needs: Process, main memory management and multiprogramming interProcess communication (IPC) device excess, file management, network Protocal etc.



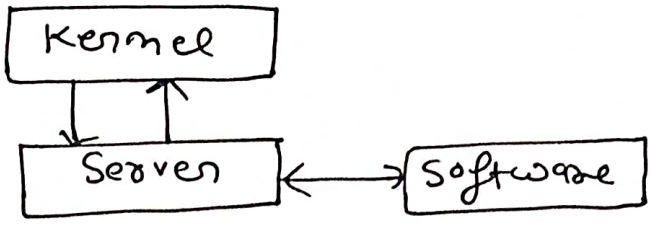
monolithic

micro Kernel:- It run most of the operating services in user space as a server, aiming to improve modulerity of operating system.

It consist of set of server communication through a minimal kernel code.

micro-kernel reduce the kernel code size and also increase security and stability of

of operating system as we have minimum code running in kernel.



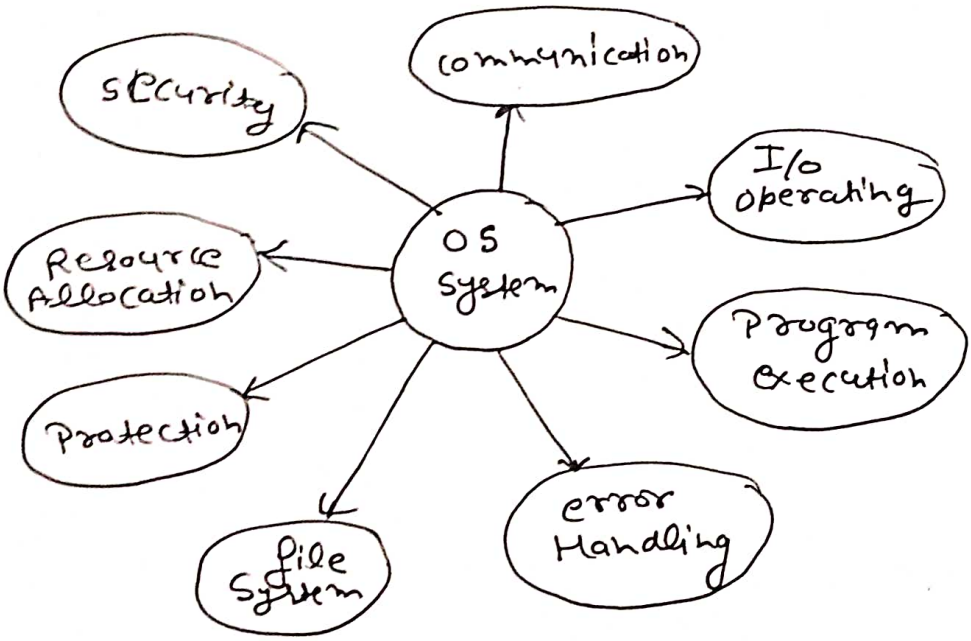
fig(microkernel

Difference between monolithic and microkernel!-

(1) In this user services & kernel services are kept in separate address Place.	(1) In this both user services and kernel services in the same address Place.
(2) They are small in size.	(2) It is bigger than micro kernel.
(3) If is a service crashes it does effect on working of micro kernel.	(3) If is a service crashes the whole system crashes in monolithic kernel.
(4) It is easy extendible.	(4) It is hard to extend
(5) To write a micro kernel more code is required.	(5) To write a monolithic kernel less code is required.
(6) Slow execution.	(6) fast execution
(7) minix	(7) Linux, microsoft window etc. Dos.

Services of operating system:-

(1) Communication
(2) I/O operating
(3) error Handling
(4) file system
(5) Protection
(6) Security
(7) Resource Allocation.



Component of operating system:-

(1) Process management
(2) file management
(3) System call
(4) Network management
(5) I/O Device management
(6) main memory management.