Unit-1 :-

11/03/2024
Monday

Operating System :-

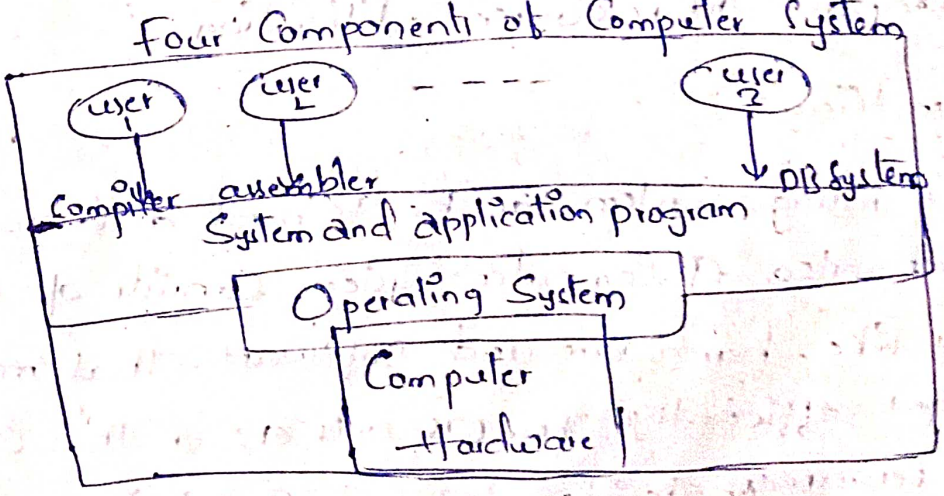
Introduction :-

Operating System :-

A Computer System has many resources (hardware and Software) which may be required to Complete a task. The Commonly required resources input/output devices, Memory, file Storage, Space, CPU etc. The Operating System acts as a Manager as of the above resources and allocates them to Specific programs and users. whenever necessary to perform a particular task. Therefore the Operating System is the resource Manager. i.e it Can Manage the resource of a Computer System internally. The resources are, processor, Memory, files and I/O devices.

→ An Operating System acts Similarly like government Means an Operating System performs no useful functions by itself; through it provides an environment within which other program Can do useful work.

→ An Abstract View of the Components of The Computer.



In the above picture:-

→ The Computer Hardware Contains a Central processing unit (CPU), the Memory, and I/O devices and it provides basic Computing resources for the System.

→ The Application Program like Spread sheets, web browsers, and web processors, etc. are used to define the ways in which these resources are used to slove the Computing problems of the users.

→ And the System program mainly Consists of Compilers, loders, editors, OS etc...

→ The Operating System is Mainly used to Control the hardware and Coordinate its use among the Various application Program for the diff. users.

→ The Operating System Consists of two Views
1. User's View
2. System View.

1) User's View :- The user View of the Computer refers to the interface being used. In these case the OS is designed mostly for easy of use, with some attention paid to performance, and nonpaid to resource utilization.

2) System View :-

The Operating System Can be Viewed as a resource allocater also. A Computer System Consists of many resources like - hardware and Software - that must be Managed efficiently. The OS acts as a the Manager of the resources, decides between Conflicting requests, Controls the Execution of the program etc.

13/03/24
Wednesday

* Types of Operating System:-

1) Simple Batch Ols
2) Multiprogrammed ole
3) Time-shared Ole
4) Personal Computer Ols
5) Parallel Ols
6) Distributed Ols
7) Real Time Ols

① Simple Batch Operating System:-

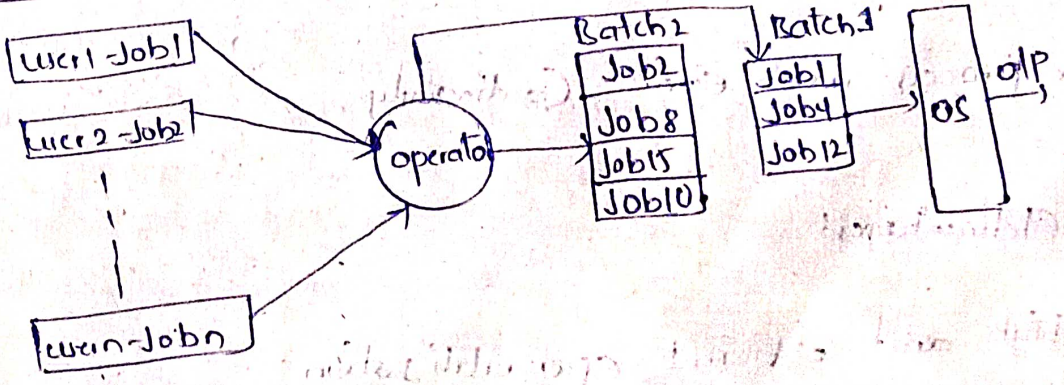
→ In a Batch Operating System, the similar jobs are grouped together into batches with the help of some operator and these batches are executed one by one.

Eg:- Let us assume that we have 10 programs that need to be executed.

→ Some of them are written in C++
→ Some of them are C and rest of them Java.

Then makes the batches of C++, C, Java.. and there are need load only once. If we cannot make batches we need to load individually.

Diagram:-



Advantages:-

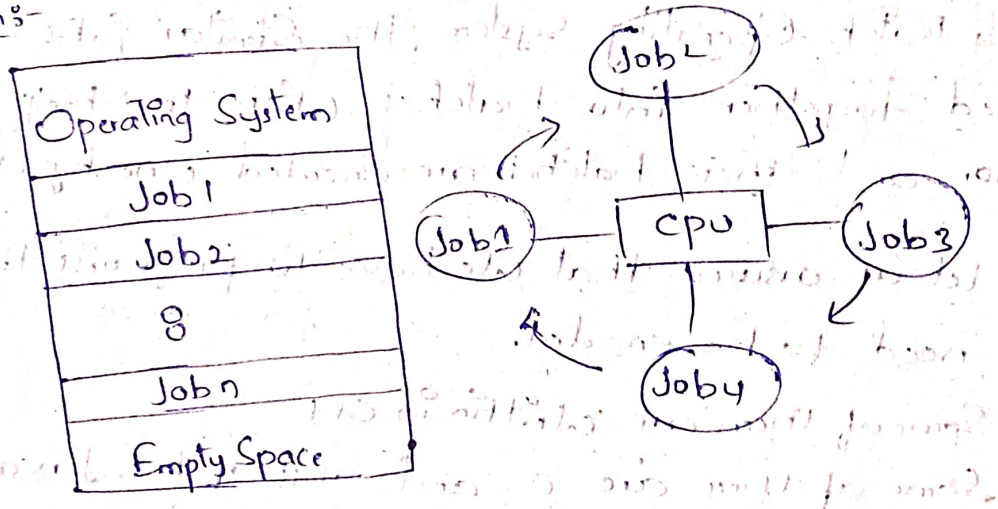
1) The Overall time taken by the System to execute all the programs will be reduced.

2) The Batch Operating System can be shared between Multiple users.

② Multiprogramming Operating System:-

→ Sharing the processor, when two or more programs reside in Memory at the same time, is reffered as Multiprogramming. Multiprogramming increases CPU utilization by Organizing jobs so that the CPU always has one to execute.

Diagram:-



→ Job 1 execute the process.

If the program ask any I/O devices, the it allocates Job 2. If Job 2 ask any I/O devices then it allocates Job 3. Simultaneously the process will be run.

→ The process will execute Continously.

→ Advantages:-

→ High and efficient CPU utilization

→ User feels that many programs are allocated CPU almost Simultaneously.

③ Time Sharing Operating System:-

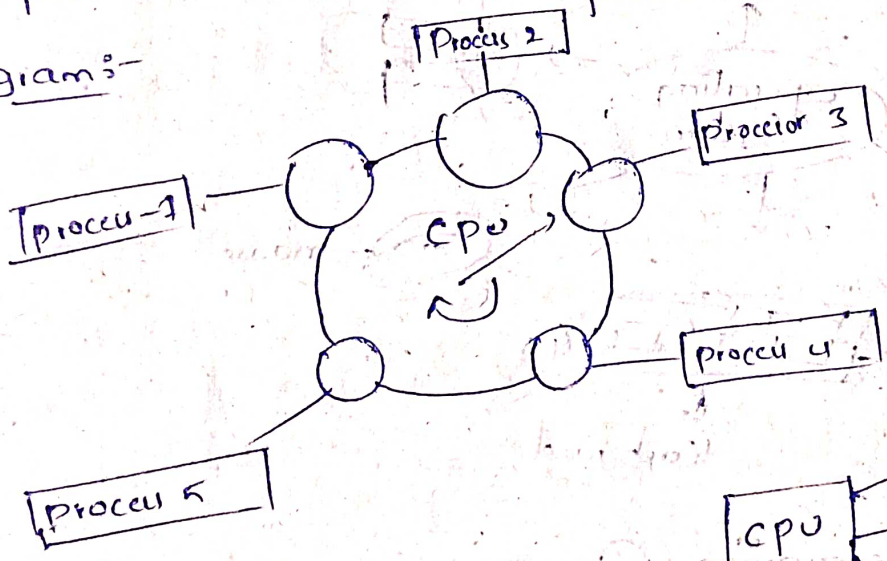
→ In a Multi-tasking Operating System, more than one process are being executed ata particular time with the help of time sharing Concept.

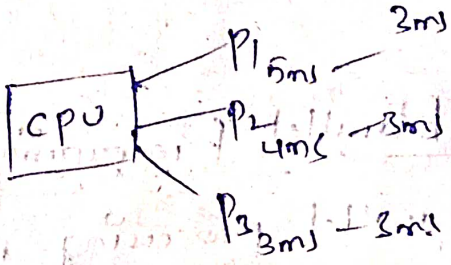
→ In the time sharing environment, we decide a time that is called time quantam.

→ when the process start its execution then the execution continous for only the amount of time, after that, other process will be given chance for the amount of time only.

→ In the next cycle, the first cycle come for its execution and it will be executed for that time quantam and again the next process will come. This process will continue.

Diogram:-





Advantages:-

1) Since equal time quantam is given to each process, so each process gets equal opportunity to execute.

2) The CPU will be busy in mat of the cases and this is a good to have case.

④ Personal Computer Operating System:-

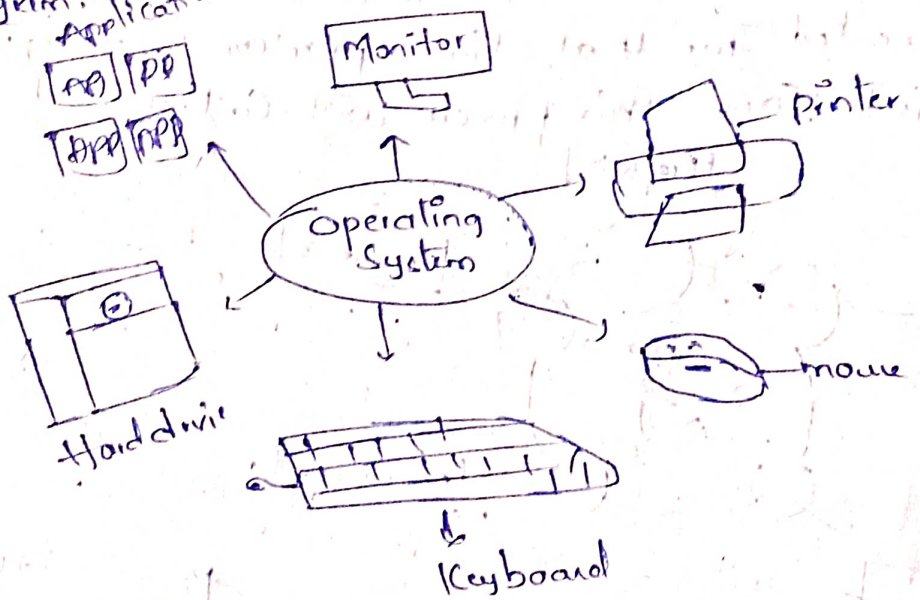
Personal Computer Operating System Provides a good interface to a single user.

→ personal Computer Operating System are widely used for processing. Spreadsheets and Internet access.

→ Personal Computer OIs are made only for personal. you can say your laptops, Computer Systems, tablets etc. ex. Personal Computer OIs such as Windows 7 and Windows 10, android etc.

→ And these used for personal purposes. And also used for Making projects, watching Vedios, playing games, etc---

Diagram:-



⑤ Parallel Processioning Operating Systems:-

→ Parallel processing requries Multiple processors and all the processor works simultaneosly in the System. Here the task is divided into subparts and these subparts are then distributed among the avaliable processor in the System.

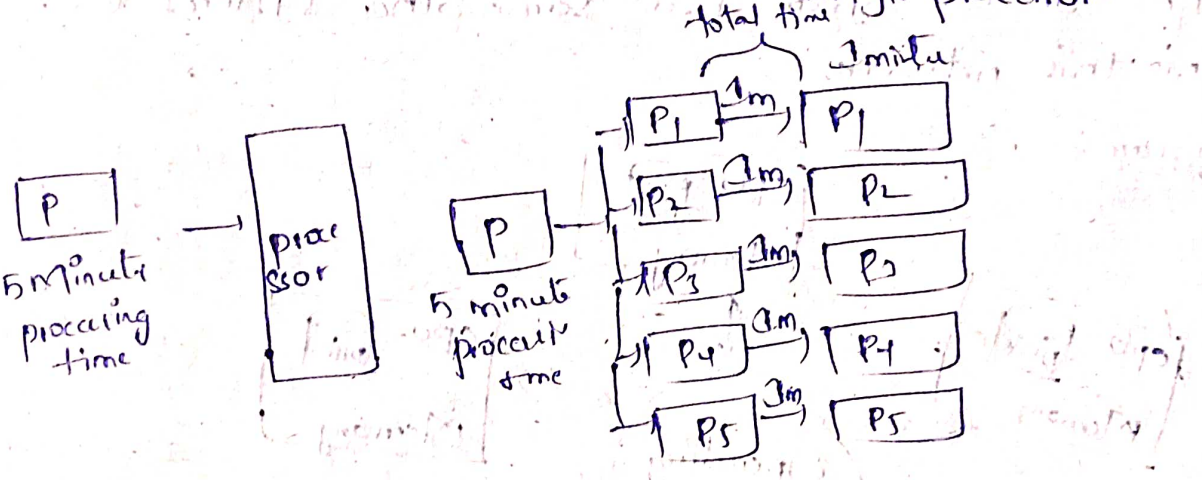
→ Parallel processing Completes the job on the shortest possible time.

→ All the processors in the parallel processing environment should run on the same Operating System.

→ All the processors in the system share the common secondary storage like the hard disk.

Diagram:-

→ The user need not to be aware of the inner architecture of the Machine. He should feel that he is dealing with the single Processor only and his interaction with the system should be the same as in a single processor.



Advantages:-

1) It saves time and Money as many resources working together will reduce the time and cut potential costs.

2) It can be impractical to solve larger prblm on Serial Computing.

3) It can take advantage of non-local resources when the local resources are finite.

⑥ Distributed Operating System:-

→ These type of OS is a recent advancement in the world of computer technology and are being widely accepted all over the world and that too, with a great peace.

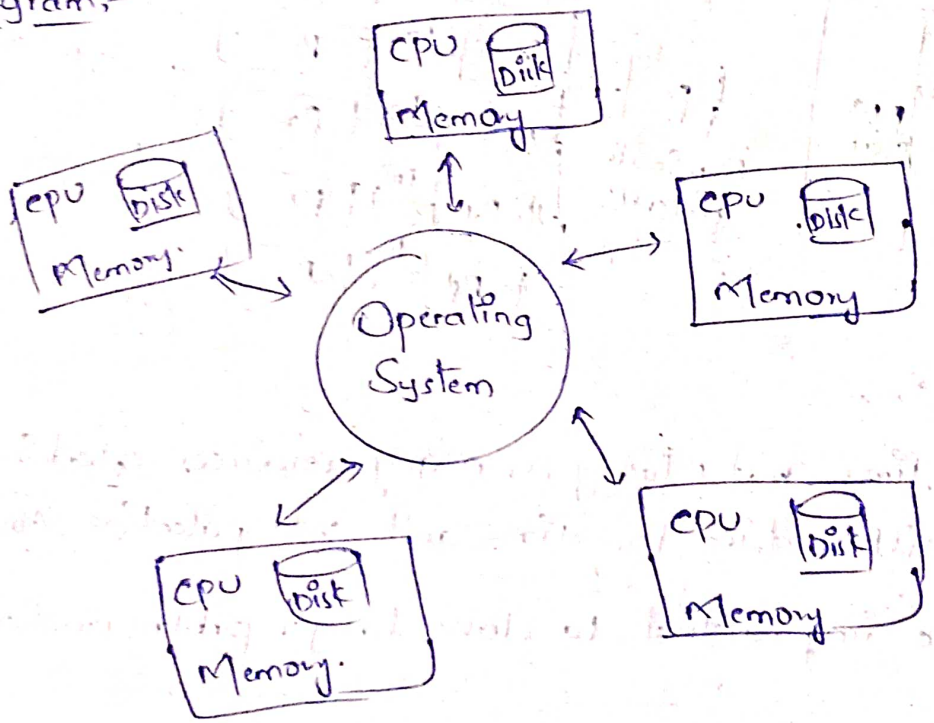
→ Various autonomous interconnected Computer Communicate with each other using a shared Communication network.

→ Independent System possess their own memory unit and CPU. They are referred to as loosely Coupled Systems.

→ They are differ in Size and function.

→ The Major benifit of working these type of the Operating System is, that it is always possible that one user can access the files or Software which are not actually present on his System but Some other Systems Connected within this network.

Diagram:



Advantages:

1) Failure of one will not effect the other network Communica as all Systems are independent from each other.

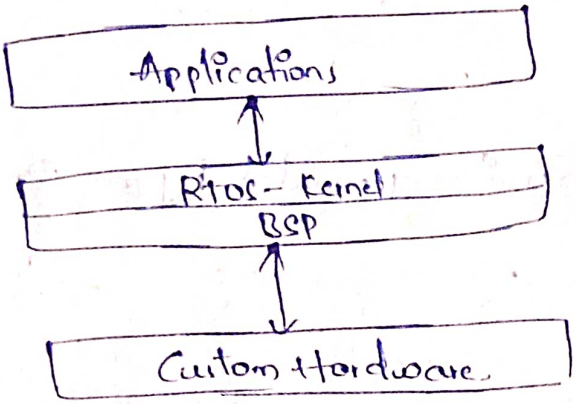
2) Electronic mail accelerate the data exchange speed.

3) load on host Computer reduces.

4) These Systems are easily Scalable as many Systems can be easily added to the network.

5) Delay in data Processing reduces.

4) Real Time Operating System:-



→ It is developed for real-time applications where data should be prossed in a fixed, small duration of time. It is used in an environment where multiple proccess are suppord to be accepted and processed in a short time.

→ It is divided into two types baced on time Constraints:-

i) Hard Real-Time System:-

→ These are use for applications where timing is critical reponse time is a major factor, even a delay of a fraction of second can result in a disaster.

Eg:- air bags, automatic parachuts etc.-

ii) Soft Real-Time Systems:-

→ These are used for application where timing or response time is less critical. Here, the failure to meet the deadline may result in a degraded performance instead of a dicaster.

Eg:- CCTV, Video player etc.

Advantages:-

1) The output is more and quick owing to the maximum utilization of devices and System.

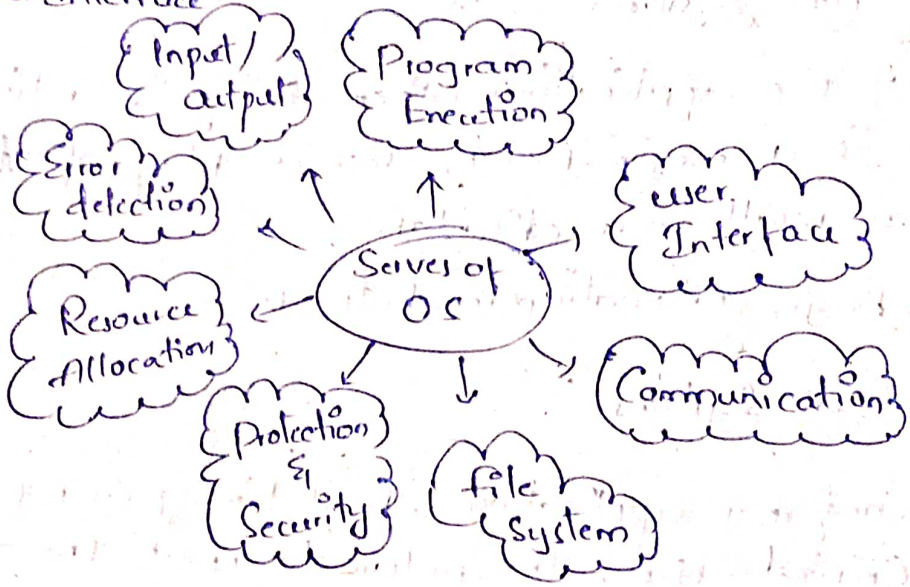
2) Task shifting is very quick, e.g 3 micro seconds, due to which it seems that several tasks are executed simultaneously.

14/02/22
Thursday

Operating System Services:-

following are the Common Services provided by an Operating System:-

1) Program Execution
2) I/O Operations
3) File System Manipulation
4) Communication
5) Error detection
6) Resource allocation
7) Protection
8) User Interface



(1) Program Execution:-

→ An Operating System must be able to load many kinds of activites into the Memory and to run it. The program must be able to end its execution, either normally or abnormally.

→ A process includes the Complete Execution of the Written program or code.

→ Some Activites performed by Operating System:-

a) The OS loads program into Memory

b) It also executes the program.

c) It provides a Machanism for process Synchronisation.

d) It provides a Machanism for process Communication.

② I/O Operations:-

→ The Communication blw the user and devices drivers are Managed by the OS.

→ I/O devices are required for running process. In I/O a file or an I/O devices can be involved.

→ I/O Operations are the read or write Operations which are done with the help of I/O devices.

→ OS gives the access to the I/O devices, when it required.

③ File System Manipulations:-

→ The Collection of related information which represent some content is known as a file. The Computer can store files on the secondary storage devices. for long-term storage Purpose.

Ex:- Magnetic tape, Magnetic disk, Optical disk, drives like CD, DVD.

→ A file System is a collection of directories for easy under stand and usage. The directories Contains some files. The Major activites performed by OS. with respect to the file Managment.

* The ole gives an access to the program for performing an Operation on the file.
* Programs need to read and write a file.
* The user can Create/delete a file by using an interface by the OLS.
* The Ole provides an interface to the user Creates/delete directories.
* The Backup of file System can be Created by using an interface provided by ole.

(4) Communication :-

In the Computer System, there is a Collection of processors which does not share any Memory peripherals devices or a clock, the Operating System Manages Communication between all the processors. Multiple process can Communicate with every process through Communication lines in the network.

→ The Major activites :-

a) Two processes may require data to be transfered blw the process.

b) Both the processes can be one Computer or a different Computer, but are Connected through a Computer network.

(5) Error Handling :-

An Error is one part of the System that may Cause Malfunctioning of the Complete System. The Operating System Constanly monitors the System for detecting errors to avoid Some Situations.

The error can occure anywhere and anytime. The error may occur anywhere in the Computer System like CPU, i/o devices or in Memory hardware.

Some activites like:-

* the OS continously checks for the possible errors
* the OS takes an appropriate action to correct errors and Consistent Computing.

6) Resource Managment :-

when there are Multiple users or multiple jobs running at the same time resources must be allocated to each of them. There are some major activites that are perfomed by an Operating System.

a) The OS Manages all kinds of resources using Schedulars

b) CPU Scheduling alogrithms is used for better utilization of CPU.

10/03/23
Friday

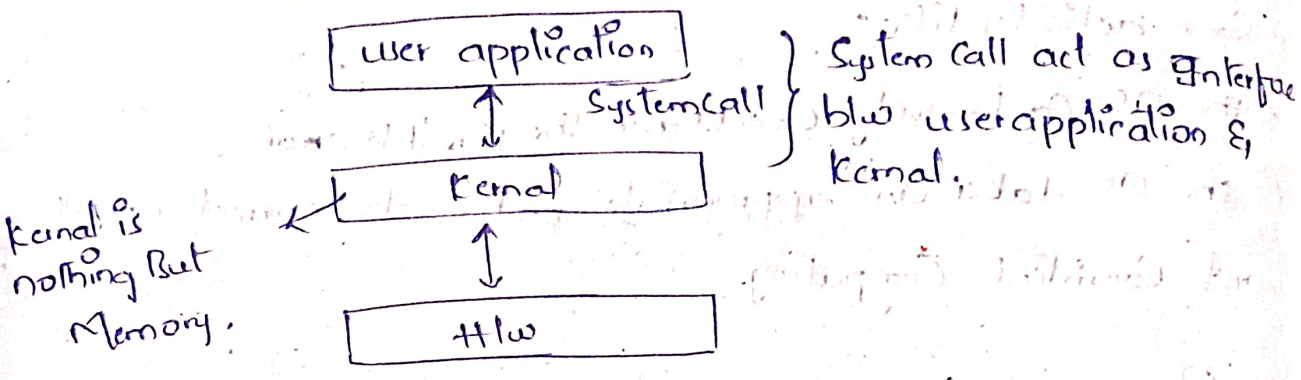
* System Calls:-

→ The System call act as an interface between the Software applications and kernal.

→ The System Call provides the Services of Operating System to the Proces via API (Application proces Interface)

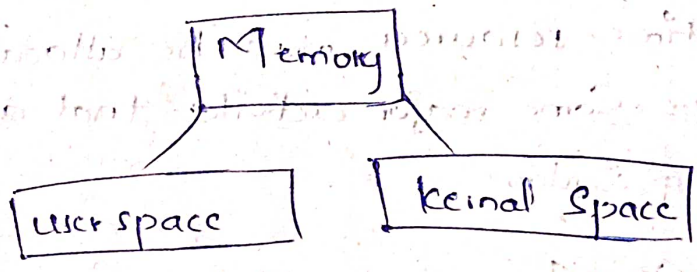
→ When we executing proces of program if it is require any resources the proces provide of the System call Provides the resources.

* When the proccu is to be execute if it requires any resources the proccu will create a System Call which is nothing but Entrupts and Call to kernel.



→ Memory is divided into two types:-

1) User Space
2) Kernal Space



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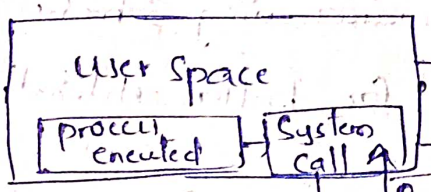
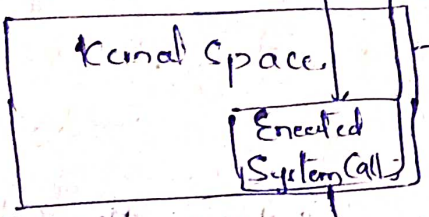


→ Creating the proccu in User Space.

→ All the Systems Call are created

Reporting to return to user

the User Space.

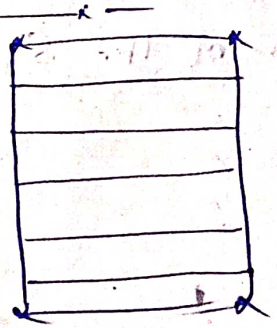


→ All the System Call are executed in the kernal space.

→ all the System executed

→ The System Calls are the only the Entry points to kernal Space. no other applications Enter into the kernal Space.

* System Calls Table:-



→ All System Call data stores in table based on the priority of the jobs.

* Different types of System Call :-

1) Process Control System Call :-

The System Call responsible for process Managment. like Creating the process and terminating the process.

2) File Managment System Call :-

This System Call responsible for file Managment like file Creating, reading the data from the file, writing, and deleting.

3) Device Managment :-

This System Call responsible for device Manipulation like writing the data into the (Buffer) tempory storage, and reading the data from the buffer.

4) Information Maintance :-

This System Call is responsible for Information being shared blw the process and Operating System.

5) Communication :-

This is responsible for exchanging the data among the System through IPC. (Inter Process Communication).

* Diff Systems Contains Diff Process :

Windows	Linux
1) Creating the System Call using {Create process()}	1) Creating System Call using {fork()}
2) terminate the System Call using {exit process()}	2) terminate System Call using {exit()}

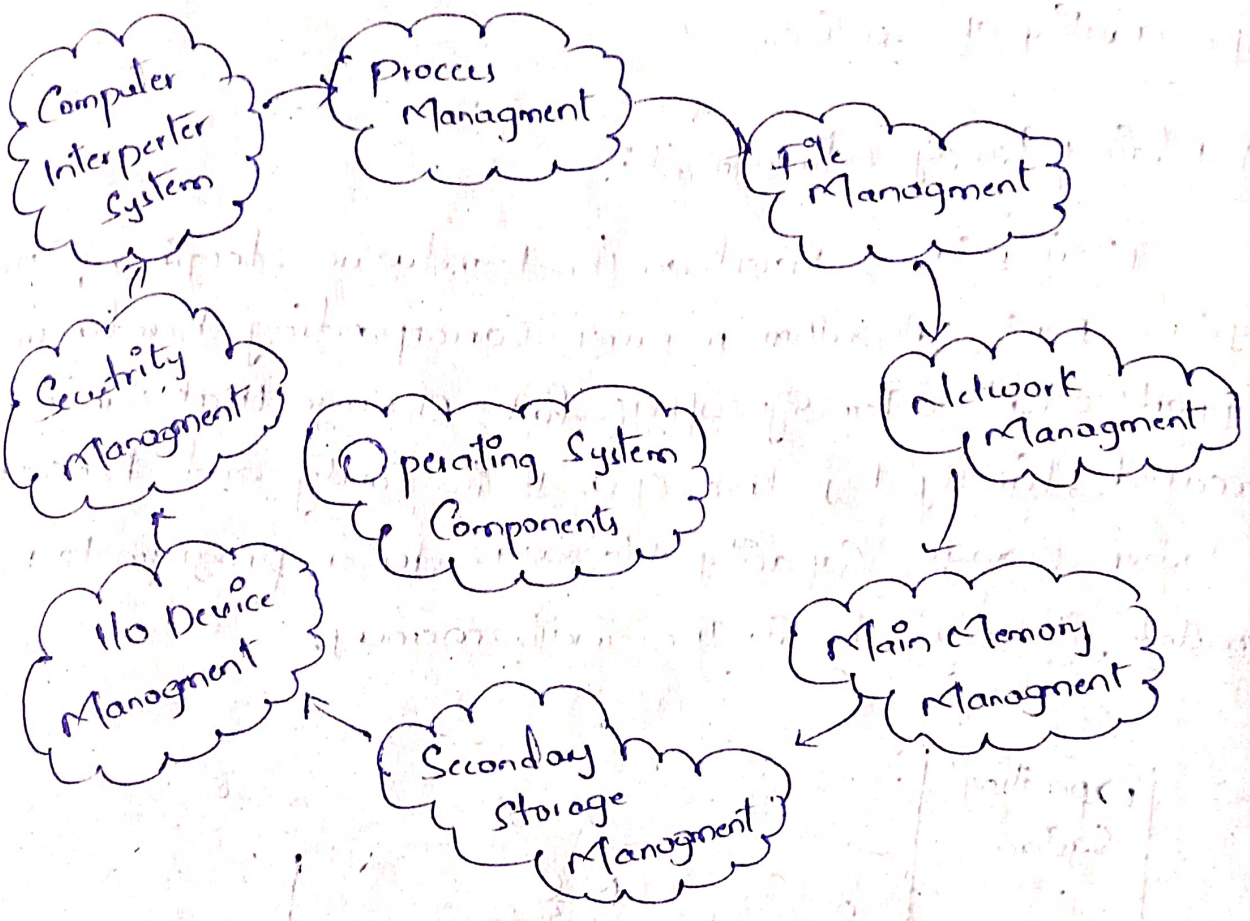
3) Read file ( ) Write file ( )	3) Read ( ) write ( ) open ( )
4) Read Console ( ) Write Console ( ) get Current proccuid ( ) Sleep ( )	4) read ( ) write ( ) getpid ( ) sleep ( )
5) Create pipe ( )	5) pipe ( ).

* System Components of Operating System :-

The Components of an Operating System play a key role to make a Variety of Computer System parts work together. There are following Components of Operating System such as.

1) Process Managment
2) File Mangment
3) Network Magment
4) Main Memory Managment
5) I/O Devices Managment.

Diagram :-



1) Proccss Managment :-

The proccss Managment Components is a procedure for Managing Many proccss running simultaneously Operating System. Every running Software application program has one or more proccsses associated with them.

2) File Managment :-

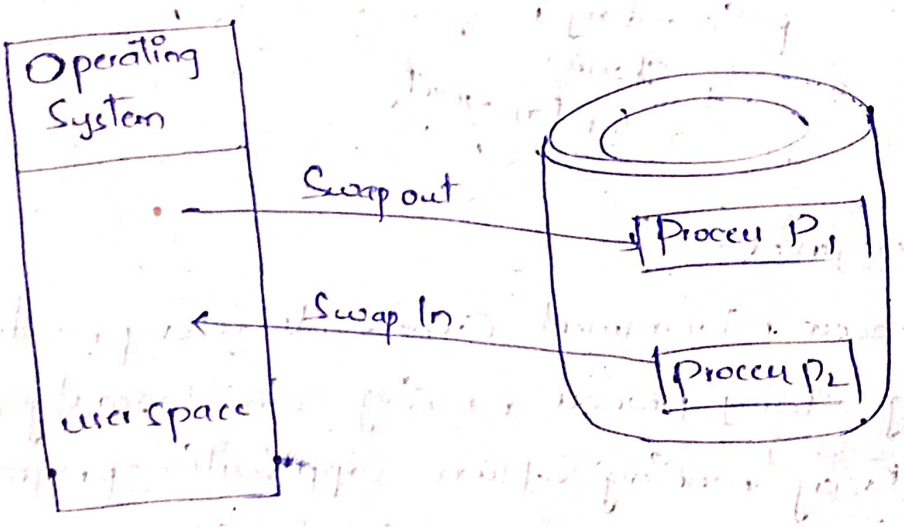
* File and directory Creation and deletion.
* For Manuplating files and directries.
* Mapping files onto secondary storage.
* Backup files on stable storage Media.

3) Network Mugment :-

Network Management is the process of administering and Managing Computer network. It includes performance Management, provising of networks, fault analysis, and maintaining the quality of Service.

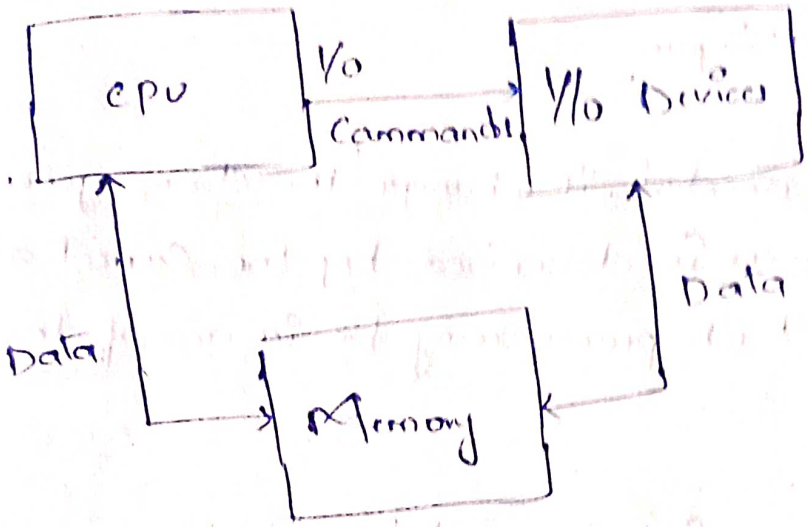
4) Main Memory Management :-

It is Mainly Baired on the hardware design of the System. Each algorithm requires Corresponding, hardware Support. Main Memory offers fast storage that can be accured directly by the CPU. It is Costly and hence has a lower storage Capacity. However, for a program to be executed, it must be in the main memory.



5) I/O Device Management :-

One of the important use of an Operating System that helps to hide the variations of specific hardware devices from the user. It provides general device code it provides drivers for particular hardware devices.



2nd part of 1st unit:

Process Concepts:

A process is a program at time of execution.

Difference between Process and program?

Process	program.
1) process is a dynamic object.	1) Program is a static object
2) Process is sequence of execution.	2) program is a sequence of Instruction.
3) Process loaded into Main Memory	3) Program loaded into Secondary Storage devices
4) Time Span of the process is limited	4) Time Span of program is unlimited
5) process is a active Entity	5) program is a passive entity.

Imp :-

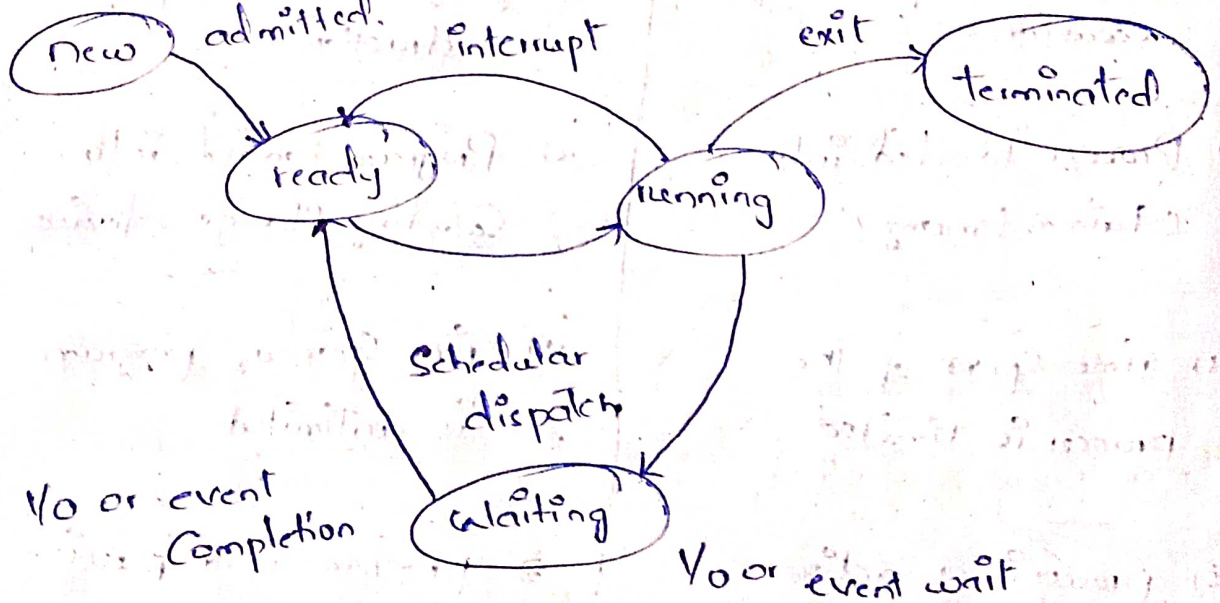
* Process State Diagram

When a process created, it changes the state, generally the state of process is determined by the current activity of the process. Each process may be in one of the following states:

1. New : The process is being Created
2. Running : The process is being executed
3. Waiting : The process is waiting for some event to occur
4. Ready : The process is waiting to be assigned to a processor
5. Terminated : The process is finished Execution.

→ One One process can be running in any processor at any time, But many process may be in ready and waiting states. The ready process are loaded into a "ready queue".

Diagram of Process State :-



a) New → Ready :- OS Creates and prepares the process to be executed, then OS moved the process into ready queue.

b) Ready → Running :- OS selects one of the Jobs from ready Queue and move them form 'ready to running.

c) Running → Terminated :- When the Execution of a process has Completed, OS terminates that process from running state. Sometimes OS terminate the process for some other reasons including time executed, memory unavaliable, access Violation, protection Error, I/O failure and Soon.

d) Running → Ready :- When the time slot of the processor expired (or) If the processor need an event occur (or) on I/O Device, the OS shifed Running → Ready state.

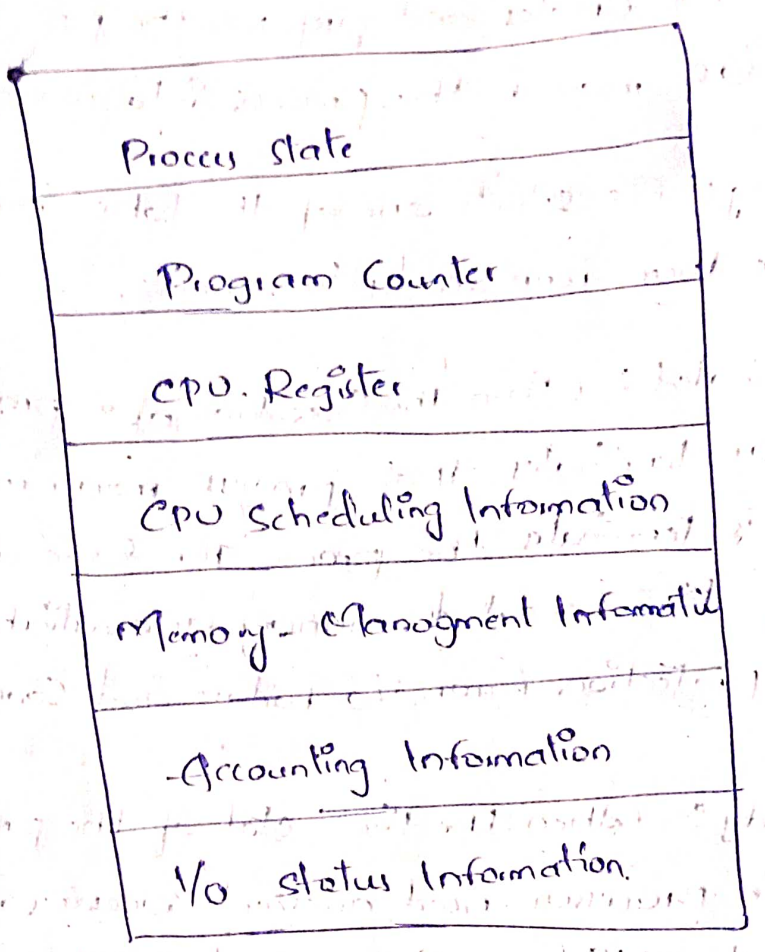
e) Running → Waiting :- A process is put into the waiting state, if the process need an event occur (or) on I/O Device require

f) Waiting → Ready :- A process in the waiting state is moved to ready state when the event for which it has been Completed.

* Process Control Block :-

Each process is represented in the Operating System by a process Control Block.

It is also Called task Control Block. It Contains many pieces of information associated with a specific process.



* Process Control Block :-

1) Process state :- The state may be, new, ready, running and waiting, terminated ...

2) Program Counter :- indicates the Address of the next Instruction to be executed.

3) CPU registers :- registers include accumulators, stack pointers, General purpose Register...

4) CPU - Scheduling Info :- Includes a process pointers, pointer to scheduling Queues, other scheduling parameters etc.

5) Memory Mangment Info :- Include page tables, Segmental tables, Value of base and limit registers.

6) Accounting Information :-

Includes amount of CPU used, time limits, Jobs (or) process numbers

4) I/O status Information:- Includes the list of I/O Devices Allocated to the processes, list of Open files.

16/03/24
Saturday

* Co-Operating Process:-

There two types of Co-Operation Processes:-

1) Independent proces (Co-operation proces)
2) Dedepen dent proces

1) In Dedependent Proces:-

A proces is Independent if cannot effect (or) Beeffected By the other proces executing in the System.

→ Clearly any proces that docinot share any data with any other proceses is Independent

* Dedepent proces (Co-oiprating proces):-

A proces is Co-operating if it can effect or Beeffected by the other proces executing in the System is called as Co-operating System.

→ Co-operating proces always share the data.

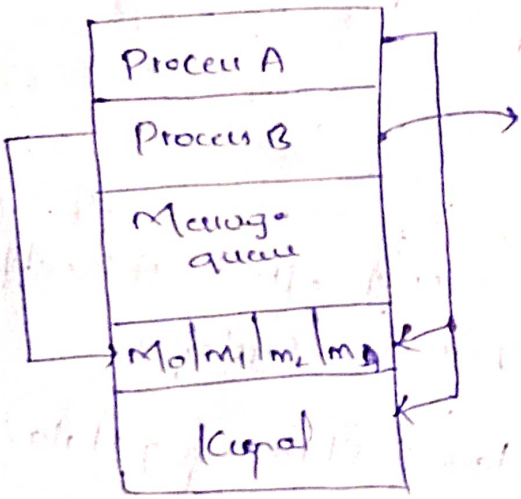
Ex:- producer, Consumerproblem.

→ A producer proces produce the Information that is Consumed by a Consumer proces.

Producer	Consumer
Compiler	Assembler
Assembler	loader
Server	client.

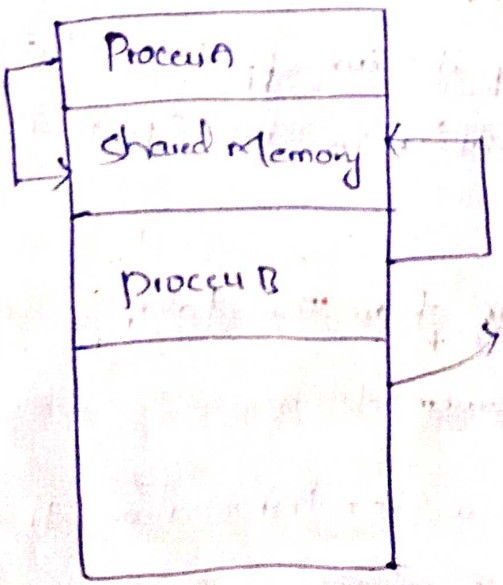
* Co-operating Process is a IPC Model (Inter process Communicati
It Contains two types of Memories

1) Message Passing System.



→ It is useful for executing Smaller amount of Data

2) Shared Memory System :-



→ Maximum Speed and Convience factor (or) executing large amount of data

* Process Scheduling:-

CPU is always busy in Multiprogramming. Because CPU switches from one job to another job. But in simple Computer CPU is sit idle until the I/O request granted. Scheduling is a important OS-function. All resources are scheduled before use. (cpu, Memory, devices...)

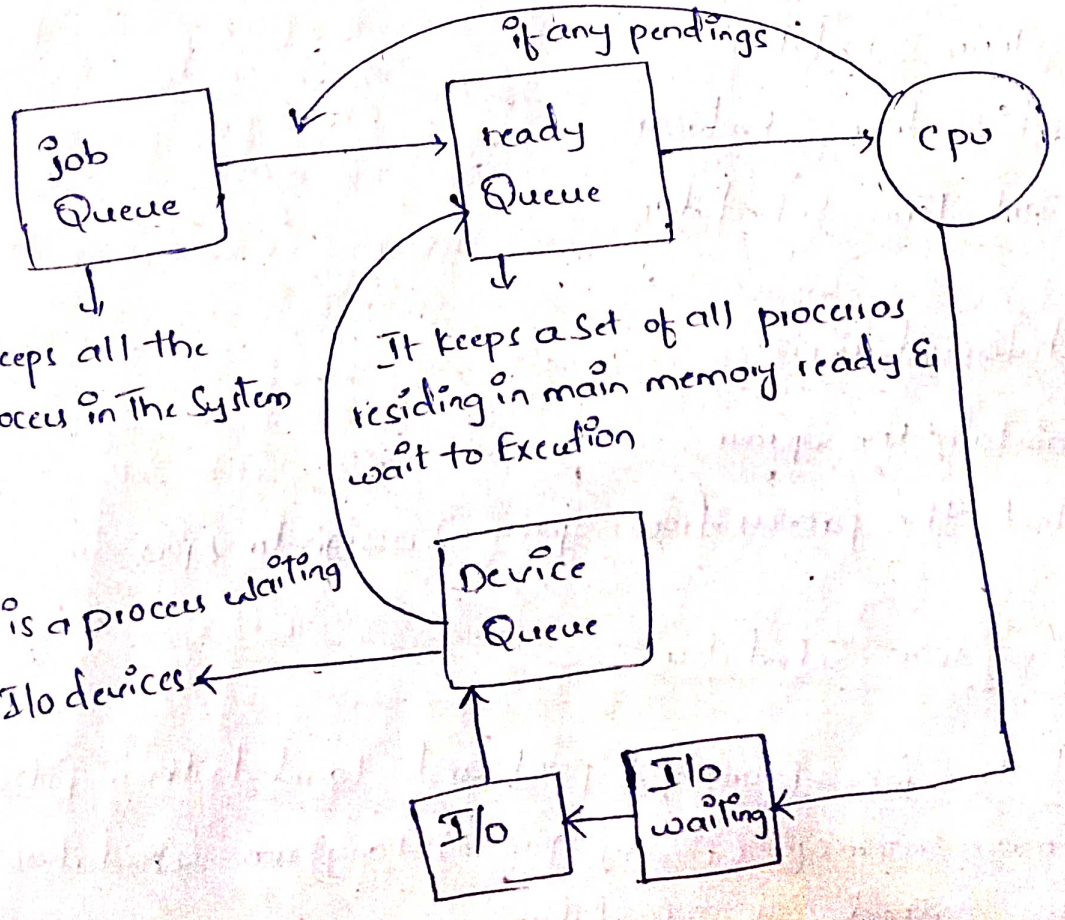
* Process Scheduling is an essential part of a Multiprogramming Operating system.

* Such Operation allows more than one process to be loded into the executable Memory at a time and the loaded process shares the CPU using Multiplexing.

* Scheduling Queues:-

Peoples live in rooms. Process are present in rooms known as queue. There are three types.

1) Job Queue 2) Ready Queue 3) device Queue.



1) Job Queue:- When process Enter the system, they are put into a job queue, which consists all process in the system. Processes in the job queue reside on mass storage and await the allocation of main memory.

2) Ready Queue:- If a process is present in Main Memory and is ready to be allocated to cpu for execution, is kept in ready queue.

3) Device Queue:- If a Process is present in waiting state (or) waiting for an i/o event to complete is said to being devic Queue.

(or)

The process waiting for a particular I/o devices is called device queue.

* Schedulars:-

There are 3 Schedulars

1) long term Schedular
2) Medium term Schedular
3) short term Schedular.

Schedular duties:-

* Maintain the queue
* Select the process from queues assign to CPU

* 1) Long term Schedular:-

Select the jobs from job pool and loaded their jobs into main memory (ready queue). long term Schedular is also called job Schedular.

2) Short term Schedular:-

Select the process from ready queue, and allocates into the cpu. If a process requires an I/o device, which is not present avaliable then process enter devicequeue. Short term Schedular Maintains ready queue. device queue. Also called as cpu Schedular.

3) Medium term Schedular:-

If Process request an I/o device in the middle of the execution, then the process removed from the main memory and located into the waiting queue. When the I/o Operate Completed, then the job moved for waiting queue to ready queue. There two Operations performed by medium term Schedular.

* Operation On Processes:-

* Process Creation Means the Construction of Process. The processes is most Systems Can execute Concurrently and they may be Created and deleted dynamically. There Systems must Provides a Machanism for process Creation and Teminations:-

There are two Operations:-

1) Process Creations:-

process Creation Creation Means Construction of Process of execution. This might be performed by the System, the user, or the old process itself. There are Several events that lead the process Creations.

* Some Such Events are the following:-

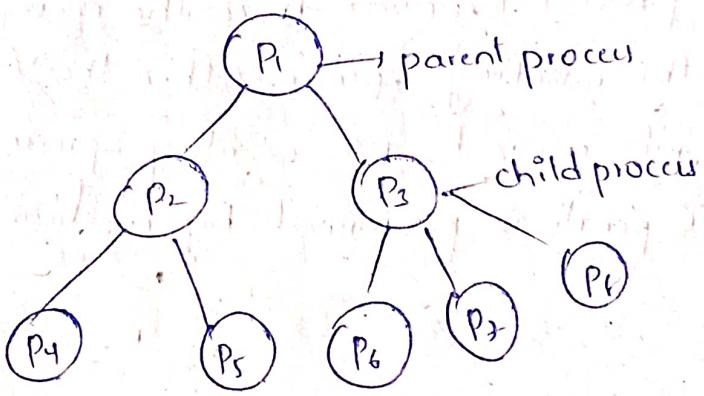
1) Late start the Computer, The System Creates Several Background process.

2) A user may request to Create a new process

3) A process can Create a new process itself while executing.

4) The Batch System takes initation of a batch job.

Process Creation Diagram:-



Another definition:-

Parent Processes can Create Several child processes and child process can Create their own child processes.

→ Resource Sharing:- whenever parent process is Create the child process

1) Parent Process can share all resources with child process
2) PP can share some of resources with CP
3) PP can never share any resources with CP.

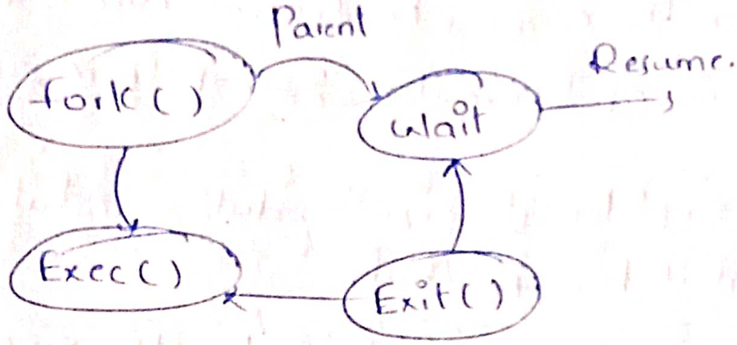
→ Execution:-

1) PP and CP Execute Concurrently
2) PP is to wait until the child process Execution.

* Process Creation in Unix Os:-

1) fork ( ) System Call Creates new process

2) Exec ( ) System Call replace the new Created process with a new program.



Program:-

```
main ( )
{
 int pid
  pid = fork ( );
  if (pid<0)
  {
   printf ("fork ( ) failure");
  }
  else
   if (pid=0) → Child process
  {
    execid ("/bin ls", "ls", null);
  }
  {
    wait ( null);
    printf (" child Complete");
  }
}
```

↑ list (above "ls")

↓ bin directory

↓ Once child process is executed is Said to be null;

2) Process Termination:-

Process termination is the activity of ending process. In other words, process termination is the relxation of Computer resources taken by the process for the execution. like Creation in termination also there may be several events that may lead to the process of termination. Some of them are:-

1) The process Completes its execution fully and it indicates to the OS that it has finished.
2) The Operating System itself terminates the process due to Service errors
3) There are may be a problem in hardware that terminates the process
4) One process can be terminated by another process.

Threads:-

A process is divided into number of light weight process. each light weight process is said to be a Thread. The Threads has a program Counter(keeps track of which instruction to execution next), register (holds its Current working Variables, Stack (execution History).

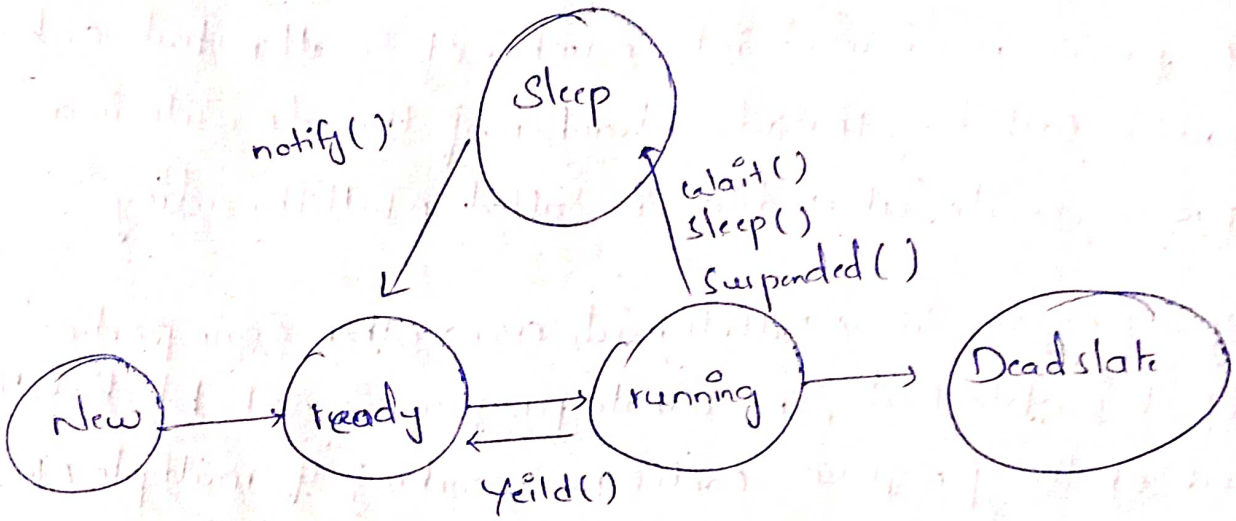
Thread States:-

1. Born state : A thread is just Created
2. ready state : The thread is waiting for CPU
3. running : System assign the processor of the thread
4. Sleep : A sleeping thread becomes ready after the derginated sleep times expires

6. dead: The Execution of Thread finished.

Ex:- Word processor, Typing, formatting, Spell check, Saving are Threads.

Diagram:-



* Difference blw Proces and Thread:-

Proces	Thread.
1) Proces takes more time to Create	1) Thread takes less time to Create
2) It takes more time to Complete execution & terminate.	2) less time to Terminate
3) Execution is Very Slow	2) Execution is Very fast
4) It takes more time to switch blw two proceues	4) It takes less time to switch blw two threads
5) Communication blw two proces is difficult.	5) Communication blw two threads is easy
6) System Calls are requested to Communicate each other	6) System Call are not required.

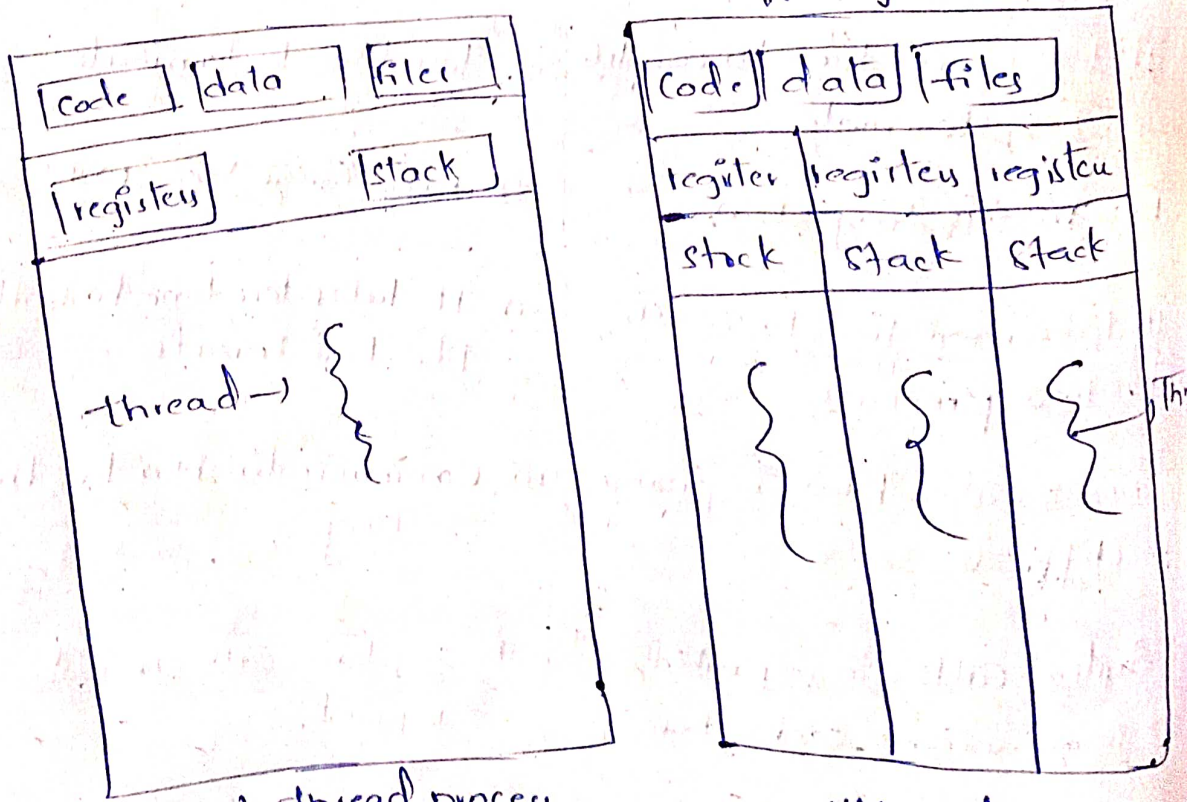
7) Process is loosely coupled	7) process is tightly coupled
8) It requires more resources to execute	8) Requires few resources to execute

* Multithreading:

A process is divided into number of smaller task each task is called a thread. Number of threads with in a process execute at a time is called Multithreading.

If a program is Multithreaded even when some portion of it is blocked, the whole program is not blocked. The rest of the program continues working If multiple CPU's are available. Multithreading gives best performance. If we have only a single thread, number of CPU's avaliable no performed benifits achived.

process Creation is heavy-weight thread Creation is light weight Can Simplify Code, Increase Efficency.



Single-thread process multithread process

—End—