Module 1

-> Functions & Operating Systems :-

-> Design Approaches : Layered, Kernel based and virtual machine approach.

- Type of Advanced Operating Systems :-
  - NOS
  - DOS
  - Multiprocessor OS
  - Mobile OS,
  - RTOS,
  - cloud OS.

Advanced concepts in Operating system

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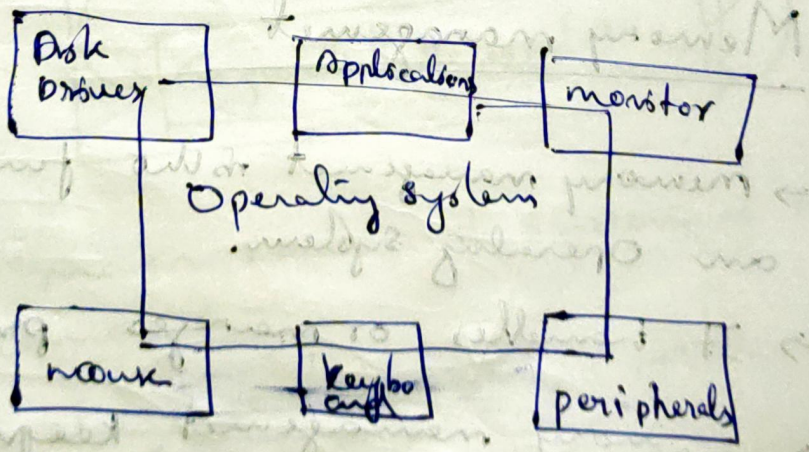
1) what is Operating System?

-> An OS is a set of programs that manage computer hardware resources and provide common services for application software.

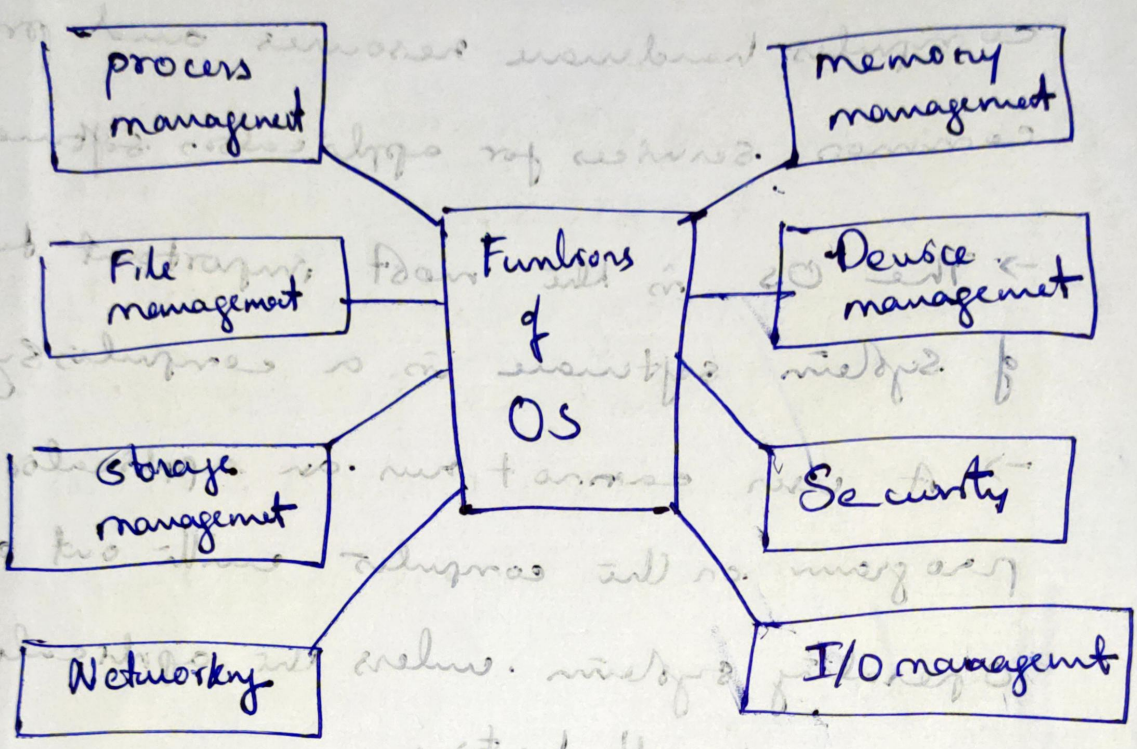
-> The OS is the most important type of system software in a computer system.

-> A user cannot run an application program on the computer without an operating system unless the application program is self booting.



eg:- windows, mac OS, Linux, Android

2) Explain detail about Functions of Operating System ?



Memory management

→ memory management is the functionality of an operating system.

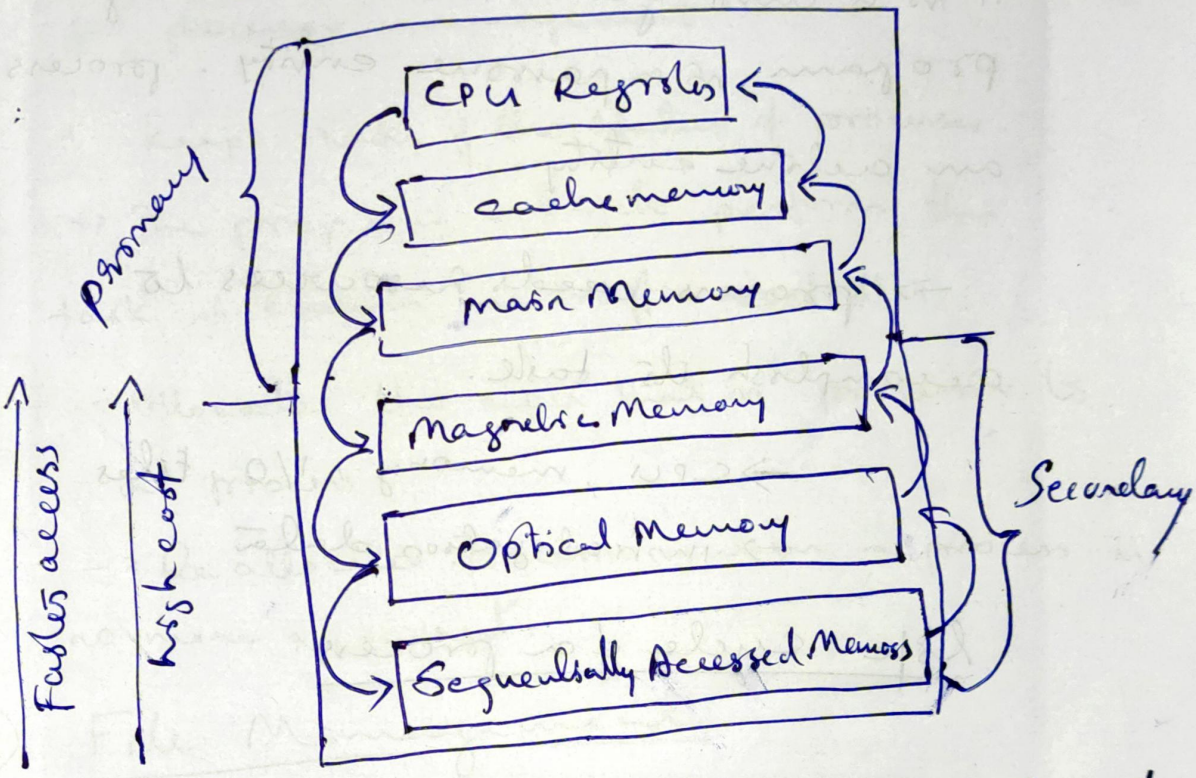
→ It handles or manages primary memory

→ memory management keeps tracks of each and every memory location either it is allocated to some process or

it is free.

→ It checks how much memory is to be allocated to processes. It decides which process will get memory at what time

→ the figure shows memory hierarchy



→ The main concern of system is RAM/ main memory

→ The cache memory is important because it boost's the speed of accessing memory but it is managed by the hardware

→ The rotating magnetic memory or

hard disk is used by the virtual memory management.

2) Process Management

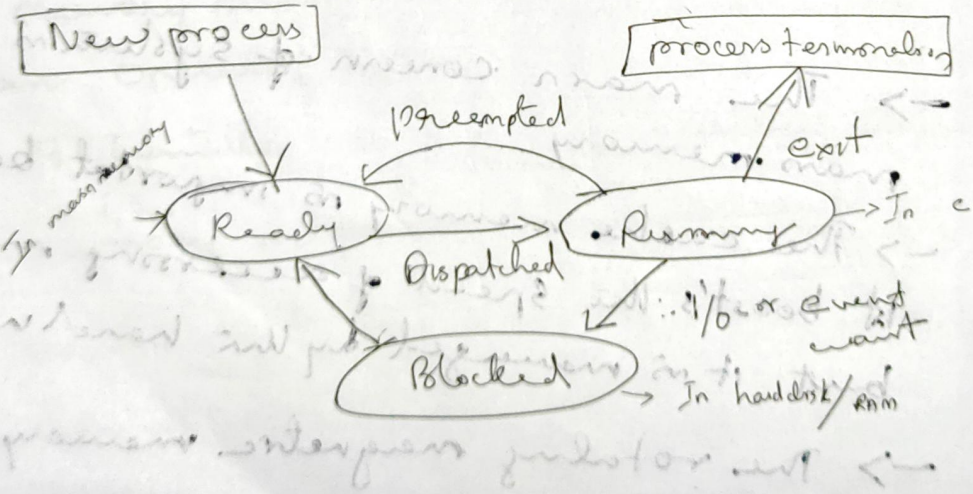
A process is a program in execution it is a unit of work within the system program is a passive entity. process is an active entity.

→ process needs resources to accomplish its task.

→ CPU, memory, I/O, files

→ initialization data

~~life cycle of a process~~



-> In a multiprogramming environment, the OS decides the order in which process have access to the processor, and how much processing time each process has.

-> This function of OS is called process scheduling

-> An OS performs the following activities for processor management

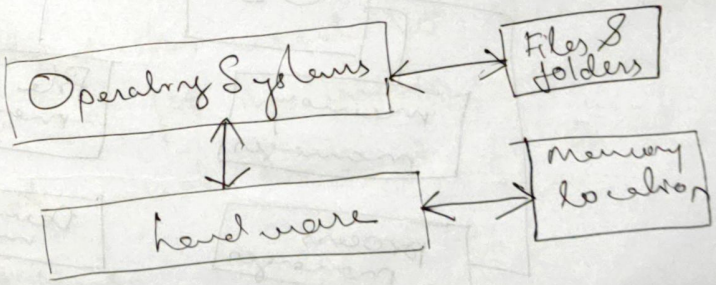
- Keeps tracks of the status of processes.

-> The program which perform this task is known as traffic controller.

- Allocates the cpu that is processor to a process.

-> Deallocates processor when a process is no more required.

3) File Management



→ The file manager (or File management) is the manager in the Operating System that creates the illusion that there are files and folders being stored in computer memory.

→ The file management keeps tracks of where files are stored.

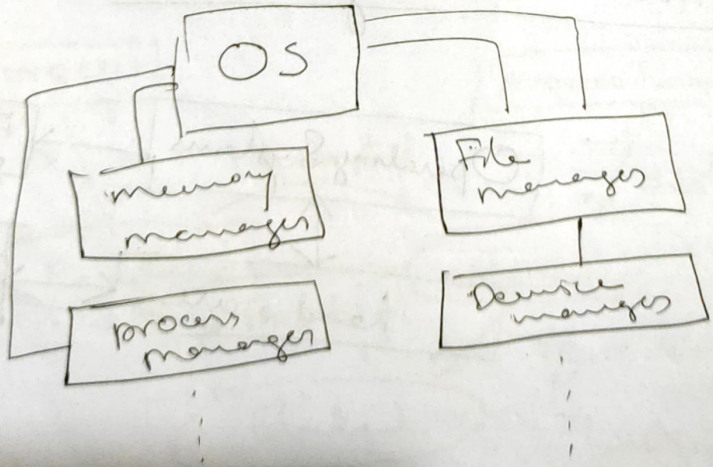
→ Determines how the files allocation policies.

→ Uses available storage space efficiently for files.

→ Allocates a file to a user if is free, and if they are permitted access to it.

→ De-allocates file when user finished with it

4) Device Management



→ Device management is the part of the Operating system that's responsible for directly manipulating the hardware devices

→ such as the computer, activating and controlling the peripheral devices. For

→ In a desktop computer, the operating system interacts with the device drivers for peripheral control.

→ keeps tracks of all devices connected to system

→ Allocates devices in an effective and efficient way.

→ De allocates devices when they are no longer required.

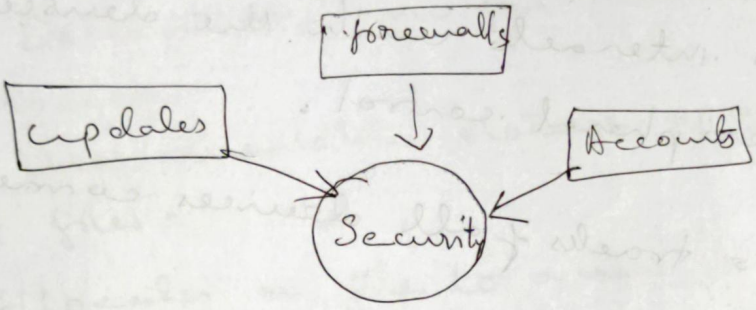
5) Storage management

→ usually disks used to store data that does not fit in main memory or data that must be kept for a long period of time

→ OS activities to Free-space management storage allocation, Disk scheduling.

→ storage management is a process that is used to optimize the use of storage devices.

(6) Security



→ The OS of a computer has a number of built-in tools to protect against security threats, including the use of virus scanning utilities and setting up a firewall to block suspicious network activity.

→ The operating system uses password protection to protect user data and similar other techniques.

→ It also prevents unauthorized access to programs and user data.

⑦ Networking

→ An Operating systems that manages network resources.. essentially an operating system that includes special functions for connecting computers and devices into a local area network (LAN)

Other Os Functions are

⑧ Job accounting

Operating System keeps track of time and resources used by various tasks and users, this information can be used to track resource usage for a particular user or group of user.

⑨ Error detecting aids

operating system constantly monitors the system to detect errors and avoid the malfunctioning of computer system.

Design Approaches

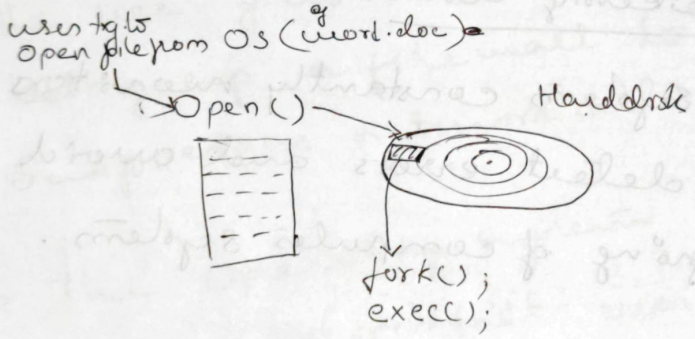
→ Operating System could designed as a huge collection of processes with out any structure.

→ any process could call any other process to request ~~from it~~ a service from it.

→ The execution of a user command involve the activation of a series of processes.

→ lack of a proper structure is extremely hard to specify, code, test and debug a large operating system.

→ design approaches ... intended to handle the complexities of large operating systems.



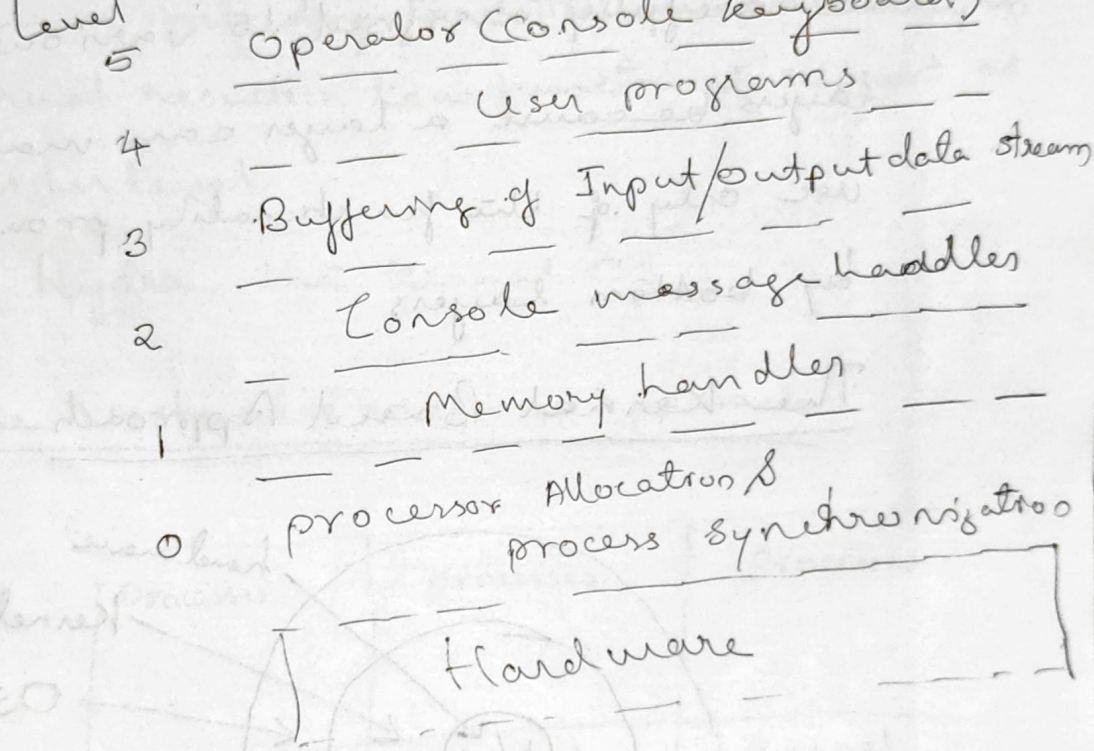
no: of system calls to Request a service.

Layered Approach

→ The layered approach divides the OS into several layers

→ Each layer has well-defined functionality and input-output info.

→ The bottom layer interfaces with machine hardware and the top layer interfaces with users.



The classical example of layered approach is THE multiprogramming OS with six layers another one is MULTICS.

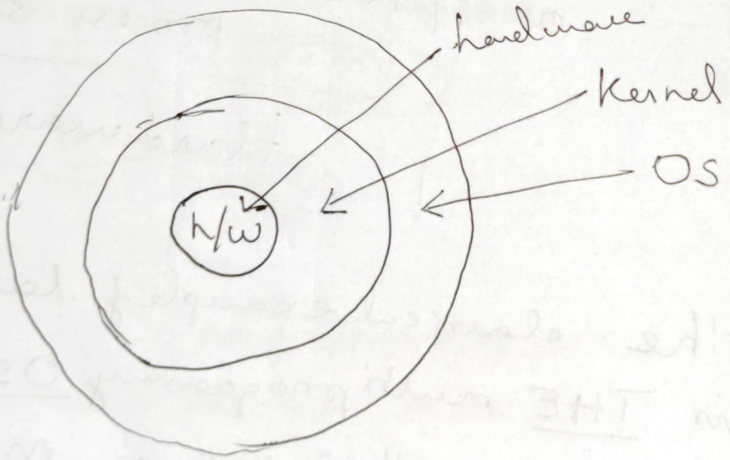
In modular design, the system is divided into several modules and each module is designed independently

So each module can be designed, coded, and tested independently.

Disadvantages of layered approach

Operating system functions must be carefully assigned to various layers because a layer can make use only of the functionality provided by bottom layers

The Kernel Based Approach



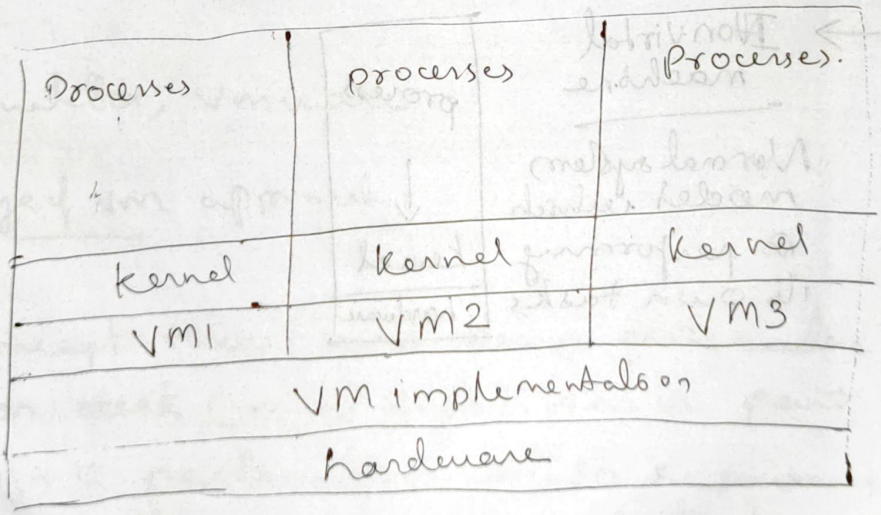
The kernel is a collection of primitive facilities over which the rest of the Operating system is built, using the function provided by the kernel.

A kernel should contain a minimal set of functionality that is adequate to build an OS with a given set of objectives.

→ Too much functionality in a kernel results in low flexibility at a higher level, whereas including too little functionality in a kernel results in low functional support at a higher level.

eg:- Hydra, the kernel OS.

3) The Virtual Machine Approach

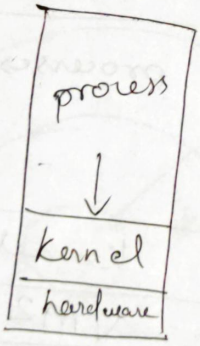


→ The fundamental idea behind a virtual machine is to abstract the hardware of a single computer (the CPU, memory, disk drives, network interface cards, and so forth) into several different execution environments, thereby creating the illusion that each separate execution environment is running its own private computer.

→ Virtual means that is not physically real. But ~~we~~ try to make it look like it is something physically real

→ Non virtual machine

Normal system model which is performing its own tasks



→ In virtual machine bare hardware which belongs to the physical machine

→ top of that there is a VM implementation,

→ In fig there is three VM_1, VM_2, VM_3 on the top of VM implementation and they are not the same.

→ for this individual VM's. they have their own kernal space.. or they have their own separate OS. installed on the top of VM's and they are running their own processes

→ In reality having only one physical h/w But on top of that by having the VM implementation, it able to have three different kind of execution spaces

→ eg: VirtualBox, vmware

Advantage of VM approach.

→ VM concept there will be a particular area on desk (mini disk), each part is assign to particular VM, so resources are completely isolated and protected from each others