

Operating System



Unit 5: Operating System

- Introduction to OS – its functional behavior and responsibilities, Need for some of monitor / command interpreter, Types of operating systems, System structure, Hierarchical and layered organization of OS, I/O methods and interrupt structure.
- Process definition, Process states and state transitions, Parallel processes and constructs, Process interaction, Operating system kernel, Data structures for processes and resources, Context switching, Process control primitives, Process scheduling.
- The determinacy problem, Mutual exclusion, Semaphores, Process synchronization,

Unit 5: Operating System

- Conditional critical regions and monitors, Inter-process communication, Deadlock problem and its solutions.
- Memory management concepts, Relocation, Linking, Multiprogramming with fixed partitions, Swapping, Variables partitions, Overlays, Virtual memory, Segmentation, Paging, Storage allocation strategies, Load control and thrashing



Unit 5: Operating System

- Organization of file and I/O subsystems, Directory management, Basic file system, file descriptors, File manipulation, File organization methods, Management of auxiliary storage space, Command language and file system utilities, I/O subsystems, Programmed I/O, DMA, Interrupt driven I/O, Recovery procedures. Protection and Security: Safeguards, Penetration, Access and Information flow control, Protection problems, Formal models of protection.





WHAT IS AN OPERATING SYSTEM?

An operating system is a program that acts as an interface between the computer user and computer hardware and controls the execution of programs.





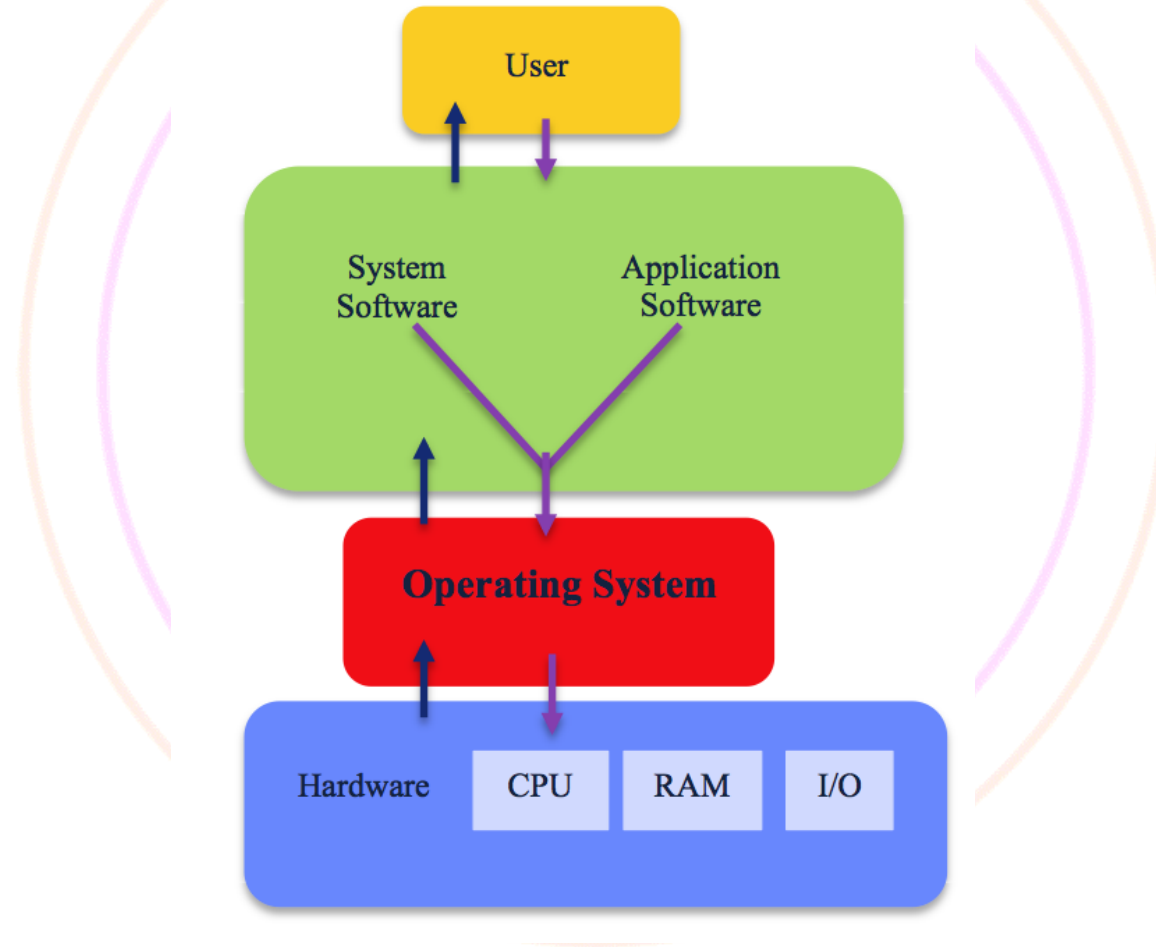
THE OPERATING SYSTEM'S JOB

- **The operating system (OS) manages all of the software and hardware on the computer. It performs basic tasks such as file, memory and process management, handling input and output, and controlling peripheral devices such as disk drives and printers.**
- **Most of the time, there are several different computer programs running at the same time, and they all need to access your computer's central processing unit (CPU), memory and storage. The operating system coordinates all of this to make sure each program gets what it needs.**





THE OPERATING SYSTEM'S JOB





TYPES OF OPERATING SYSTEMS

GUI

(Graphical user Interface)



CUI

(Graphical user Interface)





WHAT IS CUI?

- **CUI stands for Character User Interface.**
- **CUI is a way to interact with computer programs by issuing them commands as one or more lines of text.**
- **In CUI based systems, the user enters a command which a computer program can understand and then computer program processes the result and return the response.**





WHAT IS GUI?

- **GUI stands for Graphical User Interface.**
- **GUI is the most common type of user interface available today.**
- **It is a very user friendly because it makes use of pictures, graphics, and icons, hence why it is called 'graphical'.**
- **The GUI makes the navigation on the screen much easier by the use of pointing devices. Also, we can customize the appearance of the interface as we want. But, the downsides of the GUI are – it requires more memory space, slow speed, etc.**





WHAT IS GUI?

- **Windows** – A rectangular area on the screen where the commonly used applications run.
- **Icons** – A picture or symbol which is used to represent a software application or hardware device.
- **Menus** – A list of options from which the user can choose what they require.
- **Pointers** – A symbol such as an arrow which moves around the screen as user moves the mouse. It helps user to select objects



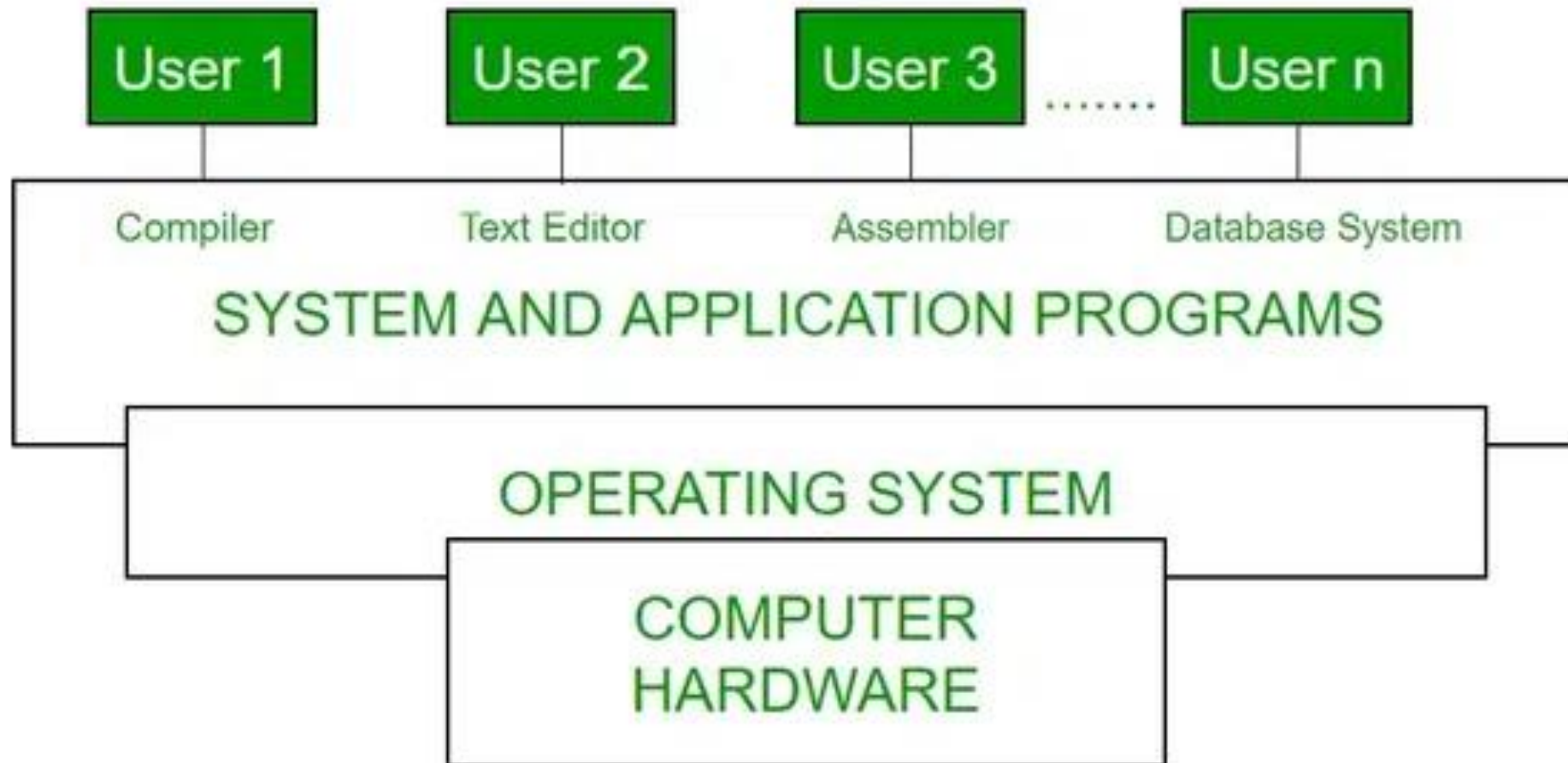


➤ **The process operating system as User Interface:**

- 1. User**
- 2. System and application programs**
- 3. Operating system**
- 4. Hardware**

➤ **Every general-purpose computer consists of hardware, an operating system(s), system programs, and application programs. The hardware consists of memory, CPU, ALU, I/O devices, peripheral devices, and storage devices. The system program consists of compilers, loaders, editors, OS, etc. The application program consists of business programs and database programs.**







TYPES OF OPERATING SYSTEMS

- **Batch Operating System**
- **Multi-Programming System**
- **Multi-Processing System**
- **Multi-Tasking Operating System**
- **Time-Sharing Operating System**
- **Distributed Operating System**
- **Network Operating System**
- **Real-Time Operating System**





BATCH OPERATING SYSTEM

- This type of operating system does not interact with the computer directly.
- There is an operator which takes similar jobs having the same requirement and groups them into batches. It is the responsibility of the operator to sort jobs with similar needs.





DISTRIBUTED OPERATING SYSTEM

- **Various autonomous interconnected computers communicate with each other using a shared communication network.**
- **Independent systems possess their own memory unit and CPU.**





NETWORK OPERATING SYSTEM

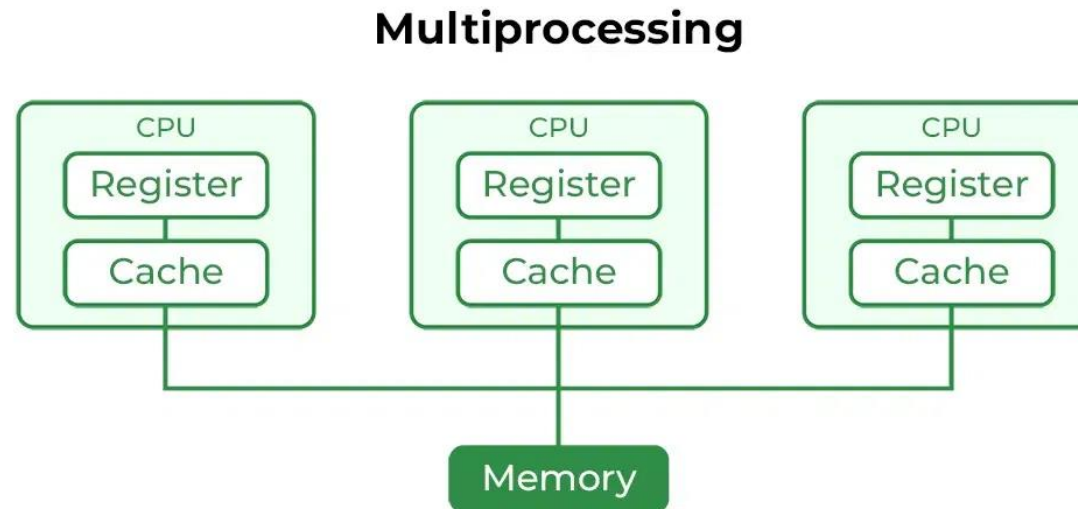
- **These systems run on a server and provide the capability to manage data, users, groups, security, applications, and other networking functions.**
- **These types of operating systems allow shared access to files, printers, security, applications, and other networking functions over a small private network.**





MULTI-PROCESSING OPERATING SYSTEM

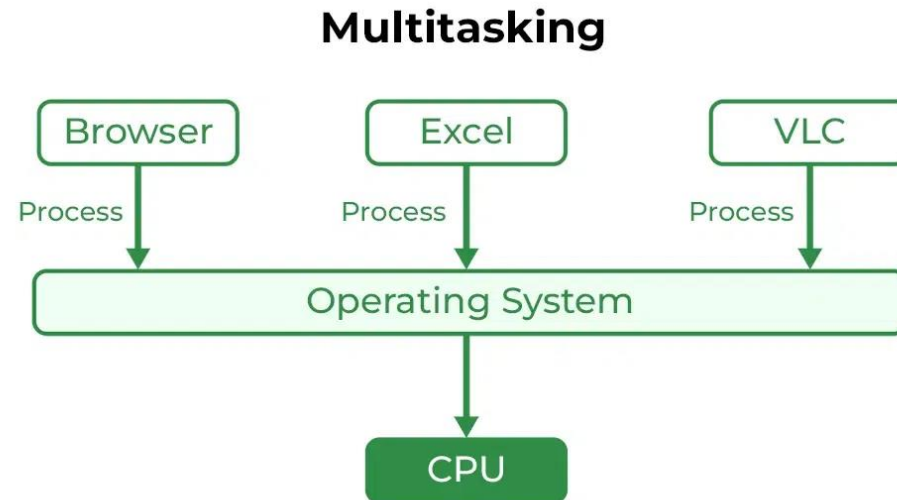
- **Multi-Processing Operating System** is a type of Operating System in which more than one CPU is used for the execution of resources.





MULTI-TASKING OPERATING SYSTEM

- Multitasking Operating System is simply a multiprogramming Operating System.
- It can run multiple programs simultaneously.





TIME-SHARING OPERATING SYSTEMS

- **Each task is given some time to execute so that all the tasks work smoothly.**
- **Each user gets the time of the CPU as they use a single system.**
- **These systems are also known as Multitasking Systems.**





REAL-TIME OPERATING SYSTEM

- **These types of OSs serve real-time systems.**
- **The time interval required to process and respond to inputs is very small.**
- **This time interval is called response time.**
- **Real-time systems are used when there are time requirements that are very strict like missile systems, air traffic control systems, robots, etc.**





CHARACTERISTICS OF OPERATING SYSTEM

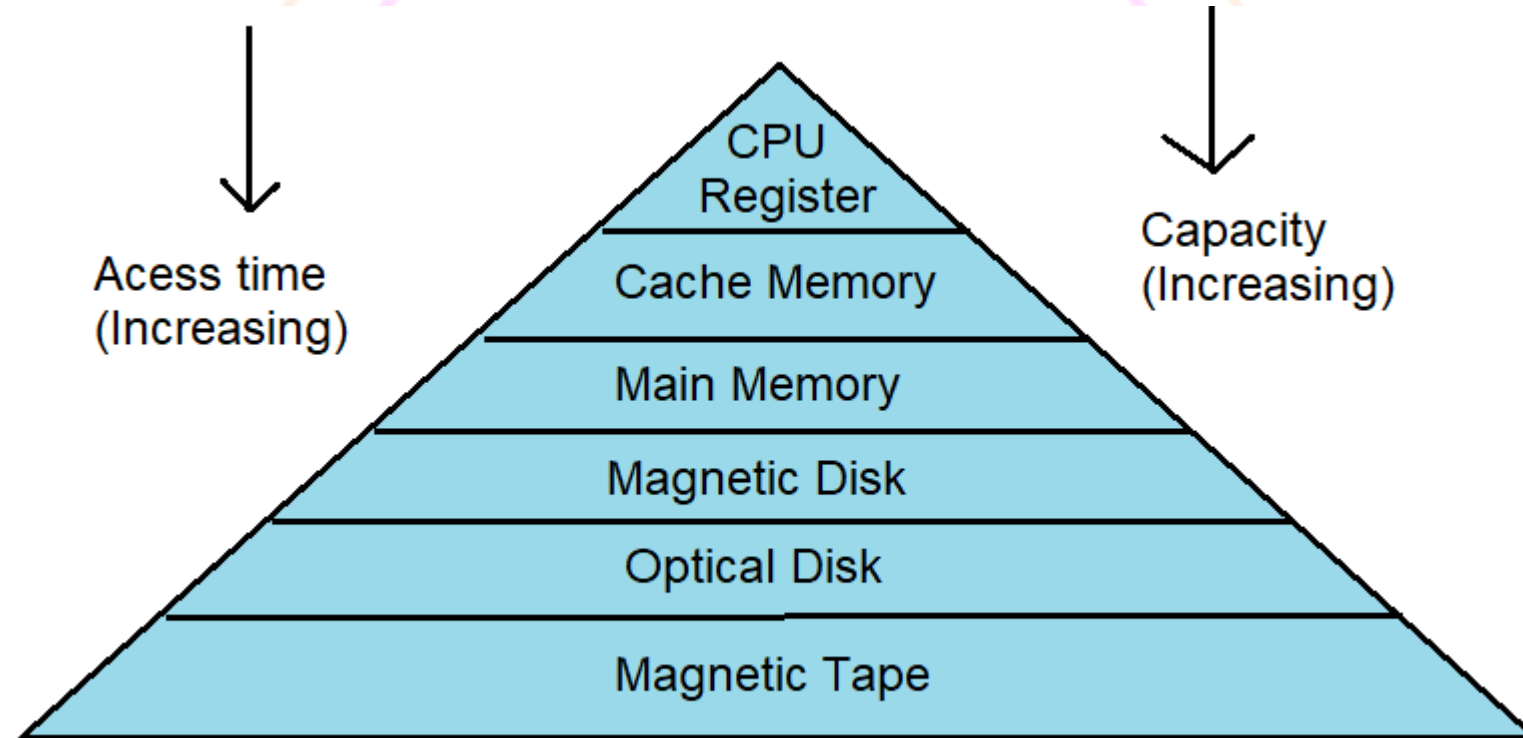
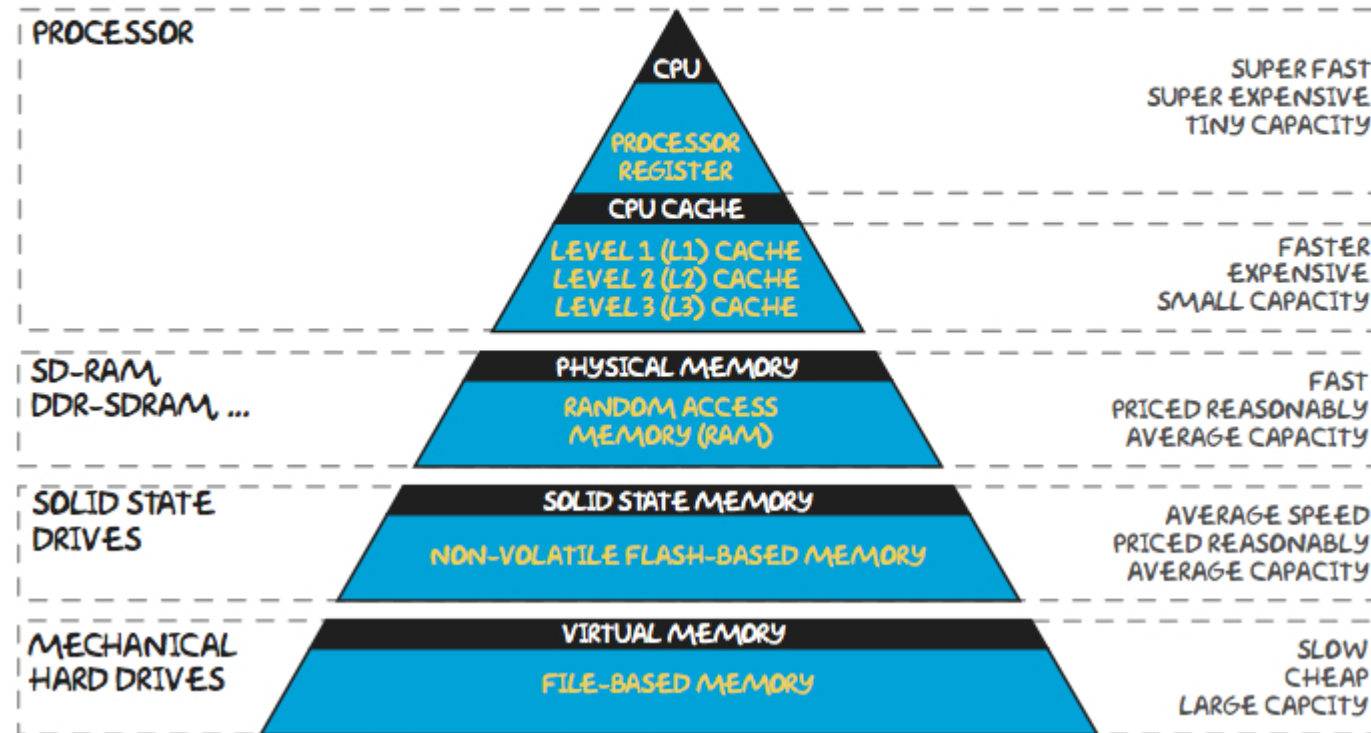


Fig:- Memory Hierarchy



CHARACTERISTICS OF OPERATING SYSTEM

THE MEMORY HIERARCHY





CHARACTERISTICS OF OPERATING SYSTEM

- Here is a list of some of the most prominent characteristic features of Operating Systems –
- **Memory Management** – Keeps track of the primary memory, i.e. what part of it is in use by whom, what part is not in use, etc. and allocates the memory when a process or program requests it.
- **Processor Management** – Allocates the processor (CPU) to a process and deallocates the processor when it is no longer required.





CHARACTERISTICS OF OPERATING SYSTEM

- **Device Management** – Keeps track of all the devices. This is also called I/O controller that decides which process gets the device, when, and for how much time.
- **File Management** – Allocates and de-allocates the resources and decides who gets the resources.
- **Security** – Prevents unauthorized access to programs and data by means of passwords and other similar techniques.





CHARACTERISTICS OF OPERATING SYSTEM

- **Job Accounting – Keeps track of time and resources used by various jobs and/or users.**
- **Control Over System Performance – Records delays between the request for a service and from the system.**
- **Error-detecting Aids – Production of dumps, traces, error messages, and other debugging and error-detecting methods.**





- **Components of an Operating Systems**
- **There are two basic components of an Operating System.**

- **Shell**
- **Kernel**

- **Shell**
- **Shell is the outermost layer of the Operating System and it handles the interaction with the user. The main task of the Shell is the management of interaction between the User and OS. Shell provides better communication with the user and the Operating System Shell does it by giving proper input to the user it also interprets input for the OS and handles the output from the OS. It works as a way of communication between the User and the OS.**





- **Components of an Operating Systems**
- **Kernel**
- **The kernel is one of the components of the Operating System which works as a core component. The rest of the components depends on Kernel for the supply of the important services that are provided by the Operating System. The kernel is the primary interface between the Operating system and Hardware.**





KERNEL

- **The kernel is defined as the middle layer between the operating system and the hardware of a system.**
- **It is the core of an operating system.**
- **The kernel is the first program that starts after the bootloader when we start a system.**
- **A kernel is responsible for managing tasks like disk, memory, and task management.**





CPU SCHEDULING

- **CPU scheduling is the process of allocating a CPU processor to a process and holding other processes in a queue if there is an unavailability of input/output resources or any other resource.**
- **CPU scheduling helps in increasing the efficiency of a CPU and makes it faster as the CPU can execute multi programs simultaneously and no job needs to wait in the queue.**





DRIVERS

- **Drivers in the operating system are used for managing all the I/O devices.**
- **As we know an operating system with the help of hardware and external devices together functions for executing a process.**
- **Hence driver manages all the connections of all the external devices in a system**





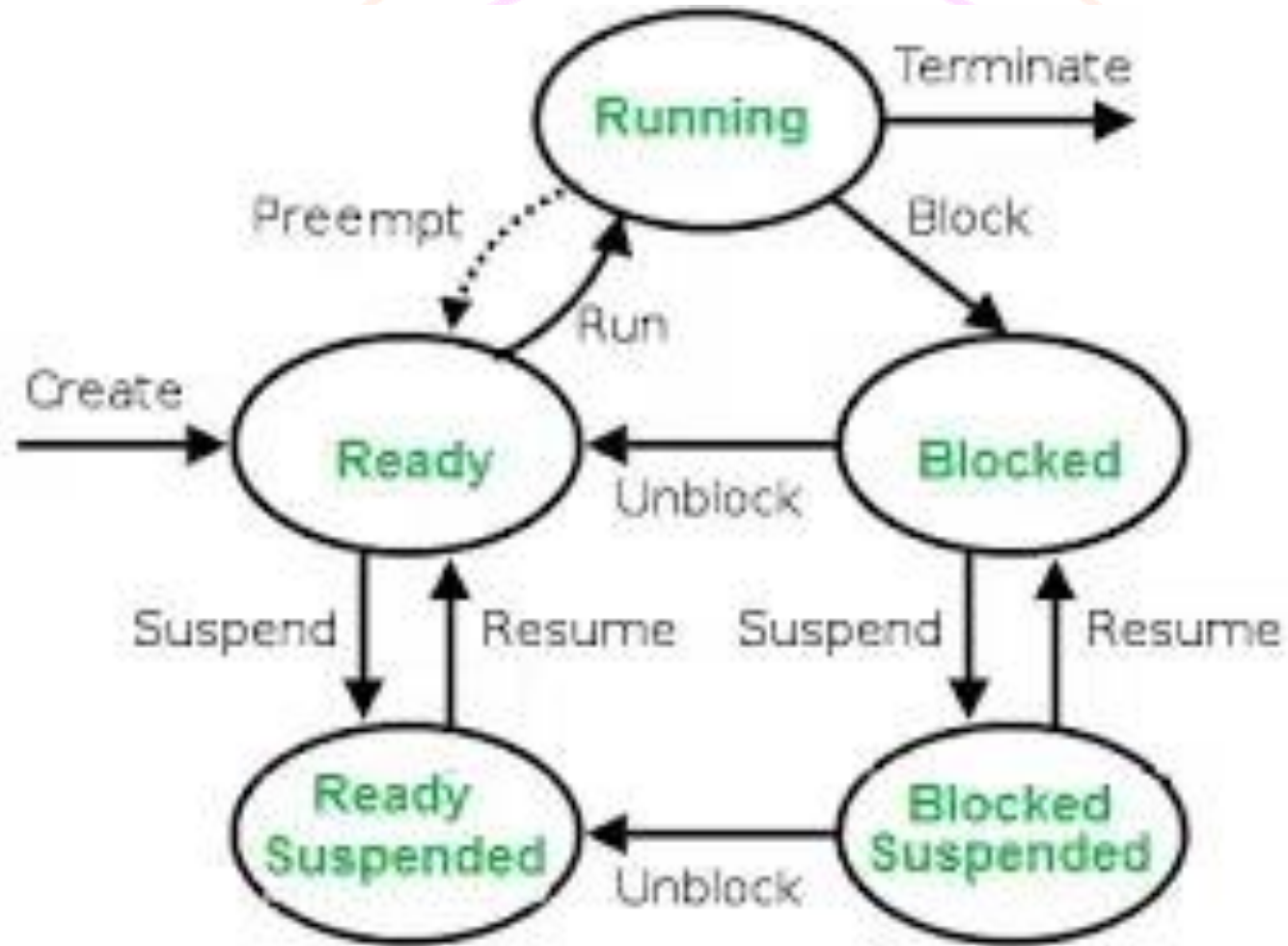
PROCESSOR MANAGEMENT

- **In a multi-programming environment, the OS decides the order in which processes have access to the processor, and how much processing time each process has. This function of OS is called Process Scheduling. An Operating System performs the following activities for Processor Management.**
- **An operating system manages the processor's work by allocating various jobs to it and ensuring that each process receives enough time from the processor to function properly.**
- **Keeps track of the status of processes. The program which performs this task is known as a traffic controller. Allocates the CPU that is a processor to a process. De-allocates processor when a process is no longer required.**





PROCESSOR MANAGEMENT





DEVICE MANAGEMENT

- **An OS manages device communication via its respective drivers. It performs the following activities for device management.**
- **Keeps track of all devices connected to the system. Designates a program responsible for every device known as the Input/Output controller.**
- **Decide which process gets access to a certain device and for how long.**
- **Allocates devices effectively and efficiently. Deallocates devices when they are no longer required.**
- **There are various input and output devices. An OS controls the working of these input-output devices.**
- **It receives the requests from these devices, performs a specific task, and communicates back to the requesting process.**





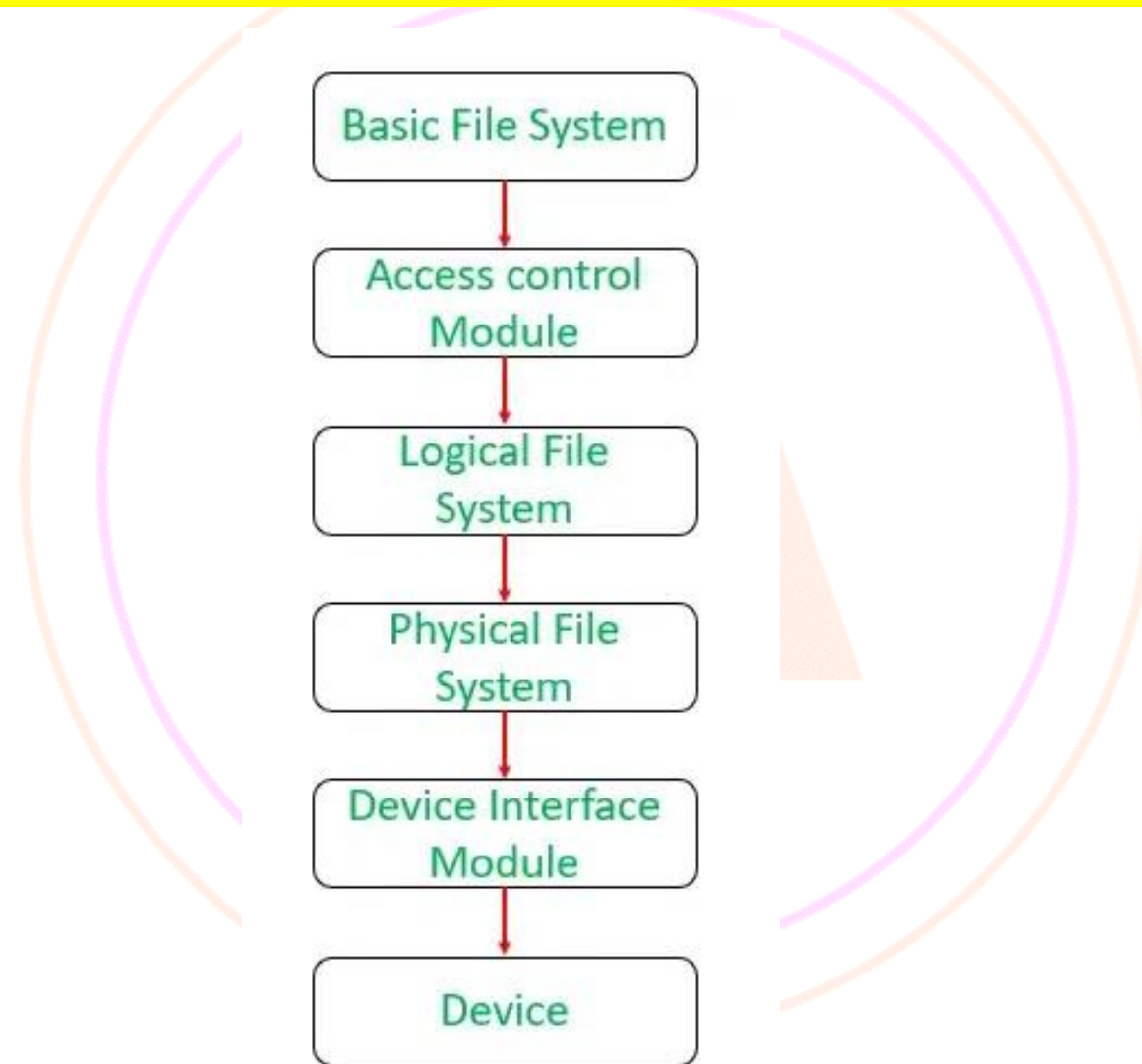
FILE MANAGEMENT

- A file system is organized into directories for efficient or easy navigation and usage. These directories may contain other directories and other files. An Operating System carries out the following file management activities.
- It keeps track of where information is stored, user access settings, the status of every file, and more.
- These facilities are collectively known as the file system.
- An OS keeps track of information regarding the creation, deletion, transfer, copy, and storage of files in an organized way.
- It also maintains the integrity of the data stored in these files, including the file directory structure, by protecting against unauthorized access.





FILE MANAGEMENT





Booting the Computer

The process of starting or restarting the computer is known as booting.

If the computer is switched off completely and if turned on then it is called cold booting. Warm booting is a process of using the operating system to restart the computer.





Q. What is an operating system?

- a) interface between the hardware and application programs**
- b) collection of programs that manages hardware resources**
- c) system service provider to the application programs**
- d) all of the mentioned**





Q. BIOS is used?

- a) By operating system**
- b) By compiler**
- c) By interpreter**
- d) By application software**





Q. Which of the following options is correct about the windows operating system?

- A. Windows is a CUI operating system.**
- B. Windows is based on CLI.**
- C. Windows is a GUI operating system.**
- D. None of the these**





Q. Which one of the following is not true?

- a) kernel remains in the memory during the entire computer session**
- b) kernel is made of various modules which can not be loaded in running operating system**
- c) kernel is the first part of the operating system to load into memory during booting**
- d) kernel is the program that constitutes the central core of the operating system**





Q. What is the main function of the command interpreter?

- a) to get and execute the next user-specified command**
- b) to provide the interface between the API and application program**
- c) to handle the files in operating system**
- d) none of the mentioned**

