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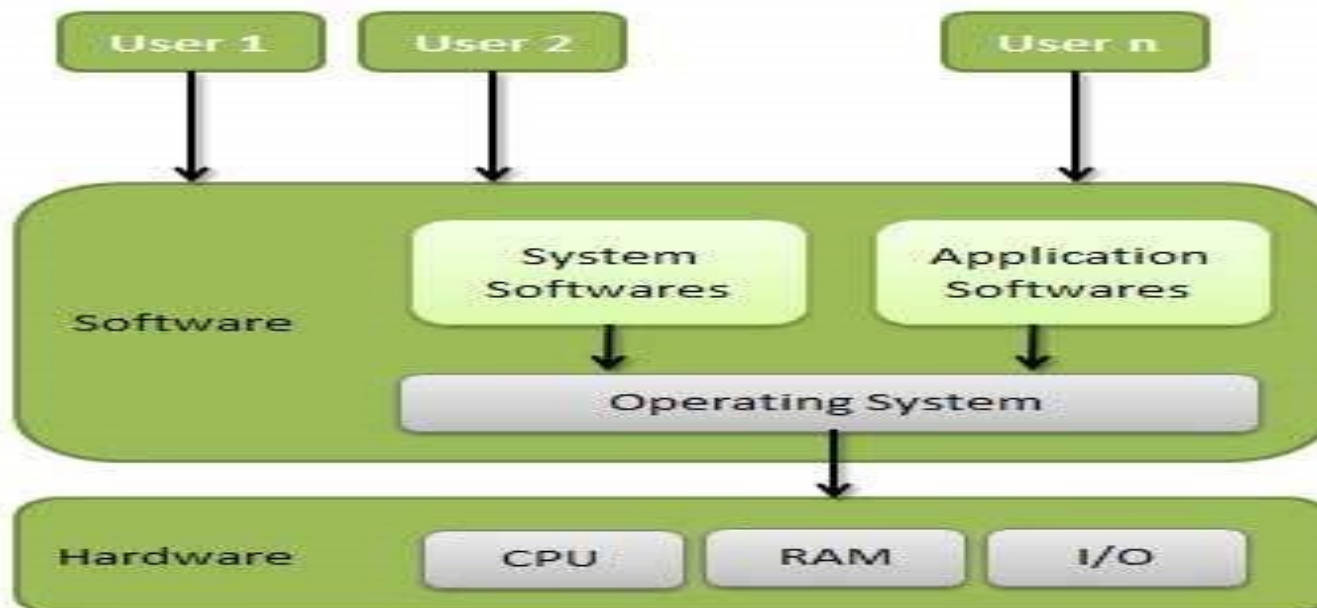
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# OPERATING SYSTEM

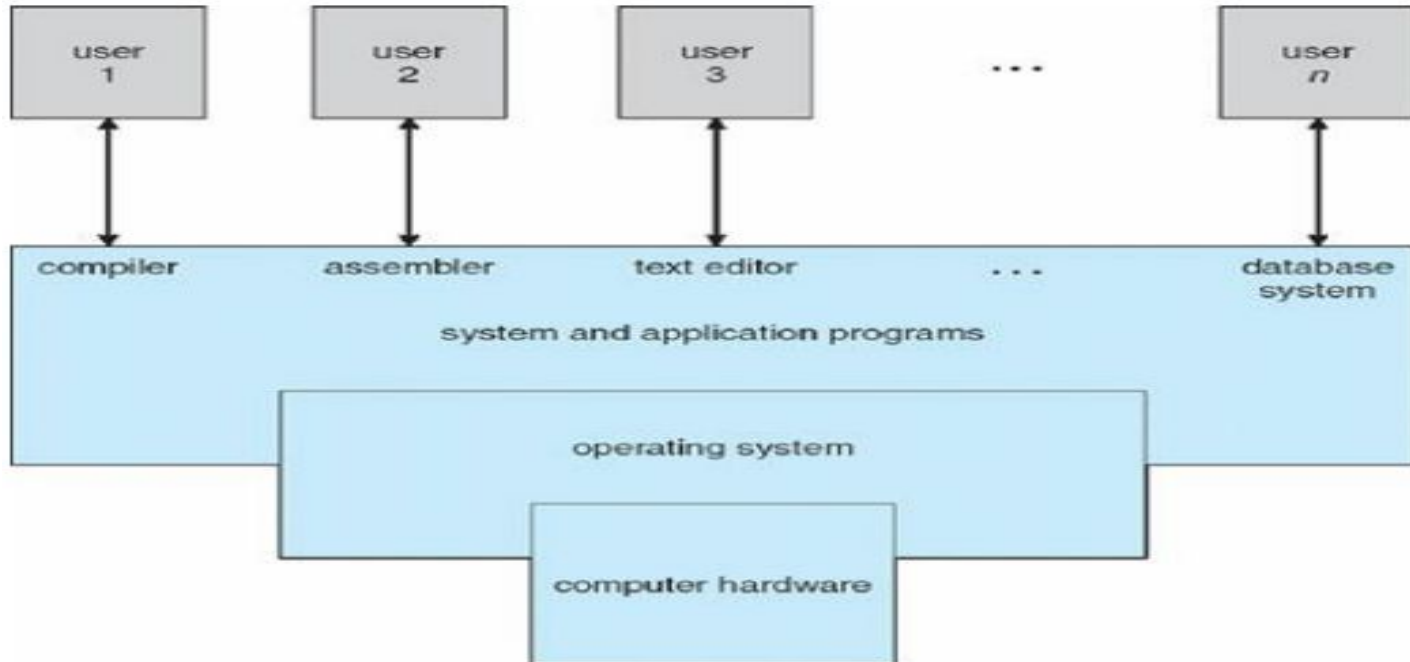
# OS Definition

- 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.



# Components of Computer System

- Hardware : CPU, Memory, I/O Services
- Operating System:
- Applications program
- Users



# Functions of an operating System.

- Memory Management
- Process Management
- I/O Device Management
- File Management
- Security
- Control over system performance
- Job accounting
- Error detecting aids
- Coordination between other software and users

# Memory Management

- Process Isolation
- Automatic allocation and Management
- Support of modular programming
- Protection and access control
- Long-term storage

# Process Management

- Process creation
- Process scheduling
- Process suspending
- Process resuming

# I/O Device Management

- Fairness
- Differential responsiveness: The OS takes the decisions dynamically based on the classes of jobs and the requirement of jobs.
- Efficiency: minimize the waiting time, response time and maximize the throughput.

# File Management

- Creation / Deletion of files.
- Creation deletion of directories.
- File and directory manipulation.
- Backing or storing files onto media like tapes.

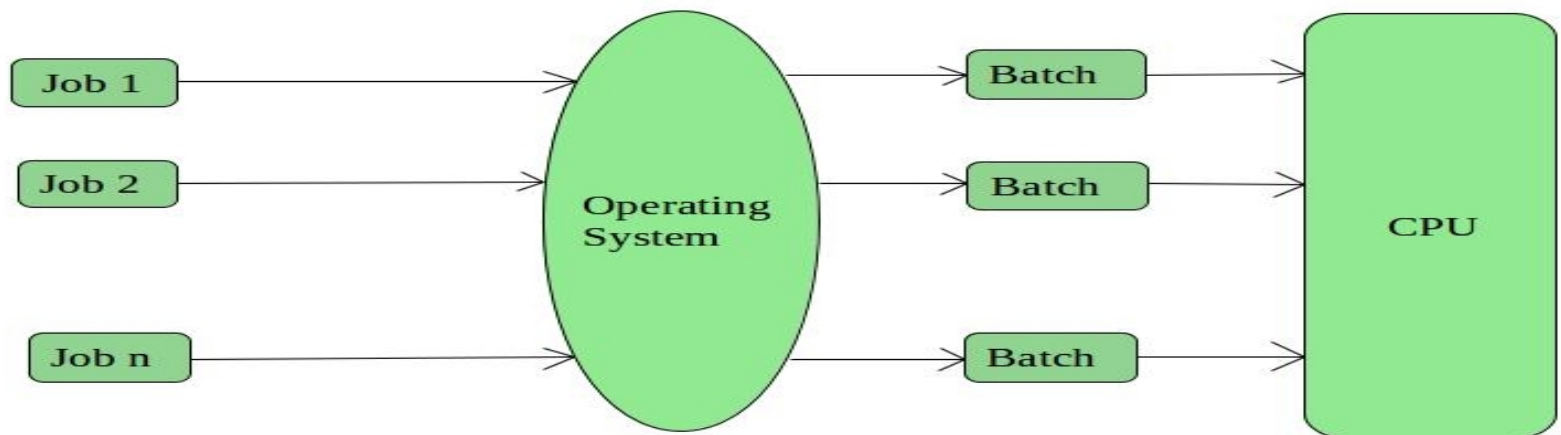


# Security

- Access control
- Information flow control: The OS regulates the flow of data within the system. So, some information should be restricted to the users also.
- Certification: The OS provides the priorities and hierarchies to the resources. So, now we can control unauthorized processes.

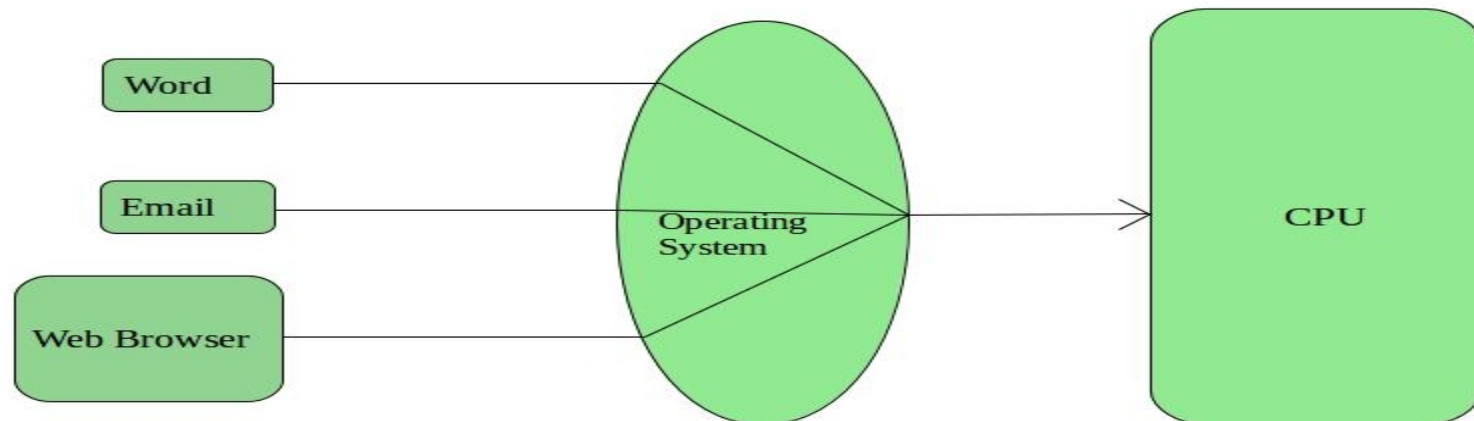
# Types of Operating Systems:

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



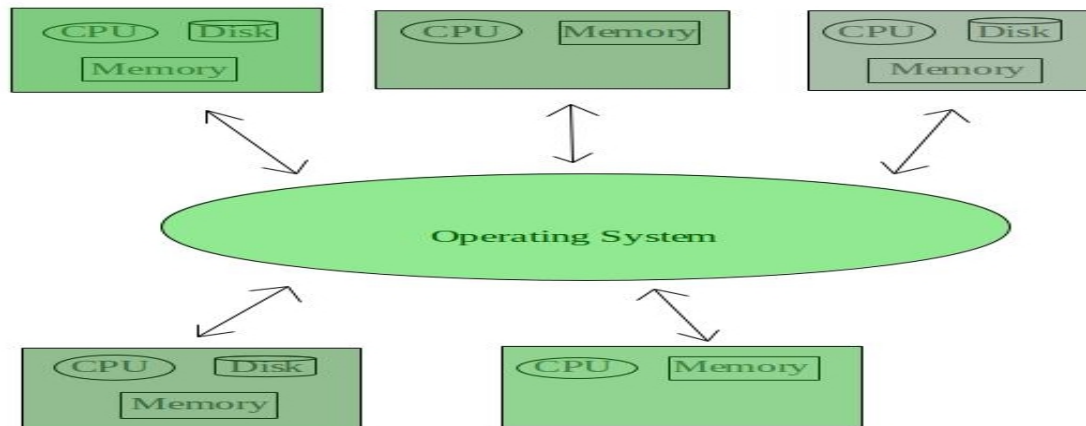
## 2. Time-Sharing Operating Systems –

Each task is given some time to execute, so that all the tasks work smoothly. Each user gets time of CPU as they use single system. These systems are also known as Multitasking Systems. The task can be from single user or from different users also. The time that each task gets to execute is called quantum. After this time interval is over OS switches over to next task. Ex. Multics, Unix, Cal, CTSS



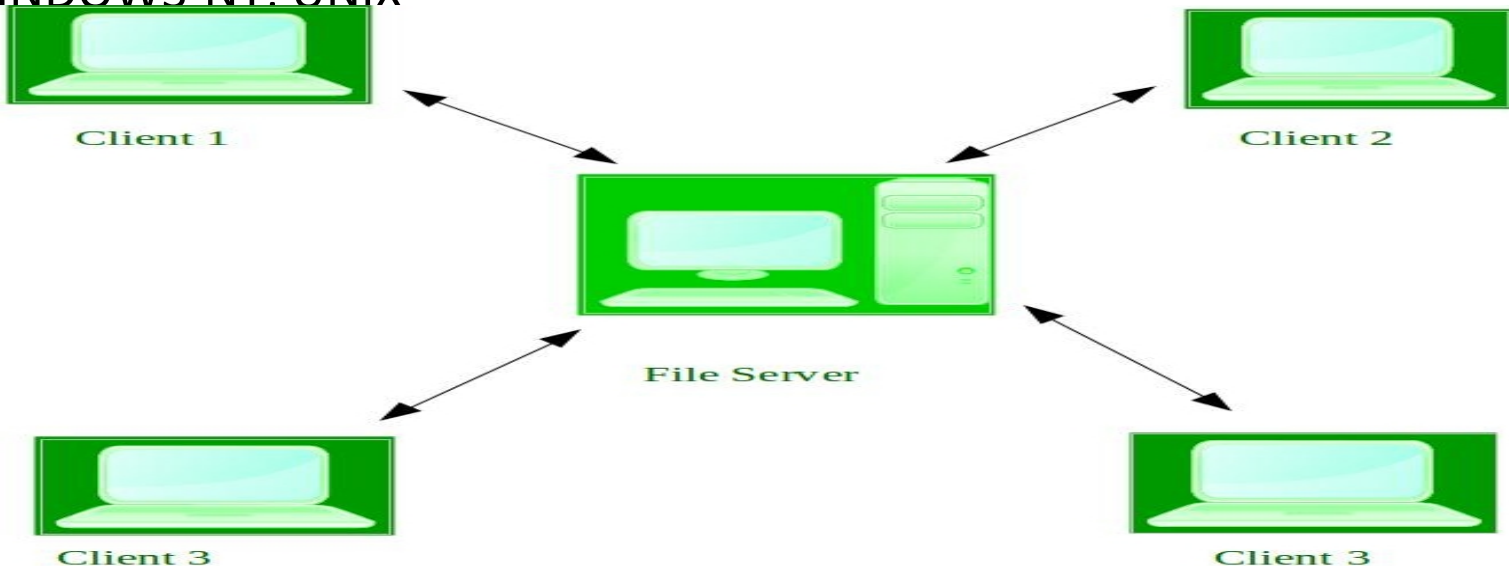
### 3. Distributed Operating System –

These types of operating system 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 pace. Various autonomous interconnected computers communicate each other using a shared communication network. Independent systems possess their own memory unit and CPU. These are referred as **loosely coupled systems** or distributed systems. These system's processors differ in size and function. The major benefit of working with these types of 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 on some other system connected within this network i.e., remote access is enabled within the devices connected in that network. Ex. Amoreba, Angle, Alpha kernel, Chorus.



## 4. 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 type of operating systems allow shared access of files, printers, security, applications, and other networking functions over a small private network. One more important aspect of Network Operating Systems is that all the users are well aware of the underlying configuration, of all other users within the network, their individual connections etc. and that's why these computers are popularly known as **tightly coupled systems**. Ex. WINDOWS-NT. UNIX



## 5. Real-Time Operating System –

These types of OSs serves the 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 are very strict like missile systems, air traffic control systems, robots etc.

**Two types of Real-Time Operating System which are as follows:**

### **Hard Real-Time Systems:**

- These OSs are meant for the applications where time constraints are very strict and even the shortest possible delay is not acceptable. These systems are built for saving life like automatic parachutes or air bags which are required to be readily available in case of any accident. Virtual memory is almost never found in these systems.

### **Soft Real-Time Systems:**

- These OSs are for applications where for time-constraint is less strict.

# Operating System Classification

Operating system

**Multiuser**

when two or more users can work with programs and share peripheral devices (printer, scanner, fax)

**Multitasking**

multiple applications operated at the same time

**Multiprocessing**

more than one CPUs that can be shared

**Multithreading**

smaller parts of a program are loaded when needed by OS



# Operating System services

An Operating System provides services to both the users and to the programs.

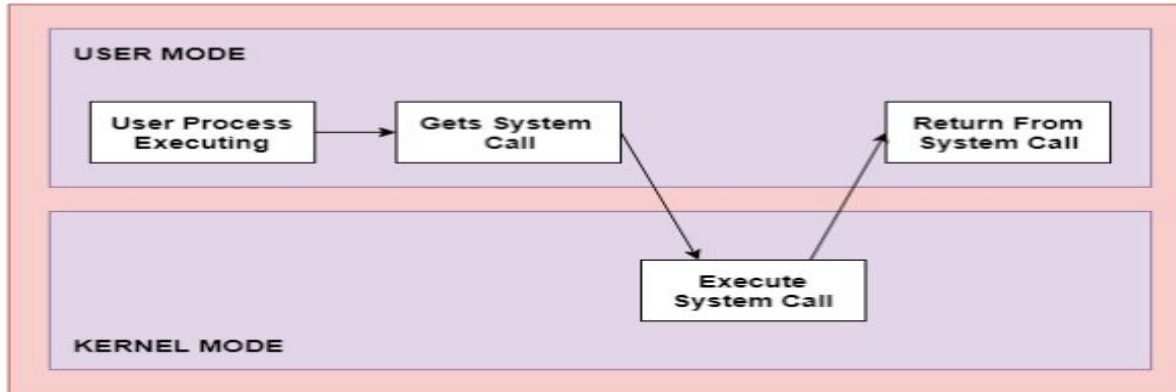
- It provides programs an environment to execute.
- It provides users the services to execute the programs in a convenient manner.

Following are a few common services provided by an operating system –

- Program execution
- I/O operations
- File System manipulation
- Communication
- Error Detection
- Resource Allocation
- Protection



# System calls



The interface between a process and an operating system is provided by system calls. In general, system calls are available as assembly language instructions. They are also included in the manuals used by the assembly level programmers. System calls are usually made when a process in user mode requires access to a resource. Then it requests the kernel to provide the resource via a system call.

## **Types of System Calls**

There are mainly five types of system calls. These are explained in detail as follows –

### **Process Control**

- These system calls deal with processes such as process creation, process termination etc.

### **File Management**

- These system calls are responsible for file manipulation such as creating a file, reading a file, writing into a file etc.

### **Device Management**

- These system calls are responsible for device manipulation such as reading from device buffers, writing into device buffers etc.

### **Information Maintenance**

- These system calls handle information and its transfer between the operating system and the user program.

### **Communication**

- These system calls are useful for interprocess communication. They also deal with creating and deleting a communication connection.

Types of System Calls	Windows	Linux
Process Control	CreateProcess() ExitProcess() WaitForSingleObject()	fork() exit() wait()
File Management	CreateFile() ReadFile() WriteFile() CloseHandle()	open() read() write() close()
Device Management	SetConsoleMode() ReadConsole() WriteConsole()	ioctl() read() write()
Information Maintenance	GetCurrentProcessID() SetTimer() Sleep()	getpid() alarm() sleep()
Communication	CreatePipe() CreateFileMapping() MapViewOfFile()	pipe() shmget() mmap()