Introduction to the Operating System

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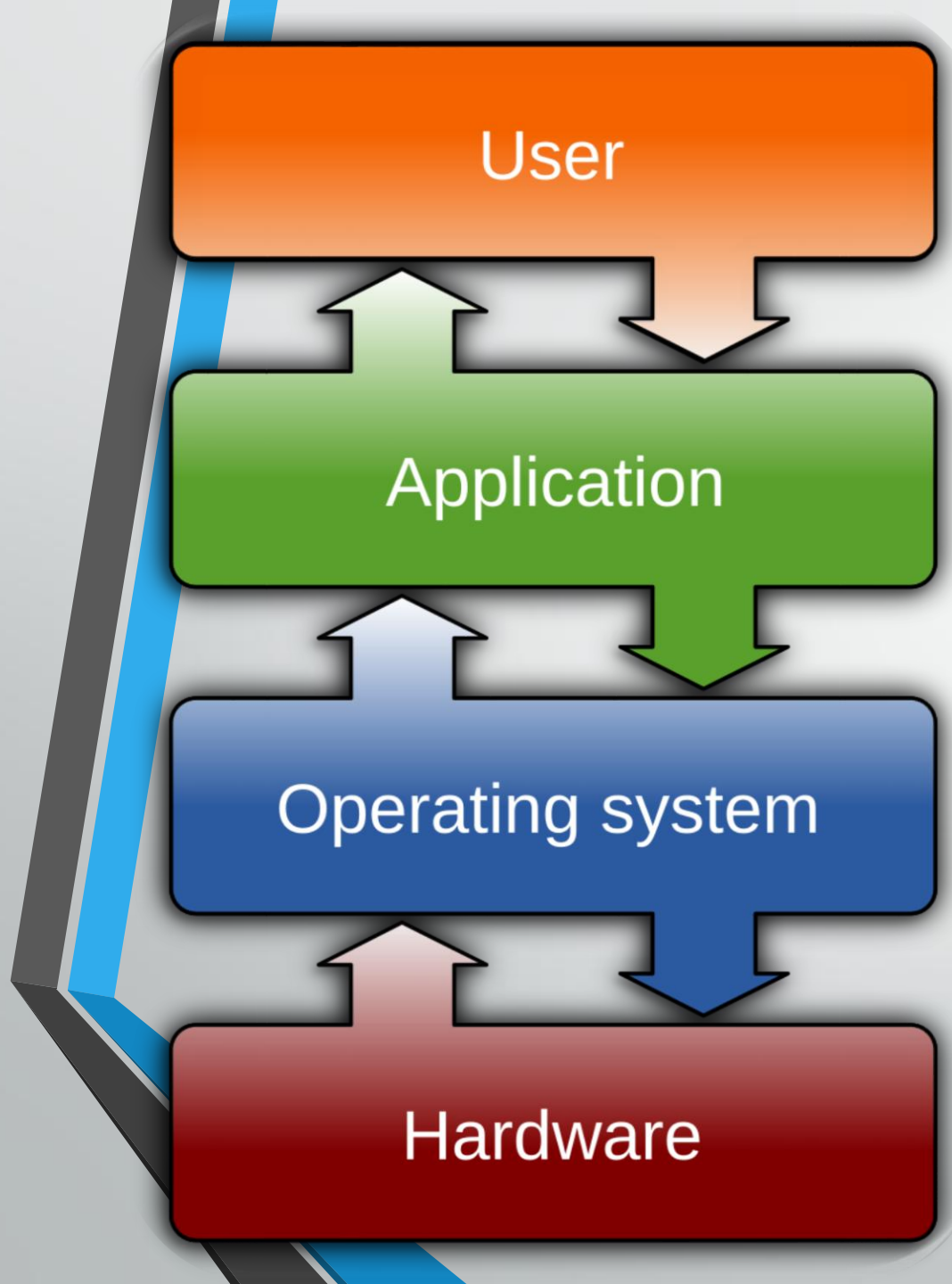
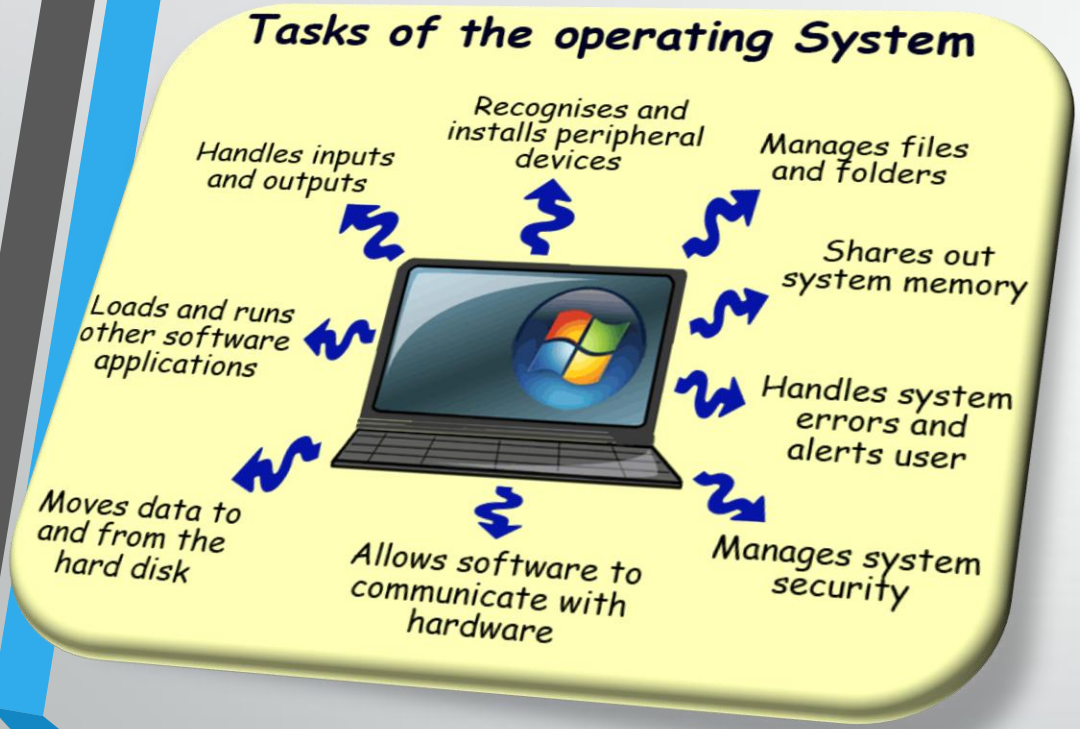


What is Operating System?

An Operating System is a System software that manages all the resources of the computing device.

- Acts as an interface between the software and different parts of the computer or the computer hardware.
- Manages the overall resources and operations of the computer.
- Controls and monitors the execution of all other programs that reside in the computer, which also includes application programs and other system software of the computer.
- Examples of Operating Systems are Windows, Linux, macOS, Android, iOS, etc.

What is an Operating System used for?



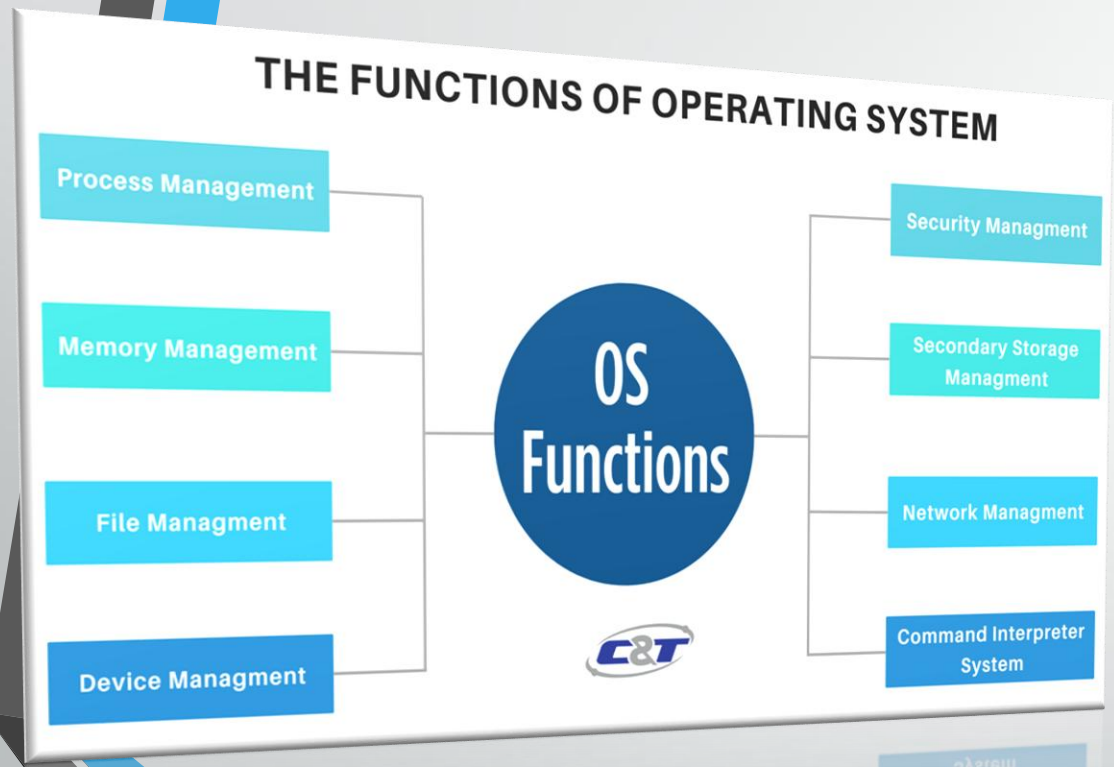
- **As a platform for Application programs**: It provides a platform, on top of which, other programs, called application programs can run.
- **Multitasking**: It manages memory and allows multiple programs to run in their own space and even communicate with each other through shared memory.
- **Manages memory and Files**: It manages the computer's main memory and second storage.
- **Provides Security**: It helps to maintain the system and applications safe through the authorization process.

Goals of Operating System

The goals of an operating system (OS) can be categorized into several key areas:

- **Security and Access Control –** The OS enforces user authentication, permissions, and security measures to prevent unauthorized access.
- **User Interface (UI) and User Experience –** It provides a user-friendly interface, such as a graphical user interface (GUI) or command-line interface (CLI), to interact with the system.
- **Efficient Resource Management –** The OS manages CPU, memory, storage, and I/O devices efficiently to ensure optimal performance.
- **Multitasking and Multiuser Support –** It allows multiple processes and users to work simultaneously without interference.

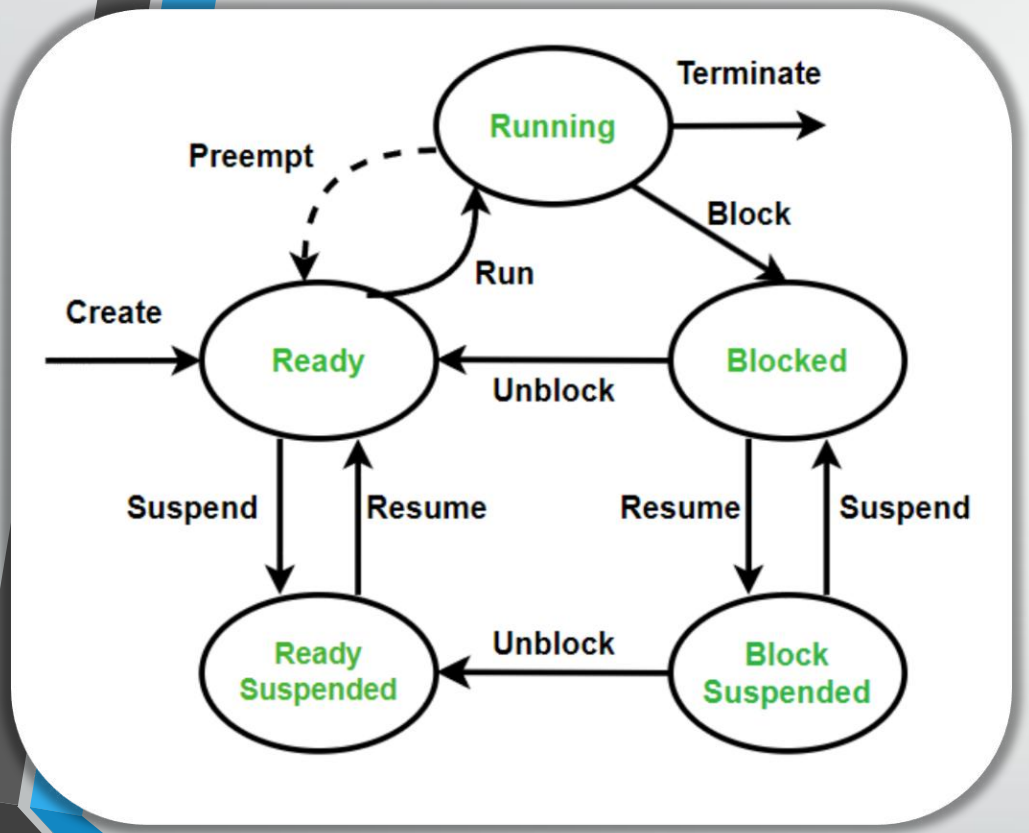
Functions of Operating System



Memory Management

- All data in memory before and after processing
- All instructions in memory in order to execute
- Memory management determines what is in memory when
- Optimizing CPU utilization and computer response to users
- Keeping track of which parts of memory are currently being used and by whom

Process Management



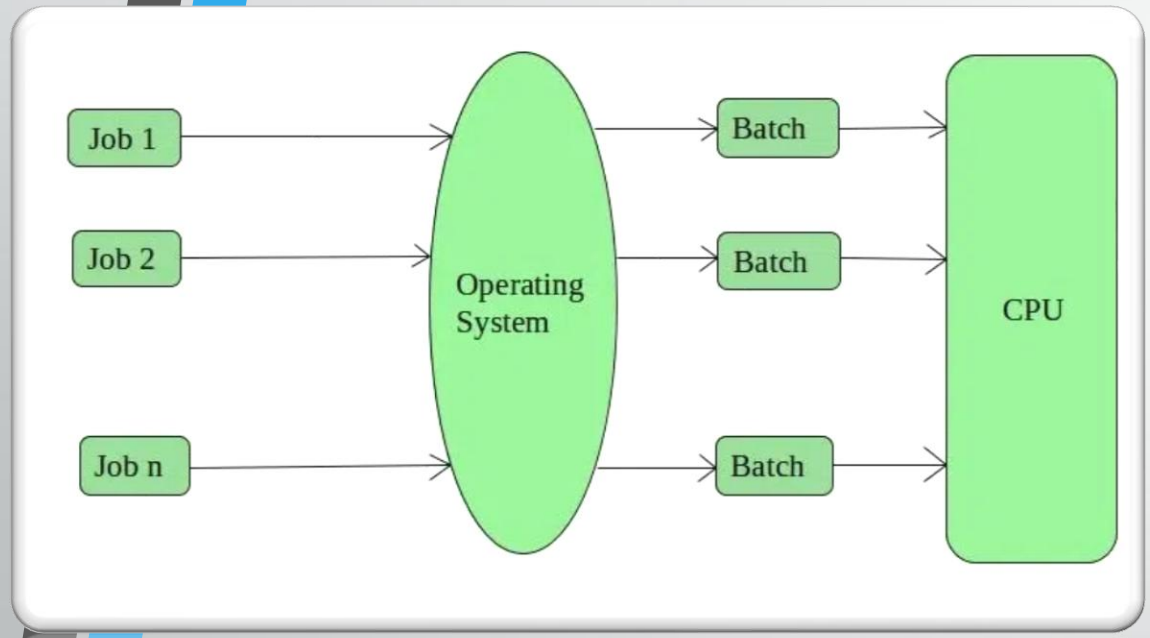
The operating system is responsible for the following activities in connection with process management:

- Creating and deleting both user and system processes
- Suspending and resuming processes
- Providing mechanisms for process synchronization
- Providing mechanisms for process communication
- Providing mechanisms for deadlock handling

Security Management

- **Protection** – any mechanism for controlling access of processes or users to resources defined by the OS
- **Security** – defense of the system against internal and external attacks
- Huge range, including denial-of-service, worms, viruses, identity theft, theft of service
- Systems generally first distinguish among users, to determine who can do what
- User identities (user IDs, security IDs) include name and associated number, one per user
- User ID then associated with all files, processes of that user to determine access control
- Group identifier (group ID) allows set of users to be defined and controls managed, then also associated with each process, file

Different types of Operating Systems



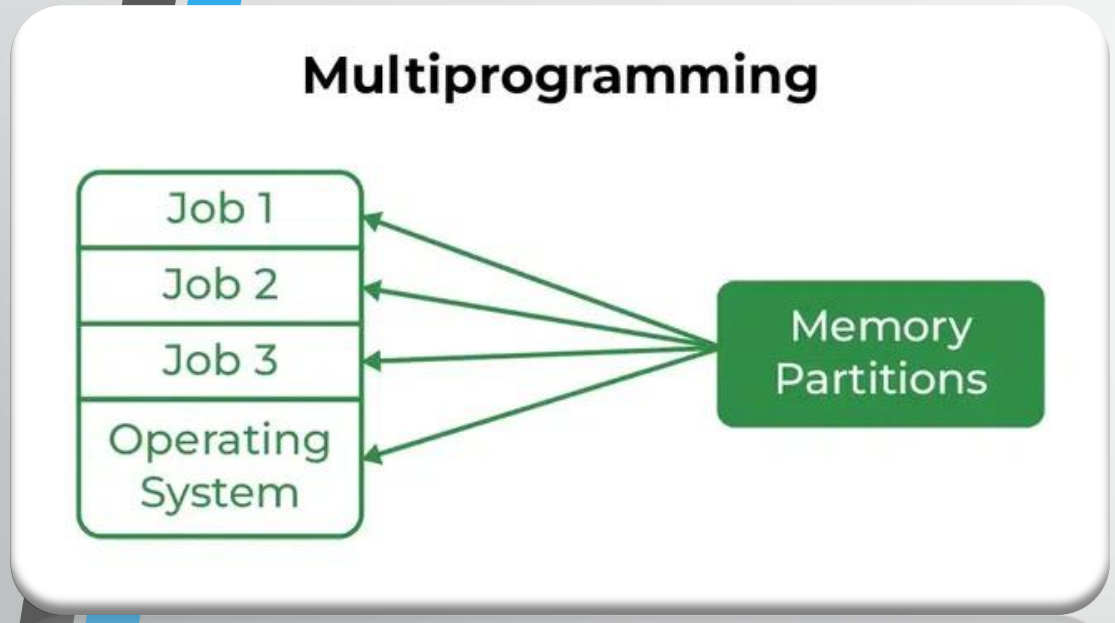
Batch Operating System

To speed up processing, operators batched together jobs with similar needs & run them through the computer as a group.

The limitations of a Batch System are as follows:-

1. User cannot interact with the computer when a job is executing.
2. In this execution, environment CPU is often idle.
3. The time gap between the job submission and completion of the job (turnround time) is quite maximum.

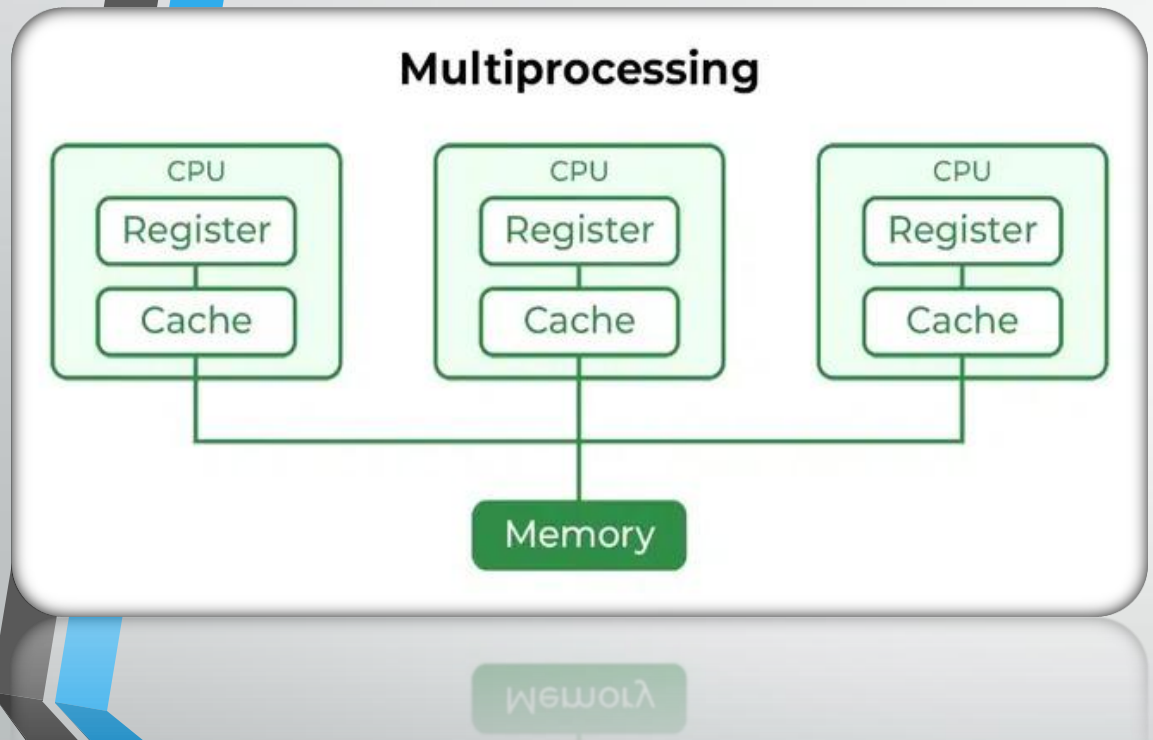
Multiprogramming System



Multiprogramming is needed for efficiency.

1. Single user cannot keep CPU and I/O devices busy at all times.
2. Multiprogramming organizes jobs (code and data) so, CPU always has one to execute.
3. A subset of total jobs in system is kept in memory.
4. One job selected and run via job scheduling.
5. When it has to wait (for I/O for example), OS switches to another job.

Multiprocessing System



1. Another computer system is the multiprocessor system having multiple processors sharing memory and peripheral devices.
2. Multiprocessor systems are classified into two as tightly-coupled and loosely-coupled (distributed).
3. In the tightly-coupled one, each processor is assigned a specific duty but processors work in close association, possibly sharing the same memory.
4. In the loosely coupled one, each processor has its own memory and copy of the OS.

Thank You!