CHAPTER - 1

# Introduction & Basics

Neso Academy

# Introduction to OPERATING SYSTEM

Windows

Linux

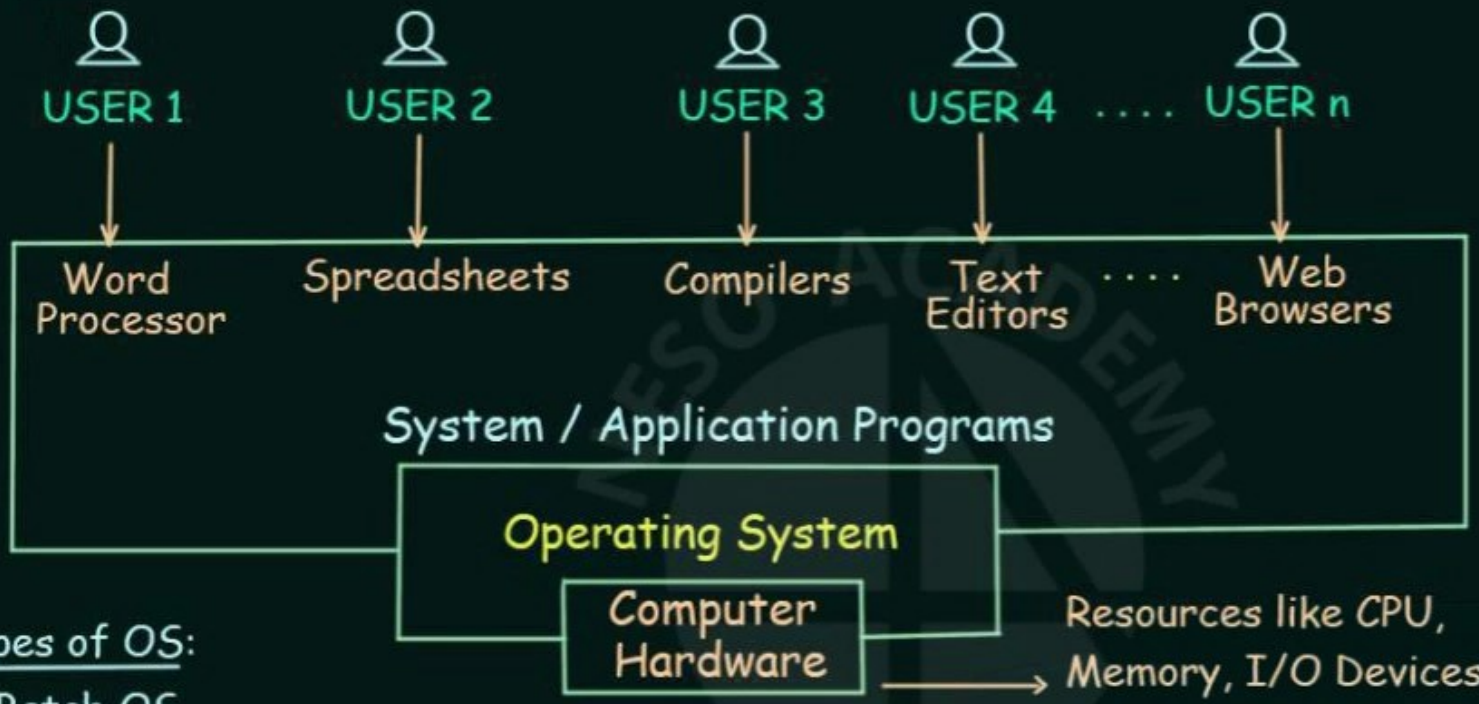
Ubuntu

Mac OS X
iOS

Android

→ An Operating System (OS) is a program that manages the computer hardware.

→ It also provides a basis for Application Programs and acts as an intermediary between computer User and compter Hardware.




Types of OS:

→ Batch OS
→ Time sharing OS
→ Distributed OS
→ Network OS
→ Real Time OS
→ Multi Programming/ Processing/ Tasking OS

Goals of OS:

i) Convenience
ii) Efficiency
iii) Both

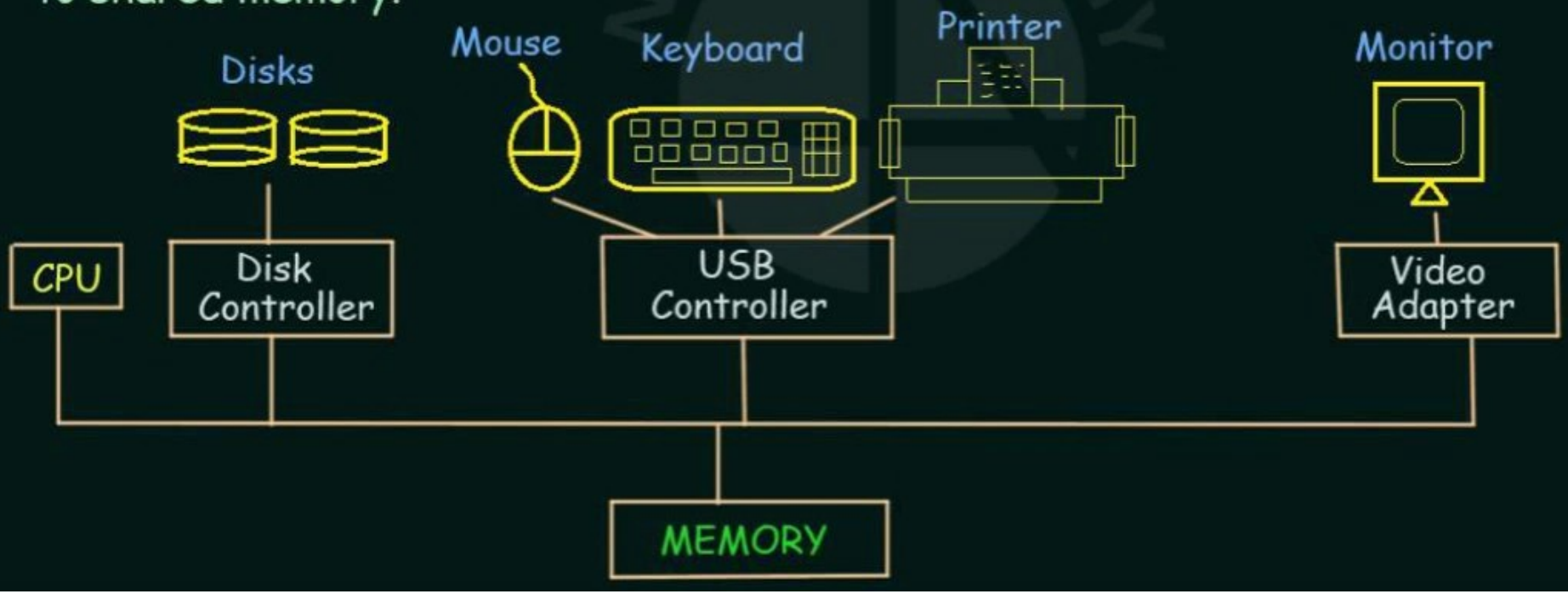
Functions of OS:

→ It is an interface between User & Hardware
→ Allocation of Resources
→ Management of Memory, Security, etc.

## Basics of Operating System (Computer System Operation)

Some basic knowledge of the structure of Computer System is required to understand how Operating Systems work.

→ A modern general-purpose computer system consists of one or more CPUs and a number of device controllers connected through a common bus that provides access to shared memory.



→ Each device controller is in charge of a specific type of device

→The CPU and the device controllers can execute concurrently, competing for memory cycles

→To ensure orderly access to the shared memory, a memory controller is provided whose function is to synchronize access to the memory

Some important terms:

1) Bootstrap Program:→The initial program that runs when a computer is powered up or rebooted.
→It is stored in the ROM.
→It must know how to load the OS and start executing that system.
→It must locate and load into memory the OS Kernel.

2) Interrupt: → The occurence of an event is usually signalled by an Interrupt from Hardware or Software.
→ Hardware may trigger an interrupt at any time by sending a signal to the CPU, usually by the way of the system bus.

3) System Call (Monitor call): → Software may trigger an interrupt by executing a special operation called System Call.

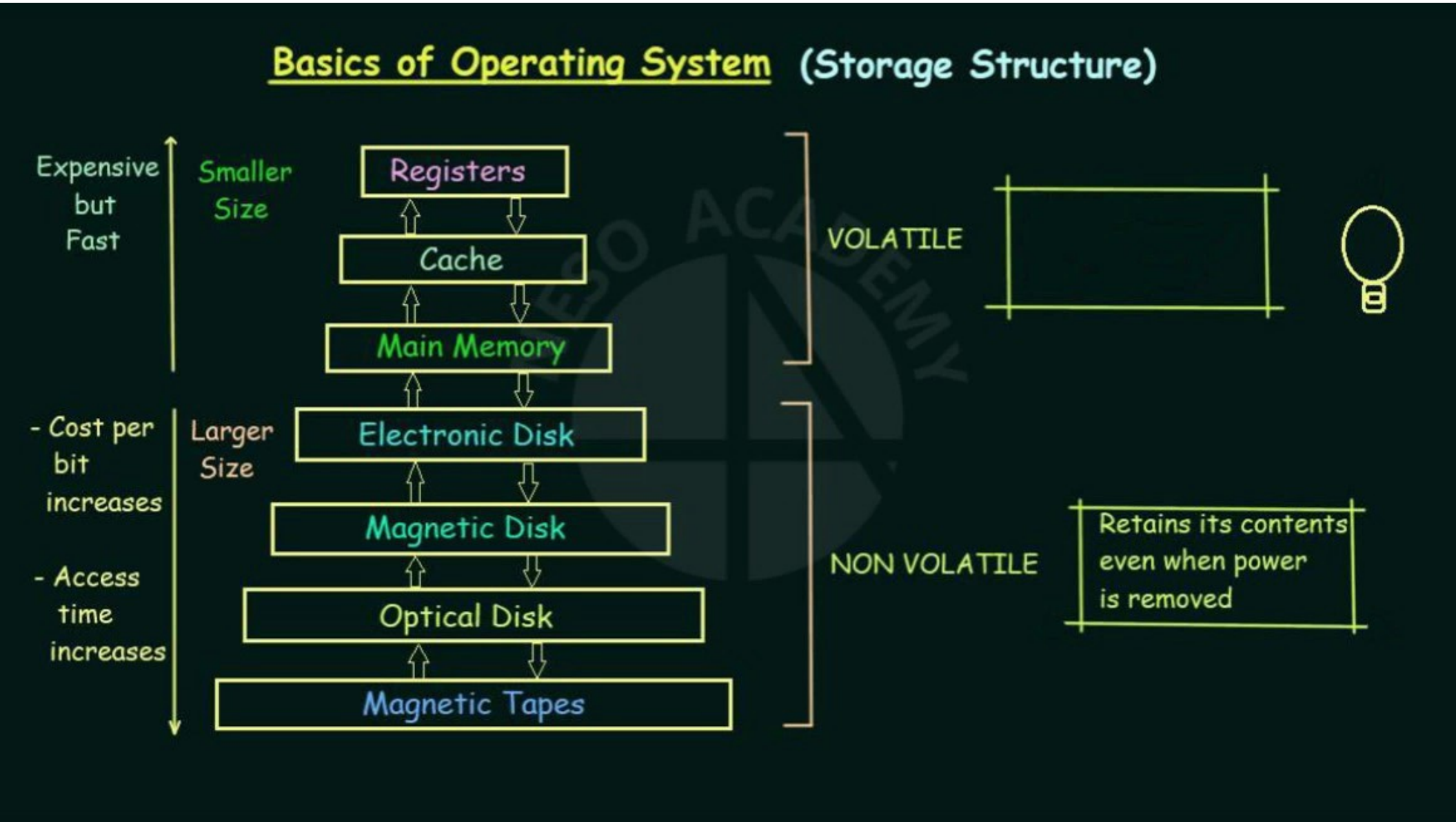
When the CPU is interrupted, it stops what it is doing and immediately transfers execution to a fixed location.

→ The fixed location usually contains the starting address where the Service Routine of the interrupt is located.

The Interrupt Service Routine executes.

On completion, the CPU resumes the interrupted computation.

# Basics of Operating System (Storage Structure)



# Basics of Operating System ( I/O Structure)

-> Storage is only one of many types of I/O devices within a computer

-> A large portion of operating system code is dedicated to managing I/O, both because of its importance to the reliability and performance of a system and because of the varying nature of the devices

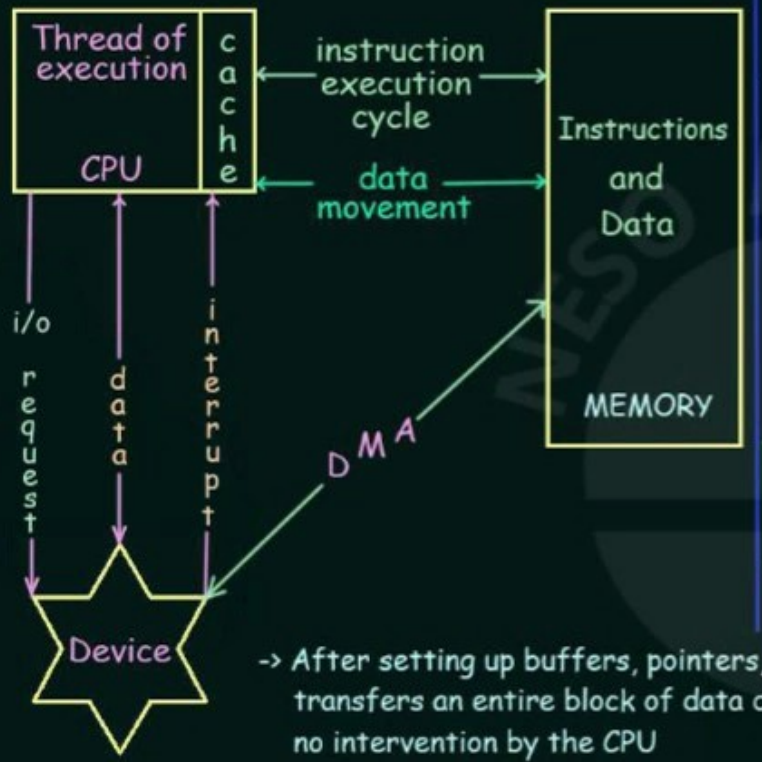
-> A general-purpose computer system consists of CPUs and multiple device controllers that are connected through a common bus

-> Each device controller is in charge of a specific type of device


-> Typically, operating systems have a device driver for each device controller

-> This device driver understands the device controller and presents a uniform interface to the device to the rest of the operating system

## Working of an I/O Operation:




-> To start an I/O operation, the device driver loads the appropriate registers within the device controller

-> The device controller, in turn, examines the contents of these registers to determine what action to take

-> The controller starts the transfer of data from the device to its local buffer

-> Once the transfer of data is complete, the device controller informs the device driver via an interrupt that it has finished its operation

-> The device driver then returns control to the operating system

This form of interrupt-driven I/O is fine for moving small amounts of data but can produce high overhead when used for bulk data movement

To solve this problem, Direct Memory Access (DMA) is used

-> After setting up buffers, pointers, and counters for the I/O device, the device controller transfers an entire block of data directly to or from its own buffer storage to memory, with no intervention by the CPU

-> Only one interrupt is generated per block, to tell the device driver that the operation has completed

-> While the device controller is performing these operations, the CPU is available to accomplish other works

# Computer System Architecture

Types of Computer Systems based on number of General Purpose Processors:

1. Single Processor Systems 


2. Multiprocessor Systems 


3. Clustered Systems 

## 1. Single Processor Systems


- Has two or more processors in close communication, sharing the computer bus and sometimes the clock, memory, and peripheral devices

**Advantages:**

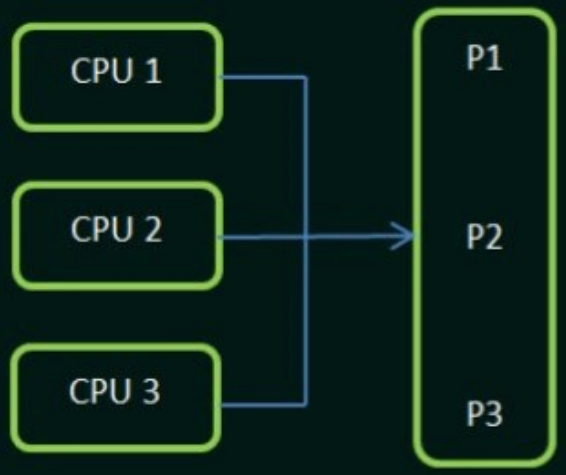
👍 Increased throughput

👍👍 Economy of scale

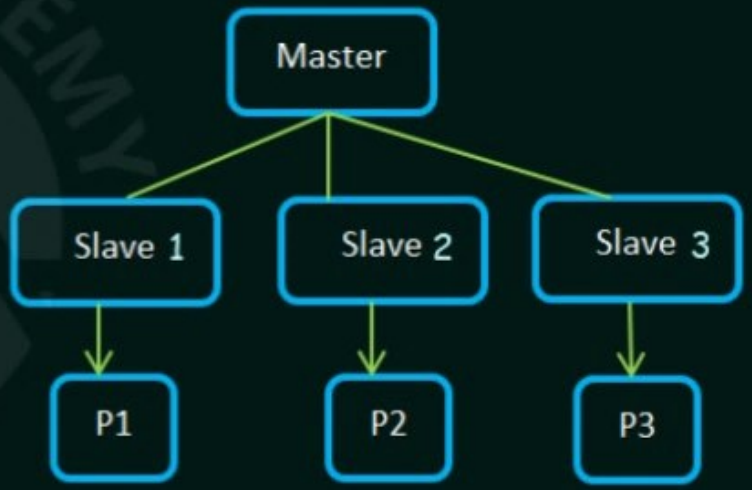
👍👍👍 Increased reliability

# Types of Multiprocessor Systems:

## Symmetric Multiprocessing




## Asymmetric Multiprocessing



## 3. Clustered Systems

- Like multiprocessor systems, clustered systems gather together multiple CPUs to accomplish computational work.
- They are composed of two or more individual systems coupled together.
- Provides high availability
- Can be structured asymmetrically or symmetrically

**asymmetrically**

- One machine in Hot-Standby mode
- Others run applications

**symmetrically**

- Two or more hosts run applications
- Monitors each other