

Operating system

Operating system

- **OS definition[5]:**

- found almost in every electronics device like **mobile phones, personal computers, automobiles, tablets, TV, toys** etc.

Examples. Windows, Android, Linux, macOS, iOS, etc.

- acts as an **interface between the software** and different **computer hardware**, and allows the user to **communicate** with the computer without knowing how to **speak in computer's language**.

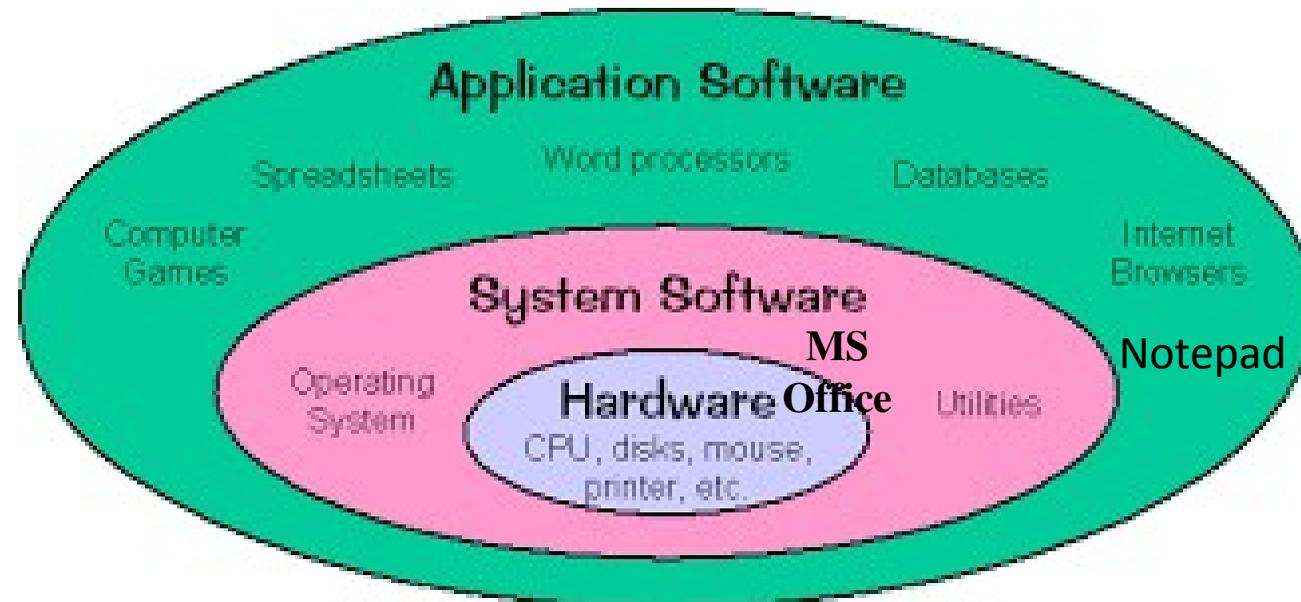


Figure 1.1 : An operating system enable the computer hardware to interact with application program

Operating system

- **it enables applications to interact with a computer's hardware, and provide an environment in which a user can execute applications.**
- **Without an operating system, a computer is useless. It is not possible for the user to use any computer or mobile device without having an operating system.**
- **a software that manages and handles the various hardware and software resources of a computing device.**
- **it enable applications (software) to interact with a computer's hardware and to manage a system's hardware and software resources.**
- **It manages the computer's memory and processes, as well as all of its software and hardware.**

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- after being initially loaded into the computer, it manages all running application, **overall resources, and entire operations of the computer system.**
- **monitors and controls** the execution of all other programs/software that reside in the computer system, which also includes **application programs** and other **system software** of the computer.
- **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.**
 - An operating system (OS) is **system software** that **manages computer hardware, software resources, and provides common services for computer programs.**

Operating system

- A collection of software that manages computer hardware resources and provides common services for computer programs
- Layer of abstraction in operating system [3]:

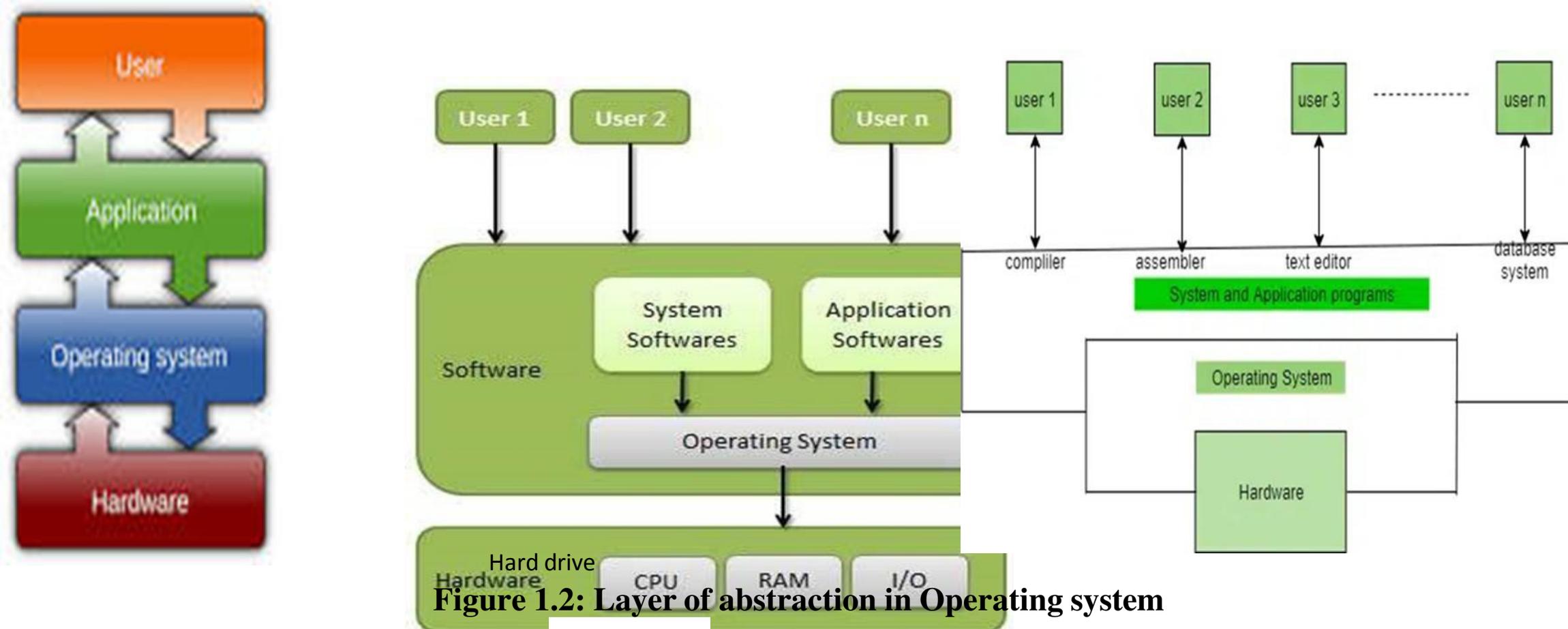


Figure 1.2: Layer of abstraction in Operating system

Operating system

- **User interface**

- user can **interact with the computer to perform its task** (either through a **GUI**, or a **CLI**)
- without an operating system, **every application** requires its **own UI**, and the **comprehensive code to handle all low-level functionality of the underlying computer's hardware**
- as the **vast array of hardware available**, and the number of **software routines** that must be run at the **system software level** to support **computer functions** would unnecessarily **increase the size of every application** and make **software development impractical**.
- OS provides a **common code for applications to interact with the hardware and other system-level functions** without the need for **applications to know any details about them**.

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- if **each application** accesses the **same resources and services** by the **common code**, the OS can **service almost any number of applications**, which vastly reduces the **amount of time and coding required to develop and debug an application**,
- An operating system **enable applications** to use **hardware functions** without the **need to know anything about the low-level OS or hardware state**.
- **Function of Operating System /Operating System services [4]:**
 - It performs the following basic tasks:
 - memory management,
 - processor management
 - device management
 - control system performance
 - file management
 - networking
 - booting
 - security , and
 - error detection

Operating system

▪ Memory Management

- refers to **management of Primary Memory or Main Memory.**
- main memory provides a **fast storage that can be accessed directly by the CPU**
- for a program to be executed, it must be in the **main memory.**
- **main memory** is divided into **large number of address**, and the **program/process** reside on that **address.**

- An Operating System does the following activities for memory management:
 - keeps tracks of **primary memory**, i.e., **what part of it are in use by which process, what part are not in use ?**
 - it decides **which process** will occupy which **memory space ?**
 - **allocates the memory** when a **process requests it** to do so
 - **de-allocates the memory** when a **process no longer needs it**, or has been terminated

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▪ Processor Management

- **every software** that runs on a computer (whether in the background or in the frontend) is a **process**.
- when there are **multiple process** run on the system, then OS decides “**which process should get the processor**, and for “**how much time**”?”
- an Operating System does the following activities for processor management:
 - keeps tracks of **processor** and **status of process**.
 - allocates the **processor (CPU)** to a **process**.
 - **de-allocates processor** when a process is **completely executed**
 - keeping track of **time and resources** used by various **jobs (process / program)**.
- The purpose of process management is as follows:
 - **Increasing the efficiency of the system:**
 - large number of process should be **executed** by the computer system **per unit time**

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- **memory space** should be **efficiently utilized** by the process
- **proper utilization of CPU:**
 - OS makes sure that the **CPU should be as busy as possible.**
- **servicing to each and every process:**
 - since **every process should get a chance to use the processor**, hence, OS makes sure that **each process should get processor time.**
- **Device Management**
 - It **manages device communication via their respective drivers.** It does the following activities for device management:
 - keeps tracks of all devices.
 - decides **which process gets the device?**

Function of Operating system [4]

➤ **allocates and deallocates** devices to **different processes**

▪ **Booting process:**

- the process of **starting or restarting a computer** is referred to as **Booting**. The operating system (OS) is in charge of **booting the computer**.

▪ **Networking:**

- It provides **networking capabilities** such as **establishing and managing network connections** and **sharing resources** (example. printers and files) **over a network**.

▪ **File Management:**

- it keeps track of **information related to file**, such as its **location, status**, etc.
- manages **resource allocation** and **de-allocation of files**,
- specifies **which process receives which file**,
- decides **which resources** is acquired by **which files** ?

Function of Operating system [4]

- **Security:**
- by means of **password and similar other techniques**, it prevents **unauthorized access to programs and data.**
- **Error detecting aids:**
- While a computer system is running, a **variety of errors** might occur. The operating system **continuously monitors the system to locate or recognize problems** and **protects the system from them**
- **Why we study this subject?**
- **What we have to study in this subject?**