Operating System

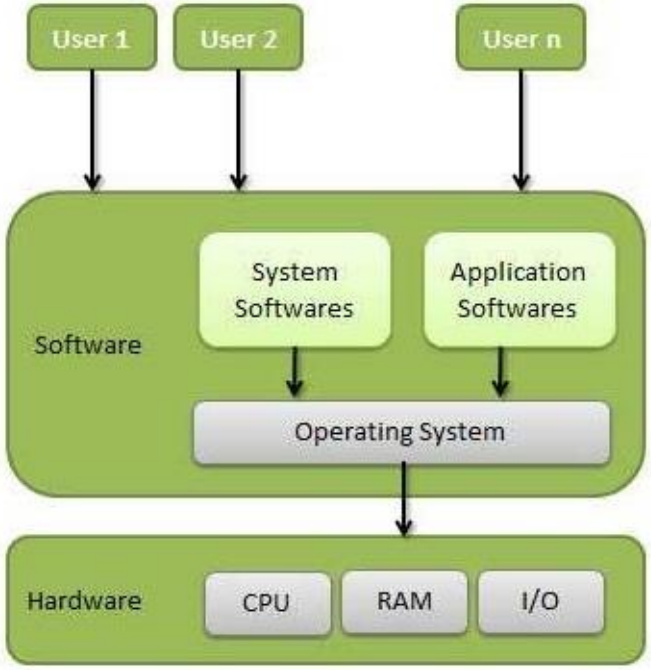
4.1 Introduction to Operating System

- An Operating System (OS) is an interface between a computer user and computer hardware.
- Is a software which performs all the basic tasks like file management, memory management, process management, handling input and output, and controlling peripheral devices such as disk drives and printers

An operating system (OS) is system software that manages computer hardware, software resources, and provides common services for computer programs.

Operating System

4.1.1 Architecture of Operating System



Examples of OS

Some of the commonly used operating systems are Microsoft Disk Operating System (MSDOS), Windows 7, Windows XP, Linux, UNIX, and Mac OS X Snow Leopard.

Operating System

4.2 Objectives of Operating System

- OS has two main objectives :

  i. Convenience:

  To make the computer system convenient and easy to use, for the user

  ii. Efficiency:

  To use the computer hardware in an efficient way, by handling the details of the operations of the hardware.

Operating System

4.3 Types of Operating System

i. Single User and Single Task OS
ii. Single-user, multi-tasking OS
iii. Multi-user OS
iv. Multiprocessing OS
v. Real-time operating system (RTOS)
vi. Embedded OS
vii. Distributed OS

Operating System

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Operating System

4.3 Types of Operating System

i. Single User and Single Task OS

- As the name implies, this operating system is designed to manage the computer so that one user can effectively do one thing at a time.
- Operating system for Personal Computers (PC) are single user OS.
- MSDOS is an example of single user OS.

Operating System

4.3 Types of Operating System

ii. Single-user, multi-tasking OS

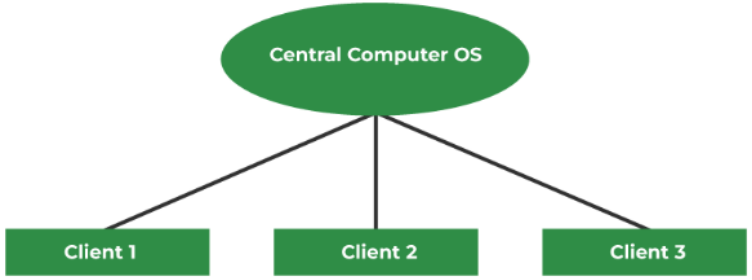
- Allows execution of more than one task or process concurrently.
- For this, the processor time is divided amongst different tasks.
- This division of time is also called time sharing.
- The processor switches rapidly between processes.
- The user can switch between the applications and also transfer data between them.
- Windows 95 and all later versions of Windows are examples of multitasking OS, MAC OS

Operating System

4.3 Types of Operating System

iii. Multi-user OS

- A multi-user operating system allows many different users to take
- advantage of the computer's resources simultaneously.
- Multi-user is used in computer networks that allow same data and applications to be accessed by multiple users at the same time.
- The users can also communicate with each other.
- Linux, UNIX, and Windows OS are examples of multiuser OS.



Operating System

4.3 Types of Operating System

iv. Multiprocessing OS

- have two or more processors for a single running process.
- Processing takes place in parallel and is also called parallel processing.
- Each processor works on different parts of the same task, or, on two or more different tasks.
- Since execution takes place in parallel, they are used for high speed execution, and to increase the power of computer.
- Linux, UNIX and Windows 7 are examples of multiprocessing OS

Operating System

4.3 Types of Operating System

v. Real Time Operating System (RTOS)

- is a special-purpose operating system used in computers that has strict time constraints for any job to be performed.
- Real Time OS are designed to respond to an event within a predetermined time.
- These operating systems are used to control processes. Processing is done within a time constraint.
- Real-time operating systems are used in traffic control systems, Command Control Systems, airline reservation systems, Heart pacemakers, Network Multimedia Systems, robots, etc.
- Examples: MTS ,Lynx, QNX, VxWorks etc.

Operating System

4.3 Types of Operating System

vi. Embedded OS

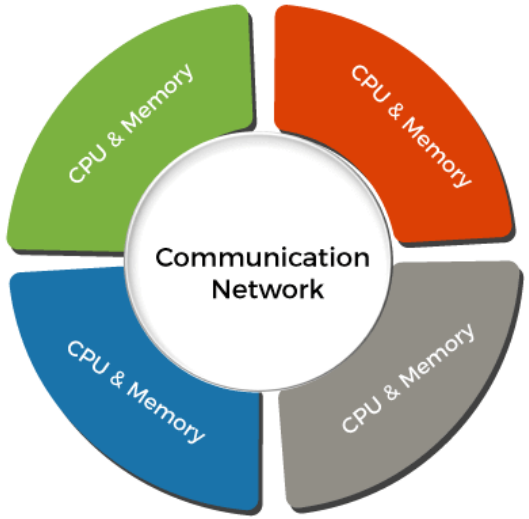
- An embedded operating system is a specialized operating system (OS) designed to perform a specific task for a device that is not a computer.
- The main job of an embedded OS is to run the code that allows the device to do its job.
- Embedded OS is embedded in a device in the ROM.
- They are specific to a device.
- They are used in appliances like microwaves, washing machines, traffic control systems etc.

Operating System

4.3 Types of Operating System

vii. Distributed OS

- Distributed operating system manages a group of independent computers and makes them appear to be a single computer.
- Distributed systems use many central processors to serve multiple real-time applications and users. As a result, data processing jobs are distributed between the processors.
- Example: Solaris, Mach, Locus



Operating System

4.4 Function of Operating System

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4.4.1 Process Management

- Process management is a crucial aspect of operating systems (OS), and it involves the creation, scheduling, and termination of processes.
- A process is an independent program in execution along with its associated resources.
- A process is a program in execution.
- The process management activities handled by the OS are
    - Control access to shared resources like file, memory, I/O and CPU,
    - Control execution of applications
    - Create, execute and delete a process (system process or user process),
    - Cancel or resume a process
    - Schedule a process, and
    - Synchronization & communication handling for processes.

Operating System

4.4.2 Memory Management

- Memory management is a method in the operating system to manage operations between main memory and disk during process execution.
- The main aim of memory management is to achieve efficient utilization of memory.
- Key activities of memory management handled by OS are
    i. allocate memory
    ii. free memory,
    iii. re-allocate memory to a program when a used block is freed, and
    iv. keep track of memory

Operating System

4.4.3 File Management

- File management in an operating system refers to the set of processes and techniques involved in creating, organizing, accessing, manipulating, and controlling files stored on storage devices such as hard drives, solid-state drives, or network storage.
- The file management tasks include
  i. create and delete both files and directories,
  ii. provide access to files,
  iii. allocate space for files,
  iv. keep back-up

Operating System

4.4.4 Device Management

- OS manages and controls the devices attached to the computer.
- OS provides appropriate functionality to the application programs for controlling different aspects of the devices.
- The OS communicates with the I/O hardware via the device driver software.
- The device driver software comes along with each device.
- In addition to managing the peripheral devices, OS also provides various services related to I/O like I/O scheduling, buffering, spooling, and error handling.
- The device management tasks handled by OS are:-
  - Open, close and write device drivers, and
  - Communicate, control and monitor the device driver

- Buffer is a memory area that stores the data, while it is being transferred between two devices or between a device and an application.
- Spool is a buffer in memory area or disk where spooling stores the jobs in a spool which the device can access it when it is ready.

Operating System

4.4.5 Protection and Security

- Security refers to providing a protection system to computer system resources such as CPU, memory, disk, software programs and most importantly data/information stored in the computer system.
- If a computer program is run by an unauthorized user, then he/she may cause severe damage to computer or data stored in it. So a computer system must be protected against unauthorized access, malicious access to system memory, viruses, worms etc.
- Security mechanism prevents unauthorized access to the computer.
- Security concerns include - security of software, security of data stored in the computer, and security of physical resources of the computer.

Operating System

4.4.6 User Interface Or Command Interpreter

- The primary goal of operating system is to make the computer convenient for use by its user.
- It should allow users to easily access and communicate with the applications and the hardware.
- The users can interact with the computer by using mainly two kinds of interfaces—(1) Command Line Interface (CLI),
  (2) Graphical User Interface (GUI).
- CLI requires the user to interact with operating system in the form of text keyed in from the keyboard. In this, the user has to learn and remember the different commands required for copying, deleting, opening a file or folder etc.
- MS-DOS and Linux shell are examples of command line mode of interfaces.