OPERATING SYSTEMS

Textbook : Operating Systems Concepts by Silberschatz

CS 206 Operating systems

Course Outcomes: After the completion of the course the student will be able to

- CO1: Explain the relevance, structure and functions of Operating Systems in computing devices.
- CO2: Illustrate the concepts of process management and process scheduling mechanisms employed in Operating Systems.
- CO3: Explain process synchronization in Operating Systems and illustrate process synchronization mechanisms using Mutex Locks, Semaphores and Monitors
- CO4:Explain any one method for detection, prevention, avoidance and recovery for managing deadlocks in Operating Systems.
- CO5:Explain the memory management algorithms in Operating Systems.
- CO6:Explain the security aspects and algorithms for file and storage management in Operating Systems.

INTRODUCTION

- Every computer is composed of two basic components:
  - Hardware
  - Software
- **Hardware:** Computer hardware includes the physical parts of a computer, such as central processing unit (CPU), monitor, mouse, keyboard, computer data storage, graphics card, sound card, speakers and motherboard.
- **Software:** is a set of programs which enables the user to solve problems using computer

SOFTWARE

- The Software is set of instructions or programs written to carry out certain task on digital computers.
- Generally, there are two main classifications of software
  - System software
  - Application software

SYSTEM SOFTWARE

- System software: is a collection of system programs which aids the effective execution of general users computational requirements on a computer system.

  Eg: OS, linker , loader

- Application software: Application software or programs are used to solve some particular application problems.

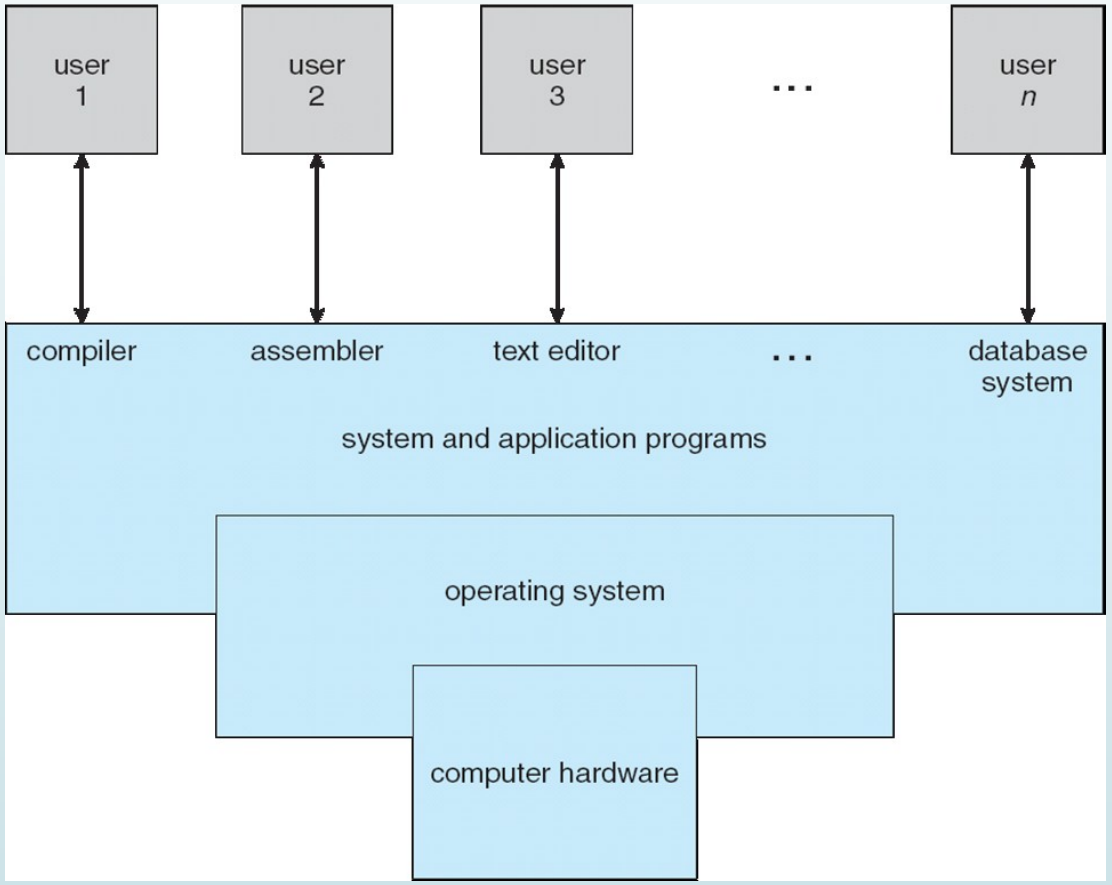
  E.g.: word processor ,spreadsheet, an accounting application etc.

COMPONENTS OF COMPUTER SYSTEMS

Computer system can be divided into four components:

- **Hardware** – provides basic computing resources
  - CPU, memory, I/O devices
- **Operating system**
  - Controls and coordinates use of hardware among various applications and users
- **System and Application programs** – define the ways in which the system resources are used to solve the computing problems of the users
  - Word processors, compilers, web browsers, database systems, video games
- **Users**
  - People, machines, other computers

Abstract view of the components of a computer system



OPERATING SYSTEM - A system software

OS takes care of effective and efficient utilization of hardware and software components of the computer system

- Act as an interface between the users and the system.
- Manages computer hardware and software resources
- Provides common services for computer programs.
- Provides an interface which is more user-friendly than the underlying hardware.
- Acts as an extended machine

  The operating system masks or hides the details of the hardware from the programmers and general users and provides a convenient interface for using the system. OS is the program that hides the truth about the hardware from the user and presents a nice simple view of named files that can be read and written

OPERATING SYSTEM

- An operating system (OS) is basically a collection of software that manages computer hardware resources and provides common services for computer programs. The operating system is a crucial component of the system software in a computer system.
- It also provides a basis for application programs and acts as an intermediary between the computer user and the computer hardware.
- The fundamental goal of computer systems is to execute user programs and to make solving user problems easier.
- The common functions of controlling and allocating resources for user programs are then brought together into one piece of software: the operating system.
- Most commonly used Operating systems for personal computers are

  Microsoft Windows, macOS,Linux

OPERATING SYSTEM

Basic Functions of Operating System:

The various functions of operating system are as follows:

1. Process Management:

- A program does nothing unless their instructions are executed by a CPU.A process is a program in execution. A time shared user program such as a complier is a process. A word processing program being run by an individual user on a pc is a process.
- A system task such as sending output to a printer is also a process. A process needs certain resources including CPU time, memory files & I/O devices to accomplish its task.
- These resources are either given to the process when it is created or allocated to it while it is running.

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The OS is responsible for the following activities of process management.

- Creating & deleting both user & system processes.
- Suspending & resuming processes.
- Providing mechanism for process synchronization.
- Providing mechanism for process communication.
- Providing mechanism for deadlock handling.

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2. Main Memory Management:

The OS is responsible for the following activities in connection with memory management.

- Keeping track of which parts of memory are currently being used & by whom.
- Deciding which processes are to be loaded into memory when memory space becomes available.
- Allocating &deallocating memory space as needed.

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3. File Management:

For convenient use of computer system the OS provides a uniform logical view of information storage. The OS abstracts from the physical properties of its storage devices to define a logical storage unit the file. A file is collection of related information defined by its creator. The OS is responsible for the following activities of file management.

- Creating & deleting files.
- Creating & deleting directories.
- Supporting primitives for manipulating files & directories.
- Mapping files into secondary storage.
- Backing up files on non-volatile media.

Operating system

4. I/O System Management:

- OS keeps track of the devices,
- Decides who should get how much time and when the devices
- Allocate the device and initiate the I/O operations
- Reclaim the resource(device)

5. Secondary Storage Management:

- Most modern computer systems are disks as the storage medium to store data & program. The operating system is responsible for the following activities of disk management.
- Free space management.
- Storage allocation.
- Disk scheduling

Because secondary storage is used frequently it must be used efficiently.

OPERATING SYSTEM

Protection or security:

- If a computer system has multi users & allow the concurrent execution of multiple processes then the various processes must be protected from one another‘s activities.
- For that purpose, mechanisms ensure that files, memory segments, CPU & other resources can be operated on by only those processes that have gained proper authorization from the OS.