Operating System
CS 3201
Introduction

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January 11, 2022

Why Take This Course?[1]

- Computers are everywhere; a general user may not bother about the way they work and providing you various services through myriad applications and the underlying hardware.
- It is prudent to know about the controlled interaction between the user, user applications and the hardware through the intermediary – the Operating System (OS)

[1] It is included in the syllabus and there is no alternative till date

What is an operating system?

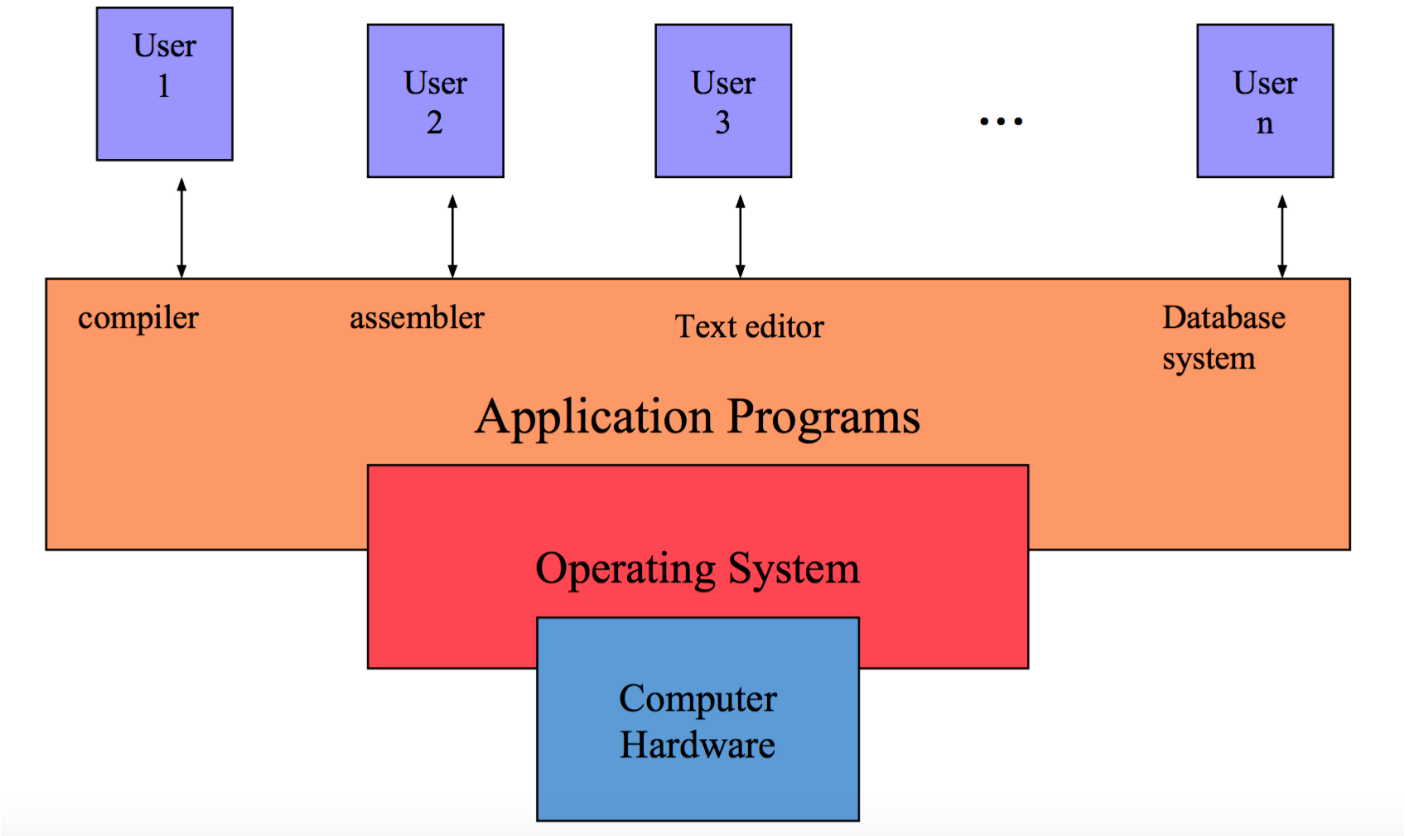
OS is the software that acts an intermediary between the user, applications and computer hardware. OS objectives/goals are:

- Providing an environment for easy executing of the user commands and applications
- Using the hardware resources in an optimized way yet maintaining a high througput

Computer System Components

- Hardware
  - Provides basic computing resources (CPU, memory, I/O devices).
- Operating System
  - Controls and coordinates the utilisation of hardware resources among application programs
- Application Programs
  - Anything that the user wants to execute in a computing system such as compilers, database systems, video games, business programs like banking software.
- Users
  - People, machines, other computers

Abstract View of System



System Program

Other than the core part of the OS – known to be the *kernel* various low level programs that help forming a bridge between the user applications and the OS are known to be the system programs. They may be divided into the following:

- File manipulation (copy, rename, create, delete etc)
- Status information (date, time, disk space, logged in users)
- Programming support (debugger)
- Program loading and executing (loaders and linkers)
- Communication (Web browsers – to communicate and acess information from the network)
- Provides a wide range of services like database, compilers, word processors spreadsheets, games and so on

Note that in modern systems the distinction between users application and application programs are getting blurred. For example compilers are considered user application.

Operating system Tasks

The OS manages many things; primarily i) Process; ii) Memory; iii) File system; iv) I/O system and v) Protection plus Security

- i) Process management
  - A program in execution is called a process
  - The process needs resources such as CPU, Memory, Files and I/O devices to complete its task.
  - Operating System allocates the resources needed.
  - When the process terminates, Operating system reclaims the resources.

  The process management responsibilities inlcude
  - Creates and deletes both user and system processes
  - Allocates and de-allocates the processor
  - Suspends and resumes processes
  - Provides mechanisms for process synchronization, process communication and deadlock handling

Operating system Tasks ... contd.

The main resource of a computing system (other than the processor) is the main memory. So, managing the main memory has to be a major responsibiliy of the OS

- ii) Memory Management
  When the program is being executed, it must be in memory. The memory management schemes are used to improve the CPU utilization and speed of the computer system. The responsibilities of the OS in this respect includes
  - Keeps track of which parts of memory are being used.
  - Decides which process will get the memory and which process will move out of the memory.
  - Based on process requirement, it allocates and de-allocates the memory space.

Operating system Tasks ... contd.

- iii) File system management

File is the collection of related information. In general, file is organized into directories for easy to access and use. Operating system may manage file sytem or allow other file management systems to do the work Operating system has the following File system management responsibilities:

- Creation and deletion files and directories.
- Support to manipulating files and directories.
- Maps the files onto secondary storage.
- Back up the files on stable storage media

Operating system Tasks ... contd.

- iv) I/O system Management

Operating system hides the typical feature of specific hardware devices from the user. Operating system manages the hardware devices with their corresponding driver. The OS provides an uniform view of the I/O devices Operating system has the following I/O system management responsibilities:

- Monitors all devices.
- Allocates the device when the process is needed.
- De-allocates the device when the process is no longer needed.

Operating system Tasks ... contd.

- v) Protection and Security

Operating system is responsible to provide protection and security for the resources defined by a computer system.

- Protection
  - Protection is a mechanism for controlling the access of processes or users to the resources that are available by the computer system.
  - Protection improves system reliability

A system may have enough access protection, but still inappropriate access is possible. To handle this situation, Operating system also takes care of security.

- The main job of security is to prevent the system from external and internal attacks.
- Most of the attacks are prevented by an operating system and others will be prevented by additional measures.