Al-Mustaqbal University
College Of Engineering Technology
Department Of Cyber Security Techniques Engineering
Class: 1st
Subject: Computer software
Lecturer: Dr. Zainab Abdullah Jasim
1st term – Lecture5-1

➢ Difference Between System Software and Application Software

Now, let us discuss some difference between system software and application software:

System Software	Application Software
It is designed to manage the resources of the computer system, like memory and process management, etc.	It is designed to fulfill the requirements of the user for performing specific tasks.
Written in a low-level language.	Written in a high-level language.
Less interactive for the users.	More interactive for the users.
System software plays vital role for the effective functioning of a system.	Application software is not so important for the functioning of the system, as it is task specific.
It is independent of the application software to run.	It needs system software to run.
Example: System software is an operating system, etc.	Example: Application software is Photoshop, VLC player, etc.

both these system software and application software are integral parts of Computer System. Each of them have a different and unique role.

Operating Systems Overview

An Operating System(OS) is a software that manages and handles hardware and software resources of a computing device.

- Manages computer resources such as CPU, memory, and files
- Acts as an interface between user and hardware

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- Performs core functions like process, memory, and file management
- Organizes system resources similar to different departments in a government
- Examples include Linux, Unix, Windows 11, MS-DOS, Android, macOS, and iOS. Figure 1 explain the functions of operating system .

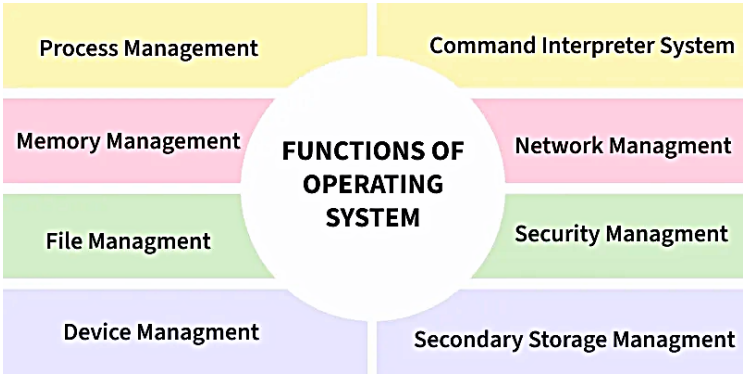

Figure 1 functions of operating system

Operating System and User Interaction

Every general-purpose computer consists of hardware, an operating system, system programs and application programs.

- The hardware includes CPU, ALU, memory, I/O devices, peripheral devices and storage devices.
- The system programs include compilers, loaders, editors and the OS itself.
- The application programs are user-level software that perform specific tasks.

Figure 2 show layered architecture of a computer system.

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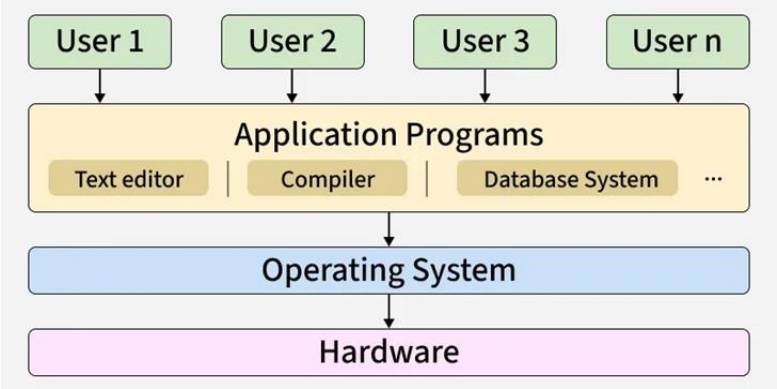

Figure 2 layered architecture of a computer system

An operating system is always running in the background to manage and coordinate the use of hardware resources among system and application programs for multiple users.

Components operating system

The components of an operating system are designed to ensure that various parts of a computer function cohesively. All user software must interact with the operating system to access hardware.

Kernel

A **kernel** is the core program of a computer's operating system and has complete control over the system. It is always resident in memory and is responsible for managing interactions between hardware and software components. The kernel controls hardware resources such as CPU, memory, input/output devices, and storage through device drivers, and it resolves conflicts between processes competing for these resources.

On most systems, the kernel is one of the first programs loaded during startup, after the bootloader. It manages system startup, memory allocation, peripherals, and I/O requests by translating them into instructions executed by the CPU.

The kernel also provides **protection and isolation** between applications and users. This protection improves system dependability and security by

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preventing errors in one program from affecting others, limiting the capabilities of malicious software, and ensuring fair use of system resources. Operating systems typically operate in two modes: **user mode**, where programs are restricted, and **kernel mode**, where the kernel has unrestricted access to system resources.

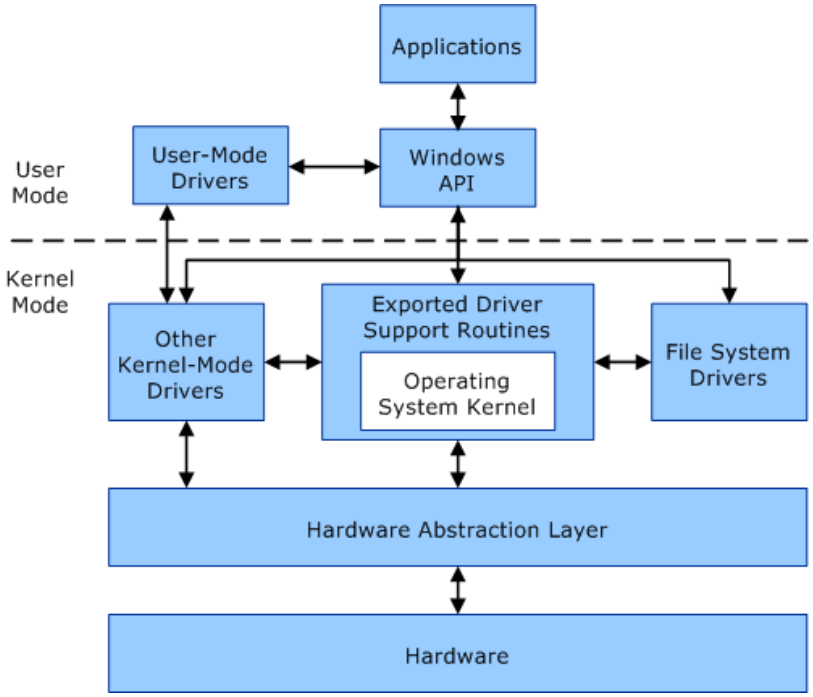

Figure 3 Windows System Architecture (User Mode and Kernel Mode)

There is no single universal definition of an operating system, but generally it includes the **kernel**, which is the core program running at all times. The kernel handles essential tasks such as process scheduling, memory management, and device control. Other system programs and applications run on top of the kernel.

Operating System Services

Operating systems provide an environment for execution of programs

and services to programs and users

■ One set of operating-system services provides functions that are

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helpful to the user:

● **User interface**

- Almost all operating systems have a user interface (**UI**).

Varies between **Command-Line (CLI) (e.g., Bash, PowerShell), Graphics User Interface (GUI) (e.g., Windows desktop, macOS Finder).**

● **Program execution**

- The system must be able to load a program into memory and to run that program, end execution, either normally or abnormally (indicating error).

● **I/O operations**

- A running program may require I/O, which may involve a file or an I/O device.

One set of operating-system services provides functions that are helpful to the user :

● **File-system manipulation**

- The file system is of particular interest. Programs need to read and write files and directories, create and delete them, search them, list file Information, permission management.

● **Communications**

– Processes may exchange information, on the same computer or between computers over a network

- Communications may be via shared memory or through message passing (packets moved by the OS)

● **Error detection** – OS needs to be constantly aware of possible errors

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- May occur in the CPU and memory hardware, in I/O devices, in user program
- For each type of error, OS should take the appropriate action to ensure correct and consistent computing.