

1.8 OPERATING SYSTEM OVERVIEW: OBJECTIVES AND FUNCTIONS

Operating system acts an interface between applications and the computer hardware.

It can be thought of as having three objectives:

- Convenience
- Efficiency
- Ability to evolve

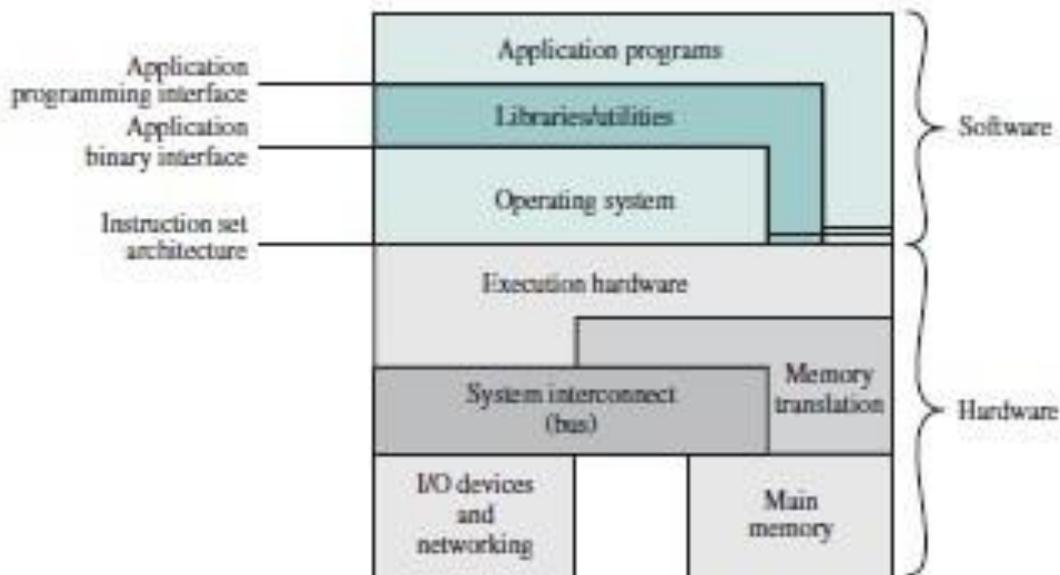
1.8.1 The Operating System as a User/Computer Interface

- The hardware and software used in providing applications to a user can be viewed in a layered or hierarchical fashion, as in Figure.
- The user of those applications, the end user, generally is not concerned with the details of computer hardware.
- Thus, the end user views a computer system in terms of a set of applications.
- An application can be expressed in a programming language and is developed by an application programmer.
- A set of system programs referred to as utilities implement frequently used functions that assist in program creation, the management of files, and the control of I/O devices.

The OS typically provides services in the following areas:

- **Program development:** The OS provides a variety of facilities and services, such as editors and debuggers, to assist the programmer in creating programs.
- **Program execution:** A number of steps need to be performed to execute a program. Instructions and data must be loaded into main memory, I/O devices and files must be initialized, and other resources must be prepared. The OS handles these scheduling duties for the user.
- **Access to I/O devices:** The OS provides a uniform interface that hides inner details so that programmers can access I/O devices using simple reads and writes.
- **Controlled access to files:** In the case of a system with multiple users, the OS provides a protection mechanism to control access to the files.
- **System access:** For shared or public systems, the OS controls access to the system as a whole and to specific system resources.

- **Error detection and response:** A variety of errors can occur while a computer system is running. In each case, the OS must provide a response that clears the error condition with the least impact on running applications.
- **Accounting:** A good OS will collect usage statistics for various resources and monitor performance parameters such as response time.



Three key interfaces in a typical computer system:

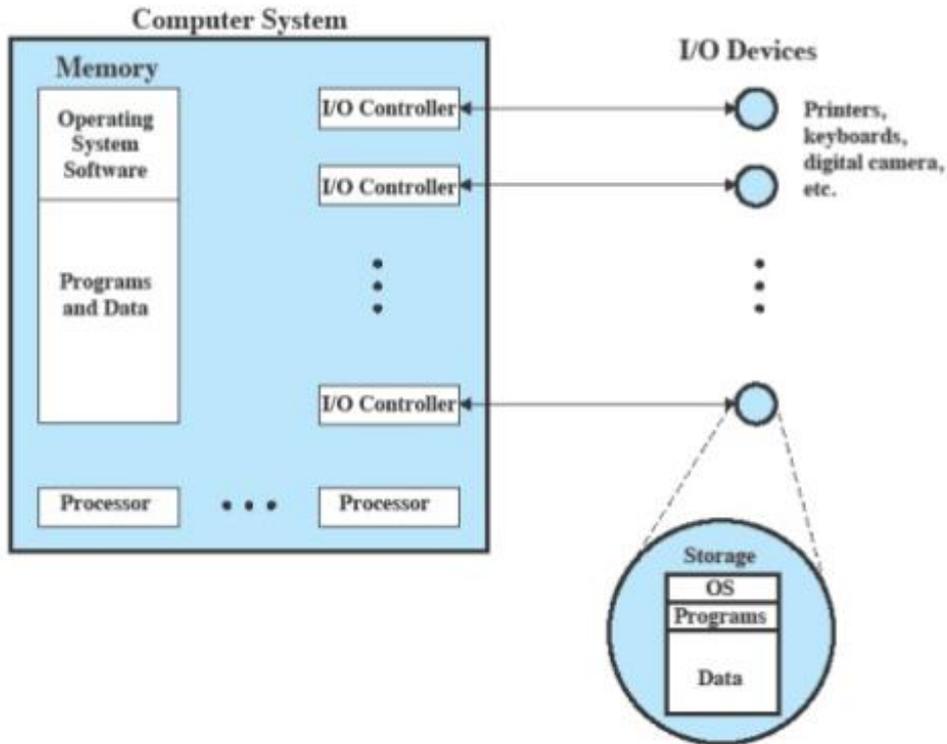
Instruction set architecture (ISA) : The ISA defines the collection of machine language instructions that a computer can follow. This interface is the boundary between hardware and software.

Application binary interface (ABI) : The ABI defines a standard for binary portability across programs. The ABI defines the system call interface to the operating system and the hardware resources and services available in a system through the user ISA.

Application programming interface (API) : The API gives a program access to the hardware resources and services available in a system through the user ISA supplemented with high-level language (HLL) library calls.

1.8.2 The Operating System as Resource Manager

- A computer is a set of resources for the movement, storage, and processing of data and for the control of these functions.
- The OS is responsible for managing these resources.



Control mechanism is unusual in two respects:

- The OS functions in the same way as ordinary computer software; that is, it is a program or suite of programs executed by the processor.
- The OS frequently relinquishes control and must depend on the processor to allow it to regain control.

1.8.3 Ease of Evolution of an Operating System

A major OS will evolve over time for a number of reasons:

- Hardware upgrades plus new types of hardware
- New services
- Fixes