Chapter 1: Introduction

Chapter 1: Introduction

- What Operating Systems Do
- Computer-System Organization
- Computer-System Architecture
- Operating-System Structure
- Operating-System Operations
- Process Management
- Memory Management
- Storage Management
- Protection and Security
- Kernel Data Structures
- Computing Environments
- Open-Source Operating Systems

Objectives

- To describe the basic organization of computer systems

- To provide a grand tour of the major components of operating systems

- To give an overview of the many types of computing environments

- To explore several open-source operating systems

Computer System Structure

- 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
  - **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
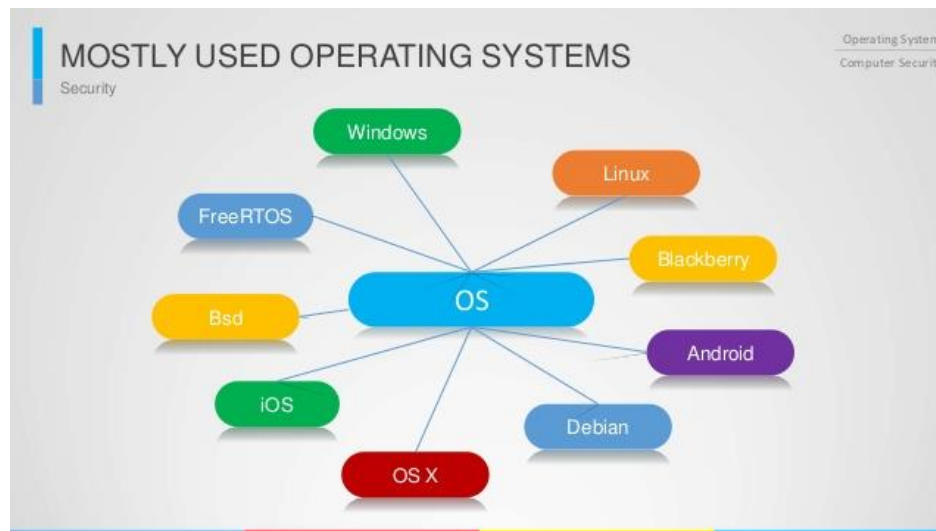 - **Users**
    - People, machines, other computers

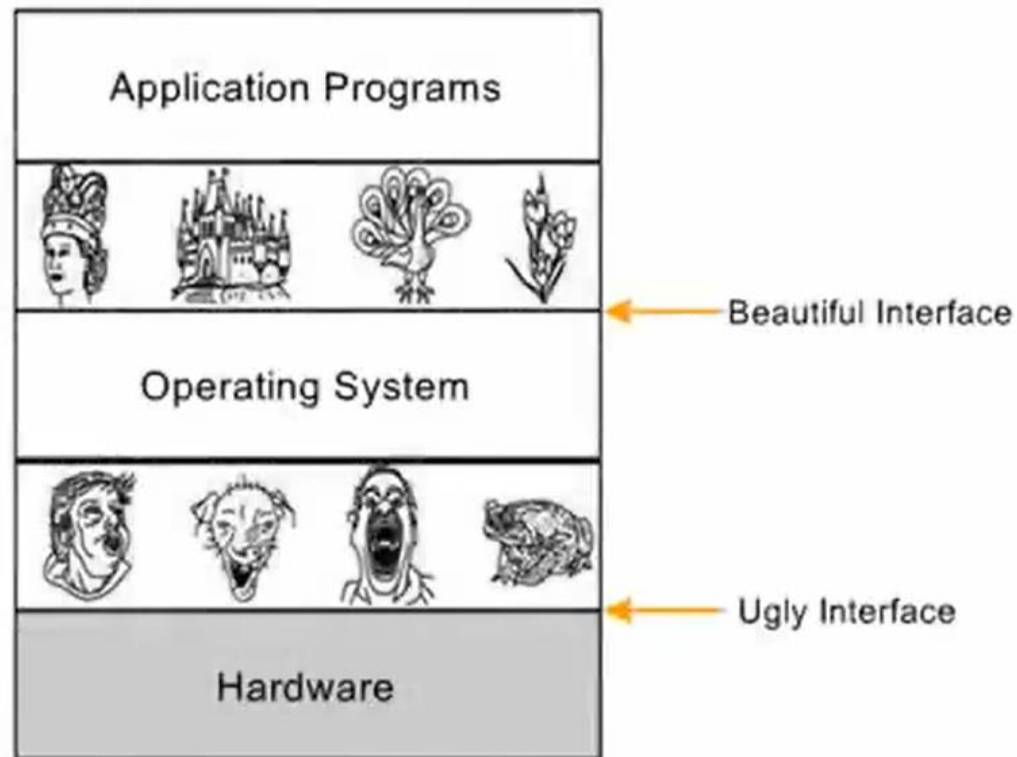# Four Components of a Computer System
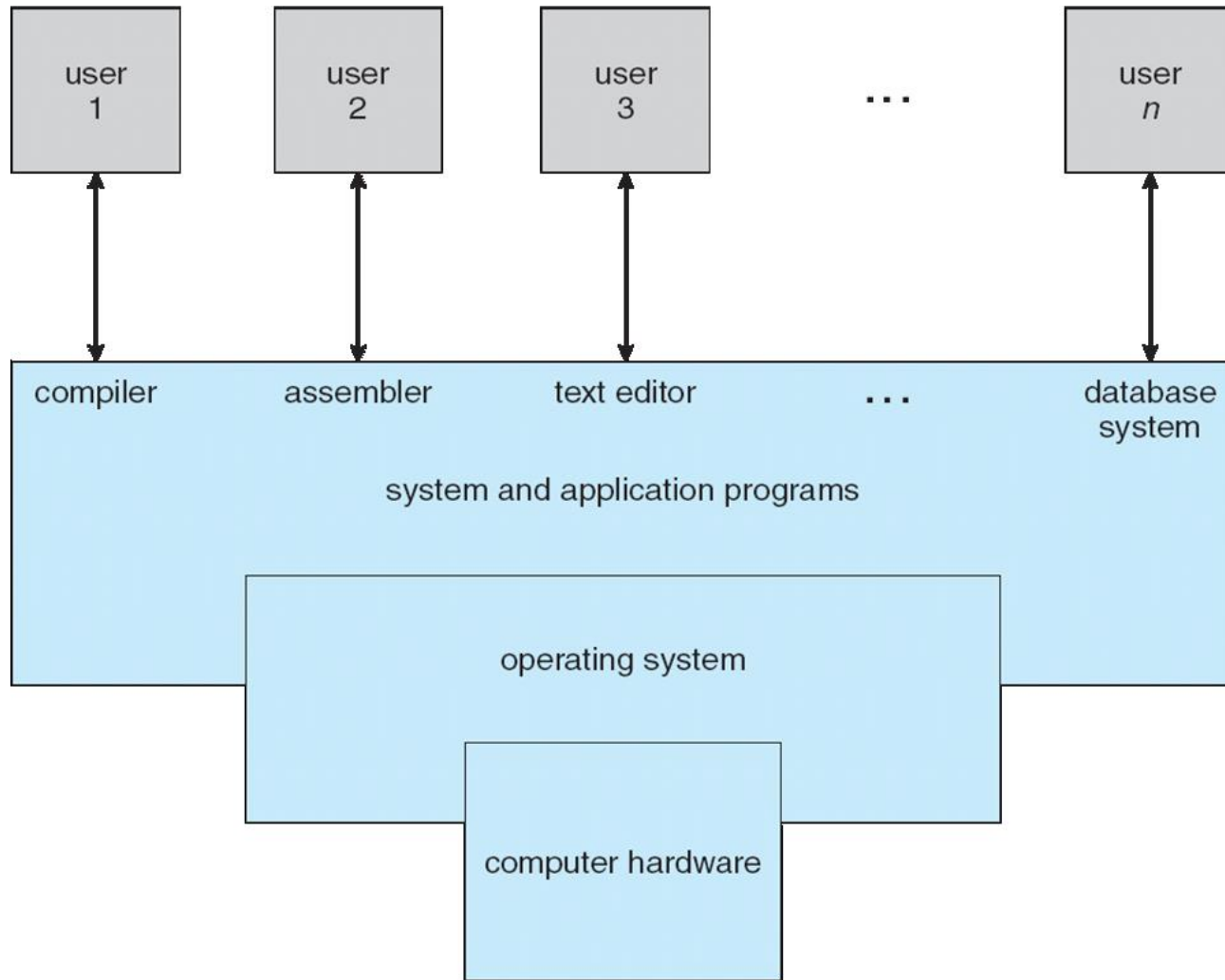
What is an Operating System?

What is an Operating System?

An **operating system** is a program that manages a computer's hardware. It also provides a basis for application programs and acts as an intermediary between the computer user and the computer hardware.

What is an Operating System?

- **Operating system goals:**
  - Execute user programs and make solving user problems easier
  - Make the computer system convenient to use
  - Use the computer hardware in an efficient manner

What Operating System Do?

User View

- Users want convenience, **ease of use** and **good performance.**

  ➢ Don't care about **resource utilization.**

- But shared computer such as mainframe or minicomputer must keep all users happy.

What Operating System Do?

System View

- From the computer's point of view, the operating system is the program most intimately involved with the hardware. In this context, we can view an operating system as a **resource allocator**.

- A computer system has many resources that may be required to solve a problem: CPU time, memory space, file-storage space, I/O devices, and so on. The operating system acts as the **manager** of these **resources**.

What Operating System Do?

- OS is a **resource allocator**

- Manages all resources

  - Decides between conflicting متضاربه requests for efficient and fair resource use (organize priority of program execution)

- OS is a **control program**

  - Controls execution of programs to prevent errors and improper use of the computer

  (give warning)

What Operating System Do?

- "The one program running at all times on the computer" is the **kernel**.

…(as human heart)

- Everything else is either

  - a system program (ships with ضمن موجود the operating system) , or

  - an application program.(shapes differ from one OS to another)

  - (Along with the kernel, there are two other types of programs: **system programs**, which are associated with the operating system but are not necessarily part of the kernel, and **application programs**, which include all programs not associated with the operation of the system.)

Computer System Organization

- Computer-system operation

  - One or more CPUs, device controllers connect through common bus **providing access to shared memory**

  - Concurrent execution of CPUs and devices competing for memory cycles

  - Each part can deal with and save in the memory then the other part can call from the memory
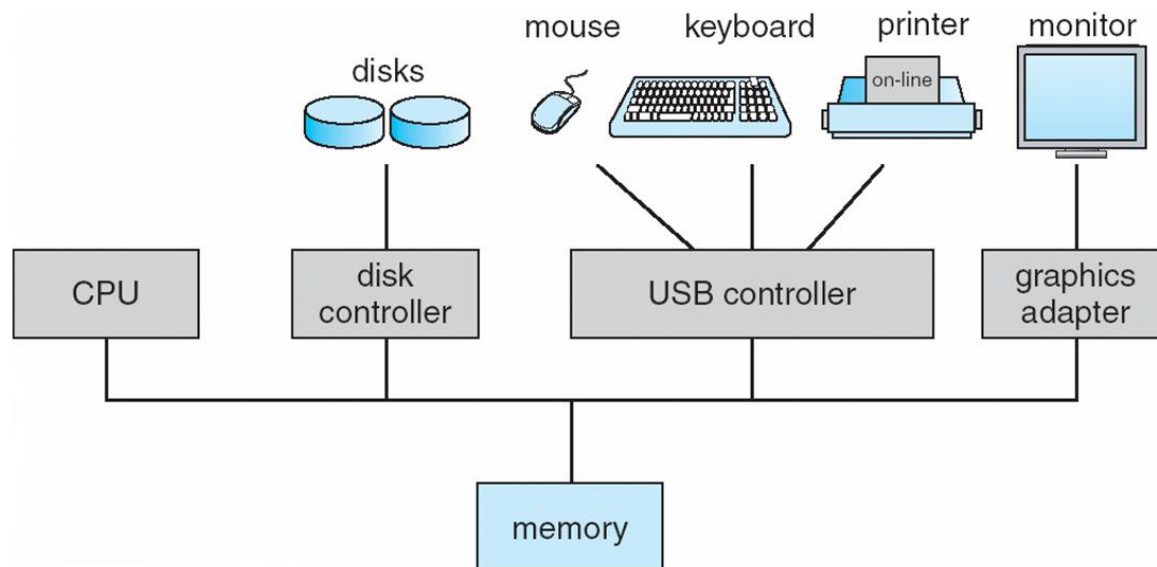
Computer Startup

- **bootstrap program** is loaded at power-up or reboot

    - Typically stored in ROM or EPROM, generally known as **firmware**

    - Initializes all aspects of system

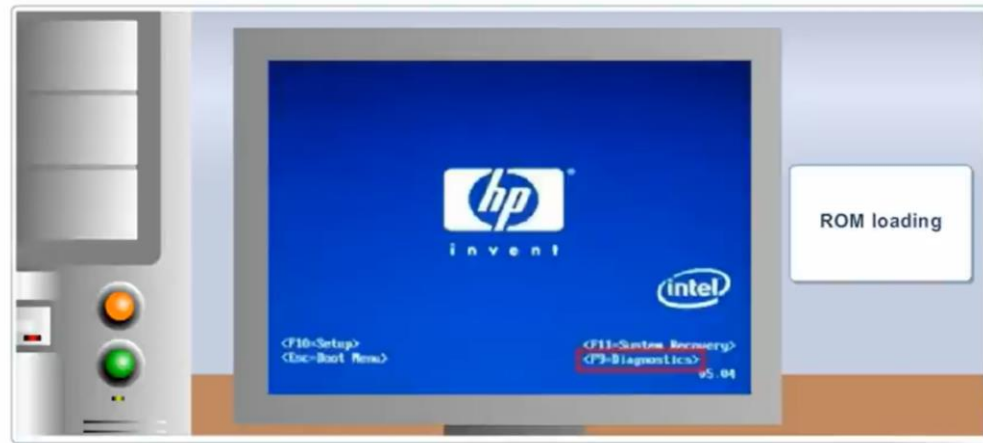   - Loads operating system kernel and starts execution

    ROM is the company memory can not change associated with storage….Every thing can be loaded using RAM which associated with running.

Computer Startup

During the picture appearance, the kernel is loading from the memory RAM

Common Functions of Interrupts

- Interrupt transfers control to the interrupt service routine generally, through the **interrupt vector**, which contains the addresses of all the service routines

- Interrupt architecture must save the address of the interrupted instruction

- A **trap** or **exception** is a software-generated interrupt caused either by an error or a user request

- An operating system is **interrupt driven**

Common Functions of Interrupts

- The occurrence of an event is usually signaled by an **interrupt** from either the hardware or the software.

  - ➤ Hardware may trigger an interrupt at any time by sending a signal to the CPU, usually by way of the system bus.

  - ➤ Software may trigger an interrupt by executing a special operation called a **system call** (also called a **monitor call**).

- Interrupts are an important part of a computer architecture. Each computer design has its own interrupt mechanism, but several functions are common.