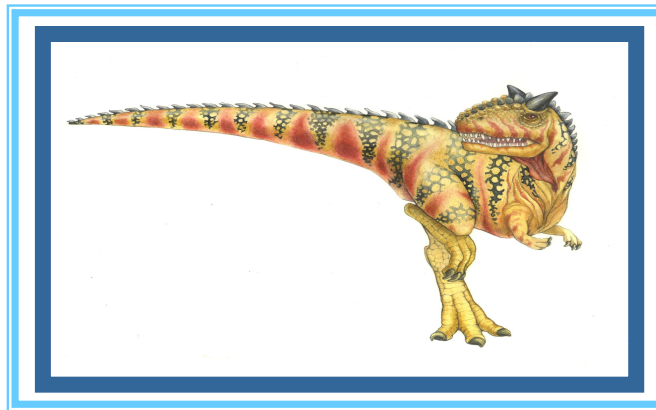
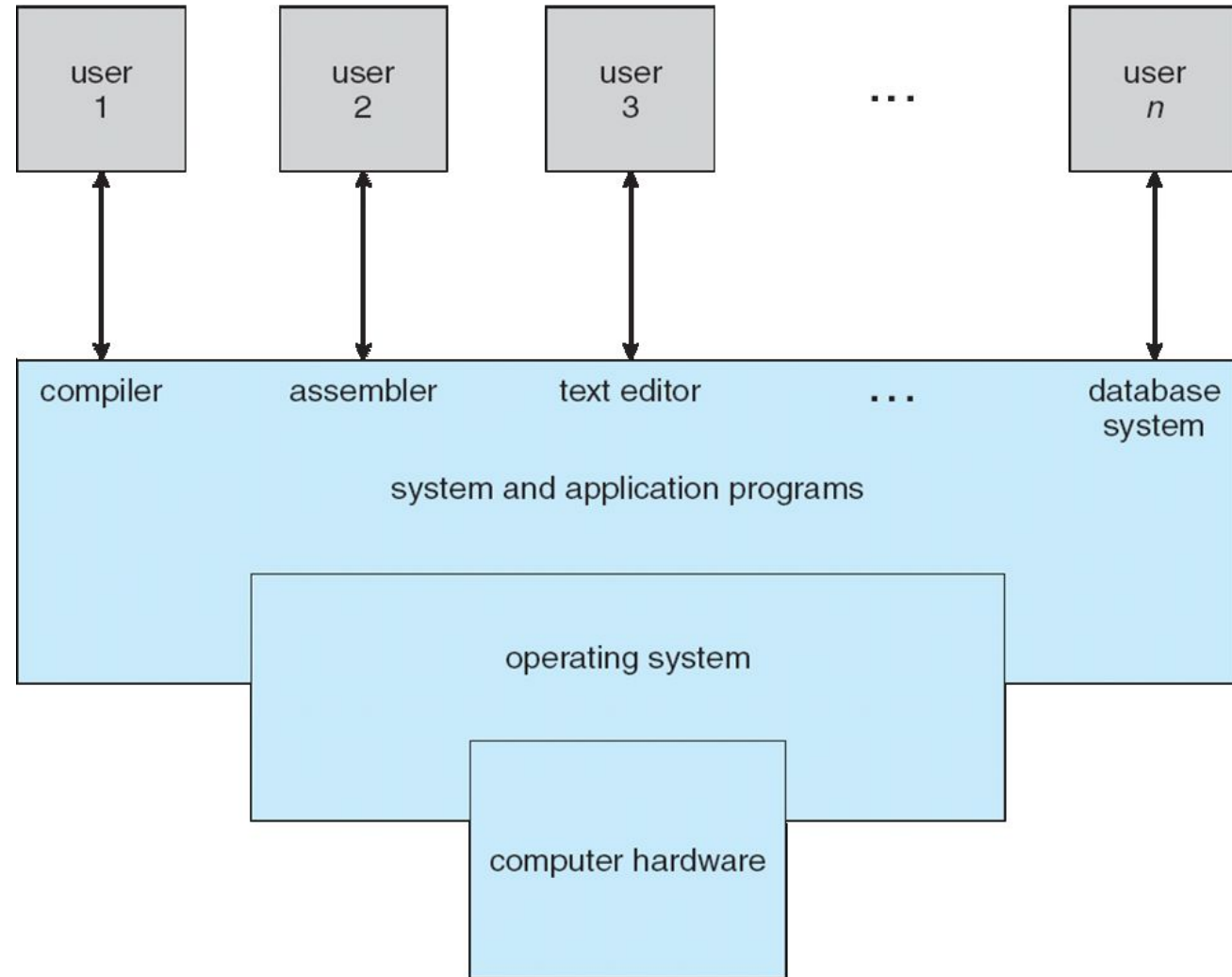


Chapter 1: Introduction



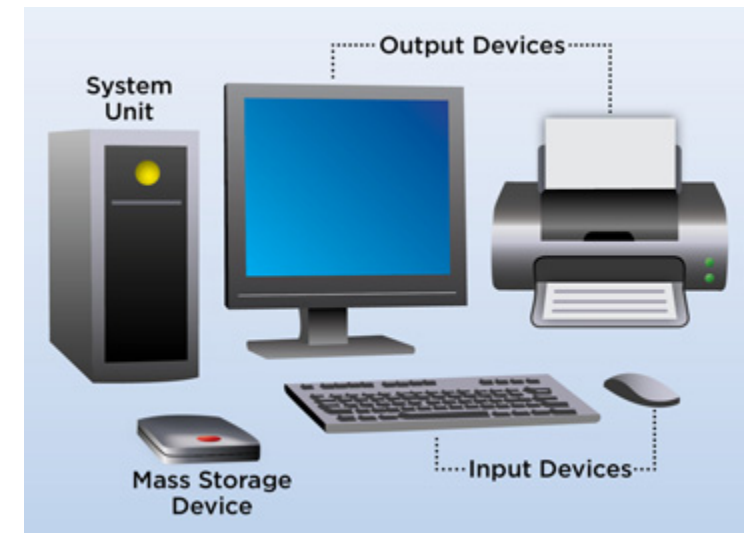
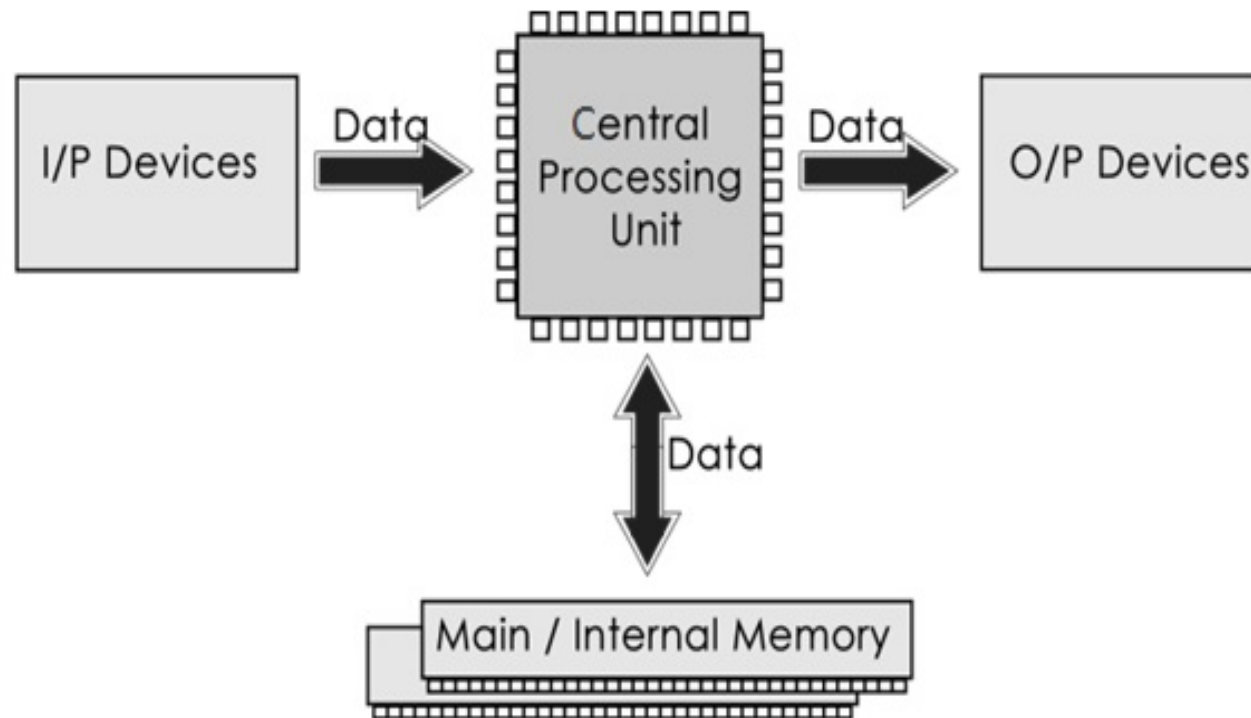


Computer System Architecture



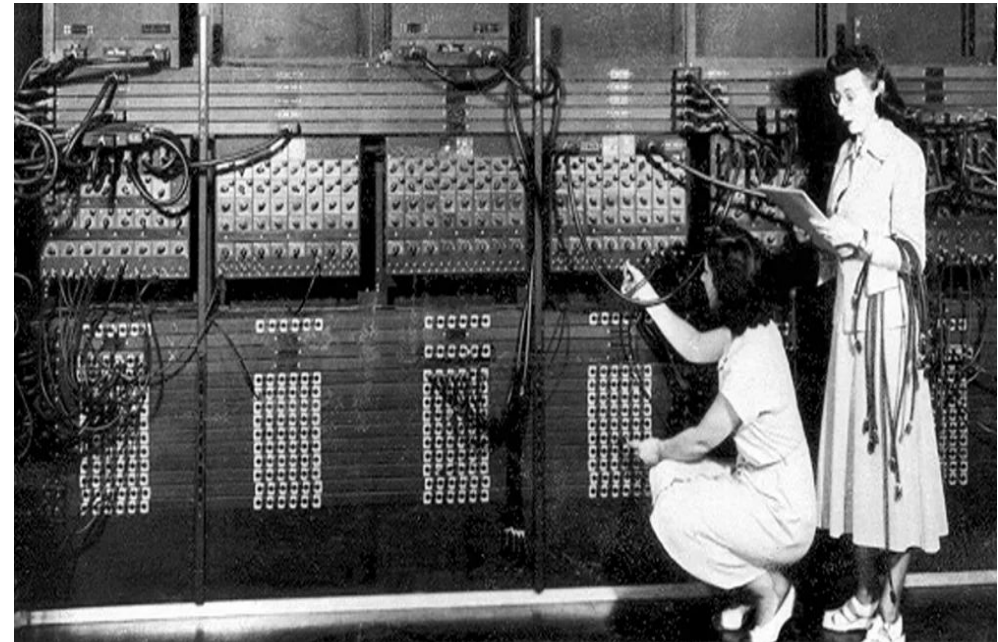
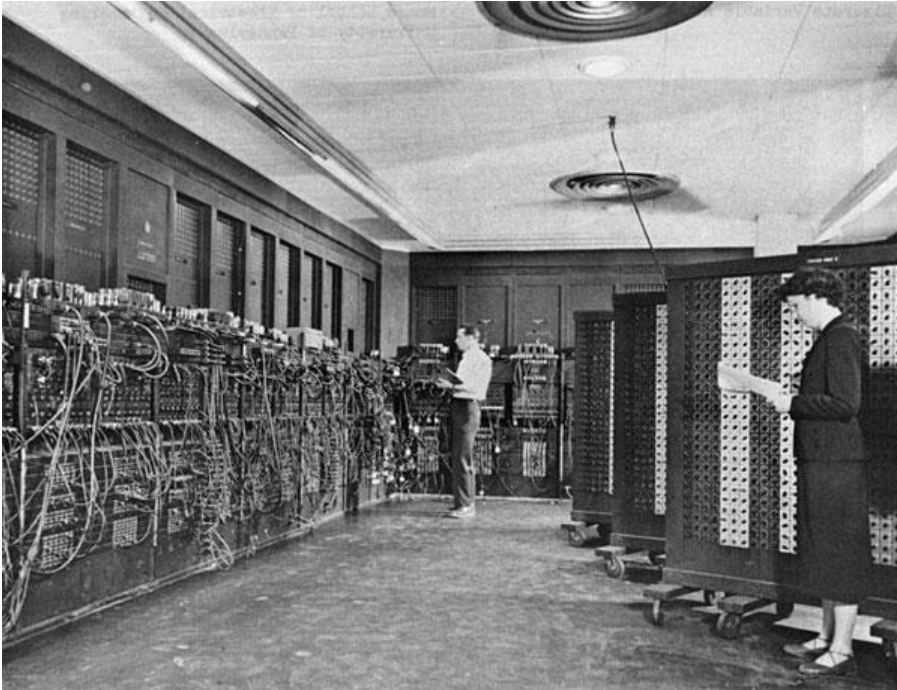


Components of a Computer System





First Computers





Role of an Operating System

- Manages Hardware
- Basis for application programs
- Act as an intermediary between computer Hardware and applications users.
- Provides the means for the proper use of the resources (Hardware, Software, Data) in the operation of the Computer system.





Definition of Operating Systems





What Operating Systems do

- Personal Computer
 - Users want convenience, **ease of use** and **good performance**
 - Don't care about **resource utilization**
- Shared Computer such as **mainframe** or **minicomputer**
 - Must keep all users happy
- Dedicate systems such as **workstations**
 - Users have dedicated resources but frequently use shared resources from **servers**
- Handheld computers such as **smart phones**
 - Handheld computers are resource poor, optimized for usability and battery life
- Embedded Computers
 - Have little or no user interface





What Operating Systems do

- OS is a **resource allocator**
 - Manages all resources
 - Decides between conflicting requests for efficient and fair resource use
- OS is a **control program**
 - Controls execution of programs to prevent errors and improper use of the computer





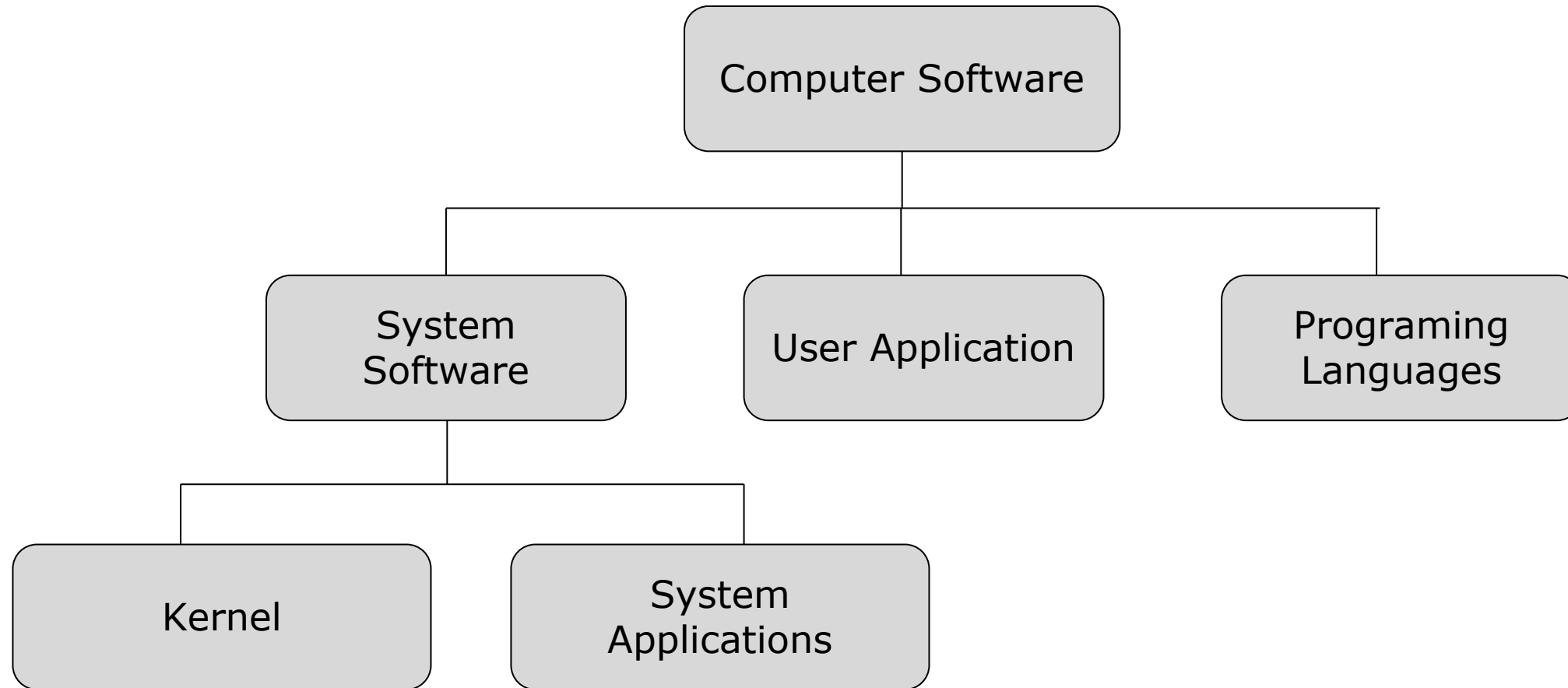
What is an Operating System?

- An operating system is the one program running all the time on a computer, acts as an intermediary between users and hardware, and provides ease of use and good performance by ensuring proper utilization of the resources.





Computer Software



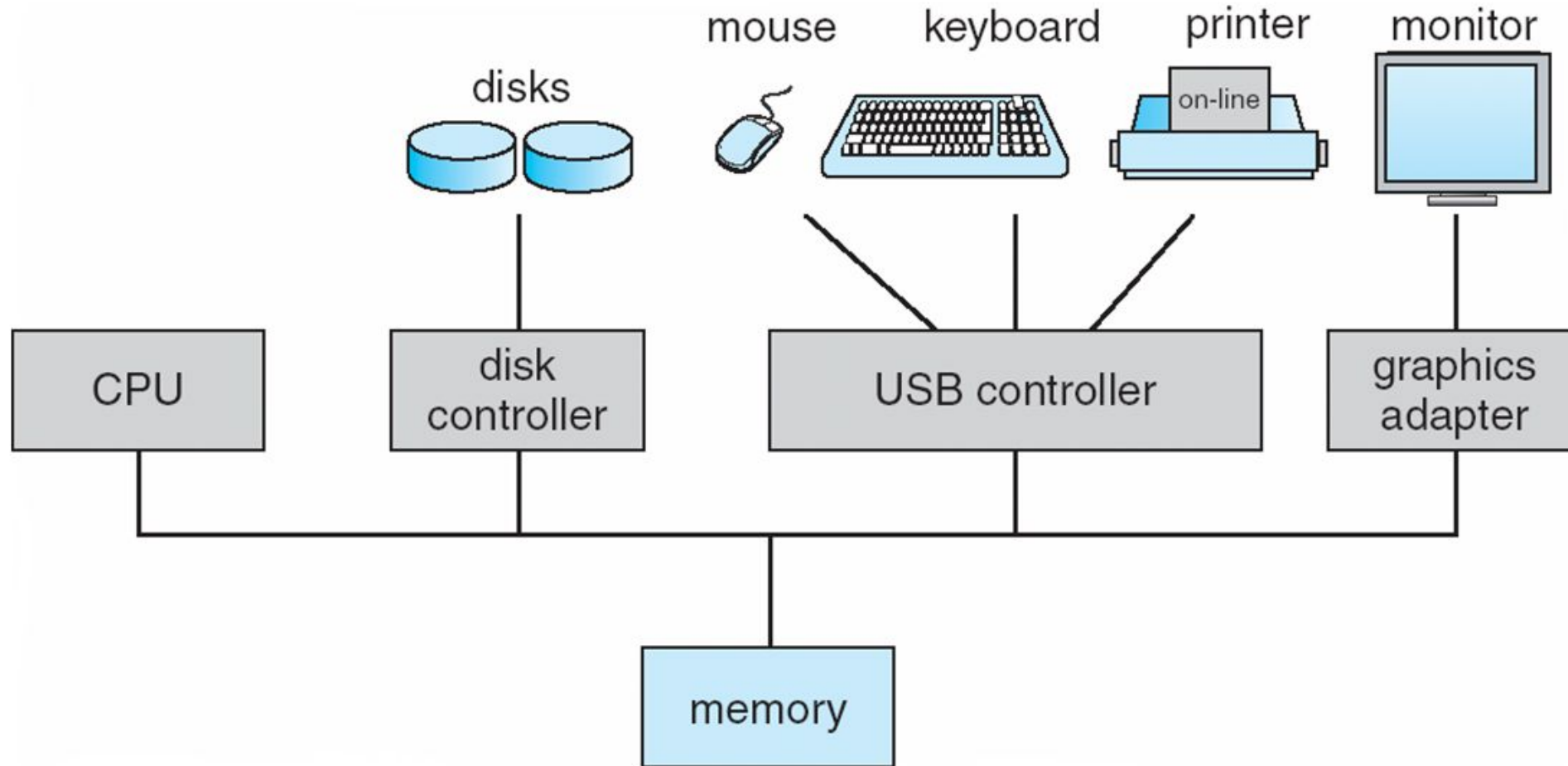


Computer System Operation





Computer System Organization





Computer Startup

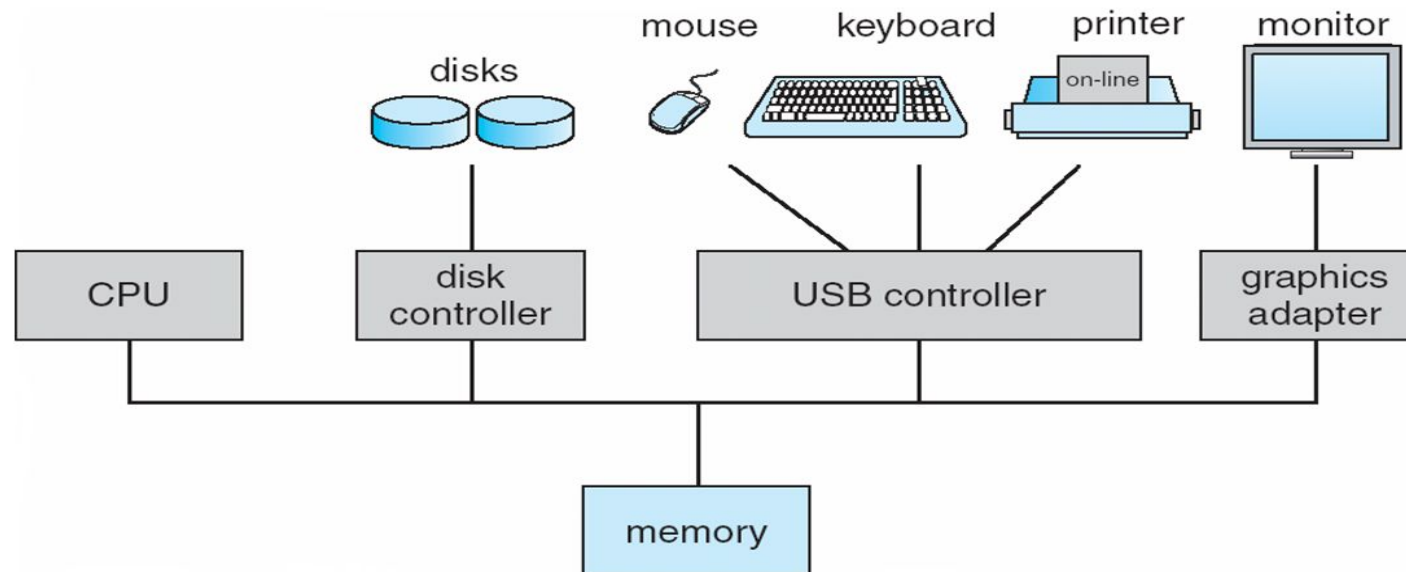
- **bootstrap program** is loaded at power-up or reboot
 - Typically stored in ROM or EPROM, generally known as **firmware**
 - Initializes all aspects of system
 - Loads operating system kernel and starts execution





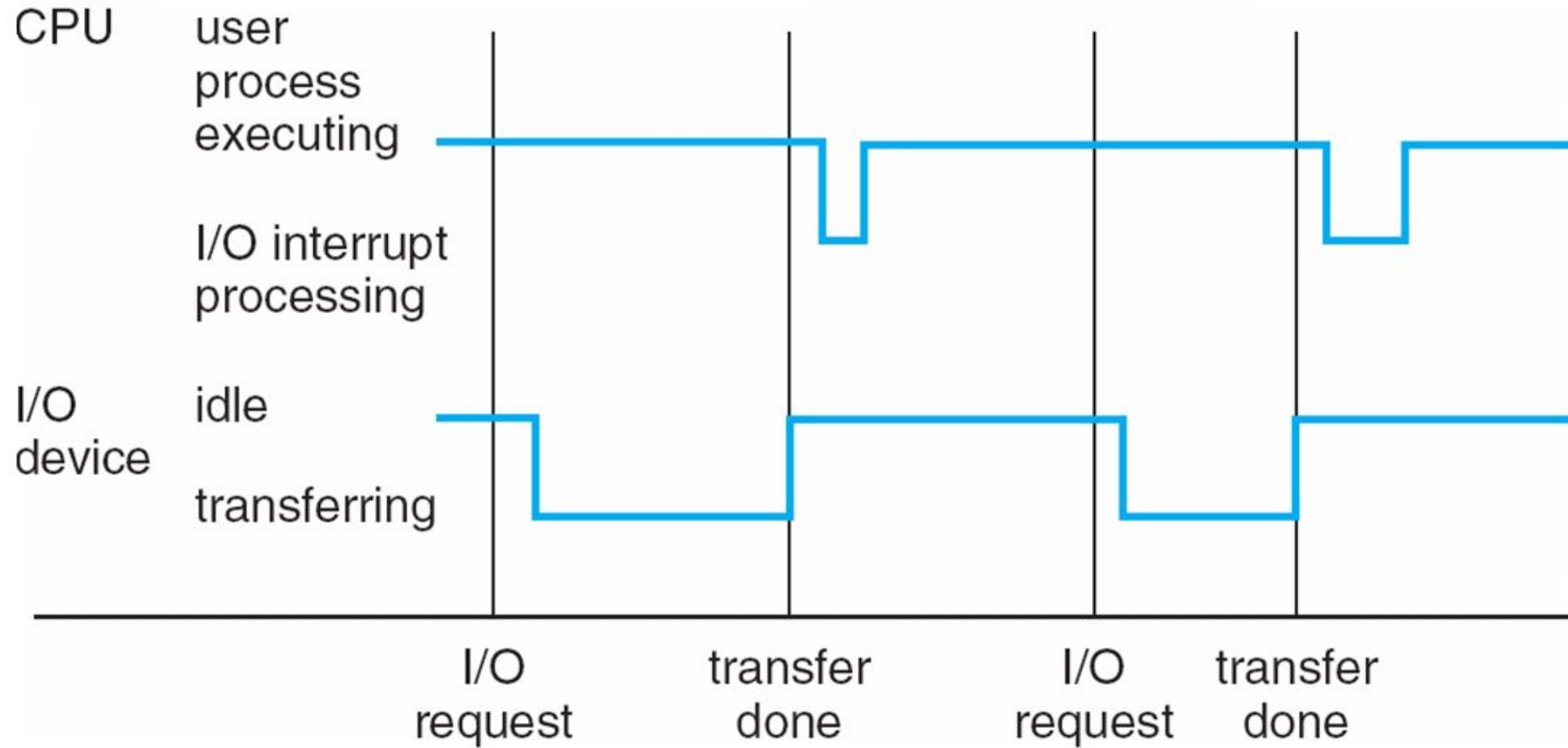
Computer System Operation

- I/O devices and the CPU can execute concurrently
- Each device controller is in charge of a particular device type
- Each device controller has a local buffer
- CPU moves data from/to main memory to/from local buffers
- I/O is from the device to local buffer of controller
- Device controller informs CPU that it has finished its operation by causing an **interrupt**





Interrupt Timeline





Storage Structure

- Main memory – only large storage media that the CPU can access directly
 - **Random access**
 - Typically **volatile**
- Secondary storage – extension of main memory that provides large **nonvolatile** storage capacity
- Hard disks – rigid metal or glass platters covered with magnetic recording material
 - Disk surface is logically divided into **tracks**, which are subdivided into **sectors**
 - The **disk controller** determines the logical interaction between the device and the computer
- **Solid-state disks** – faster than hard disks, nonvolatile
 - Various technologies
 - Becoming more popular





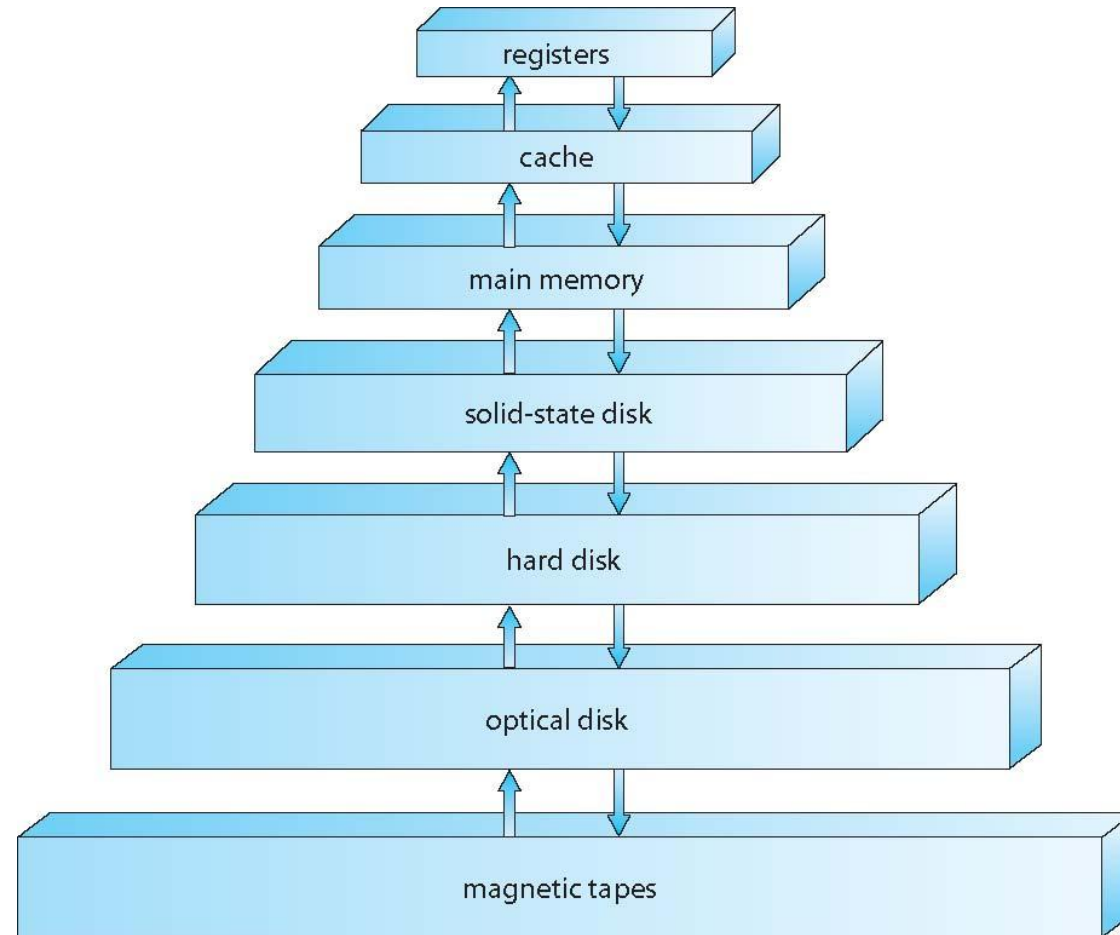
Storage Hierarchy

- Storage systems organized in hierarchy
 - Speed
 - Cost
 - Volatility





Storage-Device Hierarchy





Caching

- Information in use copied from slower to faster storage temporarily
- **Caching** – copying information into faster storage system; main memory can be viewed as a cache for secondary storage
- Faster storage (cache) checked first to determine if information is there
 - If it is, information used directly from the cache (fast)
 - If not, data copied to cache and used there
- Cache smaller than storage being cached
 - Cache management important design problem
 - Cache size and replacement policy





Thank You

