

Introduction to Operating Systems

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Lecture Objectives

- Understand what an Operating System (OS) is.
- Describe the basic functions of an OS.
- Recognize different types of operating systems.
- Appreciate the role of the OS in computer system architecture.
- Get an overview of OS evolution and examples.

Computing System

- Basic purpose of any computing system is to perform computation on input data and generate results.
- At its core a computing system is comprised of hardware, software and data.

Computer System Organization

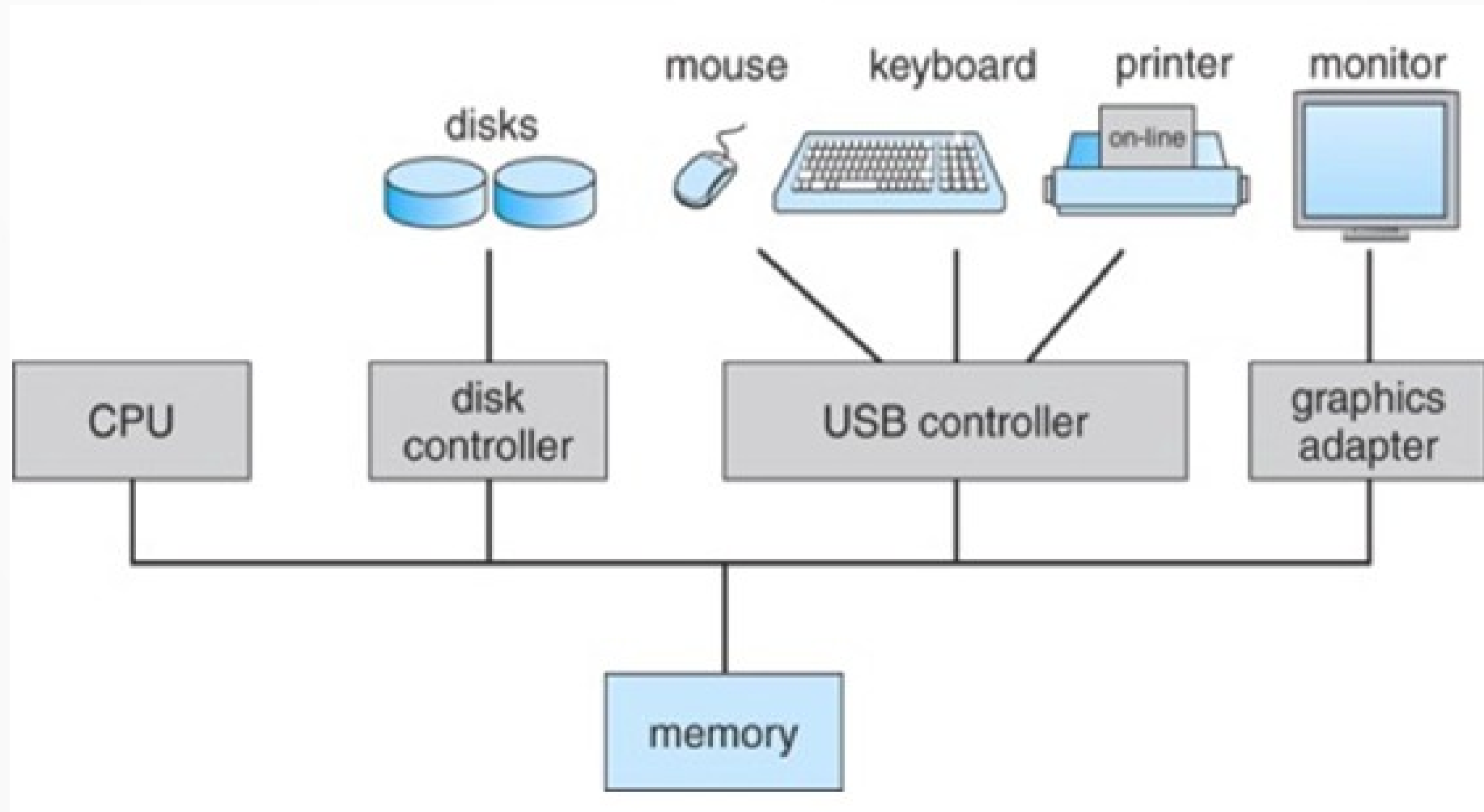


Image Source : **Operating System Concepts by Silberschatz, Galvin and Gagne**

Simplified View

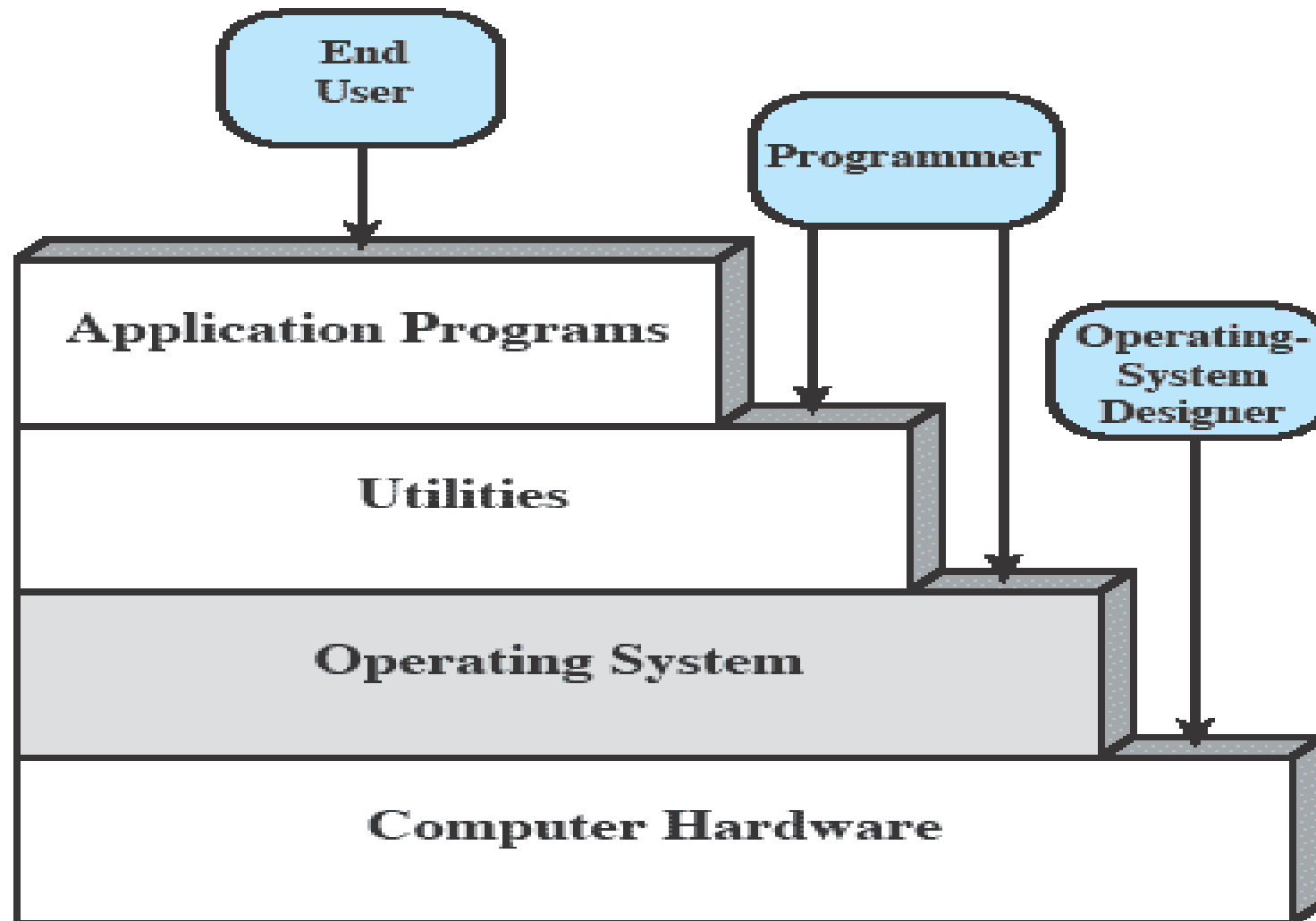


Image Source : **Operating Systems: Internals and Design Principles** by William Stallings

OS in Computer System Architecture

- Bridges user applications and hardware.
- Manages multitasking, concurrency, and interrupts.
- Provides abstraction to application developers.

Definition of OS

Definition:

- An Operating System is a software that acts as an interface between the user and the hardware of a computer.
- It manages hardware resources and provides services for computer programs.

Objectives of OS

Main Objectives of an OS:

- **Convenience** - Makes the computer easier to use
- **Efficiency** - Manages system resources effectively to improve performance
- **Ability to evolve** - Should be adaptable to new hardware and technologies

Functions of OS

Functions	Description
Process Mgmt	Creating, scheduling, and terminating processes.
Memory Mgmt	Allocating and deallocating memory space.
File System Mgmt	Organizing and controlling files and directories.
Device Mgmt	Managing I/O devices and their drivers.
Security and Access Control	Protecting data and resources from unauthorized access.
User Interface	Command Line Interface (CLI) or Graphical User Interface (GUI).

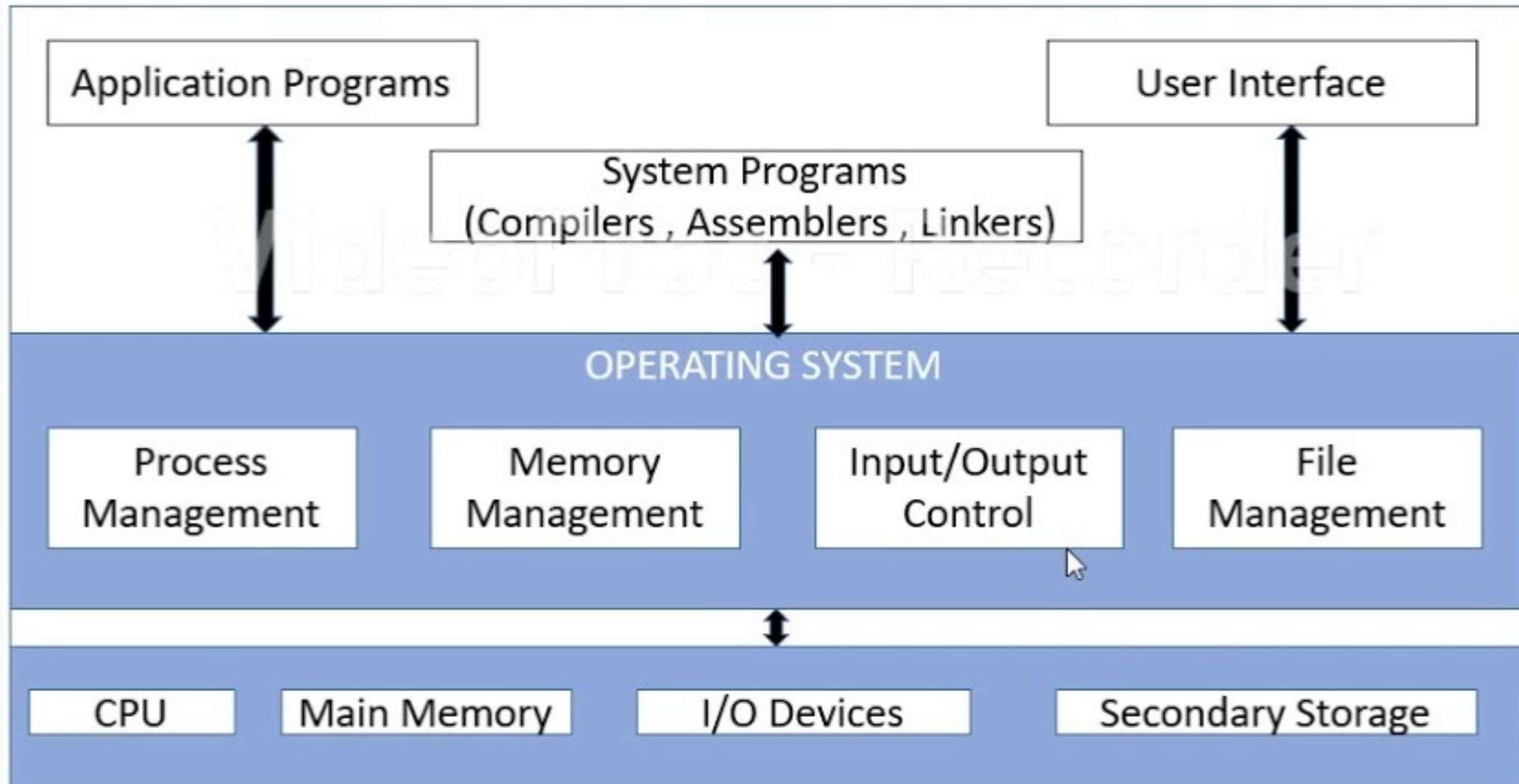
Types of OS

Type	Description	Example
Batch OS	No interaction with user during execution. Jobs processed in batches.	IBM OS/360
Time-Sharing OS	Multiple users use the system interactively via terminals.	UNIX
Real-Time OS	Responds to input immediately; used in embedded systems.	VxWorks, RTLinux
Distributed OS	Multiple systems connected via network share tasks.	LOCUS, Apache Hadoop
Mobile OS	OS for mobile devices.	Android, iOS

Evolution of OS

- **1940s-50s:** No OS, programs loaded manually.
- **1950s-60s:** Batch systems.
- **1960s-70s:** Multiprogramming, time-sharing.
- **1980s:** GUI-based OS (Windows, MacOS).
- **2000s-Present:** Mobile OS, Cloud OS, Embedded OS.

Components of OS



Popular OS

- **Desktop OS:** Windows, Linux, MacOS
- **Mobile OS:** Android, iOS
- **Server OS:** Ubuntu Server, Red Hat Enterprise Linux, Windows Server

OS as a Resource Manager

- A computer is a set of resources for the
 - movement,
 - storage and
 - processing of data
- The OS is responsible for managing these resources. – Hence OS is called **resource manager**

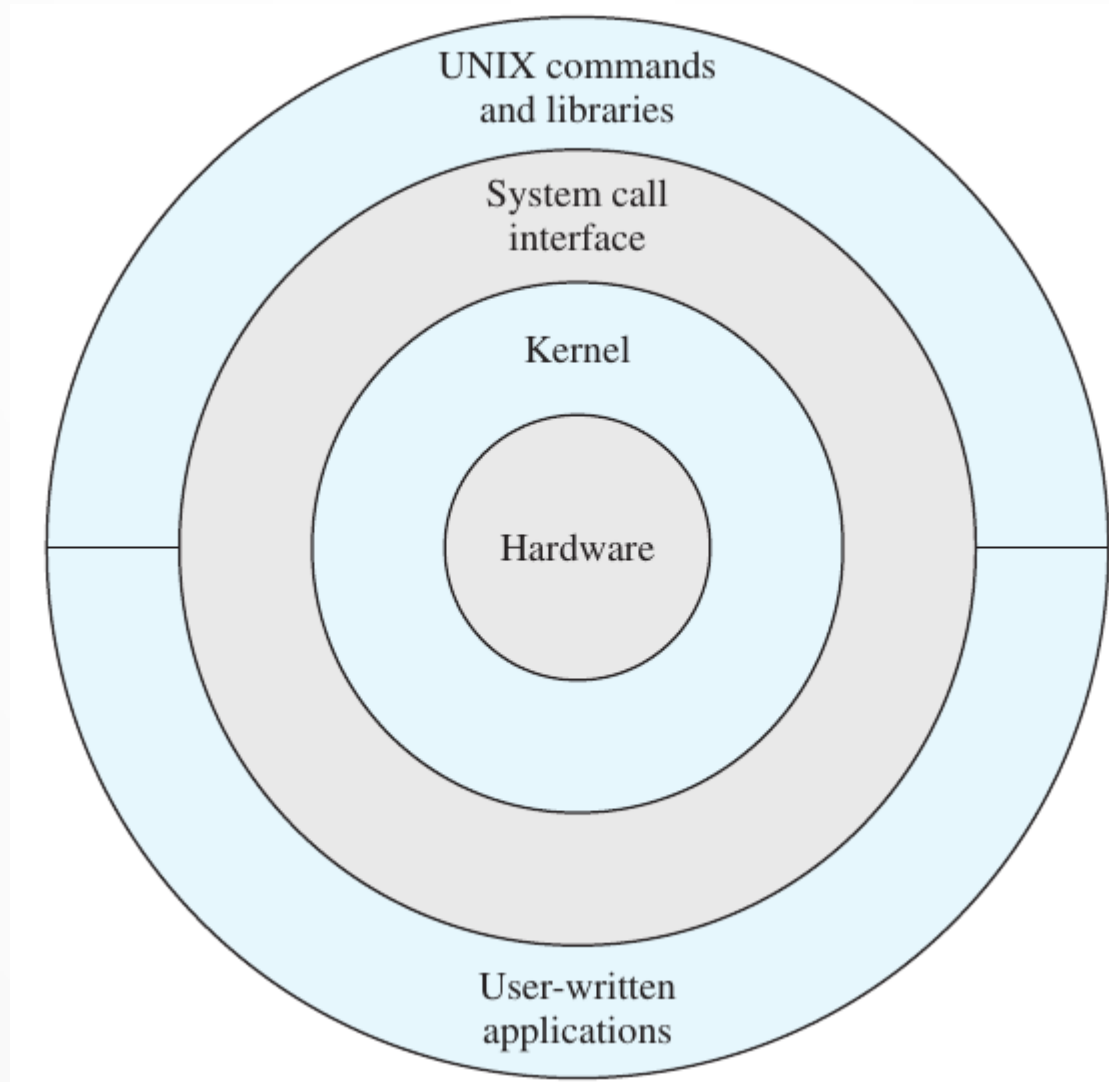
OS as a Resource Manager

- The OS functions in the same way as an ordinary computer software
- It is a program that is executed by the CPU
- Operating system relinquishes control of the processor and regains when needed

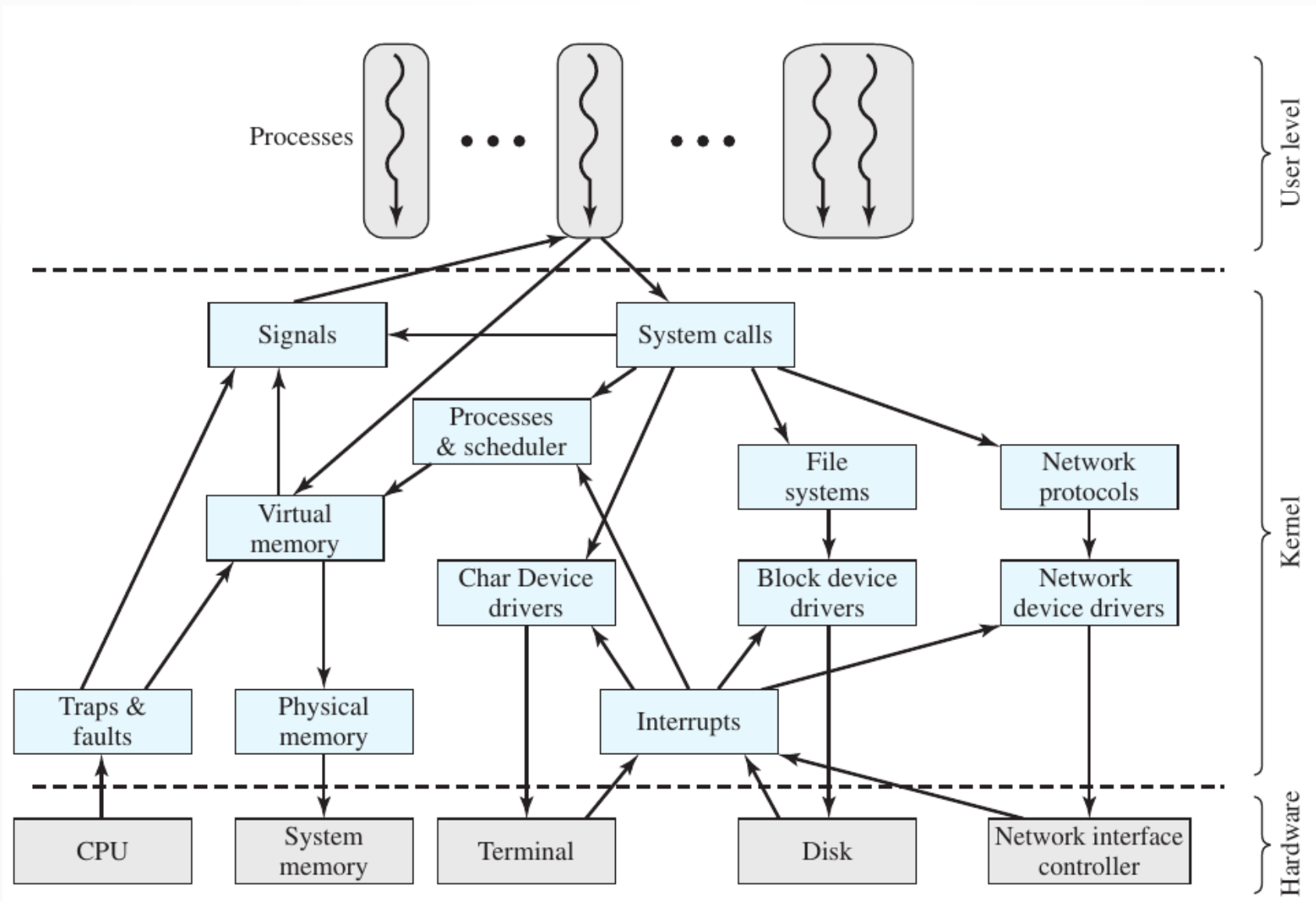
OS as a Resource Manager

- **Allocates:**
 - CPU time
 - Memory
 - Disk space
 - I/O devices
- Ensures **fairness, efficiency, and security**

General UNIX Architecture



Linux Components



References

- Operating Systems: Internals and Design Principles by William Stallings (6th Edition)
- Operating System Concepts by Silberschatz, Galvin and Gagne (9th Edition)

Questions ?