

Introduction to Operating System

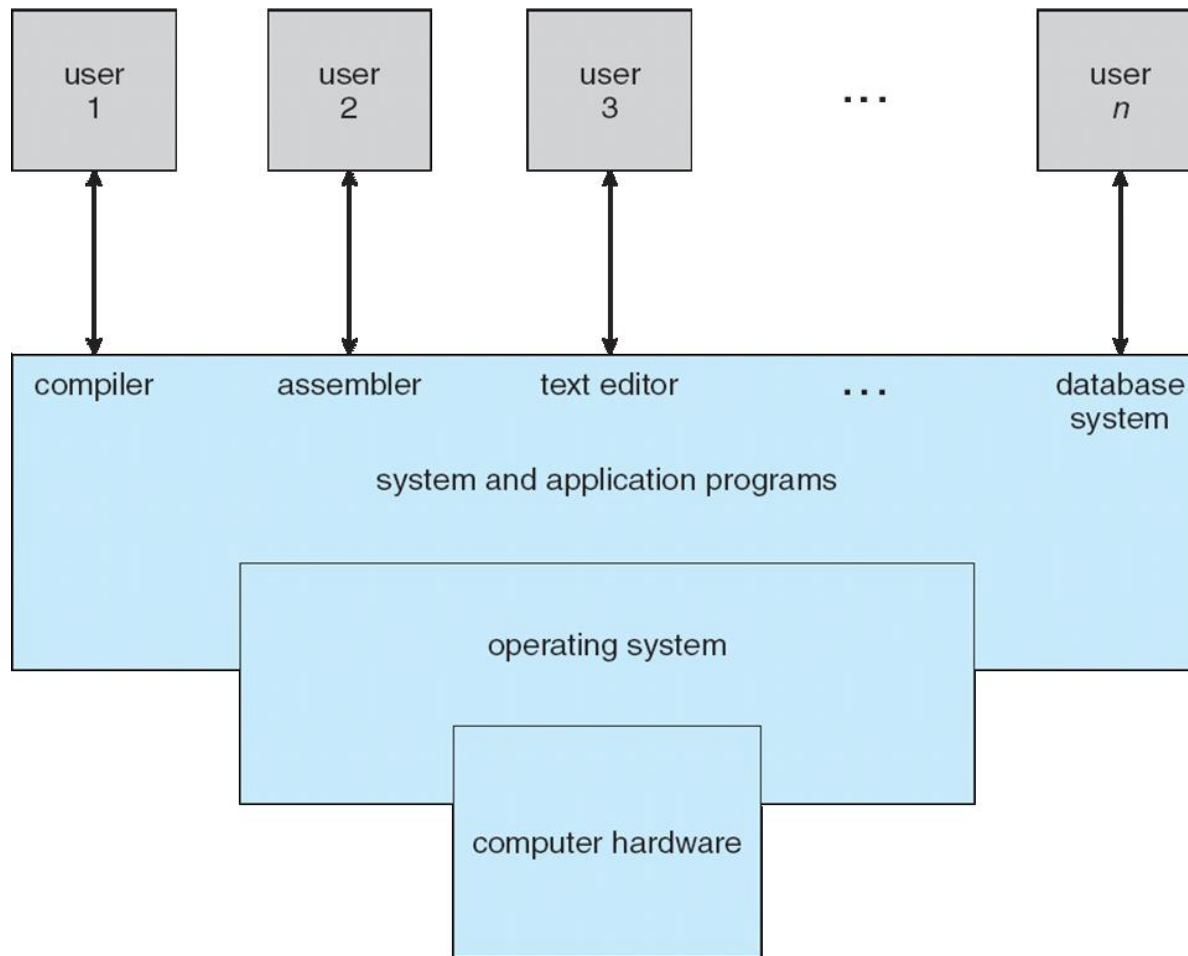
What is an Operating System

- It is a system that provides a platform to user for execution of their program in easy and efficient manner.

4-Layer Architecture

- Computer system can be divided into four components:
 - Hardware – resources for providing basic functionalities
 - 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, web browsers, database systems, video games
 - Users
 - People

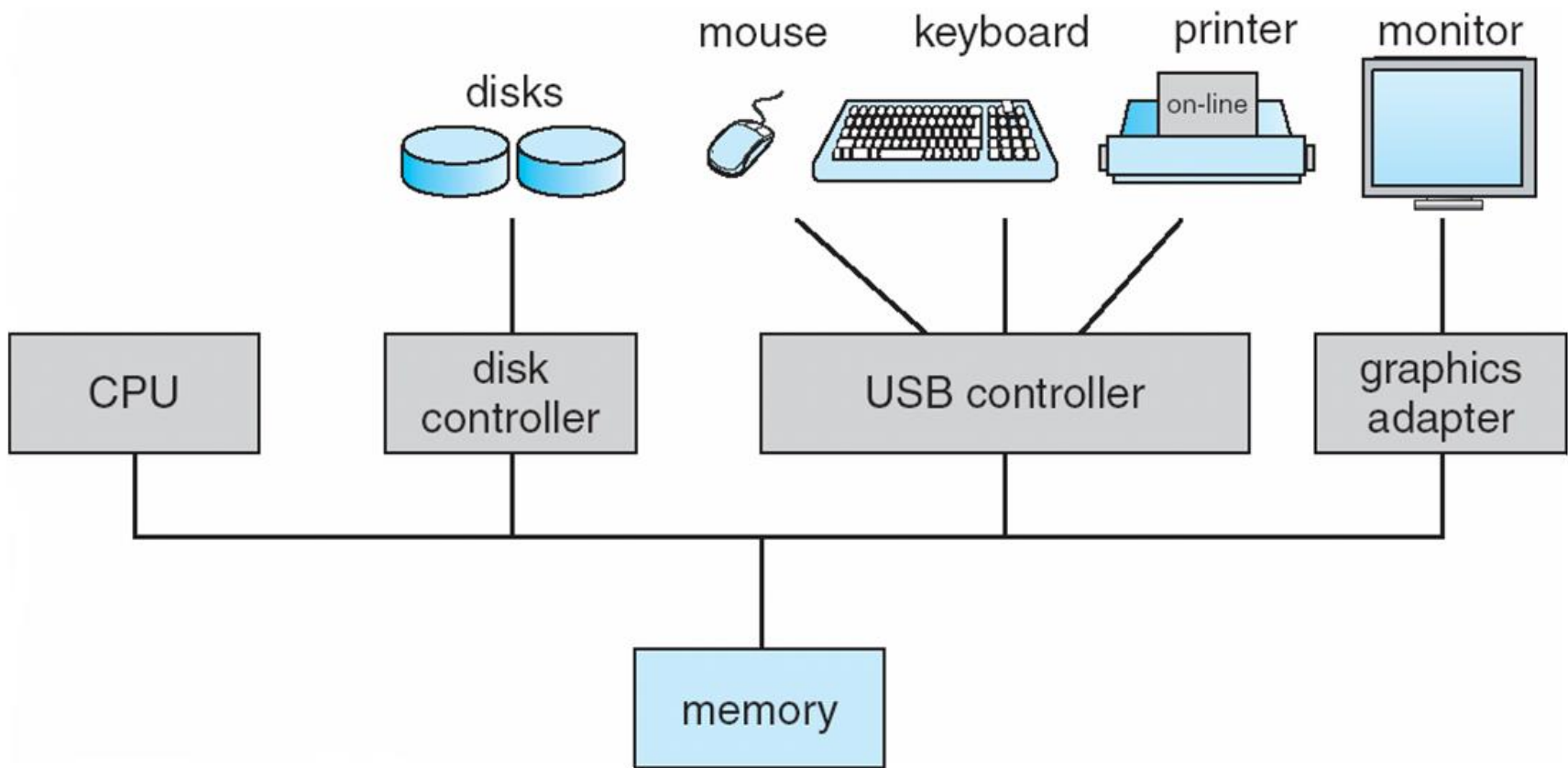
4-Layer Architecture



Efficient resource Manager

- CPU
- Main Memory
- Secondary Memory
- I/O

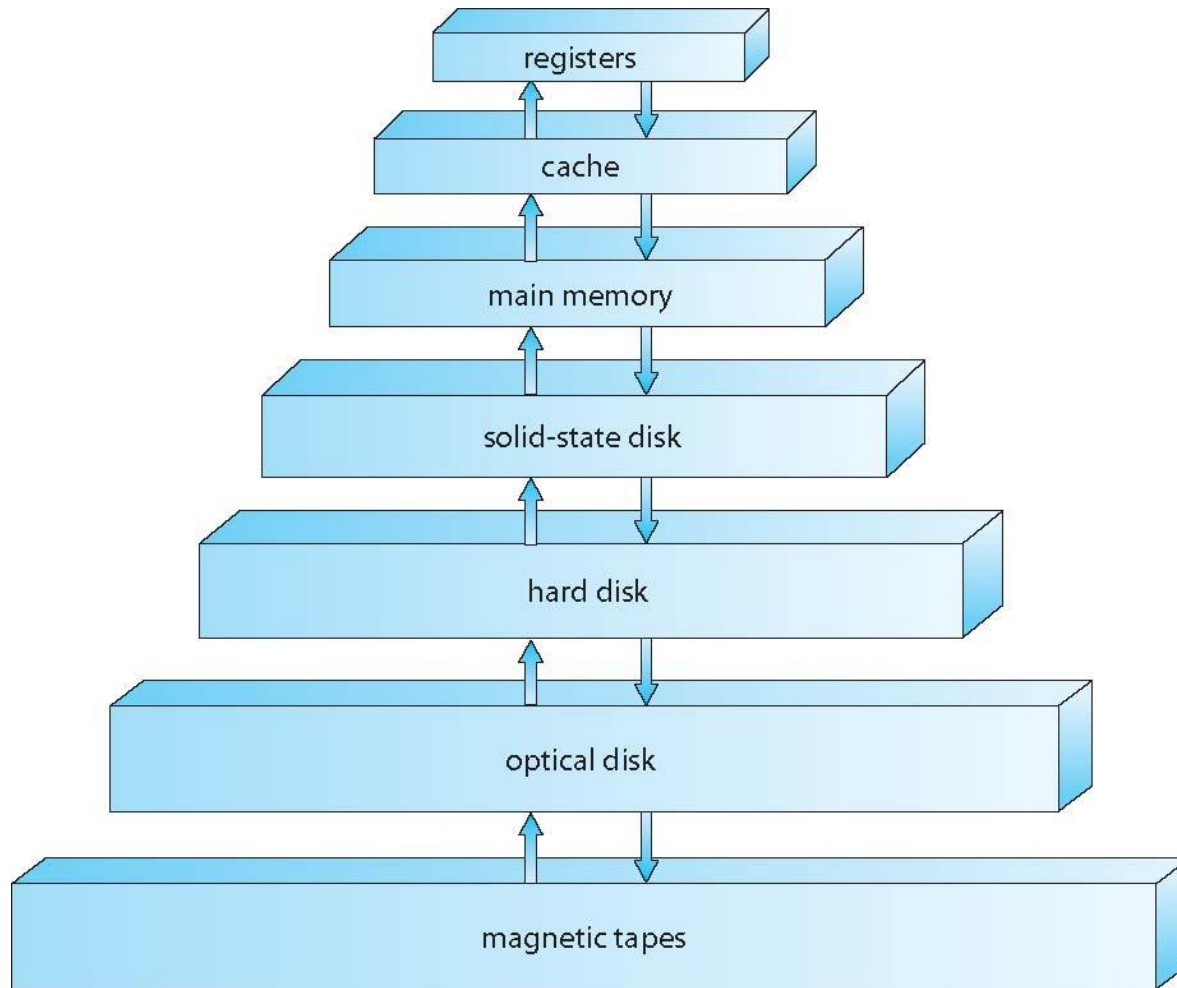
Computer System Organization



CPU/Process Management

- There is nothing to do in DOS like system
- In Unix at the same time there might be a number of jobs looking for CPU time
 - Process scheduling
 - process communication
 - Concurrency management
 - synchronization
 - Deadlock handling

Storage Hierarchy



Comparison of various level of storage

Level	1	2	3	4	5
Name	registers	cache	main memory	solid state disk	magnetic disk
Typical size	< 1 KB	< 16MB	< 64GB	< 1 TB	< 10 TB
Implementation technology	custom memory with multiple ports CMOS	on-chip or off-chip CMOS SRAM	CMOS SRAM	flash memory	magnetic disk
Access time (ns)	0.25 - 0.5	0.5 - 25	80 - 250	25,000 - 50,000	5,000,000
Bandwidth (MB/sec)	20,000 - 100,000	5,000 - 10,000	1,000 - 5,000	500	20 - 150
Managed by	compiler	hardware	operating system	operating system	operating system
Backed by	cache	main memory	disk	disk	disk or tape

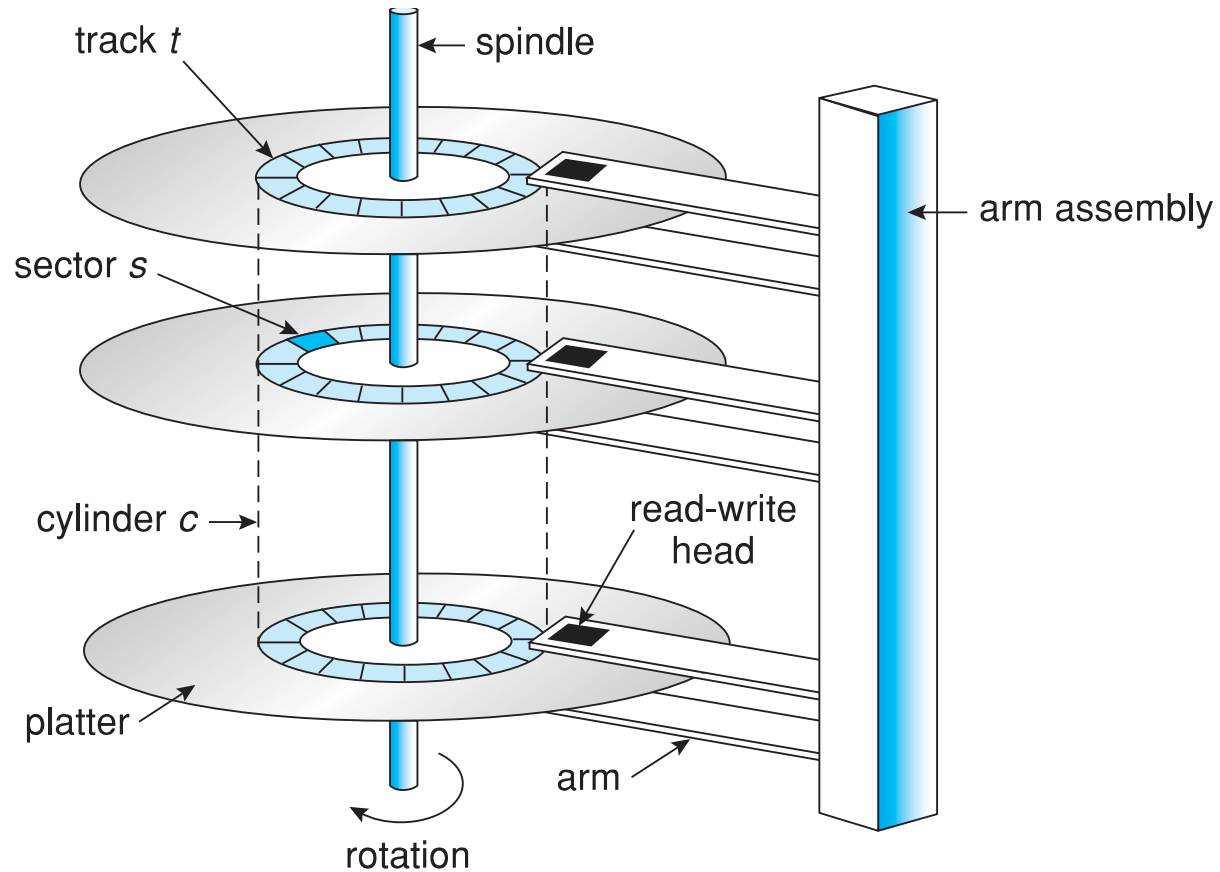
Memory Management

- To execute a program all (or part) of the instructions must be in memory
- All (or part) of the data that is needed by the program must be in memory.
- Memory management activities
 - Keeping track of which parts of memory are currently being used and by whom
 - Deciding which processes (or parts thereof) and data to move into and out of memory
 - Allocating and deallocating memory space as needed

Secondary Storage Management

- Usually disks used to store data that does not fit in main memory or data that must be kept for a “long” period of time
- Entire speed of computer operation hinges on disk subsystem and its algorithms
- OS activities
 - Free-space management
 - Storage allocation
 - Disk scheduling

Disk Structure

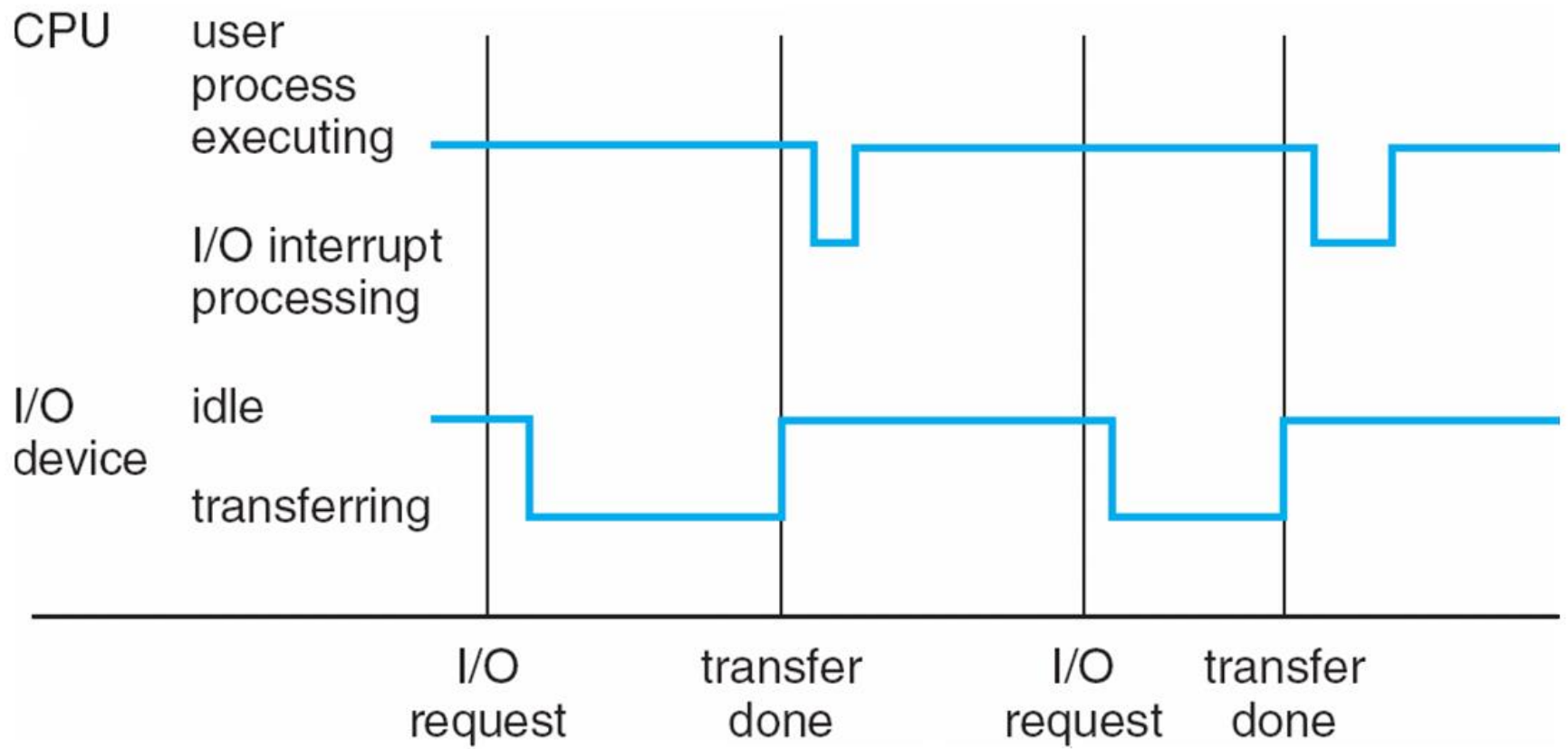


I/O Subsystem

- I/O devices and the CPU can execute concurrently
- Each device controller is in charge of a particular device type
- Devices usually have registers where device driver places commands, addresses, and data to write, or read data from registers after command execution
- Device controller informs CPU that it has finished its operation by causing an **interrupt**

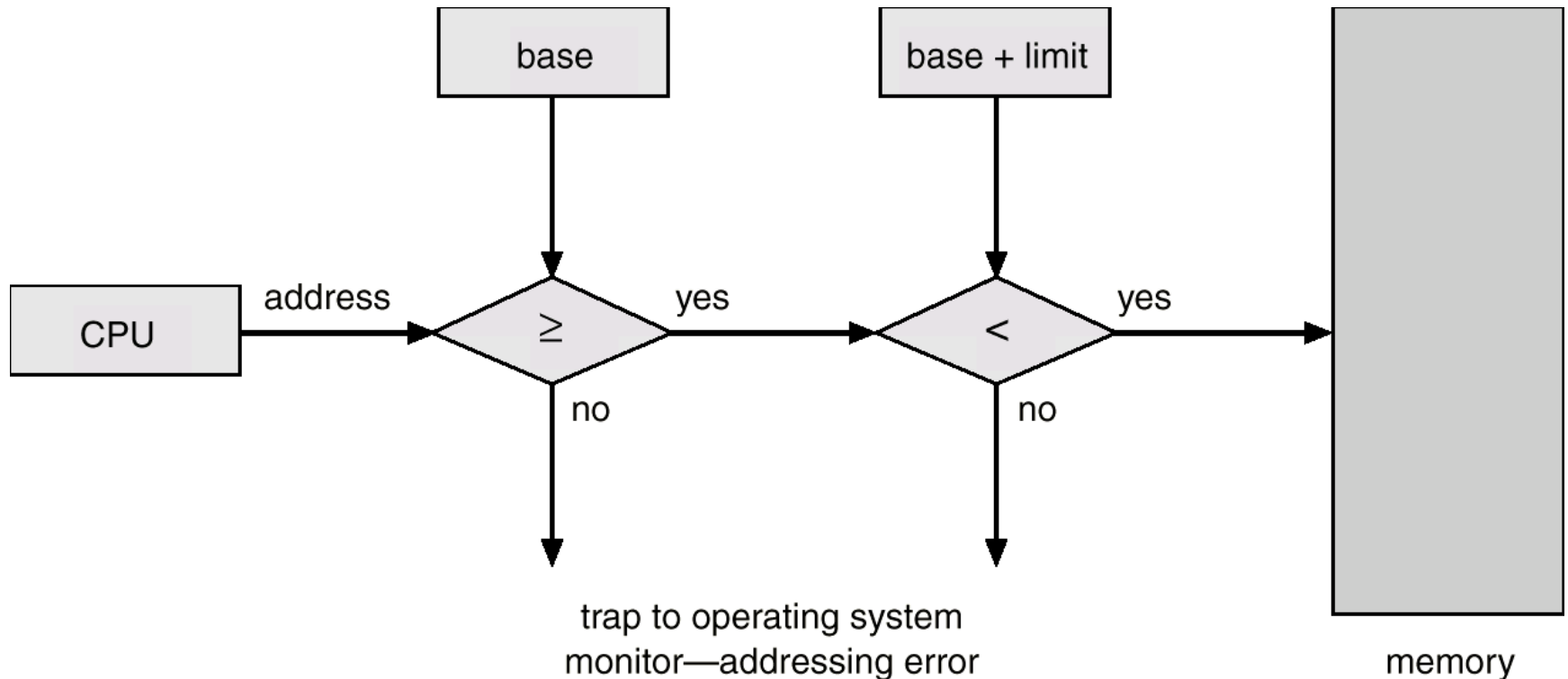
Interrupt Handling

- 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



Protection & Security

Protection: Mechanism for controlling access of processes or users to resources defined by the OS



Security – defense of the system against internal and external attacks worms, viruses etc

Course Evaluation

- End Sem – 50
- Mid Sem – 30
- Quiz1 and Quiz2 – $2 \times 10 = 20$
- Text Book:
 - Operating System Concepts (Silberschatz, Galvin, Gagne)