

OPERATING SYSTEMS  
CS F372

# What is System?

- A collection of components organized to accomplish a specific function or set of functions. [IEEE STD 610.12]
- A system is an assemblage of interdependent, inter-related elements (Components) comprising a unified whole

# What Is Operating System ?

- A system that helps in operating computing systems

## Goal

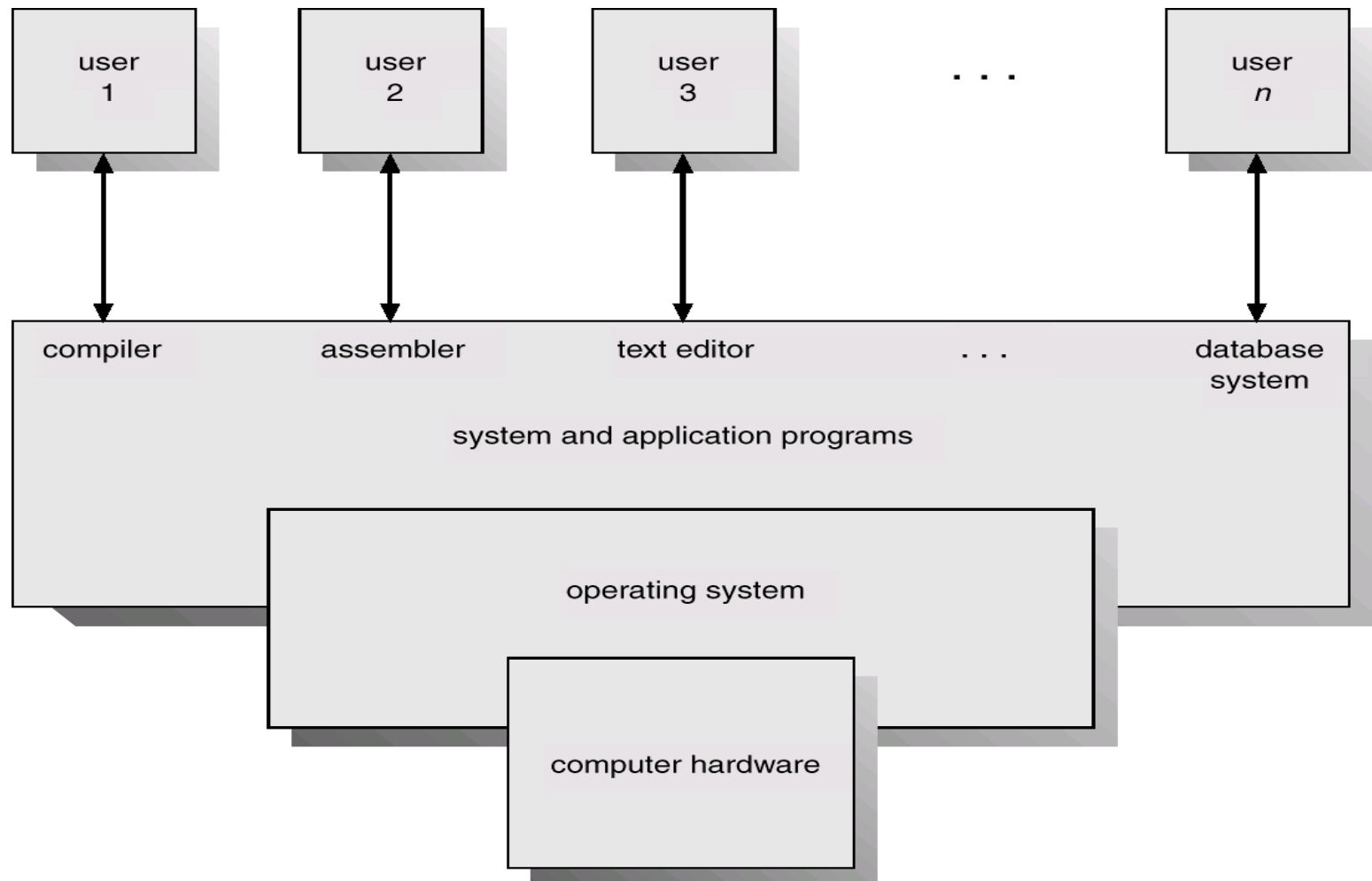
- Provide ease of operation
- Provide efficient resource management

## Feature

- It is self loading and self executing code
- OS Kernel is the code which is running all the time

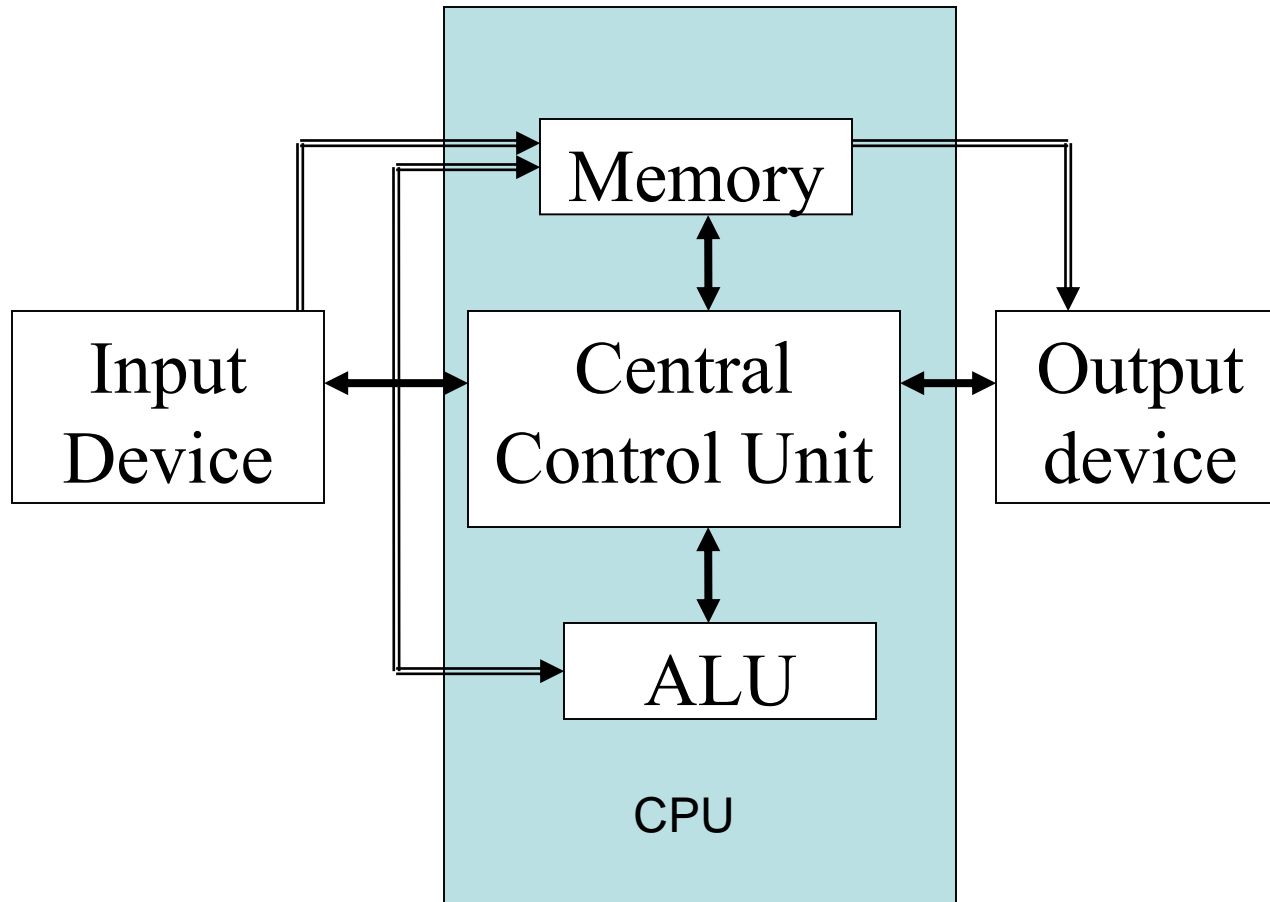
# Computer System Components

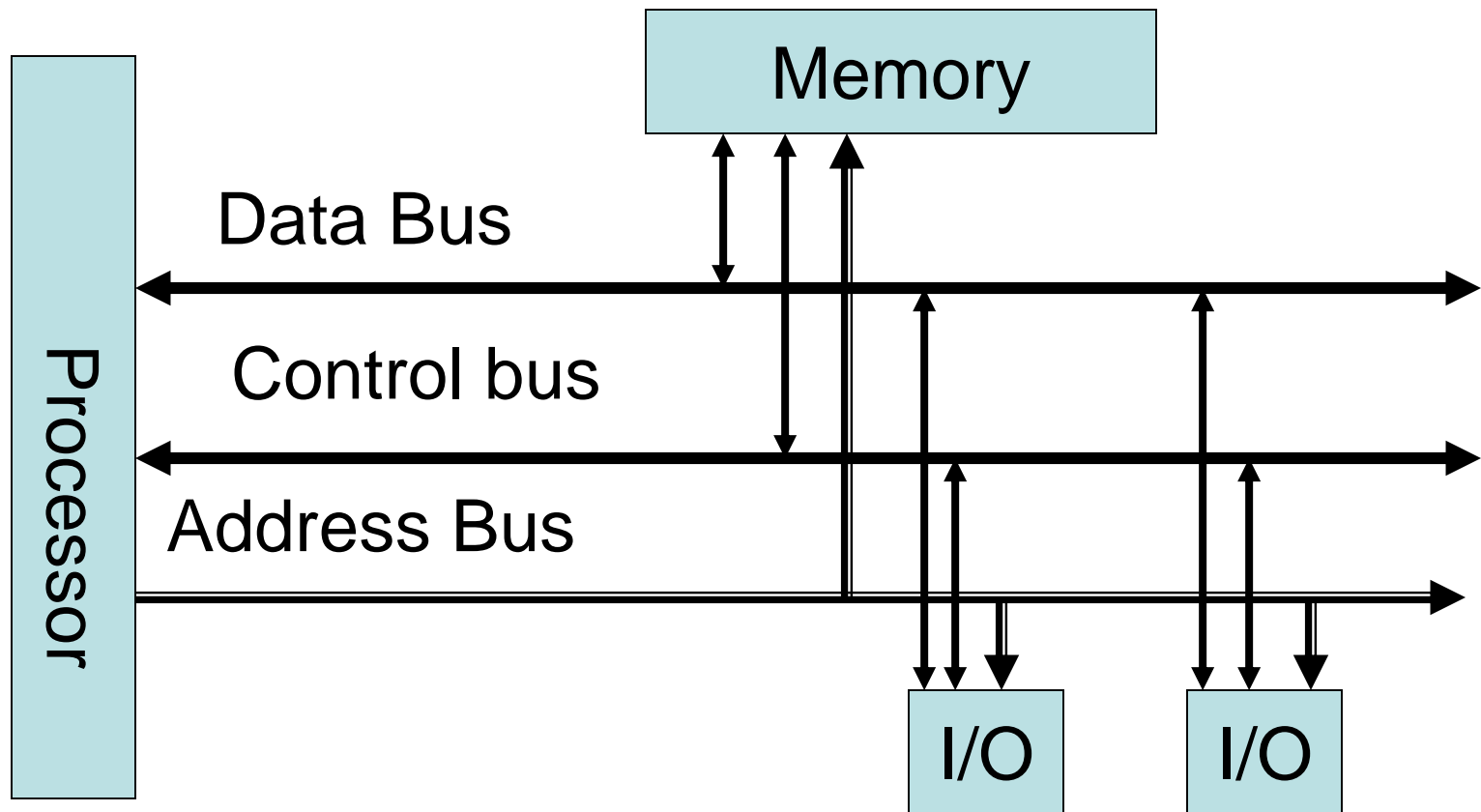
1. **Hardware** – provides basic computing resources (CPU, memory, I/O devices).
2. **Operating system** – controls and coordinates the use of the hardware among the various application programs for the various users.
3. **Applications programs** – define the ways in which the system resources are used to solve the computing problems of the users (compilers, database systems, video games, business programs).
4. **Users** (people, machines, other computers).



# Abstract View of Computing System Components

# Computer Block Diagram



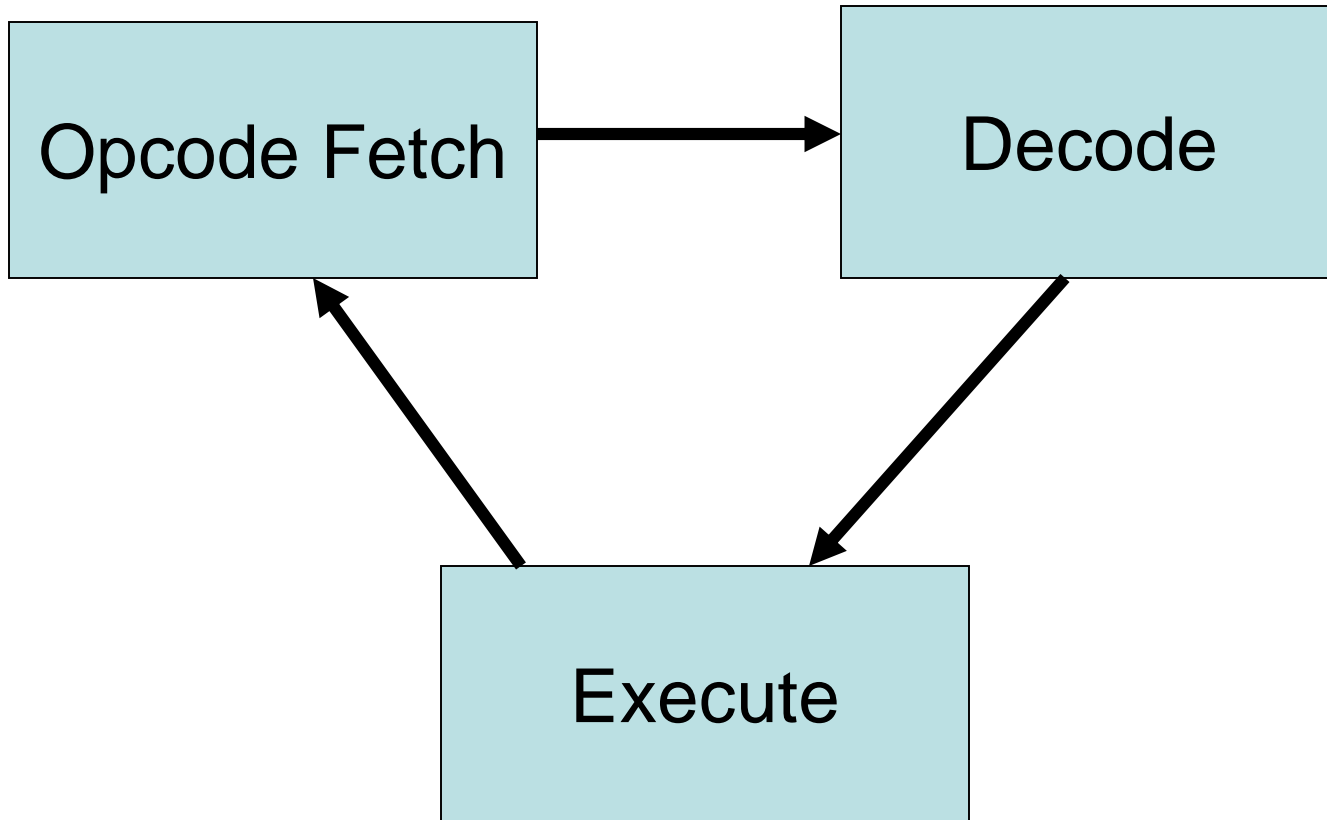


# Hardware Components

- Processor
- Memory
  - Cache Memory (Static RAM)
  - Primary Memory ( RAM, ROM)
  - Secondary Memory (Hard Disk)
- I/O Devices
- System Bus eg. PCI, IDE, USB, etc.



# Fetch-Decode & Execute Cycle



# Program can execute only if it is loaded in Primary memory

- Who loads it in memory ?
- Who decides how much memory is required by a program?
- Who decides where the program is loaded in memory?
- After loading how and when the execution begins?
- How do I get/put data from/to hard disk or any other device?

# Some more questions

- Can there be more than one program loaded in memory at the same time ? If Yes -
  - who will guarantee territorial integrity?
  - Which particular program will run first and for how long?
  - How much memory should be allocated to each program?

# Solution

- Bare Hardware is not enough. We need a component which will act as **hardware resource manager**

## Definition

- Operating system is a resource manager

# Operating System is a resource manager and resources are

- Processor
- Memory
- I/O devices
- Busses
- File system
- Network

## User View of OS

- Provides ease of operation
- Supports resource sharing
  - **Sequential sharing** : A resource is allocated for exclusive use of program eg. CPU
  - **Concurrent sharing**: Two or more program concurrently use same resource eg. Files, memory, disk array etc.

## Systems View of OS

- OS acts as **Resource allocator** and is responsible for handling resource request, resource allocation and optimal utilization of system resources.
- Acts as **control program** that manages the execution of user program and prevents error and improper use of computer system.

# What OS Does?

- Maintain a list of authorized users
- Construct list of all resources in the system
- Initiate execution of programs
- Maintain resource usage information by programs and current status of programs
- Maintain current status of all resources and allocate resources to programs when requested
- Perform scheduling
- Maintain information for protection

# Goals Of Operating System

- Provide user interface for ***ease of operation***
  - Command line interface (CLI) eg. Unix, DOS
  - Graphical User Interface (GUI) eg. Windows
- ***Efficient*** use of hardware & software resources (system)
- Maximize ***System performance***
- Protection and access control
- Ability to evolve and offer new services
- Footprint of OS should be small !!!



# Can we measure System Efficiency, Performance and user convenience ?

- Efficiency---- CPU efficiency
- System performance ----- Throughput
- User services ---- Turn around time ,  
Response time

# Operating System and Computer Architecture are tightly bonded together.

- Change in architecture usually leads to change in OS.
- The requirements of OS have led to several architectural changes.

# Book Keeping

# Evaluation Components

<b>Component</b>	<b>% weightage</b>	<b>Remark</b>
MidSem	35	Closed Book
Quiz / Assignment	20	Open Book
Comprehensive	45	Closed Book