Chapter 1: Introduction

Chapter 1: Introduction

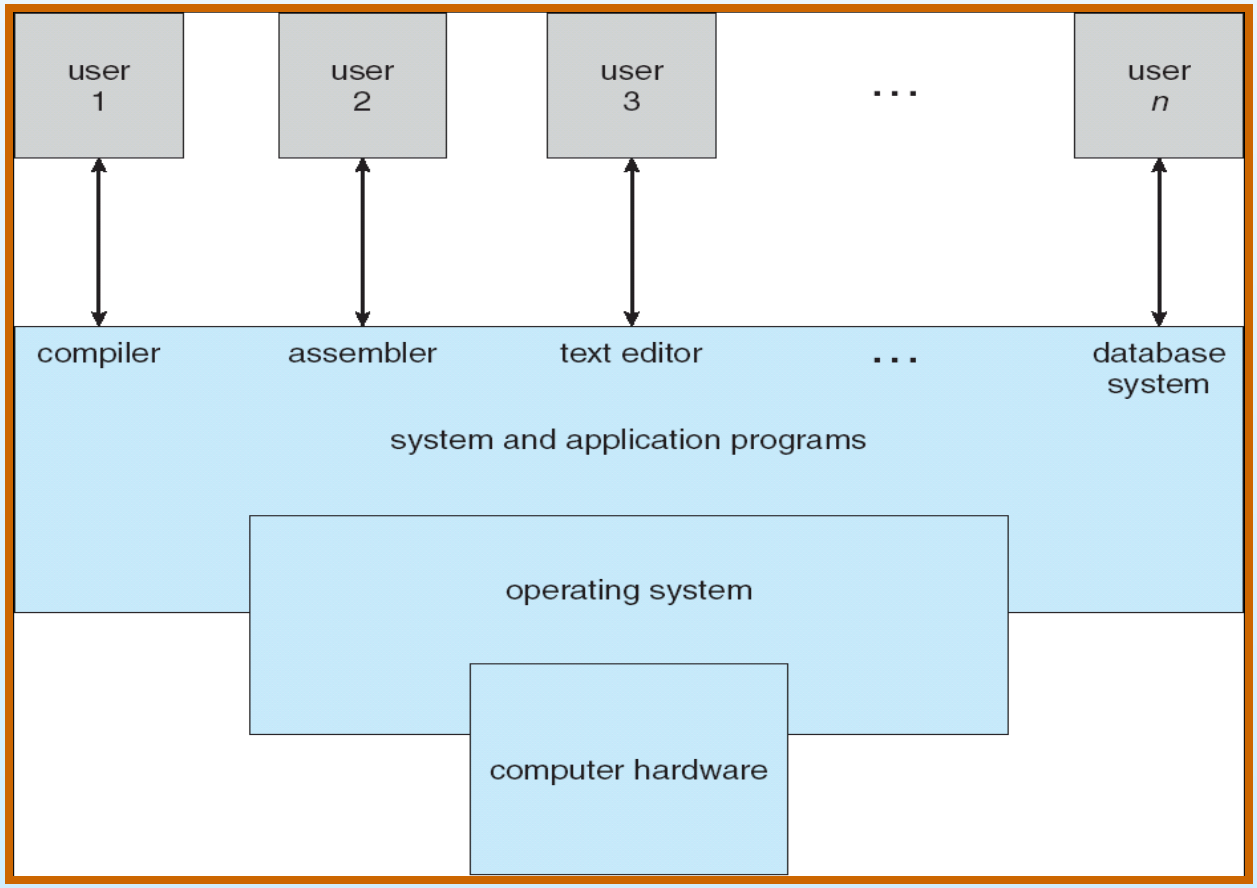
- What Operating Systems Do
- What we need
  - Computer-System Organization & Architecture
- What to learn
  - Multiprogramming, Timesharing
  - OS Operations
  - Process, Memory and File-system
  - Device Drivers

Questions

- Tell the names of OSes you know
  - .....
- Why they are called OS but others not?
  - .....

What is an Operating System?

- A program that acts as an intermediary between a user of a computer and the computer hardware.



Operating system goals

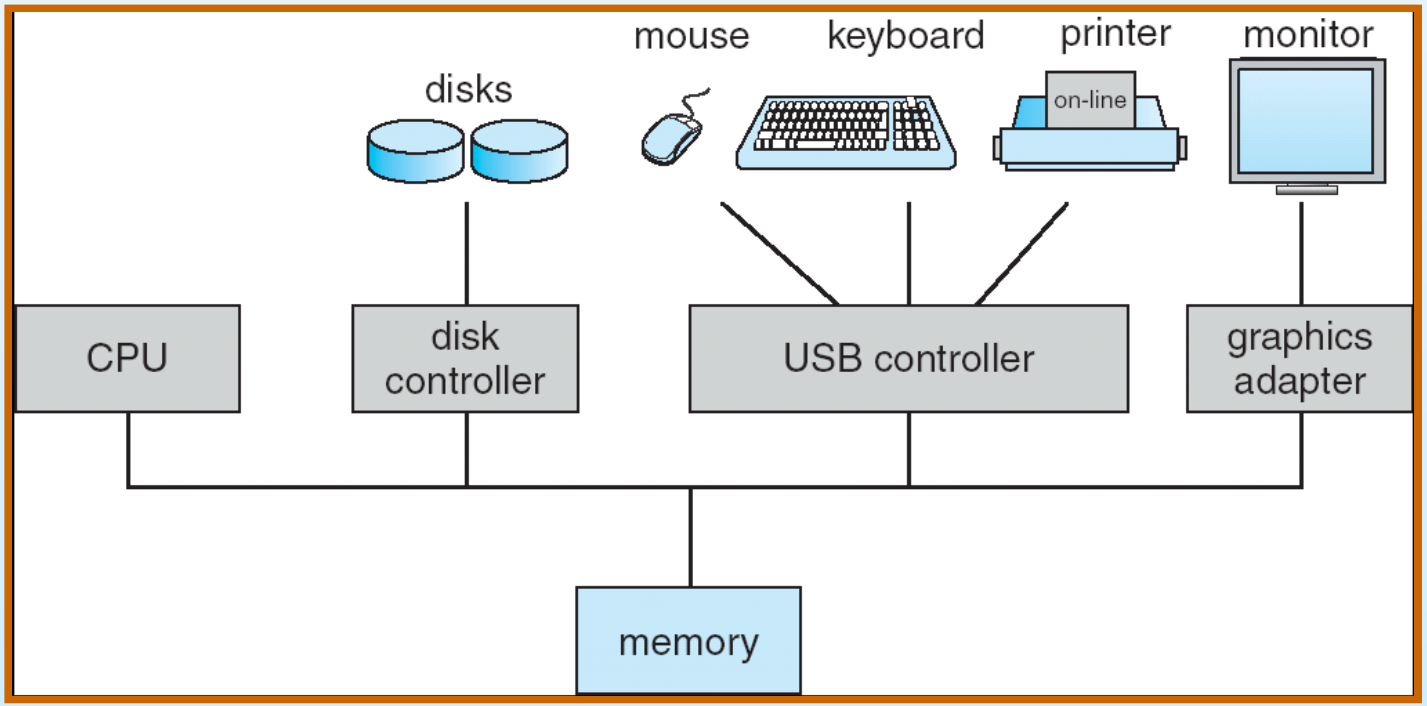
- *Convenience* for users and programs
- *Efficiency* for hardware
- *Reliability & Security* for all

Operating System Definition

- 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
    - Improper use

Computer System Organization

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



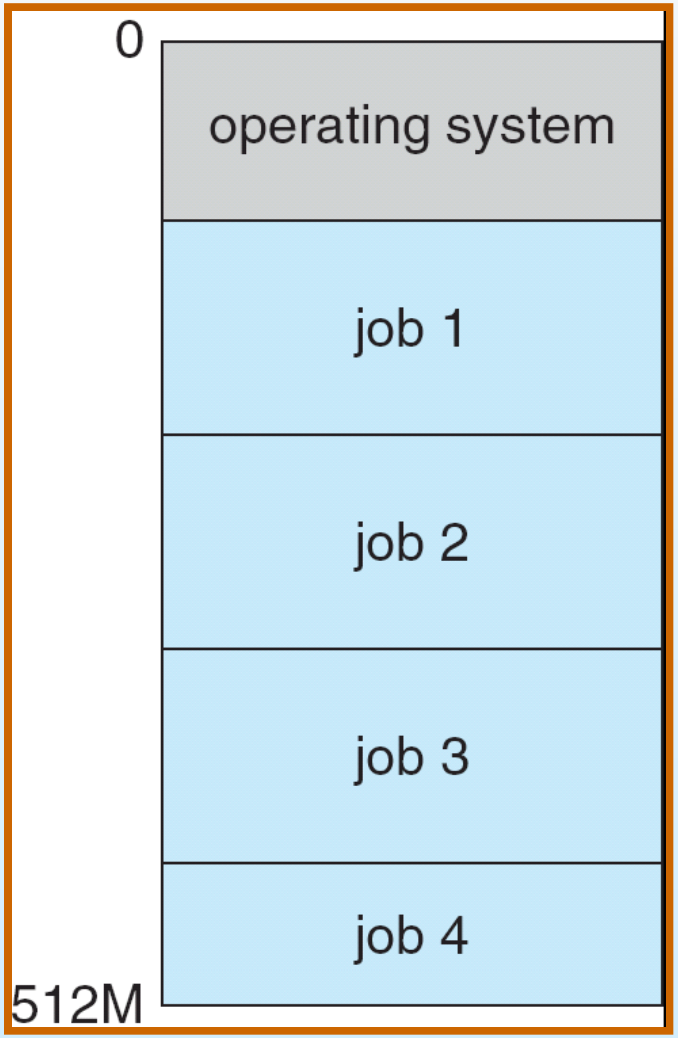
Computer System Architecture

- Single-processor system
  - The netbook I'm using
- Multi-processor system
  - What you were playing with yesterday night
- Clustered system
  - Don't you know you've accessed it?

Operating System Structure

- Multiprogramming needed for efficiency
- Timesharing (multitasking) is logical extension
  - CPU switches jobs so frequently
  - Users can interact with each job while it is running

Memory Layout for Multiprogrammed System



Operating-System Operations

- Interrupt driven by hardware
- Software error
  - Division by zero
  - Access invalid memory
- Request creates exception or trap
  - Request for OS service
- Dual-mode operation allows OS to protect itself
  - User mode and kernel mode
  - Mode bit provided by hardware

Process Management

- A process is a program in execution.
  - A unit of work within the system
- Multi-threaded process has one program counter per thread
- Many processes run concurrently on one or more CPUs
  - Concurrency by multiplexing the CPUs among the processes / threads

Memory Management

- All data in memory to process
- All instructions in memory to execute

- Memory management determines what is in memory when optimizing:
  - CPU utilization
  - Computer response to users

Storage Management

- Uniform, logical view of information storage
  - File
  - Abstracts physical properties to logical storage unit
- File-System management
  - Files usually organized into directories
  - Access control on most systems to determine who can access what

I/O Subsystem

- Hide peculiarities of hardware devices
- Device drivers

Protection and Security

- Protection
  - Controlling access of processes or users to resources
- Security
  - Against internal and external attacks
    - denial-of-service, worms, viruses, Trojans..
- Systems generally first distinguish among users, to determine who can do what

Special-Purpose Systems

- Embedded systems
  - Everywhere
- Multimedia systems
  - MP3/MP4 player, DVD/Blu-ray player, PSP, PS/2/3, Xbox 360, Wii
- Handheld systems
  - PDA, mobile phone, GPS

End of Chapter 1