

OPERATING SYSTEM

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What is an Operating System?

- ▶ Operating System is a software, which makes a computer to actually work.
- ▶ It is the software that enables all the programs we use.
- ▶ The OS organizes and controls the hardware.
- ▶ OS acts as an interface between the application programs and the machine hardware.
- ▶ Examples: Windows, Linux, Unix and Mac OS, etc.

What OS does?

- ▶ Controlling and allocating memory
- ▶ Prioritizing system requests
- ▶ Controlling input and output devices
- ▶ Facilitating networking
- ▶ Managing file systems

Operating System Objectives

- ▶ **Convenience**
 - Makes the computer more convenient to use
- ▶ **Efficiency**
 - Allows computer system resources to be used in an efficient manner
- ▶ **Ability to Evolve**
 - Permit effective development, testing, and introduction of new system functions without interfering with service

Layers of Computer System

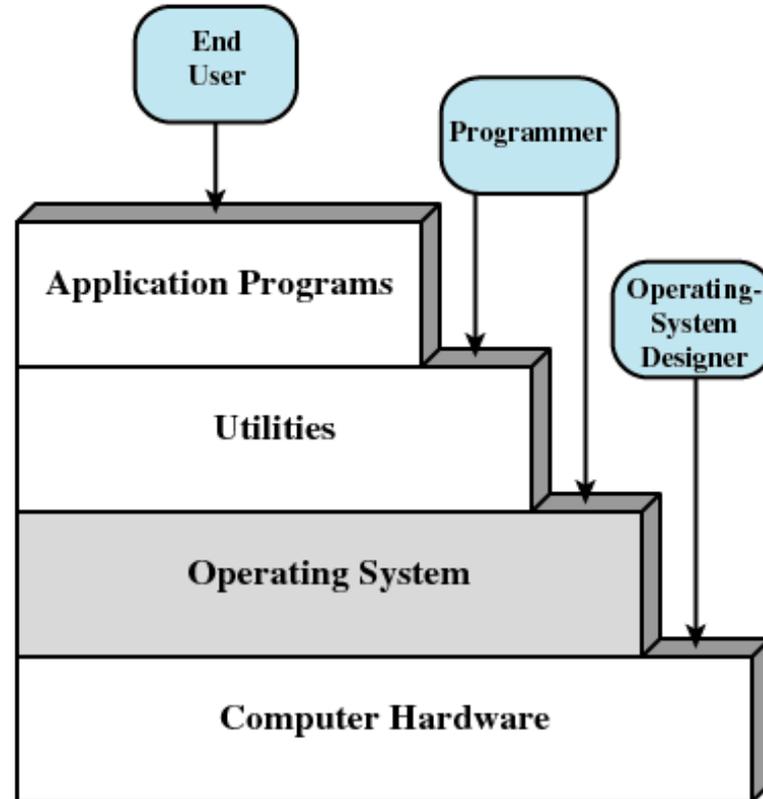


Figure 2.1 Layers and Views of a Computer System

Structure of Operating System

The structure of OS consists of 4 layers:

1. Hardware

- Hardware consists of CPU, Main memory, I/O Devices, etc.

2. Software (Operating System)

- Software includes process management routines, memory management routines, I/O control routines, file management routines.

Structure of Operating System

3. System programs

- This layer consists of compilers, Assemblers, linker etc.

4. Application programs

- This is dependent on users need.
- **E.g.:** Railway reservation system, Bank database management etc.

Functions of Operating System

- ▶ Process Management
- ▶ Memory Management
- ▶ File Management
- ▶ Device Management
- ▶ Command Interpretation
- ▶ Security

Types of Operating Systems

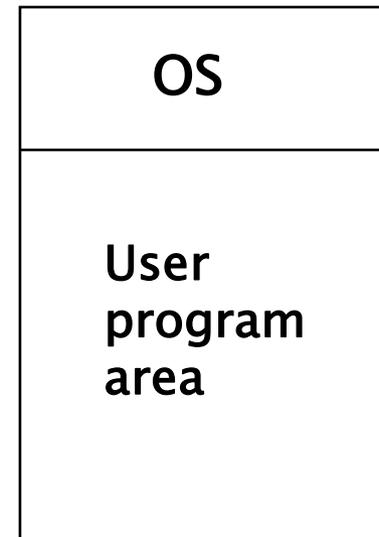
- ▶ Batch Operating System
- ▶ Multiprogramming
- ▶ Multiprocessing
- ▶ Timesharing / Multitasking
- ▶ Single User Operating System
- ▶ Multiuser Operating System
- ▶ Real Time Operating System

Batch Operating System

- ▶ In Batch processing, same type of jobs batch together and execute at a time.
- ▶ The OS was simple, its major task was to transfer control from one job to the next.
- ▶ The job was submitted to the computer operator in form of punch cards.
- ▶ The monitor is system software that is responsible for interpreting and carrying out the instructions in the batch jobs. When the monitor starts a job, the entire computer is dedicated to the job, which then controls the computer until it finishes.
- ▶ The OS was always resident in memory. Common Input devices were card readers and tape drives.

Batch Operating System

- ▶ Common output devices were line printers, tape drives, and card punches.
- ▶ Users did not interact directly with the computer systems, but he prepared a job (comprising of the program, the data & some control information).



Multiprogramming

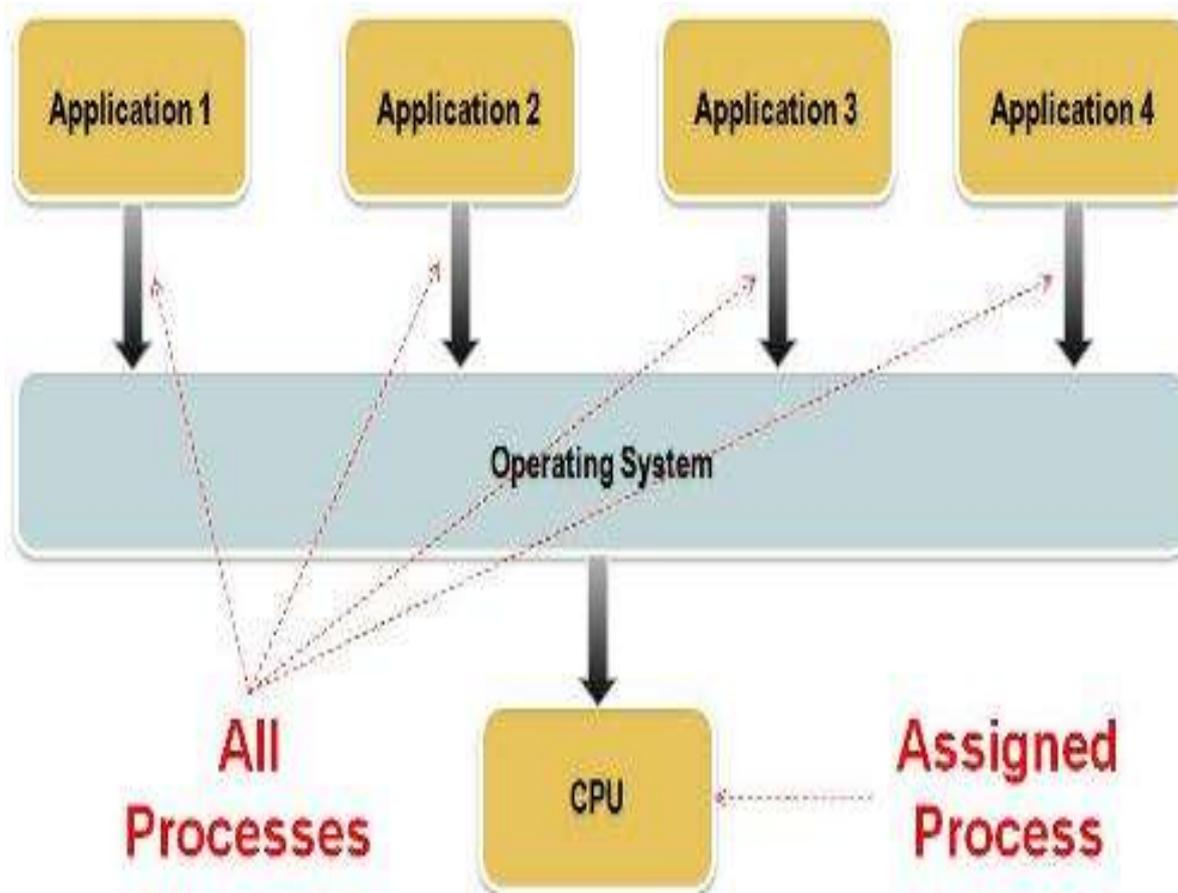
- ▶ Multiprogramming is a technique to execute number of programs simultaneously by a single processor.
- ▶ In Multiprogramming, number of processes reside in main memory at a time.
- ▶ The OS picks and begins to execute one of the jobs in the main memory.
- ▶ If any I/O wait happened in a process, then CPU switches from that job to another job.
- ▶ Hence CPU is not idle at any time.

Multiprogramming

OS
Job 1
Job 2
Job 3
Job 4
Job 5

- Figure depicts the layout of multiprogramming system.
- The main memory consists of 5 jobs at a time, the CPU executes one by one.
- ▶ **Advantages:**
 - Efficient memory utilization
 - Throughput increases
 - CPU is never idle, so performance increases.

Multiprogramming



Timesharing

- ▶ Simultaneous interactive use of a computer system by many users in such a way that each one feels that he/she is the sole user of the system.
- ▶ Multiple jobs are executed by switching the CPU between them.
- ▶ In this, the CPU time is shared by different processes, so it is called as “Time sharing Systems”.
- ▶ Time slice is defined by the OS, for sharing CPU time between processes. CPU is taken away from a running process when the allotted time slice expires.
- ▶ Examples: Multics, Unix, etc.

Advantages of Timesharing

- ▶ Reduces CPU Idle time.
- ▶ Provides advantages of quick response time.
- ▶ Offers good computing facility to small users.



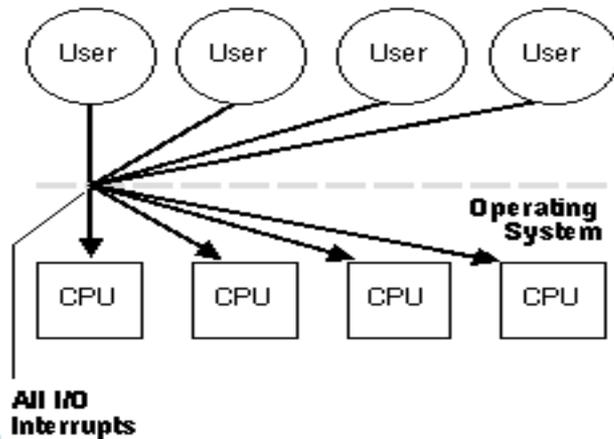
Multiprocessing

- ▶ **Multiprocessing** is the use of two or more central processing units (CPUs) within a single computer system.
- ▶ The term also refers to the ability of a system to support more than one processor and the ability to allocate tasks between them.
- ▶ An operating system capable of supporting and utilizing more than one computer processor.
- ▶ Below are some examples of multiprocessing operating systems.
 - Linux
 - Unix
 - Windows 2000

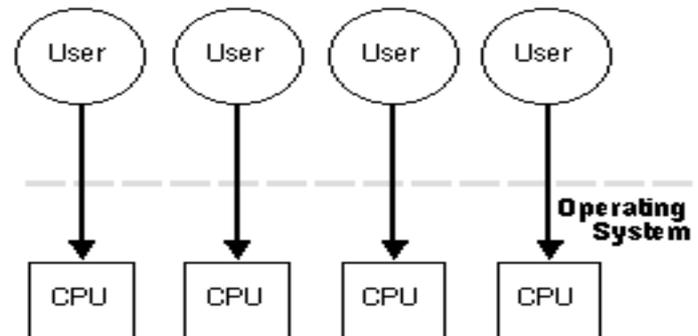
Multiprocessing

- ▶ Systems that treat all CPUs equally are called **symmetric multiprocessing (SMP)** systems.
- ▶ If all CPUs are not equal, system resources may be divided in a number of ways, including **asymmetric multiprocessing (ASMP)**,

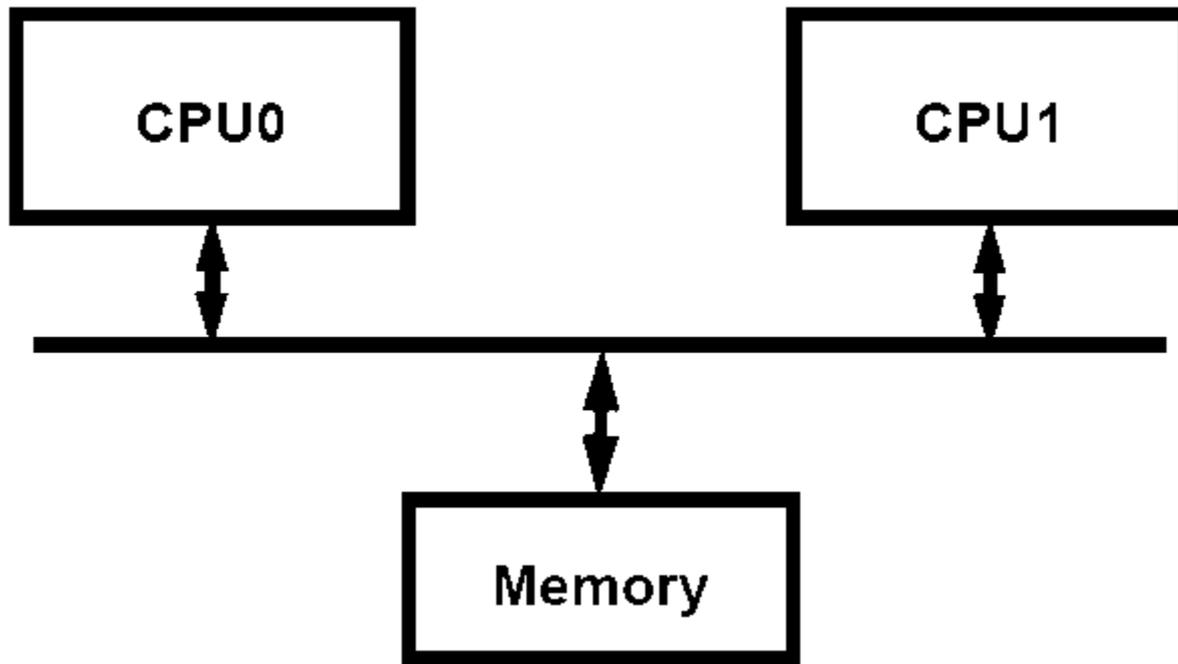
Asymmetric Multiprocessing:



Symmetric Multiprocessing:



Multiprocessing



Single User Operating System

- ▶ Provides a platform for only one user at a time.
- ▶ **Single-User, Single Tasking**
 - As the name implies, this operating system is designed to manage the computer so that one user can effectively do one thing at a time.
 - The Palm OS for Palm handheld computers is a good example of a modern single-user, single-task operating system.
- ▶ **Single-User, Multi-Tasking**
 - This is the type of operating system most people use on their desktop and laptop computers today.
 - Example Microsoft's Windows, it's entirely possible for a Windows user to be writing a note in a word processor while downloading a file from the Internet while printing the text of an e-mail message.

Multi-User Operating System

- ▶ Provides regulated access for a number of users by maintaining a database of known users.
- ▶ Refers to computer systems that support two or more simultaneous users.
- ▶ Another term for *multi-user* is *time sharing*.
- ▶ E.g.: All mainframes are multi-user systems.

Real Time Operating System

- ▶ Real-time operating systems are used to control machinery, scientific instruments and industrial systems.
- ▶ A system is said to be **Real Time** if it is required to complete its work & deliver its services on time.
- ▶ Example – Food Processing System, Flight Control System
- ▶ All tasks in that system must execute on time.

Types of RTOS

Soft Real Time System

- In Soft Real Time System, tasks are completed as fast as possible without having to be completed within a specified timeframe.

Hard Real Time System

- In Hard Real Time System however, not only must tasks be completed within a specified timeframe, but they must also be completed correctly.

The Operating System: What It Does

Task Management

	No. of Users	No. of Processors	Order of Processing
Multi-tasking	One	One	Concurrently
Multiprogramming	Multiple	One	Concurrently
Timesharing	Multiple	One	Round Robin
Multiprocessing	One or more	Two or more	Simultaneously

Thanks a Lot