Lecture 1 Introduction of Operating System

Before starting the journey of Operating system answer the following questions

- What is Software ?
- Types of software?
- What is data?
- What is information ?
- Define program

AGENDA of Lecture 1

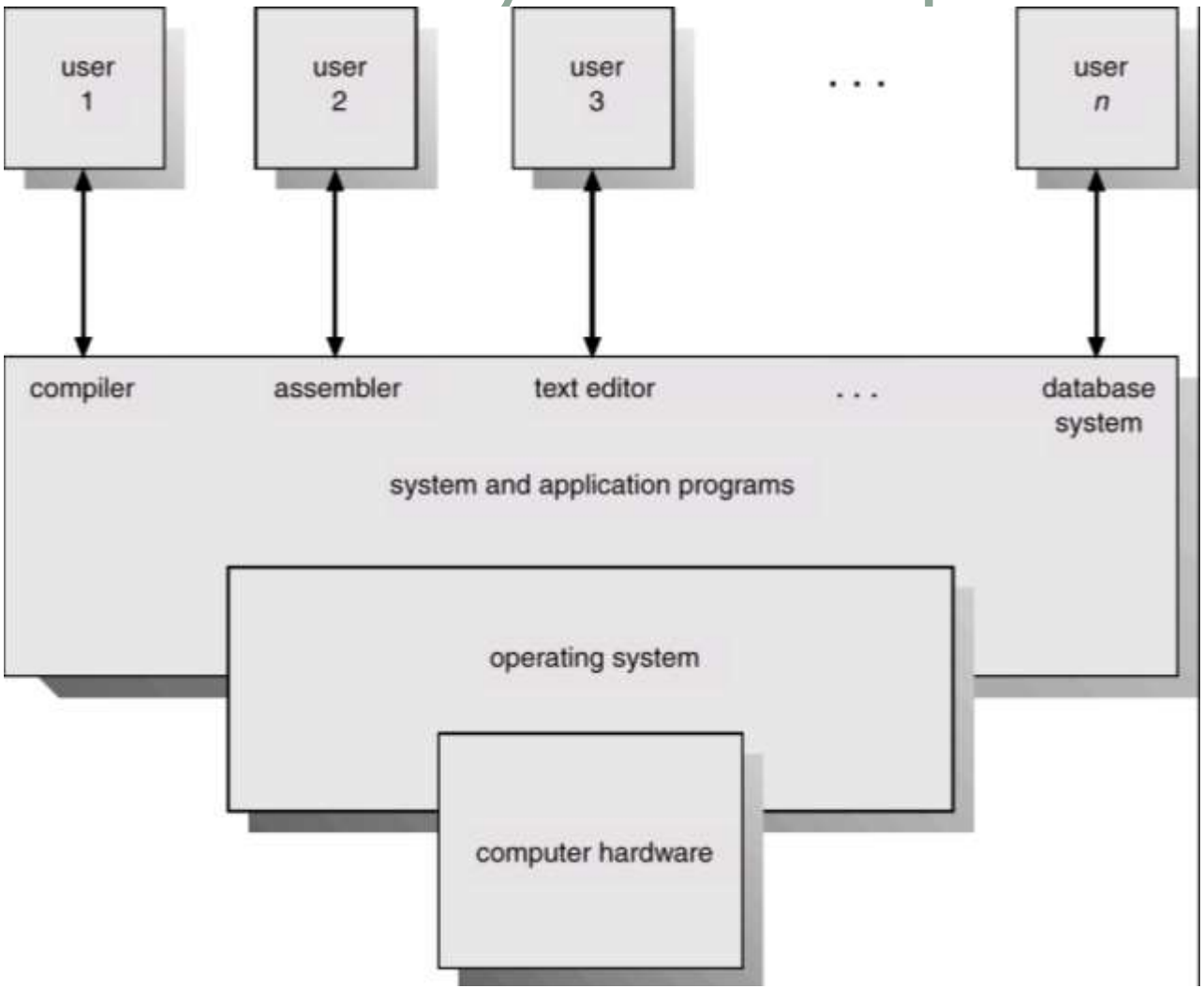
Topics to Be Covered:

- Introduction
- Definition
- Goals of Operating System
- History
- Operation /Functions of OS
- Types of Operating System

Introduction

- An **Operating system (OS)** is system software which acts as an interface between the end user and computer hardware.
- An operating system is software that manages the computer hardware
- The OS helps you to communicate with the computer without knowing how to speak the computer's language.

Abstract View of System Components



Definitions

- 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 and improper use of the computer

Operating System Definition (Cont.)

- No universally accepted definition
- “Everything a vendor ships when you order an operating system” is a good approximation
  - But varies wildly
- “The one program running at all times on the computer” is the **kernel**.
- Everything else is either
  - a system program (ships with the operating system) , or
  - an application program.

Goals

- **Convenience:** An OS provide a convenient environment

- **Control and Manage Resource:** An OS allows the computer system resources to be used in an efficient manner. It control and manage resources of computer

History

- The first operating system was created by General Motors in 1956 to run a single IBM central computer.
- In the 1960s, IBM was the first computer manufacturer to take on the task of developing operating systems and began distributing
- In the late 1960s, the first version of the Unix operating system was developed

History

- The first operating system created by Microsoft was not called Windows, it was called MS-DOS and it was built in 1981
- The Windows name was first used in 1985 when a graphical user interface was created and paired or joined with the MS-DOS.
- Today Apple, OS X, Microsoft Windows and the various forms of Linux (including Android)

Operation /Functions of OS

- Memory Management
- Processor Management
- Device Management
- File Management
- Security
- Control over system performance
- Job accounting
- Error detecting aids
- Coordination between other software and users

Operating System Services

- Operating systems provide an environment for execution of programs and services to programs and users
- One set of operating-system services provides functions that are helpful to the user:
  - User interface - Almost all operating systems have a user interface (UI).
    - Varies between Command-Line (CLI), Graphics User Interface (GUI), Batch
  - Program execution - The system must be able to load a program into memory and to run that program, end execution, either normally or abnormally (indicating error)
  - I/O operations - A running program may require I/O, which may involve a file or an I/O device

Process Management Activities

The operating system is responsible for the following activities in connection with process management:

- Creating and deleting both user and system processes
- Suspending and resuming processes
- Providing mechanisms for process synchronization
- Providing mechanisms for process communication
- Providing mechanisms for deadlock handling

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 determines what is in memory and when
  - Optimizing CPU utilization and computer response to users
- 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

I/O Subsystem

- One purpose of OS is to hide peculiarities of hardware devices from the user
- I/O subsystem responsible for
  - Memory management of I/O including buffering (storing data temporarily while it is being transferred), caching (storing parts of data in faster storage for performance), spooling (the overlapping of output of one job with input of other jobs)
  - General device-driver interface
  - Drivers for specific hardware devices

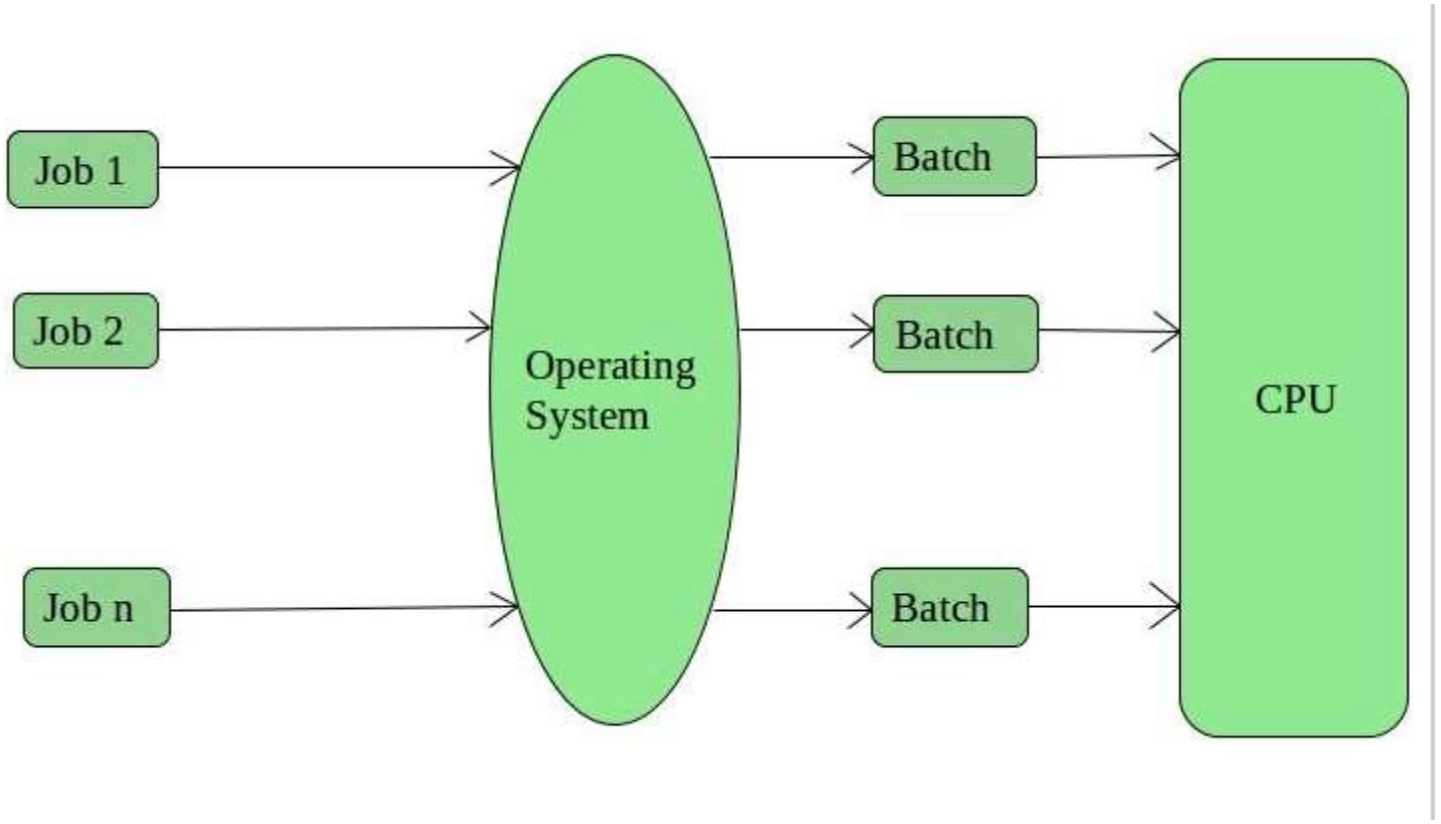
Protection and Security

- **Protection** – any mechanism for controlling access of processes or users to resources defined by the OS
- **Security** – defense of the system against internal and external attacks
  - Huge range, including denial-of-service, worms, viruses, identity theft, theft of service
- Systems generally first distinguish among users, to determine who can do what
  - User identities (**user IDs**, security IDs) include name and associated number, one per user
  - User ID then associated with all files, processes of that user to determine access control
  - Group identifier (**group ID**) allows set of users to be defined and controls managed, then also associated with each process, file
  - **Privilege escalation** allows user to change to effective ID with more rights

Types of Operating System

- Batch operating system
- Multiprogramming
- Time sharing
- Distributed operating system
- Network operating system
- Real Time operating system

Simple Batch Systems



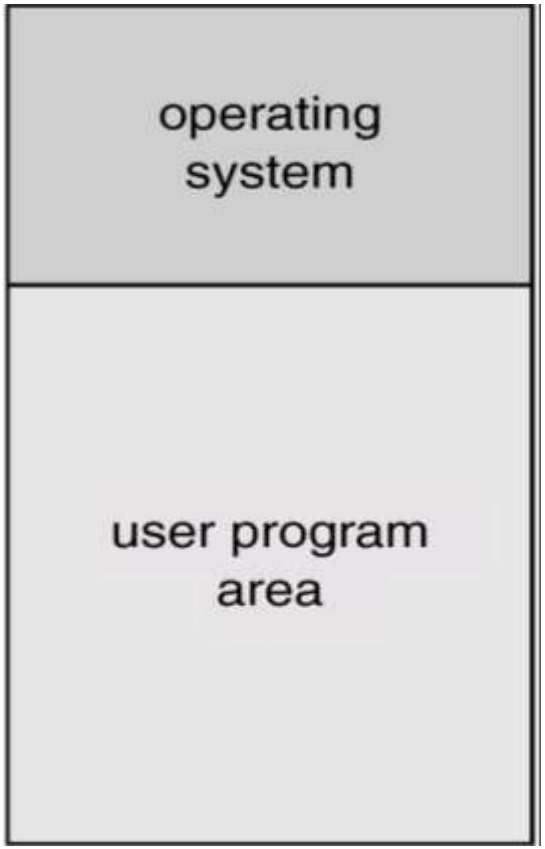
Simple Batch Systems

- The users of a batch operating system do not interact with the computer directly.

- Each user prepares his job on an off-line device like punch cards and submits it to the computer operator.

- To speed up processing, jobs with similar needs are batched together and run as a group

Memory Layout for a Simple Batch System



Advantages of Batch processing operating system:

- Repeated jobs can be completed easily without any human intervention
- Hardware or system support is not required to input data in batch system
- It can be shared among multiple users.

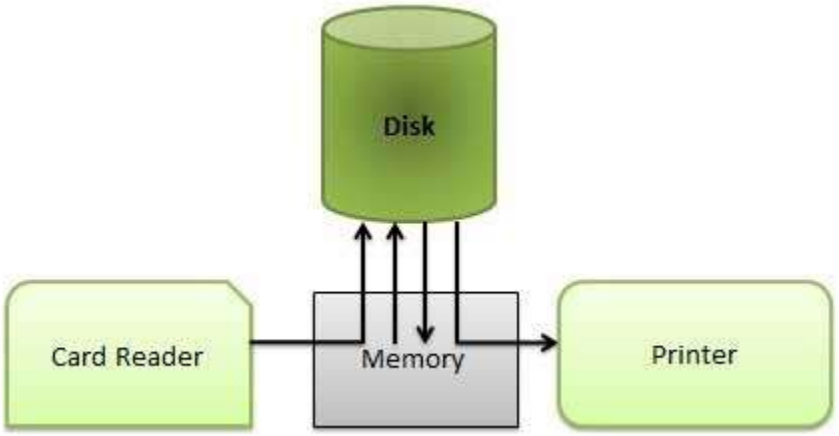
Disadvantages of batch processing operating systems:

- You need to train the computer operators for using the batch system.
- It is not easy to debug this system.
- If any error occurs in one job, the other jobs may have to wait for an uncertain time.

Spooling

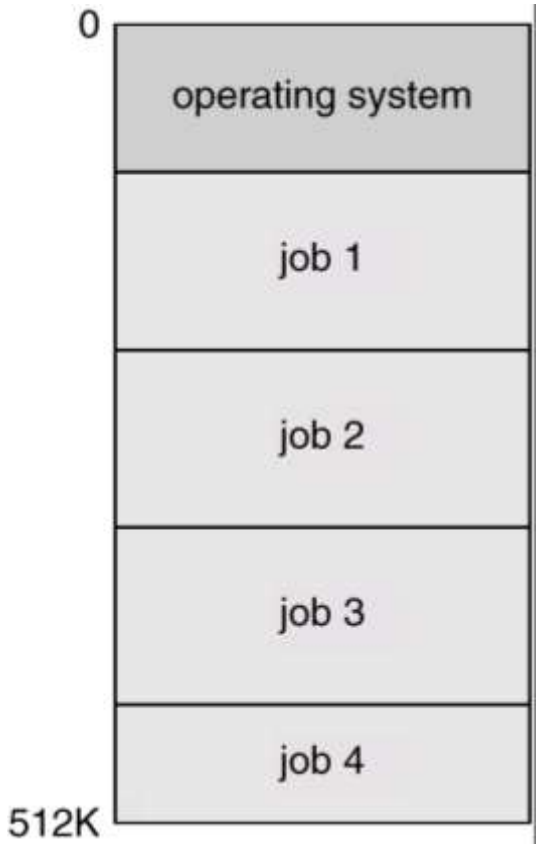
- Spooling is an acronym for simultaneous peripheral operations on line.
- Spooling refers to putting data of various I/O jobs in a buffer
- This buffer is a special area in memory or hard disk which is accessible to I/O devices

Spooling



Multiprogrammed Systems

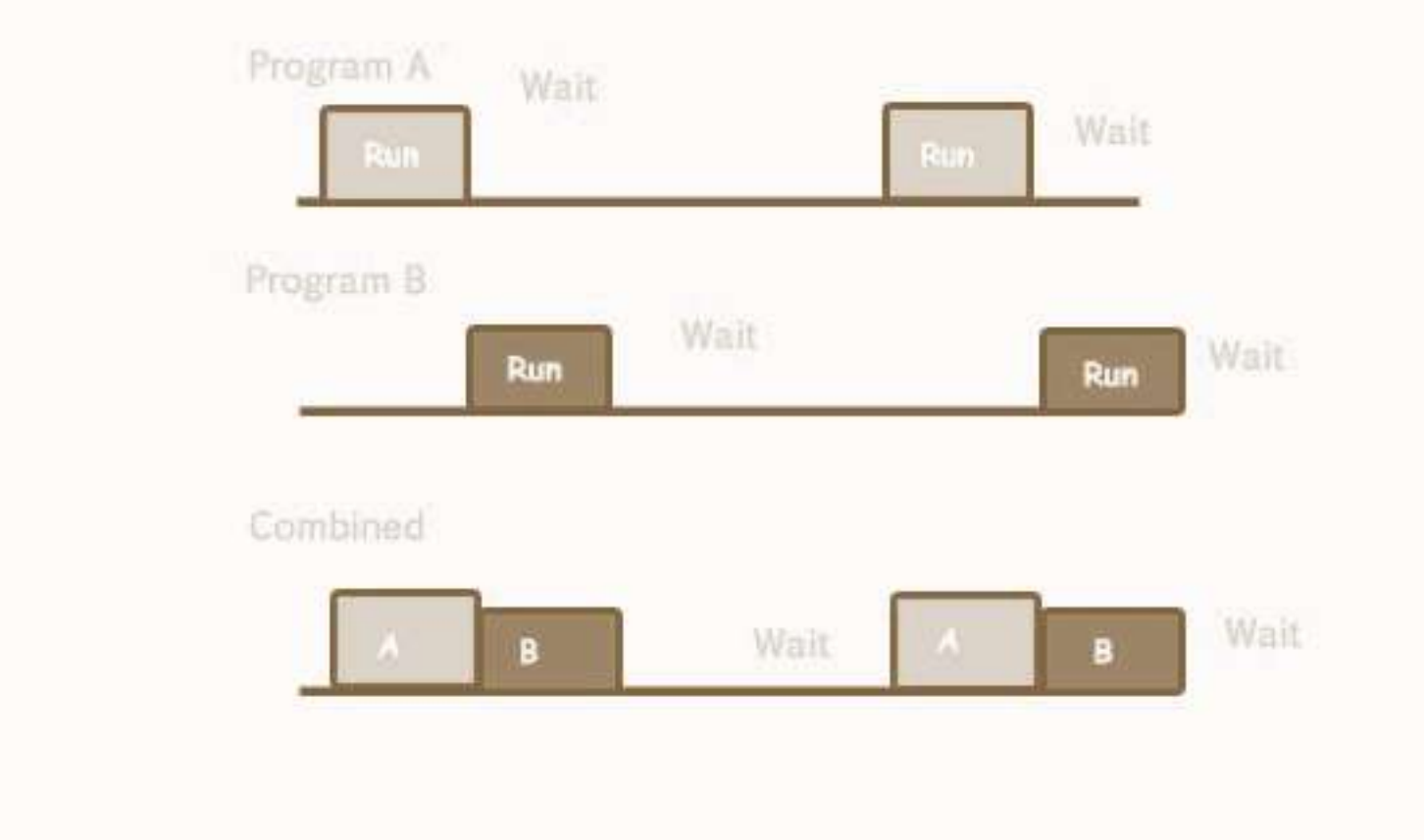
Several jobs are kept in main memory at the same time, and the CPU is multiplexed among them.



Multiprogrammed Systems

- The operating system keeps several jobs in memory at a time.
- This set of jobs is a subset of the jobs kept in the job pool.
- The operating system picks and begins to execute one of the jobs in the memory.

Multi programming



Advantages of Multi programming

- High and efficient CPU utilization.
- User feels that many programs are allotted CPU almost simultaneously.

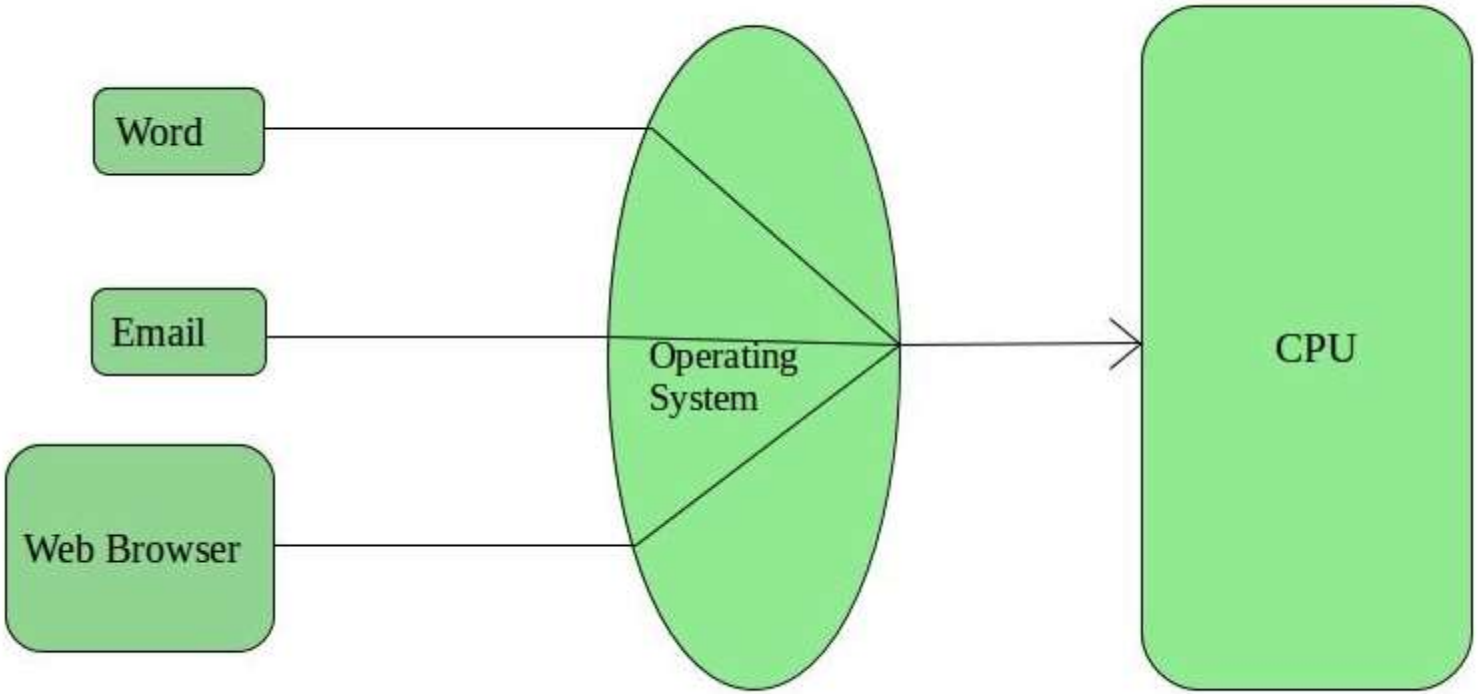
Disadvantages of Multi programming

- CPU scheduling is required.
- To accommodate many jobs in memory, memory management is required.

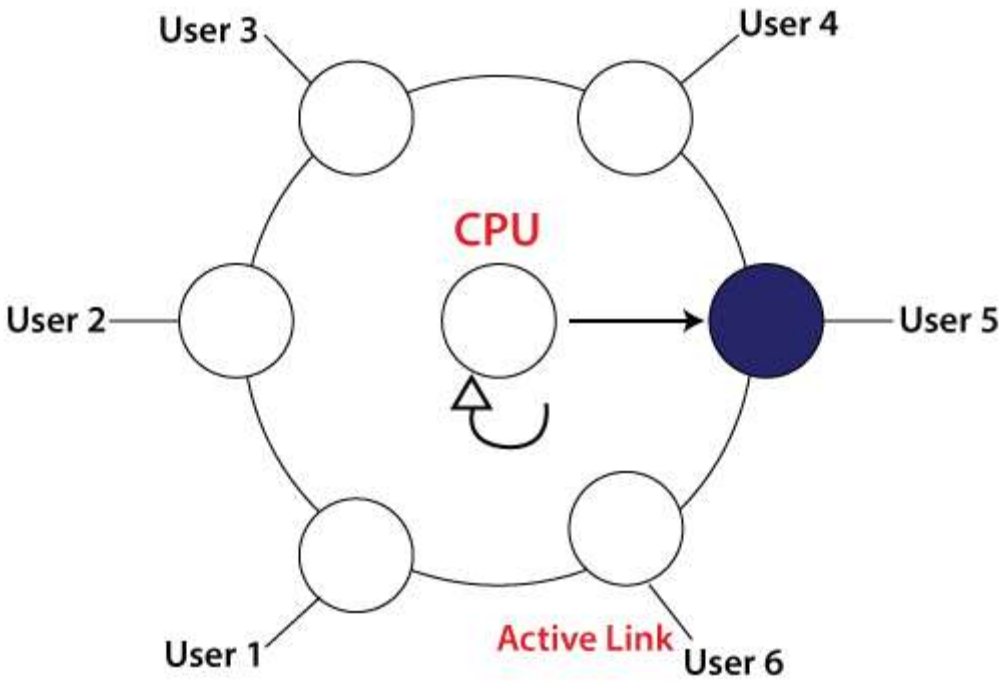
Time-Sharing Systems–Interactive Computing

- The CPU is multiplexed among several jobs that are kept in memory and on disk
- A job is swapped in and out of memory to the disk.
- On-line communication between the user and the system is provided

Time-Sharing Systems–Interactive Computing



Time-Sharing Systems–Interactive Computing



Advantages of time sharing operating system:

- It reduces CPU idle time and thus makes it more productive.
- Each process gets the chance to use the CPU.
- It allowed different applications run simultaneously.

Disadvantages of time sharing operating system:

- It requires a special operating system as it consumes more resources.
- Switching between tasks may hang up the system as it serves lots of users and runs lots of applications at the same time, so it requires hardware with high specifications.
- It is less reliable.

Question & Answer

- Define operating system
- Goals of operating system
- When was the first operating system was created and by whom?
- The first operating system created by Microsoft was known as?
- What are the main operations perform by operating system

Question & Answer

- What was the problem associated by Batch operating system?
- Explain the term multiprogramming
- What are the main features of timesharing operating system?