1.2 TYPES OF OPERATING SYSTEM

An operating system (OS) acts as an interface between the user and the computer hardware. It provides a bridge that allows users to interact with the computer and its resources without needing to understand the complex technical details of how the hardware works. The different types of operating system is

1. **Batch Operating System.**
2. **Multi-tasking/Time-sharing Operating systems.**
3. **Real-Time Operating System (RTOS)**
4. **Distributed Operating System (DOS)**

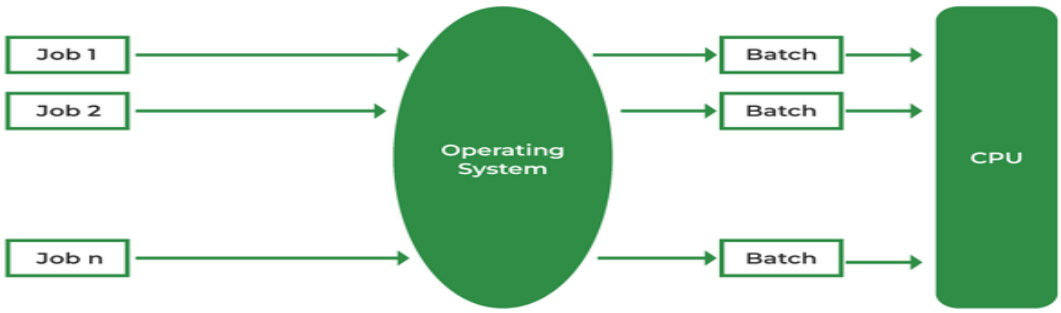
1. Batch Operating System

- 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.

How it works

The programmers leave their programs with the operator and the operator then sorts the programs with similar requirements into batches.

Now, they are stored on the Punch card (a stiff paper in which digital data is stored and represented using some specific sequence of holes) which will be submitted to the *system* for processing. E.g.: Bank Statements



Advantages:

- Suppose a job takes a very long time (1 day or so). Then, such processes can be performed even in the **absence** of humans.
- They don't require any **special** hardware and system support to input data.

Disadvantages:

- It is very difficult to **debug** batch systems.
- Lack of **interaction** between user and operating system.
- Suppose an error occurs in one of the jobs of a batch. Then, all the remaining jobs get affected i.e.; they have to wait until the error is resolved.
- CPU is often idle, because the speed of the mechanical I/O devices is slower than the CPU.
- Difficult to provide the desired priority.

2. Multi-tasking/Time-sharing Operating systems

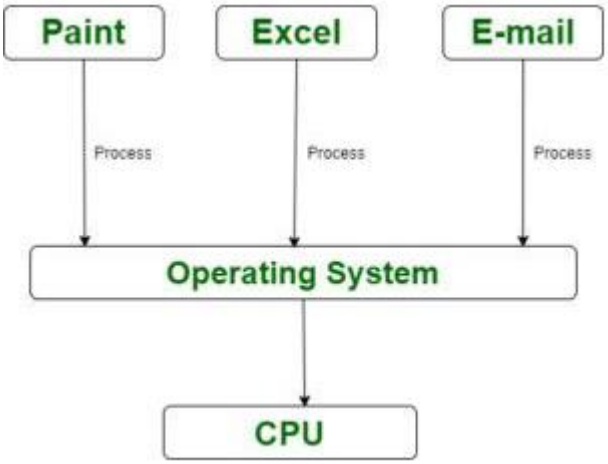
Time-sharing is a technique which enables many people, located at various terminals, to use a particular computer system at the same time.

− When the Processor's time is shared among multiple users simultaneously is termed as **time-sharing**

- As the name itself suggests, in a time-sharing system or multi-tasking system, multiple
- jobs can be executed on a system at the same time by sharing the CPU **time** among them.
- It is considered to be a **logical** extension of multiprogramming because both does simultaneous execution but differ in their prime objectives.

Difference between Multiprogrammed batch systems and time sharing is:

- **Multiprogrammed batch systems**, the objective is to **maximize processor**
- **Time-Sharing Systems**, the objective is to **minimize response time**
- The operating system uses CPU scheduling and multiprogramming to provide each user with a small portion of a time.
- Computer systems that were designed primarily as batch systems have been modified to time-sharing systems.



How it works

Multiple jobs are executed by the CPU by switching between them, but the switches occur so frequently. Thus, the user can receive an immediate response.

For example, in a transaction processing, the processor executes each user program in a short burst or quantum of computation. That is, if n users are present, then each user can get a time quantum.

When the user submits the command, the response time is in few seconds at most.

Advantages

- Provides the advantage of quick response
- Avoids duplication of software
- Reduces CPU idle time

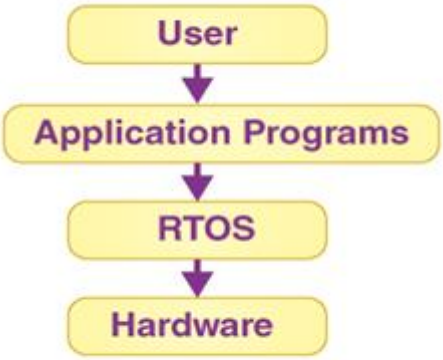
Disadvantages

- Problem of reliability
- Question of security and integrity of user programs and data
- Data communication must be enabled.

3. Real-Time Operating System (RTOS)

- Real time system is defined as a data processing system in which each task has a deadline to complete.
- Real Time Operating System (RTOS) adheres to this deadline as missing a deadline can cause affects ranging from undesired to disastrous.
- A real-time system has well-defined, fixed time constraints. otherwise the system will fail. For example, Scientific experiments, medical imaging systems, industrial control systems, weapon systems, robots, air traffic control systems, etc.

- The time taken by the system to respond to an input and display of required updated information is termed as the **response time**.
- So in this method, the response time is very less as compared to online processing.



There are two types of real-time operating systems.

a) Hard real-time systems

- Hard real-time systems guarantee that critical tasks complete on time.
- In hard real-time systems, **secondary storage is limited or missing** and the **data is stored in ROM**.
- In these systems, **virtual memory is almost never found**.

b) Soft real-time systems

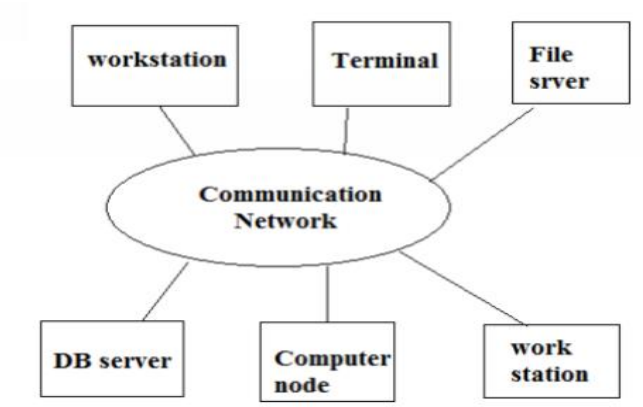
- Soft real-time systems are less restrictive.
- A critical real-time task gets priority over other tasks and retains the priority until it completes.
- Soft real-time systems have limited utility than hard real-time systems.
- For example, multimedia, virtual reality, Advanced Scientific Projects like undersea
    - exploration and planetary rovers, etc.

4. Distributed Operating System (DOS)

- These are the systems in which **data** is stored and processed on many machines which are connected by some network.
- Manages a collection of independent computers that work together as a single system.

- Allows for resource sharing and improved fault tolerance.
- Distributed systems use multiple central processors to serve multiple real-time. applications and multiple users.
  Example: Systems with geographically distributed servers
- Data processing jobs are distributed among the processors accordingly.
- To make it more simple, distributed systems are a collection of several separate (individual) systems which **communicate** (through a LAN or WAN) **and cooperate** with each other (using some software) in order to provide the users, access to various resources that the system maintains.
- Distributed systems are **loosely-coupled** i.e; hardware and software may communicate with each other but they need not depend upon each other.

Eg: Solaris Operating System



Objectives

- Making resources easily available.
- Open Scalable.
- Distribution transparency i.e; the fact that the resources are distributed must be hidden.
- With resource sharing facility, a user at one site may be able to use the resources available at another.
- Speedup the exchange of data with one another via electronic mail.
- Reliable- If one site fails in a distributed system, the remaining sites can potentially continue operating.

Advantages

- Reduced load on the host computer.
- Reduced delay in data processing.
- Better service to the users.

Disadvantages:

- Network Security.
- Network complexity.
- Unpredictability.