

**Lecture: 4**  
**(Part-I)**  
**Types of Operating System**

Before 1950's the programmers directly interacted with the computer hardware, there was no OS at that time. If the programmer want to execute the program on those days, he has to follow some serial steps:

- Type the program on punched card.
- Convert the punched card to card reader.
- Submit to the computing machine, if any error in the program, the error condition was indicated by lights.
- The programmer examine the registers and main memory to identify the cause of error.
- Take the output on the printers.
- Then the programmer is ready for the next program.

Such type of method is called as "Serial Processing" as programs are submitted to the machine one after the other and it takes much time & next program should wait for the completion of previous one.

**1. Batch Operating System:**

- This type of operating system **does not interact with the computer directly**. There is an operator which takes similar jobs having the same requirement and group them into batches.
  - ✓ Early computers were physically large machine.
  - ✓ The common input devices were card readers, tape drivers.
  - ✓ The common output devices were line printers, tape drivers and card punches.
  - ✓ i.e. earlier, one room for card reader and one for executing the program and another room for printing the output.
  - ✓ The user or machine operator used to run between these three rooms to complete a job.
- In batch processing, **similar type of jobs batch together and execute at a time**. The operator carries the group of jobs at a time from one room to another. Therefore, the programmer need not run between three rooms several times.

- **Advantages:**
  - ✓ Reduced setup time: as for one batch the compiler, assembler, the loader etc had to be loaded only once, thus reducing setup time to some extent.
  - ✓ multiple users can share the batch system.
  - ✓ the idle time for the batch system is very less.
  - ✓ it is easy to manage large work repeatedly in batch systems.
- **Disadvantages:**
  - ✓ Batch systems are hard to debug.
  - ✓ It is sometimes costly.
  - ✓ The other jobs will have to wait for an unknown time if any job fails.

## 2. Time Sharing Operating System:

- Each task is given some time to execute so that all the tasks work smoothly.
- Each user gets the time of CPU as they use a single system. These systems are also known as Multitasking Systems.
- The task can be from a single user or different users also.
- The time that each task gets to execute is called quantum. After this time interval is over OS switches over to the next task.
- The time sharing system allows many users to share the computer simultaneously. Since, each action in this system is short, only a little CPU time is needed for each user.
- The system switches rapidly from one user to the next so each user feels as if the entire computer system is dedicated to his use, even though it is being shared by many users.
- **Advantages:**
  - ✓ Each task gets an equal opportunity.
  - ✓ CPU idle time can be reduced.
- **Disadvantages:**
  - ✓ The system must have memory management & protection, since several jobs are kept in memory at the same time.
  - ✓ It provides mechanism for concurrent execution which requires complex CPU scheduling schemes.

### 3. Multiprogramming Operating System:

- Multiprogramming concept **increases CPU utilization by organizing jobs so that the CPU always has one job to execute.**
- In this environment, CPU simply switches and executes another job. When a job needs to wait, the CPU is simply switched to another job and so on.
- e.g. if any I/O wait happened in a process, then the CPU switches from that job to another job in the job pool.
- **It has no fixed time slice for processes.**
- **The main purpose of multiprogramming is resource utilization.**
  
- **Advantages:**
  - ✓ No CPU idle time.
  - ✓ Tasks run in parallel.
  - ✓ Shorter response time.
  - ✓ Maximized total job throughput of a computer.
  - ✓ Increases resource utilization.
  
- **Disadvantages of Multiprogramming OS:**
  - ✓ Sometimes long time jobs have to wait for a longer time.
  - ✓ Tracking of all processes sometimes difficult.
  - ✓ Requires CPU scheduling.
  - ✓ Requires efficient memory management.