A Deep Dive into Batch Operating System

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Abstract

As we all know , how computers have evolved from being a device which required coding knowledge and difficult to use to being a device easy to use and being essential part of our daily life. If we see what has actually changed about computers over these years that helped computers evolve and become an essential part of our life It can be easily observe that this miracle happened due to Operating System.

An operating system is the most important software that runs on a computer. It manages the computer's memory and processes, as well as all of its software and hardware by acting as a intermediary between user and actual hardware. It also allows us to communicate with the computer without knowing how to speak the computer's language.

So, in this project we would like to learn the basic idea and implementation of first operating system i.e. **Batch operating system**

Roadmap


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1

History of Operating System

An **Operating System (OS)** is an interface between a computer user and computer hardware. An operating system is a software which performs all the basic tasks like file management, memory management, process management, handling input and output, and controlling peripheral devices such as disk drives and printers.

History

Back in 1950s and 1960s, there were no well-developed operating system, advanced computer architecture and secondary memory devices. Instead there were large mainframe computers for the processing work and punched cards or magnetic tapes were used to provide the input and receive the output. The major problem was the lack of hard disk in those times.

So, what the users did was that they prepared the program (which was termed as a job in those days) manually and then used an input magnetic tape using which the job's code was submitted to the computer. Once this was done, the user could no longer interact with the job and when the processing was done, an output magnetic tape was used to obtain the output.

Batch OS

Now that we know a small history about OS. Let's understand what Batch Operating System is

Batch Operating System

The very basic and ancient type of operating system which was first introduced was this batch operating system. These types of operating systems, as the name suggests, were used to perform a single task at a given interval of time. According to the concept of the batch operating systems, it states that until a JOB (or process) has been completely processed and has been successfully executed, we cannot perform another job or process at the same time

Batch Operating System

The First operating system of the second-generation computer is the batch operating system. Batch operating system took the input on the punch card. Each punch card had the different form of data. System executed the jobs one by one in batch. When one job from the batch executed, then the second job has taken from it and so on. The process of placing the jobs in queue for execution is known as spooling.

Types of Batch OS:

Simple Batch OS

In simple batch operating system user did not directly interact with computer system for job execution rather, the user required to prepare a job which entailed of the program the control information and data about the nature of job the control cards. Then this job was submitted to the computer operator which were usually in the form of punch card. Output appeared after some time it may took minutes, hours or days

Multiprogram Batch OS

Spooling deals with several jobs that have already been read waiting on disk ready to run. Disk which contains a pool of jobs allows operating system to select job to run next for sack of CPU's proper utilization. When jobs come in direct manner on magnetic tape or cards jobs cannot run in a different order. Jobs execute on the bases of first come, first serve so they must run in sequential fashion.

Need of Batch OS

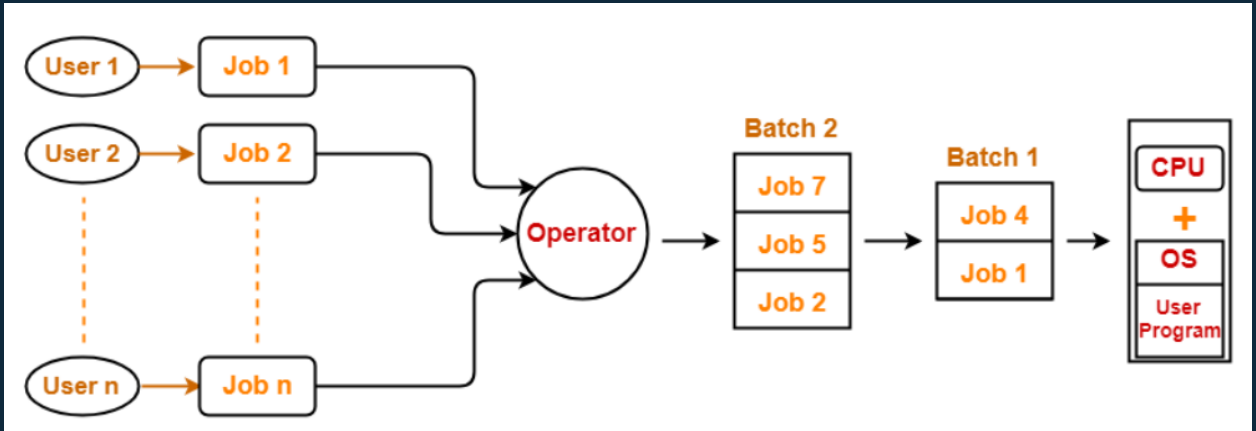
Need of Batch OS

Suppose one job is in C language and other one is in Java. We know that both the jobs now require entirely different environments for their execution. So, the I/O magnetic tapes needed to be loaded and unloaded again and again. As the number of users increased, so did the number of jobs and it was really a time-consuming process. Most of the time was wasted in this I/O work only and CPU remained idle for too long.

Then a solution to this problem was devised that jobs requiring similar environmental conditions will be submitted altogether within a batch. Since similar jobs were put together in a batch, this system was termed as a batch system.

Working of Batch OS

Working of Batch OS



OS keeps the number of jobs in memory and executes them one by one. Jobs processed in first come first served order. Each set of a job considered as a batch. When a job completes its execution, its memory is released, and the output for the job gets copied into an output spool for later printing or processing. User interaction in the batch processing system is minimal. One's system accepts the jobs from users, and then the user is free. That is why we can use batch processing system in large organizations in these days.

Role and Some terms

Role of Batch OS

The main role of a batch operating system is to automatically executing the jobs in a batch. This is the primary task of a batch processing system i.e. performed by the 'Batch Monitor' resides in the low end of main memory. This technique was feasible due to the invention of hard-disk drives and card readers. Now the jobs can be saved on the disk to make the pool of jobs for its execution as a batch. Firstly the extracted jobs are read and executed by the batch monitor, and then these jobs are grouped, placing the similar jobs (jobs with the similar needs) in the same batch, So, in the batch operating system, the batched jobs were executed automatically one after the other saving its time by performing the tasks (like loading of compiler) only for once.

It resulted in better system utilization due to reduced turn around time. To speed up processing, jobs with similar needs are batched together and run as a group. The programmers leave their programs with the operator and the operator then sorts the programs with similar requirements into batches. Lack of interaction between the user and the job.

Some Terms

BATCH WINDOW

A batch window is "a period of less-intensive online activity", when the computer system is able to run batch jobs without interference from, or with, interactive online systems.

A bank's end-of-day (EOD) jobs require the concept of cutover, where transaction and data are cut off for a particular day's batch activity ("deposits after 3 PM will be processed the next day as seen in banks").

BATCH SIZE

- The *batch size* refers to the number of work units to be processed within one batch operation. Some examples are:
- The number of lines from a file to load into a database before committing the transaction.
- The number of messages to dequeue from a queue.
- The number of requests to send within one payload.

Comparison, Advantages & Disadvantages

Comparison

BATCH OPERATING SYSTEM	MULTIPROGRAMMING
• Batch processing System is also called as Simple Batch System	• Multiprogramming System is also called as Multiprogram Task System.
• A series of jobs are executed without any human intervention in Batch processing system. In this set of jobs with similar needs are batched together and inputted to the computer for execution.	• Multiprogramming operating system allows to execute multiple processes by monitoring their process states and switching in between processes. It executes multiple programs to avoid CPU and memory underutilization.
• Batch processing system is slower in processing than Multiprogramming system.	• Multiprogramming System is faster in processing than Batch Processing system.
• In Batch processing system CPU needs to stand idly.	• In Multiprogramming system CPU needs not stand idly.
• In this the processes have to wait in a queue.	• In this the process has to wait in a queue.
• In batch processing Operating System execution of process starts batch wise.	• In multi-programming Operating System execution of process starts as it centers the processor.
• In batch processing grouping of several processing jobs to be executed one after another by a computer without any user interaction.	• Multi-programming operating system ability of an OS to execute multiple programs at the same time on a single processor.

BATCH OPERATING SYSTEM	REAL TIME OPERATING SYSTEM
• In batch processing processor only needs to busy when work is assigned to it.	• In real time processing processor needs to very responsive and active all the time.
• Jobs with similar requirements are batched together and run through the computer as a group.	• In this system, events mostly external to computer system are accepted and processed within certain deadlines.
• Completion time is not critical in batch processing.	• Time to complete the task is very critical in real-time
• It provides most economical and simplest processing method for business applications.	• Complex and costly processing requires unique hardware and software to handle complex operating system programs.
• Normal computer specification can also work with batch processing.	• Real-time processing needs high computer architecture and high hardware specification.
• In this processing there is no time limit.	• It has to handle a process within the specified time limit otherwise the system fails.
• In this system sorting is performed before processing.	• No sorting is required.

Comparison

BATCH OS	TIME SHARING OS
Multiple processes are managed at once.	Multiple users are managed at once.
Multiple processes are put together in a buffer (queue) and are executed in a batch with minimum or no user intervention.	User sessions are contexed switched to give the illusion of concurrent execution.
It is used to achieve a multiprocessing environment.	It is used achieve multi-user environment.
Goal is to maximize resource utilization by keeping computing resources as busy as possible.	Goal is to minimize the response time i.e. the time taken to give response to a user.

Advantages

- A lot of manual work is reduced.
- Execution becomes fast and well managed.
- CPU's idle time is reduced.
- Repetitive use of Punched cards and magnetic tapes is reduced.

Disadvantages

- Sequential execution: This is one of the major disadvantages of Batch Systems. Jobs in a batch are always executed sequentially. For example, if there are 4 jobs in one batch, then they are always executed one by one and the output is obtained only once all 4 jobs are completed. so Difficult to provide the desired priority.

Disadvantages(Contd.)

- **Starvation:** Different jobs in a single batch might take different amounts of time in execution. This might lead to starvation of some jobs. Suppose there are 4 jobs in a batch and the first job takes too long to execute then the other three jobs in the same batch will have to wait for long until the first one is completed.

- **No interaction between job and user:** Once a batch is submitted to the computer, the user is no longer able to interact with any of the jobs. Suppose there is a job which requires the user to give the input data during runtime. Now, He must wait until all the jobs in that batch are completed. So, the overall execution time is increased a lot.

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Thanks!

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