Comparative Study of Scheduling Algorithms in Operating System

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Abstract

Scheduling Algorithms deals with the problem and decides which process should be executed next and allocate to the CPU. We have various process scheduling algorithm like First Come First Serve (FCFS), Shortest Job First (SJF), Priority Scheduling Algorithm, Round Robin Scheduling Algorithm, Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling. First come first serve scheduling algorithm is based on FIFO. It is suitable for batch system and is non preemptive in nature. Shortest job first scheduling algorithm is deal with both preemptive and non preemptive scheduling. Priority scheduling is necessarily a form of preemptive scheduling where priority is based upon preemption. The Round robin scheduling algorithm is used to support the time sharing process and it is also suitable for interactive system. In Multilevel queue scheduling the processes are permanently assigned to a queue on entry to the system. Multilevel feedback queue deals with those processes that move between queues.

Keywords

Scheduling Algorithm, First come first serve, Round robin, Shortest job first, Priority.

1. Introduction to operating system

An operating system is a program that acts as an interface between user and the hardware. The basic purpose of an operating system is to provide an environment where a user can execute program in convenient manner. Operating system is a software program which act as an interface between the user and the hardware. The job of an operating system is to provide an orderly and controlled allocation of the various processes. An operating system is an important part of every computer system; basically we can say that operating system is a program that controls the computer hardware. Mainframe operating system are designed primarily to optimize utilization of hardware. Personal computer operating system supports complex applications and handheld computer operating system are designed to provide an environment in which a user can easily interface with the computer to execute programs. Basically an operating system is a collection of system programs that together control the operation of the computer system. The operating system consists of thousands of lines of program code and stored on the hard disk portion of the operating system are load into computer system memory when needed. In operating system, utilities are provided for managing files and documents, development of programs and software, communication between people and with other computer system. An operating system manages resources of the computer system it keeps track of the status of each resources and decides who will have a control over computer resources it also provide common services that are needed by user and applications

2. An Introduction to Scheduling Algorithms

Scheduling algorithms decides which process should be executed next and allocates to the CPU .We discuss various Scheduling algorithms like First come first serve Scheduling algorithms, Shortest job first Scheduling algorithms , Round robin Scheduling algorithms ,Priority Scheduling algorithms. In first come first serve scheduling algorithm is of the simplest Scheduling algorithm because the implementation of FCFS Scheduling algorithm is easily managed with FIFO queue, this Scheduling algorithm is simple to understand and it is also suitable for batch system. The shortest job first Scheduling algorithm is non preemptive algorithm that assumes the run times are known in advance the major advantage of this Scheduling algorithm is that it gives the minimum average waiting time. The Priority Scheduling algorithm is completely based on priority in which the higher priority should get CPU whereas lower priority job can be made to wait. The round robin Scheduling algorithm is preemptive and it is good for interactive system
And simple to understand this Scheduling algorithm is similar to the first come first serve Scheduling. Basically scheduling criteria is the possible metrics for determining these Scheduling algorithms. The first parameter is CPU utilization, in this we want to keep the CPU busy as possible. Next we measure the throughput, the number of processes completed per time unit is called throughput. The next parameter measure the interval from the time of submission of the process to the time of completion it is known as turnaround time. The next criterion is waiting time in which it is the sums of the periods spend waiting in the ready queue. In an interactive system the response time is a best metric it is defined as the time interval between the job submission and the first response produced by the job. Response time should be minimized in an interactive system.

2.1 First Come First Serve Scheduling Algorithm

It is one of the simplest Scheduling algorithms we have it allocate the CPU in the order in which the process arrive. It assumed that ready queue is managed as first in first out. This Scheduling algorithm is simple to understand and it is suitable for batch system but the waiting time can be large if short request wait behind the long ones. This Scheduling algorithm is not suitable for time sharing system. The First come first serve (FCFS) Scheduling algorithm is non preemptive.

2.2 Shortest Job First Scheduling Algorithm

This Scheduling algorithm is deal with different approach in this algorithm CPU is allocated to the process with least burst time the major advantage of this scheduling algorithm is this is usually considered to be an optical algorithm and it gives the minimum average waiting time. It is also non preemptive Scheduling algorithm.

2.3 Priority scheduling Algorithm

This Scheduling algorithm is preemptive in which all things are based on the priority in this scheduling algorithm each process in the system is based on the priority whereas highest priority job can run first whereas lower priority job can be made to wait, the biggest problem of this algorithm is starvation of a process.

2.4 Round robin Scheduling Algorithm

The Round robin Scheduling algorithm is similar to the first come first serve Scheduling algorithm the basic purpose of this Scheduling algorithm is to give response to the user in a reasonable time. The basic motive of this Scheduling algorithm is to support time sharing process it is simple to understand and this Scheduling algorithm is suitable for interactive system.

3. Comparison of Various Scheduling Algorithms

<table>
<thead>
<tr>
<th>Sr.no</th>
<th>Parameter</th>
<th>FCFS Algorithm</th>
<th>SJF Algorithm</th>
<th>Priority algorithm</th>
<th>Round Algorithm</th>
<th>Robin</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Preemption</td>
<td>This scheduling algorithm is non preemptive.</td>
<td>This scheduling algorithm is preemptive.</td>
<td>This scheduling algorithm is also preemptive.</td>
<td>This scheduling algorithm is also preemptive.</td>
<td>In this scheduling algorithm performance heavily depends upon the size of time quantum.</td>
</tr>
<tr>
<td>2.</td>
<td>Complexity</td>
<td>This is simplest scheduling algorithm.</td>
<td>This algorithm is difficult to understand and code.</td>
<td>This algorithm is also difficult to understand.</td>
<td>In this scheduling algorithm the preemption take place after a fixed interval of time.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Allocation</td>
<td>In this scheduling algorithm it allocates the CPU in the order in which the processes arrives.</td>
<td>In this scheduling algorithm CPU is allocated to the process with least CPU burst time.</td>
<td>This scheduling algorithm is based on priority the higher priority job can run first.</td>
<td>In this scheduling algorithm the preemption take place after a fixed interval of time.</td>
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<td>4.</td>
<td>Application</td>
<td>This scheduling algorithm is good for non interactive system.</td>
<td>This scheduling algorithm is also good for non interactive system.</td>
<td>This scheduling algorithm is also good for non interactive system.</td>
<td>This scheduling algorithm is good for interactive system.</td>
<td></td>
</tr>
</tbody>
</table>
5. **Waiting Time**  
In this scheduling algorithm the Average waiting time is large.

| In this scheduling algorithm the Average waiting time is small as compare to FCFS scheduling algorithm. |
| In this scheduling algorithm the Average waiting time is small as compare to FCFS scheduling algorithm. |
| In this scheduling algorithm the Average waiting time is large as compare to all the three scheduling algorithm. |

6. **Usability**  
This scheduling algorithm is never recommended whenever performance is a major issue.

| This scheduling algorithm the problem is to know the length of time for which the CPU is needed by the process. |
| This scheduling algorithm is the sometime becomes the biggest cause of starvation. |
| In this scheduling algorithm if the quantum size is large then this algorithm become same as FCFS algorithm and its performance degrade. |

7. **Type of system**  
This scheduling algorithm is suitable for Batch system.

| This scheduling algorithm is also suitable for Batch system. |
| This scheduling algorithm is based upon priority. |
| This scheduling algorithm is suitable for time sharing system. |

4. **Conclusion**

From the above discussion we can say that the first come first serve scheduling algorithm is simple to understand and suitable only for batch system where waiting time is large. The shortest job first scheduling algorithm deals with different approach in this algorithm the major benefit is it gives the minimum average waiting time. The priority scheduling algorithm is based on the priority in which the highest priority job can run first and the lowest priority job need to wait though it will create a problem of starvation. The round robin scheduling algorithm is preemptive which is based on round robin policy one of the scheduling algorithm which follows the interactive system and the round robin scheduling algorithm is deal with the time sharing system.

5. **References**

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