ASANSOL ENGINEERING COLLEGE

PROCESS SCHEDULING AND DIFFERENT SCHEDULING ALGORITHMS

Presented by :- Anshika Kushwaha

Roll no : 10800121003

Department : CSE Section : A

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INTRODUCTION

Process scheduling is a fundamental concept in operating systems that involves allocating system resources to multiple processes.
It is essential because it allows the operating system to efficiently manage resources, such as CPU time and memory, and ensure that all processes are executed fairly.

TYPES OF PROCESS SCHEDULING

Process scheduling is a crucial component of operating systems that helps manage multiple processes and allocate system resources. There are two main types of process scheduling:

preemptive and non-preemptive.
Preemptive scheduling allows the operating system to interrupt a running process and switch to another process with higher priority.

Non-preemptive scheduling, on the other hand, does not allow interruptions and lets the current process run until it completes or blocks. Both types have their advantages and disadvantages depending on the system's needs.

FIRST-COME, FIRST-SERVE (FCFS) SCHEDULING

- First-Come, First-Serve (FCFS) is the simplest scheduling algorithm. As the name suggests, the process that arrives first is served first. FCFS is easy to understand and implement, making it a popular choice for many operating systems.
- One advantage of FCFS is that it is fair - every process gets its turn in the order it arrived. However, this can also be a disadvantage as shorter processes may be stuck waiting behind longer ones. This can lead to longer average wait times and lower system throughput.

Shortest Job First (SJF) Scheduling

- Shortest Job First (SJF) scheduling is a non-preemptive algorithm that selects the process with the smallest burst time to execute first.
- The advantages of SJF scheduling include a shorter average waiting time and turnaround time for processes with shorter burst times. However, it can lead to starvation for longer processes and may not be practical in real-time systems where the burst time of a process is unknown.

ROUND ROBIN (RR) SCHEDULING

- Round Robin (RR) scheduling is a preemptive scheduling algorithm that assigns time slices to each process in a circular order, ensuring fairness and preventing starvation.
- The advantages of RR scheduling include responsiveness and predictable performance, while its disadvantages include high overhead and poor performance with long processes.

Priority Scheduling

- Priority scheduling is a type of process scheduling algorithm that assigns priorities to each process in the system. The process with the highest priority is executed first, followed by the process with the next highest priority, and so on. This ensures that processes with higher importance or urgency are given precedence over other processes.
- One advantage of priority scheduling is that it allows for real-time systems to be implemented, where certain processes must be executed within strict time constraints. Additionally, priority scheduling can improve system performance by ensuring that important processes are completed quickly. However, one disadvantage of priority scheduling is that it can lead to starvation, where low-priority processes may never get a chance to execute if high-priority processes continue to be added to the queue.

MULTILEVEL QUEUE SCHEDULING

- Multilevel queue scheduling is a complex algorithm that involves dividing processes into multiple queues based on their priority. Each queue has its own scheduling algorithm, which helps to ensure that high- priority processes are executed before low-priority ones.
- One of the advantages of multilevel queue scheduling is that it allows for more efficient use of system resources. By prioritizing certain processes over others, the operating system can ensure that critical tasks are completed in a timely manner. However, this approach can also lead to issues with starvation, where low-priority processes are never executed because higher-priority processes are constantly being added to the queue.

Multilevel Feedback Queue Scheduling

- Multilevel feedback queue scheduling is a process scheduling algorithm that allows processes to move between different priority queues. Each queue has its own scheduling algorithm, and the processes are moved between the queues based on their behavior.
- The algorithm assigns a priority level to each process, and it uses a combination of preemption and time slicing to ensure that all processes get a fair share of the CPU. The algorithm also allows for dynamic priority adjustments based on the behavior of the processes.

COMPARISON OF SCHEDULING ALGORITHMS

- When it comes to process scheduling, there are several different algorithms that can be used. Each algorithm has its own strengths and weaknesses, making it important to choose the right one for a given situation. One of the most commonly used algorithms is First-Come, First-Serve (FCFS). This algorithm is simple to implement, but it can lead to long wait times for processes that arrive later. Another popular algorithm is Shortest Job First (SJF), which prioritizes shorter processes. This can lead to faster turnaround times, but it can also create problems if longer processes get stuck waiting behind shorter ones.
- Round Robin (RR) scheduling is another common algorithm. With this approach, each process gets a fixed amount of time to run before being preempted and moved to the back of the queue. This can help prevent long wait times, but it can also result in slower overall performance if the time slice is too small. Priority scheduling is yet another option. This approach assigns priorities to each process based on factors like its importance or resource requirements. While this can be effective, it can also lead to lower-priority processes getting stuck waiting indefinitely.

CONCLUSION

IN CONCLUSION, CHOOSING THE RIGHT SCHEDULING ALGORITHM DEPENDS ON THE SPECIFIC REQUIREMENTS AND GOALS OF THE SYSTEM. SOME ALGORITHMS PRIORITIZE RESPONSIVENESS, WHILE OTHERS PRIORITIZE THROUGHPUT OR FAIRNESS. REAL-WORLD OPERATING SYSTEMS OFTEN USE A COMBINATION OF SCHEDULING ALGORITHMS AND ADVANCED TECHNIQUES TO STRIKE A BALANCE BETWEEN DIFFERENT OBJECTIVES. THE FIELD OF PROCESS SCHEDULING REMAINS DYNAMIC, AND ONGOING RESEARCH CONTINUES TO IMPROVE SCHEDULING EFFICIENCY AND PERFORMANCE IN MODERN COMPUTING ENVIRONMENTS.

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