COEN383 Advanced Operating System Project 2 Report

Group No. 4

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The following is the output generated from the 5 algorithms implemented and average of runtime has been shared below:

ALGORITHM: FIRST COME FIRST SERVE:

Average Response Time(RT) : 30.7

Average Wait Time(WT) : 31.2

Average Turn Around Time(TAT) :36.6

Average throughput(tr) :17.0

ALGORITHM: ROUND ROBIN PREEMPTIVE:

Average Response Time(RT) : 21.9

Average Wait Time(WT) : 64.4

Average Turn Around Time(TAT) :69.8

Average throughput(tr) :25.0

ALGORITHM: SHORTEST JOB FIRST NON PREEMPTIVE:

Average Response Time(RT) : 3.8

Average Wait Time(WT) : 4.3

Average Turn Around Time(TAT) :7.1

Average throughput(tr) :30.0

ALGORITHM: SHORTEST REMAINING TIME FIRST PREEMPTIVE:

Average Response Time(RT) : 2.1

Average Wait Time(WT) : 3.3

Average Turn Around Time(TAT) :6.0

Average throughput(tr) :29.0

ALGORITHM: HIGHEST PRIORITY FIRST PREEMPTIVE:

Average Response Time(RT) : 2.1

Average Wait Time(WT) : 9.0

Average Turn Around Time(TAT) :12.3

Average throughput(tr) :53.0

ALGORITHM: HIGHEST PRIORITY FIRST NON PREEMPTIVE:

Average Response Time(RT) : 4.7

Average Wait Time(WT) : 5.0

Average Turn Around Time(TAT) :8.6

Average throughput(tr) :20.0

The statistical data provided offers insights into the performance of six CPU scheduling algorithms. Here's a summary of the key metrics:

1. Average Response Time: This indicates the time taken for a process to receive its initial response from the system. It encompasses waiting time in the ready queue and the time taken by the OS to start executing the process. Lower values are preferable as they suggest quicker access to the CPU.

2. Average Wait Time: This reflects the average duration processes spend waiting in the ready queue before execution. It considers the time spent waiting while other processes are running. Lower values are desirable as they imply faster access to the CPU.

3. Average Turnaround Time: This measures the average duration from process submission to completion, including both waiting and execution time. Lower values indicate quicker task completion.

4. Average Throughput: This denotes the average rate of successful task completion, data transfer, or processing within a specific timeframe. Higher values indicate better efficiency in handling tasks or data.

These metrics help evaluate the efficiency, responsiveness, and overall performance of CPU scheduling algorithms.

6 Implemented CPU Scheduling Algorithms Used:

1) First Come First Serve Policy:

- First Come First Serve (FCFS) is a simple and non-preemptive scheduling algorithm used in operating systems to manage the execution of processes.
- In this policy, processes are scheduled based on the order in which they arrive in the ready queue. The process that arrives first is the first to be executed, and it continues to execute until it completes its execution or voluntarily releases the CPU.
- FCFS is straightforward to implement but may not provide optimal performance in scenarios where process execution times vary significantly or when there is a need for prioritization.
- It follows a "first in, first out" (FIFO) order for process execution.

Observation Derived from Output:

- The FCFS policy exhibits moderate response and wait times, potentially leading to longer turnaround times.
- The average throughput indicates that a reasonable number of processes are being completed.
- However, FCFS may not always provide the most optimal performance, particularly in scenarios with varying process execution times or prioritization requirements.

2) Shortest Job First Non-Preemptive:

- Shortest Job First (SJF) Non-Preemptive is a scheduling algorithm where processes are executed in order of their total execution time.
- The process with the shortest execution time is given precedence and is allowed to run to completion without interruption.
- This algorithm is non-preemptive, meaning that once a process begins execution, it continues until it finishes or voluntarily releases the CPU.
- SJF Non-Preemptive is designed to minimize the average waiting time of processes, improving system efficiency by prioritizing shorter tasks.

Observation Derived from Output:
- SJF Non-Preemptive achieves quick initial responses, enhancing system responsiveness.
- Processes spend very little time waiting in the queue, optimizing queue management.
- Overall execution time is efficient, thanks to prioritizing shorter jobs.
- SJF Non-Preemptive efficiently completes a substantial number of tasks.
- High Throughput: SJF Non-Preemptive efficiently completes a substantial number of tasks.
- Risk of Starvation: Longer processes may face potential starvation if constantly outranked by shorter jobs in the queue.

3) Shortest Remaining Time First Preemptive:
- Shortest Remaining Time First (SRTF) Preemptive is a scheduling algorithm where processes are executed based on their remaining execution time.
- The process with the shortest remaining time is given precedence and is allowed to run. If a shorter job arrives while another is executing, the currently running process can be preempted (interrupted) to allow the shorter job to run, optimizing for the shortest possible execution time for all processes.
- SRTF Preemptive is designed to minimize the average waiting time of processes by dynamically selecting the shortest job at any given.

Observation Derived from Output:
- SRTF Preemptive demonstrates ultra-low response times, achieving exceptional system responsiveness.
- Processes experience minimal wait times, reflecting highly efficient queue management.
- Overall execution time is efficient, with a focus on prioritizing the shortest available tasks.
- SRTF Preemptive efficiently completes a substantial number of tasks, showcasing its excellent performance in handling dynamic workloads.

4) Round Robin Preemptive:
- Round Robin (RR) Preemptive is a scheduling algorithm in which processes are placed in a circular queue and are given equal time slices or quanta for execution.
- Each process runs for its allotted time slice, and if it doesn't complete within that time, it is temporarily preempted, moved to the end of the queue, and the next process in line gets a turn.
- This preemption and cycling continue until all processes have had a chance to execute.
- Round Robin is designed to provide fair and predictable execution times for processes, making it suitable for multitasking and time-sharing systems.
- It helps prevent processes from monopolizing the CPU and ensures reasonable responsiveness for all tasks.

Observation Derived from Output:
Round Robin Preemptive demonstrates moderate average response times, implying reasonably timely initial responses. However, it results in higher wait times for processes in the queue, potentially causing increased latency in task execution.
The overall turnaround time is reasonable, with a focus on fairness and resource sharing among processes.

Round Robin Preemptive achieves decent throughput, efficiently completing a substantial number of tasks. However, its efficiency may not match that of some other scheduling algorithms.

5) Highest Priority First Preemptive:

- Highest Priority First Preemptive (HPF) is a scheduling algorithm where each process is assigned a priority value.
- The process with the highest priority is given immediate access to the CPU and is allowed to execute.
- If a process with an even higher priority becomes available, it can preempt the currently running process, causing it to be temporarily interrupted.
- HPF Preemptive is designed to execute higher-priority tasks as soon as they are ready, ensuring that critical tasks are handled promptly.
- It is commonly used in real-time systems and situations where tasks have varying levels of importance or urgency.

Observation Derived from Output:

- Exceptionally Low Response Time for highly responsive handling of high-priority tasks.
- Low Wait Time with minimal queue wait, showcasing efficient priority-based scheduling.
- Efficient Turnaround Time prioritizing high-priority tasks while maintaining fairness.
- High Throughput for effective handling of high-priority workloads.
- For given Inputs Highest Priority First Preemptive works better than Highest Priority First Non-Preemptive.

6) Highest Priority First Non-Preemptive:

- Highest Priority First Non-Preemptive (HPF) is a scheduling algorithm where each process is assigned a priority value.
- The process with the highest priority is given immediate access to the CPU and is allowed to execute. Once a process begins execution, it continues until it finishes or voluntarily relinquishes the CPU.
- HPF Non-Preemptive is designed to execute higher-priority tasks first without interruption, making it suitable for scenarios where task priorities are fixed, and there is no need for preemptive task switching.
- It is commonly used in real-time systems and situations where tasks have predefined levels of importance or urgency.

Observation Derived from Output:

- HPF Non-Preemptive exhibits a moderate average response time, indicating relatively timely initial responses for high-priority tasks.
- Processes experience moderate wait time in the queue, suggesting efficient priority-based scheduling without the overhead of preemption.
- The overall execution time is reasonable, with a focus on executing high-priority tasks promptly while maintaining fairness.
- HPF Non-Preemptive efficiently completes a moderate number of tasks, providing good performance in handling priority-driven workloads.

Output:

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The average of the 5 runs of all algorithms is as follows:

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