Project Part 2: Parameter Sweep Report

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1. Introduction

The goal of conducting this experiment was to see Round Robin quantum and CPU instruction probability affect key performance metrics. From using these scheduling parameters and sweeping them, we are able to know the impact of the average waiting time, average turnaround time, and total simulation time.

What were the key variables in this experiment?

2. Key Observations

Average Waiting Time

With a high Round Robin quantum, processes are getting extended too long, which causes waiting time to increase. Although with the Round Robin quantum being low, waiting times are also high because there to much overhead due to context-switching. With a moderate quantum having the lowest waiting time. When the CPU instruction probability increases, CPU occupancy is longer in addition to higher waiting time from other processes.

Average Turnaround Time

With a high Round Robin quantum, processes are getting extended too long, which causes the queue to get longer. Although with the Round Robin quantum being low, turnaround times are also high because there to much overhead due to context-switching. With a moderate quantum having the lowest turnaround times in the queue. When the CPU instruction probability increases, the turnaround time also increases due to each process taking longer.

Total Simulation Time

Having a short and long quantum value increases in high overhead and process scheduling causing the the middle quantum to reduce overall simulation time. As the CPU instruction probability increases, the overall runtime of the simulation increases.

3. Reflection

From having a short quantum, there are too many context switches, and due to this the waiting times and overhead are increasing. From having a long quantum, other processes are delayed to start. With a higher CPU instruction probability makes the execution times longer and the system load is being increase due to it being CPU-bound. These results can affect real-world OS design by being able to adjust the quantum dynamically. This can be done by changing the workload and the process behavior. This maximizes CPU utilization to keep turnaround times low. The mid-range quantum provides the highest CPU utilization because processes are being delayed. The reasoning behind this is that it minimizes context switching. There is non-linearity in the charts because of quantum agitation and CPU instruction probability. As quantum increases, performance improves till a certain point then at very high values, it worsens. When increasing CPU Instruction Probability, after its optimal point, processing gets delayed at a rapid pace.