Project 1: CPU and DISK Components Simulation

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1 Abstract

This report summarizes the outcomes of a sequence of experiments aimed at evaluating the efficiency of the CPU and Disk components within an operating system across diverse workloads. These evaluations were carried out using a discrete-time event simulator. The primary goal was to analyze the impact of varying rates of process arrivals, represented by lambda (λ), on critical system performance indicators.

2 Running the Simulator

The simulation can be executed directly from the command line by following these steps to run the simulator:

1. Open your terminal or command prompt.
2. Navigate to the directory where the simulation scripts are located.
    a. Should be traced too /home/Students/a_l523/Project1
3. Download the get-pip script using curl:

    [user]$ curl https://bootstrap.pypa.io/get-pip.py -o get-pip.py
4. Run the get-pip script:

    [user]$ python get-pip.py
5. Install the required dependencies using the following command:

    [user]$ python -m pip install matplotlib pandas

6. Run the simulation using the following command format:

   [user]$ python main.py <lambda> <average_CPU_service_time> <average_Disk_service_time>

   a. Example is python main.py 12 0.02 0.06

3 Introduction

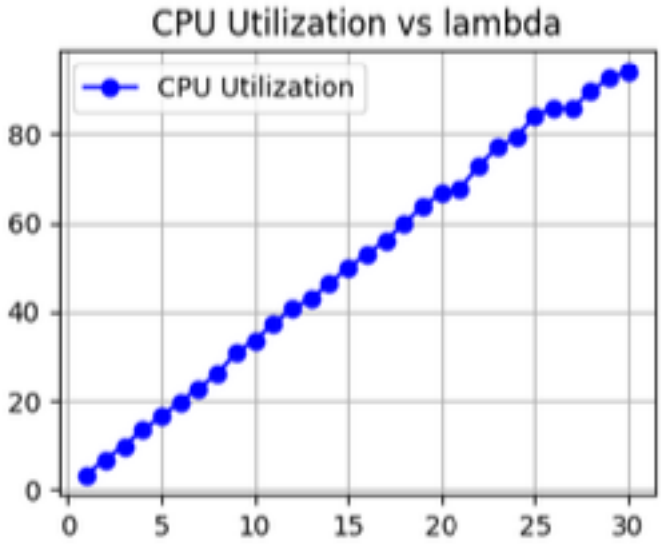
The discrete-time event simulation project seeks to assess the effectiveness of two essential components within the operating system: the CPU and Disk. Through simulating diverse workload levels, this investigation offers insights into how the system behaves across a range of scenarios.

4 Implementation Details

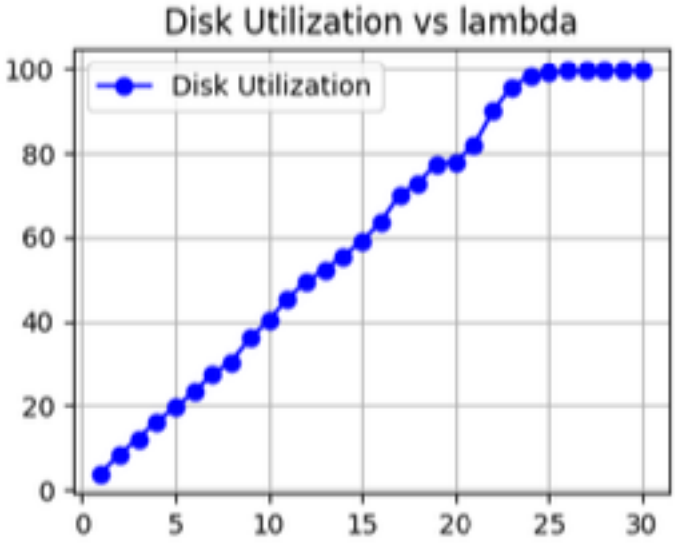
The simulation is created with classes: CPU, Disk, Process, Event, Simulator, and Main. These components mimic the scheduling and processing of tasks within an operating system environment.

5 Results

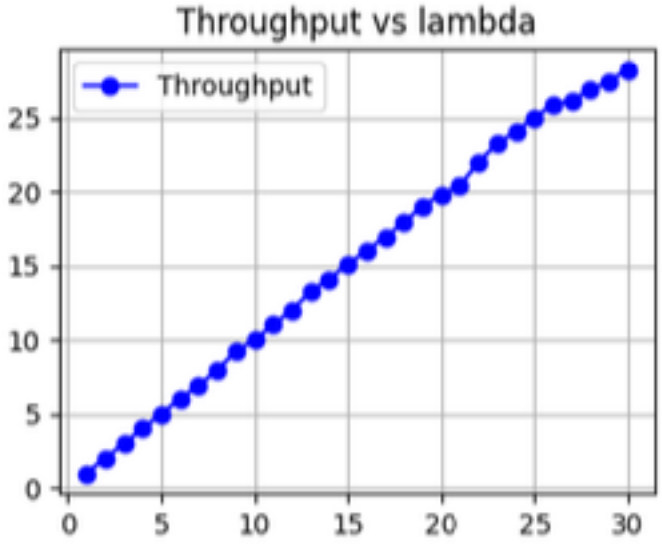
- CPU Util



- Disk Util



- Throughput



6 Analysis

The plots illustrate a clear correlation between the process arrival rate (λ) and various system performance metrics. As λ increases, both the average turnaround time and system utilization rates demonstrate discernible patterns, reflecting the system's capability and efficiency in handling tasks. With 12 lambda being the sweet spot it is crucial seeing all the lambda changes from 1 to 34.

7 Conclusion

Overall, this simulation has been a great display in demonstrating the way workload affects CPU performance and Disk components. The results help with practicing design that can be implemented for management of operating systems. Even under different conditions the general idea of a CPU and Disk queue can be varied with implementation other than FCFS.