Assignment 3 - Process Scheduling

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1 Abstract

In this assignment, we will explore various scheduling algorithms for a system scheduler, including First-In, First-Out (FIFO), Shortest Job First (SJF), Shortest Remaining Time First (SRTF), and Round Robin (RR). Each algorithm will be analyzed for its efficiency and performance in managing processes.

1. **First-In, First-Out (FIFO):** First-Come, First-Served (FIFO) is a scheduling algorithm where processes are executed in the order they arrive in the ready queue. It is simple to implement but can lead to the "convoy effect," where short processes wait for long ones to complete.

2. **Shortest Job First (SJF):** Shortest Job First (SJF) is a scheduling algorithm that selects the process with the smallest execution time to run next. It minimizes the average waiting time but can lead to starvation for longer processes if shorter ones continuously arrive.

3. **Shortest Remaining Time First (SRTF):** Shortest Remaining Time First (SRTF) is a preemptive scheduling algorithm that allows a currently running process to be interrupted if a new process arrives with a shorter remaining time. While it optimizes turnaround time and reduces waiting time, it can also lead to starvation for longer processes.

4. **Round Robin (RR):** Round Robin (RR) is a preemptive scheduling algorithm that assigns a fixed time slice, or quantum, to each process in the ready queue, allowing for equitable CPU time distribution. It is effective for time-sharing systems but can suffer from high turnaround time if the time quantum is too short.

Part I: Single CPU Processor

Algorithms	FIFO	SJF	SRTF	RR
Makespan	1426	1428	1429	1429
Avg completion time	1095	758	610	898
Max completion time	1427	1428	1423	1429
Avg waiting time	891	555	406	690
Max waiting time	1237	1226	1220	1026

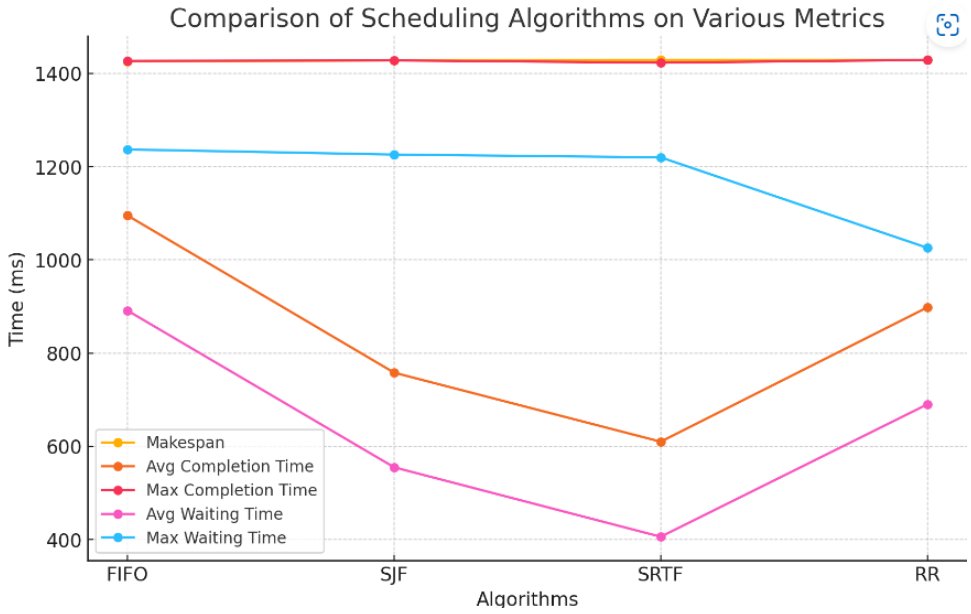

Figure 1: Single CPU metrics

Part II: Dual CPU Processor

Algorithms	FIFO	SJF	SRTF	RR
Makespan	441	727	718	423
Avg completion time	292	451	355	218
Max completion time	440	726	717	422
Avg waiting time	85	244	147	11
Max waiting time	205	514	505	19

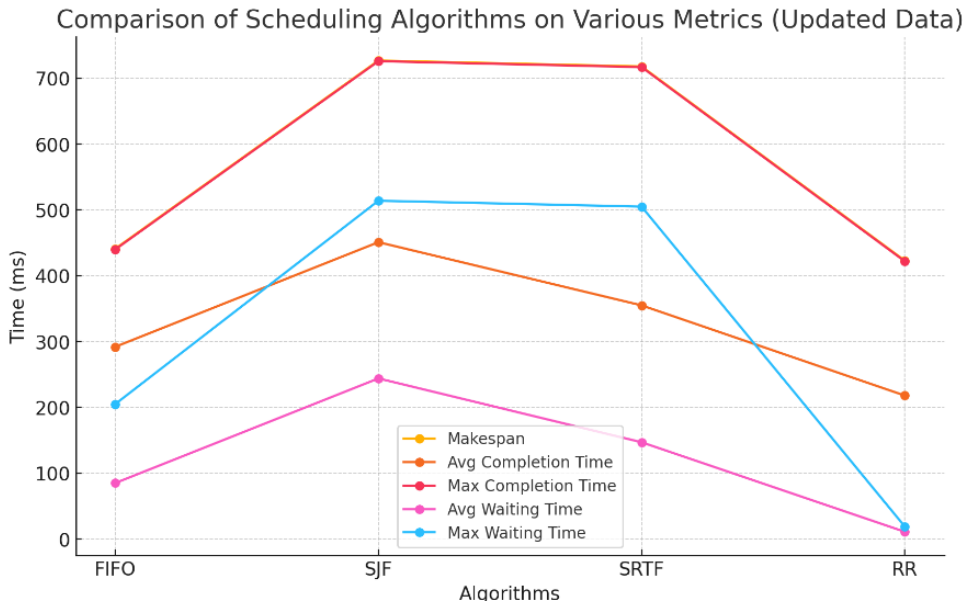

Figure 2: Dual CPU metrics

Conclusion

- Increased Throughput: A dual CPU processor can handle multiple tasks simultaneously, leading to higher overall throughput compared to a single CPU, which processes tasks sequentially.
- Reduced Latency: By distributing workloads across two CPUs, a dual processor system can reduce the time each process waits for CPU resources, resulting in lower latency and faster response times for applications.