ISAE106 Operating Systems 2025

Case Study: Choosing the Best CPU Scheduling Algorithm for a University System Upgrade

Scenario:

A university's Computing Center is planning a major system upgrade. The new system will handle:

- Student Portals (highly interactive, real-time response needed)
- Batch Processing of Grades (large, long-running background jobs)
- Online Registration System (must handle thousands of concurrent users smoothly)
- Research Data Analysis (periodic CPU-intensive tasks)

The system will have multi-core processors and must maximize CPU utilization, minimize response time for users, and ensure fairness so no job gets starved.

Your Task:

Form a group of five (5) members. As the Operating Systems Team, you are asked to:

1. Analyze the different CPU Scheduling Algorithms discussed:
   - First-Come, First-Served (FCFS)
   - Shortest-Job-First (SJF)
   - Priority Scheduling
   - Round-Robin (RR)
   - Multilevel Queue Scheduling
   - Multilevel Feedback Queue (MLFQ)

2. Decide which scheduling algorithm or combination of algorithms would be most appropriate for this system.

3. Justify your recommendation by answering:
   - Why is your chosen scheduling strategy appropriate for each workload (student portals, batch processing, registration, research analysis)?
   - How does it balance response time, throughput, fairness, and CPU utilization?

- What are potential risks or limitations of your chosen method?

4. Suggest Improvements:

- Would you propose any custom modifications (e.g., adjusting time quantum, dynamic priority boosting) to make it even better?

Guide Questions:

- Which algorithm suits time-sensitive interactive applications? Why?
- How can long-running jobs avoid starving short interactive tasks?
- What scheduling challenges might arise with multiple cores?
- Should real-time elements (like student portal responsiveness) have higher priority?
- Would a Multilevel Feedback Queue system be more flexible? Explain.

Rubric for Evaluation:

Criteria:

Analysis of Scheduling Algorithms (40%)
- Excellent: Thorough, insightful comparison.
- Good: Good comparison with minor gaps.
- Fair: Basic comparison; some confusion.
- Needs Improvement: Very little or incorrect analysis.

Justification of Recommendation (30%)
- Excellent: Strong, logical justification.
- Good: Good justification with some weaker connections.
- Fair: Justification lacks depth.
- Needs Improvement: Weak or missing justification.

Creativity and Improvements Suggested (20%)
- Excellent: Smart, creative enhancements or tweaks.

- Good: Some creative ideas but not detailed.
- Fair: Few or generic suggestions.
- Needs Improvement: No improvements suggested.

Clarity and Organization (10%)

- Excellent: Very clear, professional writing.
- Good: Generally clear, minor issues.
- Fair: Understandable but confusing at times.
- Needs Improvement: Disorganized or poorly written.

Submission:

- Deadline: On or before the scheduled Final Examination week.
- Group Composition: Maximum of five (5) members per group.