Assignment III

General description

Below are the guidelines for a theoretical-practical activity for students in the operating systems course. This assignment focuses on exploring the fundamental concepts and mechanisms of devices and disk scheduling.Students will analyze and implement algorithms to improve I/O efficiency and minimize disk access latency.

Goals

During the activity, students will achieve the following:

- Understand the concepts of I/O management and its role in operating systems.
- Explore disk scheduling algorithms and their impact on performance.
- Simulate and compare the efficiency of different scheduling techniques.

Before You Begin

Read the following:

- *Operating System Concepts (10th Edition) by Silberschatz and Galvin, Chapters 11 and 12.*
- *Modern Operating Systems by Tanenbaum, Chapters 5.*

1. Conceptual Review [20%]

After completing the recommended reading in this document, answer the following questions in your own words, concisely and precisely:

- Disk requests come into the disk driver for cylinders 10, 22, 20, 2, 40, 6, and 38, in that order. A seek takes 6 msec per cylinder. How much seek time is needed for (a) First-come, first served. (b) Closest cylinder next. (c) Elevator algorithm (initially moving upward). In all cases, the arm is initially at cylinder 20.
- Suppose that a disk drive has 5,000 cylinders, numbered 0 to 4,999. The drive is currently serving a request at cylinder 2,150, and the previous request was at cylinder 1,805. The

queue of pending requests, in FIFO order, is: 2,069; 1,212; 2,296; 2,800; 544; 1,618; 356; 1,523; 4,965; 3,681 Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for each of the following disk-scheduling algorithms? a. FCFS b. SCAN c. C-SCAN

- A slight modification of the elevator algorithm for scheduling disk requests is to always scan in the same direction. In what respect is this modified algorithm better than the elevator algorithm?

2. Practical Implementation [60%]

Write a program that implements the following disk-scheduling algorithms: a. FCFS b. SCAN c. C-SCAN Your program will service a disk with 5,000 cylinders numbered 0 to 4,999. The program will generate a random series of 1,000 cylinder requests and service them according to each of the algorithms listed above. The program will be passed the initial position of the disk head (as a parameter on the command line) and report the total amount of head movement required by each algorithm.

3. Data Visualization [20%]

Develop a visual representation of the disk-scheduling algorithms to better illustrate their performance. Your visualization should include: Graphs of Head Movement, Performance Comparison or performance and system responsiveness

Ensure you complete and submit the document well before the specified deadline, as late submissions may not be accepted. Additionally, please do not send the file via email.