IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 10, Issue 5, May 2022

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.165

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 5, May 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1005345 |

Disk Scheduling in Operating System – A Comparative Study

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ABSTRACT: Processes make the I/O requests to the operating system to access the disk. Disk Scheduling Algorithm manages those requests and decides the order of the disk access given to the requests. Disk Scheduling Algorithms are needed because a process can make multiple I/O requests and multiple processes run at the same time. The requests made by a process may be located at different sectors on different tracks. Because of this, the seek time may vary. The comparative study of various algorithms helps to decide the optimal seek time among algorithms.

I. INTRODUCTION

Whenever a process needs I/O to or from the disk, it issues a system call to the operating system. The request specifies several pieces of information.

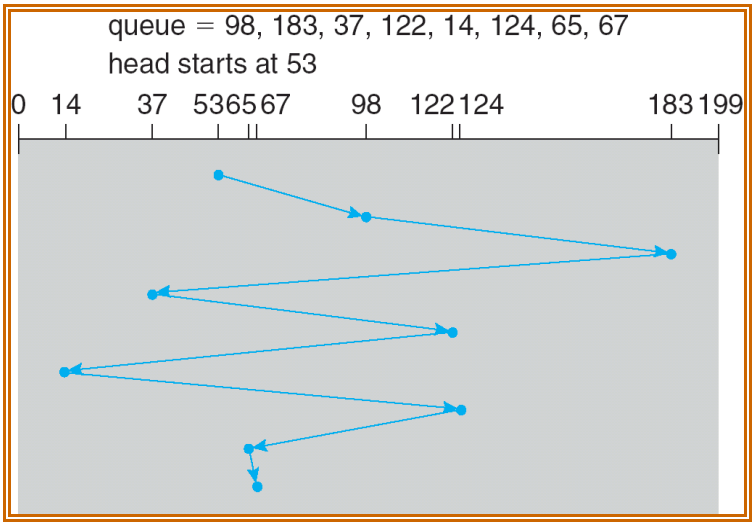
Whether this operation is input or output
What the disk address for the transfer is
What the memory address for the transfer is
What the number of bytes to be transferred is

If the desired disk drive and controller are available, the request can be serviced immediately. If the drive or controller is busy, new requests will be placed on the queue of pending requests for that drive. For multiprogramming system with many processes the disk queue may often have several pending requests. Disk scheduling selects which pending request to service next, when one request is completed.

FCFS Scheduling (first-come, first-serve)

The simplest form of disk scheduling is the first-come, first-served (FCFS) algorithm. It is fair, but it generally does not provide the fastest service.

Illustration shows total head movement of 640 cylinders



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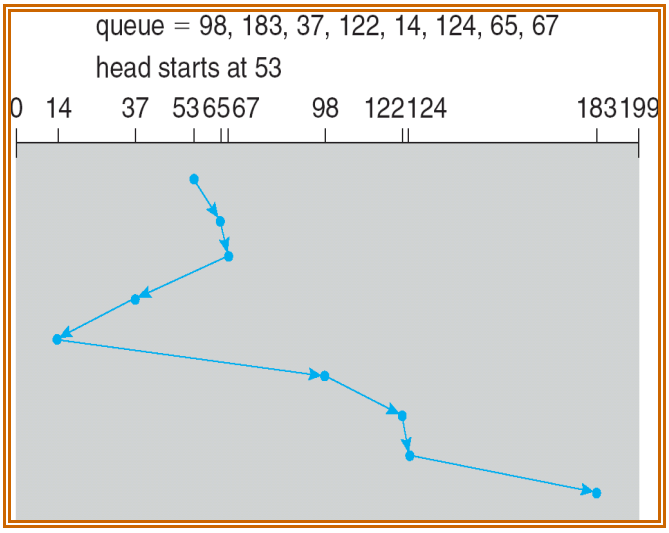
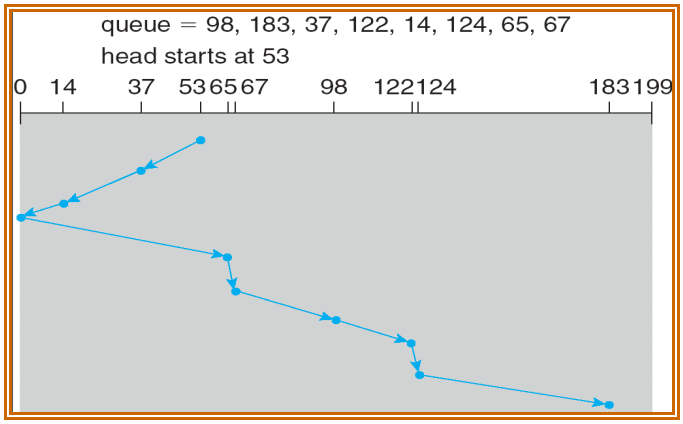
SSTF (Shortest seek time first)

The **SSTF** algorithm selects the request with the minimum seek time from the current head position.Since seek time increases with the number of cylinders traversed by the head, SSTF chooses the pending request closest to the current head position.



SCAN

In the SCAN algorithm, the disk arm starts at one end of the disk, and moves toward the other end, servicing requests as it reaches each cylinder, until it gets to the other end of the disk. At the other end, the direction of head movement is reversed, and servicing continues. The head continuously scans back and forth across the disk.



C-SCAN

CircularSCAN (C-SCAN) scheduling is a variant of SCAN scheduling. The head moves from one end ofthe disk to the other, servicing requests along the way. When the head reachesthe other end, however, it immediately returns to the beginning of the disk.

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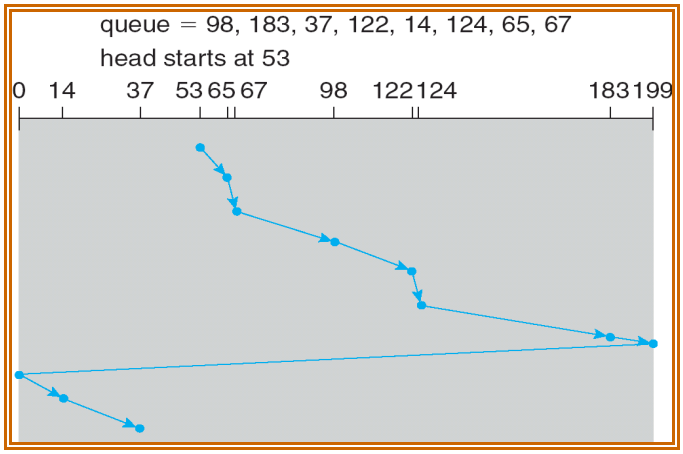


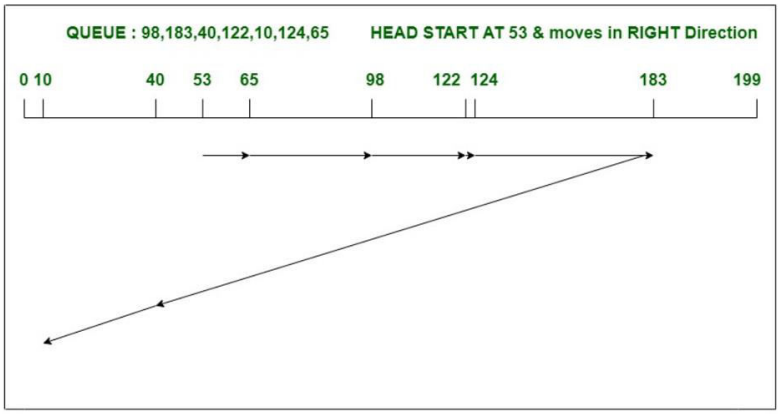
LOOK

Look Algorithm is actually an improved version of SCAN Algorithm. In this algorithm, the head starts from first request at one side of disk and moves towards the other end by serving all requests in between. After reaching the last request of one end, the head reverse its direction and returns to first request, servicing all requests in between. Unlike SCAN, in this the head instead of going till last track, it goes till last request and then direction is changed.

Example

Consider a disk with 200 tracks (0-199) and the disk queue having I/O requests in the following order as follows: 98, 183, 40, 122, 10, 124, 65. The current head position of the Read/Write head is 53 and will move in Right direction. Calculate the total number of track movements of Read/Write head using LOOK algorithm.

Total head movements,
= (65-53)+(98-65)+(122-98)+(124-122)+(183-124)+(183-40)+(40-10)
= 303



C-Look

C-LOOK is the modified version of both LOOK and SCAN algorithms. In this algorithm, the head starts from first request in one direction and moves towards the last request at other end, serving all request in between. After reaching last request in one end, the head jumps in other direction and move towards the remaining requests and then satisfies them in same direction as before. Unlike LOOK, it satisfies requests only in one direction.

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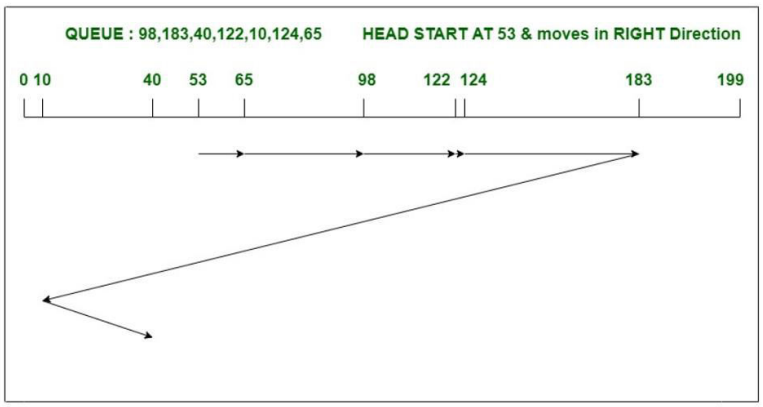
Example –

Consider a disk with 200 tracks (0-199) and the disk queue having I/O requests in the following order as follows: 98, 183, 40, 122, 10, 124, 65. The current head position of the Read/Write head is 53 and will move in Right direction. Calculate the total number of track movements of Read/Write head using C-LOOK algorithm.

Total head movements,
= (65-53)+(98-65)+(122-98)+(124-122)+(183-124)+(183-10)+(40-10)
= 333



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II. CONCLUSION

In this paper, we studied disk scheduling and disk scheduling algorithms. We went through each algorithm and explored it with the help of examples. The study helps to decide the optimal algorithm that can be used for disc scheduling with minimum head movement.

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Impact Factor: 8.165

doi cross ref

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

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