

TUTORIAL ELEVEN**I/O Systems**

1. Why is it necessary to separate the device driver layer from the kernel I/O subsystem?
2. Suppose that in a multiprogramming system, a process reads blocks of data from a file on disk for processing. As shown below, it reads one block of data at a time to a buffer using synchronous I/O and then processes the data.

```

while ( not end of file) {
    buffer <- read a block of data from disk using synchronous I/O;
    process data in buffer;
}

```

- a) Discuss how the performance of the above process can be improved.
- b) For a system running mainly with this type of processes, which file allocation scheme is best in terms of I/O performance?

Disk

3.
 - a) During his presentation, a salesman emphasized on the substantial effort his company has made to improve the performance of their UNIX version - one example he quoted was that the disk driver used the SCAN algorithm and also queued multiple requests within a cylinder in sector order. You bought a copy and wrote a program to randomly read 10,000 blocks spread across the disk. The performance measured was the same as what would be expected from FCFS algorithm. Was the salesman lying?
 - b) Another salesman claims that his system uses sector queueing to minimize head movement on moving head disks. What is wrong with this comment?
 - c) Under what circumstances could a disk scheduling discipline not improve the performance or even degrade performance of the system?
4. Assume that a disk drive has 200 cylinders, numbered 0 to 199. The disk head starts at cylinder 0. A seek takes $(20 + 0.1 \times T)$ milliseconds, where T is the number of cylinders to move. Rotational latency is 2 milliseconds and data transfer per request takes 8 milliseconds, assuming each request accesses the same amount of data. The following table shows the arrival time and destination cylinder number of requests:

Arrive Time (ms)	0	15	20	23	30	35	50	65	70	88
Cylinder Number	45	132	35	4	23	50	70	40	10	35

Compute the average time to service a request using the Shortest Seek Time First (SSTF) disk head scheduling algorithm.