

CS418— Operating Systems

Lecture 7

Device Management

Textbook: Operating Systems
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1. Basic Concepts

- Device Manager manages every peripheral device of the system.
 - 1. Track the status of each device.
 - 2. Determine which process will get a device & for how long.
 - 3. Allocate devices.
 - 4. Deallocate devices.
- System Devices
 - 1. Dedicated devices: those assigned to only one job at one time. Example: tape drivers, printers, plotters.
 - 2. Shared devices: those can be assigned to several processes. Example, disk pack or any other direct access storage device.
 - 3. Virtual devices: combination of the 2, e.g., printer with a queue.
- Storage Media
 - 1. Sequential access media: store records sequentially, one after the other.
 - 2. Direct access media: store either sequential or direct access files.

- Advantage of blocking: **I/O is more efficient** and **Less tape is wasted**
- Disadvantage of blocking: **Overhead: block/deblock/record keeping** and **Buffer space may be wasted** if you need **only one logical record** but must read the whole **block to get it**

- Optical Disc Storage (CD-ROM)
- Access Time
 - 1. Seek time: time required to position the read/write head on the proper track.
 - 2. Search time (rotational delay): time it takes to rotate the drum/disk until the requested record is moved under the read/write head.
 - 3. Transfer time: time to transfer the data to main memory.

- Access Time for fixed-head devices
 - 1. Access time = Search time + Transfer time.
 - 2. Access time depends on the rotational speed and the position of the record relative to the position of the read/write head.

- Access Time for movable-head devices
 - 1. Access time = Seek time + Search time + Transfer time.
 - 2. Seek time: arm movement time, usually is much longer than search time and transfer time.
 - 3. Search time: rotational delay.
 - 4. Transfer time: data transfer time.

4. Device Handler Seek Strategies

- First Come First Serve (FCFS)

- Shortest Seek Time First (SSTF)—the request at the track closest to the one being served is the next to be served.

- SCAN—almost like round-robin.

- LOOK—similar to SCAN, except that it won't go all the way to track 0 (or the highest track) unless there is a request.

- C-SCAN—similar to SCAN except that only when the head moves inward (toward the center) the requests are served.

- C-LOOK—similar to LOOK except that only when the head moves inward (toward the center) the requests are served.

- N-step-SCAN and FSCAN

5. Search Strategies: Rotational Ordering

- Rotational Ordering—Once the read/write head is positioned as some track, re-order the requests to optimize the search time.

6. RAID (Redundant Array of Independent Disks)

- Motivation and key idea
 - 1. To close the widening gap between processor speeds and relatively slow disk drives.
 - 2. Instead of using large-capacity disk drives, we use multiple smaller-capacity drives.
 - 3. Distribute data to enable simultaneous access to data from multiple drives.
 - 4. Improve I/O performance and allow easier incremental increases in capacity.