CSCI 460— Operating Systems

Lecture 10

Device Management

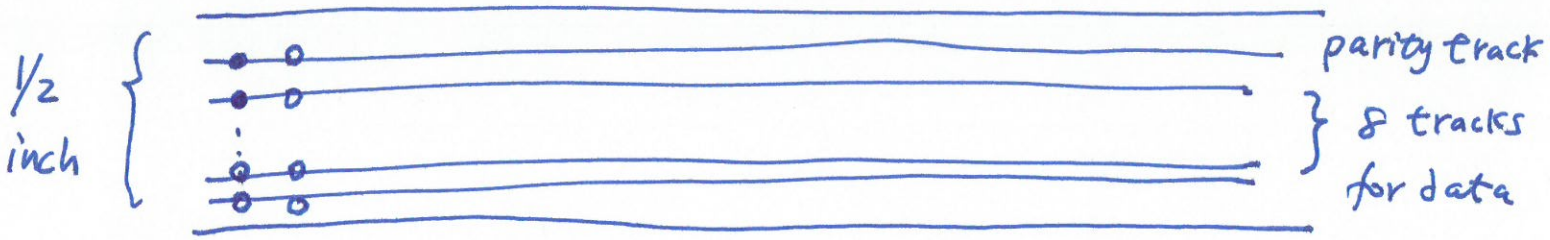
Textbook: Operating Systems
by William Stallings

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.
- Type: human readable (printers), machine readable (disk drives), and communication (communicating with modem)

2. Sequential Access Storage Media

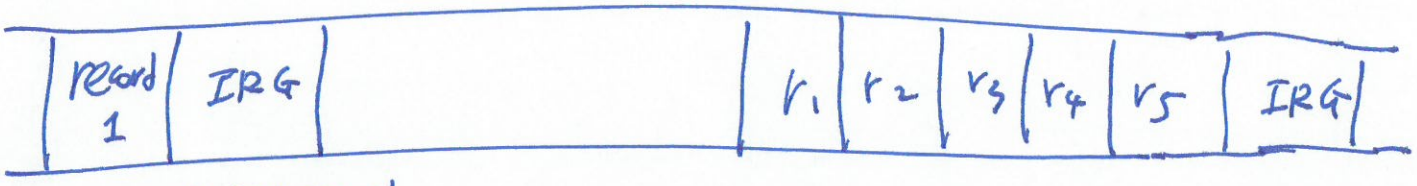
- **Paper:** printouts, punch cards, and paper tape. This is already outdated.
- **Magnetic tape:** now mainly used for routine archiving and store back-up data.



This can only check whether some data is corrupted. Correction will be covered later.

RAID

- Blocking: an alternative way to group the records into blocks before recording them on tape.



interrecord gap, about 1/2 inch.

1/4 inch.

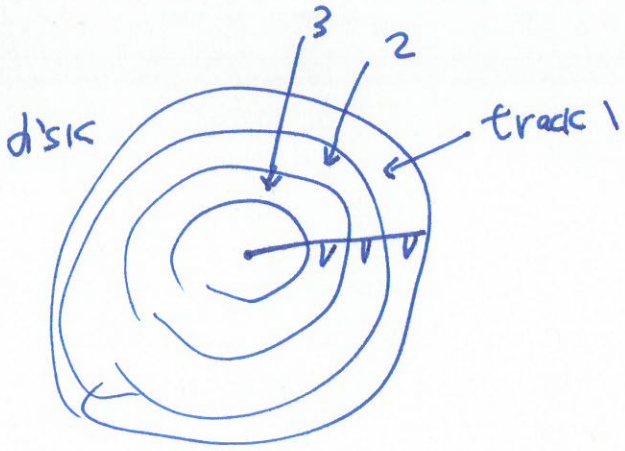
Blocking:

- 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**

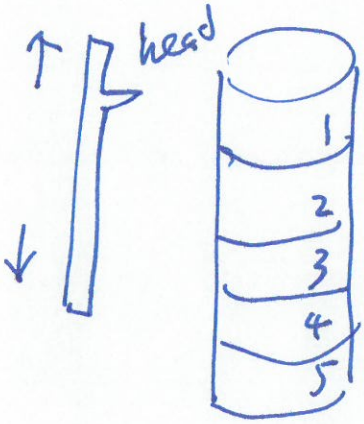
3. Direct (random) Access Storage Devices

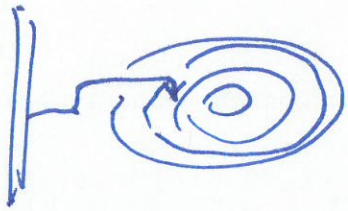
- Direct Access Storage Devices
  - 1. Those with fixed read/write heads.
  - 2. Those with movable read/write heads.
- Fixed-head drums/disks

drum.



- Movable-head drums/disks





- Optical Disc Storage (CD-ROM)
- Access Time
  - 1. Seek time: time required to position the read/write head on the proper track. // physical, slow.
  - 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.

Ex for fixed-head devices

set up: 10 records, 100 bytes each.

Average search time (rotational delay): 8.4 ms

transfer rate: 0.00094 ms/byte

No blocking: for one record, access time =

$8.4 + 100 \times 0.00094 = 8.4 + 0.094$ (for 1 record)

$= 8.494$

for 10 records: $10 \times (8.494) = 84.94$ ms

with blocking: $8.4 + (0.00094 \times 100) \times 10$

$= 8.4 + 0.094 \times 10$

$= 8.4 + 0.94$

$= 9.34$ ms (with 10 records blocked in one).