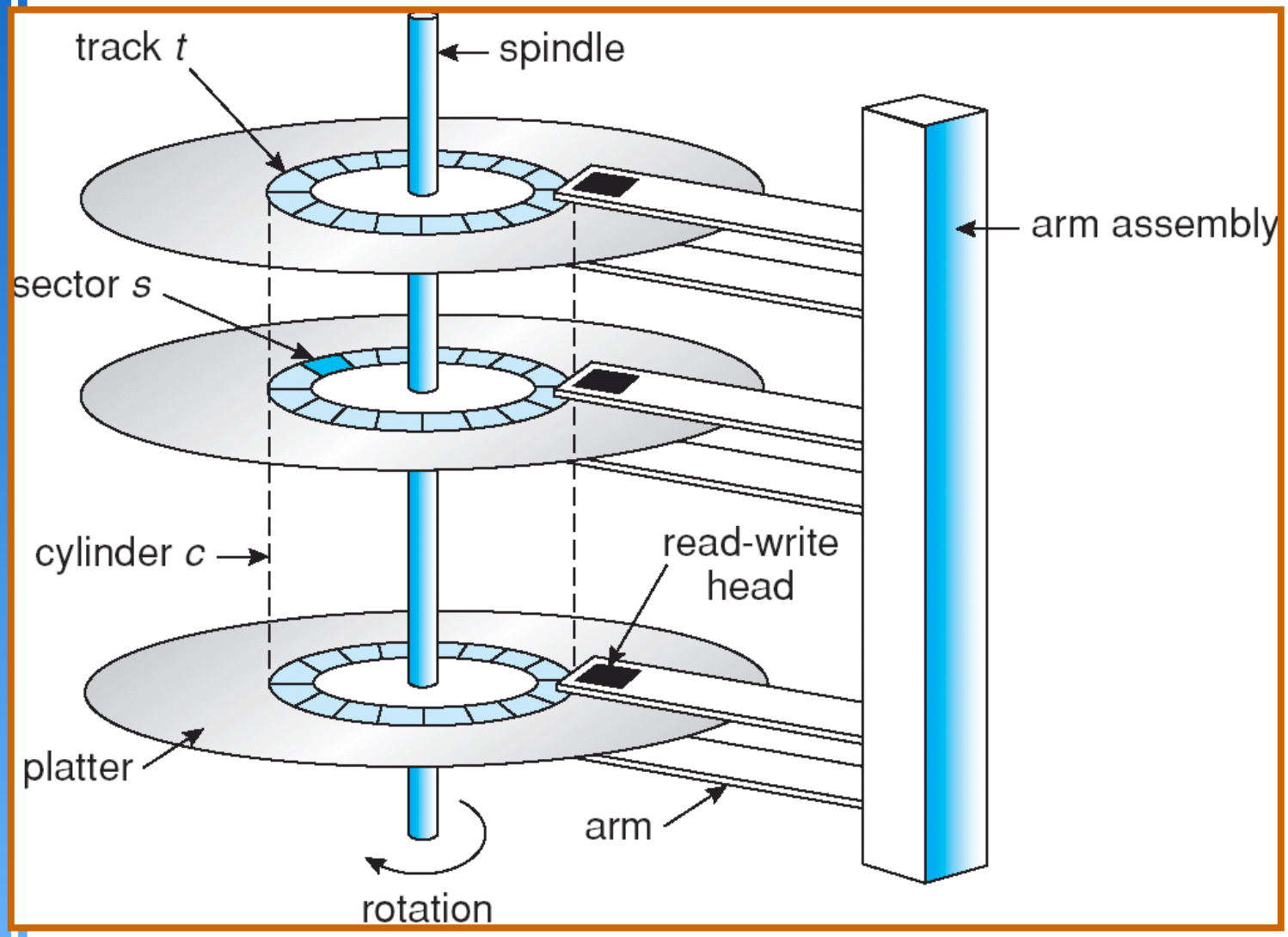
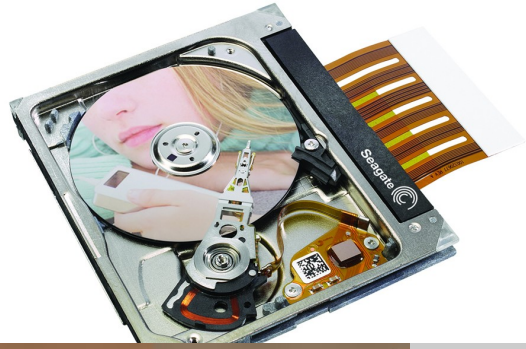
Overview of Mass Storage Structure

- Magnetic disks provide bulk of secondary storage
  - Drives rotate at 70 to 250 times per second
    - Ipod disks: 4200 rpm
    - Laptop disks: 4200, 5400 rpm or 7200 rpm
    - Desktop disks: 7200 rpm
    - Server disks: 10000 rpm or 15000 rpm
  - **Transfer rate** is rate at which data flow between drive and computer
  - **Positioning time** (**random-access time**) is time to move disk arm to desired cylinder (**seek time**) and time for desired sector to rotate under the disk head (**rotational latency**)
  - **Head crash** results from disk head contacting disk surface
    - That's bad
- Disks can be removable
- Drive attached to computer via **I/O bus**
  - Busses vary, including **EIDE, ATA, SATA, Firewire, USB, Fibre Channel, SCSI**
  - **Host controller** in computer uses bus to talk to **disk controller** built into drive or storage array

Moving-head Disk Mechanism



Disk drives

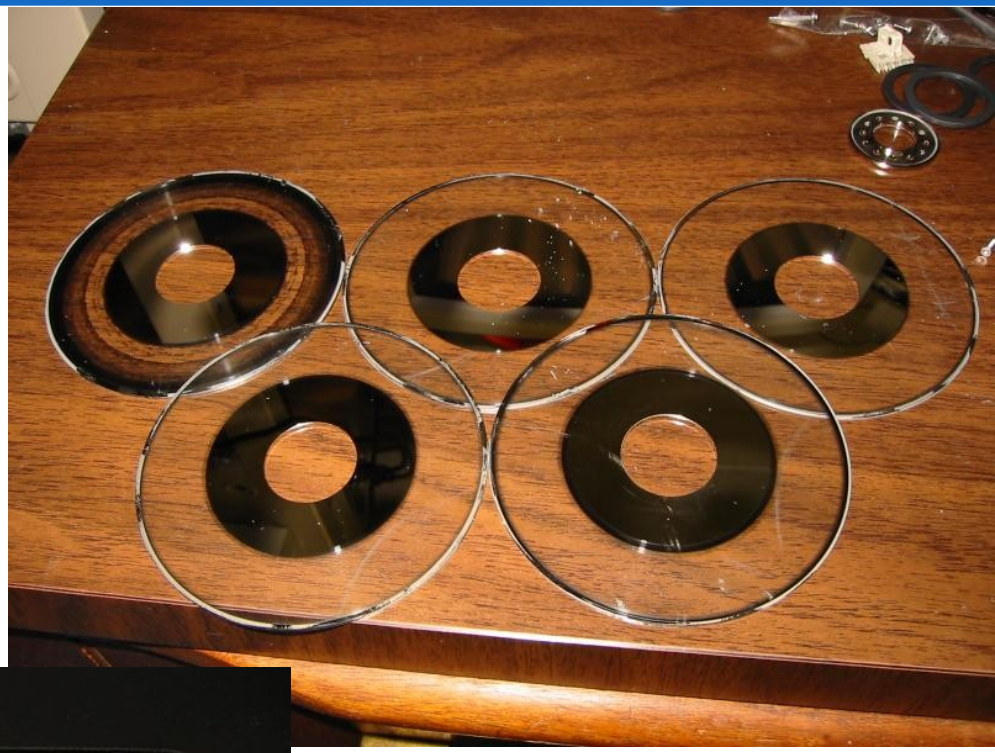

Seagate


Seagate
8.0GB
CompactFlash
Photo Hard Drive


Server disk
Seagate


Desktop disk
Seagate

Hard disk head, platter and disk crash



Disk Structure

- Disk drives are addressed as large 1-dimensional arrays of *logical blocks*, where the logical block is the smallest unit of transfer.

- The 1-dimensional array of logical blocks is mapped into the sectors of the disk sequentially.
  - Sector 0 is the first sector of the first track on the outermost cylinder.
  - Mapping proceeds in order through that track, then the rest of the tracks in that cylinder, and then through the rest of the cylinders from outermost to innermost.

Magnetic tape

- Was early secondary-storage medium
- Relatively permanent and holds large quantities of data
- Access time slow
- Random access ~1000 times slower than disk
- Mainly used for backup, storage of infrequently-used data, transfer medium between systems
- Kept in spool and wound or rewound past read-write head
- Once data under head, transfer rates comparable to disk
- 20-200GB typical storage
- Common technologies are 4mm, 8mm, 19mm, LTO-2 and SDLT

Tape pictures