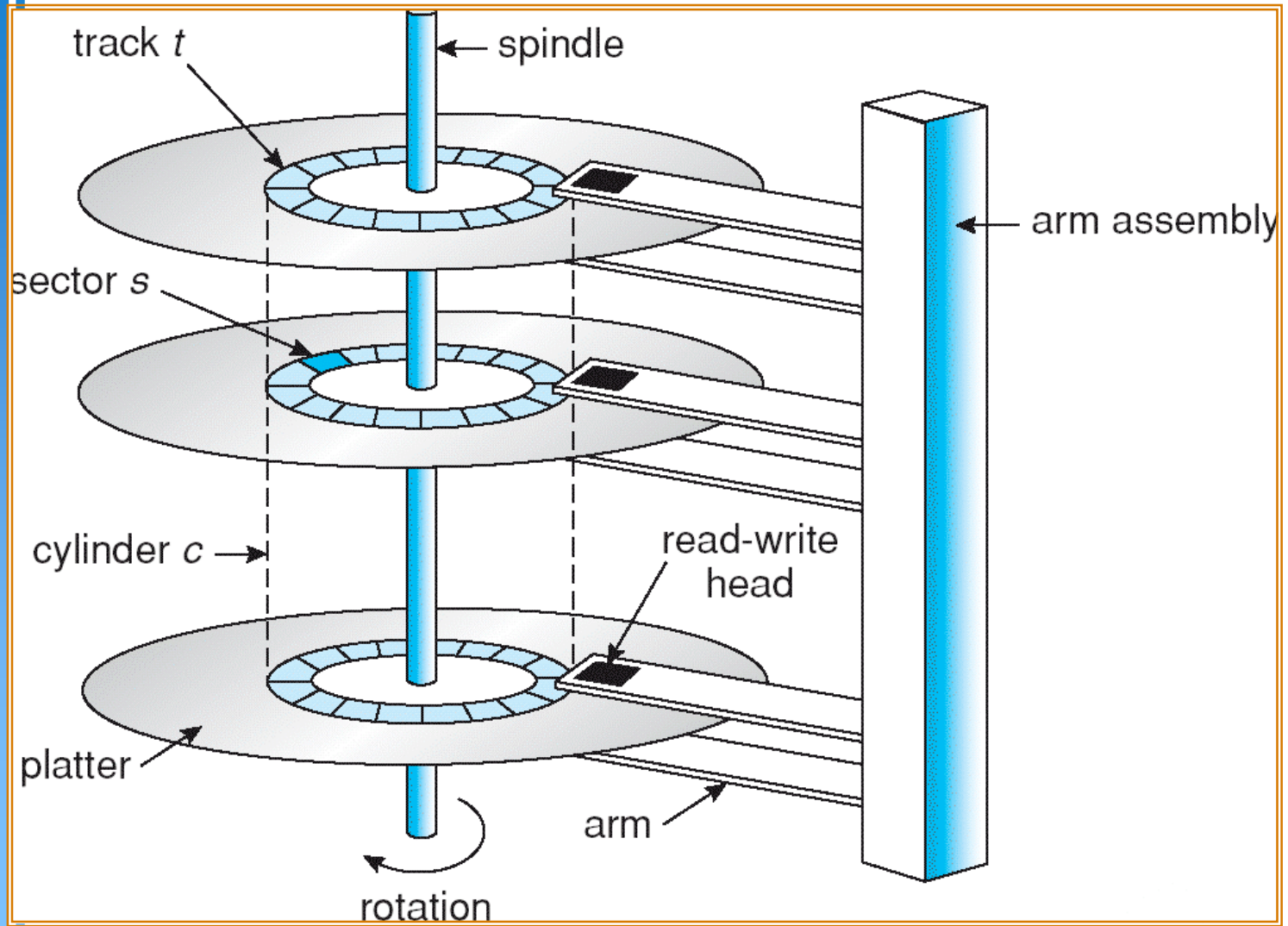


Overview of Mass Storage Structure

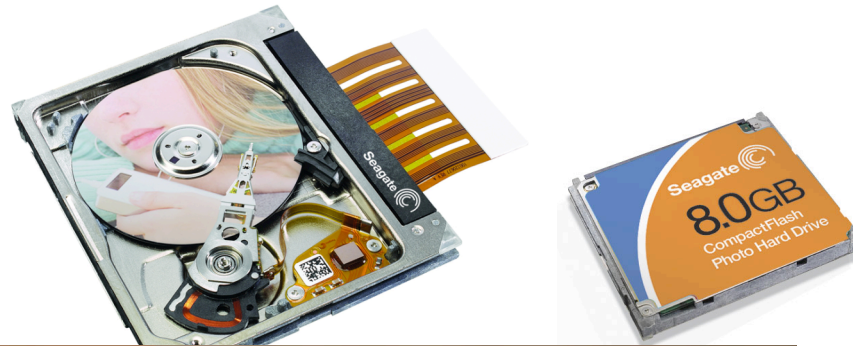
- ▶ Magnetic disks provide bulk of secondary storage
 - Drives rotate at 70 to 250 times per second
 - Ipad disks: 4200 rpm
 - Laptop disks: 4200, 5400 rpm or 7200 rpm
 - Desktop disks: 7200 rpm
 - Server disks: 10000 rpm or 15000 rpm
 - **Transfer rate** is rate at which data flow between drive and 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



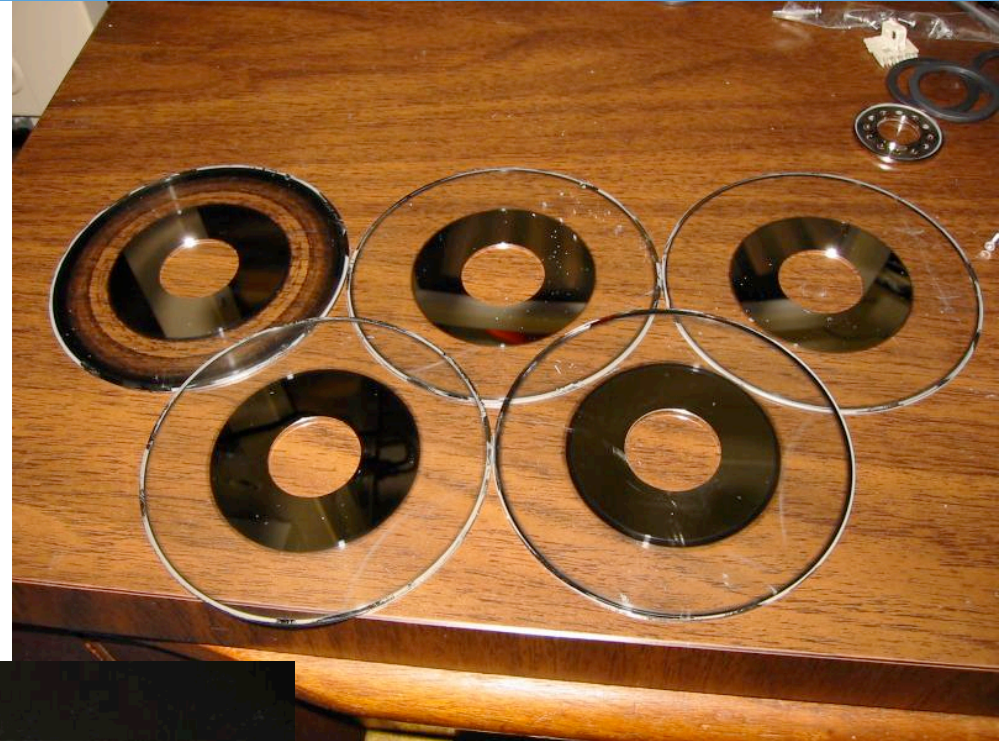
Moving-head Disk Mechanism



Disk drives



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

