Magnetic/Hard Disk (Movable head)

(Track #, Surface #, Sector #) "Physical" View of Disk

Steps to perform a disk read (or write):
1) Move Read/Write (R/W) heads over correct track/cylinder
2) Wait for start of specified sector to spin to R/W head
3) Read (or write) specified sector as it spins under the R/W head

Figure 6.7 Timing of Disk I/O Transfer
Logical View of Disk as Linear Collection of Blocks

(track #, surface #, sector #) to Linear block # mapping

<table>
<thead>
<tr>
<th>(0,0,0)</th>
<th>(0,0,1)</th>
<th>(0,0,2)</th>
</tr>
</thead>
</table>

Bits of linear block # : [track # | surface # | sector #]
Figure 6.3 Disk Layout Methods

RAID - Redundant Array of Independent/Inexpensive Disks
- 6 levels in common use
- Not a hierarchy
- Set of physical disks viewed as single logical drive by O/S
- Data distributed across physical drives
- Can use redundant capacity to store parity information
- Selection of RAID level can optimize for one of the following:
  1. fast response time for many small I/O requests, e.g., database access, or
  2. very high data-transfer rates for single large I/O request, e.g., CAD
Figure 6.8  RAID Levels

(a) RAID 0 (non-redundant)

(b) RAID 1 (mirrored)

(c) RAID 2 (redundancy through Hamming code)

(d) RAID 3 (bit-interleaved parity)

(e) RAID 4 (block-level parity)
(f) RAID 5 (block-level distributed parity)

(g) RAID 6 (dual redundancy)