

Disk I/O Performance(*)

- **Seek Time**
 - Time required to move the disk arm to the required track
 - $T_s = m.n + s$
 - n = number of tracks traversed
 - m = track-to-track disk arm movement time
 - s = startup time
- **Rotational Delay**
 - Time required for disk to rotate so that request sector passes by the disk arm
 - $T_r = 0.5 \times (60/r)$
 - r = disk rotation speed in rpm
 - $(60/r)$ = rotational delay (seconds)
- **Transfer Time**
 - Time needed to transfer data from disk
 - $T_d = (b/N) \times (60/r)$
 - b = number of bytes to be transferred
 - N = number of bytes on track
 - (b/N) = fraction of revolution that is needed
- **Total time = $T_s + T_r + T_d$**

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Timing Comparison

Disk with seek time of 20ms, 3600 rpm, 512-byte sectors,
and 32 sectors per track

Need to read a 128KB file → 256 sectors

File packed compactly on disk

→ occupies all sectors on adjacent tracks (8 tracks x 32 sectors = 256)

Time to read first track (32 sectors)

= average seek + rotational delay + read 32 sectors

= 20 msec + 8.3 msec + 16.7 msec = 45 msec

Time to read subsequent tracks (7 x 32 sectors)

= 7 x (rotational delay + read 32 sectors) = 7 x 25 ms (no seek time needed)

Total time = 45 + 7x25 = 0.22 sec

File packed randomly on disk

→ must seek each sector

Time to read any sector

= average seek + rotational delay + read 1 sector

= 20 msec + 8.3 msec + $(1/32) \times (16.7)$ msec = 28.8 msec

Time to read 256 sectors

= 256 x 28.8 = 7.37 sec !!!!!!!

NEED TO MINIMISE THE NUMBER OF SEEKS!