Hard Disk Failures

official vendor claims (data sheet):

1,000,000 to 1,500,000 hours \textit{mean time to failure (MTTF)}

\textasciitilde0.88\% \textit{annualized failure rate (AFR)}

in reality:

- 2-4\% AFR
- up to 13\% on some systems
Redundant Array of Inexpensive Disks (RAID)

motivation:

be able to survive one or multiple disk failures

core idea:

multiple cheap disks

store data redundantly

=> different RAID levels: different degrees of redundancy/performance
RAID 0

B1 B3 B5 B7

B2 B4 B6 B8

\[2 \times R \quad 2 \times W\]
RAID 4

$B_1 \text{ XOR } B_2 \text{ XOR } B_3 = \text{ Stripe 1 parity}$

$B_7 \text{ XOR } B_9 = \text{ Stripe 3 parity}$
hard disk failure rates as reported in:

*Disk failures in the real world: What does an MTTF of 1,000,000 hours mean to you?*
Bianca Schroeder, Garth A. Gibson
FAST’07