

RAID invented in 1988 (4 years after first Macintosh)

A Case for Redundant Arrays of Inexpensive Disks (RAID)

David A. Patterson, Garth Gibson, and Randy H. Katz

Computer Science Division
Department of Electrical Engineering and Computer Sciences
571 Evans Hall
University of California
Berkeley, CA 94720
(patt@cs.berkeley.edu)

Abstract Increasing performance of CPUs and memories will be squandered if not matched by a similar performance increase in I/O. While the capacity of Single Large Expensive Disks (SLED) has grown rapidly, the performance improvement of SLED has been modest. Redundant Arrays of Inexpensive Disks (RAID), based on the magnetic disk technology developed for personal computers, offers an attractive alternative to SLED, promising improvements of an order of magnitude in performance, reliability, power consumption, and scalability. This paper introduces five levels of RAID, giving their relative cost/performance, and compares RAID to an IBM 3380 and a Fujitsu Super Eagle.

One of the major trends in the development of magnetic disk technology is the growth in the maximum number of bits that can be stored per square inch, or the bits per inch in a track times the number of tracks per inch. Called MAD, for maximal areal density, the "First Law in Disk Density" predicts [Frank87]

$$MAD = 10^{(Year-1971)/10}$$

Magnetic disk technology has doubled capacity and halved price every three years, in line with the growth rate of semiconductor memory, and in practice between 1967 and 1979 the disk capacity of the average IBM data processing system more than kept up with its main memory [Stevens81].

Described up to RAID 5 (also, RAID 2, RAID 3, RAID 4)