# LECTURE

# RAID

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redundant array of inexpensive independent disks

idea: don't just use one disk; why?

- → performance
- → capacity
- → reliability

all done transparently: no change to host above → just plug in RAID (not disk) and go!

(interface: just like disk ~ array of blocks, read + write)

h/w raid:


fault model: entire disk works, or fails (and is easily detected)

RAID-0: striping

RAID-1: mirroring

RAID-4: parity

RAID-5: rotated parity

$disk = Addr \% NumDisks$

$offset = Addr / NumDisks$

Perf Analysis:

- Latency of single request
- Throughput of many requests
  - → random (small)
  - → sequential (large)

| | $R_0$ | $R_1$ | $R_4$ | $R_5$ |
|---|---|---|---|---|
| Seq Read | $N \cdot S$ | $\frac{N}{2} \cdot S$ | $(N-1)\,S$ | $(N-1)\,S$ |
| Seq Write | $N \cdot S$ | $\frac{N}{2}\,S$ | $(N-1)\,S$ | $(N-1)\,S$ |
| Rand Read | $N \cdot R$ | $N \cdot R$ | $(N-1)\,R$ | $N \cdot R$ |
| Rand Write | $N \cdot R$ | $\frac{N}{2} \cdot R$ | $\frac{1}{2}\,R$ | $\frac{N}{4}\,R$ |
| Latency$_R$ | | | | |
| Latency$_W$ | | | | |

Simulator: