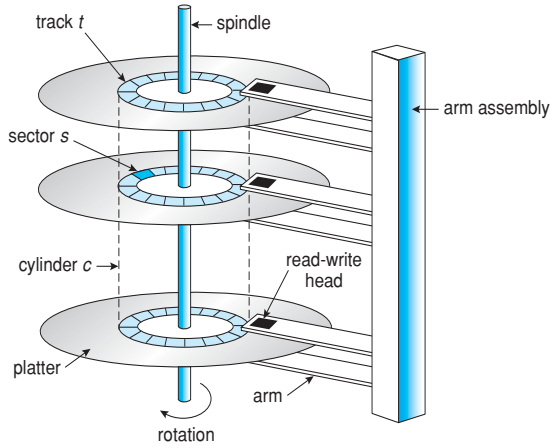
Graduate Operating Systems
(Storage & File Systems)

Fall 2020

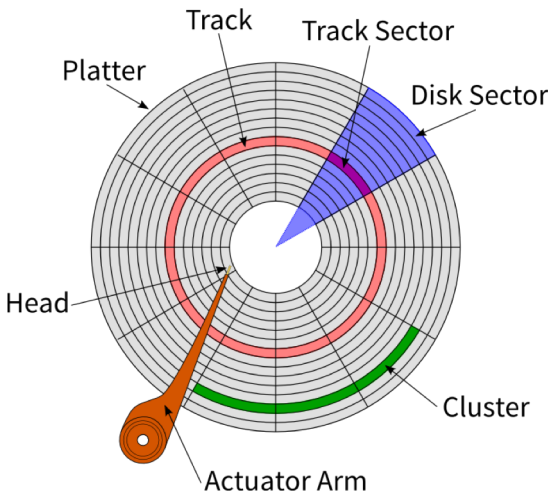
Paper "RAID"

- Redundant array of independent disks
- *What are the two main goals of RAID?*
- *What is Amdahl's Law?*
- *What are downsides of redundant disks?*

Paper “RAID”

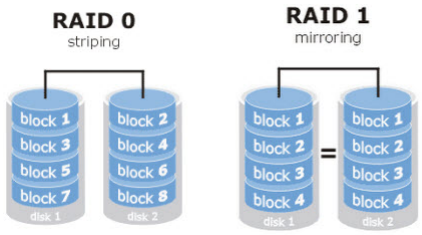


Paper “RAID”



Paper “RAID”

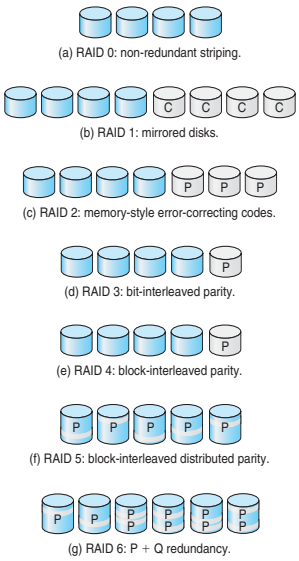
- Seek time, rotational latency, data transfer time
- *What are techniques to reduce these times?*
- DMA (Figure 2)



Paper “RAID”

- Fine-grained vs. coarse-grained interleaving
- “Hot spots”; concentrated/distributed patterns
- Load balancing

Paper “RAID”



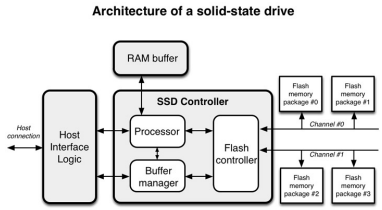
Paper “RAID”

- Reliability and correlated disk failures
- Buffering/caching
- Floating parity
- On-line spare disks

- *Thoughts on RAID? Pros/cons?*
- *Do Google, Microsoft, Facebook, etc. use RAID?*

Paper "Differential RAID"

- SSD vs. HD
- SLC vs. MLC
- Bit error rate (BER)
- Correlated failures



- Age differential: low vs. high differential?
- Diff-Raid technique 1: distribute parity unevenly (why?)
- Diff-Raid technique 2: reshuffle parity on drive replacements (why?)

Paper "Differential RAID"

- Pages & blocks; erase operations
- Wear-leveling algorithms
- RAID-5 load balancing & reliability
- *Diff-RAID: why focus on parity distribution?*
- Uneven parity distribution
- "Aging older devices faster"
- *Thoughts on Diff-RAID? Pros/cons?*