Power Saving Architectures Enabled by Smarter Software

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Saving Power with Flash

- Known:
  - > Cheap
  - > Fast
  - > Low power
- Unknown:
  - > How best to put flash to use

slides available here: http://blogs.sun.com/ahl/resource/fms09_leventhal_power.pdf

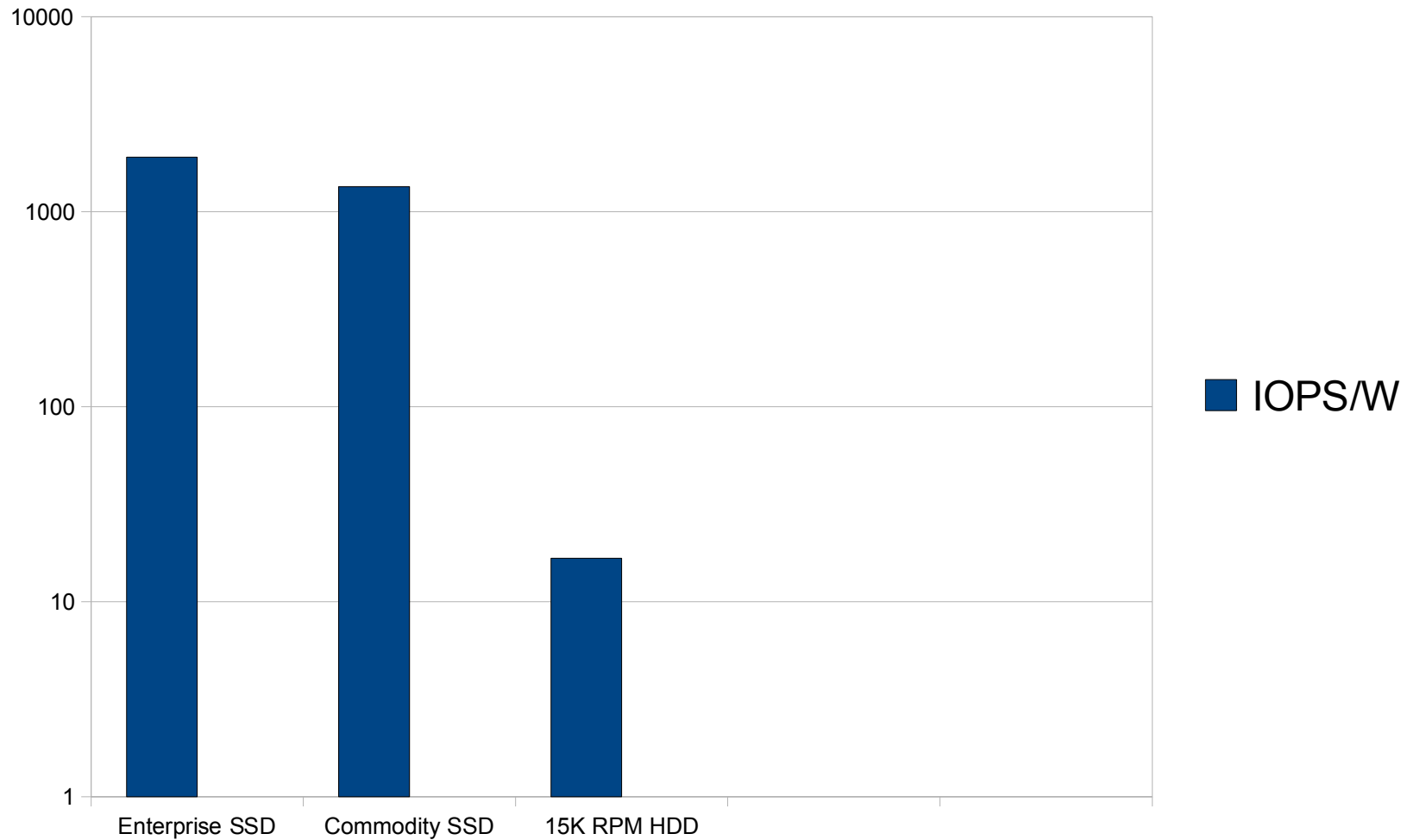# Storage Technologies

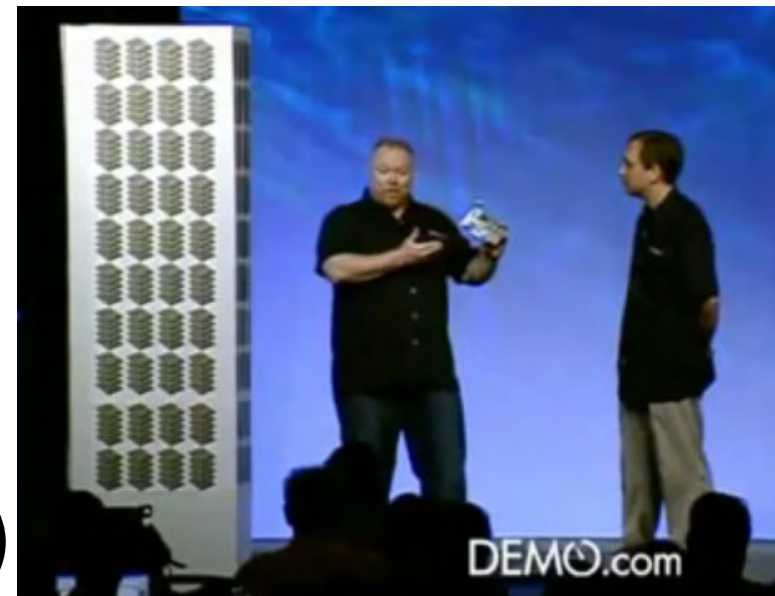15K RPM HDD   Enterprise SSD   Commodity SSD

Case for Flash

Time to throw out our hard drives!

- "Performance of a SAN in the palm of your hand"
  – Fusion-io

- IDC 2008: 1.3EB NAS

- If that's for performance...

- Reduce power consumption by an **order of magnitude** or more (assuming 15K drives)
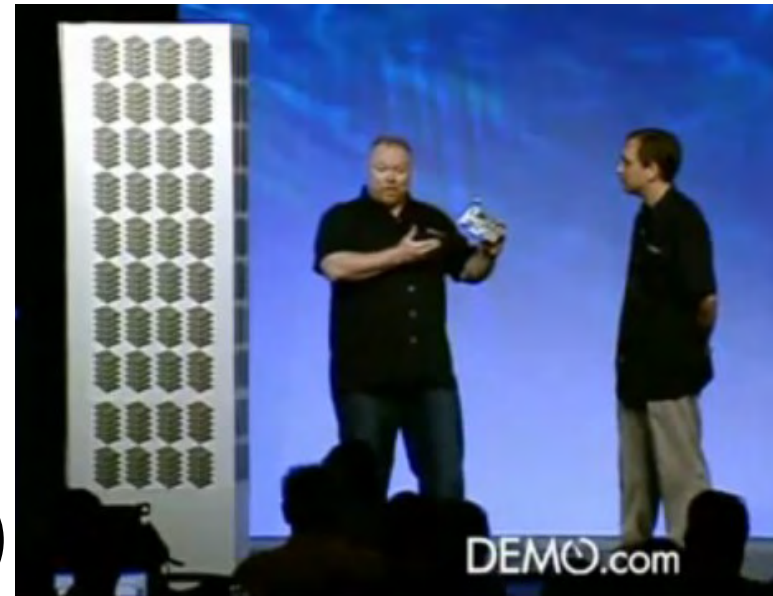
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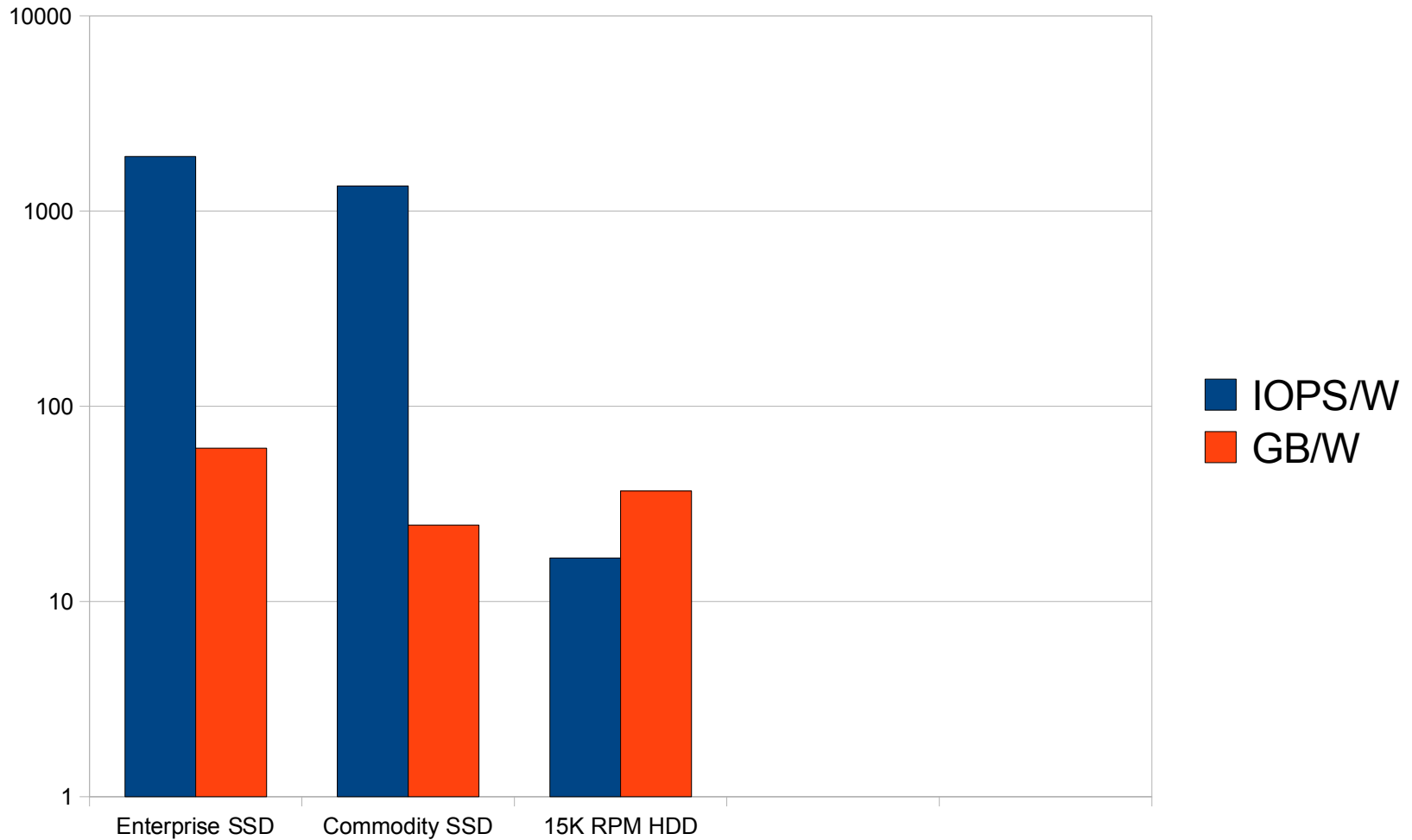- Reduce power consumption by an **order of magnitude** or more (assuming 15K drives)
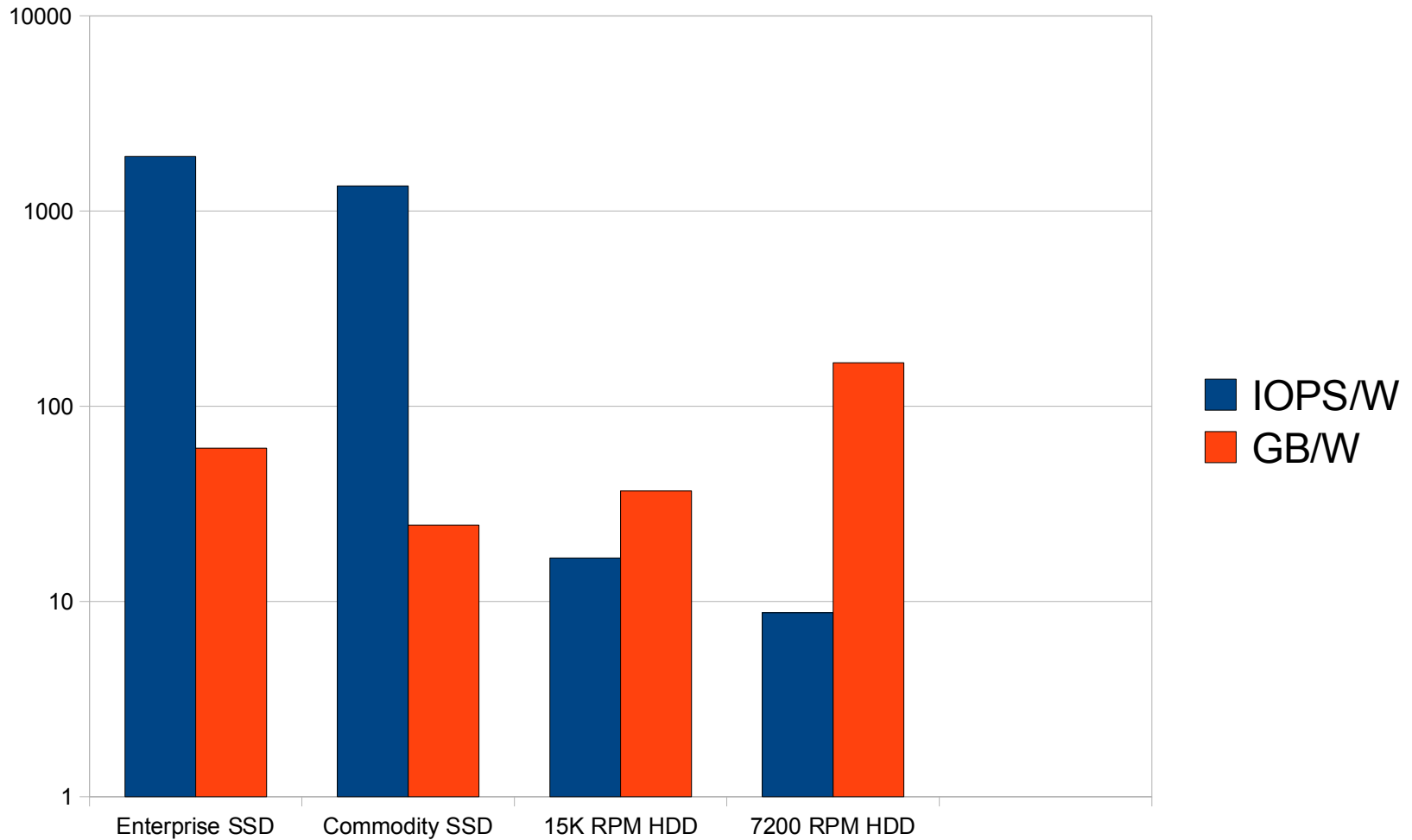

- … but wasn't I storing data on those drives?

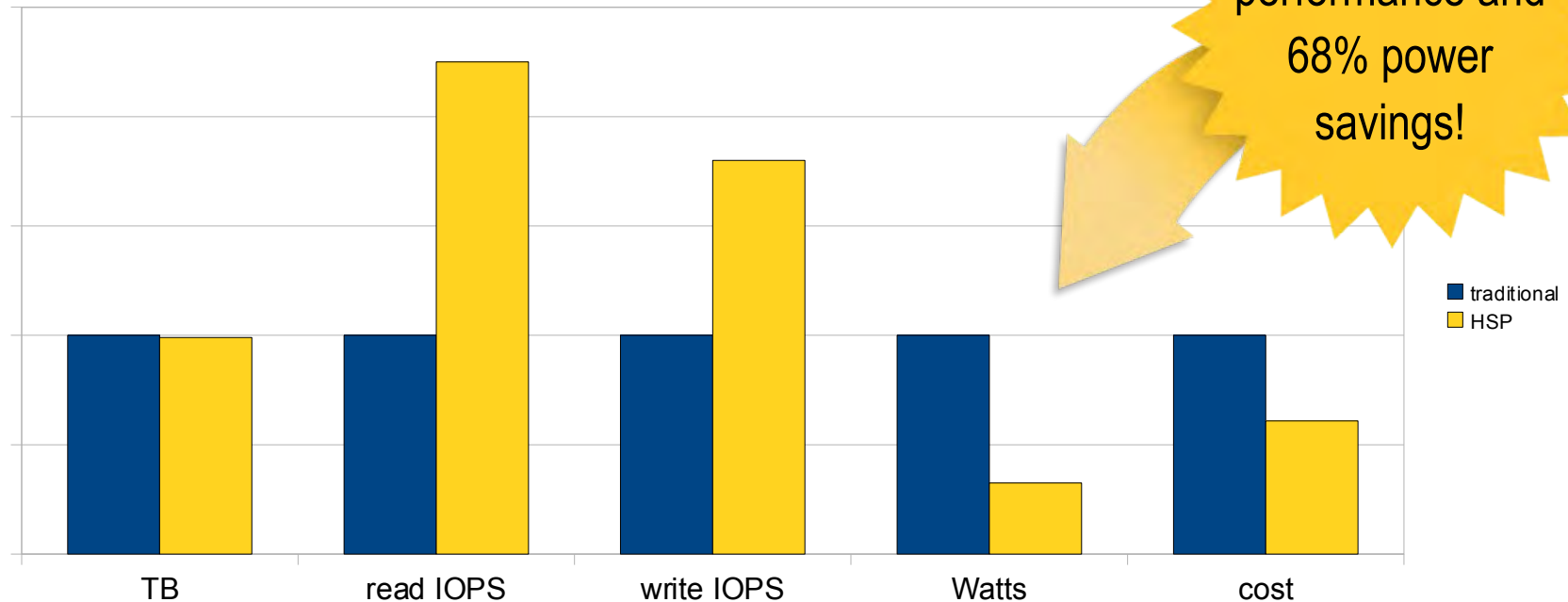# GB/W *roughly* equivalent

IOPS vs. Capacity

- HDDs for IOPS → flash is a clear win

- HDDs for capacity → flash about the same

- Solution: flash as an augmentation of the storage hierarchy, not an HDD replacement

- HDDs for capacity

- Flash for IOPS

7200 RPM Drives

Hybrid Storage Pool Results

- 216 x 450GB 15K RPM HDD

- 48 x 1TB 7200 RPM HDD
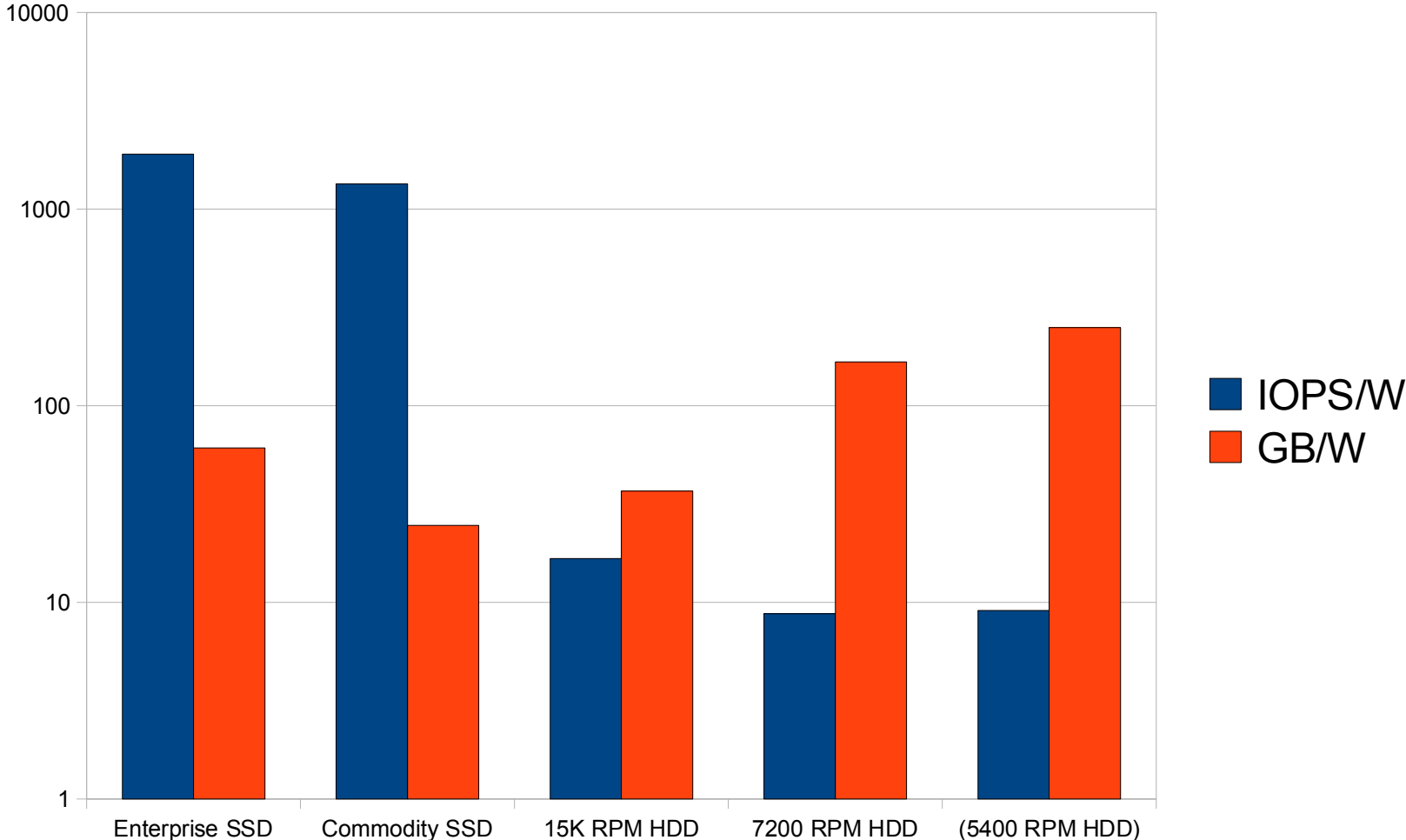 6 x read-optmized SSD
  2 x write-optimized SSD

Better performance and 68% power savings!

Legend: ■ traditional ■ HSP

Chart categories: TB, read IOPS, write IOPS, Watts, cost

Hybrid Storage

- Smarter software: Hybrid Storage Pools in ZFS

- Integrates knowledge of specialized components into the filesystem

- Scales to fit application needs
  > In this case, match capacity/performance; better power

- Unlocks the potential of flash for general purpose storage

- Customize your application or use ZFS to take advantage of flash

What's next?

Flash to Unlock More Power Savings

- Putative 5400RPM drive
  - > Lower power / higher density
  - > Higher GB/watt, (and GB/$)
- Flash enables a new storage hierarchy
- Software: changing today
- Hardware: slower moving, but needs to react to the new realities created by flash

Questions?

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http://blogs.sun.com/ahl