OCZ Saber 1000 HMS SSDs

TAKE CONTROL with an Innovative Host Managed SATA SSD Solution

A Toshiba Group Company

CONFIDENTIAL | Under Embargo Until Oct 15th @ 8AM EST
Please honor our *news embargo* until 8:00 am Eastern Time on Thursday, October 15, 2015

Thank you!
What are Host-Managed SSDs?

The Technology:

• Allows host control of SSD background processing tasks
• Enables system-level orchestration of these tasks to increase overall performance

Benefit:

• Obtain consistent latency and predictable performance
What is Saber HMS?

OCZ Enterprise Portfolio

Hyperscale

Saber HMS

Intrepid 3700

Intrepid 3800

Intrepid 4500

Z-Drive 4500

Z-Drive 6000

New firmware enabling HMS control in Saber 1000 SSDs

HMS controls exposed to the host via APIs that integrate into the software stack

HMS APIs allow the host to tightly manage SSD background tasks for obtaining consistent SSD latency
Anatomy of an SSD

SSDs store data in flash memory chips and need specific housekeeping to maintain performance and endurance.

SSDs are heavily influenced by several factors:

- **PROGRAM/ERASE CYCLE**: Existing data (page or block) needs to be erased before the cell can be programmed.
- **WRITE AMPLIFICATION**: Modifying data initiates read / erase / write which writes data to different memory cells.
- **GC/TRIM**: GC frees up usable blocks in memory. TRIM is GC but at the file system level (flagged but not erased).
- **WEAR-LEVELING**: Ensures even wear across all available NAND memory cells.
- **ENDURANCE**: NAND type & quality, OP, FW updates and architecture, GC processes, workload and temperature.
What Problem Does **HMS** Solve?

- Internal housekeeping processes tax the IO response of SSDs performance and latency
- Hosts have no visibility to these processes and therefore cannot mitigate them

BEFORE

AFTER

- Allow consistent and predictable latency
- In a pool of SSDs housekeeping processes can be orchestrated across the pool such that housekeeping will not affect IO
HMS Benefits

Consistent Latency
- Very important feature for enterprise applications requiring consistent latency
- Examples include modern data bases, online trading, real time bidding

Higher Application SLA
- Optimized house-keeping adds predictability of storage IOPS when needed
- Added performance can be monetized via SLA terms

Boost Storage System Efficiency
- Allows Server/Storage OEMs to optimize and tailor the background tasks around their workloads
- Certain workloads may realize significant performance increases
Product Highlights

**SPECS:**
- Saber is the 1st OCZ SSD to support HMS controls
- SATA 6Gb/s 2.5” x 7mm
- 480GB and 960GB

**USES:**
- Enable Performance and Latency Improvements
- Read-Intensive and Latency-Sensitive Applications

**DEVELOPMENT MATERIALS:**
- HMS Software Library
- Programmer’s Guide
- Reference Design
New frontier for SSDs - No current SATA competitors

- Other SSD vendors currently working on HMS solutions
- Standards body adoption for SATA, SAS and NVMe based products
  - T10 Technical Committee
  - T13 Technical Committee
  - NVMe Technical Committee
- Initiative referred to as “Storage Intelligence”

OCZ/Toshiba gain early mindshare
Customer Profile and Applications

Targets customers who are already optimizing their software for storage, or would like to start doing that work going forward.

HMS Provides another tool for them to work with

Sample Workloads
1. High-Frequency Trading
   Real-Time Bidding (RTB)
2. Virtual Desktop Infrastructure (VDI)
3. OnLine Transaction Processing (OLTP)
4. Scale-out applications

Storage/server OEMs
All-flash/hybrid arrays
Hyperconverged, software-defined storage systems
Hyperscale data centers
Saber HMS SSD operates without performing background processes, servicing incoming workload at maximum performance and with consistent latency.

Saber HMS SSD performs internal background processes while the host diverts IO to SSDs that are in active state.

Saber HMS SSD operates without performing background processes, servicing incoming workload at maximum performance and with consistent latency.

**Round Robin Transition:** One group in housekeeping while others are active.
Saber HMS Pricing & Availability

Pricing (MSRP):

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Saber 1000</th>
<th>Saber 1000 HMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>480GB</td>
<td>$370</td>
<td>$370</td>
</tr>
<tr>
<td>960GB</td>
<td>$713</td>
<td>$713</td>
</tr>
</tbody>
</table>

*Saber 1000 HMS Ships in bulk packaging to volume partners

Partners:

- OCZ is available for supporting volume development partners, and Saber 1000 HMS will be available through normal sales channels in bulk

Warranty:

- 5-year enterprise warranty or the average P/E count across the Saber 1000 SSD, whichever occurs first

Product Availability:

- November 2015
Saber HMS Summary

Product:
- APIs to control primitives including source code for customer modifications
- Programmer’s Guide & Reference Design to support customer development of their platform

Primary Target:
- Storage/server OEMs
- Hyperscale data centers
- Software-defined storage vendors

Opportunity:
- Superior performance consistency and latency
- OCZ first to market with SATA-based product
- HMS initiative driven to T10 / T13 committees (Toshiba / OCZ participation)
- OEM play – early adopter – credible technology
Questions?
Please honor the news embargo!

Thank you,