wear-levelling

garbage collection

power management

over-provisioning

OCZ Saber 1000 HMS SSDs

TAKE CONTROL with an Innovative Host Managed SATA SSD Solution

OCZ STORAGE SOLUTIONS | A Toshiba Group Company

Please honor our <u>news</u> <u>embargo</u> until 8:00 am Eastern Time on Thursday, October 15, 2015

Thank you!
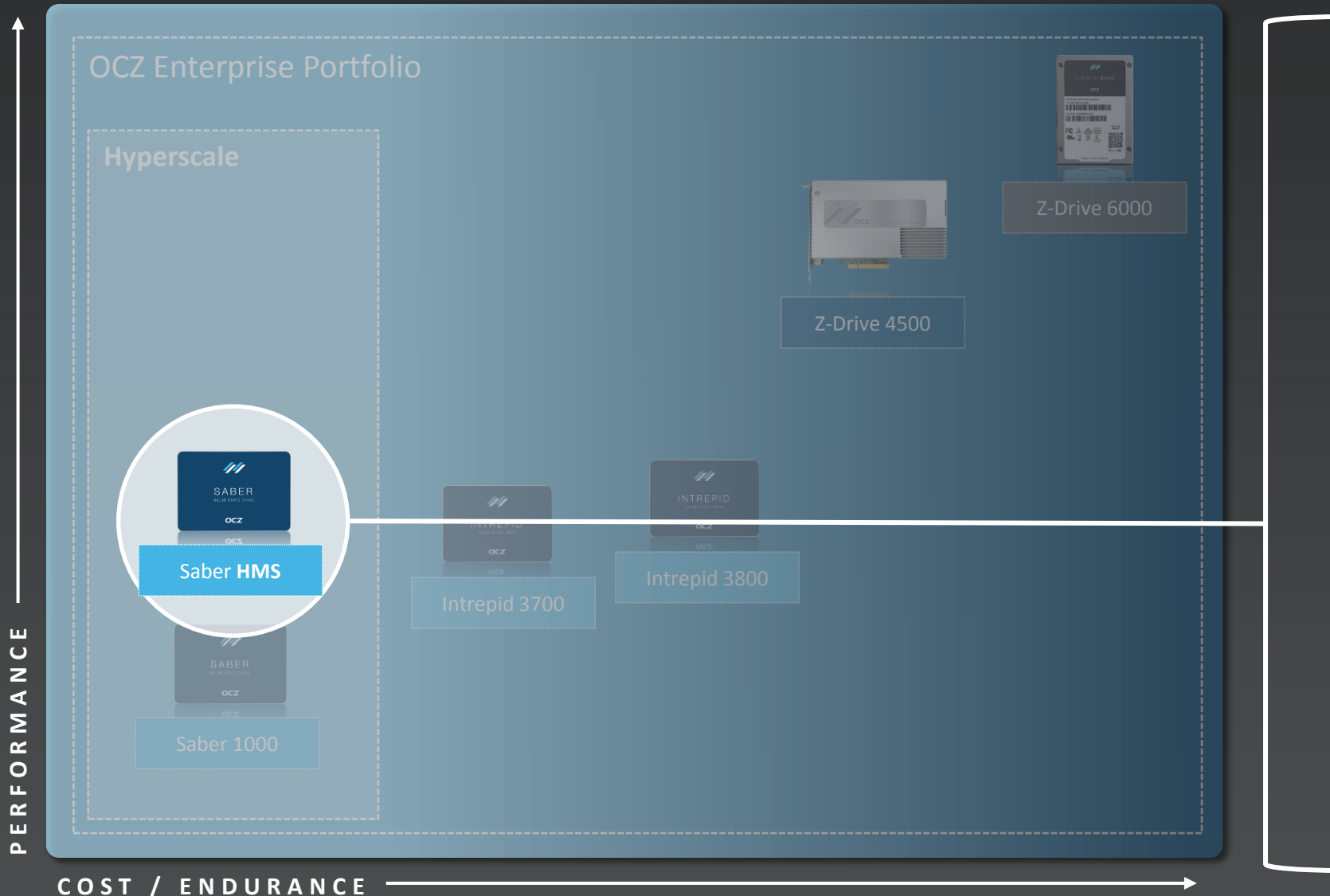
What are Host-Managed SSDs?

The Technology:

- Allows host control of SSD background processing tasks

- Enables system-level orchestration of these tasks to increase overall performance

Benefit:

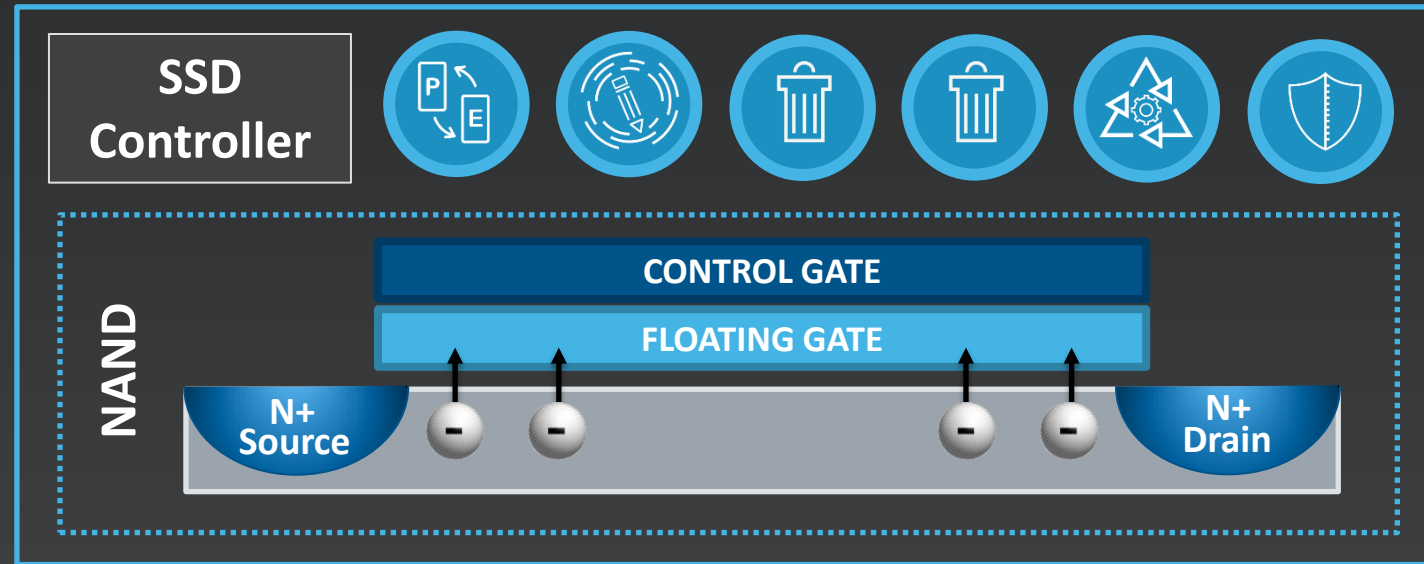- Obtain consistent latency and predictable performance

SABER HMS
HOST MANAGED SSD
OCZ

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What is **Saber HMS**?

OCZ Enterprise Portfolio

Hyperscale

Z-Drive 6000

Z-Drive 4500

Saber **HMS**

Intrepid 3800

Intrepid 3700

Saber 1000

PERFORMANCE

COST / ENDURANCE

New firmware enabling HMS control in Saber 1000 SSDs

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

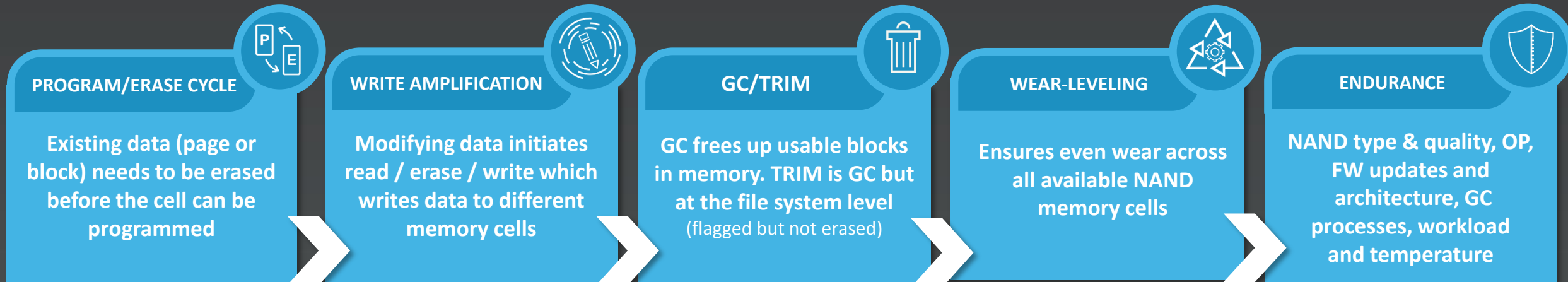**HMS APIs allow the host to tightly manage SSD background tasks for obtaining consistent SSD latency**

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Anatomy of an SSD

SSDs store data in flash memory chips and need specific house-keeping to maintain performance and endurance

SSD Controller

NAND

CONTROL GATE

FLOATING GATE

N+ Source

N+ Drain

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

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# What Problem Does **HMS** Solve?

BEFORE	AFTER

BEFORE

- Internal housekeeping processes tax the IO response of SSDs performance and latency

- Hosts have no visibility to these processes and therefore cannot mitigate them

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
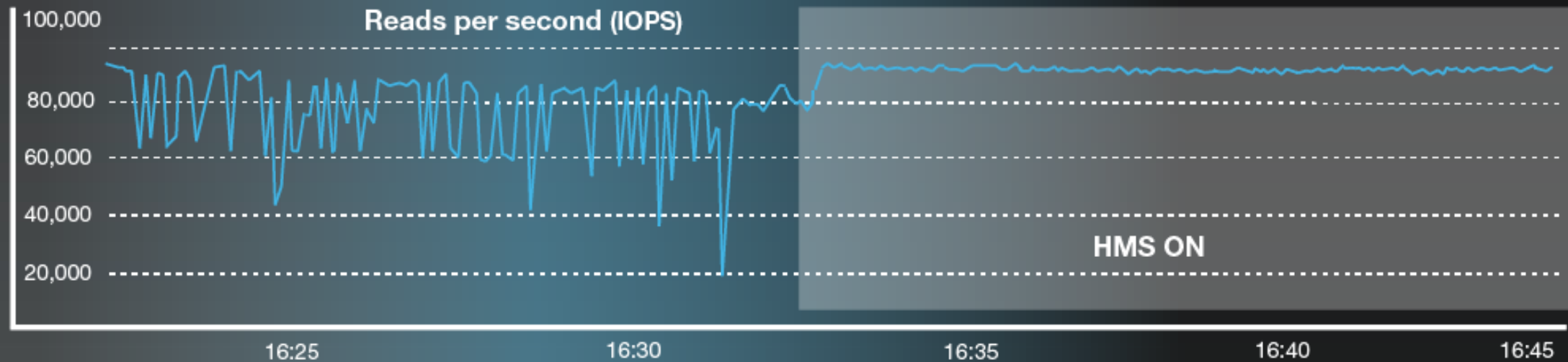
HMS Benefits

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

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Product Highlights

USES:

Enable Performance and Latency Improvements

Read-Intensive and Latency-Sensitive Applications

SPECS:

Saber is the 1st OCZ SSD to support HMS controls

SATA 6Gb/s 2.5" x 7mm

480GB and 960GB

SABER **HMS**

HOST MANAGED SSD

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DEVELOPMENT MATERIALS:

HMS Software Library

Programmer's Guide

Reference Design

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Competitive Landscape

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

Storage/server OEMs

All-flash/hybrid arrays

Hyperconverged, software-defined storage systems

Hyperscale data centers

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

Customer Profile and Applications

Sample Workloads

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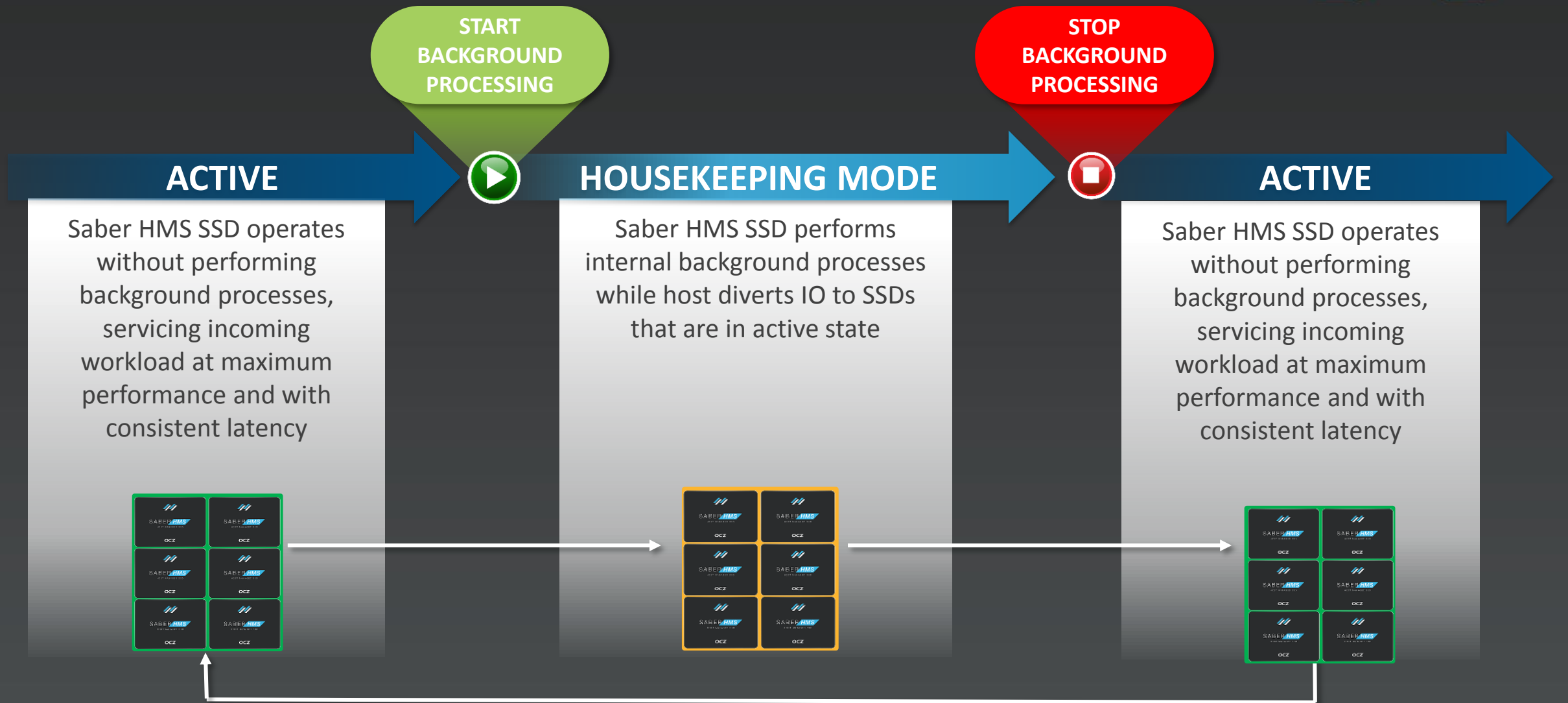3. OnLine Transaction Processing (OLTP)
4. Scale-out applications

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Typical HMS Implementation

ACTIVE

START BACKGROUND PROCESSING

HOUSEKEEPING MODE

STOP BACKGROUND PROCESSING

ACTIVE

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 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

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Saber HMS Pricing & Availability

Pricing (MSRP):

Capacity	Saber 1000	Saber 1000 HMS
480GB	$370	$370
960GB	$713	$713

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

Firmware modifications & embedded APIs

OEM storage enclosure

Guides for smooth implementtation

HMS host glueware to allow SSD management

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Questions?
Please honor the news embargo!

Thank you,