Busting Through I/O Bottlenecks with PCIe Flash Caching

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The Data Deluge Gap

Network Traffic and Storage Capacity Growth 32-50% *

IT and Telecom Equipment Spending CAGR 5-7% **

Sources: *Cisco VNI 2012 IDC 2011; **LSI and Industry Sources 2011
Solving Datacenter Challenges

**Challenges**
- **Latency**
- **TCO**
- **Always On**

**Typical solution**
- **Over-provisioning**
- **Reduced CapEX – Lower capability and replication**
- **Increased HW and SW Unaddressed need for SME**

**Implications**
- **Lower server utilization**
  - Not scalable
- **Biz risk: Work done, Data availability and reliability**
- **High Complexity and OpEX**
  - Costly downtime
Flash Fills the Latency Gap

Immediate performance gains:
- 2x - 4x improved work / SW licenses
- 10x reduced transaction latency
- Onboard flash Management to preserve PCU resources
- Support for multiple environments
- Support native storage protocols with varying form factors

Flash can immediately and seamlessly improve application response times for a range of environments
The Growing Gap Needs Flash

Flash Cell Geometries

System Requirements

- Increasing Writes
- Higher Reliability
- More Performance

- Less Writes
- Higher Reliability
- 30% Cost Reduction Y-Y

All flash is different and changes every 18 months!
- Per bit cost dropping 30% YoY
- Endurance, Reliability, Performance, Interface

Faster flash solutions to bridge the gap

Program / Erase Cycles

<table>
<thead>
<tr>
<th>Generation</th>
<th>100K</th>
<th>10K</th>
<th>3K</th>
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</thead>
<tbody>
<tr>
<td>Previous</td>
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<td>Current</td>
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<td>Next</td>
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Error Correction Requirements (per KB)

- 12-bit
- 24-bit
- 40-bit
- 60-bit

5xnm MLC & MLC & MLC & MLC per cell

Confidential
## Solving Datacenter Challenges

<table>
<thead>
<tr>
<th>Challenges</th>
<th>Typical solution</th>
<th>SSD Flash + Cache Intelligence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Latency</strong></td>
<td>Over-provisioning</td>
<td>Flash-based application acceleration</td>
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<tr>
<td><strong>TCO</strong></td>
<td>Reduced CapEX – Lower capability and replication</td>
<td>Increase work/server through intelligent caching</td>
</tr>
<tr>
<td><strong>Always On</strong></td>
<td>Increased HW and SW Unaddressed need for SME</td>
<td>Efficient HW / SW utilization Highly reliable</td>
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Approaches to Flash: DAS

Flash as Primary Storage

High performance PCIe Flash Module

- Low latency and a low CPU burden
- Designed to maximize transactional I/O performance
  - Big Data, OLTP, web serving
  - Data analytics and warehousing
  - Data mart, data mining

On-board flash is ideal for environments where performance trumps all else
Approaches to Flash: DAS

Flash Cache

PCle Flash + RAID + Software

- Complete solution for acceleration of SAS connected storage
- Provides RAID protection and read and write caching software.
- Automatic, dynamic classification of “hot” data

Cost-effective solution for accelerating DAS with enterprise-RAID reliability
Approaches to Flash: SAN

Server-side Caching

High performance PCIe Solid State Storage and Software

- Out-of-the-box application acceleration for the SAN (FC, iSCSI) with intelligent caching
- Dramatically improves I/O performance to meet the requirements of the high-performance applications
- Write through caching preserves SAN features (replication, thin provisioning, etc.)

Improve IT agility and responsiveness of your existing SAN infrastructure
Flash in Use Today

- Integrated Flash Accelerators in Exadata X3
- Sun Flash Accelerator F40 PCIe Card for Sun x86 and SPARC
- PCIe flash mezzanine cards for Cisco UCS B-Series Blade Servers with EMC VFCache™ support
- IBM High IOPS Modular Storage Adapters
- IBM EasyTier
- NetApp Flash Accel™
- NetApp Alliance server caching solutions
Identifying the Biggest Impact from Flash

Will caching data on flash accelerate your application?

Utilize sizing tools that are purpose-built for cache to identify and solve your database acceleration requirements
## LSI’s in Datacenter Flash Solutions

### Uniquely Positioned in PCIe Flash Solutions
- Fully offloaded architecture does not tax server CPU
- Low host memory footprint
- Based on industry leading SandForce Flash Storage Processor

### Proven Enterprise Experience
- Key supplier to all major OEMs for servers and storage
- Generations of successful validation in server ecosystem

### Technologies and Capabilities for Sustained Advantage
- 9 of the top 10 server OEMs run on LSI’s MegaRAID software
- Full portfolio for storage ecosystem (HDD, SSD, RAID, Flash)

For all things flash, go to [www.thesmarterwaytofaster.com](http://www.thesmarterwaytofaster.com)
Q and A