Server-Side Flash & Application Integration

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Agenda

- Today’s Server-Side Flash Reality
- 2\textsuperscript{nd} Platform Use Cases
- 3\textsuperscript{rd} Platform Use Cases
- What The Future Holds…
Today’s Server-Side Flash Reality

2nd Platform - Enterprise
- Need more IOPs for performance & headroom
- Improve CPU/Core utilization—license costs
- Architectural/Management “Fit”
- Dominated by shared-storage

3rd Platform - Cloud
- High latency across distributed nodes
- Inefficient storage utilization
- Massive server sprawl
- Dominated by direct-attached storage
Server-Side Flash for Enterprise (2nd Platform)
**Before**

- Multi-millisecond latencies
- Poor CPU/Core Utilization
- High License Fees
- 20-70 millisecond wait times

**After**

- 7x IOPs improvement
- <80 microsecond wait times
- 1/4th the cost of equivalent SAN Upgrade
- No change to operations or Management
- 80 to 90% CPU/Core Utilization
Shared Access to SSDs for Oracle® RAC

Before

- Monolithic SAN Array
- Poor CPU Utilization
- Milliseconds of Latency
- High Cost to Add IOPs

After

- Server-Side PCIe Flash with Sharing Software
- Microsecond Latency, Millions of IOPs
- Optimized CPU Utilization
- Repurpose Existing SAN
- 6x Performance at 30% Cost of AFA SAN
Microsoft® SQL Server – Flash Caching

**Before**

- Reads and Writes from Local SAN
- Milliseconds of Latency
- Low IOPS, thus Lower Transaction Speed

**After**

- Write-Through Caching for Data Consistency
- Microsecond Read Latency
- No Changes to Operations or Management
- 7x Improvement in IOPs
Server-Side Flash For 3rd Platform (Cloud)
What does 3rd Platform Mean for Flash?

**2nd Platform - Shared Storage**
- Shared with many servers
- Maximizes Utilization
- Central Data Management Built In
- 25 years of “tradition”

**3rd Platform – Shared Nothing**
- Flash in all servers and servers deployed in a cluster
- Applications provide built-in data management
- Data replicated/distributed automatically
- Many Read-Only copies (master-slave) are possible
- Workloads are Read-Dominated – 70% to 90% Read
### Cloud Use Cases – PCIe Flash for MySQL

<table>
<thead>
<tr>
<th>Before</th>
<th>After</th>
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<tbody>
<tr>
<td>MySQL using disk form-factor SATA SSDs</td>
<td>3:1 server consolidation &amp; 6:1 rack consolidation</td>
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<td>Massive server sprawl</td>
<td>3x increase in performance</td>
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<td>Escalating space/power/operations expense</td>
<td>Increased revenue</td>
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<td>High management costs</td>
<td>Excellent user response times</td>
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<td>Reduced capital expenses</td>
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Clustered Caching for MySQL

Before

High Latency AFA SAN for Indexing Algorithms
Latency Measured in Milliseconds
100M Uniques/Month
50B Recommendations/Month

After

Transparent Acceleration for AFA SAN
Latency of 40 uSec
400M Uniques/Month
150B Recommendations/Month
SSD Clustering “Flash Pools” for MySQL

**Before**
- Dedicated Asynchronous Replication Pairs
- Slaves for Read Off-load
- Inefficient Server Utilization
- Server Sprawl

**After**
- Shared, Clustered “Multi-Function” Server
- 8 Servers to 5, 38% Consolidation
- Fully Mirrored Pool of Flash
- Any Server to Any Volume
Putting It All Together

Flash Memory Summit

Flash in Servers for Ultimate Performance

MySQL

Oracle

MySQL SQL Server

KVM

mongoDB

vmware

SAN Volumes

“Tiering” to Active Archives and Hybrids for Local Capacity

Flash Systems for High Density Storage

Microsoft SQL Server

Windows Hyper-V

EMC

amazon web services

Interfaces to Private & Public Clouds for Remote Capacity and DR