Inspiring IT Innovation with SSD Solutions

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Solid-State Drives - The Possibilities Ahead

Technology and SSDs Advancements

How Solid-State Drives Deliver Business Value
Solid-State Drives Technology Advancements
Rapid Technology Advancements

2012
- 20nM
- Hi-K Dielectric Metal Gate
- Planar Cell

Planar Cell Products ramping quickly

2013Q1 2013Q2 2013Q3 2013Q4
Client Platform Trends

2008

HDD

SATA

2013

m.2

Intel
Enterprise Platform Trends

2008  2013
Enterprise Platform Trends

2008

HDD
SATA

2013

DELL
IBM
HP
Time to Target the Majority

Intenders using SSDs in Data Centers

Early Adopters using SSDs in Data Centers

Sources: Intel Insights and Market Research (IMR), Q3'12, and Geoffrey Moore, Crossing the Chasm
Solid-State Drives Delivering Business Value
Key IT Challenges

- Scaling Performance / TCO
- Energy Efficiency
- Delivering New Workloads
- Securing the Environment
Improved performance while saving space, power and cost
### Cloud Virtualization Solutions

Cloud Solution with HDDs

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>VMs Supported</td>
<td>500</td>
</tr>
<tr>
<td>Storage Cost ($$)</td>
<td>~$145K</td>
</tr>
<tr>
<td>Storage Rackspace (U)</td>
<td>42</td>
</tr>
<tr>
<td>Storage Power (kW)</td>
<td>7.5</td>
</tr>
<tr>
<td>Storage Cooling Power (kW)</td>
<td>9.4</td>
</tr>
</tbody>
</table>

1. Configuration: Five hundred 600Gb 15k RPM HDDs running 500 VMs at 200 IOPs each. Source: Intel Internal testing For more information go to: [intel.com/go/ssd]
## Intel® SSDs Accelerate Cloud Virtualization

<table>
<thead>
<tr>
<th>Metric</th>
<th>Cloud Solution with HDDs</th>
<th>Cloud Solution with Intel® SSDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>VMs Supported</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>Storage Cost(^1) ($)</td>
<td>~$145K</td>
<td>&gt;12X ↓ ~$12K</td>
</tr>
<tr>
<td>Storage Rackspace(^2) (U)</td>
<td>42</td>
<td>&gt;20X ↓ 2</td>
</tr>
<tr>
<td>Storage Power (kW)</td>
<td>7.5</td>
<td>&gt;125X ↓ .06</td>
</tr>
<tr>
<td>Storage Cooling Power (kW)</td>
<td>9.4</td>
<td>&gt;125X ↓ .075</td>
</tr>
</tbody>
</table>

Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors and SSDs. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases. New Configuration: Intel® SSD DC S3500 SW SAN Solution (12 x 800G) Internal Intel testing July 2013. Results have been estimated based on internal Intel analysis and are provided for informational purposes only. Any difference in system hardware or software design or configuration may affect actual performance. 1 Capital cost of server and SSDs only divided by number of active users. Additional savings of rack space, power and cooling not included. 2 From 42u to 2u rackspace. Performance based on VM latency per equal number of VMs.
Business Solution
Email Server Design with Intel® SSDs

More Users with Improved User Experience
# Email Proof of Concept with Intel® SSDs

<table>
<thead>
<tr>
<th></th>
<th>40 HDDs</th>
<th>16 Intel® SSDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active Users¹</td>
<td>6000</td>
<td>12000</td>
</tr>
<tr>
<td>Size¹</td>
<td>6U</td>
<td>2U</td>
</tr>
<tr>
<td>Mail Submission Time¹</td>
<td>600ms</td>
<td>100ms</td>
</tr>
<tr>
<td>Total Power + Cooling¹</td>
<td>1.8 kW</td>
<td>0.4 kW</td>
</tr>
</tbody>
</table>


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Business Solution
Accelerating Existing Storage with Intel® CAS

Maximizing limited hardware and storage resources
Accelerating Existing ERP Applications Storage

Operating System & Applications

Intel® SSD

Direct Attached Storage

Performance

11x-18x

DAS

DAS w/ Intel® CAS

Latency

90%

DAS

DAS w/ Intel® CAS

“Intel® CAS and Intel® SSDs provides an immediate return on investment while delivering a significant increase on system performance.”

– Dan Oughton, CTO, IndustryBuilt

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Solid-State Drives
The Possibilities Ahead
Storage Moves Closer to the Processor

Yesterday

I/O Controller

I/O Controller

Today

Tomorrow

Intel Xeon®

PCI Express

NVM Express
NVMe is the largest percentage storage latency reduction since the SSD!
Thank You
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