Redefining the Economics of Enterprise Storage

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Product Marketing Manager
Customer Questions about Flash

• How can I accelerate my applications without adding headcount?
• How do I achieve the lowest possible $/GB or $/IOPS?
• Once data is written, it’s barely used so why am I forced to store it on expensive SSD drives?
• How much longer will 7K RPM HDD provide the lowest $/GB?
• How do I know which SSD drive type, SLC, MLC or TLC, has the right endurance without overpaying?
• There’s a lot of new SSD drives and arrays entering the market daily, how do I future proof my enterprise?
Today’s Outline

• Market data
• Why tiering works addresses economic, new technology innovation, and data value
• TLC overview
• Tiering can protect less endurant drives
• Cost / GB comparison
• Case study
Redefining the Economics of Enterprise Storage

Supply Shifts Left

- Price
- Demand
  - Same demand curve
  - Lower quantity demanded
- Supply
  - Supply shifts in
  - Less quantity supplied at each price
- Equilibrium
  - Higher P & Lower Q

Quantity
Cost is the No. 1 driver for flash adoption

<table>
<thead>
<tr>
<th>Consideration</th>
<th>2015 (N=601)</th>
<th>2014 (N=562)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved security/risk management</td>
<td>31%</td>
<td>40%</td>
</tr>
<tr>
<td>Return on Investment</td>
<td>36%</td>
<td>38%</td>
</tr>
<tr>
<td>Business process improvement</td>
<td>35%</td>
<td>37%</td>
</tr>
<tr>
<td>Reduction in operational expenditures</td>
<td>30%</td>
<td>37%</td>
</tr>
<tr>
<td>Improved regulatory compliance</td>
<td>20%</td>
<td>27%</td>
</tr>
<tr>
<td>Reduction in capital expenditures</td>
<td>22%</td>
<td>26%</td>
</tr>
<tr>
<td>Reduced time-to-market for our products or services</td>
<td>18%</td>
<td>19%</td>
</tr>
<tr>
<td>Speed of payback</td>
<td>17%</td>
<td>18%</td>
</tr>
</tbody>
</table>


Use of SSD in servers or storage

- Yes, we currently use SSD, 49%
- No, but we plan to deploy in 12 months, 20%
- No, but we are currently evaluating, 14%
- Not familiar with SSD, 1%
- No SSD plans at this time, 6%
- Don’t know, 2%
- n=373
High Cost of Inactive Data

“Enterprises consistently report that only 20-25% of their data is primary while rest is secondary.”

“85% of production data is inactive – 68% not accessed on 90 days”
Different Cost and Performance Options

<table>
<thead>
<tr>
<th>Type</th>
<th>Speed</th>
<th>Size</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLC/MLC SSD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TLC SSD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.2K HDD</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

SSD costs near parity with 15K by 2016

7.2K HDDs still up to 20x lower $/GB
Tiered Storage Architecture Addresses Problem

Tier 1  Tier 2  Tier 3
Tiered Storage Architecture Addresses Problem

Tier 1: RAID 10
Tier 2: RAID 5, RAID 5
Tier 3: RAID 6, RAID 6, RAID 6

Metadata
# Overview and Use of TLC Technology

<table>
<thead>
<tr>
<th>Type</th>
<th>Endurance</th>
<th>Cost</th>
<th>Common Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLC</td>
<td>High</td>
<td>High</td>
<td>Enterprise</td>
</tr>
<tr>
<td>MLC</td>
<td>Med</td>
<td>Med</td>
<td>Mixed</td>
</tr>
<tr>
<td>TLC</td>
<td>Low</td>
<td>Low</td>
<td>Consumer</td>
</tr>
</tbody>
</table>

**Diagram**

- **SLC**
  - 1 bit
  - Values: 0, 1

- **MLC**
  - 2 bits
  - Values: 00, 01, 10, 11

- **TLC**
  - 3 bits
  - Values: 000, 001, 010, 011, 100, 101, 110, 111
Tiered Storage Architecture Solves Problem

Writes from Application

Directed to Tier 1

Tier 2

Tier 3

Virtualized Volume
Tiering Protects Less Endurant Drives

- All incoming writes steered to Tier 1, data moved only as needed
- Tier 2 drives spec at 1 write full write per day
- No drive in service longer than a year average more than 1 DWPD

- 66% of drives have less than .1 DWPD
Key Observations

• Most systems use SSD Mix + 7K HDD
• Flash less $ than 15K drives
• TLC 50% less than MLC
• Dedupe lowers TLC 50% more

Vendor 1
Vendor 1 Flash w/ Dedupe
Vendor 2
Vendor 2 Flash w/ Dedupe

WI = Write Intensive
RI = Read Intensive
Opportunity:
West Virginia’s Wheeling Hospital needed flexible, cost-effective storage and networking to support the latest version of its critical clinical-information system.

Solution:
The hospital deployed Dell Compellent SC8000 hybrid flash storage arrays, Dell PowerEdge servers and Dell Networking switches to boost system performance and support new initiatives.

Results:
- Upgrade to latest version of clinical-information system in less than one month
- 50 percent reduced backup times and database performance increase of 40 percent
- Flexible 60TB hybrid flash and spinning-disk storage at one-third the cost of competitor solutions

“We’re a small community hospital that doesn’t have a huge budget to buy a full flash solution. With Compellent, we get the benefit of having multiple tiers, with affordable spinning-disk storage at lower tiers and high-performance flash at the higher tiers.”

— Sean Loy, Director of Clinical Informatics at Wheeling Hospital
Conclusion

Tiering technology
- Redefines the Economics of Enterprise Storage
- Leverages the right amount of high performance / high capacity drives
- Protects less endurant SSD drives
- Drives wider adoption of flash

TLC Technology
- Ideal for enterprise apps when used properly
TLC Provides 50% lower $/GB than current SSD options

**Displace 15K HDD and crank up the speed of general-purpose arrays**

- **15K HDD replacement**
  - Optional hybrid tier (7.2K)

**Optional hybrid tier (7.2K)**

![Graph showing performance comparison between different SSDs](image)

- Up to **24x** more IOPs @ same cost
- Lower latency
- Lower power/cooling
- Smaller footprint

**Reduce the cost of premium performance “flash-optimized” arrays**

- **All writes to WI SSDs Tier 1**
- **Less expensive** Tier 2
- **Read-only tier**
  - Optional hybrid tier (7.2K)

![Graph showing performance comparison between different SSDs](image)

- **50%** lower $/GB
- No read performance reduction vs. other RI SSDs

**Legend:**
- 15K HDD
- Mainstream RI SSD
- Premium RI SSD
- WI SSD