Why and How SSDs are Economical

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OBJECTIVE

ANALYSIS
SSDs Can be Economical Depending on Your Environment

1. Low-cost laptops
2. Notebook computers
3. Desktop computers
4. Enterprise servers
Problem 1)

“We need to meet a price point, even if we have to sacrifice storage capacity!”
SSDs Can Be The Cheaper Alternative

Cost of Storage

From: The Solid State Disk Market: A Rigorous Look

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Who Needs Cheap Mass Storage?

- MP3 players
- Cell phones/Blackberries
- Low-cost PCs
  - OLPC/Classmate PC
  - Mobile Internet Device - MID
Problem 2)

“Let’s add an SSD option to our new line of Notebook PCs”
What Notebook Buyers Look For

- Price same or lower than last time
- More of everything else
  - Gigahertz
    - (Cores?)
  - Megabytes of main memory
  - Gigabytes of disk space
  - Larger screen size
  - Features, features, features!
NAND Unlikely to Match HDD $/GB

From: Understanding the NAND Market

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The SSD Feature Sell

• Longer battery life
• Faster:
  – Boots twice as fast
  – Faster overall operation
• More rugged
• No disk crashes
Longer Battery Life?

Source: Intel
The SSD Feature Sell

• Longer battery life
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# Is Solid State Really More Reliable?

<table>
<thead>
<tr>
<th>Component</th>
<th>HPC1</th>
<th>COM1</th>
<th>COM2</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDD</td>
<td>30.6%</td>
<td>18.1%</td>
<td>49.1%</td>
</tr>
<tr>
<td>Memory</td>
<td>28.5%</td>
<td>20.1%</td>
<td>3.4%</td>
</tr>
<tr>
<td>Power Supply</td>
<td>1.6%</td>
<td>34.8%</td>
<td>10.1%</td>
</tr>
<tr>
<td>All Other</td>
<td>39.3%</td>
<td>27.0%</td>
<td>37.4%</td>
</tr>
</tbody>
</table>

Source: Carnegie Mellon paper: *Disk Failures in the Real World*
Bad!
Problem 3)

“OK, then let’s use SSDs in our Desktop line!”
The SSD Feature Sell

• Longer battery life
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SSD Features that are Important to the Desktop

- Longer battery life
- Faster:
  - Boots twice as fast
  - Faster overall operation
- More rugged
- No disk crashes

BAD!
Problem 4)

Something Interesting is Happening Here!
NAND Shot Past DRAM’s Price per GB

Average Price per Gigabyte

From: *Hybrid Drives: How, Why, & When?*
Now NAND Fits in Computers

From: *Solid State Drives in the Enterprise*

[OBJECTIVE ANALYSIS – www.OBJECTIVE-ANALYSIS.com](http://www.OBJECTIVE-ANALYSIS.com)
An SSD Can **Save Money** In an Enterprise Server!

- IT managers go to extremes for throughput:
  - Enterprise HDDs
    - 10K & 15K RPM
    - Fewer tracks = lower capacity but faster access
    - High price: $300 to $1,000+
  - RAID
  - Over provisioning & striping
  - Short stroking
- These jack up the system’s price
- One SSD can often replace several HDDs
An SSD Saves More than Money

• Space
• Power
• Cooling
• Maintenance

GOOD!
SSDs: A Good Choice & A Bad Choice

• Good
  – Low-Cost PC (OLPC or MID)
  – Enterprise Server

• Bad
  – Notebook PC
  – Desktop PC
Thank You!

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