SSDs Enable New Growth In Enterprise Storage

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Safe Harbor Statement

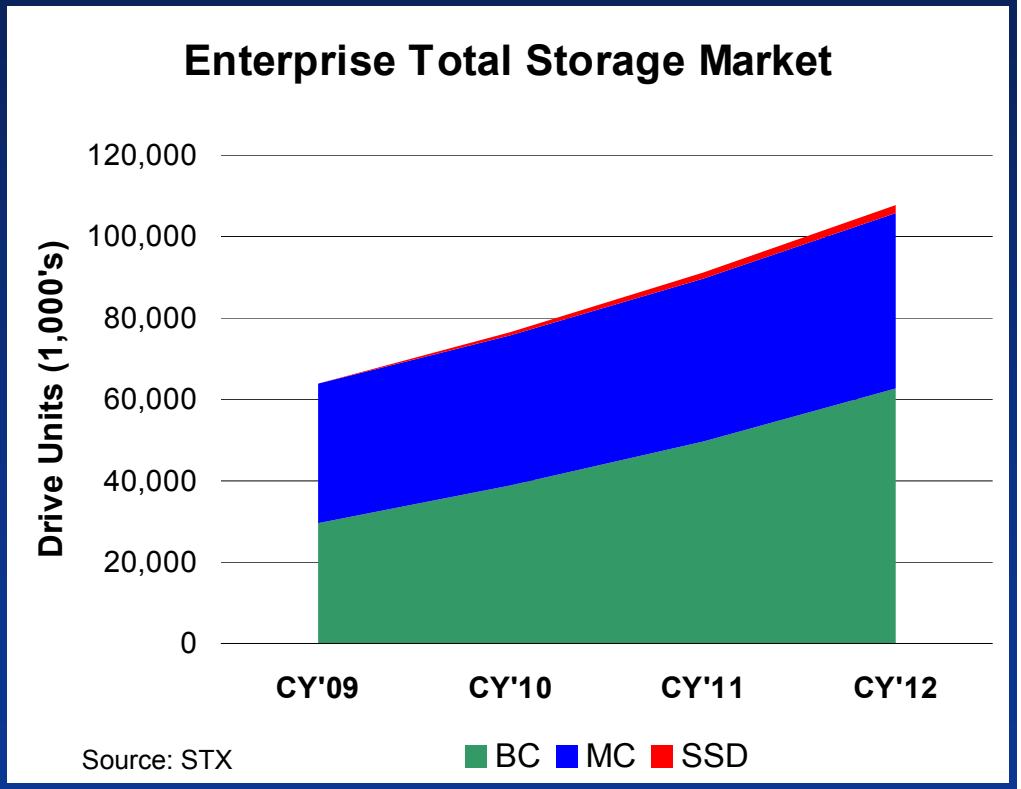
Today's presentation may include predictions, estimates or other information that might be considered forward-looking. While these forward-looking statements represent our current judgment on what the future holds, they are subject to risks and uncertainties that could cause actual results to differ materially. Throughout today's discussion, we will attempt to present some important factors relating to our business that may affect our predictions. Please review our current SEC filings for a more complete discussion of our risk factors.

Technology Introductions Create Growth

Solid state drives offer a growth opportunity to expand the overall storage market by creating a new tier of performance

Historical examples of new technology introductions which created an expanded storage market:

- **SAN / NAS**
- **Business Critical Drives**



Enterprise Use Case

Why People Want to Use SSD in Enterprise:

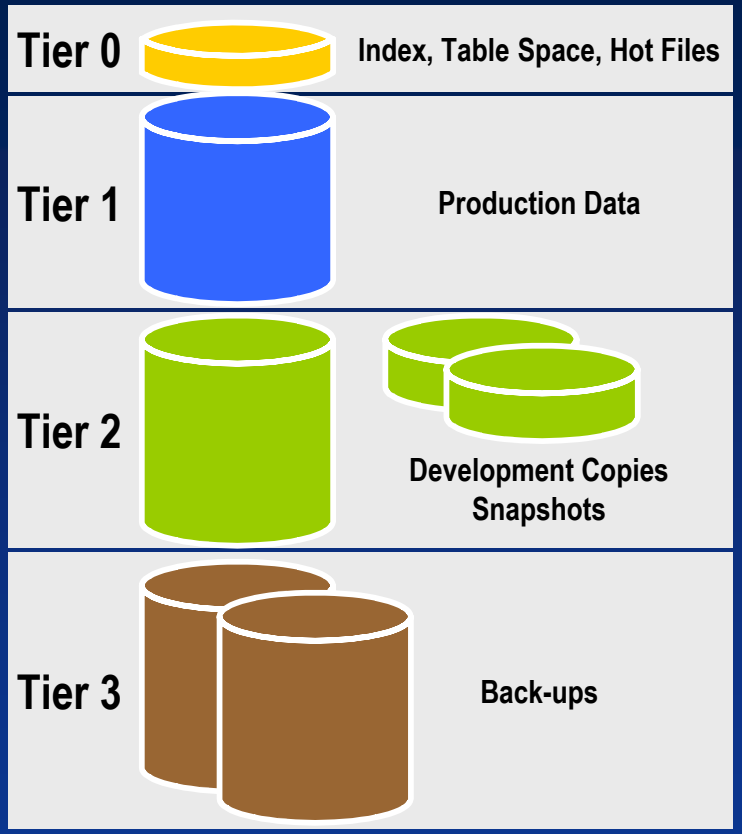
- Performance
  - Excellent IO throughput
  - Improved media latencies
- Lower system level power
- Reduced Data Center footprint

What's stopping them:

- Price
- Endurance
- Data Retention

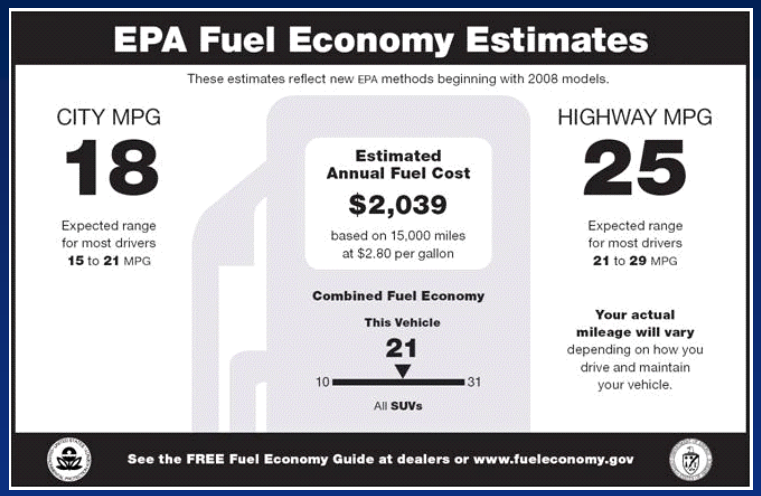
Significant industry work is needed to enable growth of SSD beyond these early applications

OLTP Database Example



Other early applications include:
- High performance servers
- Video-on-demand
- Internet use cases

Performance



Current performance measurement metrics aren't effective for SSDs

New performance measurements metrics are needed for increased clarity

Enterprise use cases are represented by very complex workloads:

- **Multiple compute platforms accessing shared storage**
- **Concurrent, multiple threads**
- **Multiple transfer sizes**
- **Queue depths vary as workloads increase / decrease**
- **Effects of RAID bindings**

Vendor claims of IOP performance at 512 byte transfers, at queue depths of 64, in a single dimension, and on a virgin drive is not a relevant data point for the enterprise.

Endurance

Reasonable endurance description exists at the media level

- SLC = 100,000 program/erase cycles
- MLC = 10,000 program/erase cycles

Industry void of good ways to describe SSD device-level endurance and data retention characteristics

Example from the tire industry… Tire Tread Rating:

- A rating of 100 for passenger tires translates to a 30,000 miles expected tread life
- A rating of 200 would translate to a 2X expected tread life

Reliability

"Fast is fine, but accuracy is everything."
- Wyatt Earp

Protecting Your Data: **The enterprise storage industry moves intentionally, to ensure enterprise data is well protected from corruption and intrusion.**

Enterprise data integrity

- **PI (Protection Info., T10 DIF)**
- **IOEDC/IOECC**
- **NAND specific integrity features**
  - Wear leveling
  - Read disturb mitigation
  - Metadata redundancy
  - Write efficiencies

Security / Encryption

- Full disk encryption (TCG Standards)
- FIPS certification (Gov't certification)
- Interoperability w/ key mgmt infrastructure
- Security/encryption w/ no perf. loss
- Cost effective secure-erase methods

Executive Summary / Call to Action

SSDs offer a growth opportunity, expanding the overall storage market by creating a new tier of performance.

Seagate is leading standards activities for SSD and HDD

Call to Action:

- **Deliver Industry standards for SSD data performance, endurance and reliability**

- **The JEDEC JC64.8 subcommittee, co-chaired by Seagate and Micron , has been formed to develop standards for Solid State Drives in cooperation with other subcommittees as well as with external standards organizations**

  => Industry stakeholders are encouraged to join the effort

Thank You!

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