

# The Need for Standardization in the Enterprise SSD Product Segment

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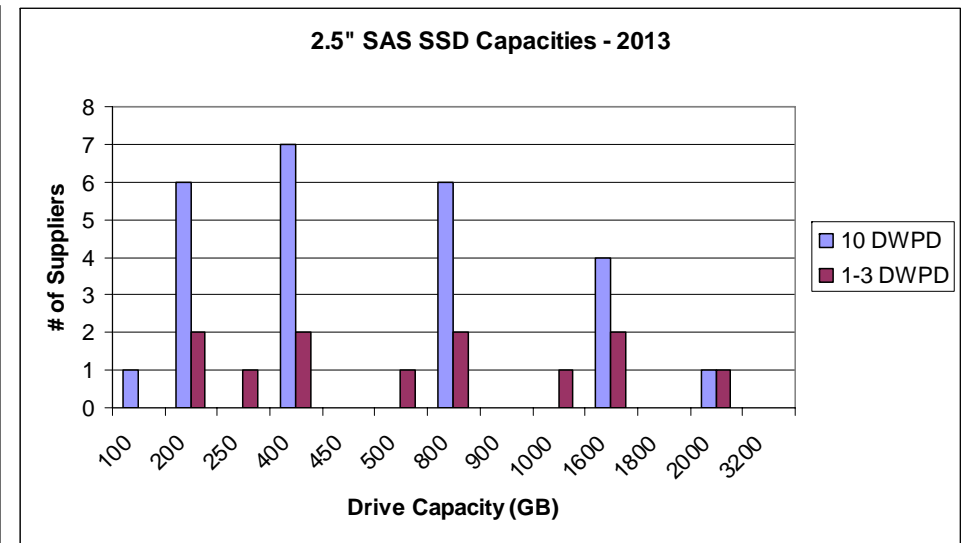
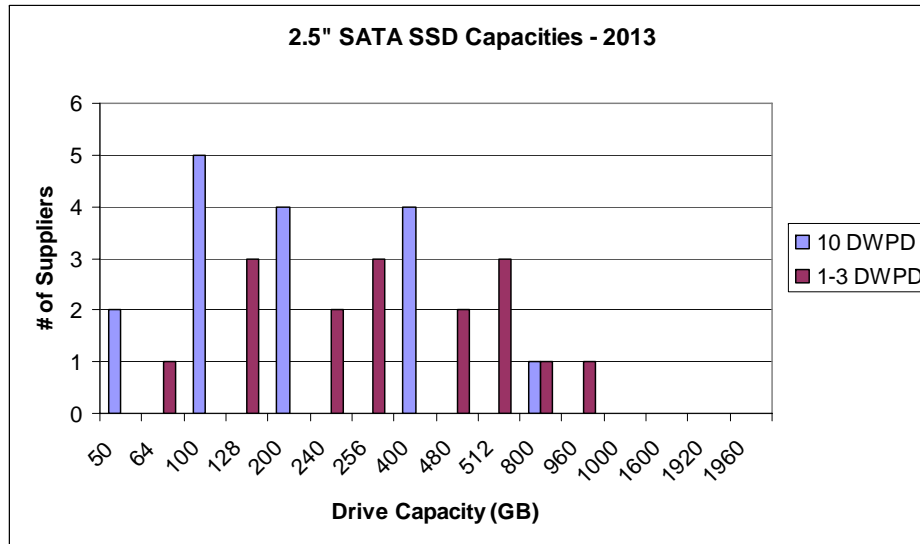
IBM Corporation

# The Need for Standardization in the Enterprise SSD Product Segment

## Agenda

- Capacity Points
- Performance
- Write Endurance
- Power Design
- Thermal Characteristics
- Flash Technology Support
- Summary

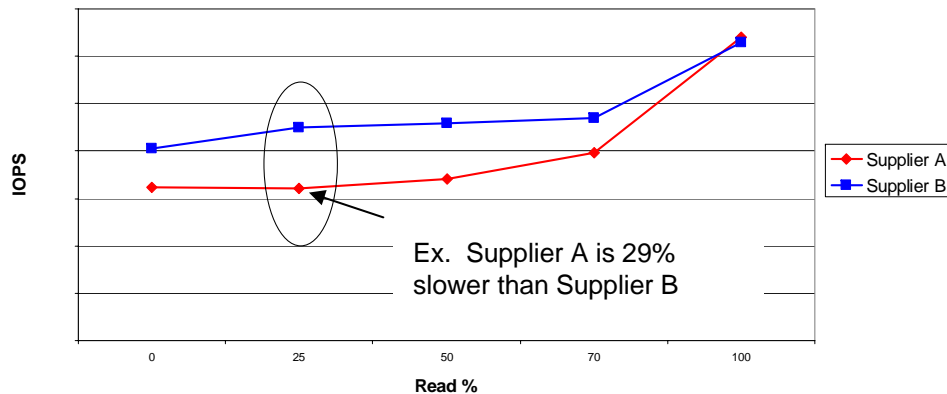
## 2.5" SSD Capacity Variation\*



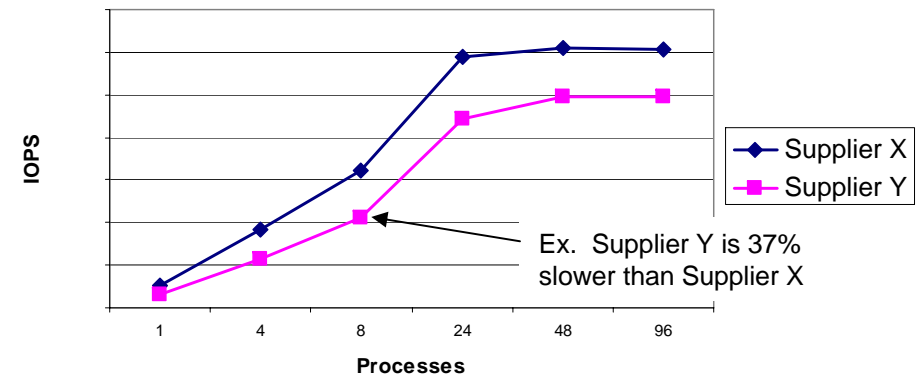
- Significant variation in capacity points across supplier SSD offerings
- Increasing the no. of suppliers for a common capacity point has various benefits
  - Improved viability for multiple sources and resulting supply stability
  - Service replacement parts availability over longer timeframe
  - Mixed drive capacities are a problem with some RAID arrays
- **Recommendation:** Industry should strive for common capacity offerings
  - Ex. 2.5" 10 DWPD - N+1 Generation = 2N, Capacity of next generation is doubled

# SSD Performance Variation

4k Random Read/Write  
Bench Performance



Drive Performance vs process threads  
(System Data)



- It is desirable to have multiple sources for a given drive design point
- End customers should not see noticeable performance differences between sources
- While we recognize the need for suppliers to get the max performance their architecture allows, the lack of consistency across suppliers is a serious limitation for clients seeking multiple sources
- **Recommendation:**
  - Enable future designs with tunable performance capabilities where possible
  - Suppliers w/this capability would have a significant advantage enabling improved consistency

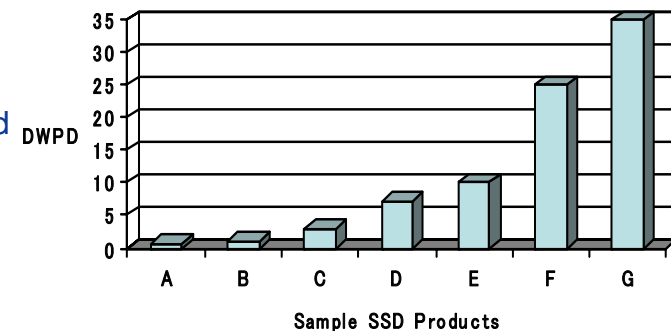
# Write Endurance Standardization

Write Endurance: Number of P/E cycles that can be applied to an area of Flash memory before the NAND is deemed unreliable

Example of SSD industry write endurance product capability in DWPD (drive writes per day):

Multiple levels of write endurance offered across industry

- Some standardization ~10 DWPD for Enterprise
- Different write endurance levels drive different price points and varying levels of SSD lifespan
- Write endurance specifications also vary with supplier – making it difficult to understand true endurance capability



Write endurance variability is a challenge for Server OEMs to provide consistent SSD offerings

- Customers want consistency in the number of years of SSD lifespan for a particular category of product
- OEMs need to provide service replacement parts over a several year period
- Ability to qualify an alternate source to protect revenue shipments against a supply or quality disruption

**Recommendation:** Establish write endurance “segments” for future SSD products

Potential segments could be 10, 3, and sub 1 DWPD

Endurance of largest capacity may be limited by the max write bandwidth capability of the SSD

# Power Considerations for SSD Designs

## Background:

- Servers typically support a specific power envelope (current, watts) for storage device slots
- Industry Enterprise SFF HDDs have conformed to a 9w (or less) power requirement. SFF SSDs are often populated in the same slots as HDDs and must also conform on power

## Future SSD Design Considerations:

- Existing server install base will continue to attach SSDs with the 9w envelope. Suppliers should have the ability to “cap” power / current to achieve that requirement. \*\*
- Maximum currents across supported voltages (i.e. 5V, 12V) are also important to maintain. There is an opportunity for enhanced SSD performance with higher power. Standardizing on a new power envelope will enable future server designs to take advantage of optimum SSD performance.

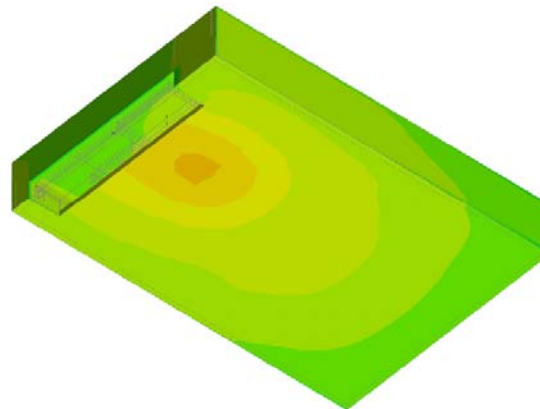
**Recommendation:** Power is another key attribute which requires standardization across the Enterprise SSD industry

- Suggest a higher level power tier for SSDs (12W?)
- Ability to achieve 9W power envelope will remain a key requirement

\*\* NOTE: When “capping” power to a lower level, it is expected there may be an associated impact on performance

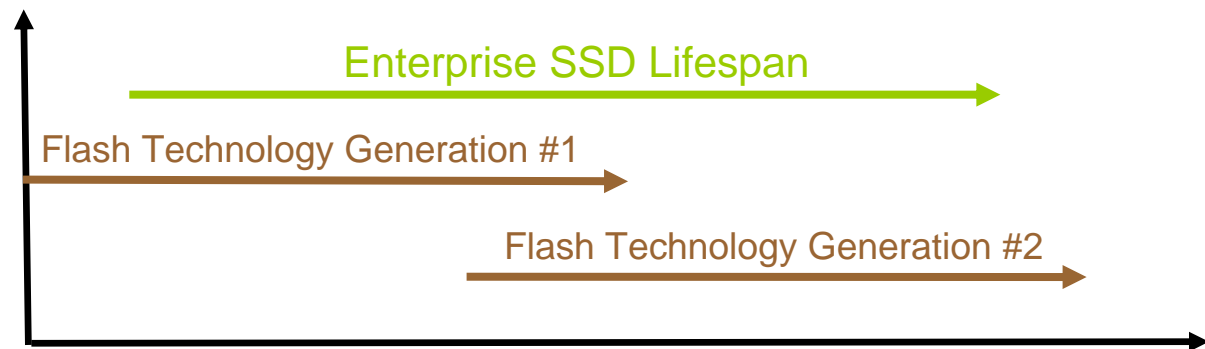
## Thermal Characteristics

- Flash memory reliability has dominant impact on overall SSD reliability
- Improved thermal management is necessary for enterprise SSD designs to achieve lifespan required by clients (e.g., 5 years)
- Typical 70°C Flash device usage temperature specification not practical for enterprise SSD design points
  - Data shows Flash intrinsic failure rate approx. doubles with each 10°C rise in Flash case temperature
- Industry should drive to reduced 50°C Flash case temperature maximum for enterprise SSDs in nominal environments to manage intrinsic reliability
- Better thermal dissipation and thermal sensors locations targeted to worst case temperatures within designs required
- Dynamic thermal throttling may also be required to manage thermal extremes



## Flash Technology Support

- Enterprise clients typically require product support for 5-7 years
- OEMs are unable to qualify new SSD technologies from multiple sources every 18-24 months
- Most enterprise SSDs designed to support only one Flash technology / supplier combination
- OEMs must demand that multiple Flash technology generations be supported for any enterprise SSD product design
  - Improved cost takedown, time to market and qualification cost management
  - Reducing generational SSD design changes will lower risk and improve quality
- Requires forward-looking mindset for SSD controller hardware and firmware designs
- Enhanced interlock between SSD controller design and future Flash technologies is also key





# The Need for Standardization in the Enterprise SSD Product Segment

## Summary

- Enterprise SSD demand growth and potential impact to system revenue have driven increasing need for extended lifespan and multiple sourcing
- Large variation across critical Enterprise SSD parametrics has limited capabilities for improved supply flexibility and risk mitigation
- Significant standardization opportunity areas exist to extend SSD lifespan and facilitate multiple sourcing
  - Capacity
  - Performance
  - Endurance
  - Power Consumption
  - Thermal Characteristics
  - Flash Technology Support
- Product standardization can substantially benefit Server and Storage OEMs, leading to delivery of higher quality SSDs to end customers

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*Thank You!*

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