Selecting the Right Enterprise SSD

Part I – Overview

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SSD Selection Criteria

- Primary or caching storage
- Performance
- Endurance (P/E cycles)
- Capacity
- Cost
- Power
- Thermal
- Security
- Warranty / Quality / Reputation
- Interface
- Form factor (shape / size)

Selection Criteria:

Primary or Caching Storage

	Primary Storage	Caching Storage
Description	Data held across power cycles	Data held temporarily to accelerate CPU access to more frequently requested data from longer term storage
Capacity required	Laptop: All user data must fit Desktop: Boot OS must fit	Larger size ≈ more acceleration
Persistence	Yes, even w/o power	Only with power
Compatibility	Universal to all systems	OS or app knowledge required

Selection Criteria:

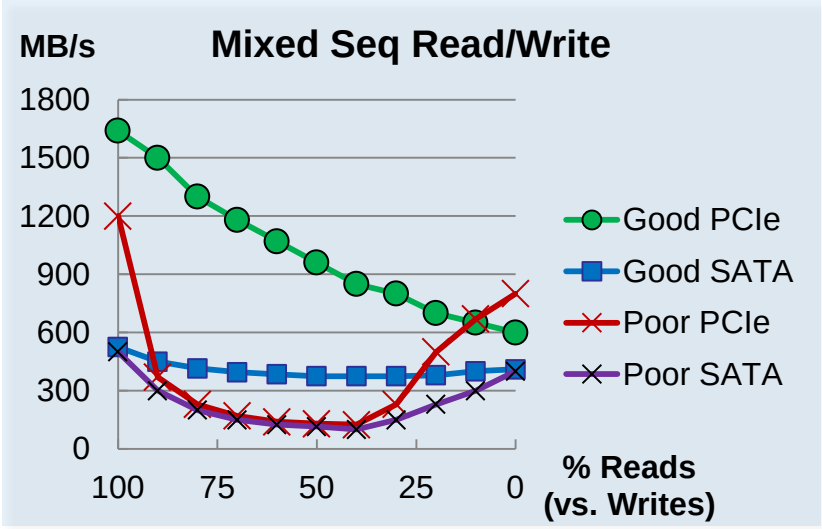
Performance

Identify application requirements:

- Minimum sequential MB/s
- Minimum random IOPS
- Maximum latency (ms)

Understand true performance

- Look for mixed reads/writes and mixed random/sequential measurements
- Avoid the bathtub curve



Example data for illustration

Selection Criteria:

Endurance (P/E Cycles)

- Flash has a limited number of program/erase cycles
  - Data reduction technologies (like LSI DuraWrite™) can mitigate this
- Manufacturers spec how many times you can write the full capacity of the drive in a day
- Ensure the expected writes per day are within the requirements
  - Or accept the SSD will wear out before the warranty period

Selection Criteria:

Capacity

- Higher capacity offers longer endurance for the same amount of data written

256GB * 3K
= 768TB written

128GB * 3K
= 384TB written

Physical Capacity * Flash P/E Cycles = Total Writable Bytes

- Single drive bay systems should get the highest capacity available that meets the selection criteria

- Multiple bay systems can keep hot/critical/boot data on the SSD and cold data on the HDD

Small amount of hot data

Large amount of cold data

Selection Criteria:

Cost

- HW cost primarily driven by the flash memory
  - Bits per cell (TLC < MLC < SLC)
  - Geometry (16nm < 20nm < 24nm, etc.)
  - Quantity of flash (capacity)
- Other HW costs (like FPGA vs custom ASICs)
- SW cost (if applicable) based on capability
  - Virtualization
  - Host caching management
  - Etc.

Selection Criteria:

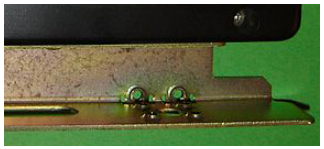
Power

- Higher performance often equates to higher power draw
  - Data reduction technologies can mitigate this
- Multi-drive configurations must account for maximum potential draw from all drives
- DevSleep now enables some SSDs to get to SUPER low power when idle

Selection Criteria:

Thermal

- Enclosed SSDs (cases) generally designed for minimal airflow
- Open designs expect some flow
  - Smaller boards have less natural heat dissipation
- Client OEM systems account for heat dissipation with airflow or through mounting brackets or thermal transfer materials
- High-density custom configurations must consider air flow



Viking Technology

Selection Criteria:

Security

A few options available if necessary

- BIOS level ATA Security (client oriented)
- Self-encrypting drives (SED)
  - AES-256
  - AES-128
- Trusted Computing Group (TCG) standards
  - TCG Enterprise
  - TCG Opal (client)
    - eDrive
- Federal Information Processing Standards (FIPS)
  - FIPS 140-2

Selection Criteria:

Warranty / Quality / Reputation

- Warranty varies by SSD manufacturer
  - Ranges typically between 3-5 years
- Quality and reputation is hard to measure in early markets, but it is none the less important

Selection Criteria:

Interface

- Options include:
  - SATA, PCIe, SAS, USB, other
- Is the interface already set and cannot be changed?
- Will the interface support the performance?
- Will the interface support the form factor?

Common SSD Interfaces

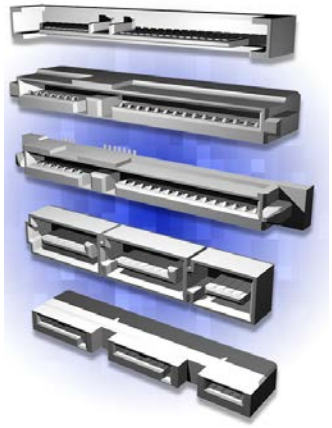

SATA (& SAS)


PCIe card


USB

Example Connector Variations


M.2
(PCIe and SATA)


SATA Express
(PCIe and SATA)

Selection Criteria:

Form Factor (Shape / Size)

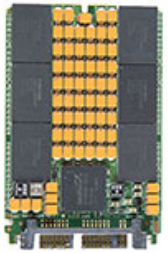
- HDD shapes were based on the rotating platter(s) and head stack assembly

- Primary SSD components are the flash chips; orientation of these chips is virtually unlimited

- Initial SSD market expansion was mainly using the HDD form factor

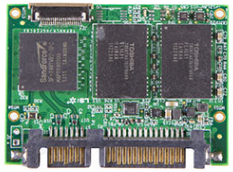
Selection Criteria:

Form Factors (examples)



1.8” 2.5”
Standard HDD form factors

SFF-8223



MO-297

MO-300 Custom
mSATA

Apple custom connectors
2010-2012 (SATA), 2013 (PCIe)

PCIe card

USB

Custom configurations

M.2 (22x80) (PCIe and SATA)

SSD Selection Overview – Key Takeaways

- Selection criteria is more than just performance
- Prioritize the criteria in case of conflicting combinations, e.g., power budget over capacity
- SSD form factors are not limited like HDDs

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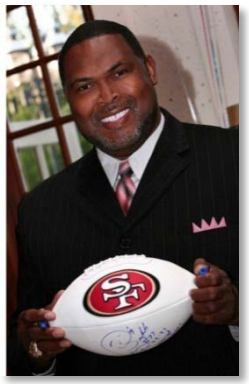

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