Solid State Storage Performance

SNIA Standardization Efforts

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Definitions

- **Solid State Storage (SSS)**
  A nonvolatile storage medium that employs integrated circuits (RAM or flash memory) rather than rotating magnetic or optical media. It generally offers very high access performance compared to that of rotating magnetic disks, because it eliminates mechanical seek and rotation time. It includes all form factors, interfaces, and technologies, including flash and RAM SSDs.

- **Solid State Drive (SSD)**
  A subset of SSS which uses the same interfaces and form factor as hard disk drives (HDDs)

These slides are about NAND flash SSS (including SSDs)

State of SSS Performance

- One of its biggest advantages
  - However, not fully understood
- SSS has different performance characteristics than spinning media
- Diverse and rapidly evolving core technologies and architectures
- Many new players in the market
- Challenging to compare performance between products from different vendors

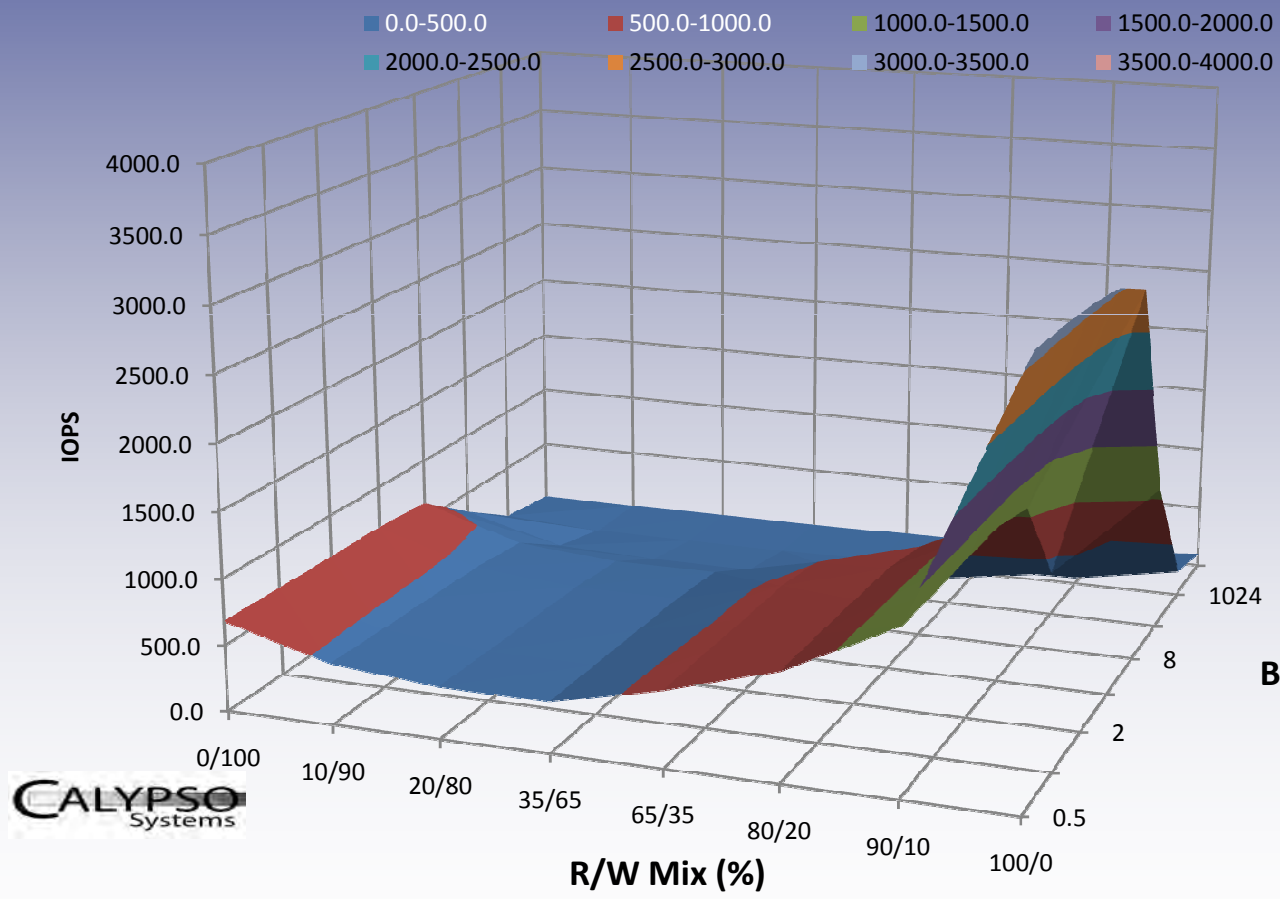
SSS Performance Issues & Challenges

- SSS Performance behaviors are quite different than HDDs
  - Reads are much faster than Writes
  - SSS device manages its own storage
    - Maintains virtual/physical LBA mapping
    - Does wear leveling and background garbage collection
    - Has reserve capacity, used by the SSS controller, not visible to OS/User
  - Performance changes with use
    - Preconditioning can have a big impact on performance
- Needs to be characterized differently

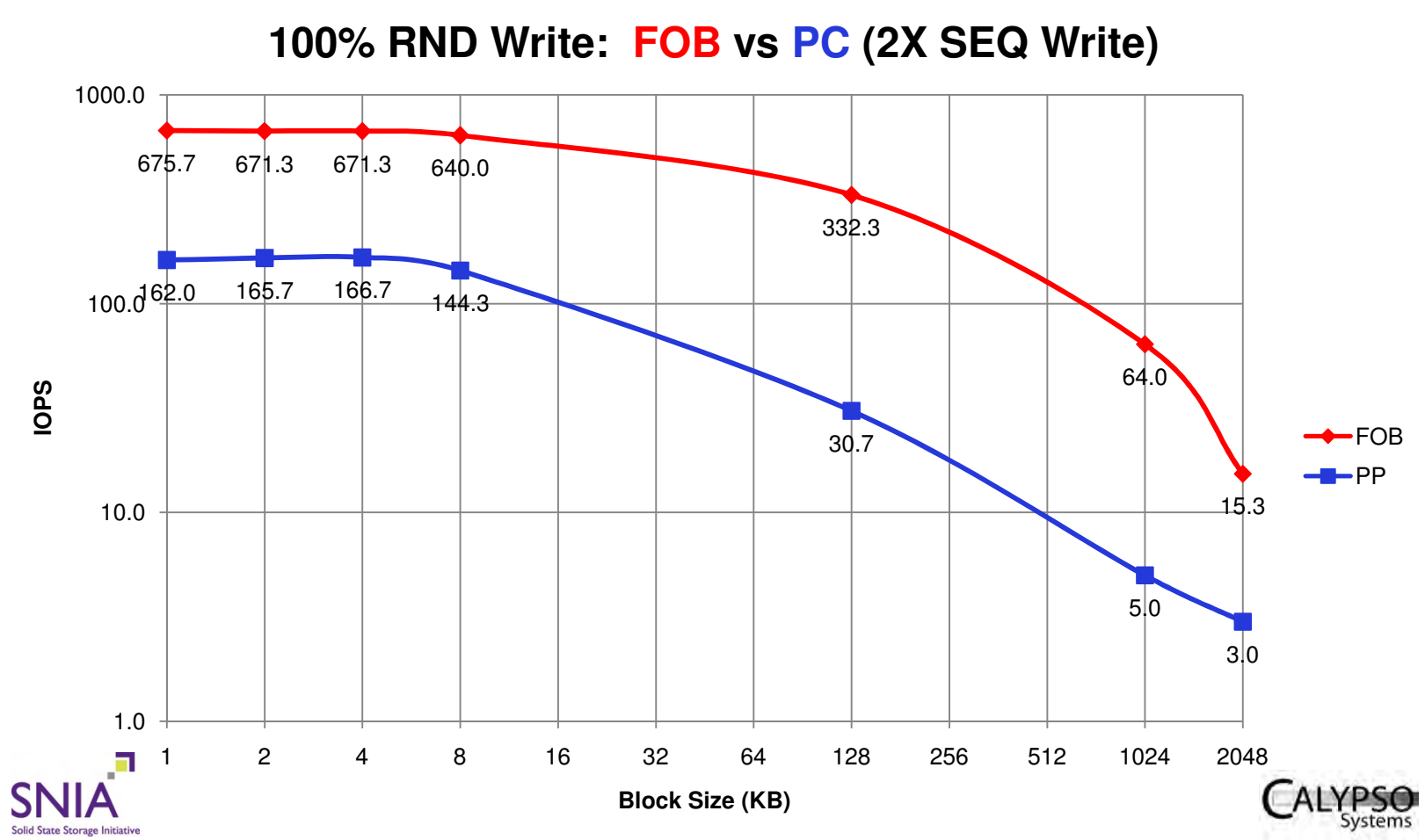
Challenges in Reporting SSS Performance

- Substantial performance variation for different parameters (e.g. Block size, R/W mix)
  - Example in following slide
- Performance variation with use
  - Example in following slide
- No standards on how to report performance
  - Metrics, methodology and state of device under test

Effect of parameters onperformance



Effect of preconditioning on performance



Need for SSS Performance Std

- What is needed:
  - Consistent metrics, parameters and methodology to quantify SSS performance
  - Methodology should specify a standard for preconditioning the SSS
  - Reference platform (common hardware/software environment)
- Benefits:
  - Allow fair comparisons between products
  - Help users select the appropriate SSS for their environment that meets their needs

Standardizing SSS Performance

What should be measured?

- IOPS?
- Latency?
- Throughput/bandwidth?
- Something else?

Standardizing SSS Performance …

- SNIA SSS Technical Working Group (TWG) is working on addressing this need
  - Developing a standard performance test suite
  - First spec targeted to be released 4Q09
  - Current focus:
    - Standardizing metrics and parameters
    - Standardizing methodology including preconditioning
  - Validation will be done by testing actual products to confirm the measurability and usefulness of each metric.

Conclusions

- SSS performance characterization has been challenging
- SNIA SSS TWG is working on defining a spec for SSS performance that is:
  - Consistent
  - Repeatable
  - Allows fair comparison between products

For participation and/or more information go to

www.snia.org/sssi

Thank you!

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