ENERGY STAR

Data Center Storage Test Procedure Workshop

October 15, 2009
Phoenix, AZ

Objectives, Assumptions and Considerations

Objectives

- To create an objective test that will create an Energy Star standard for storage systems

Assumptions

- An idle system state is unreal, and therefore is irrelevant

- An Energy Star rating should look at those systems designed to perform under a multitude of workloads

- Currently, only larger enterprises are in a position of making energy efficient decisions that have a material and significant enough impact

Considerations

- Do not wish to just measure power consumption of disk drives

- Allow vendors the ability to optimize their systems for the benchmark

- Relevance needs to be created for mid-market as well

- While features and functions can also be a measure of "green-ness", this measure becomes very subjective

Other Considerations

Separate measures using a weighted points system could also augment performance and capacity based tests.

- However, this can become highly subjective

- Vendors will view features differently – some will look at one feature as a standard, while others may consider it a premium feature. Others still may specialize in one or more of these features giving them a particular advantage
  - This can lead to vendors not desiring to participate in the program
  - Or, it can generate a lack of confidence
  - Features that may be considered here include:
    - Thin Provisioning
    - Leveraging Cloud Services
    - Primary storage de-duplication
    - Disk spin down
    - The use of SSDs/EFDs

Establish an arbitrarily high I/O and bandwidth specification to meet

- **100,000 IOPS** (combined and sustained) under a 100% random load of 80:20 read:write ratio across 4 Windows hosts running Windows Server 2003 as measured by Iometer – A suggested name for this metric might be something like: The Enterprise Transactional Index

- **15 GB/s** (combined and sustained) under a 100% sequential load of 100% read across 4 Windows hosts running Windows Server 2003 as measured by Iometer – A suggested name for this metric might be something like: The Enterprise Streaming Index

- **xx IOPS** (combined and sustained) under a 50:50 sequential:random load of 50:50 read:write ratio across 4 Windows hosts running Windows Server 2003 as measured by Iometer – A suggested name for this metric might be something like: The Enterprise Analysis Index

- The storage system should be configured to provide **150TB**[1] of useable capacity formatted for Windows Server 2003 , with at least **90%**[3] of the drives used being HDD's

Vendors should submit their best configuration to meet the above specifications

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[1] 150TB used since this is the rough average of TB/unit based on IDC's 2Q'09 Disk Tracker for PB 8 ($500k-$749.99k)

[3] The 10% limit on SSD's or EFD's is to ensure that the results are not artificially skewed. There is no requirement to use SSD's or EFD's, however, there *is* a requirement to use HDD's (no definition or guidance with respect to the speed or size of HDD's should be given)

Proposed Tests – Mid Market

Establish an arbitrarily high I/O and bandwidth specification to meet

- **20,000 IOPS** (combined and sustained) under a random load of 80:20 read:write ratio across 4 Windows hosts running Windows Server 2003 as measured by Iometer – A suggested name for this metric might be something like: The Modular Transactional Index

- **4 GB/s** (combined and sustained) under a sequential load of 100% read across 4 Windows hosts running Windows Server 2003 as measured by Iometer – A suggested name for this metric might be something like: The Modular Streaming Index

- **xx IOPS** (combined and sustained) under a 50:50 sequential:random load of 50:50 read:write ratio across 4 Windows hosts running Windows Server 2003 as measured by Iometer – A suggested name for this metric might be something like: The Modular Analysis Index

- The storage system should be configured to provide **10TB**[2] of useable capacity formatted for Windows Server 2003

Vendors should submit their best configuration to meet the above specifications

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[2] 10TB used since this is the rough average of TB/unit based on IDC's 2Q'09 Disk Tracker for PB 4 ($15k-$49.99k)

Measuring the Storage System

For each of the three tests proposed, the power consumption of the storage system would be measured.

A factor of **yy** would be applied to each Index to gain a measure of both power and cooling.

Each Index is then comparable against each other.

For Energy Star purposes, each Index would be equally rated, and then combined to form an overall Energy Star Index.

Those systems that exhibit an Energy Star Index of **zz** (and it could be a range) would be classified as being Energy Star compliant and receive the honors and privileges associated with the compliance and rating.

Comparing Storage Systems

The Energy Star rating should act as a market enabling symbol

Therefore, while the results are comparable quantitatively, they also serve to act as a relative measure, rather than an absolute one.

To become a market enabler, the Energy Star symbol should distinguish Energy Star compliant products from those that are not; however, prices, solution packaging, service, etc. should ultimately be the market forces around which end-users will make their final decision.

Backup Slides

Some Software Tests

Suggested Software: Iometer

- Why?
    - It is already a commonly used barometer in most storage vendor's R&D and engineering labs, so it is pervasive.
    - It is a generally accepted barometer of performance by the storage community.
    - It's simple to use and free!

Other software available:

- Windows
    - Winbench/Serverbench (Ziff Davis)
        - This is a commercial product. Although free, it is focused more on single server or desktop PCs than storage.

- UNIX/Linux
    - bonnie (open source)
        - *bonnie* is a great testing tool, however, it is very complex to use and has too many parameters, creating too many opportunities for vendors to question why certain parameters are being used.