EPA - Energy Star
Overview of Energy Star for Storage
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Agenda

- What is Energy Star for Datacenter Storage
- Where Energy Star affects Storage
- Where Energy Star affects Server
- Where Energy will affect NETWORK equipment
- What others have done (that works)
- Latest update for storage (from meeting with EPA)
- A closer look on storage
  - Entry Conditions to get energy Star (update)
  - How to Certify-Qualify a storage system (update)
  - Energy Star decision process (update)
- World Wide influence of Energy Star
- Conversation and personal experience
What is Energy Star for Datacenter Storage

ENERGY STAR is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy helping us all save money and protect the environment through energy efficient products and practices.

http://www.energystar.gov/index.cfm?c=about.ab_index

For Datacenter Storage is a program in flux (about to be released)

http://www.energystar.gov/index.cfm?c=new_specs.enterprise_storage

Compliance with Energy Star™ represents the ability to remain and compete on markets highly regulated by governments. In some cases this compliance is NOT voluntary as it normally is in the USA.
Where Energy Star affects Storage

The Importance of an Energy Star for Storage products represents the ability to be able to maintain a presence on key markets; some examples are:

- **Government at all levels**
  - Federal
  - State
  - Local

- **Health care systems**
  - Hospitals
  - Clinics
  - Medical offices
  - Laboratories

- **Education and research facilities**
  - Universities
  - Meteorological systems

- **Tax Incentives**
  - Data Centers with the Energy Star certification may get up to a 30% on incentives
  - For a data center to be Energy Star ALL its equipment MUST be Energy Star qualified

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**SNIA Focus Taxonomies**

<table>
<thead>
<tr>
<th></th>
<th>Online 2 (OL2)</th>
<th>Online 3 (OL3)</th>
<th>Online 4 (OL4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small drive count</td>
<td>Medium drive count</td>
<td>Medium to large drive count</td>
<td></td>
</tr>
<tr>
<td>Entry level systems</td>
<td>Mid range systems</td>
<td>Mid range to large systems</td>
<td></td>
</tr>
<tr>
<td>For EPA NO JBODs</td>
<td>No JBODs</td>
<td>Non large Enterprise</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RAS is considered</td>
<td>RAS is a must</td>
<td></td>
</tr>
</tbody>
</table>

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Energy Star qualification will be fully based on SNIA Emerald Program

Emerald web site is [http://www.snia.org/emerald](http://www.snia.org/emerald)
Where Energy Star affects Server

- Mainly Servers that fall under the definition of sockets
  - Lead by SPEC
  - Use the sert tool [http://www.spec.org/sert/](http://www.spec.org/sert/)
  - Recently the introduction of resilient servers

- It remains a huge data gathering effort:
  - Learn where the thresholds should be set

- On version 1 of energy start it was mainly an IDLE (definition according to SPEC) measurement

- On version 2 some performance has been introduced.

- Still the biggest challenge remains on how to cover the bigger servers.

- Server definition can be found here

- Percentage market affected
  - Confirmed 30% (current market sales)
  - Expected a minimum of 50% and a maximum of 90% by end of 2016 (this information is based on possible government regulation and incentives, in the case the regulation and incentives aren’t present then the market will dictate the percentage)
Where Energy Star affects Networks??????

Don’t Know?

Feel LOST?

One simple fact: THE EPA WILL ASK FOR YOUR GUIDANCE

If not you will get the SHRECK benchmark

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What others have done (that works)

- Agree to a way to divide the type of equipment
  - Servers ➔ Number of processors
  - Storage ➔ Taxonomy
  - For both (servers and storage)
    • Family (EPA prefers the term family)

- Look to first go for a minimal common denominator
  - Attack what is known that can have immediate positive look from the EPA
    • Power supplies is a good start
  - Eliminate from the proposal the most complex systems

- What defines “work” on your hardware (no, not the Nm or Joule … but close)
  - Servers ➔ MIPS
  - Storage ➔ (IOPS and MBPS)
  - Basically what causes your equipment to consume those precious watts (and watt-hour) of electric energy in the data center
    • And cause BTUs

- From the previous, can you define a specific metric to use that makes sense?
Latest update for storage (from meeting with EPA on 4/1)

- **Based on EPA information, target launch date for E* is end of July 2013**
- Data submission will be by end of October 2013
- Energy Star label will be granted within 90 days of data submitted

<table>
<thead>
<tr>
<th>System Optimization</th>
<th>SNIA Emerald Power Efficiency Measurement Spec.</th>
<th>Metric</th>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimal Cache use</td>
<td>Hot Banding</td>
<td>Mixed</td>
<td>Show quality of caching system by increasing performance and reduction of power used</td>
</tr>
<tr>
<td>Transaction Optimized</td>
<td>1. Random Write  2. Random Read</td>
<td>IOPS/watt</td>
<td>To Maximize IOPS/watt</td>
</tr>
<tr>
<td>Streaming Optimized</td>
<td>1. Sequential Write 2. Sequential Read</td>
<td>MBPS/watt</td>
<td>To Maximize MBPS/watt</td>
</tr>
<tr>
<td>Idle Optimized</td>
<td>Idle Ready</td>
<td>GB/watt</td>
<td>Largest system a stakeholder can assemble to amortize controller overhead over many disks</td>
</tr>
</tbody>
</table>

Certification and Qualification Criteria:
- Each vendor can choose to submit their system as transaction optimized, streaming optimized, or both. This choice will determine which data is published and which data will determine the range of the product family for each line of products.
- How to certify on next charts
A closer look to storage based on Draft 4 from EPA

- The next 6 charts show how the EPA plan to evaluate the storage systems on version 1. This can change by the time the final spec is released. Target month is July 2013
## Entry Conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Online 2</th>
<th>Online 3</th>
<th>Online 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply 80+ Silver or better</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Power reporting (watts)</td>
<td>Optional</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Temperature Reporting</td>
<td>Optional</td>
<td>Optional</td>
<td>Optional</td>
</tr>
<tr>
<td>IOPS Reporting</td>
<td>Optional</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>MBPS Reporting</td>
<td>Optional</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>IOPS/watt Reporting</td>
<td>Optional</td>
<td>Optional</td>
<td>Optional</td>
</tr>
<tr>
<td>MBPS/watt Reporting</td>
<td>Optional</td>
<td>Optional</td>
<td>Optional</td>
</tr>
<tr>
<td>Available Capacity Optimization Methods (COMs)</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>User available software to collect data and/or API that grants access to the data</td>
<td>Yes if any of the options is available</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
How to Certify/Qualify (example) part 1

15 K RPM
146 GB
Drive

BFF = Best Foot Forward

Run COM Validation and collect data

BFF
24 Drives
24 Drives
24 Drives
24 Drives
24 Drives

BFF-20%
24 Drives
24 Drives
24 Drives
24 Drives
24 Drives

BFF + 5%
24 Drives
24 Drives
24 Drives
24 Drives
24 Drives

Run Emerald benchmark and collect data

24 Drives
How to Certify/Qualify (example) part 2

10 K RPM 300 GB Drive

BFF = Best Foot Forward

BFF-20%
24 Drives
24 Drives
24 Drives
24 Drives

BFF
24 Drives
24 Drives
24 Drives
24 Drives
24 Drives
24 Drives

BFF + 5%
24 Drives
24 Drives
24 Drives
24 Drives
24 Drives
24 Drives

Run Emerald benchmark and collect data
ALL THESE SYSTEMS CAN HAVE THE LOGO

E* Certified

24 Drives
24 Drives
24 Drives
24 Drives
24 Drives

From Part 1 Certified System

E* Qualified

24 Drives
24 Drives
24 Drives
24 Drives
24 Drives
24 Drives
24 Drives

No Benchmark or data needs to be sent to EPA

E* Certified

24 Drives
24 Drives
24 Drives
24 Drives
24 Drives
24 Drives
24 Drives
24 Drives

From Part 2 certified system
Energy Star process
(based on meeting with EPA on April 2, 2013)

- Contract signed with the EPA for the identified systems that will apply for Energy Star.
- Certifying Lab will validate that:
  1. Entry criteria on chart is met
  2. Run the benchmarks and verify results
  3. Generate the documentation for the CB (Certifying Body)
  4. Deliver the data to the CB and wait for the response from EPA
- Once EPA receives the data of the candidate systems will review the data with the CB and if it is to their satisfaction **EPA will grant an Energy Star.**
  - The CB will notify YOU the date that it can start using the logo
World Wide influence of Energy Star

- European Code of Conduct Commission
- Japan has started to implement centralized labs for industry certification in cooperation of SNIA/ASIA.
- Other Geographies like South Pacific have plans to be disclosed in a near future.
Conversation of personal experience
Questions and Answers
An example using storage raw power
An example using storage performance metrics

Performance Metrics

IOPS

Time on 12/20/2012
An example using storage ratios

This is what EPA wants to see for Energy Star
THANK YOU
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