ENERGY STAR
Version 1.0 Storage Program Overview

November 18, 2015
U.S. Environmental Protection Agency
EPA and SNIA

- Collaboration over last 5 – 6 years
- SNIA developed Emerald™ Specification
  - Test procedure adopted by EPA for ENERGY STAR Storage Version 1.0
  - Planned to continue for future Storage revisions
EPA and SNIA

• Current ENERGY STAR Storage specification result of years of discussions between EPA and SNIA

• How to use Emerald Specification in ENERGY STAR

• SNIA and its members have provided major contributions to the development of this specification.

• Feedback on drafts, hosting face-to-face talks, system test data, conference calls, training, and more.

• EPA looks forward to continuing to work with SNIA.
Data Center Storage – Version 1.0

• Version 1.0 finalized August 28, 2013 and became effective December 2, 2013
  – Covers Online 2-4 systems
    • <80ms response time, has RAID controller, 12 to hundreds of drives
  – Focuses on block I/O systems, but can test unified systems
    • Unified systems combine block I/O and file based I/O
    • Only tests block I/O performance and power
  – No levels set in Version 1.0, any product can certify within a certain range in system size (drive count) close to the product’s optimal performance point (in performance/watt).
  – Provisions included to handle mixed drive configurations, auto-tiering solutions, and pure SSD configurations.
  – Provisions also included to allow the updating of drives within a storage product within certain performance boundaries to limit the need for frequent retesting
Data Center Storage – Product Family Structure

- Test Point 40% smaller in device count than optimal point
- Optimal Test Point
- Test Point 15% larger in device count than optimal point
- Default Certified Range: -20% to +5%
- Expanded Certified Range: -40% to +15%
Data Center Storage – Version 1.0

• Binary Requirements:
  – Power supply efficiency requirements (minimum 80Plus Silver)
  – Minimum number of capacity optimizing methods (COMs) available in the product. COMs include:
    • Thin Provisioning, Data Deduplication, Compression, Data Snapshots
    – Adaptive active cooling (e.g. variable speed fans)
  • Emerald performance/watt test data collected for the following workloads:
    – Hot band, random read, random write, sequential read, sequential write, ready idle
  • Systems are optimized for one of three possible workload types
    – Transaction (IOPS/W), Streaming (MiBPS/W), Capacity (GB/W)
Current Storage Certified Product List

- 120 products certified
- 12 manufacturers represented

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<thead>
<tr>
<th>Online Category Breakdown</th>
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<tbody>
<tr>
<td>Online 2</td>
<td>26</td>
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<tr>
<td>Online 3</td>
<td>70</td>
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<tr>
<td>Online 4</td>
<td>24</td>
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<table>
<thead>
<tr>
<th>Workload Configuration Representation</th>
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<tr>
<td>Transaction</td>
<td>69</td>
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<tr>
<td>Streaming</td>
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<tr>
<td>Capacity</td>
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<table>
<thead>
<tr>
<th>Storage Type</th>
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<tbody>
<tr>
<td>Block I/O Only</td>
<td>94</td>
</tr>
<tr>
<td>Block I/O + NAS</td>
<td>26</td>
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References and Resources

• Certification Body Resources (including application form): www.energystar.gov/CBresources

• ENERGY STAR Data Center Storage specification revision: www.energystar.gov/NewSpecs

• Select “Data Center Storage”
Please send any additional comments to **storage@ energystar.gov** or contact:

<table>
<thead>
<tr>
<th>RJ Meyers</th>
<th>John Clinger</th>
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<tr>
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**ENERGY STAR is the simple choice for energy efficiency.**