



ENERGY STAR®

Version 2.0 Data Center Storage Stakeholder Meeting – San Jose, CA

U.S. Environmental Protection Agency
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Introductions

- Ryan Fogle – EPA, Data Center Storage Product Lead
- John Clinger – ICF
- Al Thomason – TBWC, LLC



EPA Goals for Today's Discussion

- Informally share proposed changes for the Draft 2 specification that address written stakeholder feedback received in response to the Draft 1 specification
 - Ideally build group consensus on path forward on these issues
- Discuss any remaining open issues from Draft 1
- Update on timeline for release of subsequent draft specifications



Agenda

- SNIA Taxonomy and Impact on Definitions and Scope
- Internal Power Supply Requirements
- Power Modeling Requirements
- Active Requirements for Transaction Optimized Systems
- Active Requirements for Streaming Optimized Systems
- Inlet Air Temperature Measurement Requirements
- Timeline



SNIA Taxonomy

- Industry proposes to align with SNIA definitions on the following:
 - Storage Taxonomy
 - Disk Set Online Storage
 - Disk Set Near-Online Storage
 - RVML Set Virtual Media Library
 - RVML Set Removable Media Library
 - NVSS Set Disk Access Online Storage
 - NVSS Set Memory Access Online Storage
- Proposal also removes obsolete definitions for Adjunct Storage Products and Interconnect Elements.



SNIA Taxonomy's Impact On Scope

- In scope:
 - Disk Set Online 2, 3, 4
 - NVSS Set Disk Access Online 2, 3, 4
- Out of scope:
 - Disk Set Near-Online
 - RVML Set Removable Media Library
 - RVML Set Virtual Media Library
 - NVSS Set Memory Access Online



Proposed Impact on Draft 2 Specification

- EPA is planning on harmonizing with the proposed SNIA taxonomy definitions.
- EPA is also planning to revise the scope section to align with the recommended from industry, which largely aligns with the existing scope in the Draft 1 but uses updated terminology.
- Aligning ENERGY STAR Version 2.0 with the taxonomy from SNIA Emerald Version 4 ensures continued clarity in product scope.



Internal Power Supply Requirements

- Stakeholders expressed that the 80Plus levels for 230V Redundant Power Supplies should apply to both single and multi-output power supplies. In Draft 1, the multi-output requirement references the 80Plus Gold 230V Non-Redundant level.
- EPA agrees with maintaining consistency between the two types of IPS output options and is proposing the following revised values in Draft 2.

Table 1: Efficiency Requirements for PSUs

Power Supply Type	Rated Output Power	20% Load	50% Load	100% Load
Multi-output (Ac-Dc)	All Output Levels	88%	92%	88%
Single-output (Ac-Dc)	All Output Levels	90%	94%	91%



Power Modeling Requirement

- EPA received feedback stating that this section was no longer relevant as certifications with modeled data are no longer allowed.
- EPA agrees that the current phrasing needs to be updated or removed in Draft 2.
- EPA would like to know if maintaining some sort of expectation for providing a customer with basic tools and/or information on how much energy their specific configuration will use is a reasonable requirement to apply to all certified storage products?



Active Requirements for Transaction Optimized Systems

- Stakeholders shared a concern that the Draft 1 approach for transaction systems is overly harsh to systems comprised of only 7.2k HDDs.
- It is expected that sales of 15k and 10k drives will shrink and that more systems will only be offered with SSD and 7.2k HDDs in the near future.
 - The Draft 1 approach forces 7.2k HDD testing if no 10k or 15k HDDs are offered as HDDs cannot be mixed with SSDs, meaning a system that could meet the requirements as it is may be typically shipped could not meet the requirements as the testing guidance in the specification requires.
- EPA is aware that hybrid systems using SSDs along with 7.2k HDDs can be very efficient for certain transaction workloads.



Active Requirements for Transaction Optimized Systems

- Rather than create separate levels for 7.2k, 10k and 15k HDDs as industry recommended, knowing that 10k and 15k systems are going to become less relevant in the life of Version 2, EPA is proposing the following instead:
 - The current level would be raised from 20 IOPS/watt to 28 IOPS/watt, continuing to eliminate any products using only 7.2k HDDs and number of 10k and 15k only HDD products as well.
 - Any transaction configuration would be allowed to test with SSDs for certification if desired. The ratio and number of HDDs to SSDs is selected by manufacturers to meet the optimal point criteria for that product family, **but** the SSD portion of the system cannot exceed X% of the addressable capacity of the product unless the product is only sold with SSDs.



Active Requirements for Transaction Optimized Systems

- Any configurations within the family shipped as ENERGY STAR would also have to meet the requirement of 28 IOPS/watt.
- Proposed approach targets systems that EPA wants to highlight as efficient on the market
 - Primarily HDD/SDD hybrid and full SSD transaction products
 - The most efficient 10k and/or 15k HDD only based systems would still be able to certify



Active Requirements for Transaction Optimized Systems

- Pros:
 - Simpler product family
 - Fewer tests and requirements to meet and track
 - QPX and QPL submissions would also be much shorter
 - Tested configurations more closely resemble real life deployments
 - Resulting test data more useful for Version 3 and for customers
- Cons:
 - Manufacturer would have to determine optimal point as well as configurations in the family where IOPS/watt drop off so much so that they cannot be included in the family
 - Greater use of SSDs in transaction testing could raise hardware cost for some tested configurations slightly



Active Requirements for Transaction Optimized Systems

- EPA would like to discuss what the appropriate maximum percentage of SSDs should be allowed in a hybrid test configuration. This maximum would not apply to products tested with only of SSDs.



Active Requirements for Streaming Optimized Systems

- EPA also received feedback stating that the 7.2k HDDs have a very hard time meeting the streaming levels in Draft 1
- EPA has reviewed the details of the feedback and is proposing to only focus on the data available for 7.2k HDDs for level setting of streaming optimized products in Draft 2
 - EPA recognizes that the 10k and 15k submissions are not relevant as they would likely not be purchased by actual customers, so they artificially increased the requirements in Draft 1
 - 7.2k HDDs are a traditional solution for streaming workloads and EPA has no desire to force a greater number of higher performance storage devices to address a given capacity that is not as performance dependent by its nature



Active Requirements for Streaming Optimized Systems

- As such, EPA is proposing to retain the Draft 1 streaming level structure but lower the requirements to 2.3 MiBS/watt for sequential read and 1.5 MiBS/watt for sequential write.

Table 3: Active State Requirements for Block I/O Storage Products

Workload Type	Specific Workload Test	Minimum Performance/Watt Ratio	Applicable Units of Ratio
Transaction	Hot Band	28.0	IOPS/watt
Streaming	Sequential Read	2.3	MiBS/watt
Streaming	Sequential Write	1.5	MiBS/watt

- EPA feels the resulting change would provide sufficient consumer choice in streaming optimized products relying on 7.2k HDDs, but still offer meaningful differentiation across the workload type for real world configurations.



Inlet Air Temperature Requirements

- EPA thanks stakeholders for alerting us to the remaining “optional” language still present in Draft 1 regarding this requirement and will remove it in Draft 2.
- EPA agrees with industry’s proposal that the inlet air temperature should only be required to be reported by the controller chassis in Version 2.0 and will present it in Draft 2.



Timeline and Next Steps

- EPA expects Draft 2 will likely release in February
- EPA expects the final specification to be published no later than Q2 of 2020 with an effective date nine months after finalization



Any Final Questions?



Thank You!

- Questions on specification development:

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