What has Changed?

SNIA Emerald™ Power Efficiency Measurement Specification V3.0.2 to V3.0.3

SNIA Emerald™

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About the SNIA

The Storage Networking Industry Association is a not-for-profit global organization, made up of member companies spanning the global storage market. SNIA's mission is to lead the storage industry worldwide in developing and promoting standards, technologies, and educational services to empower organizations in the management of information. To this end, the SNIA is uniquely committed to delivering standards, education, and services that will propel open storage networking solutions into the broader market. For more information about SNIA, visit www.snia.org.

About the SNIA Green Storage Initiative

SNIA's Green Storage Initiative (GSI) is focused on advancing energy efficiency and conservation for data center networked storage technologies in an effort to minimize the environmental impact of data storage operations. SNIA's Green Storage activities take place in two separate working bodies, the SNIA Green Storage Technical Working Group (TWG) and the Green Storage Initiative. The TWG is focused on developing repeatable and fair test methodologies and metrics for enterprise storage systems through which energy consumption and efficiency can be measured. The Green Storage Initiative is focused on creating and publicizing best practices to the industry for energy efficient storage networking, promoting storage–centric applications that reduce storage footprint and associated power requirements, and educating regulatory bodies and testing organizations to apply test methodologies and best practices.

About the SNIA Emerald™ Program

The SNIA Emerald™ Program is a vendor-neutral, public service to the storage industry, IT community, and regulatory body community that is sponsored and operated by the SNIA GSI. The program supports the use and evolution of the SNIA Emerald™ Power Efficiency Measurement Specification. The measurement procedure and test metrics are documented in the SNIA Emerald™ Power Efficiency Measurement Specification, which is developed, released, and maintained by the Green Storage TWG under the guidance of the GSI. GSI produces education programs and materials for testers to consistently and competently use the SNIA Emerald™ Power Efficiency Measurement Specification.

The EPA ENERGY STAR® Data Center Storage Program is based on the methodology defined in the Specification and offers another vehicle for publication of product test results created in accordance with the Specification. Some national regulatory bodies cross-reference the EPA ENERGY STAR Program for their needs, while other national regulatory bodies around the world are aware of the SNIA Emerald™ Specification and in the future, may base their programs on the methodology and metrics.

For more information about the SNIA Emerald™ Program, visit www.sniaemerald.com.

Contents

1   Introduction

This document describes the changes in *SNIA Emerald™ Power Efficiency Measurement Specification V3.0.2* and how these impact other testing materials.

Section 2 provides a summary overview of the changes made to the *SNIA Emerald™ Power Efficiency Measurement Specification V3.0.2* (referred to within this document as simply *Specification V3.0.2*), developed as part of the *SNIA Emerald™ Program*, which resulted in the *SNIA Emerald™ Power Efficiency Measurement Specification V3.0.3* (referred to within this document as simply *Specification V3.0.3*).

Specification V3.0.3 is an editorial update of *Specification V3.0.2* whose primary purpose was to provide a specification formatted and organized according to ISO Directives Part II so that it would be suitable for submission to ISO as a Publicly Available Specification for international standardization. In the course of making these changes, some additional clarifications and corrections were made. There are no substantive changes to the testing process.

Any conflict between this document and the *Specifications* shall defer to the *Specifications*.

Section 3 describes how ancillary testing documents apply to testing with *Specification V3.0.3*.

1.1   Audience

The target audience of this document includes organizations and individuals planning for and testing in accordance with *Specification V3.0.3*. An organization or individual performing such testing is referred to as a test sponsor.

Test sponsors are urged to carefully read the *Specification V3.0.3* in order to become aware of all changes.

Important note: If the tester or evaluators are not familiar with *Specification V3.0.2*, the most helpful part of this document will be the references section explaining how ancillary documents addressing *Specification V3.0.2* apply to *Specification V3.0.3*.

1.2   References

Specification V3.0.2 and *Specification V3.0.3* are available through the SNIA Emerald™ website: www.sniaemerald.com/download/Spec_v3.0.

Complete information for testing in accordance with the *SNIA Emerald™ Power Efficiency Measurement Specification* is available at: www.sniaemerald.com/download.

Training for testers and organizations using the *SNIA Emerald™ Power Efficiency Measurement Specification* is available at: www.sniaemerald.com/education/vendor-training.

2 Changes from *Specification V3.0.2* to *Specification V3.0.3*

The changes from *Specification V3.0.2* to *Specification V3.0.3* are primarily to make the formatting, language, and organization more consistent with the requirements of ISO Directives Part II. During this update, additional clarifications and corrections were made.

NOTE 1: All references (to Clauses, figures, and tables) in this Clause pertain to the *Specification V3.0.3* unless otherwise noted.

NOTE 2: Test sponsors should not expect any difference in SUT metric results between *Specification V3.0.2* and *Specification V3.0.3*, given all other test conditions are the same (e.g., SUT configuration, initial conditions, test environment, benchmark driver type, revision, script parameters, etc.).

2.1 General

Some style changes were made throughout the document and are listed here. With a few exceptions, these are not be addressed in this document beyond this section.

2.1.1 ISO Style Numbers

ISO style for expressing numbers was adopted, so that

- space is used as the separator before each group of 3 digits of a number, e.g. one thousand is written as 1 000; and

- comma is used as the decimal point, e.g., an approximation of the constant pi is written as 3,14.

2.1.2 ISO Style Quantities

Expressions of values with units, e.g., three seconds or 3 s, are written in accordance with ISO style.

2.1.3 Mathematical Expressions

In mathematical expressions, e.g., formulae, center dot ($\cdot$) is used to express multiplication, replacing asterisk (*).

2.1.4 References

References to external materials are updated throughout the document.

Some cross-references within the document were improved or corrected.

2.1.5 Clarity and Consistency

Language changes were made in various places to make the language more consistent within the document and to improve clarity for the reader.

2.1.6 Normative Language

Usages of "need not" as normative language were changed to conform with 2018 ISO Directives Part II, Eighth edition, 2018 that no longer allows "need not".

Some text was changed or relocated in anticipation of an ISO document based on *Specification V3.0.3* that will replace all text prior to Clause 1 (Introduction) and change the name of the document.

2.2   Scope (Clause 2)

Subclauses 2.5 and 2.6 of *Specification V3.0.2* were deleted. The definition of "efficiency" given in subclause 2.6 was moved to clause 4, Definitions, Symbols, Abbreviations, and Conventions; and was constrained to address only the usage in *Specification V3.0.3*.

2.3   Definitions, Symbols, Abbreviations, and Conventions (Clause 4)

2.3.1   Overview (Subclause 4.1)

Wording mandated by ISO Directives Part II was added.

2.3.2   Definitions (Subclause 4.2)

Definitions were reformatted according to requirements of ISO Directives.

Unused definitions were deleted.

Several definitions that had been other parts of the specification were moved to this subclause.

Definitions of some terms used in the document were added.

Some terms and definitions were modified to be more consistent with the remainder of the document.

2.3.3   Symbols and Abbreviated Terms (Subclause 4.3)

The title of the subclause was reworded.

Many abbreviations used in the document were added.

2.4   Taxonomy (Clause 5)

2.4.1   Online Category (Subclause 5.5)

Table 4, Online Classifications, the Connectivity attribute of Online 2 was reworded to provide greater clarify.

2.5   Test Definition and Execution Rules (Clause 7)

2.5.1   Power (Subclause 7.2.7)

Tables 9 and 10 and the associated text were reorganized to incorporate the text into the Tables and to reorganize the information for greater clarify and simplicity, without change to the stated requirements.

2.5.2   Block and File Access Capacity Optimization Test (Subclause 7.6)

In several places in subclause 7.6, the tester is required to create a container of a certain size. In *Specification V3.0.2*, that size was given as an exact number. To avoid precluding testing of

products that cannot create a container of exactly the specified size, *Specification V3.0.3* adds a tolerance to the specified size.

2.5.3 Data Deduplication Heuristics (Subclause 7.6.4.5)

Item 8 in the numbered list provides a formula. As the wording of the formula seemed inconsistent and potentially confusing, the formula was revised to more clearly state its intent. No substantive change to the heuristic result occurs.

2.5.4 Compression Heuristics (Subclause 7.6.4.6)

Item 8 in the numbered list provides a formula. As the wording of the formula seemed inconsistent and potentially confusing, the formula was revised to more clearly state its intent. No substantive change to the heuristic result occurs.

2.6 Metrics (Clause 8)

2.6.1 Secondary Metrics (Subclause 8.7.1)

For consistency, the expressions of the binary values of the secondary metrics were adjusted to be 1 (Yes) or 0 (No).

2.7 Disclosure Requirements (Clause 9)

Some changes were made to terms to be consistent with definitions and the rest of *Specification V3.0.3*. These changes are reflected in an updated Test Data Report Template. The updated terms are:

- data deduplication (replacing deduplication)
- storage protection (replacing data protection)
- 80 PLUS (replacing ECOS (80+))
- raw, unformatted, uncompressed capacity of the storage media (replacing media capacity)

2.8 Annex C (Normative) Stable Storage

In item 3 of the numbered list, "system crashes" replaces "software crashes". System crash is a defined term in both *Specification V3.0.3* and *Specification V3.0.2*.

2.9 Annex H (informative) sFlow®

The paragraph on Host sFlow® was deleted since the referenced information is no longer available.

2.10 Bibliography

References were updated.

The reference to Host sFlow® was removed.

A reference for 80 PLUS was added.

3   Ancillary Testing Materials

Since *Specification V3.0.3* is an editorial update of *Specification V3.0.2*, SNIA has not updated all the ancillary documents supporting testing. The following table lists the ancillary materials and how they apply to testing with *Specification V3.0.3*. In most cases, no substantive changes were needed for the transition from *Specification V3.0.2* to *Specification V3.0.3* and therefore, SNIA did not undertake to revise the material solely to change the version number.

All these materials are available at www.sniaemerald.com/download/Spec_v3.0. Note that a revision history is available which includes past versions of SNIA-provided materials.

Document	For use when testing with *Specification V3.0.3.*	Notes
Specification	*SNIA Emerald™ Power Efficiency Measurement Specification V3.0.3.*	Included for completeness.
SPEC SFS 2014	Same as for testing with *Specification V3.0.2.*	No change.
File Access IO Load Driver Configuration File	Same as for testing with *Specification V3.0.2.*	No change.
Vdbench	Same as for testing with *Specification V3.0.2.*	No change.
Vdbench Script for Online and Near-Online Testing	Same as for testing with *Specification V3.0.2.*	No change. Use the script developed for V3.0.2 testing.
Vdbench Script for Removable and Virtual Media Library Testing	Same as for testing with *Specification V3.0.2.*	No change. Use the script developed for V3.0.2 testing.
COM Test Data Set Generator	Same as for testing with *Specification V3.0.2.*	No change.
What Has Changed?	This document.	This document summarizes the changes from *Specification V3.0.2* to *Specification V3.0.3*. If you are migrating from *Specification V2.1.1* direction to *Specification V3.0.3*, read this document in conjunction with *What Has Changed? SNIA Emerald Power Efficiency Measurement Specification V2.1.1 to V3.0.2.*

Document	For use when testing with *Specification V3.0.3.*	Notes
User Guide	Same as for testing with Specification *V3.0.2.*	No change. Use *User Guide for the SNIA Emerald™ Power Efficiency Measurement Specification V3.0.2.*
Training	Same as for testing with Specification *V3.0.2.*	No change.
Test Data Report Template	Use revision designated for use with Specification *V3.0.3.*	Updated to address the change in the Specification version number and naming changes to a few reported items.
Tester's Kit	Use current version.	The Tester's Kit is updated whenever any of the included testing materials change.