SPC BENCHMARK 1™ (SPC-1™)
Replication Extension

Official Specification

Revision 1.0 – Effective TBD

Storage Performance Council (SPC)

PO Box 3504
Redwood City, CA 94064-3504
Phone (650) 556-9384
www.storageperformance.org

SPC Membership as of 31 March 2020

Amazon, Inc.
Austin Automation Center
– Department of Veteran Affairs
Cybernetics
Dell, Inc.
ETRI
Foundation for Research and Technology
– Institute of Computer Science
Fujitsu America, Inc.
Futurewei Technologies Co., Ltd.
The George Washington University
Hewlett-Packard Enterprise
Hitachi Vantara Corporation
Hongik University
IBM Corporation
Infortrend Technology, Inc.
Inspur Corporation
Korea Advanced Institute of Science and Technology
Lenovo
MacroSAN Technologies Co. Ltd.
NEC Corporation
NetApp, Inc.
Pennsylvania State University
Pure Storage, Inc.
Ruijie Networks Co. Ltd.
Samsung Information Systems, America
Seagate Technology LLC
Silicon Motion Technology Corporation
Sunlight.io
Telecommunication Technology Association (TTA)
Toshiba America Electronic Components, Inc.
University of California, Santa Cruz
University of Patras
Western Digital Corporation
Yunify Technologies Inc.

The SPC would also like to acknowledge the contributions of the members who helped to create the initial release of version 3 of the SPC-1 specification Austin Automation Center – Department of Veteran Affairs, DataDirect Networks, Datera, Inc., Dell, Inc., Dot Hill Systems Corp., EMC Corporation, Foundation for Research and Technology – Institute of Computer Science, Fujitsu America, Inc., The George Washington University, Hewlett-Packard Company, Hitachi Data Systems, Hongik University, Huawei Technologies Co., Ltd., IBM Corporation, Imation, Corp. Infortrend Technology, Inc., Kaminario, Inc., Korea Advanced Institute of Science and Technology, LSI Corporation, NEC Corporation. NetApp, Inc., Nimbus Data Systems, Inc., Oracle Corporation, Pennsylvania State University, QLogic Corporation, Samsung Information Systems, America. SanDisk Corporation, Seagate Technology LLC, Silicon Graphics International, Skyera, Inc.. SolidFire, Inc., Symantec Corporation, Toshiba America Information Systems, Inc., University of California, Santa Cruz, University of Patras, Violin Memory, Inc.. Western Digital Corporation. X-IO Technologies

Document History

Effective Date	Version	Description
TBD	1.0	Creation of stand-alone extension document.

Table of Contents

Clause 0 Introduction

0.1 Preamble

Benchmark extensions are optional additions to an existing benchmark ("the underlying benchmark specification") that are designed to showcase a feature or set of features, and to provide vendors with a means to differentiate their products across dimensions other than the existing performance or price-performance metrics of the benchmark

The SPC benchmark extensions are intended to be vendor and platform independent. Any vendor should be able to sponsor and publish an SPC result, with or without extensions, provided their tested configuration satisfies the performance, integrity, and availability requirements of the specification.

Rather than requiring or favoring a particular implementation, it is the goal of SPC benchmarks and extensions to provide a robust, verifiable, reproducible environment within which the relative strengths of differing design and configuration approaches can be evaluated.

0.2 General Guidelines

The purpose of SPC benchmarks is to provide objective, relevant, and verifiable data to purchasers of I/O subsystems. To that end, SPC specifications require that benchmark tests be implemented with system platforms and products that:

- Are generally available to users.
- A significant percentage of the users in the target market segment (server class systems) would implement.
- Are relevant to the market segment that the benchmark represents.

More detailed requirements can be found in the body of the SPC Benchmark-1 specification.

0.3 Measurement Guidelines

SPC benchmark results are expected to be accurate representations of subsystem performance. Therefore, stringent measurement, auditing, and reporting guidelines are mandated by this specification. In general, fidelity and candor must be maintained in reporting any anomalies in the results, even if not specified in the benchmark requirements.

More detailed measurement, evaluation and disclosure requirements can be found in the body of the specification.

0.4 Related Documents

This benchmark extension relies on:

- Version 3 of SPC Benchmark-1
- Version 1 of the *SPC Pricing Guide*
- Version 1 of the *SPC Glossary (included as Appendix A)*

0.5 Document Conventions

This document follows the standard typographical conventions for SPC publications.

Generally, words and expressions will adhere to their common English usage. Where a particular term is being defined or assumed to have a benchmark-specific meaning, it appears in SMALLCAPS, and its formal definition can be found in the *SPC Glossary,* which is included here as Appendix A.

0.6 Disclaimer

While this workload models a rich multi-user environment that emulates a broad range of server applications, it neither represents the entire range of I/O requirements for server systems nor precisely mimics any particular application. In addition, the extent to which anyone is capable of achieving the results reported by a vendor is highly dependent upon how closely the customer's application maps to the SPC-1 workload. The extrapolation of SPC-1 results to other environments is therefore not recommended.

Actual system performance is highly dependent upon specific workload characteristics, platform configuration, and application-specific tuning. Relative system performance will vary as a result of these and other factors. Thus, SPC-1 should not be used as a substitute for customer application benchmarking when critical performance requirements are called for.

SPC-1 uses terminology and metrics that are similar to other benchmarks. This similarity does not imply that results from this benchmark are comparable with other benchmarks.

Clause 1 Workload Environment

1.1 Overview

One of the core capabilities of many Enterprise storage arrays is the ability to replicate data stored on one storage array to another storage array. Replication may use a variety of techniques, suitable for various use cases. This extension covers fully synchronous replication intended for use in architecting zero-data-loss disaster recovery solutions.

This extension allows test sponsors to demonstrate that their storage system has the ability to synchronously replicate data under reasonable load in a manner that is suitable for disaster recovery.

This extension does not demonstrate a full zero-data-loss disaster recovery solution, only the replication component of such a solution.

No finite set of tests can fully verify that a system is capable of meeting this minimal set of requirements. The goal of this extension is to provide, through a combination of tests and test-sponsor attestation, reasonable assurances that the system under test likely meets these requirements.

Clause 2 Storage Capacity and Content

This extension has no impact on the storage capacity and content requirements defined in SPC-1.

Clause 3 Workload and I/O Operation Profile

This extension has no impact on the workload and I/O operation profile as defined in SPC-1.

Clause 4 Benchmark Configuration and Tested Storage Configuration

4.1 The benchmark configuration used to run this extension shall support synchronous replication.

4.2 The EXTENSION CONFIGURATION shall have at least these attributes:

1. In normal operation any data written to the primary storage system must be committed to both the primary system and the secondary storage system prior to sending an acknowledgment to the host.
2. If communications between the source and destination storage systems are interrupted, the source system shall continue to operate, committing data only to the source system. When communications resume, the two storage systems shall resynchronize in a timely manner and resume full synchronous operation. Such loss-of-communication events must be logged.
3. If communication between the source and destination storage systems is interrupted, the image of the data on the destination system must be a CRASH-CONSISTENT image of the source data.
4. If the source system fails while in normal operation, the image of the data on the destination system must contain all data from all writes acknowledged to the host by the source system.

This set of capabilities is minimal. Practical systems will have additional requirements that are beyond the scope of this benchmark to specify or test.

4.3 The TSC used in the underlying benchmark is the primary system. The TSC and the secondary storage subsystem shall be distinct. The TSC in the EXTENSION CONFIGURATION includes both primary and secondary systems.

Comment: *The intent is that the target storage system should be capable of preserving the data set in the event that the underlying benchmark's TSC were to be completely unavailable.*

4.4 The EXTENSION CONFIGURATION may vary significantly from the BENCHMARK CONFIGURATION used to execute the underlying benchmark, which does not necessarily require multiple independent storage systems. The changes between the BENCHMARK CONFIGURATION and the EXTENSION CONFIGURATION shall be limited to those changes necessary to support replication.

4.5 The EXTENSION CONFIGURATION shall not remove any components present in the BENCHMARK CONFIGURATION.

4.6 Any reconfiguration of the BENCHMARK CONFIGURATION, shall be disclosed.

4.7 While the secondary storage must be substantially the same model as the primary storage, the configuration of the secondary system may differ from the primary system's configuration:

- The destination system may use a different type and number of storage devices;
- It may have more or less physical capacity;
- It may have a different number or type of interfaces to connect it to hosts;

- It may be configured differently, for example not including data reduction that may be enabled on the source array.

4.8 The reconfiguration may include connecting the source and destination arrays, configuring and enabling replication.

4.9 All of the volumes used by all 3 ASUs shall be replicated.

Clause 5 Test Methodology

This extension has no impact on the SPC test methodology as defined in SPC-1.

Clause 6 Measurement Requirements (Execution Rules)

6.1 This extension requires a separate TEST PHASE ("replication run").

6.2 Prior to the execution of the replication test phase the test sponsor shall execute the baseline transfer, as defined in 6.5.

6.3 Other than booting/starting the HOST SYSTEMS, bringing ASUS on-line for use by the SPC-1 WORKLOAD GENERATOR, and starting the SPC-1 WORKLOAD GENERATOR, no substantive work shall be performed on the EXTENSION CONFIGURATION prior to or in between the baseline transfer and the replication run.

6.4 The replication TEST PHASE includes 4 sub-phases, that shall be executed in sequence during the measurement interval of the TEST PHASE:

- Synchronous (defined in 6.6)
- Single System (defined in 6.7)
- Resync (defined in 6.8)
- Resumption (defined in 6.9)

6.5 Baseline Transfer

6.5.1 The baseline transfer sub-phase is used to synchronize the data images on the primary and secondary storage systems.

6.5.2 There is no workload generator-based IO load during this sub-phase. It is intended to establish a baseline against which the other sub-phases can be executed.

6.5.3 The data set used by the underlying SPC-1 run (and any benchmark extensions that have been run subsequently) shall be intact, and not truncated, unmapped, zeroed, or otherwise optimized for the baseline transfer.

6.5.4 The baseline transfer is deemed complete when the primary and secondary systems are able to operate in a synchronous mode.

6.5.5 The duration of the baseline transfer shall be disclosed.

6.5.6 The command(s) required to execute the baseline transfer shall be disclosed.

6.6 Synchronous Sub-phase

6.6.1 During the synchronous sub-phase both the primary and secondary arrays run in normal mode, with replication running synchronously between the two arrays for the entire phase.

6.6.2 The IO load level shall be 25% of the I/O load level used to generate the reported SPC-1 IOPS™ rate the underlying benchmark MEASUREMENT.

6.6.3 This sub-phase shall have a duration of at least 5 minutes.

6.7 Single System Subphase

6.7.1 The single-system sub-phase covers communication failure. During its measurement interval, all communication between the primary and secondary arrays shall be interrupted.

6.7.2 The communications interruption may be accomplished by cable-pulls or by some administrative action to simulate a communications failure, but shall model an instantaneous failure. There shall be no coordination between the primary or secondary systems in advance of the failure. If multiple steps are required to model the communications failure (e.g., pulling multiple cables), then there must be no substantive delay between the steps, and the failure must occur within no more than 1 second.

Comment: *Test sponsors may use diagnostic commands or other commands not available to customers to simulate the interruption and resumption of communications.*

6.7.3 The communication shall be disabled for at least 15 minutes.

6.7.4 The IO load level shall be 25% of the I/O load level used to generate the reported SPC-1 IOPS™ rate the underlying benchmark MEASUREMENT.

6.7.5 During the communications interruption, the workload shall continue to execute on the primary system without any IO failures or other errors.

6.8 Resync Subphase

6.8.1 The resync sub-phase re-establishes the replication relationship between the primary and secondary systems.

6.8.2 The IO load level shall be 25% of the I/O load level used to generate the reported SPC-1 IOPS™ rate the underlying benchmark MEASUREMENT.

6.8.3 During the sub-phase, the workload shall continue to execute on the primary system without any IO failures or other errors.

6.8.4 During the sub-phase, TEST SPONSOR shall restore communications between the primary and secondary storage systems.

6.8.5 The duration of this phase is variable. Its sub-phase is complete once the primary and secondary systems resume fully synchronous replication.

6.9 Resumption Subphase

6.9.1 The resumption subphase demonstrates resumption of normal operation.

6.9.2 This phase begins once resynchronization completes and lasts for a minimum of 15 minutes.

6.9.3 The IO load level shall be 25% of the I/O load level used to generate the reported SPC-1 IOPS™ rate the underlying benchmark MEASUREMENT.

6.9.4 During this sub-phase, the workload shall continue to execute without interruption, and IO operations on the primary system shall be replicated on the secondary system.

Clause 7 Data Persistence Requirements and Test

This extension has no impact on the Persistence test defined in SPC-1.

Clause 8 Reported Data

8.1 Comparability and Permitted Use

8.1.1 Results that execute this extension are subject to all Permitted Use requirements.

8.1.2 Public reference that includes a comparison of one or more SPC-1 RESULTS may distinguish those results that included the execution of this extension from those that did not.

8.1.3 If the testing defined in this extension is completed successfully, the result may be referred to "SPC-1 Synchronous Replication Enabled".

Clause 9 Pricing

9.1 Comparability and Permitted Use

9.2 This extension is subject to the general pricing guidelines defined in version 1 of the *SPC Pricing Guidelines*.

9.3 The cost of the synchronous replication shall be part of the pricing disclosure for the benchmark extension. This must include:

- any additional hardware required in the EXTENSION CONFIGURATION,
- any additional software licenses required on the EXTENSION CONFIGURATION.

9.4 The secondary system is not priced, nor are any switches used to connect the primary and secondary systems.

9.5 If the replication function is performed by an external hardware system, that external hardware shall be priced.

Clause 10 Full Disclosure Report

10.1 For the Replication Extension, the FDR shall disclose:

a) The steps taken to configure the secondary system.
b) The full configuration of the secondary system. This shall include enough information to enable a user to order the configuration. Prices of the components need not be disclosed

Comment: *This disclosure can be a list of components, similar to a price quote, or it may be a short description, of the differences, if any, between the primary and secondary systems.*

c) A network diagram that includes the primary and secondary systems, and all networks that connect them.
d) Listings of scripts used in the creation of the extension configuration or the execution of the benchmark extension, or a description of the processes used with sufficient detail to recreate the configuration and execution.
e) The duration, to 1-minute accuracy, of the baseline transfer that brings the primary and secondary storage systems into synchronization
f) A graph of throughput (SPC-1 IOPS) during all of the phases of the replication test, except the baseline transfer. This graph shall be annotated with information showing when the various test phases began and ended.
g) A graph of response time in milliseconds during all of the phases of the replication test, except the baseline transfer. This graph shall be annotated with information showing when the various test phases began and ended.

Clause 11 Measurement, Audit and Result Submission

11.1 Replication Extension Related Verification Items

1. The auditor shall verify the duration of the various phases of the replication test. Information on when the replication relationship was established and when the replication partners were in sync and out of sync should be available in the TSC's event log. However, if not such log is available the test sponsor will provide other documentation, with time stamps, of these events.

Appendix A Glossary

The SPC Glossary is used in all SPC specifications, and is available as a stand-alone document. It is included here in its entirety for ease of reference.

SPC Glossary, version 1.0, which was current as of 24 March 2020

A.1 A

ADDRESSABLE CAPACITY
the portion of the storage capacity of a LOGICAL VOLUME that is accessible to the WORKLOAD GENERATOR.

APPLICATION STORAGE UNIT (ASU)
the logical representation of the persistent, non-volatile storage read and or written in the course of executing a BENCHMARK.

An ASU represents is a logical interface between a BENCHMARK CONFIGURATION's data and a workload generator.

APPLICATION STORAGE UNIT CAPACITY
the total ADDRESSABLE CAPACITY of all the portions of LOGICAL VOLUMES to which an ASU is mapped.

APPLICATION STORAGE UNIT STREAM
a collection of one or more I/O STREAMs, that completely defines the I/O sent to a given ASU.

ASSOCIATED DATA
data and measurements defined by a given BENCHMARK that are used to calculate, clarify or reinforce the metrics reported as part of a RESULT.

ASU *see APPLICATION STORAGE UNIT.*

ASU CAPACITY *see APPLICATION STORAGE UNIT CAPACITY.*

ASU PRICE *the ratio of TOTAL SYSTEM PRICE to ASU CAPACITY.*

ASU STREAM *see APPLICATION STORAGE UNIT STREAM.*

AUDIT *the process that verifies that a MEASUREMENT is eligible for submission as a RESULT.*

AUDITOR *An individual who has been certified by the SPC to perform an AUDIT.*

AVAILABILITY DATE
a date by which a given product, component or configuration is released for general availability.

AVERAGE RESPONSE TIME
the sum of the RESPONSE TIMES for all MEASURED I/O REQUESTS within a given interval, divided by the total number of MEASURED I/O REQUESTS.

A.2 B

BC *see BENCHMARK CONFIGURATION.*

BENCHMARK *a collection of TESTS, TEST PHASES, documentation requirements, and comparability constraints that fully define the process for taking a MEASUREMENT and creating a RESULT.*

BENCHMARK CONFIGURATION
all hardware and software components used in the creation of a MEASUREMENT.

A.3 C

COMPLETED I/O REQUEST *an I/O REQUEST with a START TIME and a COMPLETION TIME.*

COMPLETION TIME
the time recorded by the WORKLOAD GENERATOR when an I/O REQUEST is satisfied by the TSC.

COMMITTED: *Of an IO operation, written to persistent, non-volatile storage, in such a manner that the data can be retrieved after recovery from a TSC failure.*

CRASH-CONSISTENT:
A data image (logical or physical) is considered crash consistent if there exists a point in time such that all write operations completed prior to that time are included in the image, and no write operation initiated after that time is included.

A.4 D

DATA RATE *the data volume transferred in a given interval divided by the duration of the interval, in seconds.*

A.5 E

EXTENSION *optional addition(s) to an existing BENCHMARK that showcase a feature or set of features not captured by the BENCHMARK'S existing metrics.*

EXTENSION CONFIGURATION
all hardware and software components used in the execution of an EXTENSION.

EXPECTED I/O COUNT
for any given I/O STREAM and TEST PHASE, the product of requested IO load in IOs per second, the duration of the TEST PHASE in seconds, and the INTENSITY MULTIPLIER parameter for that I/O STREAM.

EXECUTIVE SUMMARY
a high-level report summarizing a RESULT, and the configuration used to produce it.

A.6 F

FAILED I/O REQUEST
any I/O REQUEST issued by the WORKLOAD GENERATOR that could not be completed or was signaled as failed by the OS running on the HOST SYSTEM .

A FAILED I/O request has no COMPLETION TIME.

FDR *see FULL DISCLOSURE REPORT.*

FULL DISCLOSURE REPORT

a report detailing a RESULT, along with the procedures, configuration, and equipment used to produce it.

A.7 G

No terms defined.

A.8 H

HOST SYSTEM *a computer system where the WORKLOAD GENERATOR executes.*

A.9 I

IN-FLIGHT I/O REQUEST

an I/O REQUEST issued by the WORKLOAD GENERATOR that does not complete within a given MEASUREMENT INTERVAL.

INTEGRATED EXECUTION

of a benchmark extension: completed during one of the test phases of a benchmark execution.

INTENSITY MULTIPLIER

the ratio of the IO load produced by a given I/O STREAM to the total IO load produced by all active I/O STREAMS.

I/O COMMAND *see I/O REQUEST.*

I/O STREAM *a single, well-defined, sequence of I/O REQUESTS.*

I/O REQUEST *a single, atomic I/O operation.*

I/O REQUEST THROUGHPUT

the total number of MEASURED I/O REQUESTS in a TEST PHASE, divided by the duration of that TEST PHASE's MEASUREMENT INTERVAL, expressed in seconds.

A.10 J

No terms defined.

A.11 K

No terms defined.

A.12 L

LOGICAL BLOCK *the smallest directly addressable unit of storage on the ASU.*

LOGICAL VOLUME *an individually addressable logical unit of storage presented to the WORKLOAD GENERATOR.*

A.13 M

MEASURED I/O REQUEST
an I/O REQUEST with a COMPLETION TIME occurring within the MEASUREMENT INTERVAL.

MEASURED INTENSITY MULTIPLIER
the percentage of all MEASURED I/O REQUESTS that were issued by a given I/O STREAM.

MEASUREMENT: *the data gathered during the execution of a BENCHMARK.*

MEASUREMENT INTERVAL
of a TEST PHASE, the time from the end of the TRANSITION to the start of the RUNOUT.

A.14 N

No terms defined.

A.15 O

ON-SITE AUDIT *an AUDIT for which the AUDITOR is physically present.*

A.16 P

PHYSICAL CAPACITY UTILIZATION
ASU CAPACITY divided by the PHYSICAL STORAGE CAPACITY.

PHYSICAL FREE SPACE
the persistent storage capacity that could be used to hold application data and the metadata required to access, maintain and protect that data, but is not in use at the time of the measurement.

PHYSICAL STORAGE CAPACITY
the total storage capacity of all of the STORAGE DEVICES in the TESTED STORAGE CONFIGURATION.

PRICED STORAGE CONFIGURATION ("PSC")*:*
the customer-orderable version of the TSC.

PRICE-PERFORMANCE
the ratio of the TOTAL SYSTEM PRICE to the primary performance metric for a BENCHMARK"):.

PRICING SPREADSHEET
a detailed computation of the total cost of ownership for a PRICED STORAGE CONFIGURATION.

PRIMARY METRIC *a metric that provides a primary basis for comparison of RESULTS.*

PROTECTED 1 *a data protection level in which the failure of any single STORAGE DEVICE in the TSC will not require user intervention to restore access to the BENCHMARK'S"): data repository.*

PROTECTED 2 *a data protection level in which the failure of any single component in the TSC will not require user intervention to restore access to the BENCHMARK'S data repository.*

PSC *see PRICED STORAGE CONFIGURATION.*

A.17 Q

No terms defined.

A.18 R

REFERENCE PRICE
the price at which component or subsystem could be ordered individually from the TEST SPONSOR or designated third-party suppler.

REMOTE AUDIT *an AUDIT for which the AUDITOR is not physically present. See ON-SITE AUDIT.*

REPLICATION *the automatic execution of all I/O operations executed against a primary storage system on a one or more, independent storage systems.*

RESPONSE TIME *for an I/O REQUEST, COMPLETION TIME minus START TIME.*

RESULT *an audited MEASUREMENT which has been submitted to the SPC for publication*

RESULTS FILES *the output of the WORKLOAD GENERATOR, created during a MEASUREMENT.*

REPORTED DATA *The set of data, as defined by a given BENCHMARK, which fully characterizes a MEASUREMENT.*

RUNOUT *of a TEST PHASE, the time period immediately following the MEASUREMENT INTERVAL during which the IO load presented by the WORKLOAD GENERATOR to the TSC remains constant long enough for any IO issued during the MEASUREMENT INTERVAL to complete.*

A.19 S

SER *see SPACE EFFECTIVENESS RATIO.*

SOR *see SPACE OPTIMIZATION RATIO.*

SNAPSHOT *a logical, point-in-time, CRASH-CONSISTENT image of one or more LOGICAL VOLUMES.*

SNAPSHOT SET *a crash-consistent collection of SNAPSHOTS, taken and managed as a unit.*

SPACE EFFECTIVENESS RATIO ("SER")
the ratio of the total amount of data that the TSC can hold to its PHYSICAL CAPACITY.

SPACE OPTIMIZATION RATIO ("SOR")
the size of a data set as generated by the WORKLOAD GENERATOR divided by the amount of incremental space consumed by that data set.

SPC RESULT *see RESULT.*

SSU *see STIMULUS SCALING UNIT.*

START TIME *for an I/O REQUEST, the time recorded by the WORKLOAD GENERATOR when the request is submitted for execution on the TSC.*

STEADY STATE *a state in which the behavior of the TSC is stable and sustainable while the load presented to the TSC by the WORKLOAD GENERATOR is constant.*

STIMULUS SCALING UNIT
a logical abstraction that captures the key elements in the IO demands of an application's user population.

STORAGE DEVICE *a discrete, physical hardware component, such as an HDD or an SSD, that provides permanent data storage.*

A STORAGE DEVICE must be capable of storing data indefinitely without external power. The requirement excludes components that provide volatile data storage, such as a read and/or write cache.

SYNCHRONOUS REPLICATION
REPLICATION IN WHICH THE INITIAL I/O OPERATION IS NOT MARKED AS COMPLETE UNTIL THE RELATED OPERATION HAS COMPLETED ON THE OTHER, INDEPENDENT STORAGE SYSTEM(S).

SUBMISSION IDENTIFIER
a unique identifier, assigned by the SPC, for each new RESULT.

SUPPORTING FILES
a collection of data, documentation, and illustrations used to demonstrate the validity of a RESULT.

A.20 T

TARGET COUNTRY
the country in which the PRICED STORAGE CONFIGURATION is available for sale no later than the AVAILABILITY DATE, and in which the required hardware maintenance and software support is provided either directly from the TEST SPONSOR or indirectly via a third-party supplier

TEST *a collection of one or more TEST PHASES sharing a common objective.*

TEST PHASE *the smallest logical component of a TEST, during which a data is collected to satisfy the requirements of a BENCHMARK.*

TEST SPONSOR *a distinctly identifiable entity that acts as the sponsor of an RESULT.*

TESTED STORAGE CONFIGURATION
all software and hardware necessary to implement and support the storage configuration defined for a MEASUREMENT.

TESTED STORAGE PRODUCT
a distinct, customer orderable product, which is the focal point of a RESULT.

TOTAL SYSTEM PRICE
the total cost of ownership for the PRICED STORAGE CONFIGURATION.

TRANSITION *of a TEST PHASE, a time period during which the IO load presented by the WORKLOAD GENERATOR to the TSC is changing, either increasing or decreasing.*

TSC *see TESTED STORAGE CONFIGURATION.*

TSC BOUNDARY *the boundary between the HOST SYSTEM and TSC.*

TSC EXECUTIVE the software component of the *TSC*.

TSP *see TESTED STORAGE PRODUCT.*

A.21 U

No terms defined.

A.22 V

No terms defined.

A.23 W

WORKLOAD *a collection of ASU STREAMS.*

WORKLOAD GENERATOR
a user-space application, provided by the SPC, that produces benchmark-specific IO STREAMS.

A.24 X

No terms defined.

A.25 Y

No terms defined.

A.26 Z

No terms defined

Index

M

O

P

R

S

T

W