



SPC BENCHMARK 1™
FULL DISCLOSURE REPORT

SUGON
FLASHNEXUS FN8200

SPC-1™ v3.10.0

SUBMISSION IDENTIFIER: A32029

SUBMITTED FOR REVIEW: FEBRUARY 19, 2025

First Edition – February 2025

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Benchmark Specification and Glossary

The official SPC Benchmark 1™ (SPC-1™) specification is available on the website of the Storage Performance Council (SPC) at www.spcresults.org.

The SPC-1™ specification contains a glossary of the SPC-1™ terms used in this publication.

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AUDIT CERTIFICATION



Zhongyuan Chao
 Sugon Building, No.36 Zhongguancun Software Park
 No.8 Dongbeiwang West Road, Haidian District
 Beijing, China

February 19, 2025

I verified the SPC Benchmark 1™ (SPC-1™ v3.10.0) test execution and performance results of the following Tested Storage Product:

FlashNexus FN8200

The results were:

| | |
|-----------------------------|------------------------------|
| SPC-1 IOPS™ | 30,002,765 |
| SPC-1 Price-Performance | \$155.01/SPC-1 KIOPS™ |
| SPC-1 Total System Price | 4,650,526.65 |
| SPC-1 IOPS Response Time | 0.202 ms |
| SPC-1 Overall Response Time | 0.144 ms |
| SPC-1 ASU Capacity | 274,882 GB |
| SPC-1 ASU Price | \$16.92/GB |

In my opinion, these performance results were produced in compliance with the SPC requirements for the benchmark.

The testing was executed using the SPC-1 Toolkit Version v3.0.2. The audit process was conducted in accordance with the SPC Policies and met the requirements for the benchmark.

A Letter of Good Faith was issued by Sugon, stating the accuracy and completeness of the documentation and testing data provided in support of the audit of this result.

A Full Disclosure Report for this result was prepared by InfoSizing, reviewed and approved by Sugon, and can be found at www.spcresults.org under the Submission Identifier A32029.

Page 1 of 2

63 Lourdes Dr. | Leominster, MA 01453 | 978-343-6562 | www.sizing.com

A32029

FlashNexus FN8200

Page 2 of 2

The independent audit process conducted by InfoSizing included the verifications of the following items:

- The physical capacity of the data repository (768,000 GB).
- The total capacity of the Application Storage Unit (274,882 GB).
- The accuracy of the Benchmark Configuration diagram.
- The tuning parameters used to configure the Benchmark Configuration.
- The Workload Generator commands used to execute the testing.
- The validity and integrity of the test result files.
- The compliance of the results from each performance test.
- The compliance of the results from each persistence test.
- The compliance of the submitted pricing model.
- The differences between the tested and the priced configuration, if any.

The Full Disclosure Report for this result was prepared in accordance with the disclosure requirements set forth in the specification for the benchmark.

The following benchmark requirements, if any, were waived in accordance with the SPC Policies:

None.

Respectfully Yours,



Doug Johnson, Certified SPC Auditor

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LETTER OF GOOD FAITH



February 19, 2025

To: Doug Johnson, SPC Auditor
Perflabs, Inc. DBA InfoSizing
63 Lourdes Drive
Leominster, MA 01453-6709
USA

Subject: SPC-1 Letter of Good Faith for the FlashNexus FN8200

Dawning Information Industry Co.,Ltd. is the SPC-1 Test Sponsor for the above listed product. To the best of our knowledge and belief, the required SPC-1 benchmark results and materials we have submitted for that product are complete, accurate, and in full compliance with V3.10 of the SPC-1 benchmark specification.

In addition, we have reported any items in the Benchmark Configuration and execution of the benchmark that affected the reported results even if the items are not explicitly required to be disclosed by the SPC-1 benchmark specification.

Sincerely,

Signed:

Date:

Zubin Guo
Vice President of Data Storage Division
Dawning Information Industry Co.,Ltd.

Date: February 19, 2025

FlashNexus FN8200

| | | | |
|-----------------------------|-------------------|---------------------------|------------------------------|
| SPC-1 IOPS™ | 30,002,765 | SPC-1 Price Performance | \$155.01/SPC-1 KIOPS™ |
| SPC-1 IOPS Response Time | 0.202 ms | SPC-1 Total System Price | \$4,650,526.65 |
| SPC-1 Overall Response Time | 0.144 ms | SPC-1 Overall Discount | 61.44% |
| | | Currency / Target Country | USD / China |
| | | Availability Date | March 30, 2025 |

Extensions

| | |
|---------------------------------|----|
| ☆ SPC-1 Data Reduction | NA |
| ☆ SPC-1 Encryption | NA |
| ☆ SPC-1 NDU | NA |
| ☆ SPC-1 Synchronous Replication | NA |
| ☆ SPC-1 Snapshot | NA |

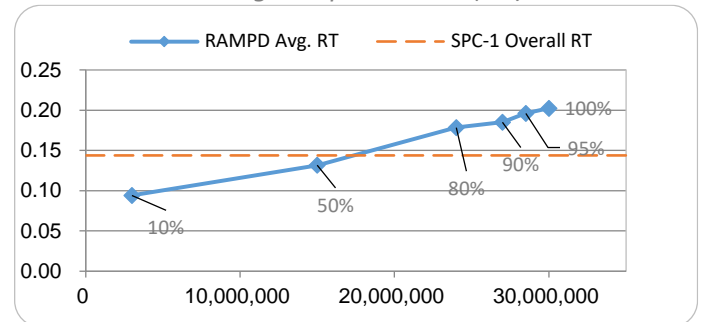
Storage Metrics

| | |
|---------------------------------|-------------|
| SPC-1 Data Protection Level | Protected 2 |
| SPC-1 Physical Storage Capacity | 768,000 GB |
| SPC-1 ASU Capacity | 274,882 GB |
| SPC-1 ASU Price | \$16.92/GB |

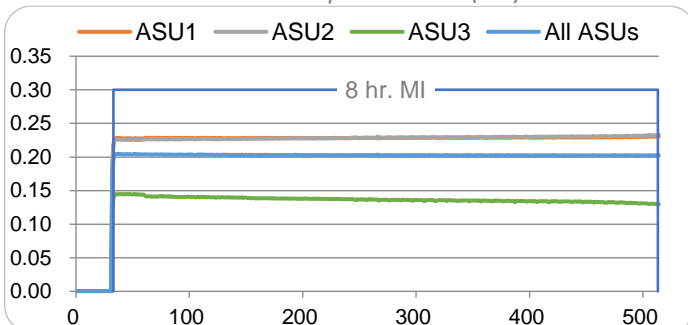
Priced Storage Configuration Summary

- 96 Mellanox CX623106AN-CDAT 100 Gb 2-port
- 16 FlashNexus FN8200 Engines
- 2 Controllers/Engine
- 16 TB Total Cache
- 128 Total Front-End Ports
- 400 Total Storage Devices (1.92 TB NVMe SSD)
- 4 100 Gb 64-port RoCE Switches
- 2 10 Gb 48-port Ethernet Switches
- 42 Total RUs

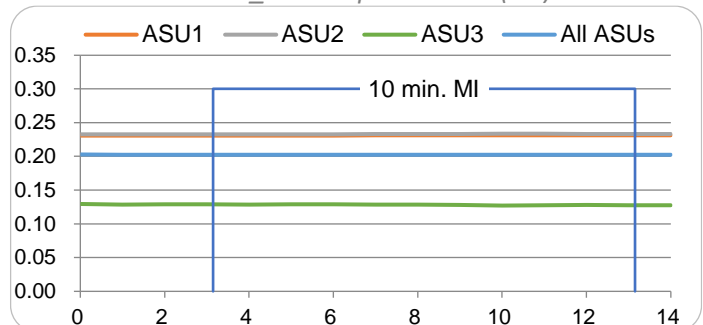
RAMPD Average Response Time (ms) vs. IOPS



SUSTAIN Response Time (ms)



RAMPD_100 Response Time (ms)



SPC Benchmark 1™ Specification Revision v3.10.0
 SPC Benchmark 1™ Workload Generator Revision v3.0.2

Submitted for Review February 19, 2025
 Submission Details www.storageperformance.org/r/A32029

PRICING DETAILS

| Part No. | Description | Source | Qty | Unit Price | Ext. Price | Disc. | Disc. Price |
|---|--|--------|-----|------------|--------------|-------|---------------------|
| Hardware & Software | | | | | | | |
| 98002059 | SUGON FN8200 Controller Enclosure(2U,Dual Controllers,1TB Cache, 25*2.5" Slot, BBU+Flash, 3Y 5x9xND Basic Svc&Warranty) | 1 | 16 | 318,423.04 | 5,094,768.64 | 60% | 2,037,907.46 |
| 54000832 | 1.92TB NVMe SSD Drive(2.5"),For FN8200 | 1 | 400 | 11,006.71 | 4,402,684.00 | 60% | 1,761,073.60 |
| 24002271 | FN8200 2*Ports 100Gb IO Card(QSFP28, for Front-End) | 1 | 64 | 2,594.42 | 166,042.88 | 60% | 66,417.16 |
| 24003128 | FN8200 4*Ports 10Gb IO Card(SFP+, for Scale-out) | 1 | 32 | 942.85 | 30,171.20 | 60% | 12,068.48 |
| 40000331 | SUGON FN8200 Storage Management Software(Basic Storage Software, support FC/iSCSI, NVMe, System Monitoring and Warning), includes starpath(Sugon-developed multipath software) | 1 | 16 | 83,964.21 | 1,343,427.36 | 70% | 403,028.21 |
| 89000416 | 10Gb Ethernet 48-Port + 100Gb Ethernet 4-Port Switch | 1 | 2 | 9,191.97 | 18,383.94 | 60% | 7,353.58 |
| 37000637 | 5M LC-LC OM4 Fibre Channel Cable | 1 | 64 | 13.87 | 887.68 | 60% | 355.08 |
| 89000479 | 100Gb Ethernet 64-Port Switch | 1 | 4 | 65,100.51 | 260,402.04 | 60% | 104,160.82 |
| 37000477 | 10M 100G QSFP28 to QSFP28 AOC Cable | 1 | 224 | 208.52 | 46,708.48 | 60% | 18,683.40 |
| 98001508 | SUGON RACK 42U AC Cabinet | 1 | 8 | 3,767.05 | 30,136.40 | 60% | 12,054.56 |
| 24001817 | Mellanox ConnectX-6 Dx EN Adapter Card 100GbE,Dual Ports QSFP56 | 1 | 96 | 2,866.35 | 275,169.60 | 60% | 110,067.84 |
| Hardware & Software Subtotal | | | | | | | 4,533,170.19 |
| Support & Maintenance | | | | | | | |
| PS-FN82-ISE | FN8200 Installation Service | 1 | 16 | 15,728.44 | 251,655.04 | 70% | 75,496.52 |
| PS-FN82-OPE | FN8200 Upgrade to Onsite Premier 24x7x4H Engineer Onsite Service Per Year | 1 | 48 | 2,906.94 | 139,533.12 | 70% | 41,859.94 |
| Support & Maintenance Subtotal | | | | | | | 117,356.46 |
| SPC-1 Total System Price | | | | | | | 4,650,526.65 |
| SPC-1 IOPS™ | | | | | | | 30,002,765 |
| SPC-1 Price-Performance™ (\$/SPC-1 KIOPS™) | | | | | | | 155.01 |
| SPC-1 ASU Capacity (GB) | | | | | | | 274,882 |
| SPC-1 ASU Price (\$/GB) | | | | | | | 16.92 |

Discount Details: The discounts shown are based on the storage capacity purchased and are generally available.

Warranty: Pricing includes Premier service with 24x7 online support, unlimited software upgrades and bug fixes, and onsite presence of a qualified maintenance engineer within 4 hours of a problem acknowledgement inside the target market.

Differences Between Tested and Priced Storage Configurations

There were no differences between the TSC and the Priced Storage Configuration.

PUBLICATION DETAILS

This section provides contact information for the test sponsor and auditor, a revision history of this document, and a description of any exceptions or waivers associated with this publication.

Contact Information

| Role | Name | Details |
|-------------------------------------|---|---|
| Test Sponsor Primary Contact | Sugon Zhongyuan Chao | www.sugon.com chaozhy@sugon.com |
| SPC Auditor | InfoSizing Doug Johnson | www.sizing.com doug@sizing.com |

Revision Information

| Date | FDR Revision | Details |
|-------------------|---------------------|---------------------|
| February 19, 2025 | First Edition | Initial Publication |

Anomalies, Exceptions, Waivers

There were no anomalies, exceptions or waivers associated with the audit of the FlashNexus FN8200.

CONFIGURATION INFORMATION

Tested Storage Product Description

FlashNexus all-flash storage is an end-to-end NVMe all-flash storage system designed by Dawning Company to meet the needs of enterprise-level users in the era of full-scenario flash storage. It is tailored to satisfy the requirements for high reliability, high performance, and high scalability of users' critical business systems. The product adopts the advanced NexusMatrix matrix interconnection architecture, which achieves global load balancing and can still provide uninterrupted storage services even in scenarios where multiple controllers fail simultaneously. It offers industry-leading RAID-QC quad-disk parity capability, supporting data non-loss when any 4 disks fail simultaneously, providing a higher level of data protection for large-capacity SSD scenarios.

FlashNexus all-flash storage can provide the highest level of storage performance and data reliability for users' critical application systems and can be widely applied in industries such as finance, telecommunications, government, energy, healthcare, etc.

Host System and Tested Storage Configuration Components

The following table lists the components of the Host System(s) and the TSC.

| Host Systems |
|--|
| 48x Sugon I620 G40 Servers, each with : 2x Intel® Xeon® Platinum 8350C CPU (2.60 GHz, 64-Core, 48 MB L3) 256 GB Main Memory CentOS Linux Release 8.5 Starpath (Sugon-developed multipath software) |
| Tested Storage Configuration |
| 96x Mellanox CX623106AN-CDAT 100 Gb 2-port HBAs |
| 16x FlashNexus FN8200 Engines, each with: 2x Storage Controllers, each with: 512 GB cache (16 TB total) 4x 100 Gb RDMA Front End Ports (128 total) 2x 10 Gb Back End Connections (64 total) 400x 1.92 TB NVMe SSD Storage Devices |
| 4x 100 Gb 64-port RoCE Switches 2x 10 Gb 48-port Ethernet Switches |

Component Changes in Revised Full Disclosure Report

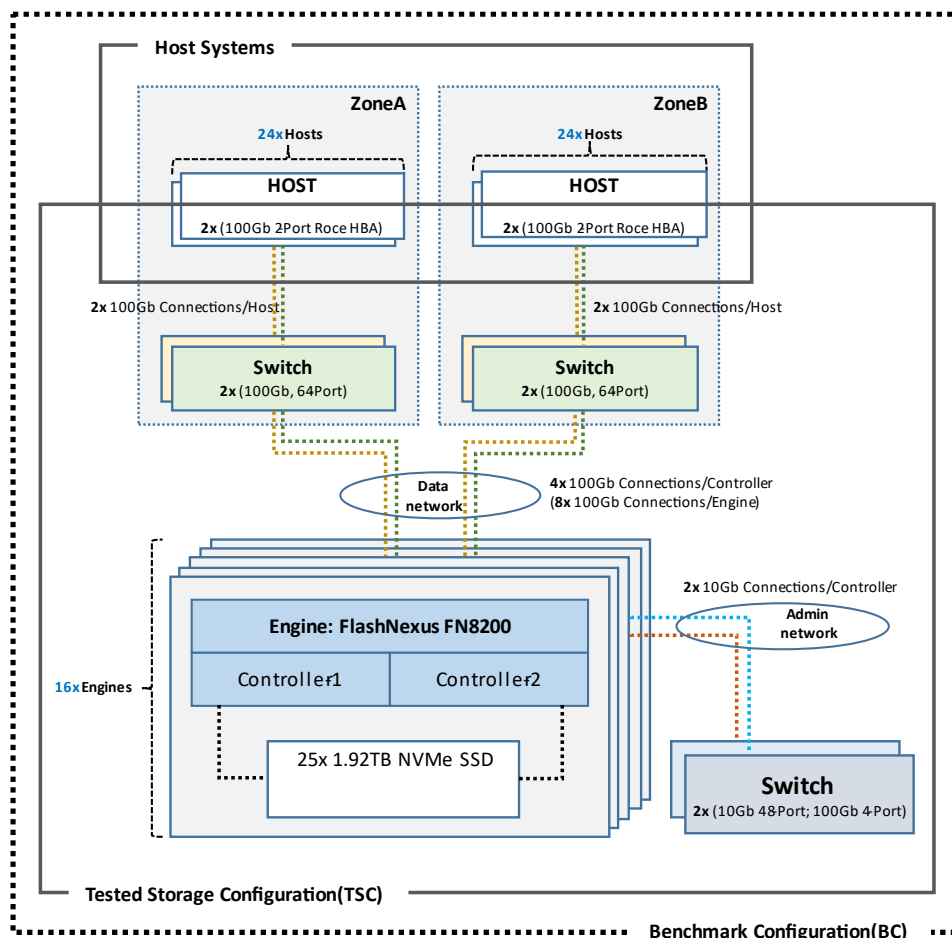
The following table outlines component changes that were made in revisions to this Full Disclosure Report.

| Original Component | Revised Component | Description of Change |
|--------------------|-------------------|-----------------------|
| n/a | n/a | Initial submission |

Configuration Diagrams

BC/TSC Configuration Diagram

The following diagram illustrates the Benchmark Configuration (BC), including the Tested Storage Configuration (TSC) and the Host System(s).



Storage Network Configuration

The Tested Storage Configuration (TSC) comprises 16 FlashNexus FN8200 storage engines driven by 48 host systems (Sugon I620 G40 Servers). Each host system has 2 100 Gb Mellanox MCX623106AN-CDAT connections to two of the four 100G switches (Ruijie RG-S6520-64CQ), resulting in a total of 96 100 Gb connections between the hosts and the switches. Each controller of the FlashNexus FN8200 storage engine has 4 100 Gb ports connected to the 4 switches (8 connections per engine), resulting in a total of 128 100Gb connections between the storage engines and the switches. Additionally, each controller has 10 Gb connections to each of two 10 Gb 48-port switches for a total of 64 internal connections.

Benchmark Configuration Creation Process

Customer Tuning Parameters and Options

All the customer tuning parameters and options that have been altered from their default values for this benchmark are included in [Appendix C](#) and in the Supporting Files (see [Appendix A](#)).

Tested Storage Configuration Creation

A detailed description of how the logical representation of the TSC was created is included in [Appendix D](#) and in the Supporting Files (see [Appendix A](#)).

Tested Storage Configuration Inventory

An inventory of the components in the TSC, as seen by the Benchmark Configuration, is included in [Appendix E](#) and in the Supporting Files (see [Appendix A](#)).

Workload Generator Storage Configuration

The SPC-1 Workload Generator storage configuration commands and parameters used to invoke the execution of the tests are included in [Appendix F](#) and in the Supporting Files (see [Appendix A](#)).

Logical Volume Capacity and Application Storage Unit Mapping

The following table details the capacity of the Application Storage Units (ASUs) and how they are mapped to logical volumes (LVs). All capacities are reported in GB.

| | LV per ASU | LV Capacity | Used per LV | Total per ASU | % ASU Capacity | Optimized* |
|---------------------------|------------|-------------|-------------|---------------|--|------------|
| ASU-1 | 9 | 13,744.1 | 13,744.1 | 123,697.0 | 45.0% | No |
| ASU-2 | 9 | 13,744.1 | 13,744.1 | 123,697.0 | 45.0% | No |
| ASU-3 | 2 | 13,744.1 | 13,744.1 | 27,488.2 | 10.0% | No |
| SPC-1 ASU Capacity | | | | 274,882 | *See Space Optimization Techniques | |

Physical Storage Capacity and Utilization

The following table details the Physical Capacity of the storage devices and the Physical Capacity Utilization (percentage of Total Physical Capacity used) in support of hosting the ASUs. All capacities are reported in GB.

| Devices | Count | Physical Capacity | Total Capacity |
|--------------------------------------|-------|-------------------|----------------|
| 1.92 TB NVMe SSD | 400 | 1,920.0 | 768,000.0 |
| Total Physical Capacity | | | 768,000 |
| Physical Capacity Utilization | | | 35.79% |

Data Protection

The data protection level used for all LVs was **Protected 2 (RAID-6)**, which was accomplished by providing fully redundant pathways from each host to the storage cluster where all storage devices were protected via RAID-6.

Space Optimization Information

Description of Utilized Techniques

The TSC did not use any space optimization techniques.

Physical Free Space Metrics

The following table lists the Physical Free Space as measured at each of the required points during test execution. If space optimization techniques were not used, “NA” is reported.

| Physical Free Space Measurement | Free Space (GB) |
|---------------------------------|-----------------|
| After Logical Volume Creation | NA |
| After ASU Pre-Fill | NA |
| After Repeatability Test Phase | NA |

Space Optimization Metrics

The following table lists the required space optimization metrics. If space optimization techniques were not used, “NA” is reported.

| Metric | Value |
|---------------------------------|-------|
| SPC-1 Space Optimization Ratio | NA |
| SPC-1 Space Effectiveness Ratio | NA |

BENCHMARK EXECUTION RESULTS

This portion of the Full Disclosure Report documents the results of the various SPC-1 Tests, Test Phases, and Test Runs.

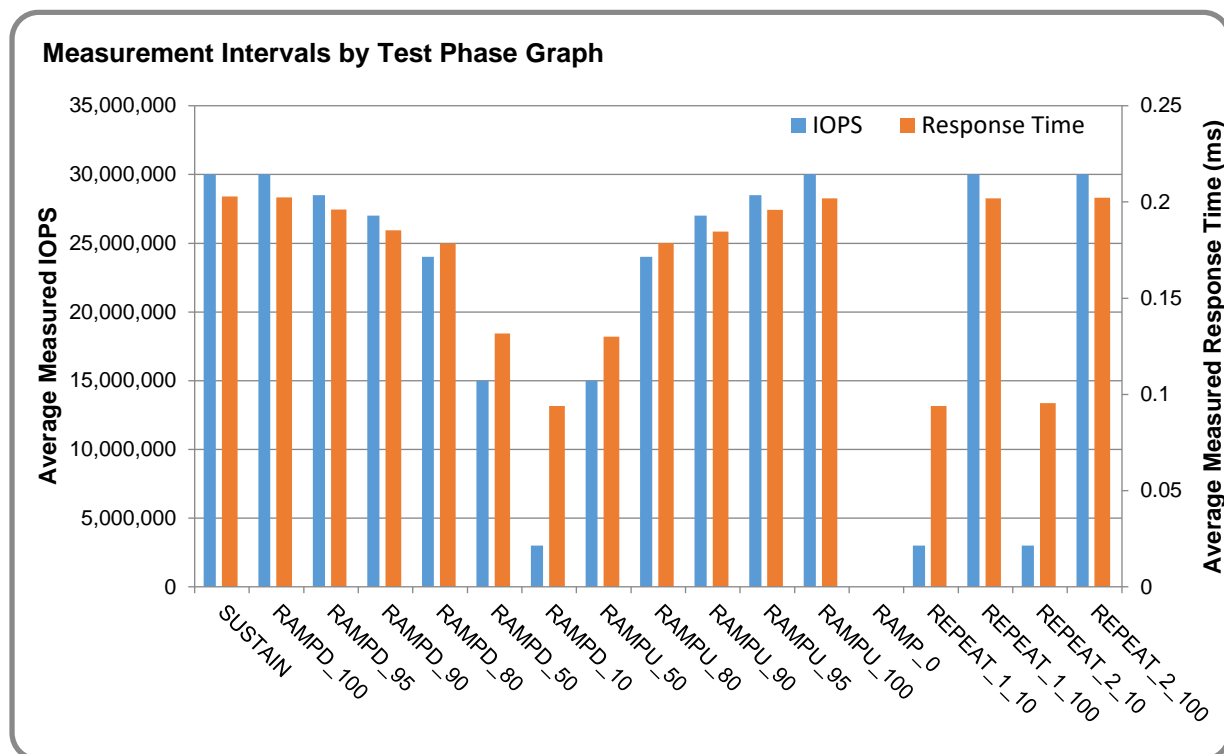
Benchmark Execution Overview

Workload Generator Input Parameters

The SPC-1 Workload Generator commands and input parameters for the Test Phases are presented in the Supporting Files (see [Appendix A](#)).

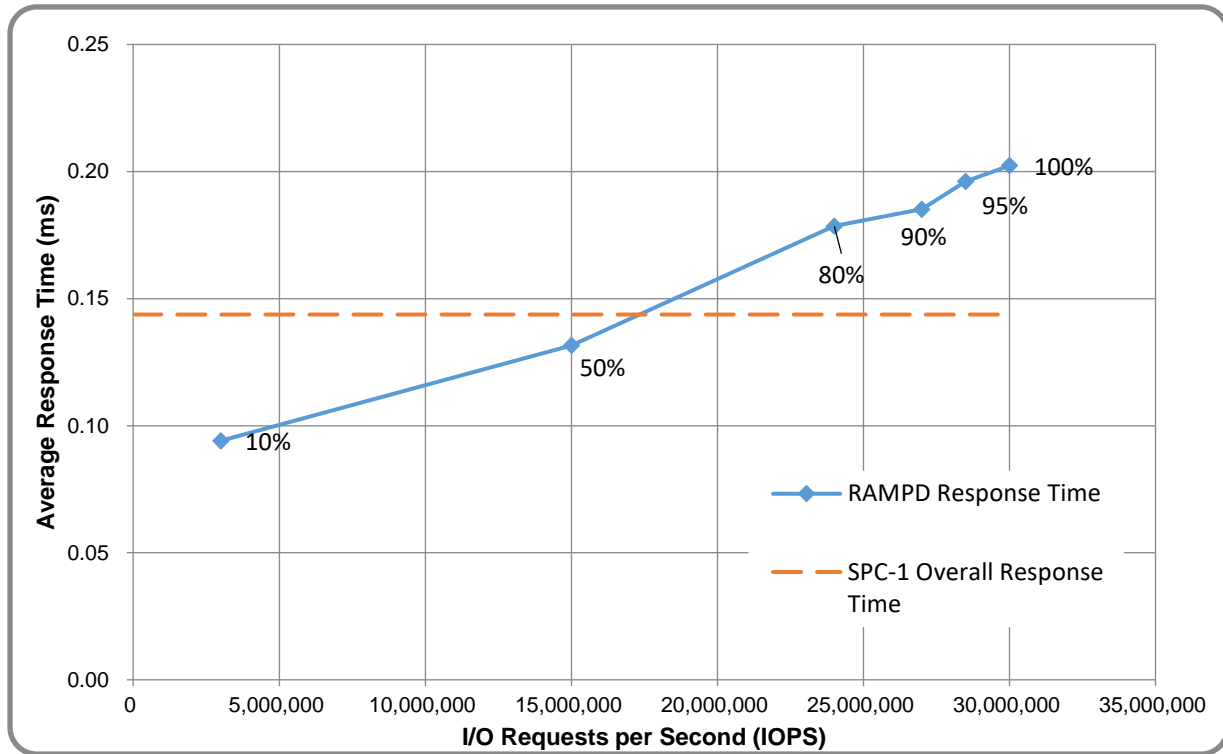
Measurement Intervals by Test Phase Graph

The following graph presents the average IOPS and the average Response Times measured over the MI of each Test Phase.



Response Time vs. Throughput Graph

The following graph presents the average Response Times versus the average IOPS for RAMPD_100 to RAMPD_10.



ASU Pre-Fill

The following table provides a summary of the Pre-Fill performed on the ASU prior to testing.

| ASU Pre-Fill Summary | | | |
|----------------------|--------------------|--|----------------|
| Start Time | 11-Feb-25 18:38:48 | Requested IOP Level | 240,000 MB/sec |
| End Time | 11-Feb-25 19:03:20 | Observed IOP Level | 186,723 MB/sec |
| Duration | 0:24:32 | For additional details see the Supporting Files. | |

SUSTAIN Test Phase

SUSTAIN – Results File

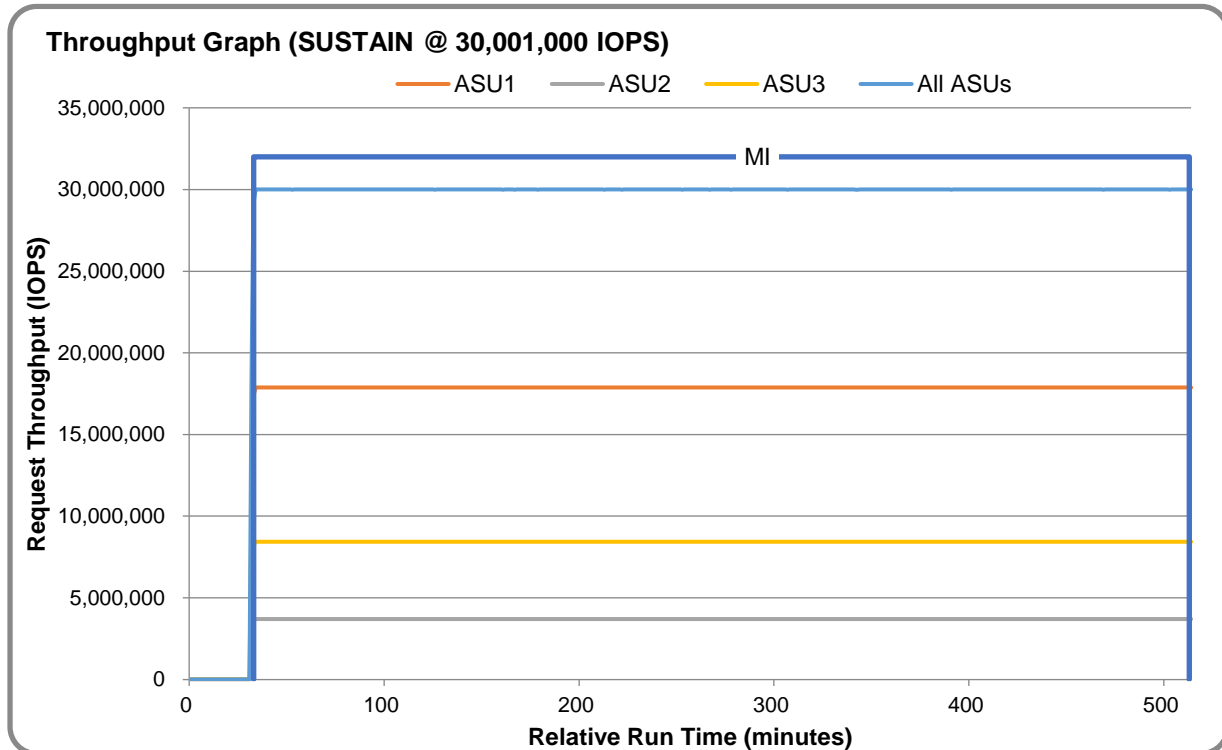
The results file generated during the execution of the SUSTAIN Test Phase is included in the Supporting Files (see [Appendix A](#)) as follows:

- SPC1_METRICS_0_Raw_Results.xlsx

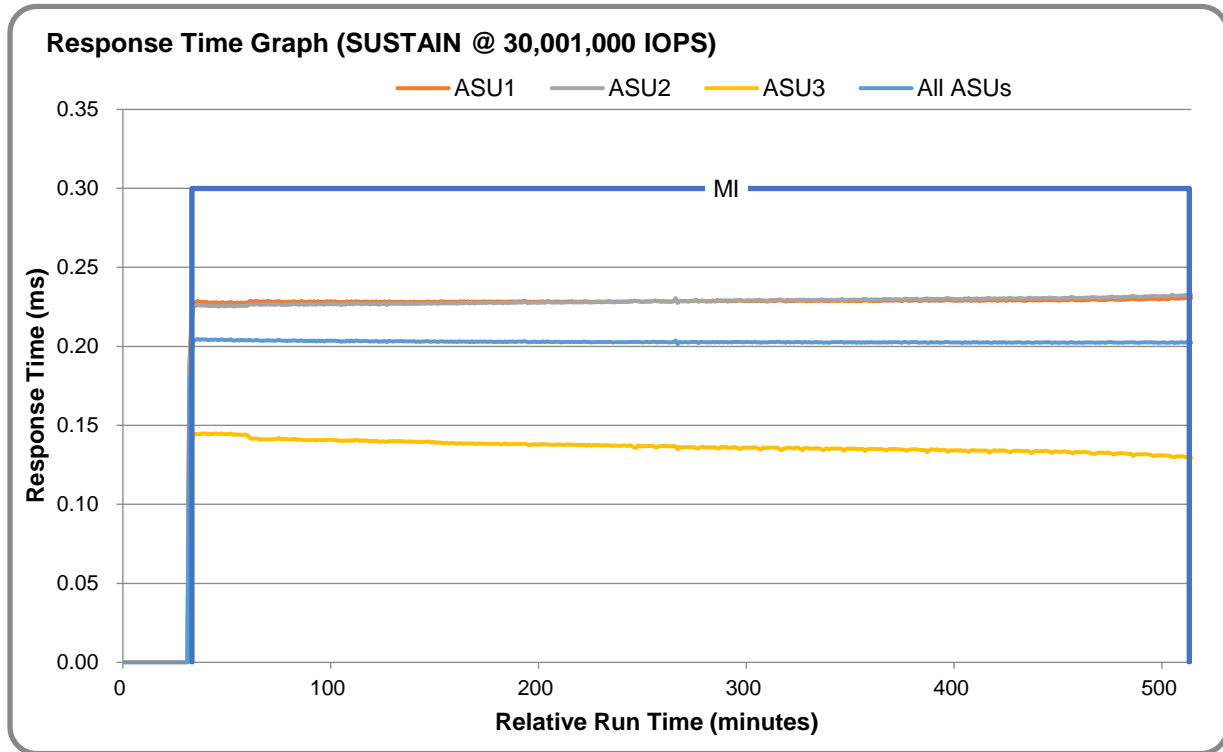
SUSTAIN – Execution Times

| Interval | Start Date & Time | End Date & Time | Duration |
|----------------------|--------------------|--------------------|----------|
| Transition Period | 11-Feb-25 19:40:50 | 11-Feb-25 19:43:50 | 0:03:00 |
| Measurement Interval | 11-Feb-25 19:43:50 | 12-Feb-25 03:43:52 | 8:00:02 |

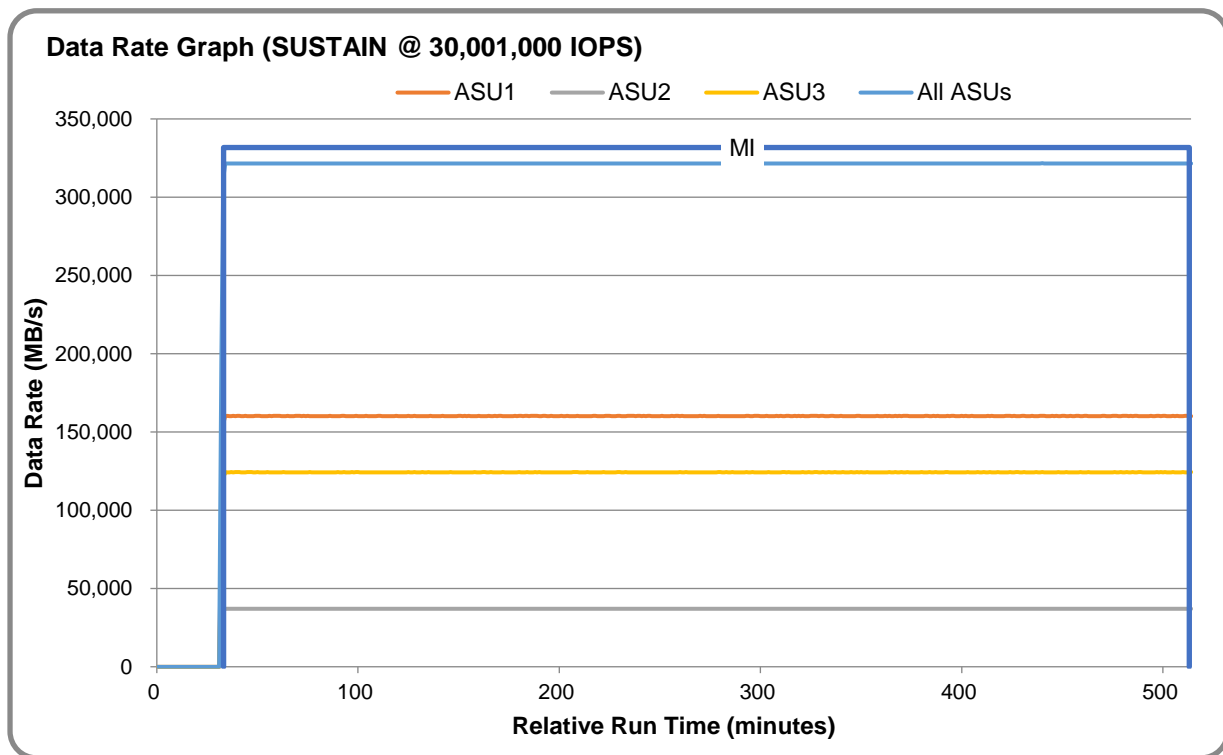
SUSTAIN – Throughput Graph



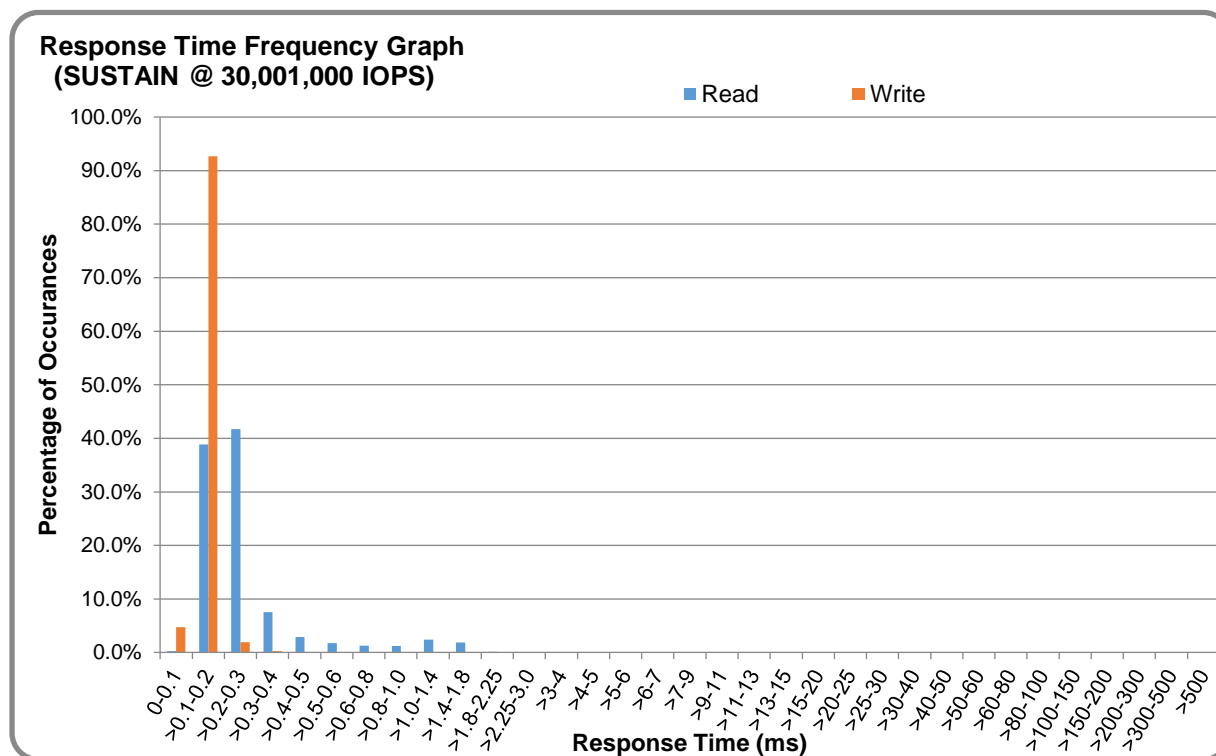
SUSTAIN – Response Time Graph



SUSTAIN – Data Rate Graph



SUSTAIN – Response Time Frequency Graph



SUSTAIN – Intensity Multiplier

The following table lists the targeted intensity multiplier (Defined), the measured intensity multiplier (Measured) for each I/O stream, its coefficient of variation (Variation), and the percentage of difference (Difference) between Defined and Measured.

| | ASU1-1 | ASU1-2 | ASU1-3 | ASU1-4 | ASU2-1 | ASU2-2 | ASU2-3 | ASU3-1 |
|-------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| Defined | 0.0350 | 0.2810 | 0.0700 | 0.2100 | 0.0180 | 0.0700 | 0.0350 | 0.2810 |
| Measured | 0.0350 | 0.2810 | 0.0700 | 0.2100 | 0.0180 | 0.0700 | 0.0350 | 0.2810 |
| Variation | 0.0001 | 0.0000 | 0.0001 | 0.0000 | 0.0002 | 0.0001 | 0.0001 | 0.0000 |
| Difference | 0.004% | 0.002% | 0.004% | 0.000% | 0.004% | 0.003% | 0.004% | 0.001% |

RAMPD_100 Test Phase

RAMPD 100 – Results File

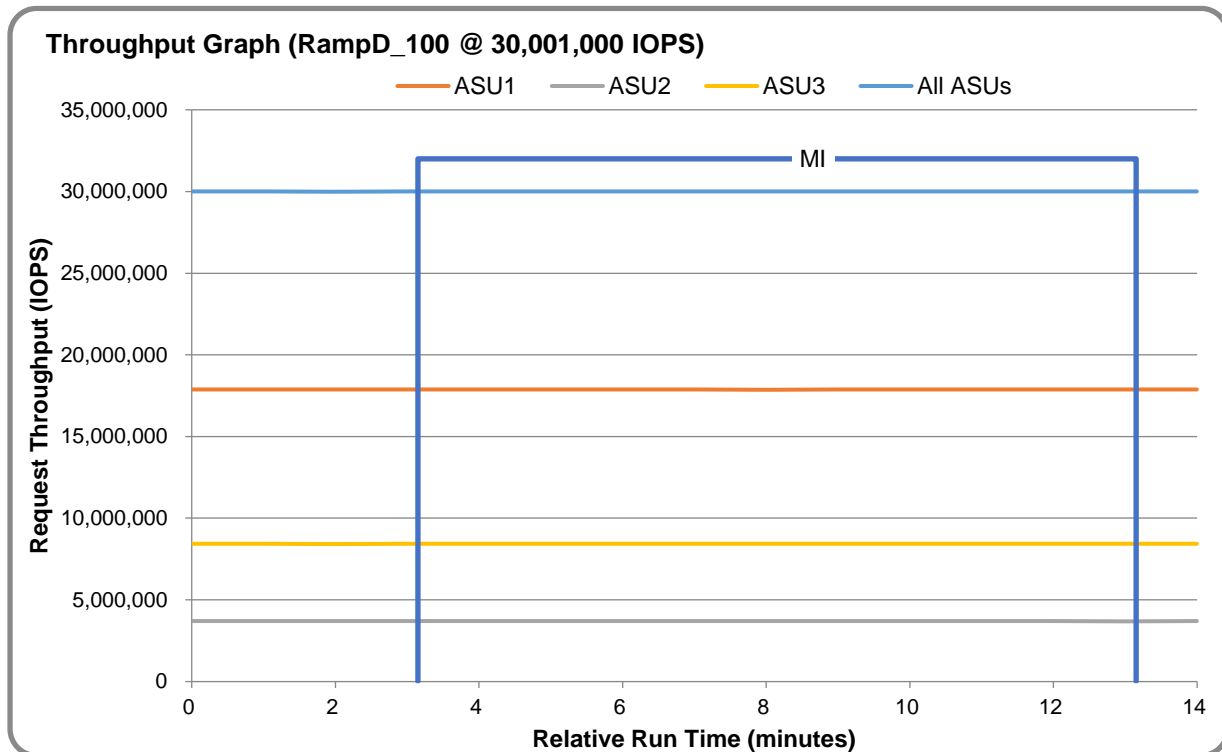
The results file generated during the execution of the RAMPD_100 Test Phase is included in the Supporting Files (see [Appendix A](#)) as follows:

- SPC1_METRICS_0_Raw_Results.xlsx

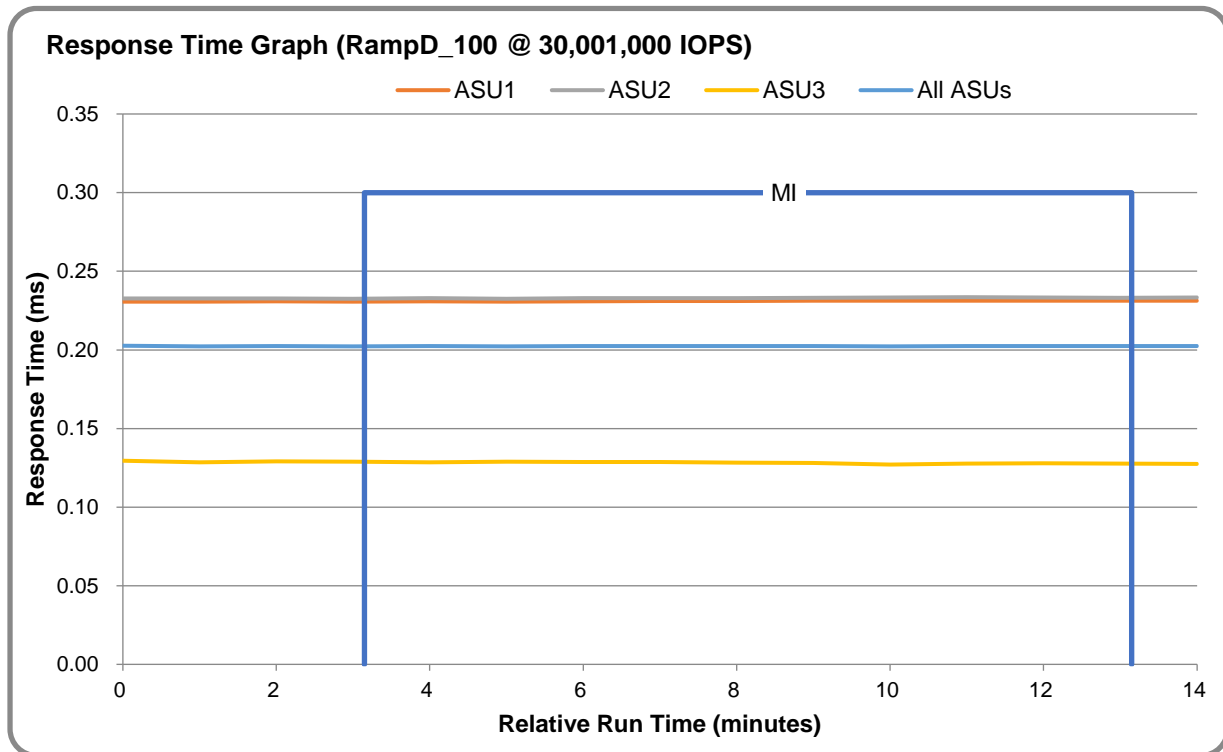
RAMPD 100 – Execution Times

| Interval | Start Date & Time | End Date & Time | Duration |
|----------------------|--------------------|--------------------|----------|
| Transition Period | 12-Feb-25 03:44:51 | 12-Feb-25 03:47:52 | 0:03:01 |
| Measurement Interval | 12-Feb-25 03:47:52 | 12-Feb-25 03:57:53 | 0:10:01 |

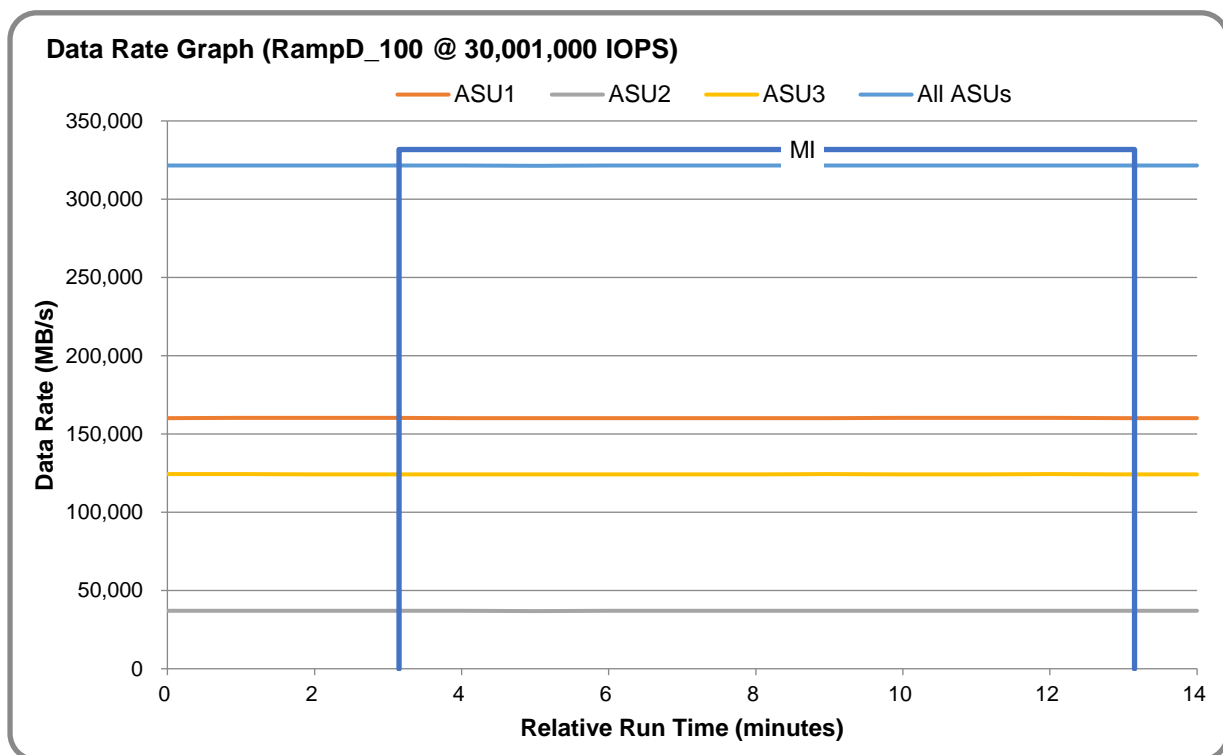
RAMPD 100 – Throughput Graph



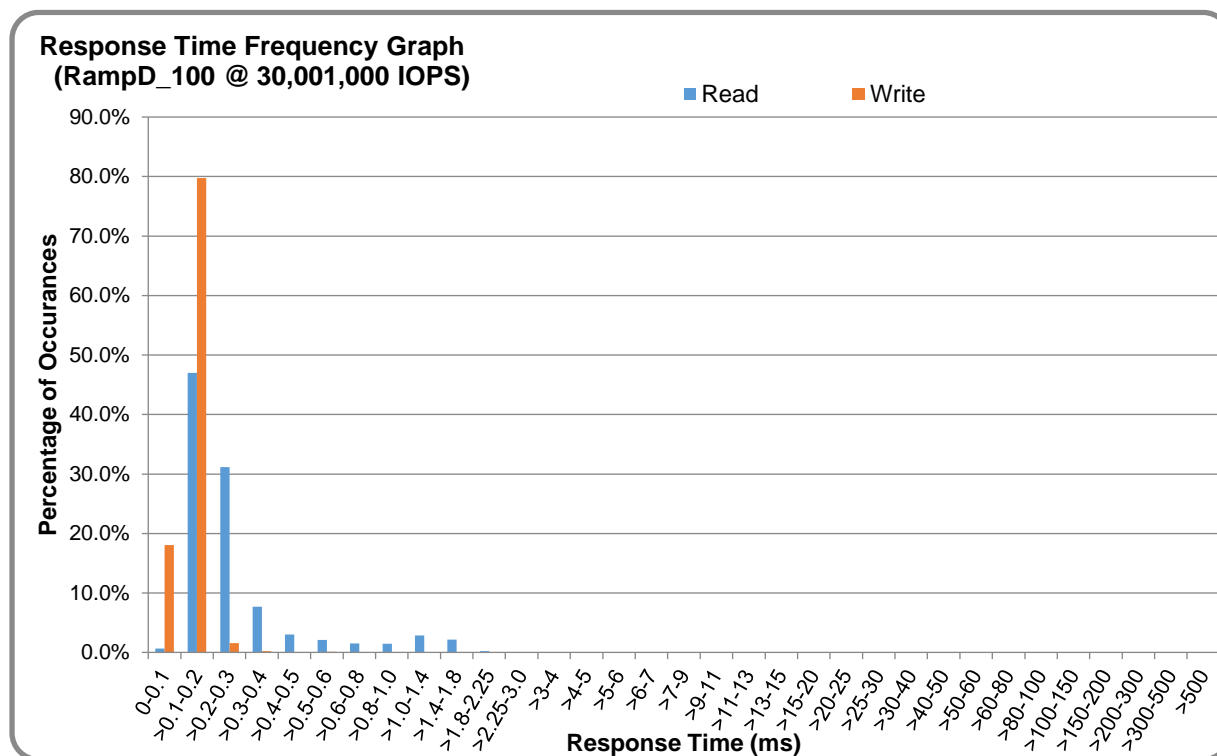
RAMPD 100 – Response Time Graph



RAMPD 100 – Data Rate Graph



RAMPD 100 – Response Time Frequency Graph



RAMPD 100 – Intensity Multiplier

The following table lists the targeted intensity multiplier (Defined), the measured intensity multiplier (Measured) for each I/O stream, its coefficient of variation (Variation), and the percentage of difference (Difference) between Defined and Measured.

| | ASU1-1 | ASU1-2 | ASU1-3 | ASU1-4 | ASU2-1 | ASU2-2 | ASU2-3 | ASU3-1 |
|-------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| Defined | 0.0350 | 0.2810 | 0.0700 | 0.2100 | 0.0180 | 0.0700 | 0.0350 | 0.2810 |
| Measured | 0.0350 | 0.2810 | 0.0700 | 0.2100 | 0.0180 | 0.0700 | 0.0350 | 0.2810 |
| Variation | 0.0001 | 0.0000 | 0.0001 | 0.0000 | 0.0002 | 0.0001 | 0.0001 | 0.0000 |
| Difference | 0.007% | 0.004% | 0.003% | 0.001% | 0.012% | 0.007% | 0.012% | 0.002% |

RAMPD 100 – I/O Request Summary

| | |
|--|----------------|
| I/O Requests Completed in the Measurement Interval | 18,001,638,370 |
| I/O Requests Completed with Response Time <= 30 ms | 18,001,624,323 |
| I/O Requests Completed with Response Time > 30 ms | 14,047 |

Response Time Ramp Test

Response Time Ramp Test – Results File

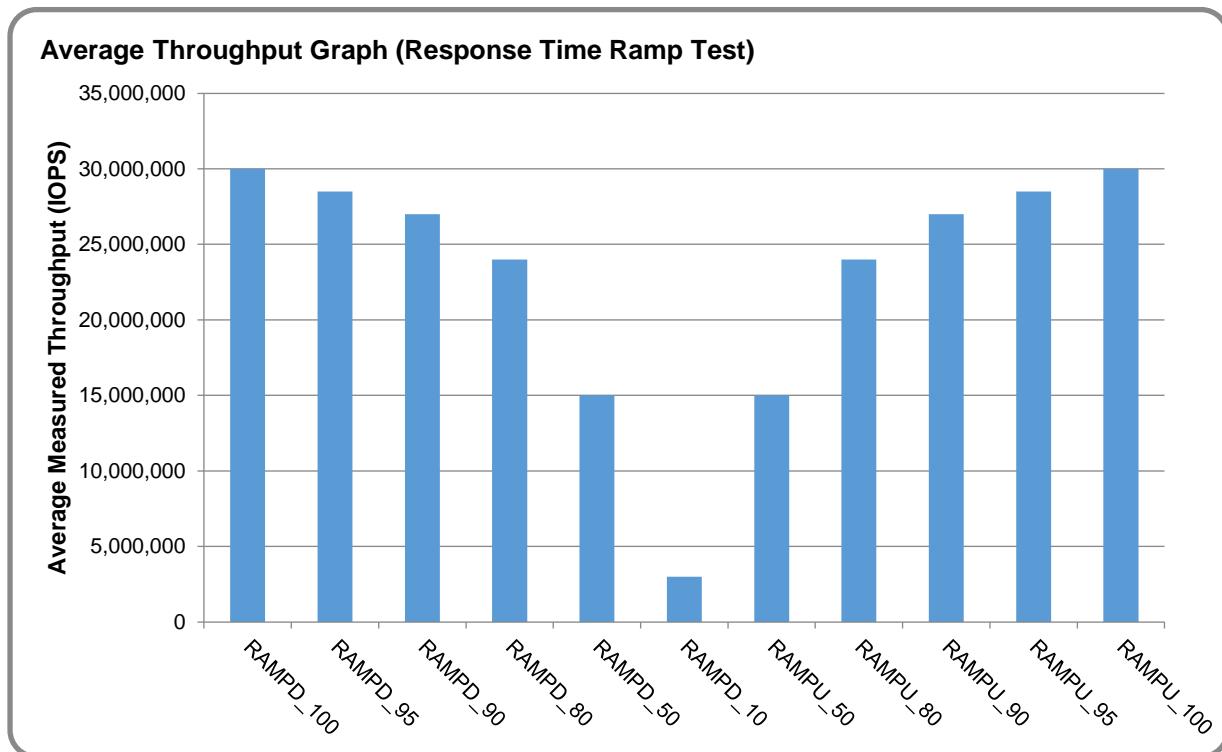
The results file generated during the execution of the Response Time Ramp Test is included in the Supporting Files (see [Appendix A](#)) as follows:

- **SPC1_METRICS_0_Raw_Results.xlsx**

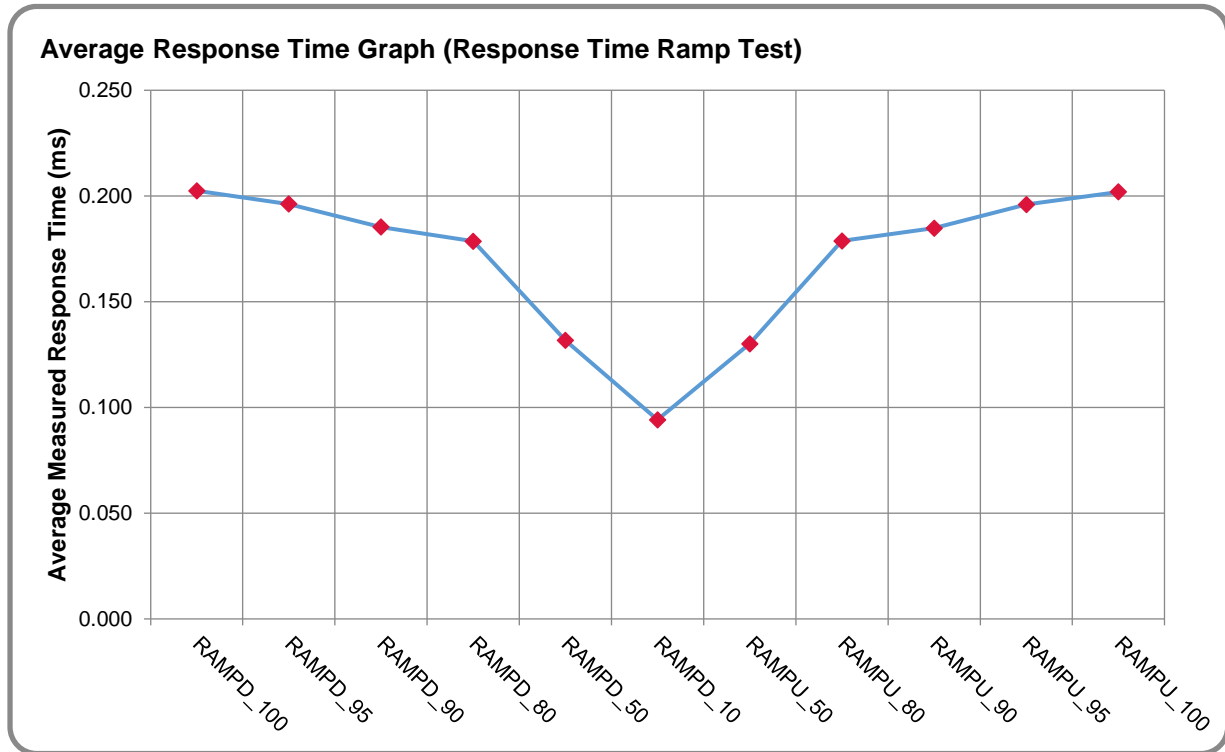
Response Time Ramp Test – Phases

The Response Time Ramp Test is comprised of 11 Test Phases, including six Ramp-Down Phases (executed at 100%, 95%, 90%, 80%, 50%, and 10% of the Business Scaling Unit) and five Ramp-Up Phases (executed at 50%, 80%, 90%, 95%, and 100% of the Business Scaling Unit).

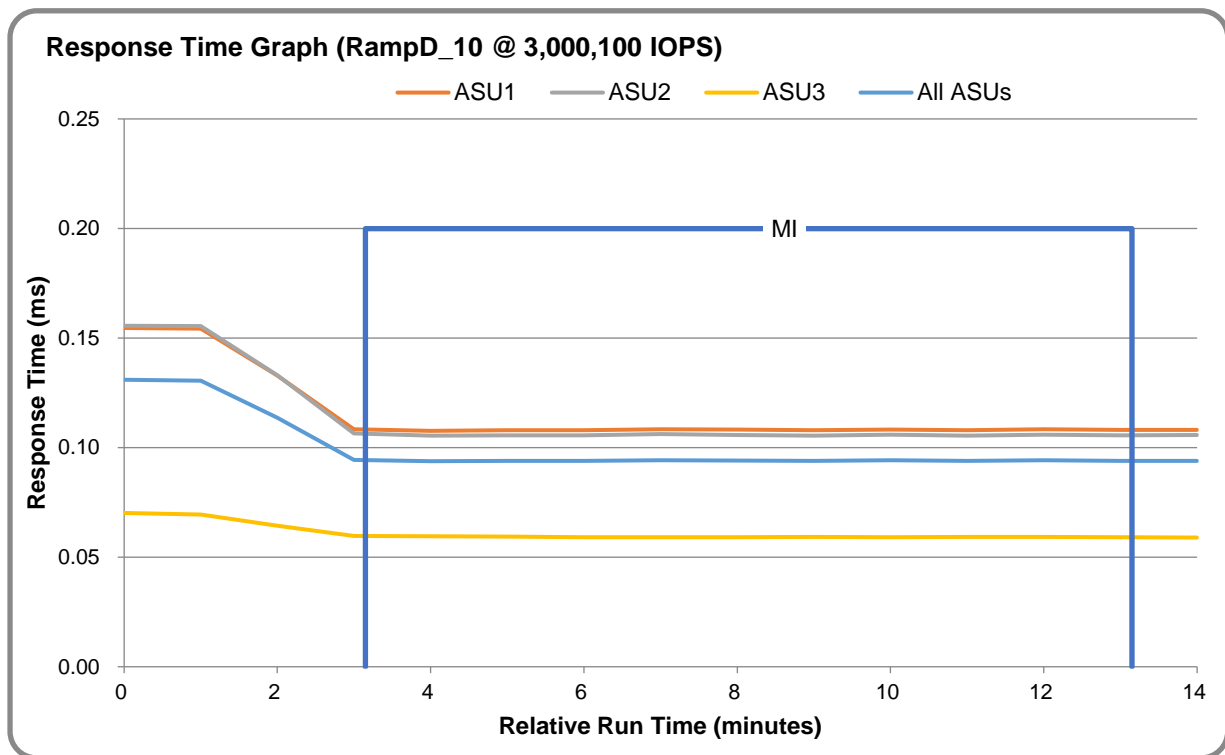
Response Time Ramp Test – Average Throughput Graph



Response Time Ramp Test – Average Response Time Graph



Response Time Ramp Test – RAMPD 10 Response Time Graph



Repeatability Test

Repeatability Test Results File

The results file generated during the execution of the Repeatability Test is included in the Supporting Files (see [Appendix A](#)) as follows:

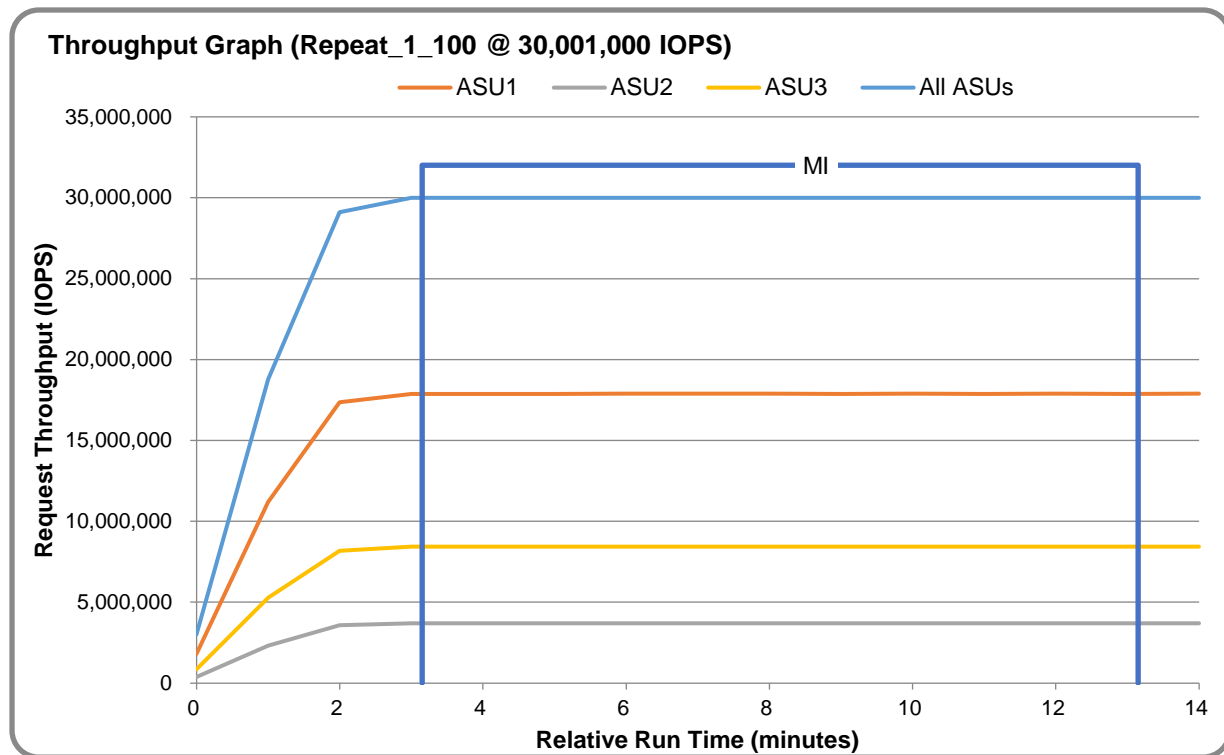
- **SPC1_METRICS_0_Raw_Results.xlsx**

Repeatability Test Results

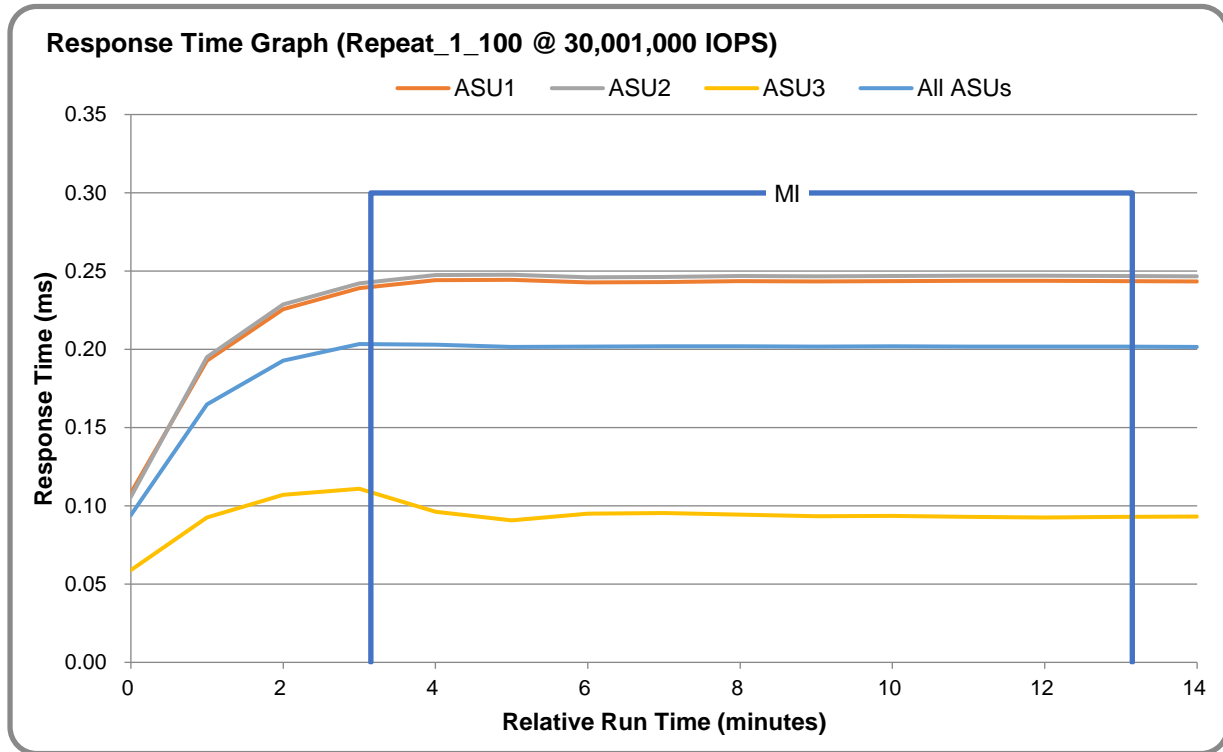
The throughput measurements for the Response Time Ramp Test (RAMPD) and the Repeatability Test Phases (REPEAT_1 and REPEAT_2) are listed in the table below.

| Test Phase | 100% IOPS | 10% IOPS |
|------------|--------------|-------------|
| RAMPD | 30,002,765.6 | 3,000,350.7 |
| REPEAT_1 | 30,002,861.3 | 3,000,136.9 |
| REPEAT_2 | 30,003,147.5 | 3,000,366.4 |

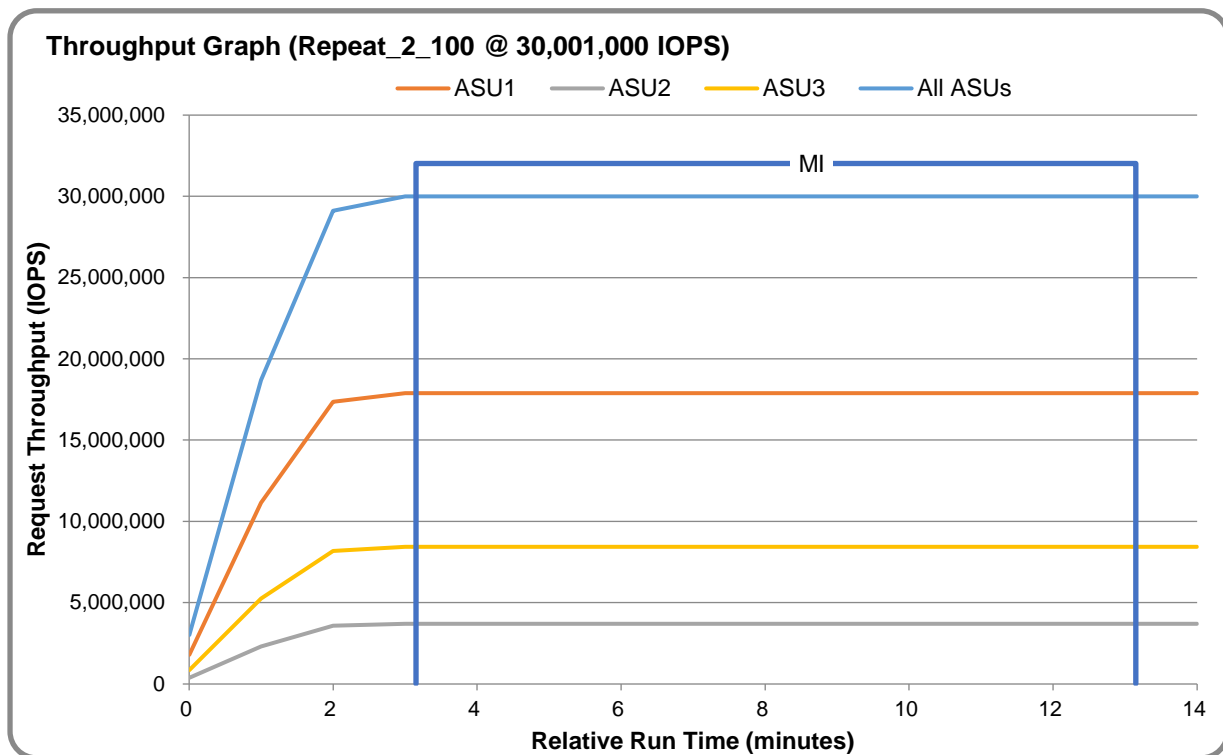
REPEAT 1 100 - Throughput Graph



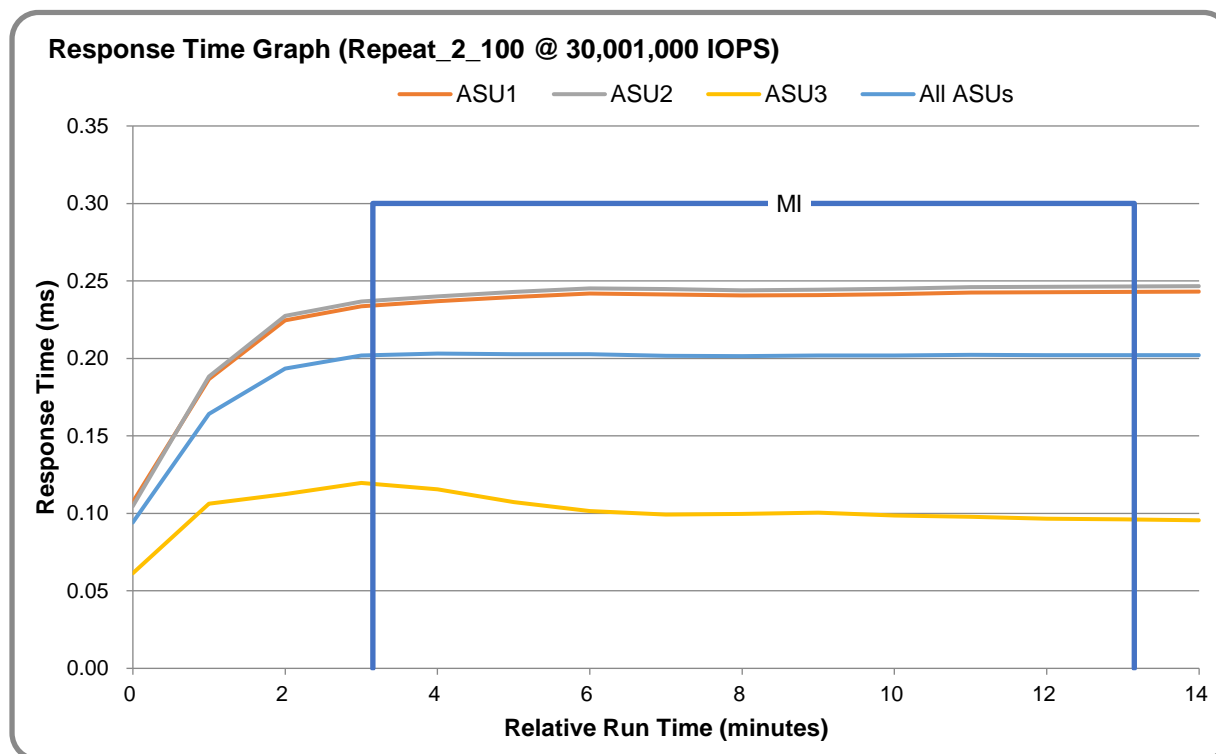
REPEAT 1 100 – Response Time Graph



REPEAT 2 100 – Throughput Graph



REPEAT 2 100 – Response Time Graph



Repeatability Test – Intensity Multiplier

The following tables lists the targeted intensity multiplier (Defined), the measured intensity multiplier (Measured) for each I/O stream, its coefficient of variation (Variation), and the percent of difference (Difference) between Defined and Measured.

REPEAT_1_100 Test Phase

| | ASU1-1 | ASU1-2 | ASU1-3 | ASU1-4 | ASU2-1 | ASU2-2 | ASU2-3 | ASU3-1 |
|-------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| Defined | 0.0350 | 0.2810 | 0.0700 | 0.2100 | 0.0180 | 0.0700 | 0.0350 | 0.2810 |
| Measured | 0.0350 | 0.2810 | 0.0700 | 0.2100 | 0.0180 | 0.0700 | 0.0350 | 0.2810 |
| Variation | 0.0001 | 0.0000 | 0.0001 | 0.0001 | 0.0003 | 0.0001 | 0.0001 | 0.0000 |
| Difference | 0.007% | 0.002% | 0.005% | 0.001% | 0.005% | 0.007% | 0.006% | 0.003% |

REPEAT_2_100 Test Phase

| | ASU1-1 | ASU1-2 | ASU1-3 | ASU1-4 | ASU2-1 | ASU2-2 | ASU2-3 | ASU3-1 |
|-------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| Defined | 0.0350 | 0.2810 | 0.0700 | 0.2100 | 0.0180 | 0.0700 | 0.0350 | 0.2810 |
| Measured | 0.0350 | 0.2810 | 0.0700 | 0.2100 | 0.0180 | 0.0700 | 0.0350 | 0.2810 |
| Variation | 0.0001 | 0.0000 | 0.0001 | 0.0000 | 0.0001 | 0.0001 | 0.0001 | 0.0000 |
| Difference | 0.002% | 0.003% | 0.008% | 0.004% | 0.006% | 0.006% | 0.021% | 0.001% |

Data Persistence Test

Data Persistence Test Results File

The results files generated during the execution of the Data Persistence Test is included in the Supporting Files (see [Appendix A](#)) as follows:

- **SPC1_PERSIST_1_0_Raw_Results.xlsx**
- **SPC1_PERSIST_2_0_Raw_Results.xlsx**

Data Persistence Test Execution

The Data Persistence Test was executed using the following sequence of steps:

- The PERSIST_1_0 Test Phase was executed to completion.
- The Benchmark Configuration was taken through an orderly shutdown process and powered off.
- The Benchmark Configuration was powered on and taken through an orderly startup process.
- The PERSIST_2_0 Test Phase was executed to completion.

Data Persistence Test Results

| Data Persistence Test Phase: Persist1 | |
|---|---------------|
| Total Number of Logical Blocks Written | 1,483,185,031 |
| Total Number of Logical Blocks Verified | 726,782,485 |
| Total Number of Logical Blocks Overwritten | 756,402,546 |
| Total Number of Logical Blocks that Failed Verification | 0 |
| Time Duration for Writing Test Logical Blocks (sec.) | 301 |
| Size in bytes of each Logical Block | 8,192 |
| Number of Failed I/O Requests in the process of the Test | 0 |

Committed Data Persistence Implementation

The storage system provides full pathway redundancy from the host to the SSD, ensuring data access is guaranteed despite any single component failure. Newly written data is stored in a cache with power retention capabilities before being conditionally flushed back to the storage pool for persistent storage. The storage pool utilizes RAID6.

The write cache has a Battery Backup Unit (BBU). If power is lost, the data that has not yet been persisted will be automatically persisted to the built-in SSD. Upon recovery, the data is automatically restored to memory, ensuring the consistency and integrity of the data.

APPENDIX A: SUPPORTING FILES

The following table details the content of the Supporting Files provided as part of this Full Disclosure Report.

| File Name | Description | Location |
|-------------------------------------|--|-----------------|
| /SPC1_RESULTS | Data reduction worksheets | root |
| SPC1_INIT_0_Raw_Results.xlsx | Raw results for INIT Test Phase | /SPC1_RESULTS |
| SPC1_METRICS_0_Quick_Look.xlsx | Quick Look Test Run Overview | /SPC1_RESULTS |
| SPC1_METRICS_0_Raw_Results.xlsx | Raw results for Primary Metrics Test | /SPC1_RESULTS |
| SPC1_METRICS_0_Summary_Results.xlsx | Primary Metrics Summary | /SPC1_RESULTS |
| SPC1_PERSIST_1_0_Raw_Results.xlsx | Raw results for PERSIST1 Test Phase | /SPC1_RESULTS |
| SPC1_PERSIST_2_0_Raw_Results.xlsx | Raw results for PERSIST2 Test Phase | /SPC1_RESULTS |
| SPC1_Run_Set_Overview.xlsx | Run Set Overview Worksheet | /SPC1_RESULTS |
| SPC1_VERIFY_0_Raw_Results.xlsx | Raw results for first VERIFY Test Phase | /SPC1_RESULTS |
| SPC1_VERIFY_1_Raw_Results.xlsx | Raw results for second VERIFY Test Phase | /SPC1_RESULTS |
| /C_Tuning | Tuning parameters and options | root |
| config_lvm.sh | LVM and Starpath tuning | /C_Tuning |
| /D_Creation | Storage configuration creation | root |
| create_lun.txt | Create the storage environment | /D_Creation |
| create_lvm.sh | Create logical volumes | /D_Creation |
| /E_Inventory | Configuration inventory | root |
| profile_lvm1.log | LVM config before INIT | /E_Inventory |
| profile_lvm2.log | LVM config before PERSIST 2 | /E_Inventory |
| profile_storage1.log | Storage config before INIT | /E_Inventory |
| profile_storage2.log | Storage config before PERSIST 2 | /E_Inventory |
| /F_Generator | Workload generator | root |
| ADV_48host.HST | Host configuration file | /F_generator |
| spc1_run.sh | Run all tests | /F_generator |
| star_asu.asu | Define LUNs hosting the ASUs | /F_generator |

APPENDIX B: THIRD PARTY QUOTATION

All components are available directly through the Test Sponsor (Sugon).

APPENDIX C: TUNING PARAMETERS AND OPTIONS

The following file(s) in the Supporting Files (see [Appendix A](#)) contain all necessary steps to set options and tune the TSC.

- `config_lvm.sh`

APPENDIX D: STORAGE CONFIGURATION CREATION

The following file(s) in the Supporting Files (see [Appendix A](#)) contain all necessary steps to create the storage configuration in the TSC.

- create_lun.txt
- create_lvm.sh

APPENDIX E: CONFIGURATION INVENTORY

The following file(s) in the Supporting Files (see [Appendix A](#)) contain the commands used and the output produced for the inventory of the storage configuration.

- profile_lvm1.log
- profile_lvm2.log
- profile_storage1.log
- profile_storage2.log

APPENDIX F: WORKLOAD GENERATOR

The ASUs accessed by the SPC-1 workload generator were defined in the script `star_asu.asu`.
The hosts used to drive the SPC-1 workload were defined using the script `ADV_48host.HST`.
The script used to execute the benchmark sequence was `spc1_run.sh`.