SPC BENCHMARK 1™
FULL DISCLOSURE REPORT

SUN MICROSYSTEMS, INC.
SUN STOREDGE™ 6130 ARRAY

SPC-1 V1.9

Submitted for Review: April 29, 2005
Submission Identifier: A00040
Revised: May 10, 2006
Accepted: June 28, 2006

First Edition – April 2005

Trademarks

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Notes

The following terms, used in this document, are defined as:

- Kilobyte (KB) is equal to 1,000 (10^3) bytes.
- Megabyte (MB) is equal to 1,000,000 (10^6) bytes.
- Gigabyte (GB) is equal to 1,000,000,000 (10^9) bytes.
- Terabyte (TB) is equal to 1,000,000,000,000 (10^{12}) bytes.
- A petabyte (PB) is equal to 1,000,000,000,000,000 (10^{15}) bytes.
- An exabyte (EB) is equal to 1,000,000,000,000,000,000 (10^{18}) bytes.

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AUDIT CERTIFICATION

Leah Schoeb
Sun Microsystems, Inc.
5300 Riata Park Court AUS08
Austin, TX 78721

April 27, 2005

The SPC Benchmark 1™ results listed below for the Sun StorEdge™ 6130 Array were produced in compliance with the SPC Benchmark 1™ V1.9 Onsite Audit requirements.

SPC Benchmark 1™ V1.9 Results	
Tested Storage Configuration (TSC) Name: Sun StorEdge™ 6130 Array	
Metric	**Reported Result**
SPC-1 IOPS™	8,394.40
SPC-1 Price-Performance	$11.16/SPC-1 IOPS™
Total ASU Capacity	692.000 GB
Data Protection Level	Mirroring
Total TSC Price (including three-year maintenance)	$93,673.00

The following SPC Benchmark 1™ Onsite Audit requirements were reviewed and found compliant with V1.9 of the SPC Benchmark 1™ specification:

- A Letter of Good Faith, signed by a senior executive.
- The following Data Repository storage items were verified by physical inspection and information supplied by Sun Microsystems, Inc.:
  - ✓ Physical Storage Capacity and requirements.
  - ✓ Configured Storage Capacity and requirements.
  - ✓ Addressable Storage Capacity and requirements.
  - ✓ Capacity of each Logical Volume and requirements.
  - ✓ Capacity of each Application Storage Unit (ASU) and requirements.
- An appropriate diagram of the Benchmark Configuration (BC)/Tested Storage Configuration (TSC).
- Physical verification of the components to mach the above diagram.

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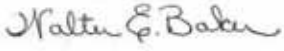
- Listings and commands to configure the Benchmark Configuration/Tested Storage Configuration, including customer tunable parameters.
- Commands and parameters used to configure the SPC-1 Workload Generator.
- The following Host System requirements were verified by physical inspection and information supplied by Sun Microsystems, Inc.:
  - ✓ The type of Host System including the number of processors and main memory.
  - ✓ The presence and version number of the Workload Generator on the Host System.
  - ✓ The TSC boundary within the Host System.
- The execution of each Test, Test Phase, and Test Run was observed and found compliant with all of the requirements and constraints of Clauses 4 and 5 of the SPC-1 Benchmark Specification.
- The Test Results Files and resultant Summary Results Files received for each of following were authentic, accurate, and compliant with all of the requirements and constraints of Clauses 4 and 5 of the SPC-1 Benchmark Specification:
  - ✓ Data Persistence Test
  - ✓ Sustainability Test Phase
  - ✓ IOPS Test Phase
  - ✓ Response Time Ramp Test Phase
  - ✓ Repeatability Test
- The difference between the Tested Storage Configuration (TSC) used for the benchmark and Priced Storage Configuration is noted below.
- The final version of the pricing spreadsheet met all of the requirements and constraints of Clause 8 of the SPC-1 Benchmark Specification.
- The Full Disclosure Report (FDR) met all of the requirements in Clause 9 of the SPC-1 Benchmark Specification.

Audit Notes:

The Tested Storage Configuration was configured with two (2) dual-port HBAs and used both ports in each HBA. The Priced Storage Configuration substituted four (4) single port HBAs for the two (2) dual-port HBAs. If the single port HBAs had been used in the Tested Storage Configuration, they would not have contributed to any measurable performance difference.

Respectfully,



Walter E. Baker
SPC Auditor

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LETTER OF GOOD FAITH

Sun Microsystems, Inc.
7777 Gateway Blvd, Newark. Ca. 94560

Date: 4/22/05

From: Kathleen Holmgren

To: Walter Baker

Subject: SPC-1 Letter of Good Faith for the StorEdge™ 6130

Sun Microsystems Inc. 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 V1.9 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.

Signed:

Kathleen Holmgren
Senior Vice President, Product Line Management Network Storage

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

Test Sponsor and Contact Information	
Test Sponsor Primary Contact	Sun Microsystems, Inc. – http://www.sun.com Leah Schoeb – leah.schoeb@sun.com 5300 Riata Park Court AUS08 Austin, TX 78721 Phone: (512) 401-1227 FAX: (512) 266-2523
Test Sponsor Alternate Contact	Sun Microsystems, Inc. – http://www.sun.com Jason Schaffer – Jason.schaffer@sun.com 7777 Gateway Blvd. 7, UNWK16 Newark CA Phone: (510) 936-2979 FAX: (510) 936-2323
Auditor	Storage Performance Council – http://www.StoragePerformance.org Walter E. Baker – AuditService@StoragePerformance.org 643 Bair Island Road, Suite 103 Redwood City, CA 94063 Phone: (650) 556-9384 FAX: (650) 556-9385

Revision Information and Key Dates

Revision Information and Key Dates	
SPC-1 Specification revision number	V1.9
SPC-1 Workload Generator revision number	V2.00.04a
Date Results were first used publicly	April 29, 2005
Date FDR was submitted to the SPC	April 29, 2005
Date revised FDR was submitted to the SPC The initial FDR was prepared using a V1.8 template rather than a V1.9 template. This revision updates the document to comply with the reporting requirements for V1.9:	May 10, 2005
Date the TSC is/was available for shipment to customers	May 18, 2005
Date the TSC completed audit certification	April 27, 2005

Summary of Results

SPC-1 Results	
Tested Storage Configuration (TSC) Name: Sun StorEdge™ 6130 Array	
Metric	**Reported Result**
SPC-1 IOPS™	8,394.40
SPC-1 Price-Performance	$11.16/SPC-1 IOPS™
Total ASU Capacity	692.00 GB
Data Protection Level	Mirroring
Total TSC Price (including three-year maintenance)	$93,673

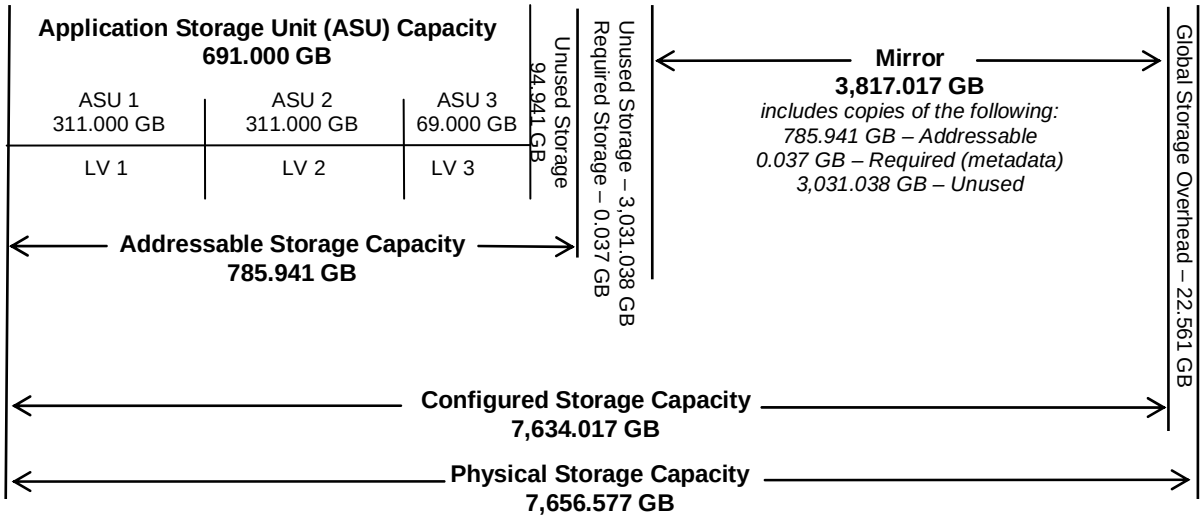
SPC-1 IOPS™ represents the maximum I/O Request Throughput at the 100% load point.

Total ASU (Application Storage Unit) **Capacity** represents the total storage capacity read and written in the course of executing the SPC-1 benchmark.

A **Data Protection Level** of Mirroring configures two or more identical copies of user data.

Storage Capacities and Relationships

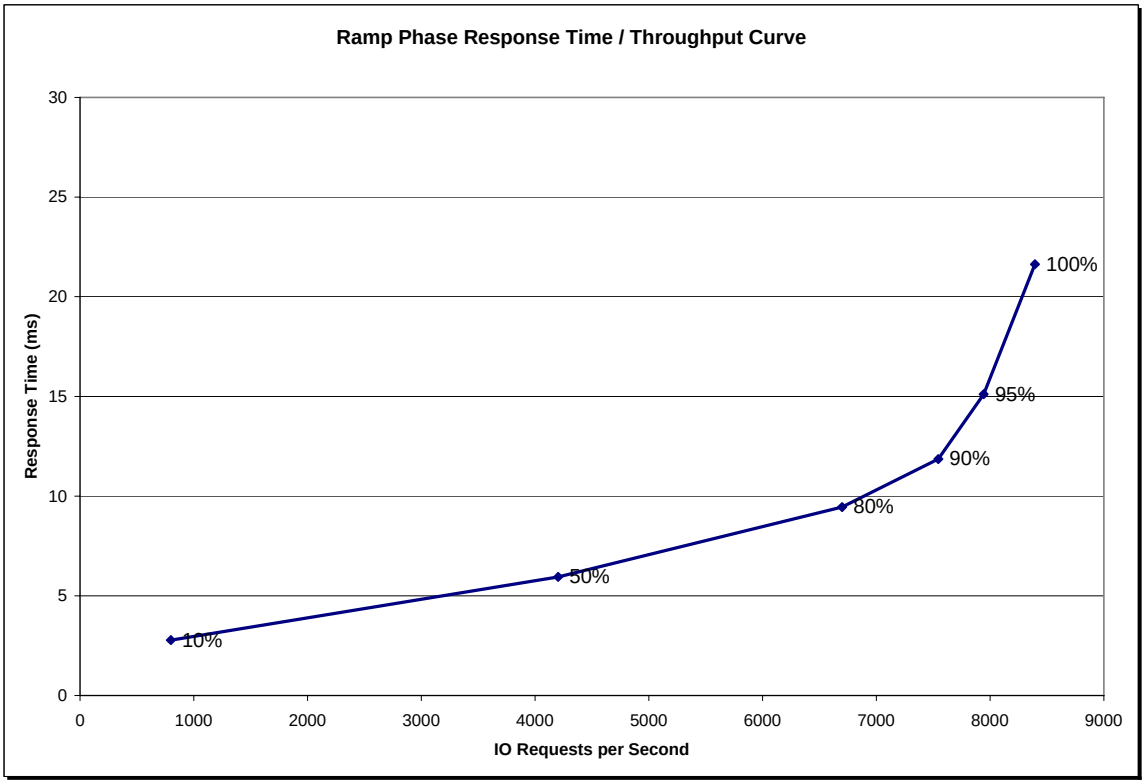
The following diagram documents the various storage capacities, used in this benchmark, and their relationships.



Response Time – Throughput Curve

The Response Time-Throughput Curve illustrates the Average Response Time (milliseconds) and I/O Request Throughput at 100%, 95%, 90%, 80%, 50%, and 10% of the workload level used to generate the SPC-1 IOPS™ metric.

The Average Response Time measured at any of the above load points cannot exceed 30 milliseconds or the benchmark measurement is invalid.



Response Time – Throughput Data

	10% Load	50% Load	80% Load	90% Load	95% Load	100% Load
I/O Request Throughput	798.83	4,203.51	6,699.85	7,545.28	7,944.25	8,394.40
Average Response Time (ms):						
All ASUs	2.78	5.95	9.45	11.86	15.12	21.63
ASU-1	3.37	6.98	11.04	13.55	16.43	23.34
ASU-2	2.93	6.16	9.95	12.69	16.60	22.52
ASU-3	1.45	3.67	5.86	7.90	11.68	17.58
Reads	4.90	9.55	15.02	18.14	21.34	29.42
Writes	1.40	3.61	5.82	7.77	11.06	16.55

Tested Storage Configuration Pricing *(Priced Storage Configuration)*

Part Number	Description	Quantity	US List	Total	discount	Ave. Price
XTA6130R11A2V1022	Dual Controller with 1022G-1x1x14x73G V-RR	1	$66,995	$66,995	38%	$41,537
XTACSM1R01A0V1022	FC Expansion tray SE CSM100-1022G-0x1x14x73G V-RR	1	$35,995	$35,995	38%	$22,317
XTACSM1R01A0Y5600	SATA expansion tray (0x1 14x400G-SATA)	1	$28,495	$28,495	38%	$17,667
X6767A	2Gb PCI Single FC Host Based Adapter	4	$4,900	$19,600	38%	$12,152
Total				**$151,085**		**$93,673**

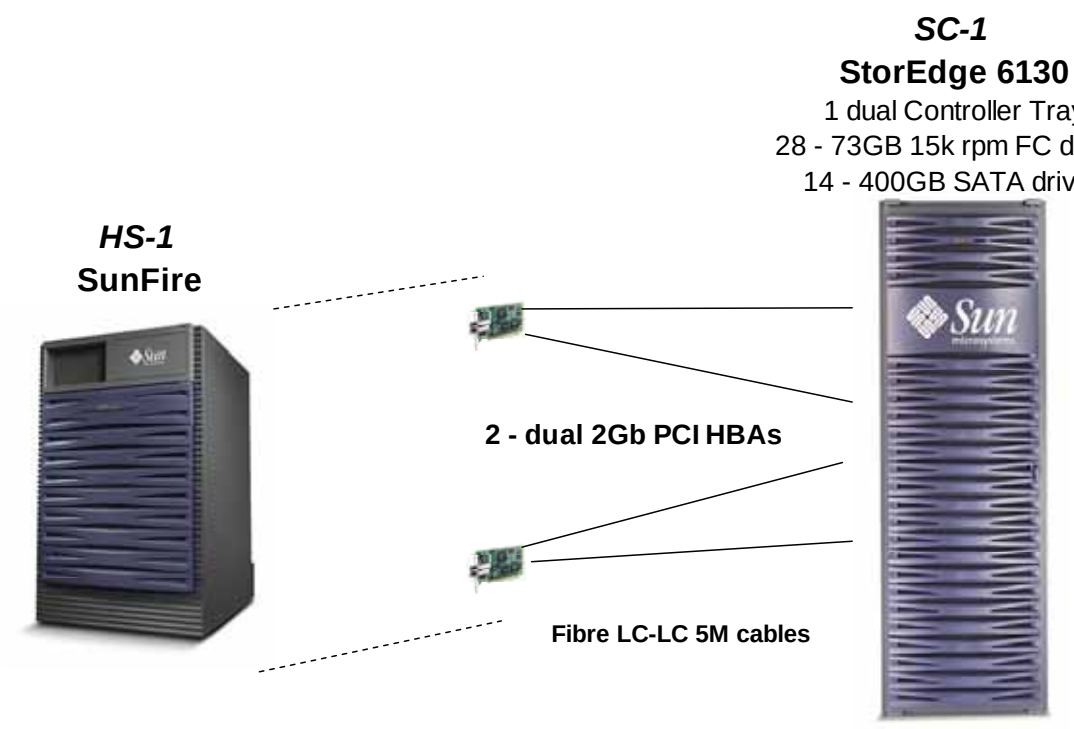
Three year "Gold Service" System Maintenance is included, which provides the following:

- 7 days per week, 24 hours per day coverage.
- Acknowledgement of new and existing problems within four hours.
- Onsite presence of a qualified maintenance engineer or provision of a customer replaceable part within four hours of the above acknowledgement for any hardware failure that results in an inoperative Priced Storage Configuration component. In either of the two cases, the remedy will result in resumption of operation.

Differences between the Tested Storage Configuration (TSC) and Priced Storage Configuration

The Tested Storage Configuration was configured with two (2) dual-port HBAs and used both ports in each HBA. The Priced Storage Configuration substituted four (4) single port HBAs for the two (2) dual-port HBAs. If the single port HBAs had been used in the Tested Storage Configuration, they would not have contributed to any measurable performance difference.

Benchmark Configuration/Tested Storage Configuration Diagram



Host System:	Tested Storage Configuration (TSC):
UID=HS-1	2 – 2 GB FC Dual PCI HBAs
Sun Fire™ V440:	***UID=SC-1:***
4 – UltraSPARC™ III 1062 MHz CPUs 8 MB EEC external cache per CPU	Sun StorEdge™ 6130 FC Array: 1 – dual controller 2 GB cache 4 – 2 Gb LC-SFF Fibre Channel host ports
8 GB – main memory	
Solaris 10 FCS	
WG	28 – 73 GB 15k rpm FC disk drives
	14 – 400 GB 7200 rpm SATA disk drives

CONFIGURATION INFORMATION

Benchmark Configuration (BC)/Tested Storage Configuration (TSC) Diagram

Clause 9.2.4.4.1

A one page Benchmark Configuration (BC)/Tested Storage Configuration (TSC) diagram shall be included in the Executive Summary…

The Benchmark Configuration (BC)/Tested Storage Configuration (TSC) is illustrated on page 13 *(Benchmark Configuration/Tested Storage Configuration Diagram).*

Storage Network Configuration

Clause 9.2.4.4.1

…

5. *If the TSC contains network storage, the diagram will include the network configuration. If a single diagram is not sufficient to illustrate both the Benchmark Configuration and network configuration in sufficient detail, the Benchmark Configuration diagram will include a high-level network illustration as shown in Figure 9-8. In that case, a separate, detailed network configuration diagram will also be included as described in Clause 9.2.4.4.2.*

Clause 9.2.4.4.2

If a storage network was configured as a part of the Tested Storage Configuration and the Benchmark Configuration diagram described in Clause 9.2.4.4.1 contains a high-level illustration of the network configuration, the Executive Summary will contain a one page topology diagram of the storage network as illustrated in Figure 9-9.

The Benchmark Configuration (BC)/Tested Storage Configuration (TSC) was configured with local storage and, as such, did not employ a storage network.

Host System Configuration

Clause 9.2.4.4.3

The FDR shall minimally contain, for each Host System running the Workload Generator, a listing of the following:

1. *Number and type of CPUs.*
2. *Main memory capacity.*
3. *Cache memory capacity.*
4. *Number and type of disk controllers or Host Bus Adapters.*

The details of the Host System configuration may be found on page 13 *(Benchmark Configuration/Tested Storage Configuration Diagram).*

Customer Tunable Parameters and Options

Clause 9.2.4.5.1

All Benchmark Configuration (BC) components with customer tunable parameter and options that have been altered from their default values must be listed in the FDR. The FDR entry for each of those components must include both the name of the component and the altered value of the parameter or option. If the parameter name is not self-explanatory to a knowledgeable practitioner, a brief description of the parameter's use must also be included in the FDR entry.

"Appendix A: Customer Tunable Parameters and Options" on page 67 contains the customer tunable parameters and options that have been altered from their default values for this benchmark.

Tested Storage Configuration (TSC) Description

Clause 9.2.4.5.2

The FDR must include sufficient information to recreate the logical representation of the TSC. In addition to customer tunable parameters and options (Clause 4.2.4.5.3), that information must include, at a minimum:

- *A diagram and/or description of the following:*
  - *All physical components that comprise the TSC. Those components are also illustrated in the BC Configuration Diagram in Clause 9.2.4.4.1 and/or the Storage Network Configuration Diagram in Clause 9.2.4.4.2.*
  - *The logical representation of the TSC, configured from the above components that will be presented to the Workload Generator.*
- *Listings of scripts used to create the logical representation of the TSC.*
- *If scripts were not used, a description of the process used with sufficient detail to recreate the logical representation of the TSC.*

"Appendix B: Tested Storage Configuration (TSC) Creation" on page 69 contains the detailed information that describes how to create and configure the logical TSC.

SPC-1 Workload Generator Storage Configuration

Clause 9.2.4.5.3

The FDR must include all SPC-1 Workload Generator storage configuration commands and parameters.

The SPC-1 Workload Generator storage configuration commands and parameters for this measurement appear in "Appendix C: SPC-1 Workload Generator Storage Commands and Parameters" on page 72.

DATA REPOSITORY

Definitions

Total ASU Capacity: The total storage capacity read and written in the course of executing the SPC-1 benchmark.

Application Storage Unit (ASU): The logical interface between the storage and SPC-1 Workload Generator. The three ASUs (Data, User, and Log) are typically implemented on one or more Logical Volume.

Logical Volume: The division of Addressable Storage Capacity into individually addressable logical units of storage used in the SPC-1 benchmark. Each Logical Volume is implemented as a single, contiguous address space.

Addressable Storage Capacity: The total storage (sum of Logical Volumes) that can be read and written by application programs such as the SPC-1 Workload Generator.

Configured Storage Capacity: This capacity includes the Addressable Storage Capacity and any other storage (parity disks, hot spares, etc.) necessary to implement the Addressable Storage Capacity.

Physical Storage Capacity: The formatted capacity of all storage devices physically present in the Tested Storage Configuration (TSC).

Data Protection Overhead: The storage capacity required to implement the ECC data protection.

Required Storage: The amount of Configured Storage Capacity required to implement the Addressable Storage Configuration, excluding the storage required for the three ASUs.

Global Storage Overhead: The amount of Physical Storage Capacity that is required for storage subsystem use and unavailable for use by application programs.

Total Unused Storage: The amount of storage capacity available for use by application programs but not included in the Total ASU Capacity.

Storage Capacities and Relationships

Two tables and an illustration documenting the storage capacities and relationships of the SPC-1 Storage Hierarchy (Clause 2.1) shall be included in the FDR.

SPC-1 Storage Capacities

SPC-1 Storage Capacities		
Storage Hierarchy Component	**Units**	**Capacity**
Total ASU Capacity	Gigabytes (GB)	691.000
Addressable Storage Capacity	Gigabytes (GB)	785.942
Configured Storage Capacity	Gigabytes (GB)	7,634.017
Physical Storage Capacity	Gigabytes (GB)	7,656.577
Data Protection (mirror)	Gigabytes (GB)	3,817.017
Required Storage	Gigabytes (GB)	0.037
Global Storage Overhead	Gigabytes (GB)	22.561
Total Unused Storage	Gigabytes (GB)	6,251.958

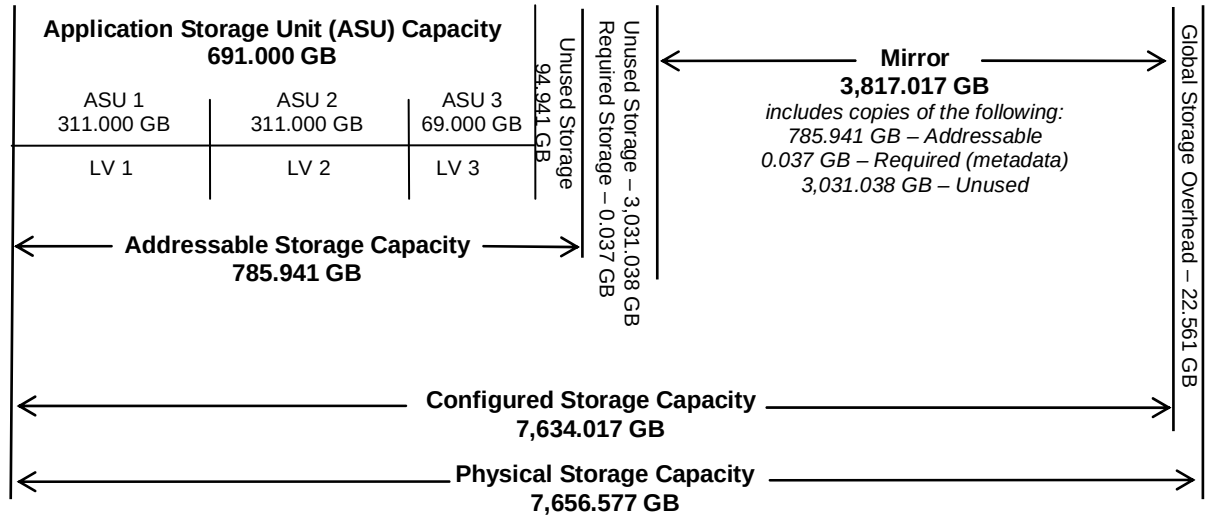
SPC-1 Storage Hierarchy Ratios

	Addressable Storage Capacity	Configured Storage Capacity	Physical Storage Capacity
Total ASU Capacity	87.92%	9.05%	9.02%
Required for Data Protection (Mirroring)		50.00%	49.85%
Addressable Storage Capacity		10.30%	10.26%
Required Storage		0.00%	0.00%
Configured Storage Capacity			99.71%
Global Storage Overhead			0.29%
Unused Storage:			
Addressable	12.08%		
Configured		80.65%	
Physical			0.00%

The Physical Storage Capacity consisted of 7,656.577 GB distributed over 28 fibre channel and 14 SATA disk drives. The formatted capacity of each fibre channel drive was 72.408 GB. The formatted capacity of each SATA disk drive was 400.083 GB. There was 0.000 GB (0.00%) of Unused Storage within the Physical Storage Capacity. Global Storage Overhead consisted of 22.561 GB (0.29%) of Physical Storage Capacity. There was 6,157.017 GB (80.65%) of Unused Storage within the Configured Storage Capacity. The Total ASU Capacity utilized 87.92% of the Addressable Storage Capacity resulting in 94.941 GB (12.08%) of Unused Storage within the Addressable Storage Capacity.

SPC-1 Storage Capacities and Relationships Illustration

The various storage capacities configured in the benchmark result are illustrated below (not to scale).



Logical Volume Capacity and ASU Mapping

Clause 9.2.4.6.2

A table illustrating the capacity of each ASU and the mapping of Logical Volumes to ASUs shall be provided in the FDR. … Logical Volumes shall be sequenced in the table from top to bottom per its position in the contiguous address space of each ASU. The capacity of each Logical Volume shall be stated. … In conjunction with this table, the Test Sponsor shall provide a complete description of the type of data protection (see Clause 2.4.5) used on each Logical Volume.

Logical Volume Capacity and Mapping		
ASU-1 (311.000 GB)	**ASU-2 (311.000 GB)**	**ASU-3 (69.000 GB)**
1 Logical Volume 334.991 GB per Logical Volume (311.000 GB used per Logical Volume)	1 Logical Volume 375.793 GB per Logical Volume (311.000 GB used per Logical Volume)	1 Logical Volume 75.158 GB per Logical Volume (69.000 GB used per Logical Volume)

The Data Protection Level used for all Logical Volumes was Mirroring as described on page 10. See "ASU Configuration" in the **IOPS Test Results File** for more detailed configuration information.

SPC-1 BENCHMARK EXECUTION RESULTS

Definitions

Average Response Time: *The sum of the Response Times for all Measured I/O Requests divided by the total number of Measured I/O Requests.*

I/O Request Throughput: *The total number of Measured I/O requests in an SPC-1 Test Run divided by the duration of the Measurement Interval in seconds.*

Measurement Interval: *The finite and contiguous time period, after the Tested Storage Configuration (TSC) has reached Steady State, when data is collected by a Test Sponsor to generate an SPC-1 test result or support an SPC-1 test result.*

Steady State: *The consistent and sustainable throughput of the TSC. During this period the load presented to the TSC by the Workload Generator is constant. Comment: Steady Stated is achieved only after caches in the TSC have filled and as a result the I/O Request throughput of the TSC has stabilized.*

Test: *A collection of Test Phases or Test Runs sharing a common objective.*

Test Phase: *A collection of one or more SPC-1 Test Runs sharing a common objective and intended to be run in a specific sequence.*

Test Run: *The execution of SPC-1 for the purpose of producing or supporting an SPC-1 test result. SPC-1 Test Runs may have a finite and measured Ramp-Up period, Start-Up period, Shut-Down period, and Ramp-Down period as illustrated in the Figure 5-1 below. All SPC-1 Test Runs shall have a Steady State period and a Measurement Interval.*

The SPC-1 benchmark consists of the following Tests, Test Phases, and Test Runs:

- **Data Persistence Test**
  - Data Persistence Test Run 1
  - Data Persistence Test Run 2
- **Primary Metrics Test**
  - Sustainability Test Phase and Test Run
  - IOPS Test Phase and Test Run
  - Response Time Ramp Test Phase
    - 95% of IOPS Test Run
    - 90% of IOPS Test Run
    - 80% of IOPS Test Run
    - 50% of IOPS Test Run
    - 10% of IOPS Test Run (LRT)
- **Repeatability Test**
  - Repeatability Test Phase 1
    - 10% of IOPS Test Run (LRT)
    - IOPS Test Run
  - Repeatability Test Phase 2
    - 10% of IOPS Test Run (LRT)
    - IOPS Test Run

Each Test is an atomic unit that must be executed from start to finish before any other Test, Test Phase, or Test Run may be executed. The Tests may be executed in any sequence.

The results from each Test, Test Phase, and Test Run are listed below along with a more detailed explanation of each component.

Primary Metrics Test – Sustainability Test Phase

Clause 5.4.2.1

The Sustainability Test Phase consists of one Test Run at the 100% load point with a Measurement Interval of three (3) hours. The intent is to demonstrate a sustained maximum I/O Request Throughput as well as insuring the Tested Storage Configuration (TSC) has reached steady state prior to measuring the maximum I/O Request Throughput (SPC-1™ IOPS).

The reported I/O Request Throughput of the Sustainability Test Run must be within 5% of the reported SPC-1™ IOPS primary metric. The Average Response Time measured in Sustainability Test Run cannot exceed thirty (30) milliseconds.

Clause 9.2.4.7.1

For the Sustainability Test Phase the FDR shall contain:

1. *A Data Rate Distribution graph and data table.*
2. *I/O Request Throughput Distribution graph and data table.*
3. *A Response Time Frequency Distribution graph and table.*
4. *An Average Response Time Distribution graph and table.*
5. *The human readable Test Run Results File produced by the Workload Generator (may be included in an appendix).*
6. *A listing or screen image of all input parameters supplied to the Workload Generator (may be included in an appendix).*
7. *The Measured Intensity Multiplier for each I/O stream.*
8. *The variability of the Measured Intensity Multiplier, as defined in Clause 5.3.13.3.*

SPC-1 Workload Generator Input Parameters

The SPC-1 Workload Generator input parameters for the Sustainability, IOPS, and Response Time Ramp Test Runs are documented in "Appendix D: SPC-1 Workload Generator Input Parameters" on Page 73.

Sustainability Test Results File

A link to the test results file generated from the Sustainability Test Run is listed below.

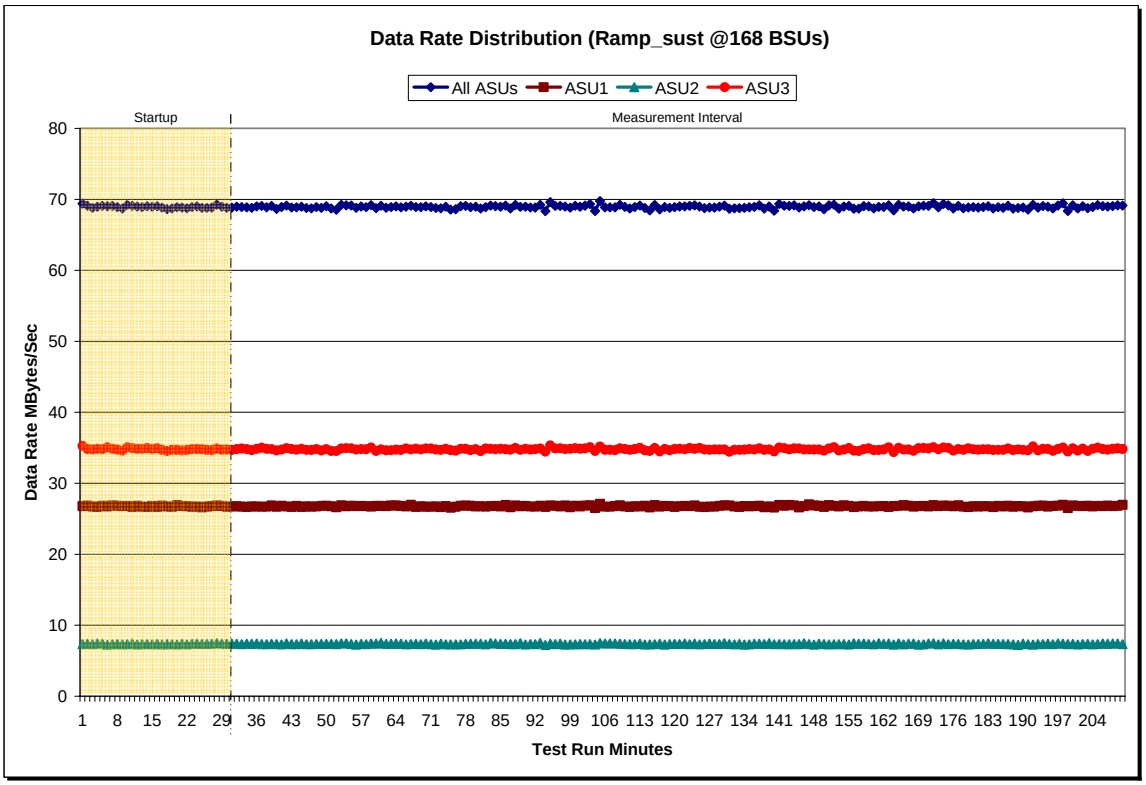
Sustainability Test Results File

Sustainability – Data Rate Distribution Data *(MB / second)*

	Start	Stop	Interval	Duration
Ramp-Up/Start-Up	19:15:32	19:45:32	0-29	0:30:00
Measurement Interva	19:45:32	22:45:32	30-209	3:00:00

Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3
0	69.40	26.79	7.34	35.26	71	68.78	26.74	7.28	34.76	142	69.07	26.95	7.34	34.78
1	69.09	26.86	7.39	34.84	72	68.74	26.64	7.40	34.70	143	69.16	26.89	7.34	34.93
2	68.82	26.71	7.33	34.77	73	68.96	26.78	7.32	34.85	144	68.85	26.60	7.36	34.90
3	68.98	26.67	7.44	34.87	74	68.55	26.56	7.31	34.68	145	69.02	26.79	7.47	34.76
4	69.09	26.84	7.42	34.82	75	68.62	26.69	7.33	34.61	146	69.17	27.03	7.37	34.78
5	69.03	26.73	7.24	35.06	76	69.03	26.85	7.31	34.87	147	68.91	26.87	7.27	34.77
6	69.08	26.89	7.33	34.86	77	69.09	26.86	7.37	34.85	148	69.01	26.83	7.41	34.77
7	68.93	26.84	7.34	34.74	78	68.90	26.83	7.40	34.68	149	68.62	26.67	7.35	34.59
8	68.70	26.79	7.32	34.59	79	68.95	26.75	7.41	34.80	150	69.15	26.93	7.32	34.91
9	69.21	26.79	7.35	35.06	80	68.71	26.77	7.41	34.53	151	69.25	26.82	7.33	35.10
10	69.07	26.66	7.45	34.96	81	68.90	26.69	7.32	34.89	152	68.70	26.74	7.34	34.62
11	68.99	26.84	7.29	34.86	82	69.13	26.79	7.49	34.85	153	68.99	26.89	7.35	34.75
12	68.91	26.69	7.35	34.87	83	69.05	26.82	7.42	34.81	154	69.07	26.81	7.29	34.97
13	69.02	26.67	7.38	34.97	84	68.96	26.73	7.38	34.84	155	68.68	26.64	7.45	34.60
14	68.95	26.79	7.31	34.85	85	69.12	26.94	7.37	34.81	156	68.70	26.74	7.39	34.57
15	69.03	26.67	7.41	34.95	86	68.72	26.63	7.35	34.74	157	69.04	26.81	7.43	34.80
16	68.84	26.86	7.30	34.69	87	69.21	26.88	7.36	34.98	158	69.01	26.73	7.36	34.92
17	68.63	26.72	7.35	34.55	88	68.94	26.76	7.48	34.70	159	68.73	26.73	7.32	34.68
18	68.71	26.68	7.34	34.69	89	68.97	26.82	7.30	34.85	160	68.94	26.77	7.48	34.69
19	68.89	26.91	7.29	34.69	90	68.86	26.72	7.37	34.77	161	68.92	26.79	7.38	34.76
20	68.83	26.81	7.41	34.62	91	68.84	26.69	7.33	34.81	162	69.16	26.66	7.44	35.07
21	68.75	26.75	7.32	34.67	92	69.22	26.82	7.50	34.90	163	68.46	26.78	7.28	34.40
22	68.91	26.69	7.40	34.82	93	68.34	26.66	7.22	34.46	164	69.24	26.81	7.44	34.99
23	69.01	26.73	7.45	34.83	94	69.61	26.89	7.41	35.32	165	68.99	26.92	7.32	34.75
24	68.79	26.60	7.38	34.81	95	69.08	26.82	7.35	34.90	166	69.00	26.84	7.39	34.77
25	68.80	26.72	7.40	34.69	96	69.07	26.73	7.40	34.94	167	68.71	26.69	7.44	34.57
26	68.85	26.79	7.41	34.65	97	68.98	26.88	7.28	34.83	168	69.01	26.78	7.28	34.94
27	69.27	26.88	7.49	34.90	98	68.82	26.63	7.33	34.86	169	69.10	26.82	7.33	34.96
28	68.96	26.81	7.44	34.72	99	69.10	26.83	7.33	34.95	170	69.08	26.74	7.42	34.92
29	68.80	26.68	7.39	34.73	100	68.95	26.73	7.34	34.88	171	69.48	26.93	7.47	35.08
30	68.84	26.73	7.43	34.69	101	69.11	26.86	7.33	34.92	172	68.89	26.77	7.32	34.80
31	68.98	26.76	7.39	34.82	102	69.33	26.90	7.35	35.09	173	69.35	26.86	7.44	35.05
32	68.93	26.71	7.33	34.89	103	68.36	26.50	7.30	34.56	174	69.16	26.84	7.34	34.98
33	68.88	26.66	7.41	34.81	104	69.76	27.11	7.49	35.16	175	68.73	26.76	7.38	34.59
34	68.81	26.75	7.39	34.68	105	68.87	26.70	7.44	34.73	176	69.08	26.90	7.36	34.82
35	69.01	26.73	7.42	34.85	106	68.87	26.70	7.46	34.71	177	68.74	26.70	7.32	34.72
36	69.06	26.70	7.35	35.01	107	68.88	26.79	7.41	34.68	178	68.86	26.64	7.29	34.93
37	68.89	26.70	7.34	34.85	108	69.23	26.90	7.41	34.92	179	68.90	26.76	7.34	34.79
38	69.07	26.87	7.38	34.83	109	68.94	26.73	7.36	34.84	180	68.85	26.75	7.37	34.73
39	68.66	26.69	7.35	34.62	110	68.72	26.66	7.34	34.71	181	68.92	26.75	7.38	34.79
40	68.91	26.85	7.31	34.75	111	68.92	26.75	7.34	34.83	182	69.02	26.77	7.45	34.80
41	69.13	26.72	7.45	34.95	112	69.12	26.72	7.41	35.00	183	68.71	26.65	7.37	34.69
42	68.85	26.67	7.35	34.83	113	68.78	26.83	7.30	34.65	184	68.89	26.81	7.37	34.70
43	68.87	26.80	7.34	34.73	114	68.45	26.58	7.31	34.56	185	68.80	26.73	7.37	34.70
44	68.96	26.68	7.43	34.85	115	69.22	26.92	7.33	34.97	186	69.10	26.84	7.35	34.91
45	68.79	26.74	7.34	34.71	116	68.58	26.70	7.39	34.49	187	68.69	26.69	7.33	34.68
46	68.74	26.71	7.33	34.70	117	68.91	26.79	7.28	34.84	188	68.78	26.78	7.23	34.78
47	68.92	26.73	7.36	34.83	118	68.80	26.78	7.36	34.66	189	68.85	26.75	7.39	34.71
48	68.80	26.81	7.38	34.62	119	68.89	26.67	7.38	34.84	190	68.57	26.59	7.34	34.65
49	69.02	26.84	7.37	34.81	120	69.00	26.77	7.37	34.86	191	69.23	26.76	7.28	35.19
50	68.71	26.76	7.38	34.57	121	69.01	26.80	7.42	34.79	192	68.84	26.83	7.37	34.64
51	68.54	26.63	7.35	34.56	122	69.07	26.78	7.34	34.96	193	69.06	26.86	7.35	34.85
52	69.24	26.90	7.45	34.89	123	69.16	26.87	7.44	34.85	194	68.95	26.70	7.41	34.84
53	69.16	26.76	7.45	34.95	124	68.98	26.69	7.31	34.98	195	68.72	26.80	7.34	34.58
54	69.14	26.83	7.37	34.94	125	68.77	26.64	7.36	34.77	196	69.12	26.84	7.46	34.83
55	68.81	26.77	7.28	34.75	126	68.86	26.73	7.42	34.72	197	69.44	26.98	7.41	35.05
56	69.00	26.80	7.38	34.82	127	68.83	26.70	7.36	34.77	198	68.35	26.52	7.35	34.48
57	68.90	26.77	7.33	34.79	128	68.95	26.82	7.37	34.77	199	69.18	26.87	7.38	34.93
58	69.19	26.72	7.42	35.05	129	69.13	26.90	7.46	34.76	200	68.72	26.81	7.30	34.61
59	68.76	26.80	7.41	34.55	130	68.68	26.88	7.37	34.43	201	69.03	26.79	7.36	34.88
60	69.10	26.80	7.52	34.78	131	68.75	26.72	7.31	34.72	202	68.76	26.82	7.37	34.57
61	68.82	26.79	7.38	34.64	132	68.76	26.67	7.38	34.71	203	68.92	26.74	7.32	34.86
62	68.92	26.87	7.39	34.66	133	68.80	26.79	7.28	34.73	204	69.18	26.80	7.37	35.02
63	69.01	26.87	7.41	34.73	134	68.88	26.75	7.31	34.81	205	69.03	26.77	7.42	34.84
64	68.88	26.80	7.39	34.69	135	68.93	26.77	7.39	34.77	206	68.99	26.86	7.40	34.74
65	68.96	26.74	7.32	34.91	136	69.16	26.83	7.40	34.93	207	69.05	26.78	7.42	34.85
66	69.10	26.96	7.36	34.78	137	68.70	26.62	7.36	34.72	208	69.15	26.81	7.42	34.92
67	68.92	26.66	7.38	34.87	138	68.99	26.74	7.48	34.78	209	69.13	26.96	7.34	34.84
68	68.90	26.77	7.34	34.78	139	68.39	26.57	7.34	34.48					
69	69.01	26.69	7.42	34.91	140	69.36	26.94	7.36	35.05					
70	68.92	26.69	7.34	34.89	141	69.10	26.82	7.34	34.94					

Sustainability – Data Rate Distribution Graph

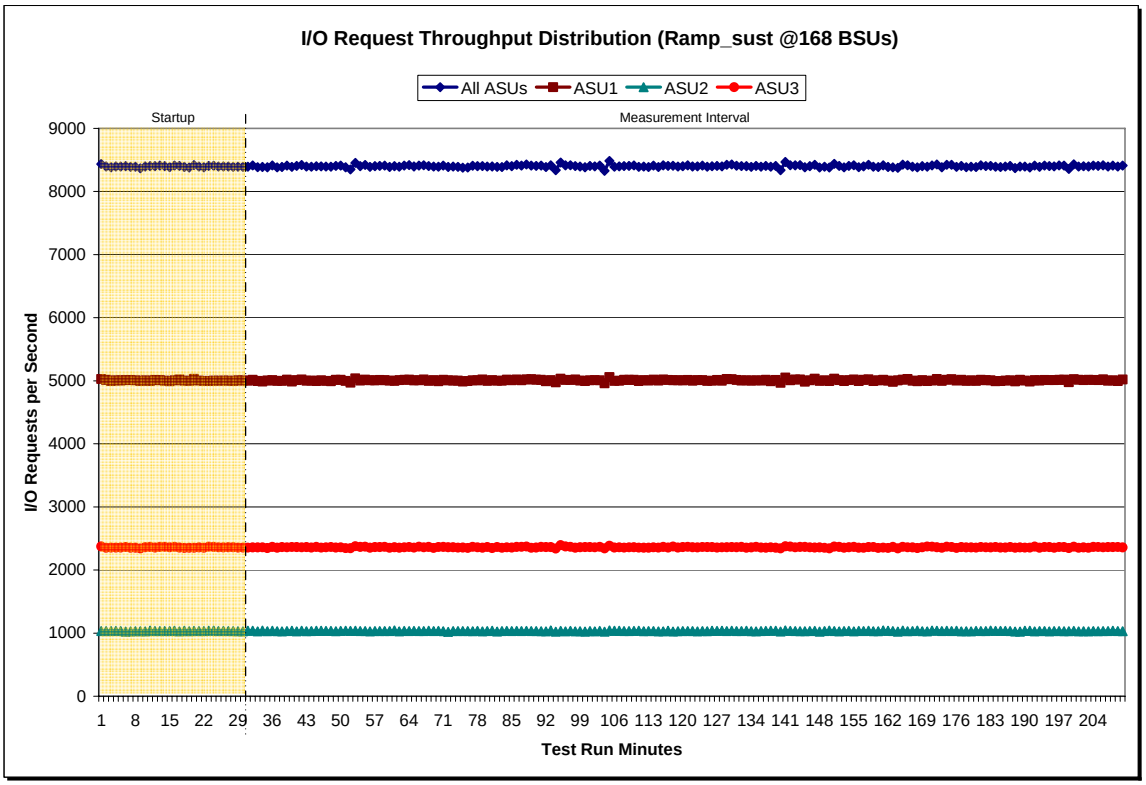


Sustainability – I/O Request Throughput Distribution Data

	Start	Stop	Interval	Duration
Ramp-Up/Start-Up	19:15:32	19:45:32	0-29	0:30:00
Measurement Interval	19:45:32	22:45:32	30-209	3:00:00

Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3
0	8,434.72	5,028.37	1,031.87	2,374.48	71	8,389.10	5,006.40	1,021.60	2,361.10	142	8,413.37	5,020.23	1,033.00	2,360.13
1	8,396.87	5,013.60	1,032.02	2,351.25	72	8,395.32	5,002.15	1,032.08	2,361.08	143	8,417.83	5,020.62	1,031.08	2,366.13
2	8,384.07	4,996.03	1,033.65	2,354.38	73	8,389.90	5,000.25	1,034.22	2,355.43	144	8,383.20	4,985.82	1,030.80	2,366.58
3	8,396.58	5,005.28	1,036.12	2,355.18	74	8,376.72	4,987.83	1,031.73	2,357.15	145	8,400.63	5,006.90	1,034.53	2,359.20
4	8,394.15	5,003.55	1,033.92	2,356.68	75	8,379.05	4,993.78	1,034.32	2,350.95	146	8,423.48	5,031.42	1,035.83	2,356.23
5	8,400.85	5,011.07	1,024.22	2,365.57	76	8,407.23	5,007.87	1,030.73	2,368.63	147	8,380.40	4,997.93	1,024.55	2,357.92
6	8,390.52	5,010.23	1,027.10	2,353.18	77	8,400.75	5,005.47	1,035.20	2,360.08	148	8,393.10	5,005.83	1,034.63	2,352.63
7	8,392.25	5,007.33	1,030.77	2,354.15	78	8,403.45	5,020.95	1,028.30	2,354.20	149	8,379.63	4,996.30	1,039.70	2,343.63
8	8,367.50	4,995.47	1,030.05	2,341.98	79	8,395.10	4,997.52	1,032.40	2,365.18	150	8,438.07	5,032.47	1,034.60	2,371.00
9	8,396.58	5,006.80	1,028.08	2,361.70	80	8,396.82	5,010.18	1,037.72	2,348.92	151	8,404.75	5,009.95	1,028.78	2,366.02
10	8,400.95	4,994.90	1,040.20	2,365.85	81	8,390.18	4,999.37	1,026.55	2,364.27	152	8,381.23	4,994.22	1,033.70	2,353.32
11	8,401.15	5,012.18	1,031.65	2,357.32	82	8,386.23	4,999.58	1,034.18	2,352.47	153	8,406.73	5,010.32	1,035.45	2,360.97
12	8,409.57	5,009.68	1,034.27	2,365.62	83	8,413.92	5,017.60	1,036.30	2,360.02	154	8,416.32	5,020.90	1,028.87	2,366.55
13	8,400.95	5,000.38	1,032.67	2,367.90	84	8,400.73	5,009.67	1,033.75	2,357.32	155	8,384.53	4,996.32	1,035.10	2,353.12
14	8,385.42	4,993.47	1,031.52	2,360.43	85	8,421.98	5,020.17	1,035.33	2,366.48	156	8,398.75	5,013.10	1,033.32	2,352.33
15	8,410.00	5,005.10	1,037.07	2,367.83	86	8,409.75	5,007.77	1,034.15	2,367.83	157	8,422.13	5,021.48	1,036.75	2,363.90
16	8,406.27	5,019.58	1,029.48	2,357.20	87	8,428.82	5,021.27	1,035.05	2,372.50	158	8,392.07	4,995.87	1,030.78	2,365.42
17	8,388.65	5,001.00	1,037.48	2,350.17	88	8,409.65	5,022.68	1,034.68	2,352.28	159	8,386.58	5,005.33	1,031.23	2,350.02
18	8,379.73	4,997.02	1,030.35	2,352.37	89	8,405.60	5,017.20	1,032.28	2,356.12	160	8,413.40	5,016.08	1,042.42	2,354.90
19	8,417.88	5,029.50	1,035.95	2,352.43	90	8,411.35	5,013.97	1,031.33	2,366.05	161	8,388.60	5,000.90	1,037.27	2,350.43
20	8,394.42	5,001.72	1,033.87	2,358.83	91	8,385.98	4,992.95	1,029.35	2,363.68	162	8,381.65	4,983.22	1,032.15	2,366.28
21	8,383.13	4,998.22	1,033.35	2,351.57	92	8,414.72	5,009.17	1,041.87	2,363.68	163	8,373.25	5,005.23	1,024.62	2,343.40
22	8,405.28	4,996.28	1,038.85	2,370.15	93	8,337.50	4,975.57	1,021.93	2,340.00	164	8,425.00	5,017.13	1,039.75	2,368.12
23	8,407.18	5,000.40	1,039.70	2,367.08	94	8,458.98	5,030.67	1,035.08	2,393.23	165	8,416.25	5,026.82	1,030.07	2,359.37
24	8,394.45	4,999.37	1,034.58	2,360.50	95	8,414.47	5,011.72	1,029.03	2,373.72	166	8,391.55	5,000.70	1,033.03	2,357.82
25	8,396.13	5,001.98	1,035.60	2,358.55	96	8,415.62	5,011.87	1,035.13	2,368.62	167	8,381.83	4,993.07	1,039.95	2,348.82
26	8,395.35	5,001.05	1,032.97	2,361.33	97	8,403.05	5,020.92	1,028.82	2,353.32	168	8,401.45	5,009.87	1,031.28	2,360.30
27	8,389.58	4,995.62	1,032.78	2,361.18	98	8,395.30	5,003.12	1,031.10	2,361.08	169	8,393.43	4,994.07	1,026.83	2,372.53
28	8,392.32	5,005.93	1,031.18	2,355.20	99	8,383.75	4,996.12	1,023.85	2,363.78	170	8,411.97	5,002.25	1,040.72	2,369.00
29	8,389.25	5,004.07	1,029.70	2,355.48	100	8,405.02	5,007.78	1,033.72	2,363.52	171	8,426.47	5,026.15	1,039.48	2,360.83
30	8,393.73	4,999.98	1,038.07	2,355.68	101	8,398.53	5,010.07	1,029.08	2,359.38	172	8,384.22	4,998.25	1,033.25	2,352.72
31	8,413.20	5,014.92	1,039.15	2,359.13	102	8,410.87	5,007.33	1,035.73	2,367.80	173	8,421.85	5,014.80	1,037.30	2,369.75
32	8,385.02	4,996.72	1,029.82	2,358.48	103	8,327.32	4,960.68	1,023.28	2,343.35	174	8,421.58	5,023.32	1,032.70	2,365.57
33	8,388.32	4,988.10	1,040.33	2,359.88	104	8,484.12	5,056.98	1,041.65	2,385.48	175	8,389.85	5,001.97	1,037.33	2,350.55
34	8,383.03	5,003.93	1,031.00	2,348.10	105	8,390.78	4,997.65	1,036.62	2,356.52	176	8,403.90	5,013.92	1,027.18	2,362.80
35	8,412.67	5,009.08	1,037.05	2,366.53	106	8,398.23	4,999.70	1,037.78	2,360.75	177	8,385.80	4,997.23	1,030.52	2,358.05
36	8,382.38	4,997.33	1,030.98	2,354.07	107	8,401.98	5,013.48	1,032.58	2,355.92	178	8,392.00	5,005.43	1,028.08	2,358.48
37	8,388.13	4,996.95	1,028.02	2,363.17	108	8,405.87	5,013.45	1,032.53	2,359.88	179	8,387.45	4,996.98	1,034.88	2,355.58
38	8,409.27	5,016.37	1,032.45	2,360.45	109	8,412.60	5,014.47	1,036.00	2,362.13	180	8,413.52	5,014.53	1,034.62	2,364.37
39	8,390.27	4,988.58	1,037.57	2,364.12	110	8,389.70	4,996.22	1,038.20	2,355.28	181	8,403.17	5,009.23	1,034.10	2,359.83
40	8,403.62	5,011.15	1,029.28	2,363.18	111	8,394.42	5,010.33	1,031.15	2,352.93	182	8,405.72	5,007.62	1,039.62	2,358.48
41	8,418.68	5,019.55	1,039.33	2,359.80	112	8,387.27	5,002.33	1,032.18	2,352.75	183	8,393.40	4,992.83	1,035.53	2,365.03
42	8,394.83	4,999.65	1,031.38	2,363.80	113	8,410.47	5,016.23	1,034.22	2,360.02	184	8,386.93	4,994.98	1,035.57	2,356.38
43	8,391.48	5,002.38	1,032.30	2,356.80	114	8,386.83	5,001.83	1,029.17	2,355.83	185	8,395.45	5,001.92	1,036.22	2,357.32
44	8,399.83	4,996.58	1,037.43	2,365.82	115	8,413.42	5,018.17	1,028.80	2,366.45	186	8,405.08	5,008.02	1,032.33	2,364.73
45	8,398.77	5,007.67	1,036.48	2,354.62	116	8,405.93	5,012.05	1,036.72	2,357.17	187	8,371.00	4,991.40	1,025.35	2,354.25
46	8,394.37	4,998.30	1,036.30	2,359.77	117	8,407.13	5,008.43	1,026.37	2,372.33	188	8,394.32	5,013.10	1,023.47	2,357.75
47	8,393.13	4,992.68	1,035.37	2,365.08	118	8,395.35	5,007.72	1,030.77	2,356.87	189	8,394.35	5,002.18	1,036.57	2,355.60
48	8,403.62	5,015.28	1,031.48	2,356.85	119	8,399.53	5,005.37	1,031.65	2,362.52	190	8,380.27	4,988.42	1,037.40	2,354.45
49	8,410.22	5,013.83	1,035.83	2,360.55	120	8,414.10	5,011.77	1,033.70	2,368.63	191	8,410.67	5,009.32	1,029.62	2,371.73
50	8,383.40	4,998.13	1,038.55	2,346.72	121	8,396.98	5,000.83	1,034.20	2,361.95	192	8,390.63	5,003.57	1,033.43	2,353.63
51	8,350.48	4,969.87	1,035.23	2,345.38	122	8,398.60	5,010.23	1,029.78	2,358.58	193	8,410.75	5,012.03	1,033.58	2,365.13
52	8,452.60	5,038.62	1,036.72	2,377.27	123	8,409.53	5,011.15	1,033.03	2,365.35	194	8,402.05	5,010.87	1,027.97	2,363.22
53	8,401.97	5,002.72	1,032.55	2,366.70	124	8,391.47	4,997.65	1,030.67	2,363.15	195	8,397.22	5,010.47	1,033.20	2,353.55
54	8,419.83	5,017.55	1,033.08	2,369.20	125	8,398.85	4,999.33	1,037.13	2,362.38	196	8,412.28	5,014.13	1,034.00	2,364.15
55	8,389.62	5,007.45	1,028.37	2,353.80	126	8,404.53	5,011.63	1,036.08	2,356.82	197	8,410.82	5,016.88	1,030.93	2,363.00
56	8,400.68	5,006.03	1,032.12	2,362.53	127	8,397.42	4,998.88	1,038.20	2,360.33	198	8,357.93	4,978.47	1,030.57	2,348.90
57	8,406.45	5,012.48	1,031.55	2,362.42	128	8,421.28	5,025.90	1,034.00	2,361.38	199	8,430.05	5,025.35	1,035.35	2,369.35
58	8,408.97	5,008.73	1,032.38	2,367.85	129	8,427.60	5,024.77	1,039.40	2,363.43	200	8,394.03	5,015.65	1,026.70	2,351.68
59	8,388.52	5,002.65	1,034.47	2,351.40	130	8,406.87	5,011.63	1,033.40	2,361.83	201	8,400.30	5,010.62	1,031.28	2,358.40
60	8,401.72	4,997.83	1,041.62	2,362.27	131	8,402.53	5,004.03	1,032.85	2,365.65	202	8,396.58	5,014.75	1,029.22	2,352.62
61	8,392.22	5,010.33	1,028.95	2,352.93	132	8,400.65	5,007.53	1,039.47	2,353.65	203	8,411.23	5,011.35	1,034.23	2,365.65
62	8,411.18	5,015.55	1,034.98	2,360.65	133	8,390.35	5,001.27	1,031.35	2,357.73	204	8,406.40	5,011.05	1,031.17	2,364.18
63	8,416.57	5,017.53	1,033.97	2,365.07	134	8,405.52	5,008.02	1,029.80	2,367.70	205	8,414.75	5,021.20	1,033.32	2,360.23
64	8,395.77	5,005.33	1,035.75	2,354.68	135	8,393.55	5,003.13	1,033.83	2,356.58	206	8,394.53	4,998.80	1,032.80	2,362.93
65	8,411.03	5,007.47	1,034.20	2,369.37	136	8,404.45	5,015.98	1,034.73	2,353.73	207	8,409.73	5,007.43	1,038.73	2,363.57
66	8,414.87	5,020.63	1,033.48	2,360.75	137	8,391.62	4,992.95	1,038.33	2,360.33	208	8,394.70	4,996.18	1,033.67	2,364.85
67	8,402.47	4,998.33	1,037.23	2,366.90	138	8,405.03	5,012.35	1,038.37	2,354.32	209	8,410.88	5,020.53	1,031.18	2,359.17
68	8,394.18	5,010.38	1,033.12	2,350.68	139	8,337.37	4,966.80	1,026.22	2,344.35	Average	8,400.77	5,007.09	1,033.36	2,360.32
69	8,391.33	4,992.47	1,034.75	2,364.12	140	8,466.58	5,049.38	1,041.33	2,375.87					
70	8,410.83	5,014.43	1,030.80	2,365.60	141	8,415.70	5,008.73	1,035.63	2,371.33					

Sustainability – I/O Request Throughput Distribution Graph

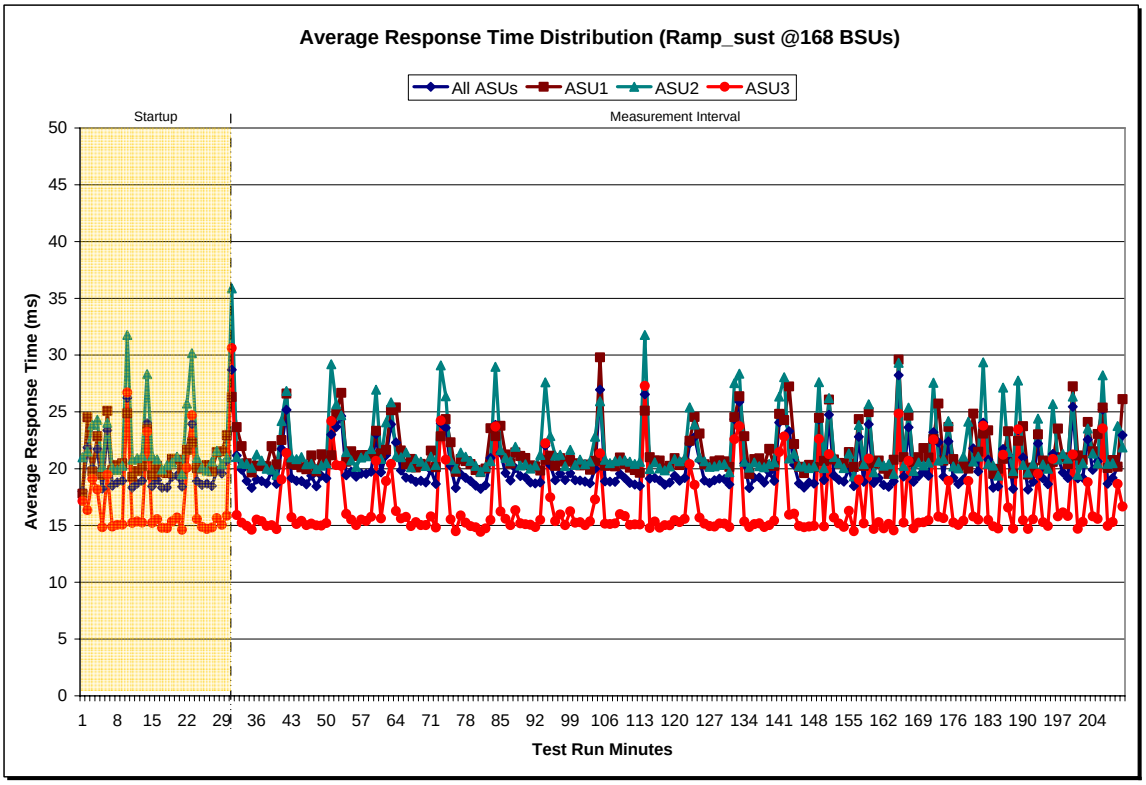


Sustainability – Average Response Time (ms) Distribution Data

	Start	Stop	Interval	Duration
Ramp-Up/Start-Up	19:15:32	19:45:32	0-29	0:30:00
Measurement Interval	19:45:32	22:45:32	30-209	3:00:00

Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3
0	18.01	17.80	21.00	17.15	71	18.66	20.13	20.33	14.82	142	23.30	27.24	20.91	15.95
1	21.87	24.53	21.52	16.35	72	24.01	22.85	29.10	24.23	143	20.34	22.17	21.33	16.04
2	20.07	19.74	23.85	19.11	73	23.60	24.35	26.38	20.79	144	18.70	20.16	20.23	14.96
3	21.72	22.85	24.31	18.17	74	20.22	22.33	20.76	15.54	145	18.34	19.60	20.20	14.84
4	18.25	19.46	20.15	14.84	75	18.30	19.73	20.01	14.50	146	18.78	20.33	20.05	14.91
5	23.38	25.09	24.04	19.48	76	19.52	20.85	21.43	15.88	147	18.69	20.14	20.21	14.96
6	18.50	19.87	20.08	14.90	77	19.19	20.67	21.06	15.25	148	24.34	24.47	27.62	22.62
7	18.78	20.31	19.88	15.05	78	18.90	20.40	20.69	14.94	149	18.99	20.69	20.06	14.92
8	18.94	20.48	20.24	15.07	79	18.51	19.88	20.25	14.84	150	24.75	26.09	26.22	21.28
9	26.24	24.88	31.77	26.71	80	18.23	19.69	19.74	14.44	151	19.40	20.81	21.04	15.70
10	18.33	19.28	20.79	15.23	81	18.55	20.01	20.16	14.75	152	19.01	20.50	20.50	15.18
11	18.70	19.80	20.94	15.36	82	20.94	23.57	20.66	15.48	153	18.86	20.49	20.06	14.87
12	18.93	20.21	21.12	15.26	83	23.86	22.86	28.97	23.72	154	19.99	21.46	21.35	16.29
13	24.00	23.46	28.32	23.24	84	21.39	23.77	21.63	16.23	155	18.46	20.15	19.33	14.50
14	18.46	19.43	21.11	15.23	85	19.62	21.24	20.96	15.59	156	22.81	24.36	23.84	19.04
15	19.00	20.26	20.82	15.56	86	18.96	20.46	20.67	15.03	157	18.85	20.25	20.41	15.19
16	18.33	19.67	19.93	14.79	87	20.06	21.43	21.93	16.35	158	23.92	24.99	25.68	20.88
17	18.33	19.60	20.30	14.77	88	19.36	21.12	20.28	15.19	159	18.74	20.45	19.69	14.69
18	19.28	20.87	20.54	15.36	89	19.24	20.94	20.39	15.11	160	19.18	20.71	20.58	15.29
19	19.40	20.78	21.06	15.70	90	18.79	20.29	20.02	15.06	161	18.56	20.00	20.27	14.75
20	18.42	19.98	19.52	14.62	91	18.70	20.19	20.28	14.86	162	18.40	19.54	20.39	15.13
21	21.70	21.64	25.73	20.08	92	18.79	19.84	21.21	15.50	163	18.89	20.78	19.55	14.57
22	23.95	22.30	30.17	24.69	93	22.02	20.78	27.61	22.24	164	28.23	29.60	29.32	24.85
23	18.90	20.05	20.95	15.58	94	20.31	21.14	22.87	17.48	165	19.31	21.01	20.26	15.26
24	18.57	20.00	20.09	14.87	95	18.98	20.24	21.15	15.38	166	23.63	24.66	25.38	20.69
25	18.68	20.33	19.83	14.70	96	19.57	20.93	21.22	15.97	167	18.84	20.56	19.80	14.76
26	18.48	19.77	20.63	14.81	97	19.00	20.61	20.22	15.03	168	19.33	21.01	20.55	15.25
27	19.84	21.46	21.57	15.65	98	19.60	20.76	21.67	16.25	169	19.78	21.82	20.29	15.28
28	19.57	21.53	20.40	15.05	99	18.98	20.48	20.33	15.24	170	19.37	20.98	20.53	15.45
29	20.71	22.94	20.98	15.86	100	18.95	20.29	20.80	15.29	171	23.21	22.61	27.57	22.55
30	28.71	26.32	35.88	30.62	101	18.87	20.36	20.39	15.03	172	22.32	25.73	20.72	15.78
31	21.16	23.65	21.02	15.92	102	18.72	19.91	20.63	15.36	173	19.31	20.71	20.86	15.65
32	19.91	21.98	20.47	15.25	103	19.99	20.69	22.82	17.30	174	22.41	23.68	24.18	18.92
33	18.92	20.48	20.42	14.97	104	26.95	29.80	25.93	21.35	175	19.20	20.84	20.21	15.26
34	18.31	19.67	20.08	14.63	105	18.89	20.26	20.79	15.15	176	18.65	20.07	20.03	15.05
35	19.05	20.27	21.25	15.52	106	18.85	20.27	20.49	15.12	177	19.05	20.35	21.06	15.42
36	18.91	20.21	20.72	15.37	107	18.85	20.20	20.67	15.18	178	20.21	20.00	24.14	18.92
37	18.70	20.21	20.00	14.96	108	19.55	20.98	20.73	16.00	179	21.79	24.85	20.63	15.79
38	19.77	21.98	19.90	15.03	109	19.17	20.42	20.75	15.82	180	19.76	21.50	21.07	15.51
39	18.66	20.37	19.47	14.68	110	18.74	20.09	20.61	15.06	181	24.05	23.08	29.36	23.79
40	21.75	22.52	24.19	19.05	111	18.60	19.87	20.43	15.10	182	20.80	23.38	20.44	15.48
41	25.18	26.61	26.85	21.38	112	18.48	19.64	20.60	15.09	183	18.33	19.53	20.29	14.93
42	19.18	20.44	21.01	15.73	113	26.54	25.11	31.77	27.29	184	18.44	19.99	19.40	14.73
43	18.93	20.32	20.85	15.13	114	19.13	21.01	19.97	14.78	185	21.74	20.86	27.14	21.23
44	18.91	20.12	21.03	15.41	115	19.19	20.72	20.56	15.35	186	21.18	23.29	21.47	16.58
45	18.62	19.95	20.39	15.03	116	18.97	20.71	20.03	14.81	187	18.23	19.57	19.80	14.72
46	19.39	21.16	20.44	15.16	117	18.59	20.02	19.85	15.03	188	23.38	22.45	27.76	23.46
47	18.44	19.75	19.98	15.01	118	18.77	20.25	20.20	15.02	189	21.00	23.74	20.34	15.46
48	19.38	21.26	20.27	14.99	119	19.38	20.92	20.86	15.47	190	18.16	19.48	19.67	14.70
49	19.15	20.73	20.48	15.20	120	18.94	20.31	20.66	15.29	191	18.85	20.09	20.43	15.54
50	23.01	21.17	29.20	24.19	121	19.18	20.53	20.91	15.58	192	22.22	23.02	24.40	19.55
51	23.68	24.85	25.66	20.31	122	22.24	22.46	25.40	20.40	193	19.15	20.72	20.37	15.29
52	24.63	26.68	24.71	20.25	123	22.79	24.55	23.88	18.58	194	18.63	20.09	20.00	14.96
53	19.42	20.60	21.46	16.02	124	20.75	23.09	21.00	15.69	195	21.30	20.59	25.68	20.86
54	19.74	21.53	20.73	15.52	125	18.95	20.39	20.66	15.16	196	21.02	23.53	20.82	15.80
55	19.29	21.11	20.17	15.03	126	18.74	20.23	20.17	14.95	197	19.67	20.99	21.30	16.15
56	19.57	21.19	20.98	15.51	127	18.98	20.65	20.21	14.90	198	19.17	20.40	20.88	15.83
57	19.55	21.20	21.09	15.39	128	19.13	20.73	20.34	15.18	199	25.45	27.24	26.36	21.26
58	19.73	21.19	21.74	15.76	129	19.08	20.64	20.41	15.16	200	19.15	21.17	19.47	14.71
59	23.04	23.34	26.97	20.69	130	18.61	20.15	19.68	14.87	201	19.20	20.77	20.50	15.32
60	19.67	21.34	20.86	15.63	131	24.36	24.53	27.54	22.59	202	22.56	24.12	23.53	18.82
61	21.19	21.66	24.08	18.91	132	25.88	26.38	28.37	23.74	203	19.90	21.53	21.35	15.80
62	23.90	25.15	25.84	20.41	133	20.47	22.86	20.62	15.34	204	20.64	23.05	20.47	15.59
63	22.30	25.40	21.09	16.28	134	18.29	19.53	20.11	14.87	205	25.21	25.38	28.23	23.55
64	19.85	21.60	21.01	15.61	135	19.19	20.83	20.55	15.12	206	18.67	20.06	20.43	14.97
65	19.21	20.39	21.43	15.76	136	19.22	20.91	20.22	15.19	207	19.19	20.75	20.50	15.30
66	19.11	20.86	20.13	14.95	137	18.78	20.34	20.13	14.87	208	20.19	20.18	23.76	18.66
67	18.84	20.11	20.86	15.30	138	19.70	21.75	20.41	15.03	209	22.95	26.12	21.88	16.67
68	18.93	20.42	20.62	15.04	139	18.92	20.24	20.56	15.43	Average	20.28	21.63	21.91	16.70
69	18.79	20.28	20.23	15.03	140	24.07	24.82	26.34	21.47					
70	19.90	21.59	21.07	15.79	141	24.34	24.28	28.06	22.84					

Sustainability – Average Response Time (ms) Distribution Graph



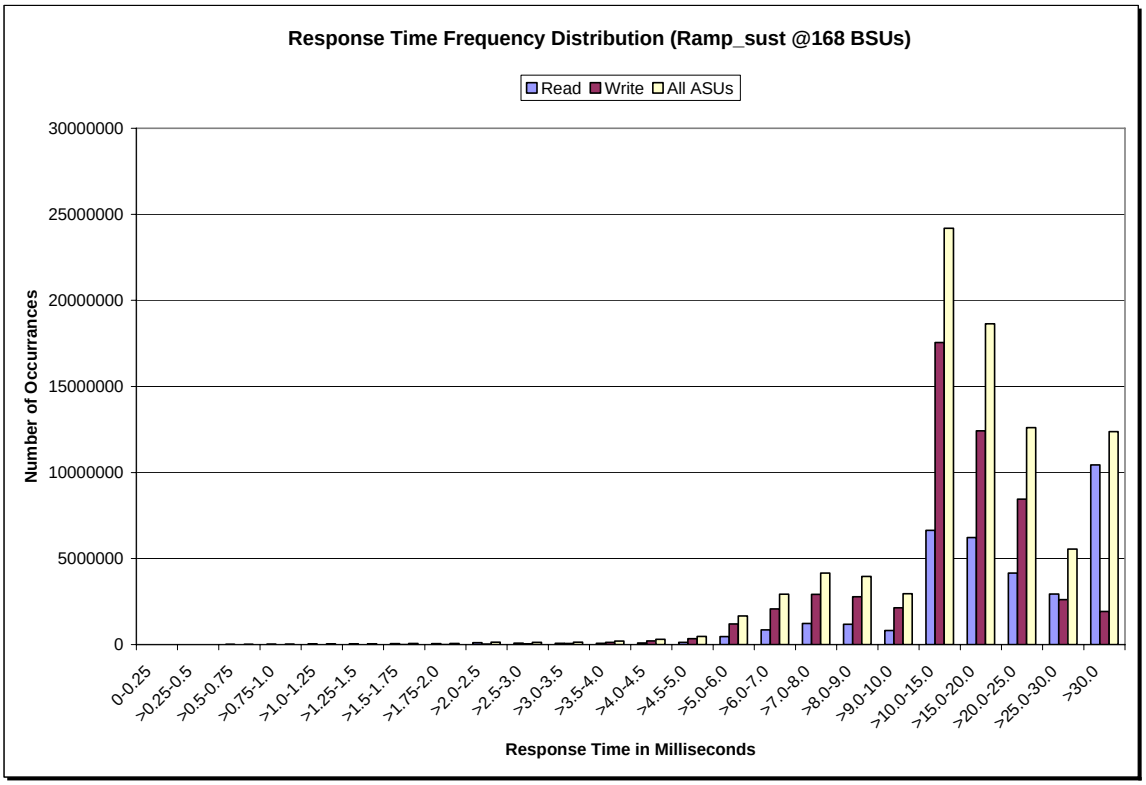
Sustainability – Response Time Frequency Distribution Data

Response Time (ms)	0-0.25	>0.25-0.5	>0.5-0.75	>0.75-1.0	>1.0-1.25	>1.25-1.5	>1.5-1.75	>1.75-2.0
Read	0	1,142	9,951	23,818	40,403	51,443	59,198	61,727
Write	0	-	17	284	438	1,119	3,112	6,490
All ASUs	0	1,142	9,968	24,102	40,841	52,562	62,310	68,217
ASU1	0	1,045	9,283	22,641	38,335	48,796	56,964	60,623
ASU2	0	97	685	1,454	2,437	3,389	4,051	4,778
ASU3	0	-	-	7	69	377	1,295	2,816

Response Time (ms)	>2.0-2.5	>2.5-3.0	>3.0-3.5	>3.5-4.0	>4.0-4.5	>4.5-5.0	>5.0-6.0	>6.0-7.0
Read	114,187	90,460	77,420	77,982	93,851	130,325	470,282	860,331
Write	24,322	43,722	71,611	127,395	220,314	347,039	1,201,750	2,070,991
All ASUs	138,509	134,182	149,031	205,377	314,165	477,364	1,672,032	2,931,322
ASU1	116,770	102,740	105,952	142,997	216,588	324,199	1,116,185	1,942,944
ASU2	11,313	13,752	17,834	24,824	35,813	51,772	167,139	273,118
ASU3	10,426	17,690	25,245	37,556	61,764	101,393	388,708	715,260

Response Time (ms)	>7.0-8.0	>8.0-9.0	>9.0-10.0	>10.0-15.0	>15.0-20.0	>20.0-25.0	>25.0-30.0	>30.0
Read	1,227,185	1,180,294	818,657	6,638,304	6,221,935	4,155,874	2,933,620	10,444,961
Write	2,925,372	2,785,262	2,141,482	17,551,386	12,422,038	8,452,561	2,617,262	1,930,864
All ASUs	4,152,557	3,965,556	2,960,139	24,189,690	18,643,973	12,608,435	5,550,882	12,375,825
ASU1	2,682,673	2,439,202	1,695,957	13,324,729	10,483,098	6,421,862	3,557,382	9,165,527
ASU2	385,076	384,689	316,101	2,781,988	2,240,628	1,715,433	696,254	2,027,625
ASU3	1,084,808	1,141,665	948,081	8,082,973	5,920,247	4,471,140	1,297,246	1,182,673

Sustainability – Response Time Frequency Distribution Graph



Sustainability – Measured Intensity Multiplier and Coefficient of Variation

	ASU1-1	ASU1-2	ASU1-3	ASU1-4	ASU2-1	ASU2-2	ASU2-3	ASU3-1
IM	*0.0350*	*0.2810*	*0.0700*	*0.2100*	*0.0180*	*0.0700*	*0.0350*	*0.2810*
MIM	0.0350	0.2809	0.0700	0.2101	0.0180	0.0700	0.0350	0.2810
COV	0.007	0.002	0.005	0.003	0.011	0.005	0.007	0.002

Clause 3.4.3

IM – Intensity Multiplier: *The ratio of I/Os for each I/O stream relative to the total I/Os for all I/O streams (ASU1-1 – ASU3-1) as required by the benchmark specification.*

Clauses 5.1.0 and 5.3.13.2

MIM – Measured Intensity Multiplier: *The Measured Intensity Multiplier represents the ratio of measured I/Os for each I/O stream relative to the total I/Os measured for all I/O streams (ASU1-1 – ASU3-1). This value may differ from the corresponding Expected Intensity Multiplier by no more than 5%.*

Clause 5.3.13.3

COV – Coefficient of Variation: *This measure of variation for the Measured Intensity Multiplier cannot exceed 0.2.*

Primary Metrics Test – IOPS Test Phase

Clause 5.4.2.2

The IOPS Test Phase consists of one Test Run at the 100% load point with a Measurement Interval of ten (10) minutes. The IOPS Test Phase immediately follows the Sustainability Test Phase without any interruption or manual intervention.

The IOPS Test Run generates the SPC-1 IOPS™ primary metric, which is computed as the I/O Request Throughput for the Measurement Interval of the IOPS Test Run.

The Average Response Time is computed for the IOPS Test Run and cannot exceed 30 milliseconds. If the Average Response Time exceeds the 30 millisecond constraint, the measurement is invalid.

Clause 9.2.4.7.2

For the IOPS Test Phase the FDR shall contain:

1. *I/O Request Throughput Distribution (data and graph).*
2. *A Response Time Frequency Distribution.*
3. *An Average Response Time Distribution.*
4. *The human readable Test Run Results File produced by the Workload Generator.*
5. *A listing or screen image of all input parameters supplied t the Workload Generator.*
6. *The total number of I/O Requests completed in the Measurement Interval as well as the number of I/O Requests with a Response Time less than or equal to 30 milliseconds and the number of I/O Requests with a Response Time greater than 30 milliseconds.*

SPC-1 Workload Generator Input Parameters

The SPC-1 Workload Generator input parameters for the Sustainability, IOPS, and Response Time Ramp Test Runs are documented in "Appendix D: SPC-1 Workload Generator Input Parameters" on Page 73.

IOPS Test Results File

A link to the test results file generated from the IOPS Test Run is listed below.

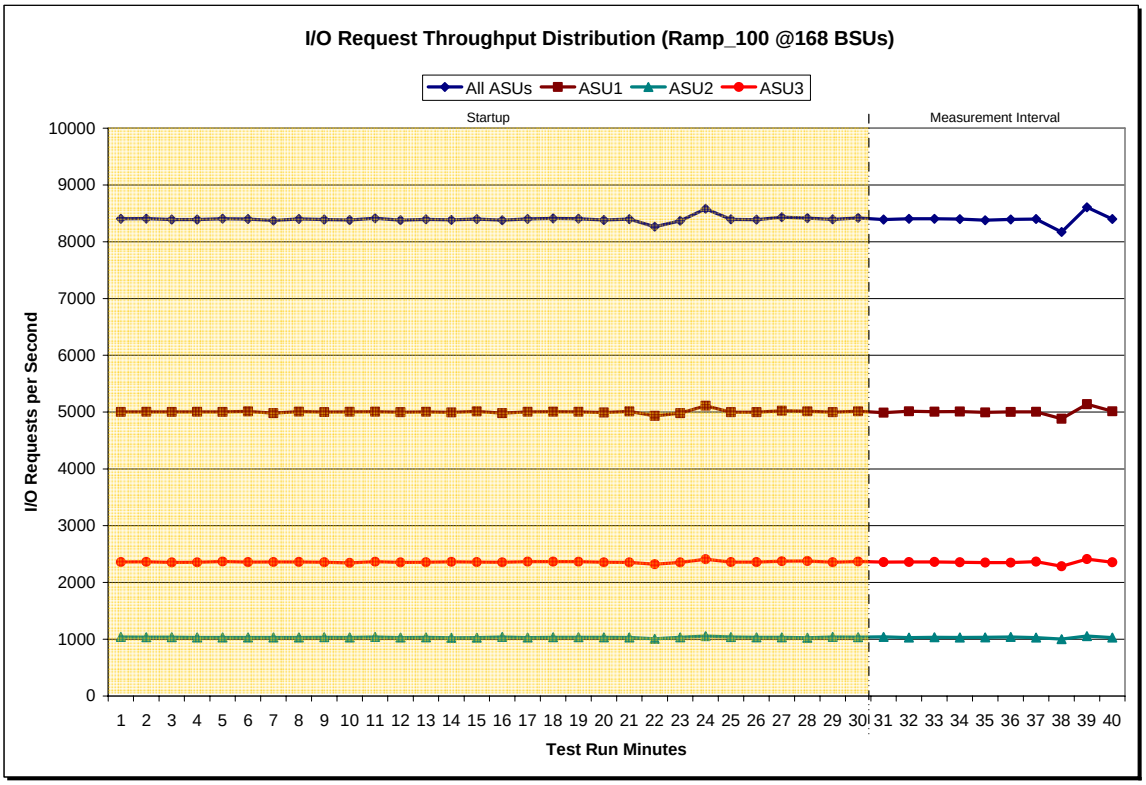
IOPS Test Results File

IOPS Test Run – I/O Request Throughput Distribution Data

168 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	22:45:41	23:15:42	0-29	0:30:01
Measurement Interval	23:15:42	23:25:42	30-39	0:10:00

60 second intervals	All ASUs	ASU1	ASU2	ASU3
0	8,402.83	5,004.02	1,039.58	2,359.23
1	8,406.33	5,005.37	1,036.63	2,364.33
2	8,391.90	5,002.92	1,036.20	2,352.78
3	8,391.85	5,005.17	1,031.55	2,355.13
4	8,405.48	5,004.38	1,031.68	2,369.42
5	8,400.60	5,012.45	1,030.47	2,357.68
6	8,372.33	4,981.45	1,030.23	2,360.65
7	8,401.57	5,009.77	1,030.50	2,361.30
8	8,391.00	4,999.90	1,034.48	2,356.62
9	8,381.28	5,006.05	1,031.88	2,343.35
10	8,411.78	5,006.67	1,039.25	2,365.87
11	8,380.58	4,998.00	1,029.58	2,353.00
12	8,394.38	5,005.38	1,032.32	2,356.68
13	8,383.93	4,994.68	1,025.42	2,363.83
14	8,397.78	5,012.38	1,028.02	2,357.38
15	8,378.20	4,982.93	1,040.78	2,354.48
16	8,400.97	5,004.88	1,029.62	2,366.47
17	8,410.20	5,007.57	1,034.95	2,367.68
18	8,405.48	5,005.30	1,034.35	2,365.83
19	8,382.33	4,993.62	1,033.67	2,355.05
20	8,397.48	5,012.38	1,031.48	2,353.62
21	8,263.48	4,933.80	1,007.97	2,321.72
22	8,368.75	4,982.50	1,033.12	2,353.13
23	8,579.27	5,112.75	1,055.88	2,410.63
24	8,394.85	4,998.08	1,038.92	2,357.85
25	8,389.72	4,998.20	1,032.65	2,358.87
26	8,431.97	5,025.38	1,033.10	2,373.48
27	8,416.38	5,013.55	1,025.15	2,377.68
28	8,393.83	4,997.93	1,039.22	2,356.68
29	8,419.53	5,014.50	1,036.65	2,368.38
30	8,390.33	4,990.55	1,041.65	2,358.13
31	8,402.98	5,013.68	1,028.87	2,360.43
32	8,404.35	5,007.10	1,035.48	2,361.77
33	8,397.43	5,010.12	1,031.17	2,356.15
34	8,379.12	4,995.40	1,032.55	2,351.17
35	8,392.48	5,004.18	1,039.15	2,349.15
36	8,399.67	5,004.57	1,028.53	2,366.57
37	8,171.60	4,883.87	1,002.90	2,284.83
38	8,606.03	5,138.87	1,056.02	2,411.15
39	8,400.02	5,015.07	1,028.40	2,356.55
Average	8,394.40	5,006.34	1,032.47	2,355.59

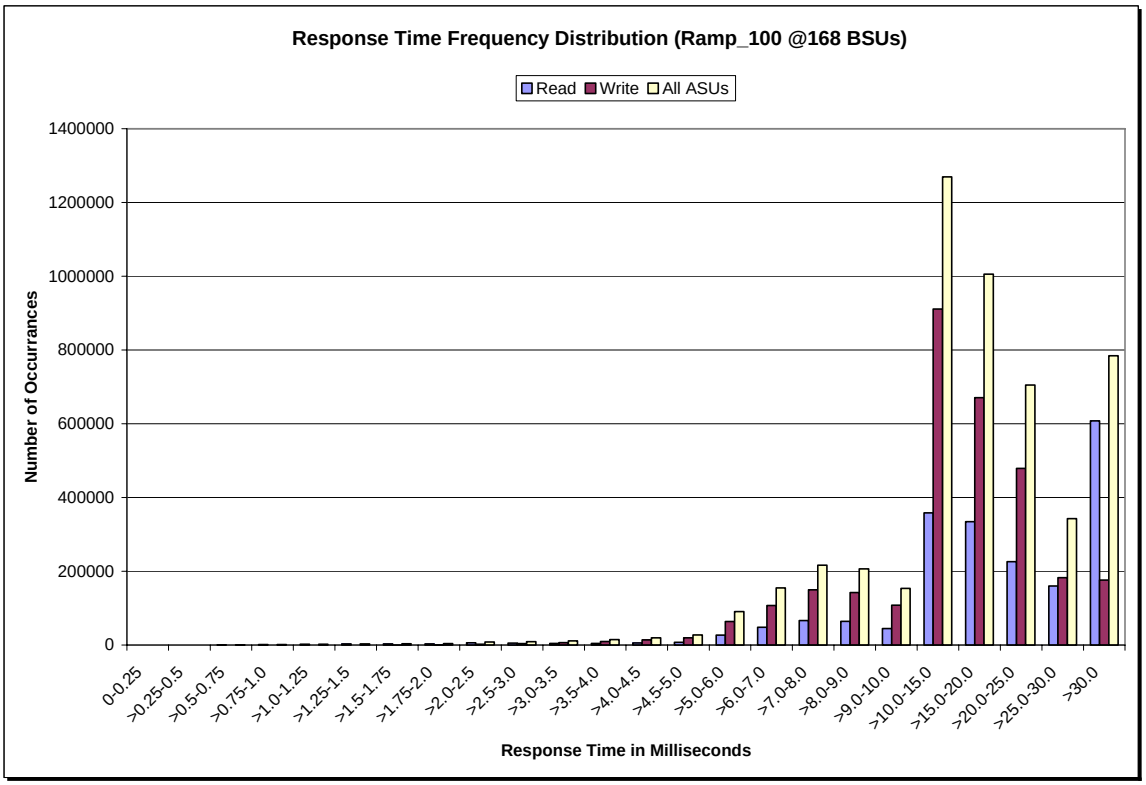
IOPS Test Run – I/O Request Throughput Distribution Graph



IOPS Test Run – Response Time Frequency Distribution Data

Response Time (ms)	0-0.25	>0.25-0.5	>0.5-0.75	>0.75-1.0	>1.0-1.25	>1.25-1.5	>1.5-1.75	>1.75-2.0
Read	0	70	618	1,464	2,276	2,933	3,419	3,385
Write	0	-	1	14	26	71	207	429
All ASUs	0	70	619	1,478	2,302	3,004	3,626	3,814
ASU1	0	62	571	1,393	2,163	2,764	3,290	3,289
ASU2	0	8	48	85	133	202	251	333
ASU3	0	-	-	-	6	38	85	192
Response Time (ms)	**>2.0-2.5**	**>2.5-3.0**	**>3.0-3.5**	**>3.5-4.0**	**>4.0-4.5**	**>4.5-5.0**	**>5.0-6.0**	**>6.0-7.0**
Read	6,427	5,193	4,569	4,770	5,695	7,795	26,983	48,232
Write	2,099	4,102	6,894	9,961	14,015	19,553	63,708	106,991
All ASUs	8,526	9,295	11,463	14,731	19,710	27,348	90,691	155,223
ASU1	6,677	6,503	7,391	9,718	13,384	18,697	61,027	103,222
ASU2	837	1,046	1,346	1,687	2,172	2,886	8,993	14,452
ASU3	1,012	1,746	2,726	3,326	4,154	5,765	20,671	37,549
Response Time (ms)	**>7.0-8.0**	**>8.0-9.0**	**>9.0-10.0**	**>10.0-15.0**	**>15.0-20.0**	**>20.0-25.0**	**>25.0-30.0**	**>30.0**
Read	66,695	64,154	45,150	358,467	334,733	225,896	160,285	608,052
Write	149,847	142,545	108,336	911,217	670,991	479,190	182,712	176,386
All ASUs	216,542	206,699	153,486	1,269,684	1,005,724	705,086	342,997	784,438
ASU1	140,022	127,576	89,203	705,392	567,815	364,041	213,498	556,064
ASU2	20,274	20,524	16,441	145,800	121,048	94,997	42,872	123,029
ASU3	56,246	58,599	47,842	418,492	316,861	246,048	86,627	105,345

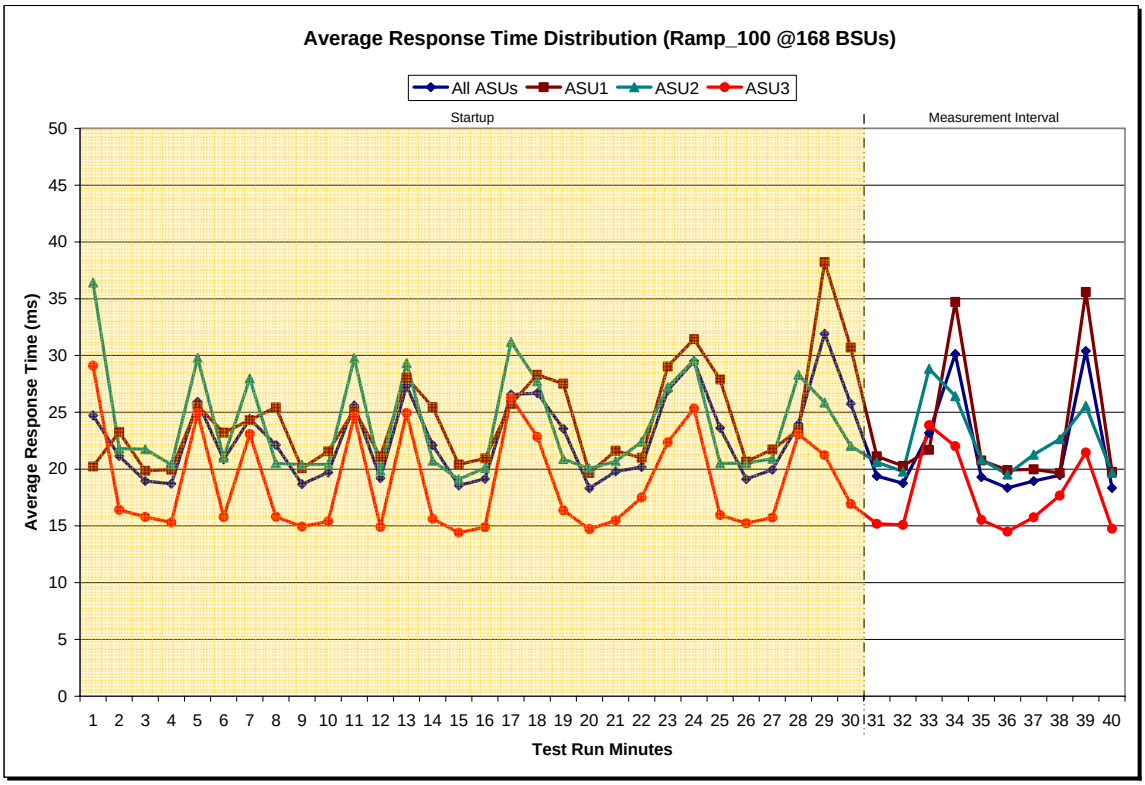
IOPS Test Run –Response Time Frequency Distribution Graph



IOPS Test Run – Average Response Time (ms) Distribution Data

168 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	22:45:41	23:15:42	0-29	0:30:01
Measurement Interval	23:15:42	23:25:42	30-39	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	24.72	20.22	36.43	29.11
1	21.15	23.25	21.80	16.41
2	18.94	19.85	21.74	15.79
3	18.70	19.95	20.39	15.30
4	25.92	25.59	29.78	24.93
5	20.85	23.21	21.02	15.78
6	24.42	24.32	27.98	23.09
7	22.13	25.44	20.52	15.80
8	18.67	20.07	20.38	14.94
9	19.70	21.56	20.41	15.40
10	25.60	25.18	29.76	24.68
11	19.20	21.09	19.85	14.91
12	27.34	28.05	29.35	24.94
13	22.11	25.46	20.72	15.62
14	18.56	20.40	19.10	14.40
15	19.14	20.94	20.10	14.89
16	26.56	25.74	31.20	26.29
17	26.69	28.30	27.73	22.84
18	23.56	27.52	20.88	16.36
19	18.31	19.65	20.05	14.70
20	19.78	21.61	20.68	15.48
21	20.19	20.99	22.42	17.50
22	26.93	29.03	27.21	22.35
23	29.50	31.44	29.60	25.33
24	23.62	27.89	20.52	15.95
25	19.11	20.66	20.51	15.23
26	19.94	21.73	20.92	15.73
27	23.93	23.44	28.31	23.07
28	31.92	38.23	25.86	21.23
29	25.76	30.70	22.03	16.93
30	19.39	21.13	20.61	15.18
31	18.75	20.27	19.77	15.09
32	23.18	21.69	28.84	23.87
33	30.14	34.72	26.43	22.02
34	19.30	20.76	20.84	15.52
35	18.35	19.92	19.53	14.49
36	18.95	19.98	21.27	15.75
37	19.46	19.65	22.64	17.67
38	30.40	35.58	25.57	21.46
39	18.34	19.75	19.68	14.75
Average	21.63	23.34	22.52	17.58

IOPS Test Run – Average Response Time (ms) Distribution Graph



IOPS Test Run – I/O Request Information

I/O Requests Completed in the Measurement Interval	I/O Requests Completed with Response Time = or < 30 ms	I/O Requests Completed with Response Time > 30 ms
5,036,5556	4,252,118	784,438

IOPS Test Run – Measured Intensity Multiplier and Coefficient of Variation

	ASU1-1	ASU1-2	ASU1-3	ASU1-4	ASU2-1	ASU2-2	ASU2-3	ASU3-1
IM	*0.0350*	*0.2810*	*0.0700*	*0.2100*	*0.0180*	*0.0700*	*0.0350*	*0.2810*
MIM	0.0351	0.2811	0.0700	0.2102	0.0180	0.0700	0.0351	0.2806
COV	0.008	0.004	0.004	0.003	0.007	0.008	0.007	0.002

Clause 3.4.3

IM – Intensity Multiplier: *The ratio of I/Os for each I/O stream relative to the total I/Os for all I/O streams (ASU1-1 – ASU3-1) as required by the benchmark specification.*

Clauses 5.1.0 and 5.3.13.2

MIM – Measured Intensity Multiplier: *The Measured Intensity Multiplier represents the ratio of measured I/Os for each I/O stream relative to the total I/Os measured for all I/O streams (ASU1-1 – ASU3-1). This value may differ from the corresponding Expected Intensity Multiplier by no more than 5%.*

Clause 5.3.13.3

COV – Coefficient of Variation: *This measure of variation for the Measured Intensity Multiplier cannot exceed 0.2.*

Primary Metrics Test – Response Time Ramp Test Phase

Clause 5.4.2.3

The Response Time Ramp Test Phase consists of five Test Runs, one each at 95%, 90%, 80%, 50%, and 10% of the load point (100%) used to generate the SPC-1 IOPS™ primary metric. Each of the five Test Runs has a Measurement Interval of ten (10) minutes. The Response Time Ramp Test Phase immediately follows the IOPS Test Phase without any interruption or manual intervention.

The five Response Time Ramp Test Runs, in conjunction with the IOPS Test Run (100%), demonstrate the relationship between Average Response Time and I/O Request Throughput for the Tested Storage Configuration (TSC) as illustrated in the response time/throughput curve on page 11.

In addition, the Average Response Time measured during the 10% Test Run is the value for the SPC-1 LRT™ metric. That value represents the Average Response Time of a lightly loaded TSC.

Clause 9.2.4.7.3

The following content shall appear in the FDR for the Response Time Ramp Phase:

1. *A Response Time Ramp Distribution.*
2. *The human readable Test Run Results File produced by the Workload Generator for each Test Run within the Response Time Ramp Test Phase.*
3. *For the 10% Load Level Test Run (SPC-1 LRT™ metric) an Average Response Time Distribution.*
4. *A listing or screen image of all input parameters supplied to the Workload Generator.*

SPC-1 Workload Generator Input Parameters

The SPC-1 Workload Generator input parameters for the Sustainability, IOPS, and Response Time Ramp Test Runs are documented in "Appendix D: SPC-1 Workload Generator Input Parameters" on Page 73.

Response Time Ramp Test Results File

A link to each test result file generated from each Response Time Ramp Test Run list listed below.

95% Load Level

90% Load Level

80% Load Level

50% Load Level

10% Load Level

Response Time Ramp Distribution (IOPS) Data

The five Test Runs that comprise the Response Time Ramp Phase are executed at 95%, 90%, 80%, 50%, and 10% of the Business Scaling Unit (BSU) load level used to produce the SPC-1 IOPS™ primary metric. The 100% BSU load level is included in the following Response Time Ramp data tables and graphs for completeness.

100% Load Level - 168 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	22:45:41	23:15:42	0-29	0:30:01
Measurement Interval	23:15:42	23:25:42	30-39	0:10:00

(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	8,402.83	5,004.02	1,039.58	2,359.23
1	8,406.33	5,005.37	1,036.63	2,364.33
2	8,391.90	5,002.92	1,036.20	2,352.78
3	8,391.85	5,005.17	1,031.55	2,355.13
4	8,405.48	5,004.38	1,031.68	2,369.42
5	8,400.60	5,012.45	1,030.47	2,357.68
6	8,372.33	4,981.45	1,030.23	2,360.65
7	8,401.57	5,009.77	1,030.50	2,361.30
8	8,391.00	4,999.90	1,034.48	2,356.62
9	8,381.28	5,006.05	1,031.88	2,343.35
10	8,411.78	5,006.67	1,039.25	2,365.87
11	8,380.58	4,998.00	1,029.58	2,353.00
12	8,394.38	5,005.38	1,032.32	2,356.68
13	8,383.93	4,994.68	1,025.42	2,363.83
14	8,397.78	5,012.38	1,028.02	2,357.38
15	8,378.20	4,982.93	1,040.78	2,354.48
16	8,400.97	5,004.88	1,029.62	2,366.47
17	8,410.20	5,007.57	1,034.95	2,367.68
18	8,405.48	5,005.30	1,034.35	2,365.83
19	8,382.33	4,993.62	1,033.67	2,355.05
20	8,397.48	5,012.38	1,031.48	2,353.62
21	8,263.48	4,933.80	1,007.97	2,321.72
22	8,368.75	4,982.50	1,033.12	2,353.13
23	8,579.27	5,112.75	1,055.88	2,410.63
24	8,394.85	4,998.08	1,038.92	2,357.85
25	8,389.72	4,998.20	1,032.65	2,358.87
26	8,431.97	5,025.38	1,033.10	2,373.48
27	8,416.38	5,013.55	1,025.15	2,377.68
28	8,393.83	4,997.93	1,039.22	2,356.68
29	8,419.53	5,014.50	1,036.65	2,368.38
30	8,390.33	4,990.55	1,041.65	2,358.13
31	8,402.98	5,013.68	1,028.87	2,360.43
32	8,404.35	5,007.10	1,035.48	2,361.77
33	8,397.43	5,010.12	1,031.17	2,356.15
34	8,379.12	4,995.40	1,032.55	2,351.17
35	8,392.48	5,004.18	1,039.15	2,349.15
36	8,399.67	5,004.57	1,028.53	2,366.57
37	8,171.60	4,883.87	1,002.90	2,284.83
38	8,606.03	5,138.87	1,056.02	2,411.15
39	8,400.02	5,015.07	1,028.40	2,356.55
Average	8,394.40	5,006.34	1,032.47	2,355.59

95% Load Level - 159 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	23:25:46	23:55:47	0-29	0:30:01
Measurement Interval	23:55:47	0:05:47	30-39	0:10:00

(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	7,946.47	4,734.65	976.52	2,235.30
1	7,924.00	4,728.08	975.05	2,220.87
2	7,952.38	4,748.42	980.67	2,223.30
3	7,942.23	4,737.95	976.75	2,227.53
4	7,948.50	4,733.18	976.97	2,238.35
5	7,941.72	4,733.00	980.93	2,227.78
6	7,954.55	4,740.15	974.05	2,240.35
7	7,946.52	4,743.75	978.10	2,224.67
8	7,956.20	4,734.88	979.42	2,241.90
9	7,952.77	4,734.58	982.65	2,235.53
10	7,938.92	4,734.50	972.83	2,231.58
11	7,970.12	4,754.95	978.50	2,236.67
12	7,947.75	4,737.37	976.48	2,233.90
13	7,814.77	4,659.68	953.52	2,201.57
14	8,095.77	4,822.35	999.08	2,274.33
15	7,939.23	4,725.93	977.77	2,235.53
16	7,917.47	4,718.85	973.47	2,225.15
17	7,946.73	4,738.17	980.18	2,228.38
18	7,921.57	4,726.40	969.90	2,225.27
19	7,923.87	4,711.47	981.67	2,230.73
20	7,958.63	4,755.08	979.38	2,224.17
21	7,804.05	4,644.85	961.35	2,197.85
22	8,077.47	4,816.00	993.50	2,267.97
23	7,949.55	4,728.00	981.87	2,239.68
24	7,945.23	4,736.73	974.85	2,233.65
25	7,978.13	4,771.68	972.00	2,234.45
26	7,924.88	4,720.30	979.57	2,225.02
27	7,955.83	4,744.98	976.08	2,234.77
28	7,946.82	4,732.48	983.23	2,231.10
29	7,946.13	4,737.42	973.97	2,234.75
30	7,951.85	4,743.12	979.38	2,229.35
31	7,962.73	4,739.33	981.65	2,241.75
32	7,953.28	4,751.60	972.58	2,229.10
33	7,948.93	4,730.35	980.53	2,238.05
34	7,932.35	4,722.75	972.23	2,237.37
35	7,950.73	4,737.82	976.22	2,236.70
36	7,932.88	4,724.80	978.87	2,229.22
37	7,925.37	4,721.58	978.58	2,225.20
38	7,938.60	4,735.53	972.45	2,230.62
39	7,945.80	4,747.35	968.18	2,230.27
Average	7,944.25	4,735.42	976.07	2,232.76

Response Time Ramp Distribution (IOPS) Data *(continued)*

90% Load Level - 151 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	0:05:50	0:35:51	0-29	0:30:01
Measurement Interval	0:35:51	0:45:51	30-39	0:10:00
(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	7,544.43	4,496.25	925.92	2,122.27
1	7,549.97	4,497.45	932.87	2,119.65
2	7,549.53	4,495.20	931.92	2,122.42
3	7,538.58	4,495.05	923.57	2,119.97
4	7,556.42	4,486.88	930.87	2,138.67
5	7,540.30	4,488.07	924.47	2,127.77
6	7,537.10	4,493.30	927.60	2,116.20
7	7,557.43	4,507.73	933.25	2,116.45
8	7,556.57	4,504.58	926.38	2,125.60
9	7,558.98	4,501.63	926.07	2,131.28
10	7,559.03	4,496.40	932.47	2,130.17
11	7,556.62	4,491.32	931.82	2,133.48
12	7,550.92	4,496.10	934.33	2,120.48
13	7,545.03	4,496.95	929.65	2,118.43
14	7,555.52	4,506.93	933.93	2,114.65
15	7,548.68	4,500.23	930.97	2,117.48
16	7,548.50	4,497.78	923.57	2,127.15
17	7,554.25	4,503.73	930.52	2,120.00
18	7,528.03	4,485.43	920.12	2,122.48
19	7,540.17	4,494.42	927.85	2,117.90
20	7,547.10	4,492.07	931.45	2,123.58
21	7,536.68	4,497.52	929.68	2,109.48
22	7,554.22	4,504.45	931.43	2,118.33
23	7,548.98	4,489.37	928.18	2,131.43
24	7,552.03	4,495.83	927.25	2,128.95
25	7,545.78	4,499.57	927.53	2,118.68
26	7,553.67	4,508.62	931.68	2,113.37
27	7,557.30	4,513.02	925.37	2,118.92
28	7,554.57	4,504.67	926.05	2,123.85
29	7,537.77	4,500.58	925.18	2,112.00
30	7,534.00	4,491.60	926.42	2,115.98
31	7,560.18	4,495.07	929.77	2,135.35
32	7,550.65	4,503.55	926.48	2,120.62
33	7,565.85	4,507.08	925.02	2,133.75
34	7,551.05	4,496.68	936.57	2,117.80
35	7,529.92	4,489.43	922.78	2,117.70
36	7,546.03	4,495.25	933.90	2,116.88
37	7,529.65	4,478.60	927.23	2,123.82
38	7,554.93	4,499.97	929.70	2,125.27
39	7,530.53	4,481.88	927.93	2,120.72
Average	7,545.28	4,493.91	928.58	2,122.79

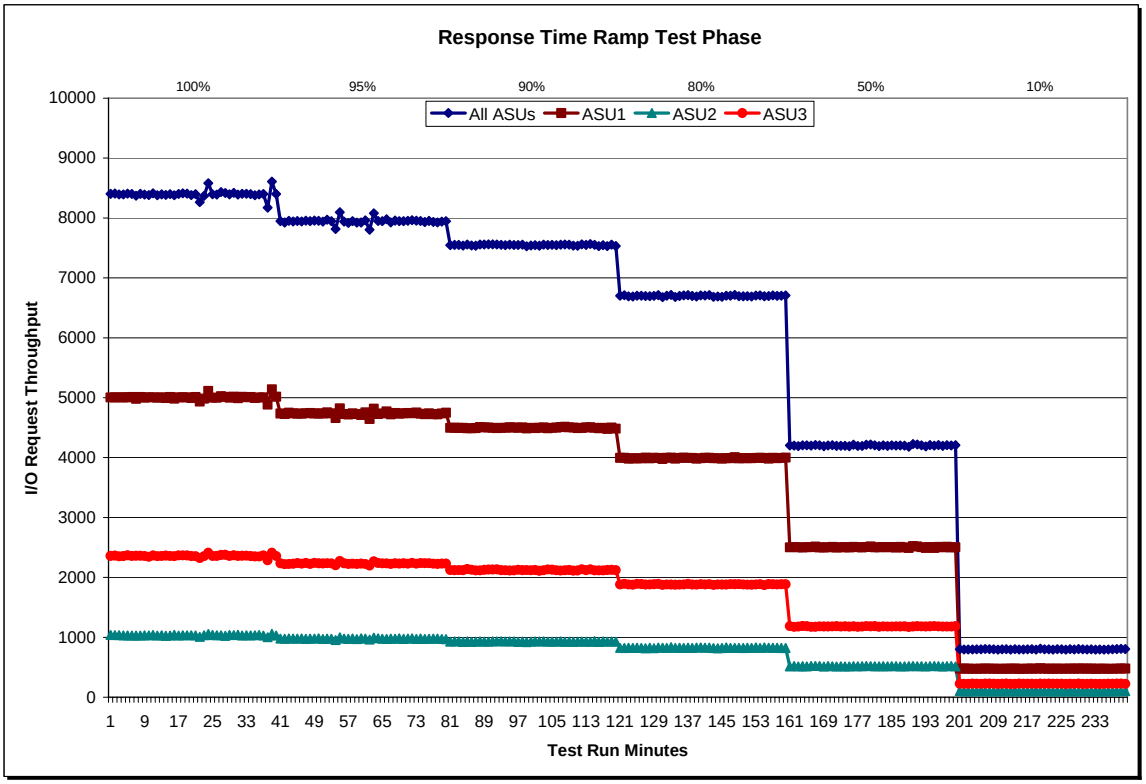
80% Load Level - 134 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	0:45:54	1:15:55	0-29	0:30:01
Measurement Interval	1:15:55	1:25:55	30-39	0:10:00
(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	6,700.70	3,995.82	822.72	1,882.17
1	6,710.32	3,996.58	821.77	1,891.97
2	6,690.42	3,982.32	826.95	1,881.15
3	6,688.80	3,987.53	824.03	1,877.23
4	6,703.23	3,985.43	825.78	1,892.02
5	6,700.30	3,987.82	823.00	1,889.48
6	6,696.63	3,999.58	816.60	1,880.45
7	6,694.87	3,985.17	827.00	1,882.70
8	6,699.17	3,995.62	818.55	1,885.00
9	6,710.50	3,992.70	828.12	1,889.68
10	6,677.52	3,975.57	827.15	1,874.80
11	6,702.53	3,997.00	824.15	1,881.38
12	6,715.32	3,999.23	836.15	1,879.93
13	6,681.60	3,980.32	823.73	1,877.55
14	6,697.53	3,993.17	825.27	1,879.10
15	6,705.40	3,999.50	824.25	1,881.65
16	6,711.95	3,993.82	827.03	1,891.10
17	6,697.18	3,993.55	822.90	1,880.73
18	6,687.63	3,980.80	827.90	1,878.93
19	6,707.15	3,988.57	830.98	1,887.60
20	6,704.60	3,995.62	827.17	1,881.82
21	6,712.10	3,997.78	827.90	1,886.42
22	6,682.67	3,989.03	820.42	1,873.22
23	6,689.43	3,989.42	817.27	1,882.75
24	6,684.37	3,981.80	821.78	1,880.78
25	6,701.93	3,990.22	831.15	1,880.57
26	6,700.92	3,990.42	824.28	1,886.22
27	6,716.07	4,007.80	822.65	1,885.62
28	6,694.53	3,984.65	822.88	1,887.00
29	6,693.07	3,990.07	821.57	1,881.43
30	6,693.67	3,990.18	824.95	1,878.53
31	6,689.57	3,988.80	823.33	1,877.43
32	6,704.73	3,993.88	829.68	1,881.17
33	6,708.03	3,997.03	823.95	1,887.05
34	6,692.33	3,992.35	829.77	1,870.22
35	6,695.78	3,981.48	824.85	1,889.45
36	6,707.92	3,996.15	826.67	1,885.10
37	6,699.70	3,990.65	827.08	1,881.97
38	6,701.45	3,993.20	822.20	1,886.05
39	6,705.35	3,998.18	821.32	1,885.85
Average	6,699.85	3,992.19	825.38	1,882.28

Response Time Ramp Distribution (IOPS) Data *(continued)*

50% Load Level - 84 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	1:25:58	1:55:59	0-29	0:30:01
Measurement Interval	1:55:59	2:05:59	30-39	0:10:00
(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	4,201.23	2,500.55	513.57	1,187.12
1	4,199.80	2,506.37	520.03	1,173.40
2	4,192.07	2,500.62	513.45	1,178.00
3	4,205.60	2,498.45	518.08	1,189.07
4	4,202.95	2,504.23	513.53	1,185.18
5	4,198.60	2,503.43	521.05	1,174.12
6	4,209.82	2,512.33	521.75	1,175.73
7	4,204.62	2,499.73	522.93	1,181.95
8	4,189.48	2,498.35	510.07	1,181.07
9	4,202.40	2,501.40	520.65	1,180.35
10	4,207.73	2,509.77	515.87	1,182.10
11	4,195.37	2,495.15	514.23	1,185.98
12	4,197.03	2,503.75	515.25	1,178.03
13	4,197.20	2,501.82	512.05	1,183.33
14	4,190.15	2,498.77	514.78	1,176.60
15	4,213.80	2,509.95	519.68	1,184.17
16	4,193.62	2,503.53	514.93	1,175.15
17	4,194.17	2,498.73	516.87	1,178.57
18	4,212.97	2,505.37	520.87	1,186.73
19	4,219.52	2,515.52	519.67	1,184.33
20	4,202.75	2,501.00	515.85	1,185.90
21	4,191.68	2,500.45	516.12	1,175.12
22	4,205.08	2,506.37	516.77	1,181.95
23	4,195.88	2,502.43	515.55	1,177.90
24	4,204.33	2,506.63	518.52	1,179.18
25	4,199.38	2,498.15	519.72	1,181.52
26	4,201.90	2,508.33	513.35	1,180.22
27	4,198.65	2,498.93	515.25	1,184.47
28	4,181.80	2,492.62	516.65	1,172.53
29	4,224.92	2,523.65	521.20	1,180.07
30	4,218.15	2,515.63	516.50	1,186.02
31	4,203.95	2,503.52	518.58	1,181.85
32	4,186.60	2,493.08	513.28	1,180.23
33	4,208.60	2,505.35	519.52	1,183.73
34	4,200.38	2,492.83	520.75	1,186.80
35	4,208.95	2,508.78	517.52	1,182.65
36	4,194.42	2,501.82	513.32	1,179.28
37	4,206.62	2,510.52	516.97	1,179.13
38	4,201.10	2,499.72	522.55	1,178.83
39	4,206.32	2,504.80	514.40	1,187.12
Average	4,203.51	2,503.61	517.34	1,182.57

10% Load Level - 16 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	2:06:02	2:36:03	0-29	0:30:01
Measurement Interval	2:36:03	2:46:03	30-39	0:10:00
(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	801.63	476.22	101.05	224.37
1	796.80	477.80	96.53	222.47
2	796.87	474.78	98.18	223.90
3	797.25	473.23	97.92	226.10
4	798.48	473.68	99.25	225.55
5	799.15	475.07	100.57	223.52
6	804.97	479.07	99.20	226.70
7	801.00	476.77	97.03	227.20
8	798.37	474.97	98.82	224.58
9	795.40	474.05	99.13	222.22
10	797.88	474.17	98.75	224.97
11	801.87	475.92	98.98	226.97
12	794.25	475.10	97.23	221.92
13	800.73	478.08	100.37	222.28
14	796.38	472.40	96.45	227.53
15	795.92	472.68	97.75	225.48
16	799.52	475.38	99.42	224.72
17	801.28	478.03	97.80	225.45
18	794.58	473.78	97.37	223.43
19	809.17	483.05	99.07	227.05
20	799.63	474.53	100.35	224.75
21	800.48	475.08	99.08	226.32
22	794.10	474.83	95.00	224.27
23	800.73	475.03	100.05	225.65
24	799.83	476.77	97.48	225.58
25	793.78	473.87	98.42	221.50
26	801.65	478.42	98.98	224.25
27	796.10	474.90	97.98	223.22
28	802.88	477.95	97.32	227.62
29	798.30	477.68	98.93	221.68
30	796.45	475.85	97.27	223.33
31	798.32	477.77	95.43	225.12
32	793.57	472.30	97.75	223.52
33	796.77	477.00	98.43	221.33
34	794.70	475.40	95.67	223.63
35	795.92	473.17	97.27	225.48
36	800.07	474.15	100.27	225.65
37	802.70	477.35	98.22	227.13
38	806.13	479.23	99.42	227.48
39	803.65	478.87	100.78	224.00
Average	798.83	476.11	98.05	224.67

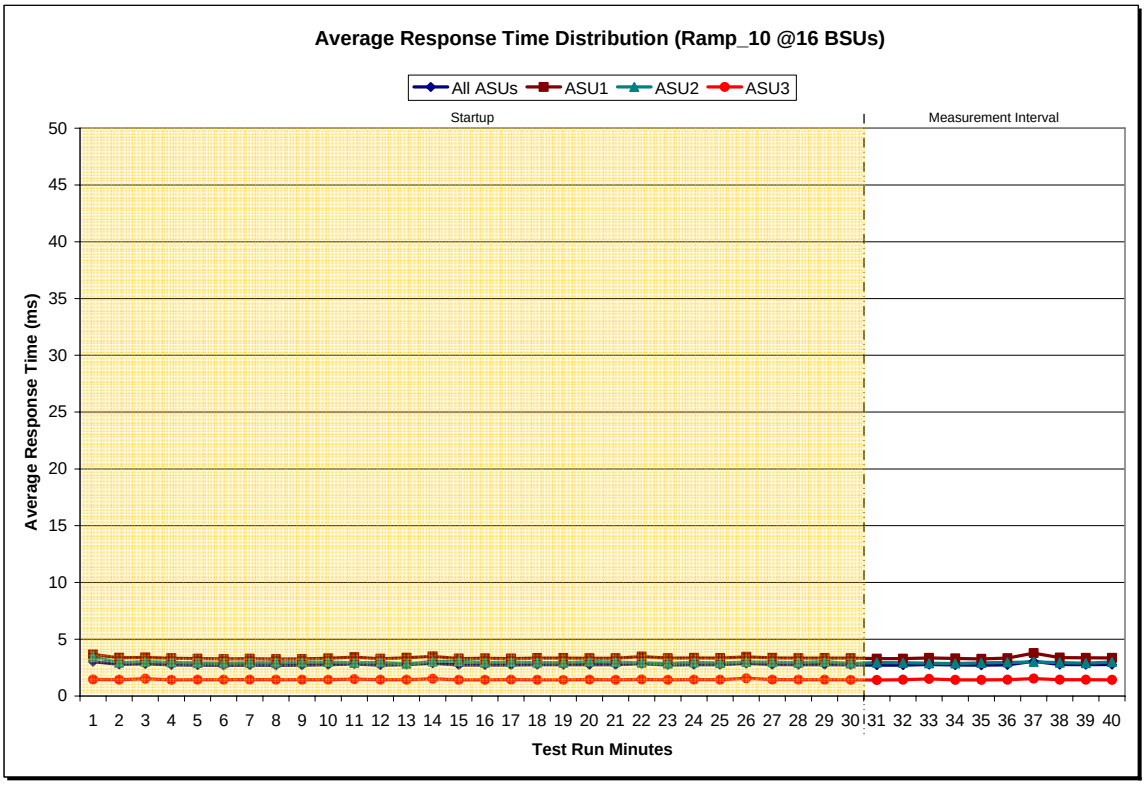
Response Time Ramp Distribution (IOPS) Graph



SPC-1 LRT™ Average Response Time (ms) Distribution Data

16 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	2:06:02	2:36:03	0-29	0:30:01
Measurement Interval	2:36:03	2:46:03	30-39	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	3.02	3.66	3.46	1.46
1	2.78	3.37	2.94	1.44
2	2.83	3.40	3.03	1.52
3	2.74	3.33	2.96	1.42
4	2.72	3.30	2.92	1.44
5	2.70	3.26	2.89	1.44
6	2.72	3.28	2.94	1.44
7	2.70	3.25	2.93	1.44
8	2.71	3.26	2.97	1.44
9	2.75	3.32	2.99	1.43
10	2.82	3.43	2.93	1.49
11	2.72	3.28	2.96	1.43
12	2.76	3.37	2.84	1.44
13	2.89	3.49	3.04	1.52
14	2.74	3.30	3.07	1.43
15	2.73	3.31	2.95	1.43
16	2.74	3.30	2.98	1.45
17	2.76	3.35	2.94	1.43
18	2.75	3.34	2.93	1.42
19	2.76	3.32	3.03	1.45
20	2.75	3.33	2.98	1.43
21	2.84	3.48	2.93	1.47
22	2.74	3.34	2.85	1.42
23	2.77	3.35	2.97	1.45
24	2.75	3.34	2.91	1.43
25	2.87	3.45	3.00	1.57
26	2.77	3.35	2.98	1.44
27	2.75	3.34	2.95	1.43
28	2.76	3.34	3.02	1.43
29	2.75	3.34	2.87	1.42
30	2.72	3.29	2.94	1.41
31	2.72	3.29	2.93	1.43
32	2.77	3.36	2.88	1.50
33	2.73	3.31	2.87	1.43
34	2.71	3.28	2.91	1.43
35	2.75	3.33	2.96	1.44
36	3.05	3.78	3.00	1.54
37	2.78	3.38	2.95	1.43
38	2.76	3.36	2.89	1.44
39	2.77	3.36	3.00	1.43
Average	2.78	3.37	2.93	1.45

SPC-1 LRT™ Average Response Time (ms) Distribution Graph



SPC-1 LRT™ (10%) – Measured Intensity Multiplier and Coefficient of Variation

	ASU1-1	ASU1-2	ASU1-3	ASU1-4	ASU2-1	ASU2-2	ASU2-3	ASU3-1
IM	*0.0350*	*0.2810*	*0.0700*	*0.2100*	*0.0180*	*0.0700*	*0.0350*	*0.2810*
MIM	0.0350	0.2808	0.0701	0.2101	0.0180	0.0698	0.0350	0.2812
COV	0.017	0.005	0.018	0.006	0.038	0.019	0.030	0.006

Clause 3.4.3

IM – Intensity Multiplier: *The ratio of I/Os for each I/O stream relative to the total I/Os for all I/O streams (ASU1-1 – ASU3-1) as required by the benchmark specification.*

Clauses 5.1.0 and 5.3.13.2

MIM – Measured Intensity Multiplier: *The Measured Intensity Multiplier represents the ratio of measured I/Os for each I/O stream relative to the total I/Os measured for all I/O streams (ASU1-1 – ASU3-1). This value may differ from the corresponding Expected Intensity Multiplier by no more than 5%.*

Clause 5.3.13.3

COV – Coefficient of Variation: *This measure of variation for the Measured Intensity Multiplier cannot exceed 0.2.*

Repeatability Test

Clause 5.4.5

The Repeatability Test demonstrates the repeatability and reproducibility of the SPC-1 IOPS™ primary metric and SPC-1 LRT™ metric generated in earlier Test Runs.

There are two identical Repeatability Test Phases. Each Test Phase contains two Test Runs. Each of the Test Runs will have a Measurement Interval of no less than ten (10) minutes. The two Test Runs in each Test Phase will be executed without interruption or any type of manual intervention.

The first Test Run in each Test Phase is executed at the 10% load point. The Average Response Time from each of the Test Runs is compared to the SPC-1 LRT™ metric. Each Average Response Time value must be less than the SPC-1 LRT™ metric plus 5%.

The second Test Run in each Test Phase is executed at the 100% load point. The I/O Request Throughput from the Test Runs is compared to the SPC-1 IOPS™ primary metric. Each I/O Request Throughput value must be greater than the SPC-1 IOPS™ primary metric minus 5%. In addition, the Average Response Time for each Test Run cannot exceed 30 milliseconds.

If any of the above constraints are not met, the benchmark measurement is invalid.

Clause 9.2.4.7.4

The following content shall appear in the FDR for each Test Run in the two Repeatability Test Phases:

1. *A table containing the results of the Repeatability Test.*
2. *An I/O Request Throughput Distribution graph and table.*
3. *An Average Response Time Distribution graph and table.*
4. *The human readable Test Run Results File produced by the Workload Generator.*
5. *A listing or screen image of all input parameters supplied to the Workload Generator.*

SPC-1 Workload Generator Input Parameters

The SPC-1 Workload Generator input parameters for the Repeatability Test Runs are documented in “Appendix D: SPC-1 Workload Generator Input Parameters” on Page 73.

Repeatability Test Results File

The values for the SPC-1 IOPS™, SPC-1 LRT™, and the Repeatability Test measurements are listed below.

	SPC-1 IOPS™	SPC-1 LRT™
Primary Metrics	*8,394.40*	*2.78*
Repeatability Test Phase 1	8,408.42	2.77
Repeatability Test Phase 2	8,392.90	2.80

A link to the test result file generated from each Repeatability Test Run list is listed below.

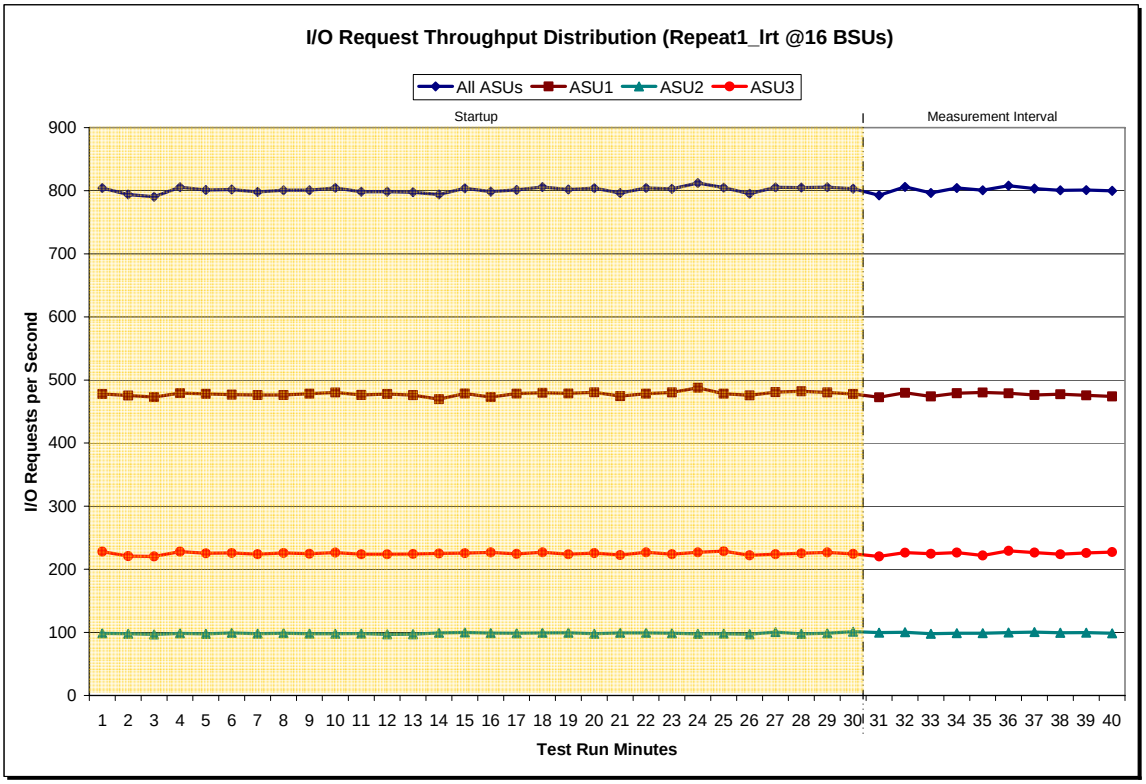
Repeatability Test Phase 1, Test Run 1 (LRT)
Repeatability Test Phase 1, Test Run 2 (IOPS)
Repeatability Test Phase 2, Test Run 1 (LRT)
Repeatability Test Phase 2, Test Run 2 (IOPS)

Repeatability 1 LRT – I/O Request Throughput Distribution Data

16 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	2:46:15	3:16:15	0-29	0:30:00
Measurement Interval	3:16:15	3:26:15	30-39	0:10:00

60 second intervals	All ASUs	ASU1	ASU2	ASU3
0	804.13	477.73	98.43	227.97
1	794.02	475.40	97.73	220.88
2	790.28	472.98	96.82	220.48
3	805.57	479.20	98.35	228.02
4	801.12	478.15	97.53	225.43
5	801.95	476.83	99.28	225.83
6	797.98	476.13	97.90	223.95
7	800.75	476.18	98.72	225.85
8	800.78	478.28	97.90	224.60
9	804.53	480.25	97.77	226.52
10	798.37	476.35	98.17	223.85
11	798.55	477.72	97.03	223.80
12	797.50	476.03	97.15	224.32
13	794.07	469.78	99.27	225.02
14	803.90	478.55	99.80	225.55
15	798.50	472.98	98.88	226.63
16	801.23	478.37	98.50	224.37
17	805.75	479.77	99.17	226.82
18	801.90	478.77	99.42	223.72
19	803.95	480.48	97.73	225.73
20	796.27	474.50	99.18	222.58
21	804.33	478.28	99.20	226.85
22	802.88	480.28	98.58	224.02
23	812.15	487.67	97.67	226.82
24	804.87	478.32	97.95	228.60
25	795.12	475.75	97.12	222.25
26	805.20	480.83	100.47	223.90
27	805.00	482.08	97.53	225.38
28	805.60	480.30	98.57	226.73
29	803.22	477.70	101.15	224.37
30	792.60	472.65	99.55	220.40
31	806.13	479.65	100.17	226.32
32	796.42	474.00	97.82	224.60
33	804.33	479.12	98.73	226.48
34	800.83	480.20	98.75	221.88
35	807.93	478.93	99.68	229.32
36	803.42	476.37	100.50	226.55
37	800.60	477.40	99.43	223.77
38	801.00	475.62	99.53	225.85
39	799.90	473.93	98.57	227.40
Average	801.32	476.79	99.27	225.26

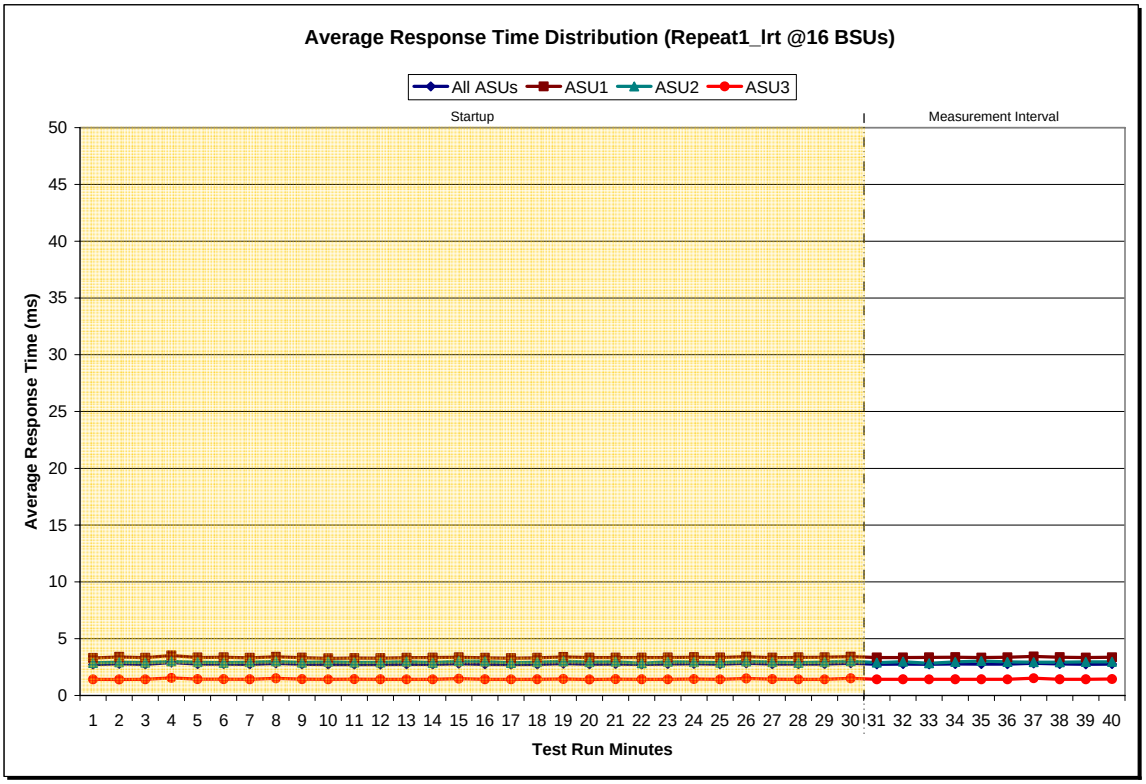
Repeatability 1 LRT – I/O Request Throughput Distribution Graph



Repeatability 1 LRT –Average Response Time (ms) Distribution Data

16 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	2:46:15	3:16:15	0-29	0:30:00
Measurement Interval	3:16:15	3:26:15	30-39	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	2.72	3.30	2.87	1.42
1	2.79	3.40	2.92	1.41
2	2.74	3.32	2.90	1.42
3	2.90	3.52	3.01	1.55
4	2.76	3.34	2.94	1.43
5	2.76	3.36	2.89	1.44
6	2.73	3.31	2.93	1.42
7	2.82	3.41	3.00	1.50
8	2.74	3.33	2.90	1.43
9	2.72	3.27	2.98	1.42
10	2.72	3.29	2.91	1.43
11	2.72	3.28	2.92	1.43
12	2.74	3.32	2.99	1.41
13	2.73	3.33	2.88	1.42
14	2.79	3.37	3.04	1.47
15	2.74	3.30	3.00	1.43
16	2.71	3.29	2.87	1.42
17	2.73	3.31	2.94	1.43
18	2.80	3.39	3.02	1.45
19	2.75	3.34	2.94	1.41
20	2.76	3.34	2.98	1.43
21	2.73	3.33	2.84	1.42
22	2.76	3.35	2.97	1.42
23	2.78	3.37	2.94	1.44
24	2.74	3.35	2.89	1.42
25	2.83	3.42	3.00	1.50
26	2.76	3.33	2.95	1.43
27	2.76	3.36	2.88	1.42
28	2.76	3.36	2.95	1.42
29	2.84	3.42	3.03	1.51
30	2.75	3.34	2.89	1.42
31	2.76	3.34	2.98	1.43
32	2.74	3.35	2.84	1.42
33	2.77	3.37	2.95	1.42
34	2.77	3.33	3.03	1.43
35	2.76	3.36	2.96	1.42
36	2.83	3.43	2.94	1.51
37	2.77	3.37	2.92	1.43
38	2.75	3.33	2.95	1.42
39	2.77	3.36	2.96	1.45
Average	2.77	3.36	2.94	1.44

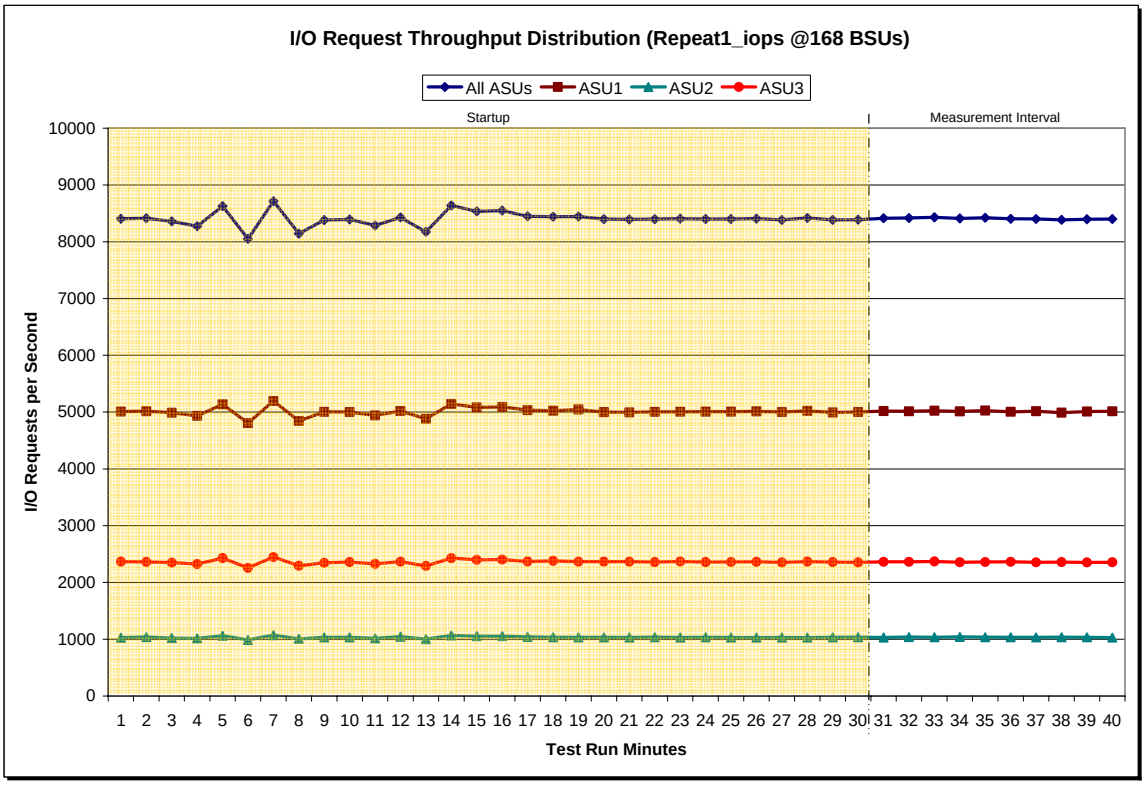
Repeatability 1 LRT –Average Response Time (ms) Distribution Graph



Repeatability 1 IOPS – I/O Request Throughput Distribution Data

168 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	3:26:20	3:56:21	0-29	0:30:01
Measurement Interval	3:56:21	4:06:21	30-39	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	8,404.07	5,008.75	1,027.50	2,367.82
1	8,414.97	5,014.25	1,038.12	2,362.60
2	8,358.15	4,988.80	1,019.55	2,349.80
3	8,272.43	4,932.72	1,015.52	2,324.20
4	8,626.73	5,136.98	1,061.07	2,428.68
5	8,050.00	4,804.88	988.27	2,256.85
6	8,714.38	5,195.17	1,072.47	2,446.75
7	8,143.67	4,842.95	1,006.23	2,294.48
8	8,382.75	5,002.95	1,033.32	2,346.48
9	8,393.30	5,000.60	1,033.67	2,359.03
10	8,286.13	4,941.40	1,016.57	2,328.17
11	8,427.77	5,017.22	1,044.50	2,366.05
12	8,175.57	4,882.55	1,002.57	2,290.45
13	8,639.35	5,143.87	1,067.15	2,428.33
14	8,535.88	5,084.37	1,053.82	2,397.70
15	8,548.88	5,091.73	1,054.22	2,402.93
16	8,448.40	5,036.10	1,041.97	2,370.33
17	8,441.33	5,025.33	1,035.45	2,380.55
18	8,445.10	5,045.98	1,032.93	2,366.18
19	8,397.30	4,997.95	1,032.53	2,366.82
20	8,391.92	4,995.42	1,030.70	2,365.80
21	8,398.13	5,003.58	1,036.88	2,357.67
22	8,405.88	5,005.68	1,031.72	2,368.48
23	8,399.52	5,006.95	1,034.52	2,358.05
24	8,399.07	5,007.42	1,031.13	2,360.52
25	8,406.47	5,012.58	1,029.72	2,364.17
26	8,384.15	4,999.57	1,031.40	2,353.18
27	8,417.57	5,021.40	1,029.25	2,366.92
28	8,383.80	4,992.82	1,033.12	2,357.87
29	8,388.68	5,000.45	1,035.57	2,352.67
30	8,413.70	5,018.13	1,031.58	2,363.98
31	8,417.00	5,015.05	1,037.68	2,364.27
32	8,430.75	5,025.25	1,034.45	2,371.05
33	8,410.33	5,012.30	1,041.62	2,356.42
34	8,423.38	5,027.12	1,036.82	2,359.45
35	8,403.30	5,005.77	1,033.92	2,363.62
36	8,402.43	5,015.98	1,032.52	2,353.93
37	8,386.22	4,991.62	1,036.35	2,358.25
38	8,397.07	5,010.25	1,034.80	2,352.02
39	8,400.00	5,014.75	1,029.02	2,356.23
Average	8,408.42	5,013.62	1,034.88	2,359.92

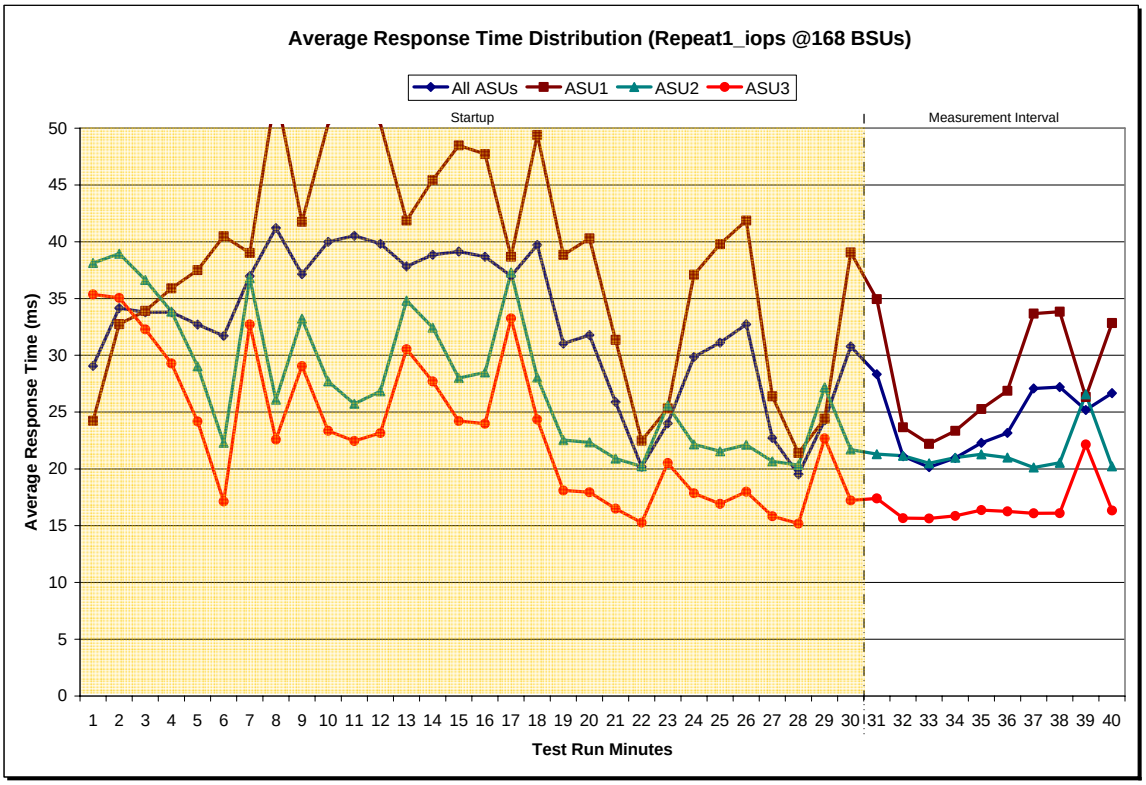
Repeatability 1 IOPS – I/O Request Throughput Distribution Graph



Repeatability 1 IOPS –Average Response Time (ms) Distribution Data

168 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	3:26:20	3:56:21	0-29	0:30:01
Measurement Interval	3:56:21	4:06:21	30-39	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	29.07	24.24	38.13	35.36
1	34.16	32.75	38.95	35.06
2	33.79	33.91	36.64	32.28
3	33.79	35.90	33.85	29.29
4	32.71	37.50	29.03	24.18
5	31.71	40.49	22.29	17.13
6	36.97	39.02	36.79	32.71
7	41.21	53.17	26.10	22.58
8	37.15	41.75	33.23	29.05
9	39.99	50.38	27.71	23.35
10	40.53	52.09	25.73	22.46
11	39.82	50.39	26.84	23.16
12	37.83	41.86	34.81	30.54
13	38.85	45.44	32.44	27.70
14	39.14	48.48	28.00	24.21
15	38.68	47.73	28.49	23.98
16	36.99	38.68	37.29	33.25
17	39.71	49.40	28.04	24.35
18	31.03	38.84	22.54	18.10
19	31.79	40.30	22.34	17.94
20	25.89	31.36	20.91	16.50
21	20.18	22.49	20.22	15.27
22	24.00	25.33	25.57	20.51
23	29.85	37.10	22.15	17.86
24	31.12	39.79	21.55	16.92
25	32.73	41.87	22.12	17.99
26	22.72	26.39	20.67	15.83
27	19.52	21.40	20.34	15.18
28	24.27	24.42	27.18	22.68
29	30.79	39.06	21.70	17.23
30	28.34	34.94	21.30	17.40
31	21.11	23.67	21.15	15.66
32	20.15	22.21	20.49	15.63
33	20.96	23.35	20.98	15.85
34	22.29	25.27	21.28	16.38
35	23.16	26.87	21.00	16.26
36	27.08	33.67	20.12	16.09
37	27.21	33.84	20.54	16.10
38	25.19	26.33	26.57	22.14
39	26.67	32.84	20.22	16.34
Average	24.21	28.30	21.37	16.78

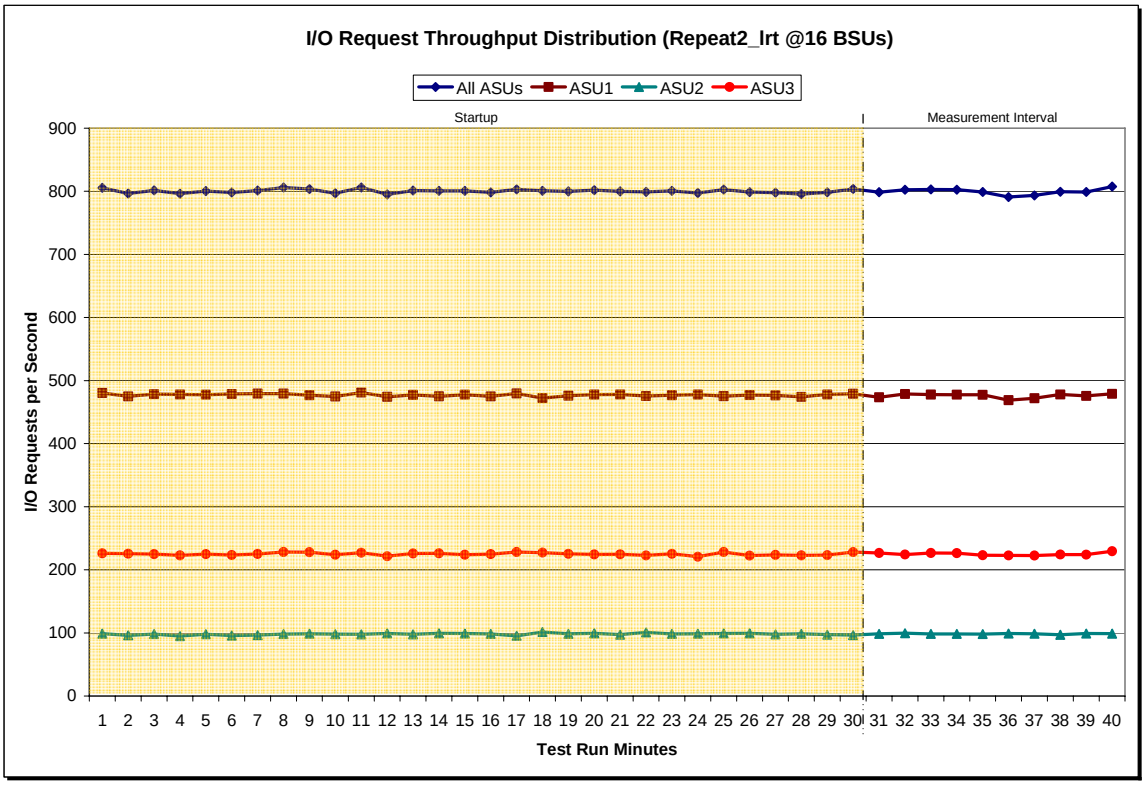
Repeatability 1 IOPS –Average Response Time (ms) Distribution Graph



Repeatability 2 LRT – I/O Request Throughput Distribution Data

16 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	4:06:35	4:36:35	0-29	0:30:00
Measurement Interval	4:36:35	4:46:35	30-39	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	805.40	480.28	98.87	226.25
1	796.50	474.85	96.10	225.55
2	801.45	478.42	98.18	224.85
3	796.05	477.88	95.12	223.05
4	800.38	477.58	97.95	224.85
5	798.08	478.80	95.80	223.48
6	801.12	479.45	96.50	225.17
7	805.98	479.45	98.28	228.25
8	803.47	476.83	98.73	227.90
9	796.85	474.78	98.08	223.98
10	806.03	481.05	97.82	227.17
11	794.97	474.17	99.23	221.57
12	801.12	477.22	97.82	226.08
13	800.58	475.10	99.33	226.15
14	800.70	477.58	99.10	224.02
15	798.27	474.92	98.48	224.87
16	803.10	479.60	95.28	228.22
17	800.75	472.12	101.38	227.25
18	799.87	475.97	98.52	225.38
19	801.68	477.78	99.38	224.52
20	799.90	477.92	97.37	224.62
21	799.02	475.40	100.83	222.78
22	800.65	476.87	98.35	225.43
23	797.28	477.82	98.77	220.70
24	802.70	475.18	99.27	228.25
25	798.75	476.95	99.32	222.48
26	797.88	476.45	97.75	223.68
27	795.55	474.03	98.58	222.93
28	798.45	477.95	97.25	223.25
29	803.70	479.13	96.50	228.07
30	798.62	473.37	98.55	226.70
31	802.47	478.68	99.47	224.32
32	802.95	477.83	98.45	226.67
33	802.62	477.65	98.47	226.50
34	798.83	477.43	98.32	223.08
35	790.90	469.02	99.12	222.77
36	793.42	472.03	98.78	222.60
37	799.25	477.88	97.08	224.28
38	798.82	475.67	99.08	224.07
39	807.50	478.88	98.97	229.65
Average	799.54	475.85	98.63	225.06

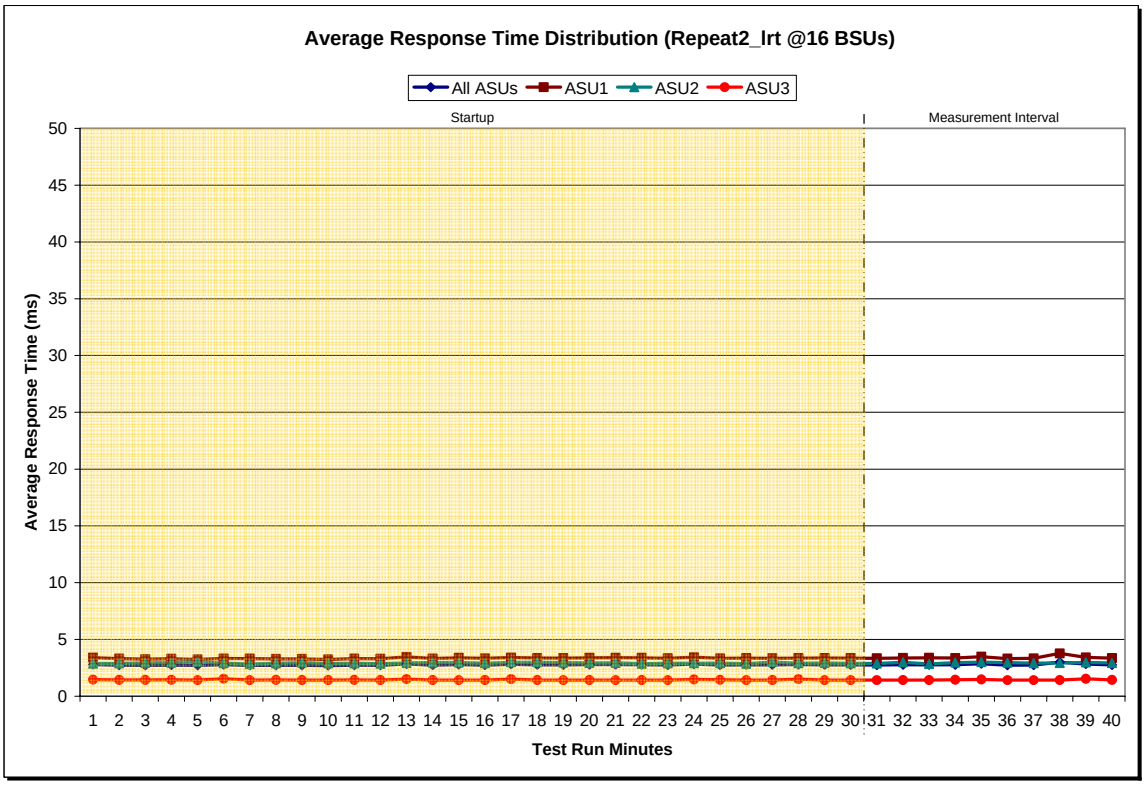
Repeatability 2 LRT – I/O Request Throughput Distribution Graph



Repeatability 2 LRT –Average Response Time (ms) Distribution Data

16 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	4:06:35	4:36:35	0-29	0:30:00
Measurement Interval	4:36:35	4:46:35	30-39	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	2.79	3.40	2.88	1.47
1	2.73	3.31	2.89	1.44
2	2.71	3.26	2.94	1.43
3	2.74	3.30	2.95	1.45
4	2.71	3.25	3.03	1.42
5	2.77	3.32	2.92	1.54
6	2.72	3.31	2.83	1.42
7	2.71	3.28	2.90	1.43
8	2.72	3.28	2.96	1.42
9	2.69	3.25	2.89	1.43
10	2.73	3.31	2.90	1.43
11	2.72	3.30	2.85	1.42
12	2.85	3.46	2.93	1.51
13	2.74	3.32	2.97	1.43
14	2.78	3.38	2.97	1.42
15	2.74	3.33	2.91	1.42
16	2.82	3.41	2.99	1.50
17	2.77	3.36	2.99	1.43
18	2.76	3.35	2.97	1.42
19	2.78	3.38	2.93	1.43
20	2.78	3.39	2.94	1.42
21	2.77	3.38	2.85	1.42
22	2.75	3.34	2.90	1.42
23	2.83	3.43	2.91	1.48
24	2.74	3.33	2.92	1.44
25	2.75	3.36	2.86	1.42
26	2.77	3.34	3.02	1.43
27	2.78	3.35	2.91	1.51
28	2.77	3.36	2.93	1.42
29	2.75	3.36	2.89	1.42
30	2.74	3.35	2.88	1.42
31	2.78	3.37	2.99	1.42
32	2.77	3.38	2.84	1.43
33	2.77	3.36	2.96	1.45
34	2.86	3.47	3.00	1.48
35	2.73	3.31	2.95	1.42
36	2.75	3.33	2.92	1.42
37	3.01	3.77	2.92	1.43
38	2.83	3.42	2.98	1.53
39	2.75	3.35	2.92	1.44
Average	2.80	3.41	2.94	1.44

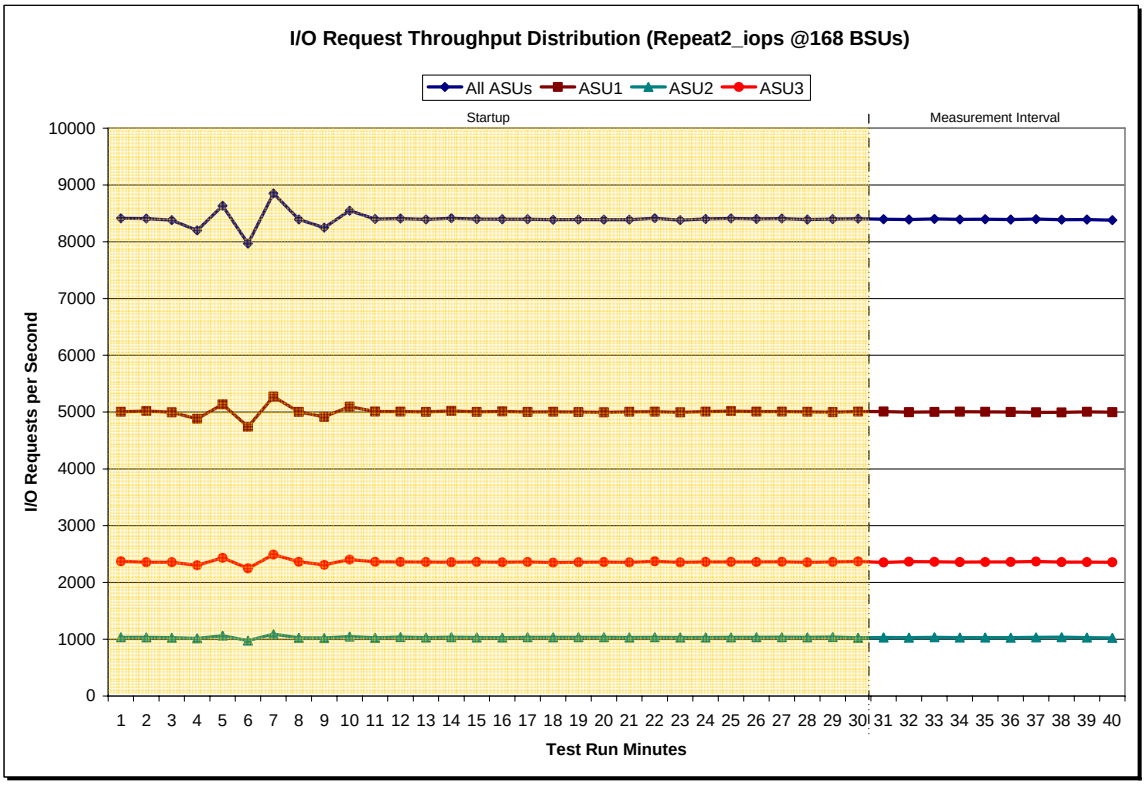
Repeatability 2 LRT –Average Response Time (ms) Distribution Graph



Repeatability 2 IOPS – I/O Request Throughput Distribution Data

168 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	4:46:40	5:16:41	0-29	0:30:01
Measurement Interval	5:16:41	5:26:41	30-39	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	8,412.23	5,005.73	1,034.90	2,371.60
1	8,408.30	5,019.43	1,032.50	2,356.37
2	8,379.57	4,995.85	1,027.00	2,356.72
3	8,200.42	4,883.03	1,014.13	2,303.25
4	8,633.65	5,137.40	1,063.22	2,433.03
5	7,967.55	4,741.40	976.62	2,249.53
6	8,851.88	5,273.10	1,089.12	2,489.67
7	8,392.45	5,004.32	1,025.30	2,362.83
8	8,249.18	4,916.95	1,022.00	2,310.23
9	8,547.98	5,096.80	1,047.80	2,403.38
10	8,400.57	5,010.13	1,026.45	2,363.98
11	8,408.10	5,008.70	1,037.90	2,361.50
12	8,392.32	5,003.87	1,029.53	2,358.92
13	8,413.95	5,021.27	1,036.32	2,356.37
14	8,397.32	5,003.83	1,031.08	2,362.40
15	8,396.35	5,013.17	1,029.22	2,353.97
16	8,396.20	5,002.35	1,033.83	2,360.02
17	8,387.87	5,005.48	1,032.93	2,349.45
18	8,391.00	4,999.67	1,034.17	2,357.17
19	8,388.98	4,995.68	1,035.38	2,357.92
20	8,388.60	5,005.50	1,031.15	2,351.95
21	8,414.38	5,006.68	1,035.33	2,372.37
22	8,380.53	4,995.73	1,031.72	2,353.08
23	8,401.93	5,009.42	1,031.05	2,361.47
24	8,411.03	5,017.35	1,032.62	2,361.07
25	8,402.18	5,008.23	1,034.77	2,359.18
26	8,409.27	5,008.23	1,037.17	2,363.87
27	8,391.00	5,006.03	1,032.72	2,352.25
28	8,398.58	4,998.93	1,037.60	2,362.05
29	8,405.55	5,008.25	1,026.43	2,370.87
30	8,395.85	5,011.42	1,031.73	2,352.70
31	8,391.87	4,998.42	1,027.77	2,365.68
32	8,402.42	5,003.47	1,034.75	2,364.20
33	8,392.70	5,006.67	1,028.63	2,357.40
34	8,395.92	5,005.80	1,030.05	2,360.07
35	8,391.20	5,001.48	1,027.88	2,361.83
36	8,397.75	4,996.97	1,032.32	2,368.47
37	8,388.83	4,994.08	1,036.28	2,358.47
38	8,391.90	5,005.15	1,028.60	2,358.15
39	8,380.55	4,999.08	1,024.55	2,356.92
Average	8,392.90	5,002.25	1,030.26	2,360.39

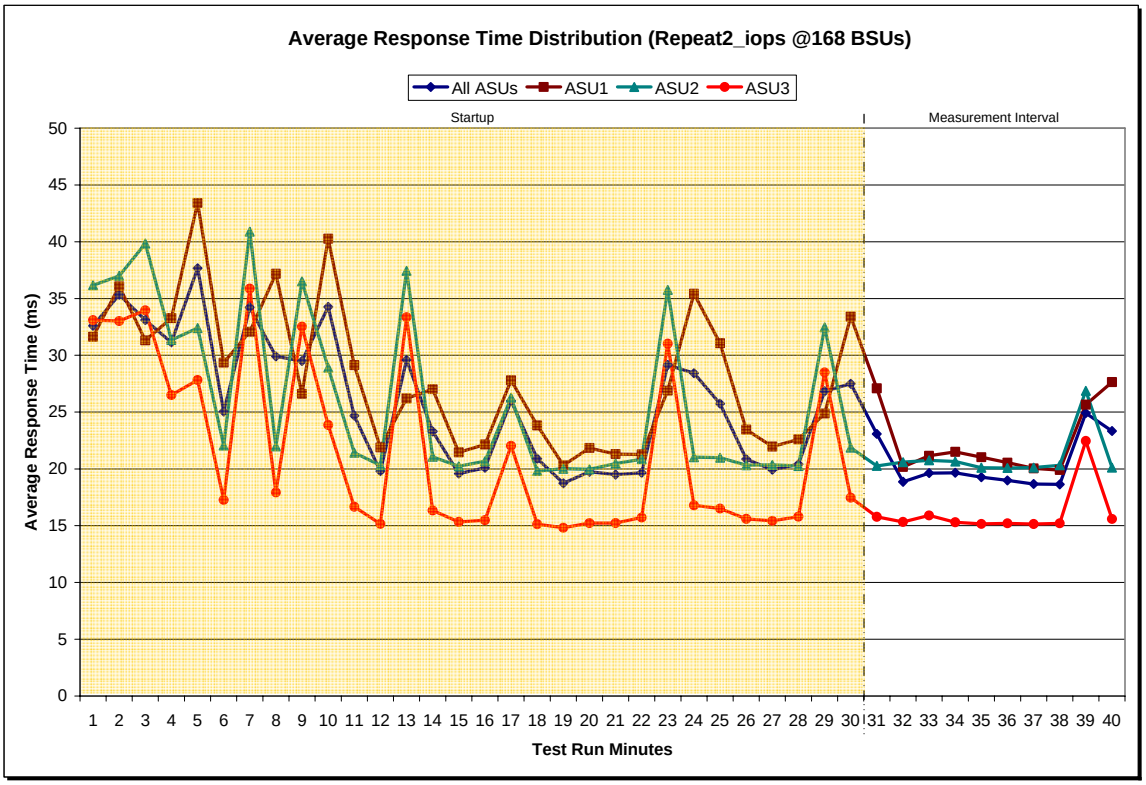
Repeatability 2 IOPS – I/O Request Throughput Distribution Graph



Repeatability 2 IOPS –Average Response Time (ms) Distribution Data

168 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	4:46:40	5:16:41	0-29	0:30:01
Measurement Interval	5:16:41	5:26:41	30-39	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	32.60	31.63	36.16	33.10
1	35.33	36.08	37.00	33.02
2	33.10	31.31	39.84	33.96
3	31.14	33.28	31.35	26.50
4	37.67	43.41	32.40	27.83
5	25.05	29.35	22.06	17.27
6	34.23	32.07	40.89	35.87
7	29.90	37.18	21.99	17.93
8	29.49	26.61	36.51	32.52
9	34.27	40.27	28.92	23.87
10	24.69	29.14	21.42	16.67
11	19.80	21.89	20.31	15.16
12	29.60	26.21	37.44	33.36
13	23.29	27.01	21.07	16.34
14	19.59	21.46	20.23	15.34
15	20.10	22.15	20.67	15.48
16	25.99	27.80	26.27	22.03
17	20.89	23.82	19.81	15.14
18	18.73	20.31	20.02	14.82
19	19.75	21.84	19.96	15.23
20	19.50	21.31	20.47	15.23
21	19.66	21.28	20.85	15.72
22	29.14	26.89	35.77	31.02
23	28.42	35.42	21.03	16.80
24	25.74	31.06	20.99	16.51
25	20.86	23.46	20.33	15.60
26	19.93	21.96	20.35	15.42
27	20.40	22.60	20.26	15.79
28	26.83	24.88	32.47	28.50
29	27.50	33.40	21.87	17.47
30	23.08	27.10	20.26	15.77
31	18.86	20.18	20.59	15.33
32	19.63	21.16	20.75	15.90
33	19.66	21.50	20.65	15.30
34	19.27	21.04	20.10	15.15
35	18.99	20.55	20.08	15.21
36	18.67	20.05	20.11	15.14
37	18.63	19.90	20.32	15.21
38	24.91	25.66	26.88	22.46
39	23.33	27.64	20.11	15.59
Average	20.50	22.48	20.99	16.11

Repeatability 2 IOPS –Average Response Time (ms) Distribution Graph



Repeatability 1 (LRT)
Measured Intensity Multiplier and Coefficient of Variation

	ASU1-1	ASU1-2	ASU1-3	ASU1-4	ASU2-1	ASU2-2	ASU2-3	ASU3-1
IM	*0.0350*	*0.2810*	*0.0700*	*0.2100*	*0.0180*	*0.0700*	*0.0350*	*0.2810*
MIM	0.0351	0.2803	0.0700	0.2096	0.0182	0.0704	0.0353	0.2811
COV	0.029	0.006	0.007	0.009	0.025	0.017	0.035	0.008

Clause 3.4.3

IM – Intensity Multiplier: *The ratio of I/Os for each I/O stream relative to the total I/Os for all I/O streams (ASU1-1 – ASU3-1) as required by the benchmark specification.*

Clauses 5.1.0 and 5.3.13.2

MIM – Measured Intensity Multiplier: *The Measured Intensity Multiplier represents the ratio of measured I/Os for each I/O stream relative to the total I/Os measured for all I/O streams (ASU1-1 – ASU3-1). This value may differ from the corresponding Expected Intensity Multiplier by no more than 5%.*

Clause 5.3.13.3

COV – Coefficient of Variation: *This measure of variation for the Measured Intensity Multiplier cannot exceed 0.2.*

Repeatability 1 (IOPS)
Measured Intensity Multiplier and Coefficient of Variation

	ASU1-1	ASU1-2	ASU1-3	ASU1-4	ASU2-1	ASU2-2	ASU2-3	ASU3-1
IM	*0.0350*	*0.2810*	*0.0700*	*0.2100*	*0.0180*	*0.0700*	*0.0350*	*0.2810*
MIM	0.0348	0.2811	0.0701	0.2102	0.0181	0.0699	0.0351	0.2807
COV	0.006	0.003	0.006	0.004	0.013	0.006	0.005	0.002

Repeatability 2 (LRT)
Measured Intensity Multiplier and Coefficient of Variation

	ASU1-1	ASU1-2	ASU1-3	ASU1-4	ASU2-1	ASU2-2	ASU2-3	ASU3-1
IM	*0.0350*	*0.2810*	*0.0700*	*0.2100*	*0.0180*	*0.0700*	*0.0350*	*0.2810*
MIM	0.0350	0.2800	0.0696	0.2105	0.0179	0.0706	0.0349	0.2815
COV	0.028	0.007	0.016	0.007	0.033	0.014	0.019	0.006

Repeatability 2 (IOPS)
Measured Intensity Multiplier and Coefficient of Variation

	ASU1-1	ASU1-2	ASU1-3	ASU1-4	ASU2-1	ASU2-2	ASU2-3	ASU3-1
IM	*0.0350*	*0.2810*	*0.0700*	*0.2100*	*0.0180*	*0.0700*	*0.0350*	*0.2810*
MIM	0.0350	0.2810	0.0699	0.2101	0.0180	0.0699	0.0349	0.2812
COV	0.008	0.002	0.005	0.002	0.010	0.005	0.007	0.002

Data Persistence Test

Clause 6

The Data Persistence Test demonstrates the Tested Storage Configuration (TSC):

- *Is capable of maintain data integrity across a power cycle.*
- *Ensures the transfer of data between Logical Volumes and host systems occurs without corruption or loss.*

The SPC-1 Workload Generator will write 16 block I/O requests at random over the total Addressable Storage Capacity of the TSC for ten (10) minutes at a minimum of 25% of the load used to generate the SPC-1 IOP™ primary metric. The bit pattern selected to be written to each block as well as the address of the block will be retained in a log file.

The Benchmark Configuration will be shutdown and restarted using a power off/power on cycle at the end of the above sequence of write operations. In addition, any caches employing battery backup must be flushed/emptied.

The SPC-1 Workload Generator will then use the above log file to verify each block written contains the correct bit pattern.

Clause 9.2.4.8

The following content shall appear in this section of the FDR:

1. *A listing or screen image of all input parameters supplied to the Workload Generator.*
2. *For the successful Data Persistence Test Run, a table illustrating key results. The content, appearance, and format of this table are specified in Table 9-12. Information displayed in this table shall be obtained from the Test Run Results File referenced below in #3.*
3. *For the successful Data Persistence Test Run, the human readable Test Run Results File produced by the Workload Generator.*

SPC-1 Workload Generator Input Parameters

The SPC-1 Workload Generator input parameters for the Persistence Test Run 1 are listed below and the input parameters for Persistence Test Run 2 are documented in "Appendix D: SPC-1 Workload Generator Input Parameters" on Page 73.

java –Xmx512m persist1 –b 168

Data Persistence Test Results File

A link to each test result file generated from each Data Persistence Test is listed below.

Persistence 1 Test Results File

Persistence 2 Test Results File

Data Persistence Test Results

Data Persistence Test Results	
Data Persistence Test Run Number: 1	
Total Number of Logical Blocks Written	14,788,544
Total Number of Logical Blocks Verified	13,564,352
Total Number of Logical Blocks that Failed Verification	0
Time Duration for Writing Test Logical Blocks	10 minutes
Size in Bytes of each Logical Block	512
Number of Failed I/O Requests in the process of the Test	0

In some cases the same address was the target of multiple writes, which resulted in more Logical Blocks Written than Logical Blocks Verified. In the case of multiple writes to the same address, the pattern written and verified must be associated with the last write to that address.

PRICED STORAGE CONFIGURATION AVAILABILITY DATE

Clause 9.2.4.9

The committed delivery data for general availability (Availability Date) of all products that comprise the Priced Storage Configuration must be reported. When the Priced Storage Configuration includes products or components with different availability dates, the reported Availability Date must be the date at which all components are committed to be available.

The FDR shall state: "The Priced Storage Configuration, as documented in this Full Disclosure Report will be available for shipment to customers on MMMM DD, YYYY." Where Priced Storage Configuration is the TSC Configuration Name as described in Clause 9.2.4.3.3 and MMMM is the alphanumeric month, DD is the numeric day, and YYYY is the numeric year of the date that the Priced Storage Configuration, as documented, is available for shipment to customers as described above.

The Sun StorEdge™ 6130 Array, as documented in this Full Disclosure Report will become available for customer purchase and shipment on May 18, 2005.

PRICING INFORMATION

Clause 9.2.4.11

A statement of the respective calculations for pricing must be included.

Clause 9.2.4.11.3

A list of all differences between the Tested Storage Configuration (TSC) and Priced Storage Configuration must be included.

Pricing information may found in the Tested Storage Configuration Pricing section on page 12. A list of all differences between the Tested Storage Configuration (TSC) and Priced Storage Configuration may be found in the Executive Summary portion of this document on page 12.

ANOMALIES OR IRREGULARITIES

Clause 9.2.4.10

The FDR shall include a clear and complete description of any anomalies or irregularities encountered in the course of executing the SPC-1 benchmark that may in any way call into question the accuracy, verifiability, or authenticity of information published in this FDR.

There were no anomalies or irregularities encountered during the SPC-1 Onsite Audit of the Sun StorEdge™ 6130 Array.

APPENDIX A: CUSTOMER TUNABLE PARAMETERS AND OPTIONS

The following settings were made in the Solaris "/etc/system" control file information for execution of the SPC-1 Workload Generator on the Star Fire™ V440:

```
*ident "@(#)system  1.18   97/06/27 SMI" /* SVR4 1.5 */
*
* SYSTEM SPECIFICATION FILE
*

* moddir:
*
*      Set the search path for modules.  This has a format similar to the
*      csh path variable. If the module isn't found in the first directory
*      it tries the second and so on. The default is /kernel /usr/kernel
*
*      Example:
*             moddir: /kernel /usr/kernel /other/modules



* root device and root filesystem configuration:
*
*      The following may be used to override the defaults provided by
*      the boot program:
*
*      rootfs:             Set the filesystem type of the root.
*
*      rootdev:      Set the root device.  This should be a fully
*                    expanded physical pathname.  The default is the
*                    physical pathname of the device where the boot
*                    program resides.  The physical pathname is
*                    highly platform and configuration dependent.
*
*      Example:
*             rootfs:ufs
*             rootdev:/sbus@1,f8000000/esp@0,800000/sd@3,0:a
*
*      (Swap device configuration should be specified in /etc/vfstab.)



* exclude:
*
*      Modules appearing in the moddir path which are NOT to be loaded,
*      even if referenced. Note that `exclude' accepts either a module name,
*      or a filename which includes the directory.
*
*      Examples:
*             exclude: win
*             exclude: sys/shmsys



* forceload:
*
*      Cause these modules to be loaded at boot time, (just before mounting
*      the root filesystem) rather than at first reference. Note that
*      forceload expects a filename which includes the directory. Also
*      note that loading a module does not necessarily imply that it will
*      be installed.
*
*      Example:
*             forceload: drv/foo



* set:
```

```
*
*      Set an integer variable in the kernel or a module to a new value.
*      This facility should be used with caution.  See system(4).
*
*      Examples:
*
*      To set variables in 'unix':
*
*             set nautopush=32
*             set maxusers=40
*
*      To set a variable named 'debug' in the module named 'test_module'
*
*             set test_module:debug = 0x13

* ITOps add
set noexec_user_stack = 1
set noexec_user_stack_log = 1
* end ITOps add
set semsys:seminfo_semmap=4096
set semsys:seminfo_semmni=4096
set semsys:seminfo_semmns=4096
set semsys:seminfo_semmnu=4096
set semsys:seminfo_semume=64
set semsys:seminfo_semmsl=256

* IPC messages
set msgsys:msginfo_msgmap=4096
set msgsys:msginfo_msgmni=4096
set msgsys:msginfo_msgssz=64
set msgsys:msginfo_msgtql=40000
* set rlim_fd_max = 8192
* set soft limit on file descriptors
set rlim_fd_cur = 1024
* increase capability to do 1Mb IOs to *raw* devices, 32MB max.
*set maxphys = 1048576
set maxphys = 4194304
* Memory allocation parameters
set vxio:voliomem_chunk_size = 1048576
set vxio:voliomem_maxpool_sz = 134217728
* I/O related parameters
set vxio:vol_default_iodelay = 10
set vxio:vol_maxkiocount = 32768
set vxio:vol_maxioctl = 131072
set vxio:vol_maxio = 8192
set vxio:vol_maxspecialio = 10240
set tcp:tcp_conn_hash_size = 32768
set maxpgio = 65536
set fastscan = 65536
set ufs:ufs_HW = 20971520
set ufs:ufs_LW = 15728640
set autoup = 1024
set tune_t_fsflushr = 1
set sq_max_size = 100
set sdd:sdd_max_throttle=256
set maxphys = 8388608
set sd:sd_max_throttle=256
set qlc:qlc_enable_pm= 0x0
set qlc:qlc_execution_throttle=256
```

APPENDIX B: TESTED STORAGE CONFIGURATION (TSC) CREATION

The following script creates and configures the Tested Storage Configuration:

```
// Logical configuration information from Storage Array sbm-6130-sata.
// Saved on April 18, 2005
// Firmware package version for Storage Array sbm-6130-sata = 06.12.03.10
// NVSRAM package version for Storage Array sbm-6130-sata = N2882-612843-002

//on error stop;

// Uncomment the two lines below to delete the existing configuration.
show "Deleting the existing configuration.";
clear storageArray configuration;



// Storage Array global logical configuration script commands
show "Setting the Storage Array user label to sbm-6130-sata.";
set storageArray userLabel="sbm-6130-sata";

show "Setting the Storage Array media scan rate to disabled.";
set storageArray mediaScanRate=disabled;

// Uncomment the three lines below to remove default volume, if exists, script
command. NOTE: Default volume name is always = "" (blank).
//on error continue;
//show "Deleting the default volume created during the removal of the existing
configuration.";
//delete volume[""];
//on error stop;

// Copies the hot spare settings
// NOTE: These statements are wrapped in on-error continue and on-error stop
statements to
// account for minor differences in capacity from the drive of the Storage Array on
which the
// configuration was saved to that of the drives on which the configuration will be
copied.
show "Setting the Storage Array cache block size to 4.";
set storageArray cacheBlockSize=4;

show "Setting the Storage Array to begin cache flush at 70% full.";
set storageArray cacheFlushStart=70;

show "Setting the Storage Array to end cache flush at 70% full.";
set storageArray cacheFlushStop=70;


show "Creating RAID 1 Volume asu1 on new Volume Group 1.";
// This command creates the Volume Group and the initial Volume on that group.
// NOTE: For Volume Groups that use all available capacity, the last Volume on this
group is
// created using all remaining capacity by omitting the capacity= volume creation
parameter.
create volume drives=(0,1 0,3 0,5 0,7 0,9 0,11 0,13 5,1 5,3 5,5 0,2 0,4 0,6 0,8 0,10
0,12 0,14 5,2 5,4 5,6) raidLevel=1 userLabel="asu1" owner=A segmentSize=128
capacity=335007449088 Bytes;
show "Setting additional attributes for Volume asu1.";
// Configuration settings that can not be set during Volume creation.
set volume["asu1"] cacheFlushModifier=10;
set volume["asu1"] cacheWithoutBatteryEnabled=true;
set volume["asu1"] mirrorEnabled=true;
set volume["asu1"] readCacheEnabled=true;
set volume["asu1"] writeCacheEnabled=true;
set volume["asu1"] mediaScanEnabled=true;
set volume["asu1"] redundancyCheckEnabled=false;
set volume["asu1"] readAheadMultiplier=0;
```

```
set volume["asu1"] modificationPriority=lowest;

show "Creating RAID 1 Volume asu2 on new Volume Group 2.";
// This command creates the Volume Group and the initial Volume on that group.
// NOTE: For Volume Groups that use all available capacity, the last Volume on this
group is
// created using all remaining capacity by omitting the capacity= volume creation
parameter.
create volume drives=(4,1 4,2 4,3 4,4 4,5 4,6 4,7 4,8 4,9 4,10 4,11 4,12 4,13 4,14)
raidLevel=1 userLabel="asu2" owner=B segmentSize=512 capacity=375809638400 Bytes;
show "Setting additional attributes for Volume asu2.";
// Configuration settings that can not be set during Volume creation.
set volume["asu2"] cacheFlushModifier=10;
set volume["asu2"] cacheWithoutBatteryEnabled=true;
set volume["asu2"] mirrorEnabled=true;
set volume["asu2"] readCacheEnabled=true;
set volume["asu2"] writeCacheEnabled=true;
set volume["asu2"] mediaScanEnabled=false;
set volume["asu2"] redundancyCheckEnabled=false;
set volume["asu2"] readAheadMultiplier=0;
set volume["asu2"] modificationPriority=highest;

show "Creating RAID 1 Volume asu3 on new Volume Group 3.";
// This command creates the Volume Group and the initial Volume on that group.
// NOTE: For Volume Groups that use all available capacity, the last Volume on this
group is
// created using all remaining capacity by omitting the capacity= volume creation
parameter.
create volume drives=(5,7 5,9 5,11 5,13 5,8 5,10 5,12 5,14) raidLevel=1
userLabel="asu3" owner=B segmentSize=64 capacity=75161927680 Bytes;
show "Setting additional attributes for Volume asu3.";
// Configuration settings that can not be set during Volume creation.
set volume["asu3"] cacheFlushModifier=10;
set volume["asu3"] cacheWithoutBatteryEnabled=true;
set volume["asu3"] mirrorEnabled=true;
set volume["asu3"] readCacheEnabled=true;
set volume["asu3"] writeCacheEnabled=true;
set volume["asu3"] mediaScanEnabled=true;
set volume["asu3"] redundancyCheckEnabled=false;
set volume["asu3"] readAheadMultiplier=0;
set volume["asu3"] modificationPriority=highest;
// Creating Host Topology
show "Creating Host Group 440.";
create hostGroup userLabel="440";

show "Creating Host v440 on Host Group 440.";
create host userLabel="v440" hostGroup="440";

show "Creating Host Port v4402 on Host v440 with WWN 25000003ba62ebe9 and Host Type
Index 0.";
// This Host Type Index corresponds to Type Solaris_MPxIO
create hostPort host="v440" userLabel="v4402" identifier="25000003ba62ebe9"
hostType=0;

show "Creating Host Port v4403 on Host v440 with WWN 210100e08b298962 and Host Type
Index 0.";
// This Host Type Index corresponds to Type Solaris_MPxIO
create hostPort host="v440" userLabel="v4403" identifier="210100e08b298962"
hostType=0;

show "Creating Host Port v4401 on Host v440 with WWN 210000e08b098962 and Host Type
Index 0.";
// This Host Type Index corresponds to Type Solaris_MPxIO
create hostPort host="v440" userLabel="v4401" identifier="210000e08b098962"
hostType=0;

show "Creating Host Port v4404 on Host v440 with WWN 210000e08b09a362 and Host Type
Index 0.";
// This Host Type Index corresponds to Type Solaris_MPxIO
create hostPort host="v440" userLabel="v4404" identifier="210000e08b09a362"
hostType=0;
```

```
// Creating Volume-To-LUN Mappings
show "Creating Volume-to-LUN Mapping for Volume asu1 to LUN 1 under Host Group 440.";
set volume ["asu1"] logicalUnitNumber=1 hostGroup="440";

show "Creating Volume-to-LUN Mapping for Volume asu2 to LUN 2 under Host v440.";
set volume ["asu2"] logicalUnitNumber=2 host="v440";

show "Creating Volume-to-LUN Mapping for Volume asu3 to LUN 3 under Host Group 440.";
set volume ["asu3"] logicalUnitNumber=3 hostGroup="440";
```

APPENDIX C: SPC-1 WORKLOAD GENERATOR STORAGE COMMANDS AND PARAMETERS

The contents of the SPC-1 Workload Generator command and parameter file are listed below.

```
sd=asu1_1,lun=/dev/rdsk/c9t600A0B800013B9F4000019424263E60Cd0s2,size=311g
sd=asu2_1,lun=/dev/rdsk/c9t600A0B80001394E900000FF94263A547d0s2,size=311g
sd=asu3_1,lun=/dev/rdsk/c9t600A0B80001394E900000FFC4263E4D3d0s2,size=69g
```

APPENDIX D: SPC-1 WORKLOAD GENERATOR INPUT PARAMETERS

The following script was used to execute the required SPC-1 Test Runs with the exception of the Persistence Test Run 1, which was executed manually at the console.

```
#!/usr/bin/ksh
bsu=168
STEP=1
startup=1800
while [[ $bsu -le 168 ]]
do
outdir=/spc/spc1/6130/audit/${bsu}
mkdir -p $outdir
cp SPC1.cfg $outdir
cp runsata $outdir
cp /etc/system $outdir
#iostat -xnzT d 60 60 > /tmp/prince_iostat.out &
java -Xmx512m persist2
mv persistence1 $outdir
mv persistence2 $outdir
#java -Xmx2048m -Xss1024k metrics -b $bsu -s $startup
java -Xmx2048m -Xss2048k metrics -b $bsu -s $startup #-t 2400
mv metrics $outdir
java -Xmx2048m -Xss1024k repeat1 -b $bsu -s $startup
mv repeatability1 $outdir
java -Xmx2048m -Xss1024k repeat2 -b $bsu -s $startup
mv repeatability2 $outdir
mv SPCOut $outdir
#cp /tmp/4800a_iostat.out $outdir
#zip -r money/${bsu}_vx_9980_dir_archive $outdir
bsu=`expr $bsu + $STEP`
echo "All done .... sleeping for 5 minutes"
sleep 300
done
```