SPC BENCHMARK 1™
FULL DISCLOSURE REPORT

SUN MICROSYSTEMS, INC.
SUN STORAGETEK® D280 DISK SYSTEM
(NON-MIRRORED WRITE CACHE)

SPC-1 V1.8

Submitted for Review: February 17, 2004
Submission Identifier: A00024
Accepted: April 17, 2004
Revised: September 5, 2006

First Edition – February 2004

Trademarks

SPC Benchmark 1, SPC-1 IOPS, and SPC-1 LRT are trademarks of the Storage Performance Council. StorageTek is registered trademark of Sun Microsystems, Inc.. All other brands, trademarks, and product names are the property of their respective owners.

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.

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AUDIT CERTIFICATION

Storage Technology Corporation®
Jaye L. Alynn
1 StorageTek Drive
Louisville, Co 80028

February 13, 2004

The SPC Benchmark 1™ results listed below for the StorageTek D280 Disk System *(non-mirrored write cache)* were produced in compliance with the SPC Benchmark 1™ V1.8 Remote Audit requirements.

SPC Benchmark 1™ V1.8 Results	
Tested Storage Configuration (TSC) Name: StorageTek D280 Disk System *(non-mirrored write cache)*	
Metric	**Reported Result**
SPC-1 IOPS™	24,507.22
SPC-1 Price-Performance	$12.56/SPC-1 IOPS™
Total ASU Capacity	1,196.092 GB
Data Protection Level	Mirroring
Total TSC Price (including three-year maintenance)	$307,904

The following SPC Benchmark 1™ Remote Audit requirements were reviewed and found compliant with V1.8 of the SPC Benchmark 1™ specification:

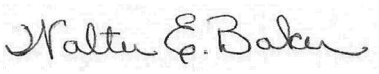
- A Letter of Good Faith, signed by a senior executive.
- The following Data Repository storage items were verified using information supplied by Storage Technology Corporation:
  - ✓ Physical Storage Capacity and requirements.
  - ✓ Configured Storage Capacity and requirements.
  - ✓ Addressable Storage 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).
- 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 reviewed using documentation supplied by Storage Technology Corporation:
  - ✓ 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 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
- There were no differences between the Tested Storage Configuration (TSC) used for the benchmark and Priced Storage Configuration.
- 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:

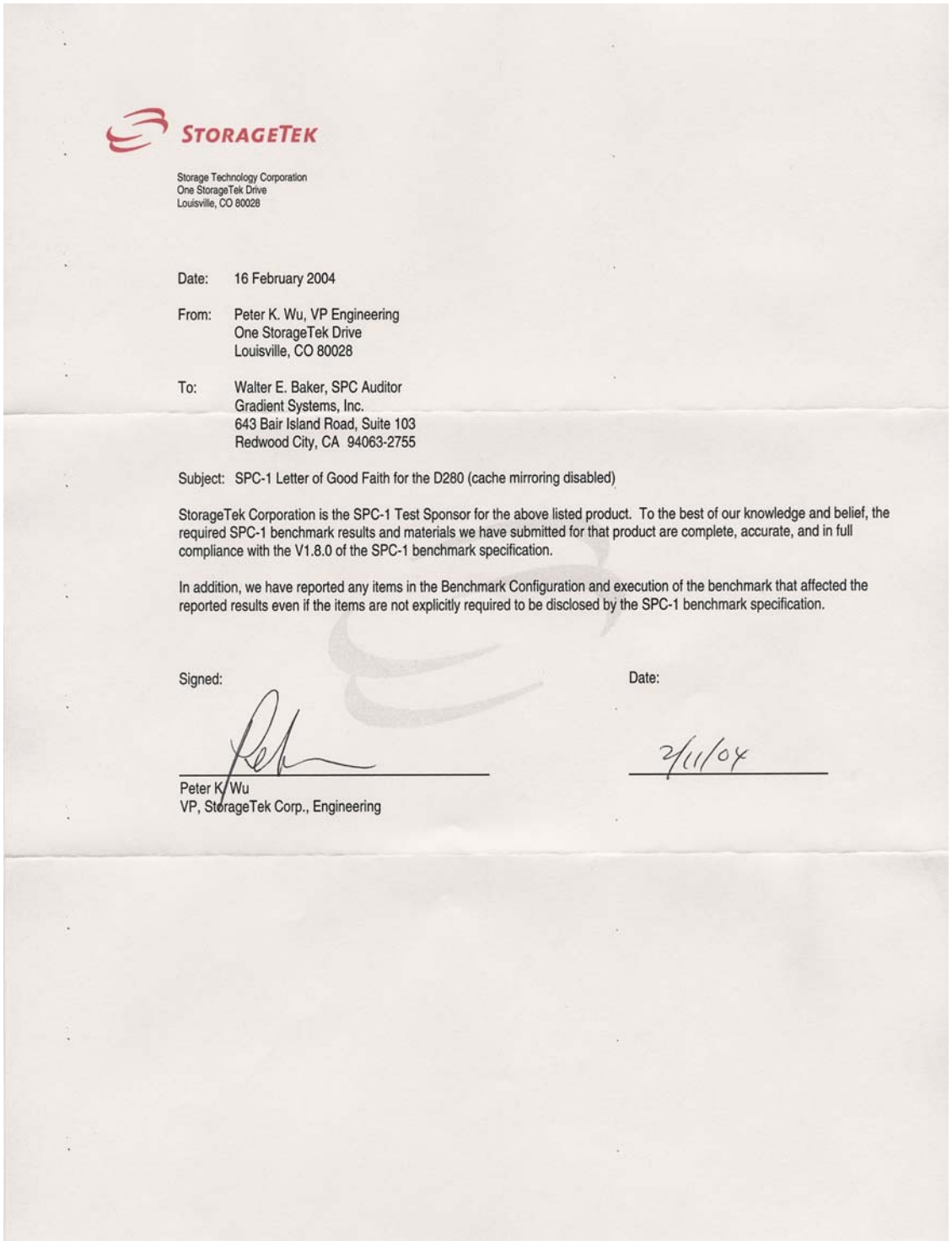
There were no additional audit notes or exceptions.

Respectfully,



Walter E. Baker
SPC Auditor

LETTER OF GOOD FAITH



STORAGETEK

Storage Technology Corporation
One StorageTek Drive
Louisville, CO 80028

Date: 16 February 2004

From: Peter K. Wu, VP Engineering
One StorageTek Drive
Louisville, CO 80028

To: Walter E. Baker, SPC Auditor
Gradient Systems, Inc.
643 Bair Island Road, Suite 103
Redwood City, CA 94063-2755

Subject: SPC-1 Letter of Good Faith for the D280 (cache mirroring disabled)

StorageTek Corporation 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 the V1.8.0 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: Date: 2/11/04

Peter K. Wu
VP, StorageTek Corp., Engineering

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 Scaffer – Jason.schaffer@sun.com 500 Eldorado Blvd., UBRM05-211 Broomfield, CO 80021 Phone: (303) 272-4743 FAX: (303) 272-3136
Auditor	Storage Performance Council – 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	V1.8
SPC-1 Workload Generator revision number	V2.00.03
Date Results were first used publicly	February 17, 2004
Date FDR was submitted to the SPC	February 17, 2004
Date revised FDR was submitted to the SPC Revised Test Sponsor Name, product name, and primary/alternate contact information to reflect Sun/StorageTek merger.	September 5, 2006
Date the TSC is/was available for shipment to customers	September 27, 2002
Date the TSC completed audit certification	February 13, 2004

Summary of Results

SPC-1 Results	
Tested Storage Configuration (TSC) Name: Sun StorageTek® D280 Disk System *(non-mirrored write cache)*	
Metric	**Reported Result**
SPC-1 IOPS™	24,507.22
SPC-1 Price-Performance	$12.56/SPC-1 IOPS™
Total ASU Capacity	1,196.092 GB
Data Protection Level	Mirroring
Total TSC Price (including three-year maintenance)	$307,904

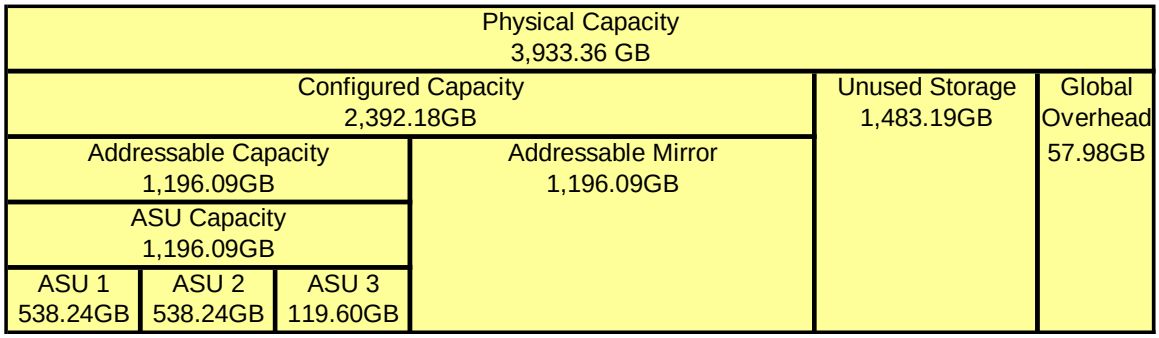
SPC-1 IOPS™ represents the maximum I/O Request Throughput at the 100% load point.

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, maintained on separate disks.

Storage Capacities and Relationships

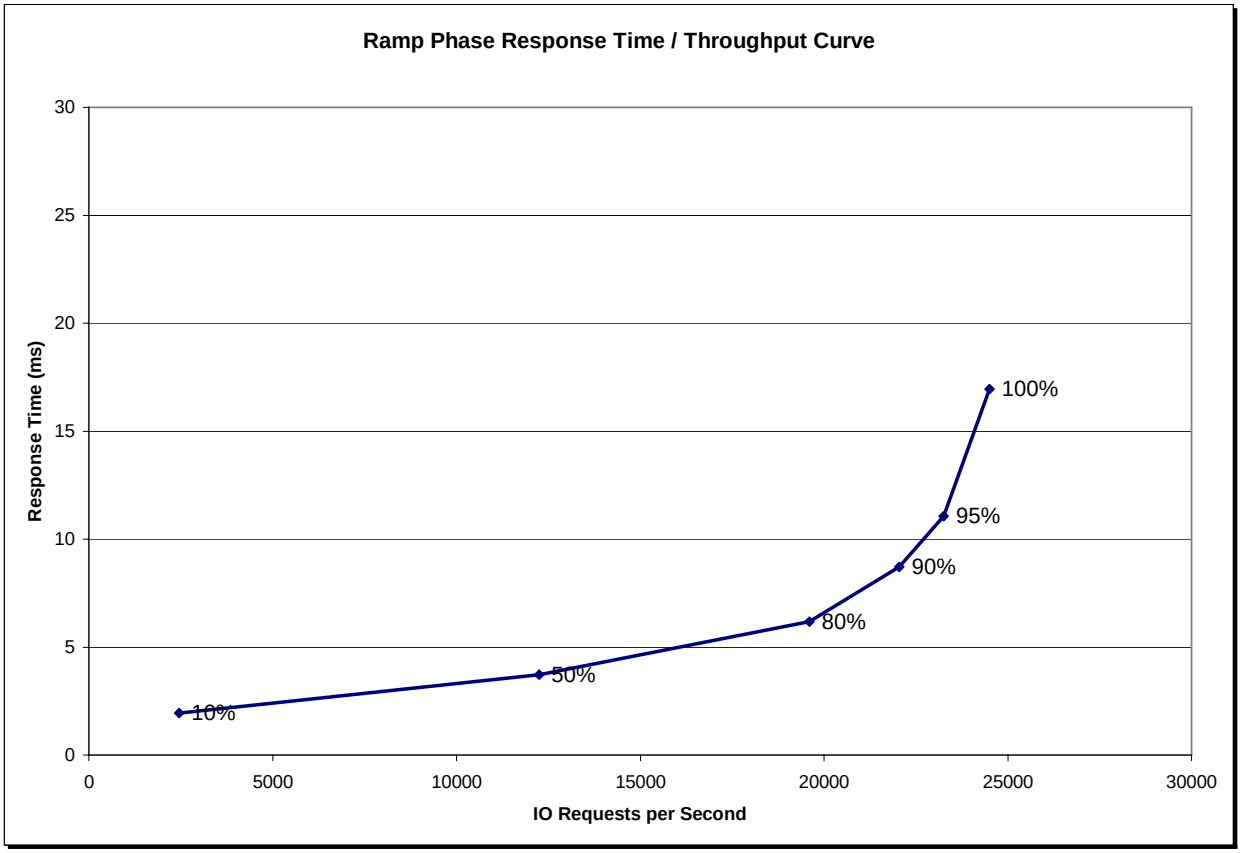
The following diagram documents the various storage capacities, used in this benchmark, and their relationships.



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 the 100% load point 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	2,450.08	12,247.67	19,609.15	22,046.76	23,259.38	24,507.22
Average Response Time (ms):						
All ASUs	1.94	3.72	6.17	8.71	11.07	16.94
ASU-1	2.70	5.18	8.92	12.86	16.39	25.15
ASU-2	1.95	3.63	4.65	5.34	6.10	7.83
ASU-3	0.35	0.64	1.00	1.39	1.96	3.52
Reads	4.46	8.51	13.77	18.23	21.94	30.07
Writes	0.31	0.59	1.22	2.51	3.99	8.39

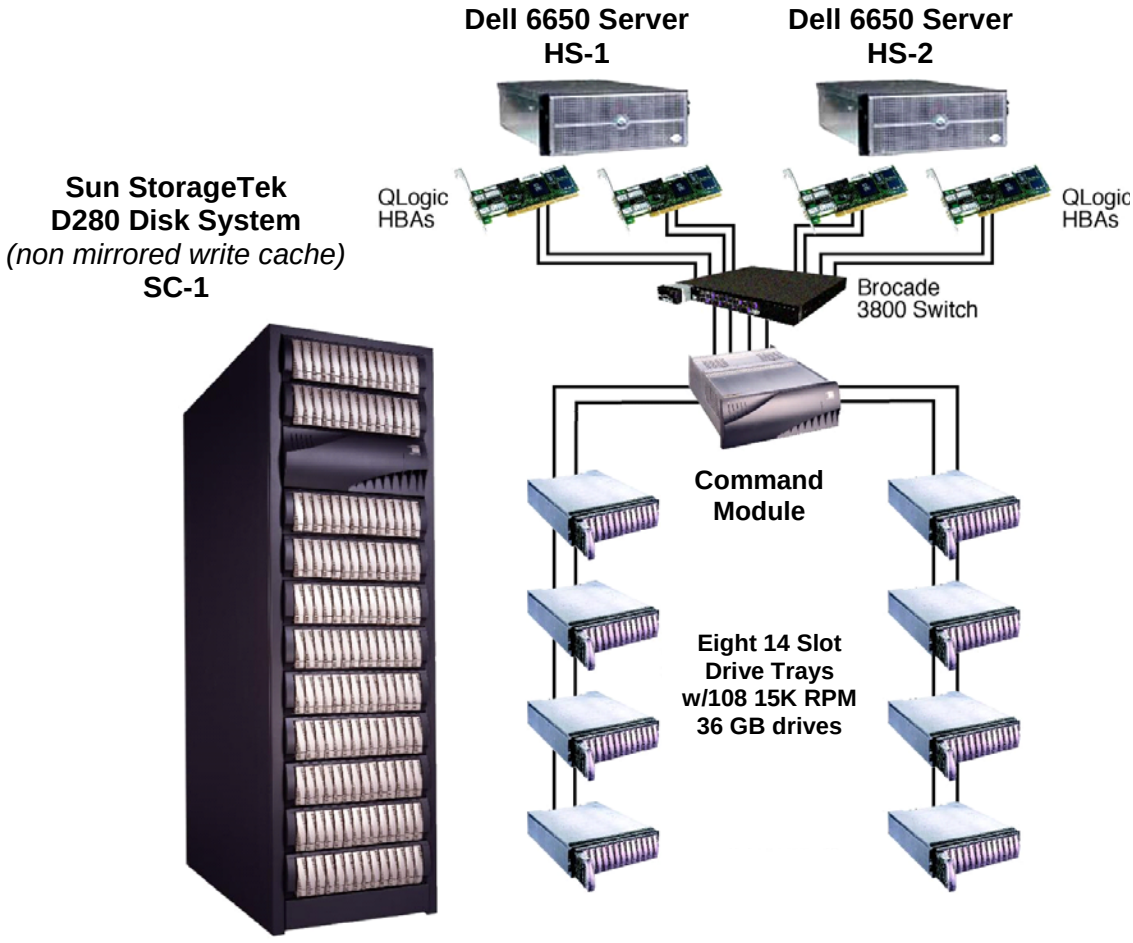
Tested Storage Configuration Pricing *(Priced Storage Configuration)*

StorageTek Item No.	Description	Unit Price	Qty	Aggregate Price
D280002	D280 Command Module, Rack Mount, Dual Controller	$ 62,000	1	$ 62,000
D200014	D200 2Gbit Expansion Drive Module, 14 Slot, Rack Mount, Dual FC ESM	$ 9,000	8	$ 72,000
SMGR-001	SANtricity 8.40 for Windows 2000 Software Feature	$ 10,000	1	$ 10,000
G36	36 GB FC 15K Drive Canister, 2Gb, 1.0" FF	$ 1,050	108	$ 113,400
10800281	FC Optical Cable - 2Gb/2Gb, 3.0m	$ 121	8	$ 968
SNFCS64	Fibre Channel 2Gb Switch, (16 port w/ SFP)	$ 29,400	1	$ 29,400
HBAQ003	QLogic 2342 Host Bus Adapter, dualport, 133 MHZ PCI-X	$ 3,729	4	$ 14,916
126544-01	25-meter fibre channel cables, optical, switch to Command Module	$ 225	4	$ 900
Select	Switch warranty upgrade to 3 yrs	$ 180	24	$ 4,320
				$ 307,904

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

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

Benchmark Configuration/Tested Storage Configuration Diagram



Host Systems:	Tested Storage Configuration (TSC):
UID=HS1, HS2	UID=SC-1
2 – Dell 6650 Servers	2 – QLogic 2342 HBAs per Host System
4 – 2 GHz Pentium 4 Xeon CPUs per Host System	Brocade 3800 Switch
3 GB main memory per Host System	Command Module *(includes 4 miniHubs)*
Windows 2000, SP3	2 –Disk Array Controllers 1 GB RAM per controller
WG	4 – 2gb Fibre Channel host connections
	4 – 2gb Fibre Channel drive connections
	8 –Drive Modules
	108 – 36GB 15K RPM 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…

A diagram of the benchmark configuration and tested storage configuration is included on the preceding page. The configuration consists of two Host Systems, with two QLogic 2342 PCI to dual-channel 2Gb fibre channel host adapters each. The eight Host System, fibre channel connections are connected to a fibre channel switch. The four fibre channel host connections on the command module are also connected to the switch. The Host Systems is running Windows 2000, with Service Pack 3 applied.

Storage Network Configuration

Clause 9.2.4.4.2

If a storage network is employed in the BC/TSC, the FDR shall contain a topology diagram… . This diagram should include, but is not limited to the following components:

1. *Storage Controller and Domain Controllers (see Clause 9.2.4.4.1)*
2. *Host Systems (see Clause 9.2.4.4.1)*
3. *Routers and Bridges*
4. *Hubs and Switches*
5. *HBAs to Host Systems and Front End Port to Storage Controllers*

Additionally the diagram shall:

- *Illustrate the physical connection between components.*
- *Describe the type of each physical connection.*
- *Describe the network protocol used over each physical connection.*
- *The maximum theoretical transfer rate of each class of interconnect used in the configuration.*
- *Correlate with the BC Configuration Diagram in Clause 9.2.4.4.1.*

The Test Sponsor shall additionally supply (referenced in an appendix) a wiring diagram of the physical connections and physical port assignments used in the storage network. The diagram should allow anyone to exactly replicate the physical configuration of the storage network.

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 14 *(Benchmark Configuration/Tested Storage Configuration Diagram).*

Customer Tuning 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.

Windows 2000 Registry Changes

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\
ql2300\Device\MaximumSGList=0xff

HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\
ql2300\Device\NumberOfRequests=0xe0

HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\
Disk\TimeOutValue=0x78

HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\
ql2300\Device\DriverParameters=UseSameNN=1;BusChange=0;
```

Array Controller Options

All array controller configuration options were set by the configuration script list in "Appendix B: Tested Storage Configuration (TSC) Creation/Configuration Script" on page 57.

Host Bus Adapter Options

The table below lists the Host Bus Adapter options that were changed from their default values.

Host Bus Adapter Settings		
Item	**Default**	**New Value**
Host Adapter Settings		
Loop Reset Delay	5	8
Adapter Hard Loop ID	Disabled	Enabled
Hard Loop ID (unique for each)	0	Eg. 22
Advanced Adapter Settings		
Execution Throttle	16	255
Fast Command Posting	Disabled	Enabled
LUNs per Target	8	0
Enable Target Reset	No	Yes
Login Retry Count	8	30
Port Down Retry Count	8	70
Extended Firmware Settings		
Data Rate	0	2

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 Benchmark Configuration (BC) diagram in Clause 9.2.4.4.1 and, if applicable, 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.*

In addition the FDR may include listings of scripts and/or commands used to configure the physical components that comprise the TSC.

The Tested Storage Configuration was created and configured using the script that appears in "Appendix B: Tested Storage Configuration (TSC) Creation/Configuration Script" on page 57. The LUNs created by the script comprised the reported Configured Storage Capacity, which contained both the Addressable Storage Capacity and a mirror of the Addressable Storage Capacity.

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 A: SPC-1 Workload Generator Storage Configuration Commands and Parameters" on page 53.

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).

User Data Copy: An identical copy of user data maintained on separate disks.

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.

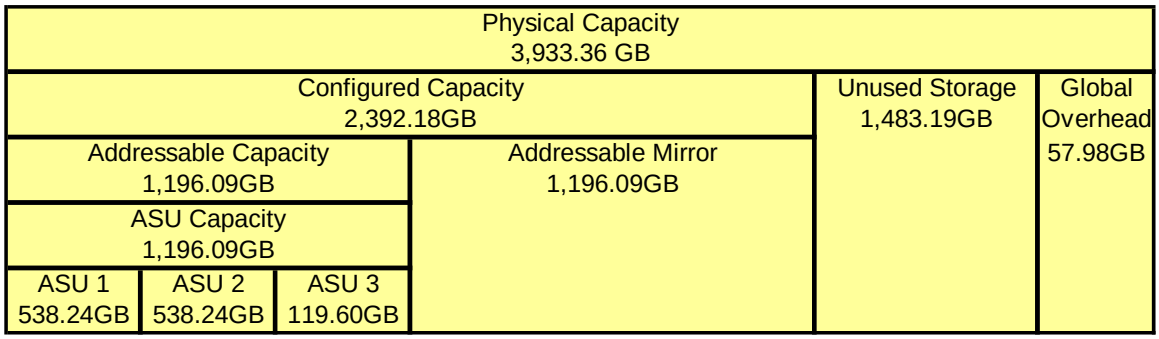
SPC-1 Storage Capacities

SPC-1 Storage Capacities		
Storage Hierarchy Component	**Units**	**Capacity**
Total ASU Capacity	Gigabytes (GB)	1,196.09
Addressable Storage Capacity	Gigabytes (GB)	1,196.09
Configured Storage Capacity	Gigabytes (GB)	2,392.18
Physical Storage Capacity	Gigabytes (GB)	3,933.36
User Data Copy (Mirroring)	Gigabytes (GB)	1,196.09
Required Storage (metadata) & Hot Spares	Gigabytes (GB)	0.00
Global Storage Overhead	Gigabytes (GB)	57.98
Total Unused Storage	Gigabytes (GB)	1,483.19

The Physical Storage Capacity consisted of 108 disk drives with a formatted capacity of 36.42GB each. Each disk drive had 0.536 GB reserved by the disk array management firmware, for a total of 57.98 GB of Global Storage Overhead. The Total Unused Storage capacity was 1,483,19 GB.

SPC-1 Storage Capacities and Relationships Illustration

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



SPC-1 Storage Hierarchy Ratios

	Addressable Storage Capacity	Configured Storage Capacity	Physical Storage Capacity
Total ASU Capacity	100.00%	50.00%	30.41%
User Data Copy (Mirror)		50.00%	30.41%
Addressable Storage Capacity		50.00%	30.41%
Required Storage (metadata) & Hot Spares		0.00%	0.00%
Configured Storage Capacity			60.82%
Global Storage Overhead			1.47%
Unused Storage	0.00%	0.00%	37.71%

The Addressable Storage Capacity and Configured Storage Capacity contained no Unused Storage. The Physical Storage Capacity contained 37.71 % (1,483.19 GB) of Unused Storage.

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 (538.24 GB)	**ASU-2 (538.24 GB)**	**ASU-3 (119.60 GB)**
40 Logical Volumes 13.46 GB per Logical Volume (13.46 GB used/Logical Volume)	1 Logical Volume 538.24 GB per Logical Volume (538.24 GB used/Logical Volume)	1 Logical Volume 119.60 GB per Logical Volume (119.60 GB used/Logical Volume)

The Data Protection Level used for all Logical Volumes was Mirroring as described on page 11. 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.*

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 (data table and graph).*
2. *I/O Request Throughput Distribution (data table and graph).*
3. *The human readable Test Run Results File produced by the Workload Generator.*
4. *A listing or screen image of all input parameters supplied to the Workload Generator.*
5. *The Measured Intensity Multiplier for each I/O stream.*
6. *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 listed below.

```
java –Xmx64m –Xms64m metrics –b 490 –s 600
```

Sustainability Test Results File

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

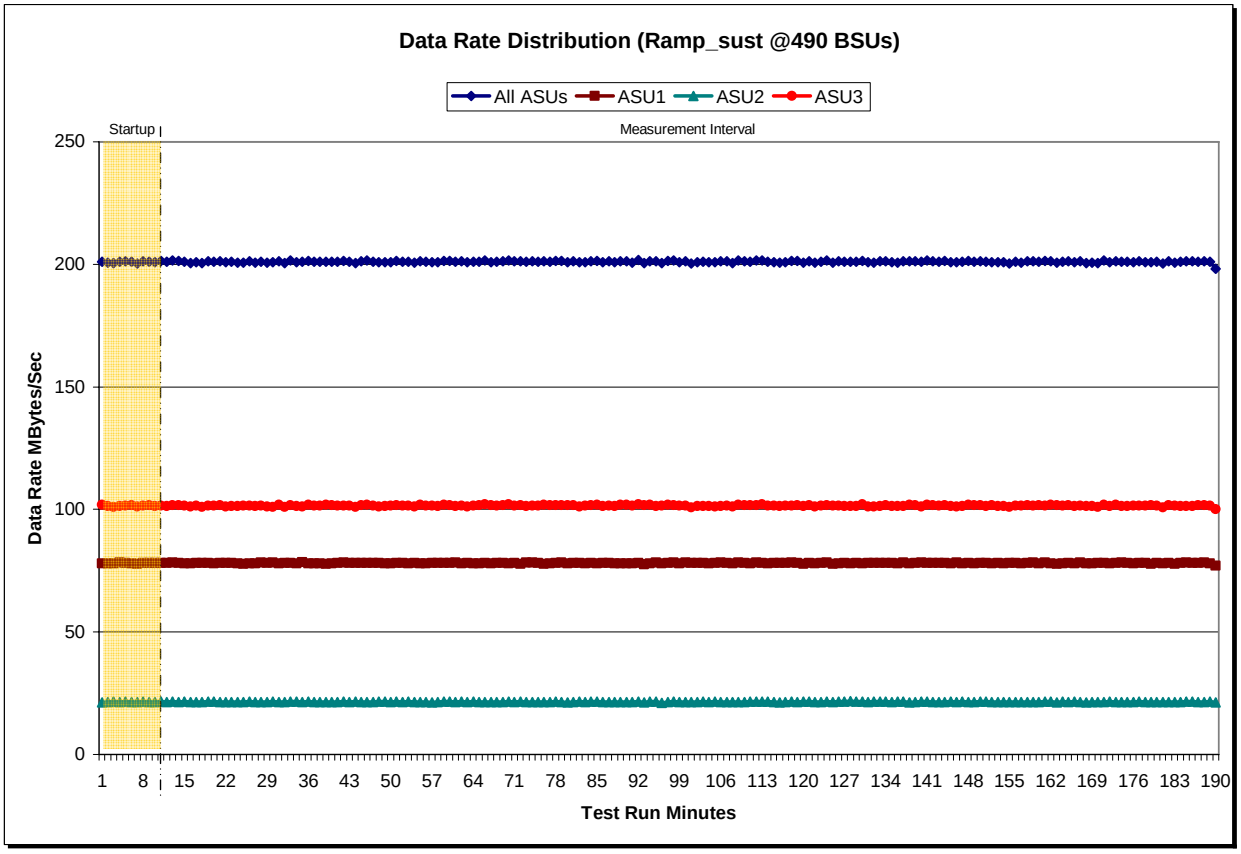
Sustainability Test Results File

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

	Start	Stop	Interval	Duration
Ramp-Up/Start-Up	22:00:33	22:10:33	0-9	0:10:00
Measurement Interval	22:10:33	1:10:33	9-189	3:00:00

Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3
0	201.10	77.95	21.32	101.82	63	201.06	78.00	21.51	101.55	126	201.06	78.14	21.53	101.39
1	200.62	77.90	21.47	101.25	64	201.11	77.97	21.49	101.65	127	200.97	77.94	21.69	101.34
2	200.47	77.90	21.57	101.00	65	201.64	78.03	21.47	102.14	128	201.00	78.06	21.55	101.38
3	201.04	78.25	21.37	101.42	66	200.91	77.90	21.37	101.63	129	201.48	77.93	21.52	102.03
4	201.21	78.18	21.52	101.50	67	201.11	78.18	21.50	101.43	130	200.83	78.16	21.47	101.20
5	201.05	77.92	21.45	101.68	68	201.24	78.16	21.47	101.61	131	200.74	78.14	21.51	101.09
6	200.31	77.81	21.37	101.13	69	201.53	77.98	21.54	102.01	132	201.14	78.20	21.61	101.34
7	201.17	78.08	21.60	101.49	70	201.22	78.16	21.46	101.60	133	201.27	78.03	21.55	101.68
8	201.12	78.03	21.36	101.73	71	201.14	77.83	21.67	101.63	134	200.80	78.04	21.36	101.40
9	200.87	78.19	21.37	101.31	72	201.00	78.24	21.47	101.29	135	200.69	77.92	21.51	101.25
10	201.33	78.10	21.66	101.57	73	201.14	78.22	21.43	101.50	136	201.13	78.20	21.62	101.31
11	200.99	78.18	21.41	101.39	74	200.97	78.06	21.48	101.43	137	201.15	77.98	21.25	101.92
12	201.52	78.32	21.56	101.64	75	201.15	77.83	21.49	101.82	138	201.26	78.12	21.41	101.73
13	201.36	78.11	21.50	101.75	76	201.12	77.91	21.48	101.73	139	201.01	78.31	21.61	101.08
14	201.05	77.94	21.55	101.56	77	201.39	78.18	21.55	101.66	140	201.56	78.13	21.51	101.92
15	200.54	77.94	21.41	101.19	78	201.49	78.22	21.49	101.78	141	201.14	78.10	21.34	101.71
16	200.88	78.03	21.34	101.51	79	200.94	77.98	21.32	101.63	142	201.07	78.10	21.41	101.56
17	200.51	78.15	21.35	101.01	80	201.18	78.03	21.48	101.68	143	201.32	78.09	21.50	101.72
18	201.14	78.12	21.58	101.44	81	200.78	78.04	21.54	101.20	144	200.84	77.96	21.52	101.36
19	201.13	77.99	21.56	101.58	82	200.85	77.99	21.39	101.47	145	200.86	78.23	21.44	101.20
20	201.21	78.12	21.35	101.75	83	201.27	78.12	21.54	101.62	146	201.04	78.00	21.67	101.37
21	200.90	78.16	21.50	101.24	84	201.45	77.96	21.57	101.91	147	201.48	78.09	21.47	101.92
22	200.98	78.11	21.50	101.37	85	200.80	78.14	21.37	101.29	148	201.02	77.96	21.40	101.66
23	200.76	78.00	21.39	101.38	86	201.15	78.14	21.48	101.52	149	201.29	78.07	21.56	101.66
24	200.64	77.84	21.35	101.45	87	200.84	78.02	21.49	101.34	150	201.09	78.15	21.55	101.38
25	201.22	78.00	21.63	101.59	88	201.15	77.95	21.39	101.80	151	200.94	77.92	21.41	101.62
26	200.69	77.90	21.42	101.37	89	201.17	77.97	21.39	101.82	152	200.82	78.03	21.40	101.39
27	201.13	78.21	21.48	101.44	90	200.70	77.85	21.42	101.43	153	200.81	77.94	21.50	101.37
28	200.76	78.05	21.50	101.21	91	201.78	78.12	21.59	102.07	154	200.41	78.17	21.33	100.91
29	200.86	78.22	21.58	101.06	92	200.50	77.66	21.23	101.62	155	201.01	78.11	21.38	101.52
30	201.28	77.95	21.49	101.83	93	201.25	77.92	21.52	101.80	156	200.73	77.92	21.37	101.44
31	200.58	78.06	21.50	101.02	94	201.22	78.29	21.52	101.40	157	201.14	78.12	21.35	101.67
32	201.51	78.16	21.57	101.78	95	200.55	77.94	21.15	101.46	158	201.30	78.32	21.41	101.57
33	200.88	78.02	21.61	101.26	96	201.35	78.11	21.42	101.82	159	201.02	77.97	21.35	101.70
34	201.05	78.38	21.44	101.22	97	201.60	78.29	21.55	101.76	160	201.41	78.37	21.60	101.44
35	201.35	77.99	21.55	101.81	98	200.94	77.94	21.47	101.53	161	201.26	77.84	21.58	101.84
36	200.97	78.00	21.39	101.57	99	201.23	78.26	21.42	101.55	162	200.77	77.78	21.26	101.73
37	200.96	77.93	21.49	101.54	100	200.36	78.07	21.47	100.82	163	201.00	77.92	21.54	101.53
38	201.09	77.82	21.36	101.91	101	200.93	78.08	21.51	101.34	164	201.22	78.14	21.43	101.66
39	200.97	77.89	21.44	101.64	102	201.06	78.09	21.63	101.34	165	200.91	77.94	21.58	101.38
40	201.12	78.11	21.48	101.53	103	200.79	77.95	21.43	101.42	166	201.29	78.20	21.51	101.58
41	201.35	78.23	21.57	101.56	104	200.88	78.16	21.51	101.20	167	200.55	78.01	21.29	101.25
42	201.00	78.11	21.41	101.48	105	201.14	78.30	21.43	101.42	168	200.76	78.00	21.42	101.34
43	200.52	78.06	21.54	100.92	106	201.17	78.12	21.46	101.59	169	200.56	78.13	21.45	100.97
44	201.17	78.14	21.35	101.68	107	200.42	77.96	21.38	101.08	170	201.58	78.17	21.51	101.90
45	201.59	78.14	21.51	101.94	108	201.60	78.26	21.43	101.91	171	200.90	77.97	21.60	101.32
46	200.97	78.04	21.44	101.48	109	201.16	78.03	21.36	101.77	172	201.21	78.08	21.35	101.78
47	200.87	78.16	21.52	101.19	110	201.06	77.90	21.52	101.64	173	201.09	78.22	21.48	101.38
48	200.93	77.99	21.55	101.39	111	201.52	78.30	21.53	101.70	174	200.98	78.19	21.51	101.29
49	200.91	78.02	21.37	101.52	112	201.64	78.03	21.55	102.06	175	200.80	77.96	21.35	101.49
50	201.37	78.08	21.52	101.77	113	201.03	78.02	21.52	101.49	176	201.25	78.13	21.58	101.54
51	200.98	78.06	21.50	101.42	114	200.92	78.04	21.35	101.53	177	200.95	78.05	21.45	101.45
52	201.08	78.00	21.53	101.55	115	200.74	78.15	21.30	101.28	178	200.80	77.83	21.36	101.61
53	200.65	78.14	21.36	101.15	116	200.94	78.10	21.38	101.46	179	201.04	78.06	21.42	101.56
54	201.31	78.02	21.43	101.87	117	201.39	78.32	21.58	101.49	180	200.26	77.99	21.44	100.83
55	201.01	77.97	21.46	101.59	118	201.33	78.17	21.49	101.67	181	201.16	78.06	21.50	101.61
56	200.87	78.04	21.30	101.53	119	200.64	77.76	21.60	101.28	182	200.62	77.81	21.36	101.45
57	200.86	78.10	21.44	101.31	120	201.27	78.09	21.53	101.64	183	201.02	78.09	21.50	101.42
58	201.39	78.10	21.51	101.78	121	200.65	77.96	21.51	101.18	184	201.15	78.21	21.56	101.38
59	201.38	78.18	21.55	101.65	122	201.05	78.07	21.41	101.57	185	201.14	78.20	21.57	101.37
60	200.98	78.21	21.43	101.35	123	201.55	78.29	21.55	101.71	186	201.12	78.06	21.36	101.69
61	201.25	78.01	21.67	101.56	124	200.70	77.77	21.46	101.47	187	201.29	78.23	21.40	101.67
62	200.85	78.12	21.49	101.24	125	201.15	77.98	21.60	101.57	188	200.96	77.88	21.57	101.51
										189	198.13	76.97	21.15	100.01

Sustainability – Data Rate Distribution Graph

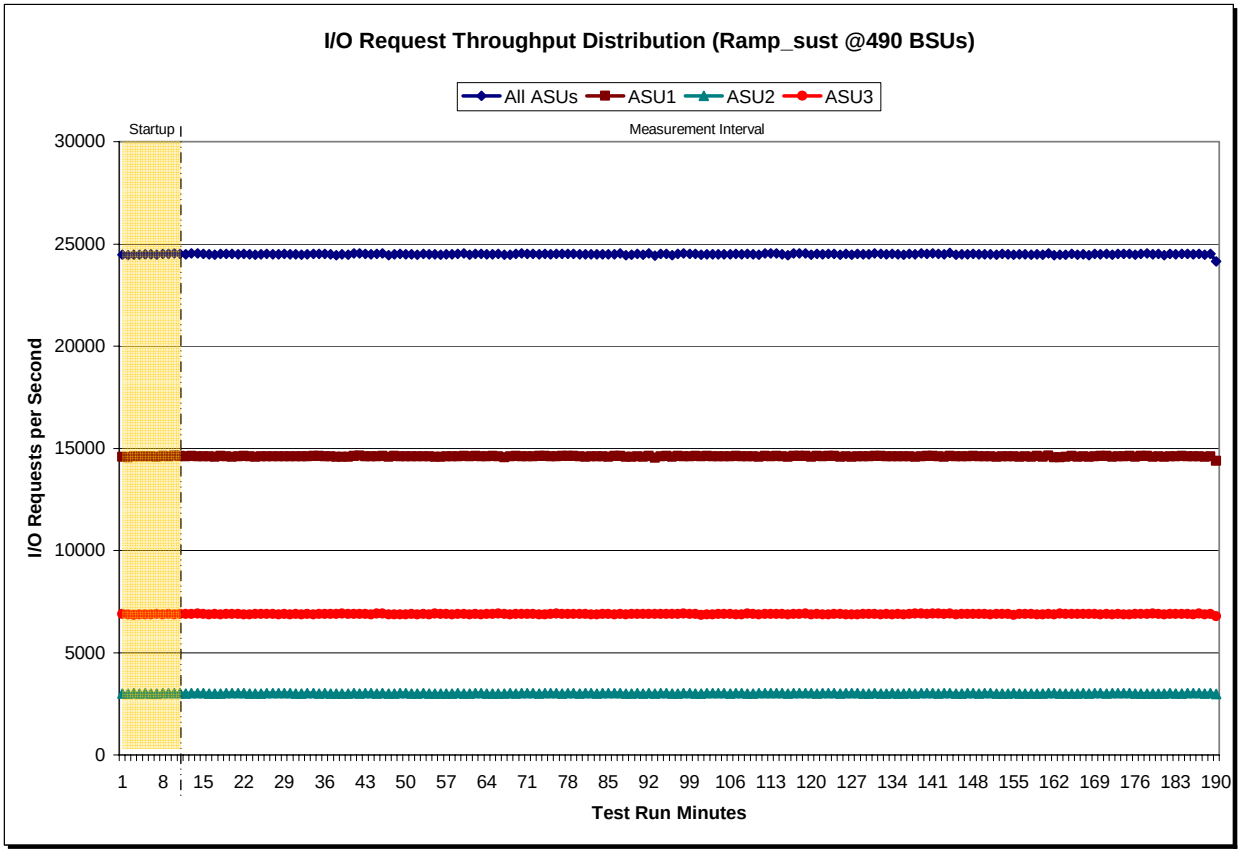


Sustainability – I/O Request Throughput Distribution Data

	Start	Stop	Interval	Duration
Ramp-Up/Start-Up	22:00:33	22:10:33	0-9	0:10:00
Measurement Interval	22:10:33	1:10:33	10-189	3:00:00

Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3
0	24,465.13	14,584.05	2,998.62	6,882.47	63	24,494.23	14,599.53	3,007.22	6,887.48	126	24,473.25	14,583.82	3,015.33	6,874.10
1	24,443.25	14,565.27	3,001.08	6,876.90	64	24,502.13	14,616.48	3,003.57	6,882.08	127	24,508.78	14,603.15	3,034.10	6,871.53
2	24,467.40	14,595.67	3,020.78	6,850.95	65	24,515.55	14,597.60	3,005.77	6,912.18	128	24,503.08	14,599.45	3,011.08	6,892.55
3	24,466.53	14,596.52	3,000.90	6,869.12	66	24,462.23	14,567.03	3,006.10	6,889.10	129	24,496.22	14,591.08	3,009.87	6,895.27
4	24,502.57	14,598.60	3,027.48	6,876.48	67	24,477.23	14,594.93	3,016.02	6,866.28	130	24,527.12	14,628.85	3,013.37	6,884.90
5	24,486.75	14,599.72	3,011.37	6,875.67	68	24,508.72	14,615.45	3,005.20	6,888.07	131	24,506.98	14,616.72	3,011.78	6,878.48
6	24,461.18	14,575.33	3,001.10	6,884.75	69	24,525.87	14,605.30	3,025.45	6,895.12	132	24,496.37	14,599.53	3,008.87	6,887.97
7	24,521.92	14,628.45	3,021.10	6,872.37	70	24,519.22	14,605.60	3,023.68	6,889.93	133	24,504.98	14,610.82	3,015.53	6,878.63
8	24,513.88	14,605.85	3,015.63	6,892.40	71	24,503.63	14,592.00	3,023.87	6,887.77	134	24,500.40	14,604.28	3,009.48	6,886.63
9	24,530.00	14,637.87	3,014.18	6,877.95	72	24,500.82	14,623.90	2,998.57	6,878.35	135	24,460.93	14,592.85	3,007.67	6,860.42
10	24,522.18	14,618.28	3,013.20	6,890.70	73	24,511.90	14,626.33	3,013.35	6,872.22	136	24,509.77	14,602.67	3,017.00	6,890.10
11	24,493.33	14,605.67	3,006.60	6,881.07	74	24,498.25	14,602.78	3,013.10	6,882.37	137	24,492.52	14,587.72	3,003.33	6,901.47
12	24,525.55	14,611.90	3,018.87	6,894.78	75	24,512.07	14,592.48	3,014.48	6,905.10	138	24,531.53	14,598.10	3,027.20	6,906.23
13	24,535.13	14,605.80	3,028.40	6,900.93	76	24,521.72	14,626.07	3,011.23	6,884.42	139	24,522.33	14,615.20	3,016.23	6,890.90
14	24,507.60	14,607.03	3,017.45	6,883.12	77	24,515.77	14,618.88	3,014.17	6,882.72	140	24,542.02	14,623.63	3,015.87	6,902.52
15	24,485.53	14,601.68	3,009.00	6,874.85	78	24,517.17	14,617.23	3,013.10	6,886.83	141	24,516.80	14,601.53	3,012.27	6,903.00
16	24,479.27	14,586.77	3,003.97	6,888.53	79	24,488.15	14,593.28	3,011.60	6,883.27	142	24,494.75	14,587.48	3,013.22	6,894.05
17	24,503.47	14,614.60	3,010.12	6,878.75	80	24,494.43	14,586.87	3,018.03	6,889.53	143	24,553.85	14,624.08	3,022.87	6,906.90
18	24,505.60	14,602.67	3,022.47	6,880.47	81	24,495.48	14,597.22	3,020.80	6,877.47	144	24,476.23	14,590.22	3,009.95	6,876.07
19	24,504.10	14,588.38	3,030.28	6,885.43	82	24,493.02	14,610.27	3,009.12	6,873.63	145	24,502.28	14,605.18	3,012.17	6,884.93
20	24,494.58	14,598.88	3,013.38	6,882.32	83	24,487.25	14,590.53	3,017.28	6,879.43	146	24,492.72	14,591.22	3,021.92	6,879.58
21	24,521.20	14,622.13	3,021.72	6,877.35	84	24,502.30	14,587.78	3,018.83	6,895.68	147	24,522.57	14,614.00	3,014.58	6,893.98
22	24,490.43	14,610.88	3,007.98	6,871.57	85	24,498.60	14,615.60	3,013.57	6,869.43	148	24,499.93	14,602.88	3,007.20	6,889.85
23	24,479.38	14,584.83	3,010.22	6,884.33	86	24,528.88	14,613.97	3,024.28	6,890.63	149	24,500.88	14,604.93	3,013.82	6,882.13
24	24,496.25	14,596.72	3,011.80	6,887.73	87	24,455.50	14,584.65	2,995.82	6,875.03	150	24,486.78	14,597.18	3,025.30	6,864.30
25	24,523.72	14,607.77	3,024.23	6,891.72	88	24,474.65	14,574.02	3,005.97	6,894.67	151	24,478.78	14,580.53	3,011.18	6,887.07
26	24,490.80	14,594.88	3,016.65	6,879.27	89	24,507.93	14,598.58	3,014.32	6,895.03	152	24,504.55	14,608.78	3,011.57	6,884.20
27	24,489.32	14,600.33	3,016.08	6,872.90	90	24,461.52	14,568.75	3,007.60	6,885.17	153	24,491.83	14,594.53	3,012.55	6,884.75
28	24,508.75	14,610.02	3,016.37	6,882.37	91	24,529.43	14,612.77	3,020.42	6,896.25	154	24,461.42	14,594.47	3,014.72	6,852.23
29	24,499.38	14,608.67	3,021.58	6,869.13	92	24,422.83	14,545.80	2,996.47	6,880.57	155	24,486.38	14,588.37	3,005.47	6,892.55
30	24,494.87	14,591.33	3,007.08	6,896.45	93	24,515.03	14,599.60	3,017.60	6,897.83	156	24,485.62	14,591.55	3,006.83	6,887.23
31	24,480.17	14,597.22	3,012.90	6,870.05	94	24,518.48	14,618.27	3,015.80	6,884.42	157	24,477.87	14,589.35	2,999.17	6,889.35
32	24,501.18	14,601.95	3,017.68	6,881.55	95	24,458.60	14,584.10	2,994.00	6,880.50	158	24,499.77	14,613.30	3,010.43	6,876.03
33	24,523.92	14,620.95	3,025.68	6,877.28	96	24,522.18	14,612.47	3,011.30	6,898.42	159	24,472.73	14,587.30	3,007.00	6,878.43
34	24,512.32	14,620.65	3,005.98	6,885.68	97	24,539.35	14,610.80	3,026.40	6,902.15	160	24,539.88	14,642.23	3,017.75	6,879.90
35	24,509.25	14,594.92	3,015.92	6,898.42	98	24,511.63	14,601.92	3,017.47	6,892.25	161	24,455.27	14,567.37	3,013.45	6,874.45
36	24,493.70	14,591.48	3,005.85	6,896.37	99	24,513.47	14,631.85	3,001.95	6,879.67	162	24,469.83	14,563.67	3,002.02	6,904.15
37	24,460.02	14,575.15	3,002.60	6,882.27	100	24,465.88	14,610.33	3,002.62	6,852.93	163	24,461.73	14,568.52	3,010.33	6,882.88
38	24,490.35	14,577.48	3,010.65	6,902.22	101	24,502.83	14,621.33	3,013.90	6,867.60	164	24,508.77	14,613.32	3,009.07	6,886.38
39	24,475.42	14,588.10	3,004.78	6,882.53	102	24,492.62	14,601.03	3,016.73	6,874.85	165	24,472.08	14,573.57	3,012.33	6,886.18
40	24,531.32	14,618.03	3,016.75	6,896.53	103	24,496.25	14,591.02	3,019.30	6,885.93	166	24,500.32	14,594.25	3,019.52	6,886.55
41	24,531.42	14,649.97	3,002.22	6,879.23	104	24,502.83	14,606.47	3,014.52	6,881.85	167	24,453.10	14,574.52	2,993.23	6,885.35
42	24,511.58	14,608.77	3,014.77	6,888.05	105	24,501.98	14,604.53	3,005.88	6,891.57	168	24,514.98	14,599.57	3,021.85	6,893.57
43	24,498.47	14,608.60	3,022.93	6,866.93	106	24,513.45	14,620.03	3,017.32	6,876.10	169	24,492.52	14,613.35	3,015.47	6,863.70
44	24,513.87	14,610.72	3,002.47	6,900.68	107	24,484.18	14,594.28	3,019.75	6,870.15	170	24,524.40	14,621.68	3,012.47	6,890.25
45	24,534.27	14,619.12	3,014.38	6,900.77	108	24,521.28	14,606.65	3,007.67	6,906.97	171	24,469.30	14,581.87	3,017.08	6,870.35
46	24,456.22	14,575.08	3,003.52	6,877.62	109	24,494.20	14,594.73	3,011.98	6,887.48	172	24,512.43	14,610.68	3,015.08	6,886.67
47	24,500.65	14,619.83	3,003.90	6,876.92	110	24,478.00	14,582.88	3,016.97	6,878.15	173	24,508.18	14,609.90	3,024.12	6,874.17
48	24,507.32	14,605.90	3,024.45	6,876.97	111	24,533.67	14,616.45	3,023.38	6,893.83	174	24,522.42	14,622.37	3,022.58	6,877.47
49	24,497.05	14,603.12	3,017.12	6,876.82	112	24,530.73	14,608.77	3,021.77	6,900.20	175	24,471.70	14,573.45	3,011.65	6,886.60
50	24,500.60	14,595.72	3,007.63	6,897.25	113	24,528.75	14,622.00	3,020.95	6,885.80	176	24,513.78	14,622.63	3,007.22	6,883.93
51	24,475.73	14,601.00	3,011.83	6,862.90	114	24,500.72	14,593.13	3,017.20	6,890.38	177	24,531.10	14,630.57	3,011.17	6,889.37
52	24,504.32	14,603.10	3,019.57	6,881.65	115	24,459.77	14,586.28	3,000.18	6,873.30	178	24,487.15	14,580.57	3,002.60	6,903.98
53	24,486.35	14,607.50	3,011.37	6,867.48	116	24,528.28	14,614.38	3,014.02	6,899.88	179	24,504.73	14,608.05	3,011.05	6,885.63
54	24,501.15	14,584.68	3,008.85	6,907.62	117	24,539.65	14,627.03	3,024.57	6,888.05	180	24,447.72	14,583.85	2,996.73	6,867.13
55	24,465.77	14,573.07	3,002.45	6,890.25	118	24,540.73	14,623.92	3,014.22	6,902.60	181	24,511.43	14,596.35	3,020.35	6,894.73
56	24,496.18	14,591.83	3,012.77	6,891.58	119	24,461.38	14,575.98	3,020.83	6,864.57	182	24,488.88	14,589.97	3,011.00	6,887.92
57	24,487.87	14,605.22	3,007.97	6,874.68	120	24,521.98	14,616.80	3,006.12	6,899.07	183	24,522.65	14,621.08	3,010.82	6,890.75
58	24,506.25	14,605.33	3,015.20	6,885.72	121	24,502.20	14,598.52	3,025.02	6,878.67	184	24,503.50	14,608.48	3,015.43	6,879.58
59	24,527.70	14,628.53	3,006.55	6,892.62	122	24,511.87	14,617.18	3,016.28	6,878.40	185	24,497.25	14,602.53	3,017.98	6,876.73
60	24,473.23	14,602.22	3,008.32	6,862.70	123	24,521.05	14,612.93	3,018.07	6,890.05	186	24,513.32	14,590.70	3,020.40	6,902.22
61	24,521.87	14,612.77	3,023.33	6,885.77	124	24,472.58	14,575.97	3,012.72	6,883.90	187	24,476.23	14,589.53	3,012.32	6,874.38
62	24,503.52	14,610.40	3,018.83	6,874.28	125	24,509.22	14,603.08	3,027.10	6,879.03	188	24,512.50	14,599.98	3,015.75	6,896.77
										189	24,137.12	14,379.80	2,974.72	6,782.60
										Average	24,498.10	14,600.57	3,013.13	6,884.39

Sustainability – I/O Request Throughput 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	0.2810	0.0700	0.2100	0.0180	0.0700	0.0350	0.2810
COV	0.005	0.001	0.003	0.002	0.006	0.003	0.005	0.001

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.*

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%.*

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

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 listed below.

```
java –Xmx64m –Xms64m metrics –b 490 –s 600
```

IOPS Test Results File

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

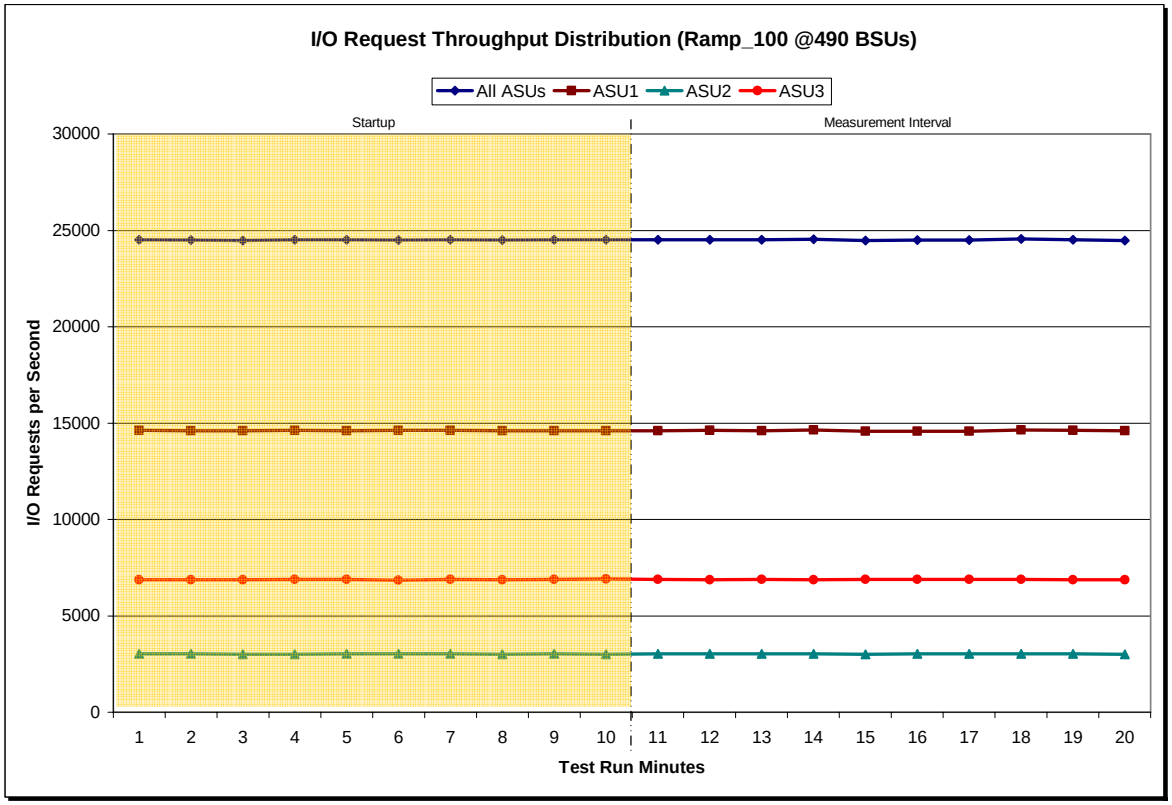
IOPS Test Results File

IOPS Test Run – I/O Request Throughput Distribution Data

490 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	1:10:51	1:20:52	0-9	0:10:01
Measurement Interval	1:20:52	1:30:52	10-19	0:10:00

60 second intervals	All ASUs	ASU1	ASU2	ASU3
0	24,516.65	14,623.18	3,015.57	6,877.90
1	24,490.43	14,602.65	3,016.45	6,871.33
2	24,472.98	14,600.72	3,012.35	6,859.92
3	24,514.28	14,620.80	3,008.58	6,884.90
4	24,504.60	14,601.42	3,015.13	6,888.05
5	24,490.02	14,615.60	3,017.95	6,856.47
6	24,521.60	14,615.75	3,021.32	6,884.53
7	24,483.25	14,598.03	3,008.82	6,876.40
8	24,508.85	14,594.20	3,026.30	6,888.35
9	24,511.95	14,596.52	3,009.03	6,906.40
10	24,508.55	14,601.58	3,016.12	6,890.85
11	24,509.02	14,612.63	3,017.35	6,879.03
12	24,522.75	14,609.52	3,022.10	6,891.13
13	24,525.77	14,637.77	3,016.25	6,871.75
14	24,471.37	14,580.72	3,004.30	6,886.35
15	24,501.05	14,584.45	3,019.55	6,897.05
16	24,500.07	14,588.45	3,020.38	6,891.23
17	24,549.63	14,636.87	3,022.45	6,890.32
18	24,515.37	14,621.67	3,019.15	6,874.55
19	24,468.65	14,593.90	3,009.53	6,865.22
Average	24,507.22	14,606.76	3,016.72	6,883.75

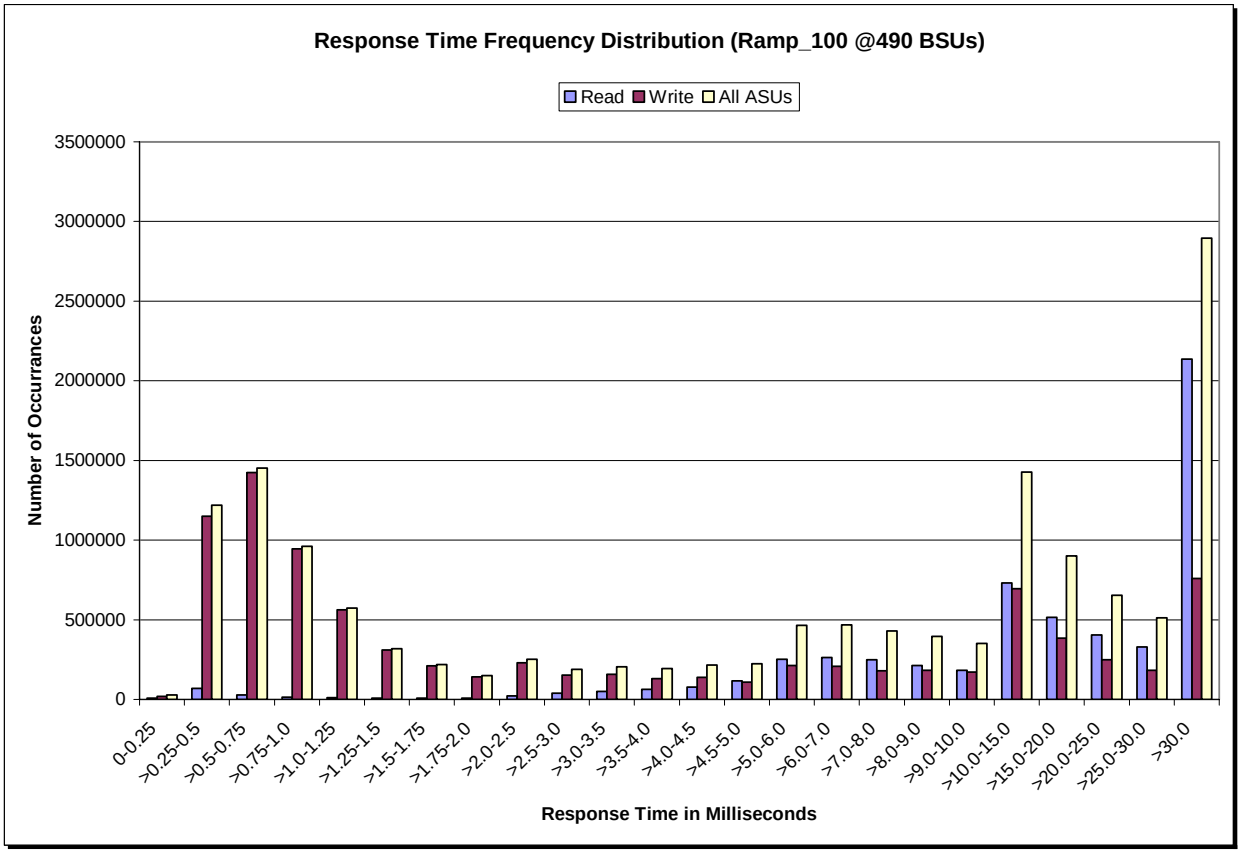
IOPS Test Run – I/O Request Throughput Distribution Graph



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	8345	68,993	27,710	14,979	10,664	8,171	7,695	7,847
Write	20036	1,150,683	1,423,024	945,764	561,887	310,414	210,272	141,631
All ASUs	28381	1,219,676	1,450,734	960,743	572,551	318,585	217,967	149,478
ASU1	13112	474,966	584,561	330,195	166,383	84,065	57,154	40,978
ASU2	5362	166,495	162,894	110,530	69,491	40,585	28,688	20,228
ASU3	9907	578,215	703,279	520,018	336,677	193,935	132,125	88,272
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	21,658	37,708	48,566	64,151	76,630	116,632	253,424	262,248
Write	229,363	151,564	157,332	129,846	139,417	108,931	212,088	206,627
All ASUs	251,021	189,272	205,898	193,997	216,047	225,563	465,512	468,875
ASU1	81,603	71,821	75,586	76,853	86,763	106,972	219,594	230,447
ASU2	34,197	30,101	36,937	40,284	46,359	54,312	117,354	114,497
ASU3	135,221	87,350	93,375	76,860	82,925	64,279	128,564	123,931
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	248,695	213,329	181,520	730,464	516,421	405,511	330,585	2,136,879
Write	179,891	183,550	171,193	696,921	384,078	248,764	182,408	759,525
All ASUs	428,586	396,879	352,713	1,427,385	900,499	654,275	512,993	2,896,404
ASU1	226,833	216,886	197,380	863,042	670,930	571,993	474,911	2,840,748
ASU2	98,388	76,568	61,540	226,102	118,272	61,581	34,202	55,048
ASU3	103,365	103,425	93,793	338,241	111,297	20,701	3,880	608

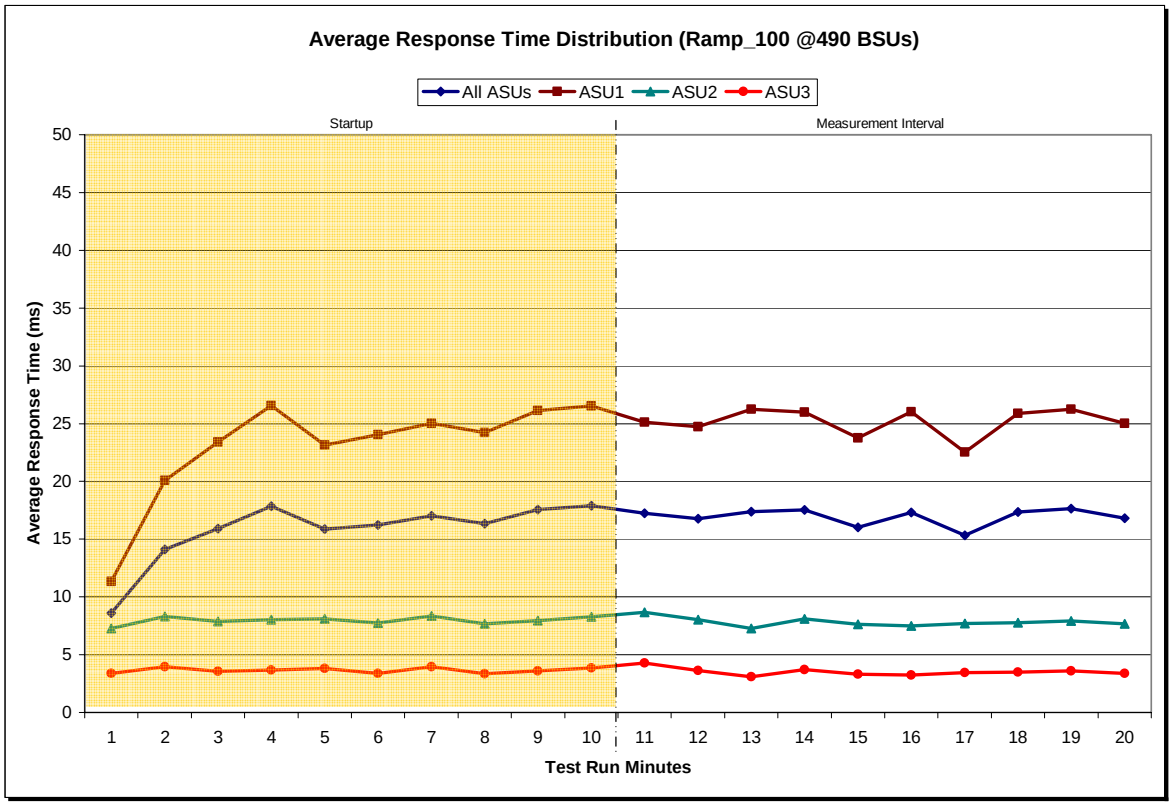
IOPS Test Run –Response Time Frequency Distribution Graph



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

490 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	1:10:51	1:20:52	0-9	0:10:01
Measurement Interval	1:20:52	1:30:52	9-19	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	8.60	11.33	7.27	3.38
1	14.12	20.10	8.32	3.96
2	15.92	23.39	7.87	3.55
3	17.86	26.56	8.04	3.66
4	15.86	23.14	8.11	3.81
5	16.25	24.04	7.75	3.37
6	17.04	25.01	8.34	3.94
7	16.33	24.22	7.67	3.36
8	17.57	26.15	7.97	3.61
9	17.91	26.54	8.27	3.86
10	17.23	25.11	8.68	4.28
11	16.77	24.74	8.04	3.65
12	17.40	26.24	7.29	3.08
13	17.53	25.97	8.10	3.70
14	16.03	23.77	7.62	3.33
15	17.31	26.01	7.50	3.22
16	15.34	22.53	7.71	3.46
17	17.36	25.87	7.77	3.49
18	17.65	26.26	7.93	3.61
19	16.81	25.01	7.66	3.38
Average	16.94	25.15	7.83	3.52

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
14,704,034	11,807,630	2,896,404

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	0.0350	0.2811	0.0699	0.2100	0.0180	0.0701	0.0350	0.2809
COV	0.004	0.002	0.003	0.002	0.004	0.002	0.004	0.002

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.*

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%.*

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

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 12.

In addition, the Average Response Time measured during the 10% Test Run is the value for the SPC-1 LRT™ primary 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 listed below.

```
java –Xmx64m –Xms64m metrics –b 490 –s 600
```

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 - 490 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	1:10:51	1:20:52	0-9	0:10:01
Measurement Interval	1:20:52	1:30:52	10-19	0:10:00

(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	24,516.65	14,623.18	3,015.57	6,877.90
1	24,490.43	14,602.65	3,016.45	6,871.33
2	24,472.98	14,600.72	3,012.35	6,859.92
3	24,514.28	14,620.80	3,008.58	6,884.90
4	24,504.60	14,601.42	3,015.13	6,888.05
5	24,490.02	14,615.60	3,017.95	6,856.47
6	24,521.60	14,615.75	3,021.32	6,884.53
7	24,483.25	14,598.03	3,008.82	6,876.40
8	24,508.85	14,594.20	3,026.30	6,888.35
9	24,511.95	14,596.52	3,009.03	6,906.40
10	24,508.55	14,601.58	3,016.12	6,890.85
11	24,509.02	14,612.63	3,017.35	6,879.03
12	24,522.75	14,609.52	3,022.10	6,891.13
13	24,525.77	14,637.77	3,016.25	6,871.75
14	24,471.37	14,580.72	3,004.30	6,886.35
15	24,501.05	14,584.45	3,019.55	6,897.05
16	24,500.07	14,588.45	3,020.38	6,891.23
17	24,549.63	14,636.87	3,022.45	6,890.32
18	24,515.37	14,621.67	3,019.15	6,874.55
19	24,468.65	14,593.90	3,009.53	6,865.22
Average	24,507.22	14,606.76	3,016.72	6,883.75

95% Load Level - 465 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	1:31:04	1:41:05	0-9	0:10:01
Measurement Interval	1:41:05	1:51:05	10-19	0:10:00

(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	23,274.68	13,863.87	2,861.87	6,548.95
1	23,260.90	13,878.70	2,854.92	6,527.28
2	23,230.20	13,855.27	2,850.68	6,524.25
3	23,276.67	13,888.50	2,854.95	6,533.22
4	23,267.07	13,861.63	2,854.47	6,550.97
5	23,251.88	13,857.32	2,854.95	6,539.62
6	23,266.02	13,879.33	2,863.13	6,523.55
7	23,240.45	13,857.02	2,854.53	6,528.90
8	23,242.67	13,853.82	2,851.33	6,537.52
9	23,256.65	13,858.15	2,867.97	6,530.53
10	23,256.08	13,843.63	2,872.87	6,539.58
11	23,259.67	13,858.38	2,856.87	6,544.42
12	23,270.33	13,856.22	2,862.75	6,551.37
13	23,246.35	13,856.92	2,866.75	6,522.68
14	23,220.45	13,859.32	2,848.38	6,512.75
15	23,258.32	13,875.10	2,862.48	6,520.73
16	23,294.98	13,868.02	2,870.00	6,556.97
17	23,279.80	13,865.08	2,866.18	6,548.53
18	23,271.83	13,876.12	2,856.18	6,539.53
19	23,235.95	13,840.77	2,861.88	6,533.30
Average	23,259.38	13,859.96	2,862.44	6,536.99

90% Load Level - 441 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	1:51:17	2:01:18	0-9	0:10:01
Measurement Interval	2:01:18	2:11:18	10-19	0:10:00

(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	22,061.18	13,142.00	2,704.08	6,215.10
1	22,073.02	13,174.15	2,703.82	6,195.05
2	22,050.87	13,124.27	2,718.77	6,207.83
3	22,062.88	13,130.62	2,712.07	6,220.20
4	22,043.98	13,141.22	2,705.68	6,197.08
5	22,043.47	13,135.22	2,717.00	6,191.25
6	22,072.25	13,153.43	2,711.48	6,207.33
7	22,048.57	13,135.85	2,730.47	6,182.25
8	22,019.78	13,108.52	2,707.75	6,203.52
9	22,059.53	13,143.28	2,715.83	6,200.42
10	22,046.92	13,135.93	2,723.72	6,187.27
11	22,054.50	13,142.37	2,717.98	6,194.15
12	22,053.82	13,142.50	2,707.27	6,204.05
13	22,065.72	13,141.88	2,712.62	6,211.22
14	22,049.80	13,141.85	2,709.88	6,198.07
15	22,047.32	13,153.52	2,696.65	6,197.15
16	22,047.65	13,144.93	2,705.20	6,197.52
17	22,014.43	13,123.35	2,703.60	6,187.48
18	22,052.15	13,130.88	2,698.92	6,222.35
19	22,035.27	13,123.88	2,697.60	6,213.78
Average	22,046.76	13,138.11	2,707.34	6,201.30

80% Load Level - 392 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	2:11:29	2:21:30	0-9	0:10:01
Measurement Interval	2:21:30	2:31:30	10-19	0:10:00

(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	19,622.15	11,697.33	2,412.00	5,512.82
1	19,604.77	11,693.57	2,416.93	5,494.27
2	19,584.78	11,674.10	2,408.20	5,502.48
3	19,615.47	11,670.52	2,412.83	5,532.12
4	19,605.38	11,684.02	2,415.65	5,505.72
5	19,571.57	11,660.93	2,411.73	5,498.90
6	19,606.35	11,690.77	2,412.63	5,502.95
7	19,589.67	11,694.28	2,401.58	5,493.80
8	19,597.88	11,675.83	2,400.08	5,521.97
9	19,609.23	11,680.18	2,418.32	5,510.73
10	19,651.05	11,711.42	2,422.45	5,517.18
11	19,600.80	11,684.40	2,403.72	5,512.68
12	19,607.40	11,694.45	2,408.27	5,504.68
13	19,616.25	11,685.98	2,412.88	5,517.38
14	19,601.42	11,672.67	2,408.62	5,520.13
15	19,598.82	11,682.12	2,406.65	5,510.05
16	19,612.28	11,687.93	2,412.32	5,512.03
17	19,613.57	11,665.97	2,423.18	5,524.42
18	19,608.78	11,697.08	2,416.33	5,495.37
19	19,581.17	11,684.67	2,404.25	5,492.25
Average	19,609.15	11,686.67	2,411.87	5,510.62

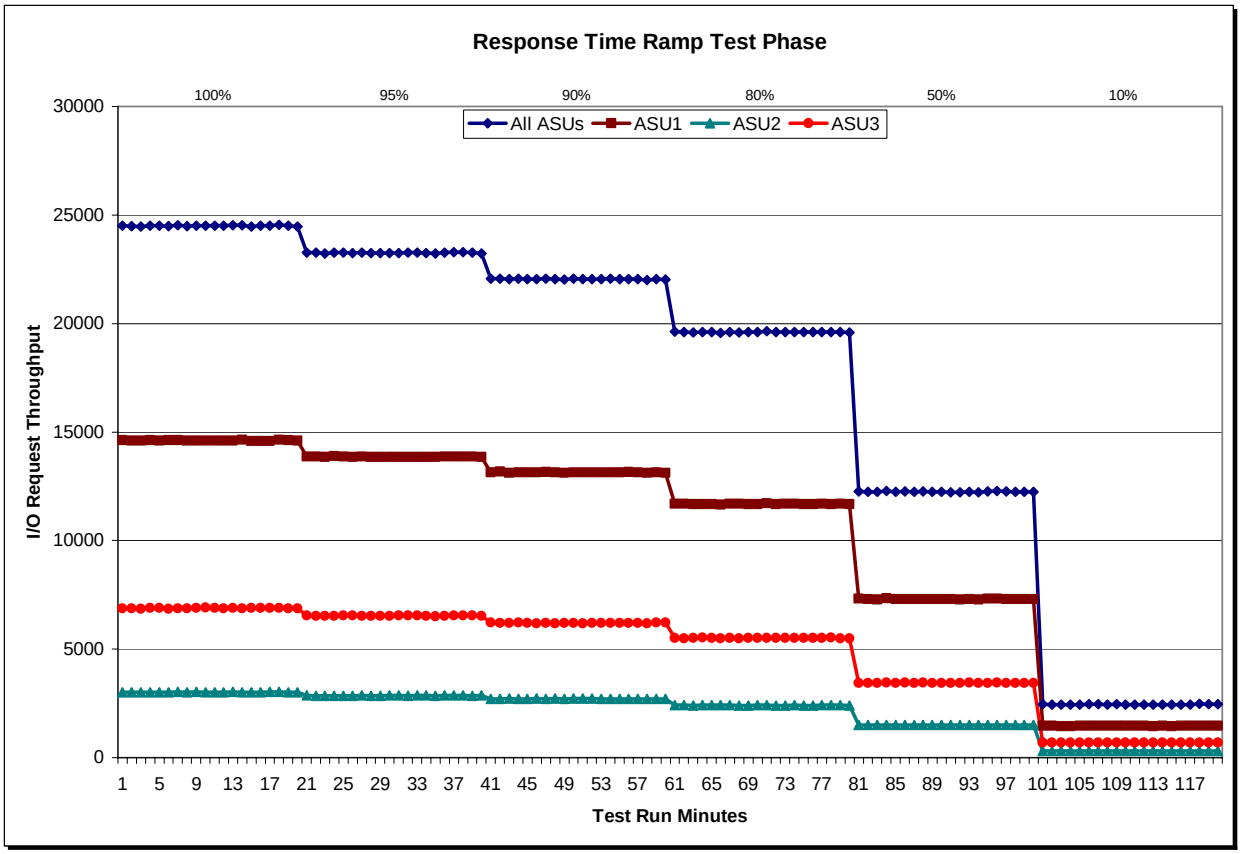
50% Load Level - 245 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	2:31:40	2:41:41	0-9	0:10:01
Measurement Interval	2:41:41	2:51:41	9-19	0:10:00

(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	12,266.00	7,322.95	1,497.05	3,446.00
1	12,238.80	7,304.03	1,501.60	3,433.17
2	12,233.92	7,275.15	1,512.60	3,446.17
3	12,284.23	7,334.33	1,501.40	3,448.50
4	12,245.57	7,306.17	1,498.35	3,441.05
5	12,274.37	7,308.35	1,509.08	3,456.93
6	12,244.32	7,292.73	1,509.48	3,442.10
7	12,268.05	7,303.47	1,514.33	3,450.25
8	12,245.08	7,297.53	1,510.97	3,436.58
9	12,246.85	7,302.28	1,506.53	3,438.03
10	12,232.93	7,295.85	1,499.97	3,437.12
11	12,228.70	7,282.92	1,502.92	3,442.87
12	12,246.52	7,292.70	1,499.25	3,454.57
13	12,226.43	7,287.85	1,508.65	3,429.93
14	12,263.47	7,314.13	1,510.38	3,438.95
15	12,276.18	7,321.67	1,506.30	3,448.22
16	12,257.82	7,310.10	1,502.37	3,445.35
17	12,245.98	7,306.70	1,500.87	3,438.42
18	12,244.77	7,299.37	1,501.97	3,443.43
19	12,253.90	7,295.82	1,511.92	3,446.17
Average	12,247.67	7,300.71	1,504.46	3,442.50

10% Load Level - 49 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	2:51:48	3:01:49	0-9	0:10:01
Measurement Interval	3:01:49	3:11:49	9-19	0:10:00

(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	2,455.42	1,460.98	303.03	691.40
1	2,449.18	1,457.23	297.62	694.33
2	2,450.27	1,453.90	303.52	692.85
3	2,444.80	1,453.55	304.98	686.27
4	2,445.25	1,455.20	302.65	687.40
5	2,456.45	1,462.13	302.82	691.50
6	2,451.77	1,458.00	300.80	692.97
7	2,448.80	1,464.90	298.75	685.15
8	2,455.03	1,462.52	302.83	689.68
9	2,450.08	1,460.73	296.53	692.82
10	2,445.80	1,458.37	300.55	686.88
11	2,450.82	1,462.20	298.20	690.42
12	2,433.77	1,452.42	298.97	682.38
13	2,446.35	1,461.33	298.13	686.88
14	2,439.58	1,454.00	299.67	685.92
15	2,450.72	1,457.80	306.97	685.95
16	2,449.63	1,458.22	301.55	689.87
17	2,475.07	1,474.17	308.10	692.80
18	2,457.73	1,465.13	300.35	692.25
19	2,451.33	1,459.83	299.40	692.10
Average	2,450.08	1,460.35	301.19	688.55

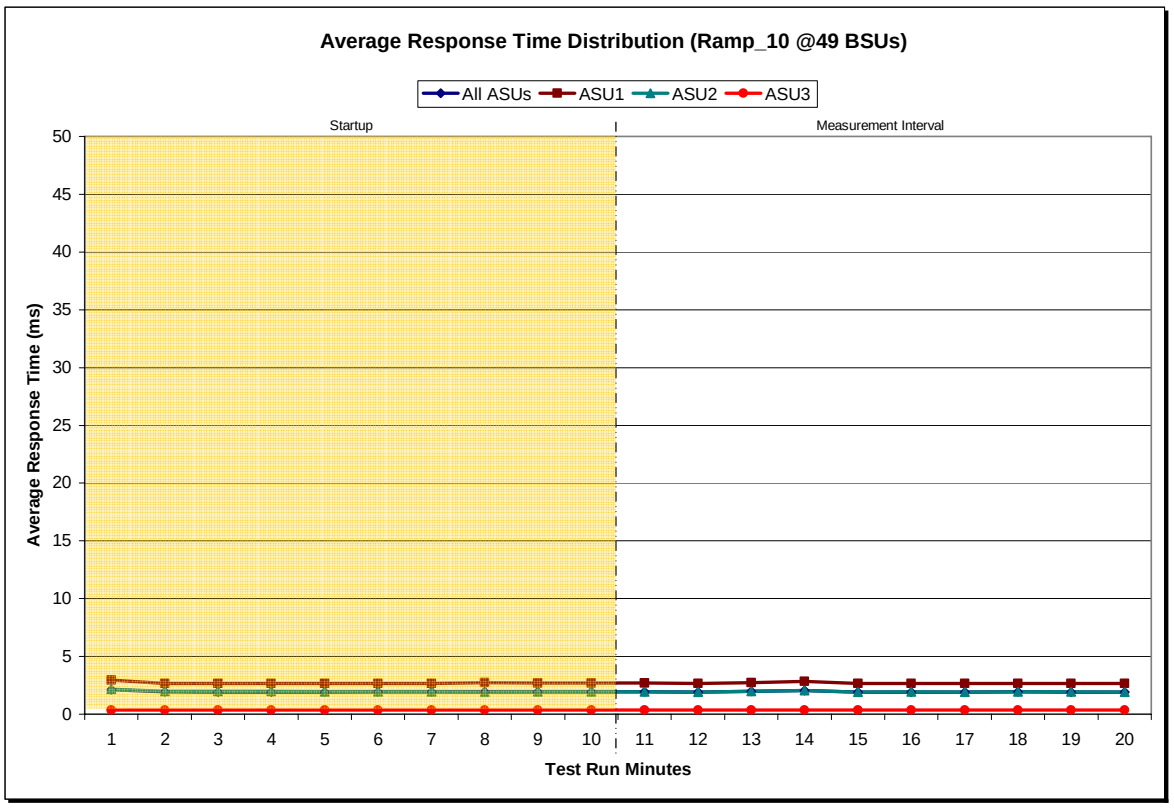
Response Time Ramp Distribution (IOPS) Graph



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

49 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	2:51:48	3:01:49	0-9	0:10:01
Measurement Interval	3:01:49	3:11:49	9-19	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	2.12	2.95	2.16	0.36
1	1.93	2.67	1.97	0.35
2	1.92	2.67	1.96	0.35
3	1.92	2.65	1.98	0.35
4	1.92	2.67	1.93	0.34
5	1.93	2.67	1.94	0.34
6	1.93	2.68	1.93	0.35
7	1.96	2.72	1.89	0.35
8	1.94	2.70	1.93	0.35
9	1.94	2.70	1.93	0.35
10	1.96	2.72	1.96	0.35
11	1.92	2.67	1.90	0.34
12	1.97	2.72	1.98	0.35
13	2.06	2.86	2.04	0.36
14	1.92	2.66	1.92	0.35
15	1.92	2.66	1.95	0.35
16	1.91	2.65	1.91	0.36
17	1.93	2.67	1.93	0.34
18	1.93	2.67	1.95	0.35
19	1.92	2.67	1.92	0.35
Average	1.94	2.70	1.95	0.35

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	0.0353	0.2801	0.0703	0.2104	0.0181	0.0698	0.0350	0.2810
COV	0.018	0.004	0.007	0.006	0.020	0.012	0.012	0.003

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.*

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%.*

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

Repeatability Test

Clause 5.4.3

The Repeatability Test demonstrates the repeatability and reproducibility of the SPC-1 IOPS™ and SPC-1 LRT™ primary metrics 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™ primary metric. Each Average Response Time value must be less than the SPC-1 LRT™ primary 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 9.2.4.7.3

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 two Repeatability Test Phases. The content, appearance, and format of the table are specified in Table 9-11.*
2. *An I/O Request Throughput Distribution (data and graph).*
3. *An Average Response Time Distribution (data and graph).*
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 listed below.

java –Xmx64m –Xms64m repeat1 –b 490 –s 600

java –Xmx64m –Xms64m repeat1 –b 490 –s 600

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	*24,507.22*	*1.94*
Repeatability Test Phase 1	24,500.52	1.95
Repeatability Test Phase 2	24,500.64	1.95

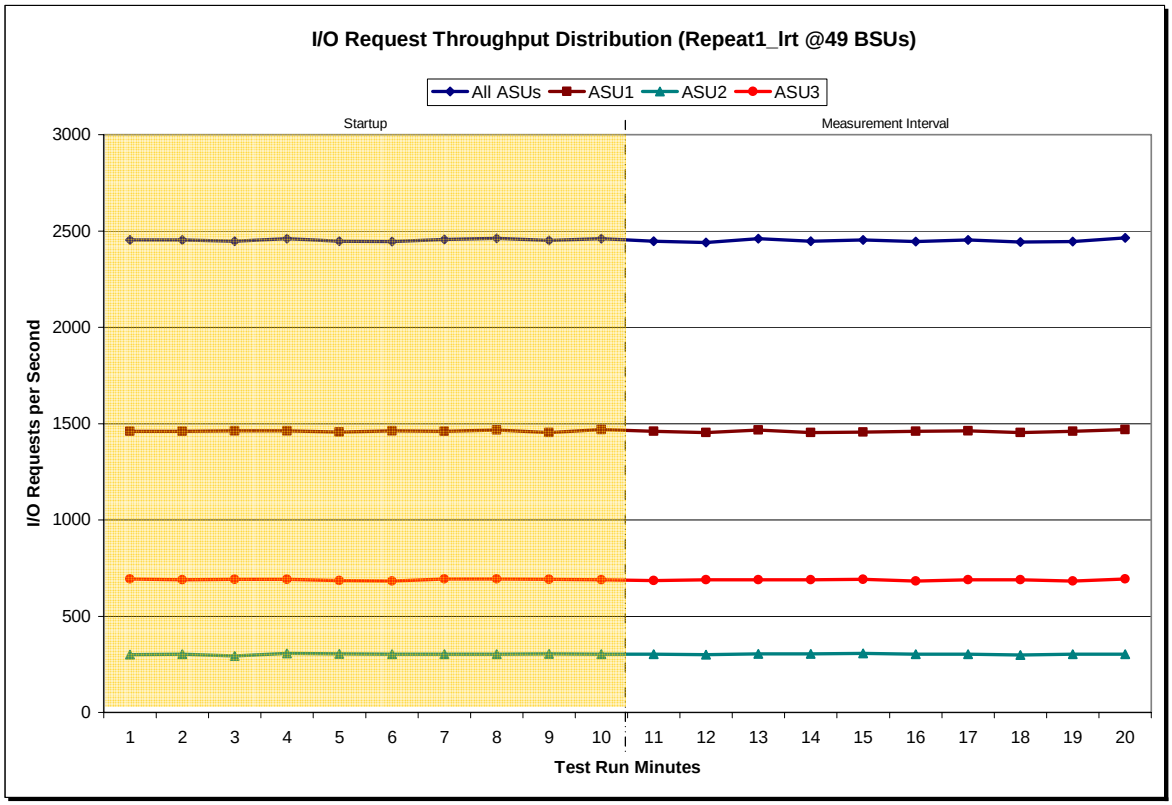
A link to the test result file generated from each Repeatability Test Run list is listed below.

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

49 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	20:39:24	20:49:24	0-9	0:10:00
Measurement Interval	20:49:24	20:59:24	10-19	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	2,454.18	1,459.67	300.70	693.82
1	2,454.03	1,460.97	303.17	689.90
2	2,446.13	1,462.28	293.62	690.23
3	2,460.27	1,461.88	306.60	691.78
4	2,447.33	1,456.78	305.35	685.20
5	2,445.72	1,461.13	302.35	682.23
6	2,455.10	1,460.67	301.62	692.82
7	2,461.28	1,466.03	301.72	693.53
8	2,451.52	1,454.22	305.15	692.15
9	2,459.37	1,468.35	302.52	688.50
10	2,446.27	1,460.05	301.95	684.27
11	2,441.48	1,453.08	299.87	688.53
12	2,460.20	1,465.55	304.85	689.80
13	2,447.30	1,454.48	303.57	689.25
14	2,454.48	1,456.75	307.03	690.70
15	2,444.92	1,459.83	303.12	681.97
16	2,454.00	1,461.18	303.42	689.40
17	2,441.73	1,454.12	298.52	689.10
18	2,444.85	1,459.55	302.15	683.15
19	2,465.00	1,467.90	303.18	693.92
Average	2,450.02	1,459.25	302.77	688.01

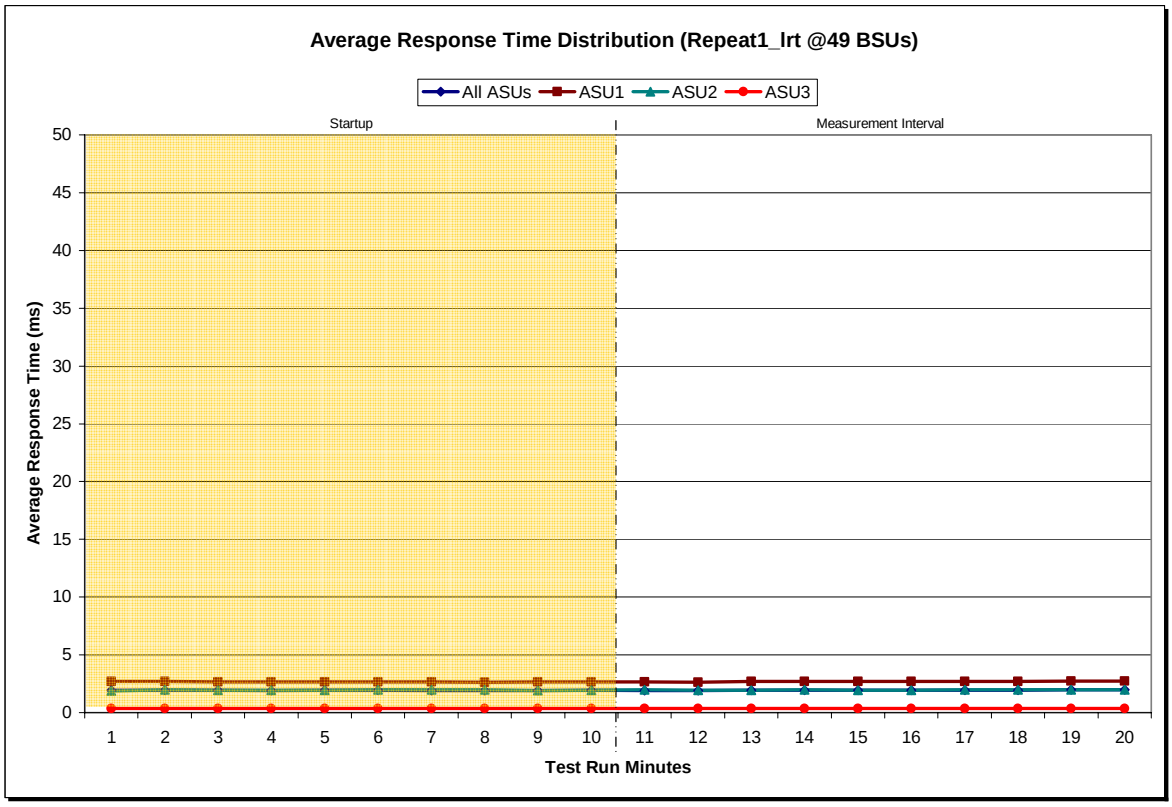
Repeatability 1 LRT – I/O Request Throughput Distribution Graph



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

49 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	20:39:24	20:49:24	0-9	0:10:00
Measurement Interval	20:49:24	20:59:24	9-19	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	1.94	2.71	1.89	0.36
1	1.95	2.71	1.98	0.35
2	1.93	2.67	1.95	0.35
3	1.92	2.66	1.95	0.36
4	1.93	2.68	1.94	0.34
5	1.93	2.66	1.99	0.35
6	1.92	2.65	1.96	0.36
7	1.91	2.64	1.97	0.35
8	1.91	2.65	1.92	0.35
9	1.93	2.67	1.96	0.35
10	1.92	2.65	1.97	0.35
11	1.91	2.64	1.93	0.36
12	1.95	2.70	1.94	0.36
13	1.95	2.71	1.96	0.36
14	1.95	2.71	1.94	0.35
15	1.95	2.70	1.95	0.35
16	1.95	2.71	1.97	0.35
17	1.94	2.69	1.97	0.35
18	1.97	2.72	1.99	0.35
19	1.98	2.74	1.98	0.36
Average	1.95	2.70	1.96	0.35

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

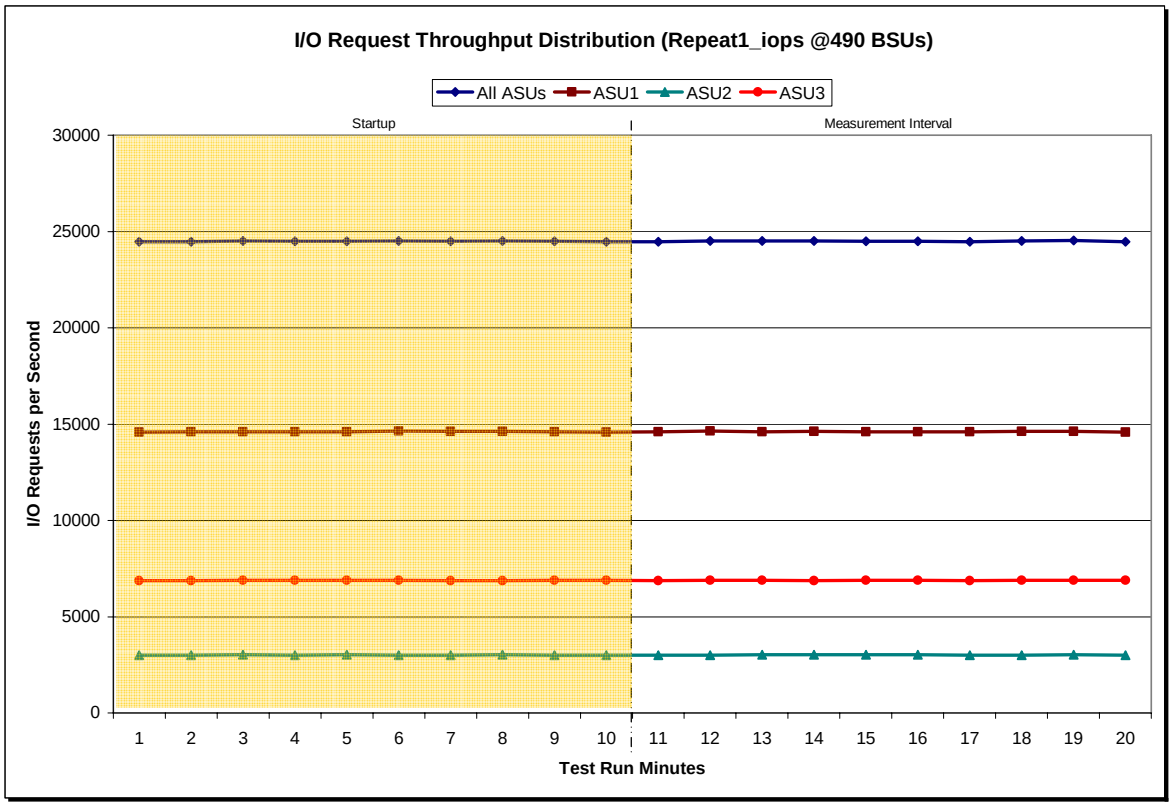


Repeatability 1 IOPS – I/O Request Throughput Distribution Data

490 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	20:59:34	21:09:35	0-9	0:10:01
Measurement Interval	21:09:35	21:19:35	10-19	0:10:00

60 second intervals	All ASUs	ASU1	ASU2	ASU3
0	24,469.93	14,586.55	3,012.25	6,871.13
1	24,471.68	14,604.47	2,997.65	6,869.57
2	24,518.32	14,608.57	3,021.82	6,887.93
3	24,496.55	14,590.15	3,010.92	6,895.48
4	24,486.60	14,589.70	3,014.82	6,882.08
5	24,520.88	14,634.13	3,003.33	6,883.42
6	24,492.18	14,615.07	3,009.92	6,867.20
7	24,514.92	14,617.85	3,018.27	6,878.80
8	24,497.45	14,607.63	3,001.63	6,888.18
9	24,467.12	14,585.35	3,002.45	6,879.32
10	24,479.13	14,602.62	3,005.98	6,870.53
11	24,524.30	14,634.13	3,005.68	6,884.48
12	24,505.42	14,609.08	3,017.13	6,879.20
13	24,510.40	14,614.62	3,018.60	6,877.18
14	24,497.83	14,599.20	3,016.07	6,882.57
15	24,501.13	14,598.67	3,019.55	6,882.92
16	24,468.82	14,604.33	3,001.40	6,863.08
17	24,512.60	14,615.77	3,011.08	6,885.75
18	24,535.70	14,617.12	3,024.67	6,893.92
19	24,469.82	14,579.82	3,009.72	6,880.28
Average	24,500.52	14,607.54	3,012.99	6,879.99

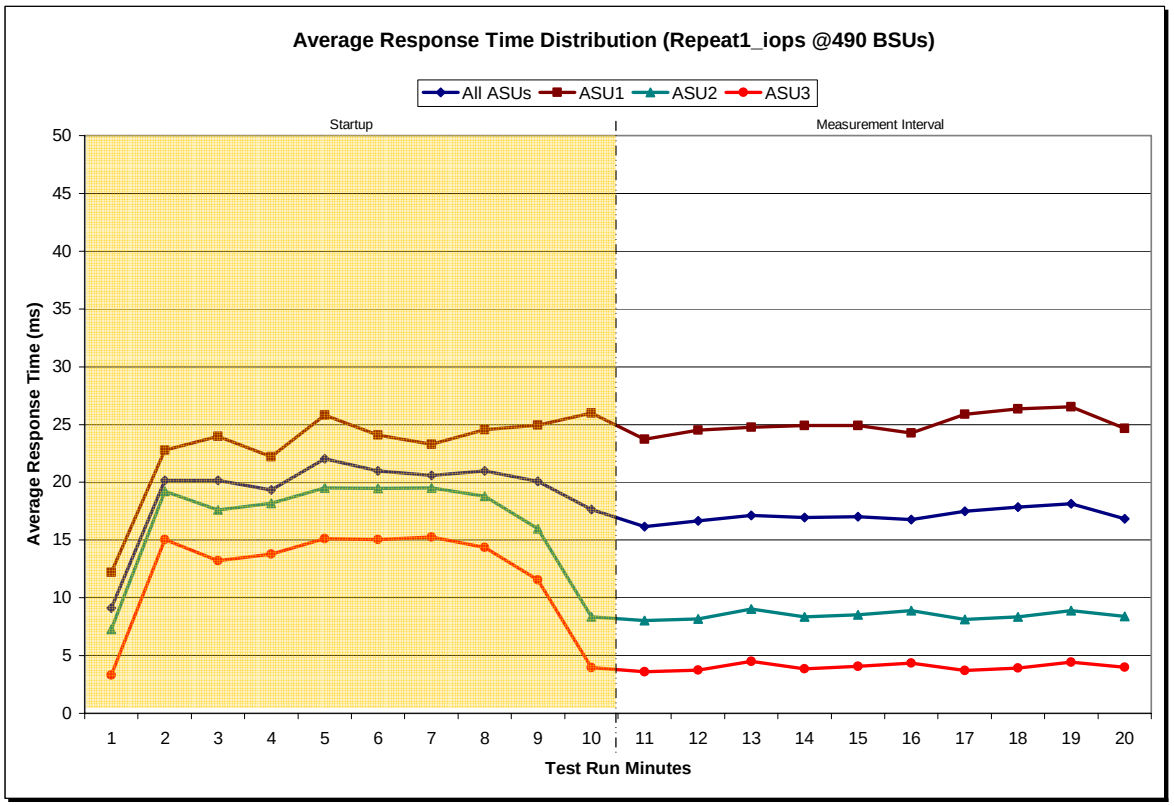
Repeatability 1 IOPS – I/O Request Throughput Distribution Graph



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

490 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	20:59:34	21:09:35	0-9	0:10:01
Measurement Interval	21:09:35	21:19:35	9-19	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	9.10	12.21	7.27	3.30
1	20.17	22.78	19.23	15.03
2	20.17	23.98	17.61	13.22
3	19.34	22.21	18.19	13.79
4	22.03	25.81	19.50	15.13
5	20.98	24.09	19.46	15.04
6	20.58	23.30	19.50	15.25
7	20.99	24.56	18.79	14.37
8	20.09	24.96	15.97	11.57
9	17.64	26.00	8.36	3.96
10	16.15	23.73	8.02	3.61
11	16.68	24.50	8.18	3.76
12	17.14	24.76	9.05	4.49
13	16.96	24.90	8.37	3.87
14	17.04	24.91	8.53	4.07
15	16.77	24.26	8.88	4.34
16	17.49	25.87	8.15	3.72
17	17.84	26.35	8.36	3.92
18	18.15	26.54	8.90	4.43
19	16.85	24.65	8.40	4.00
Average	17.11	25.05	8.48	4.02

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

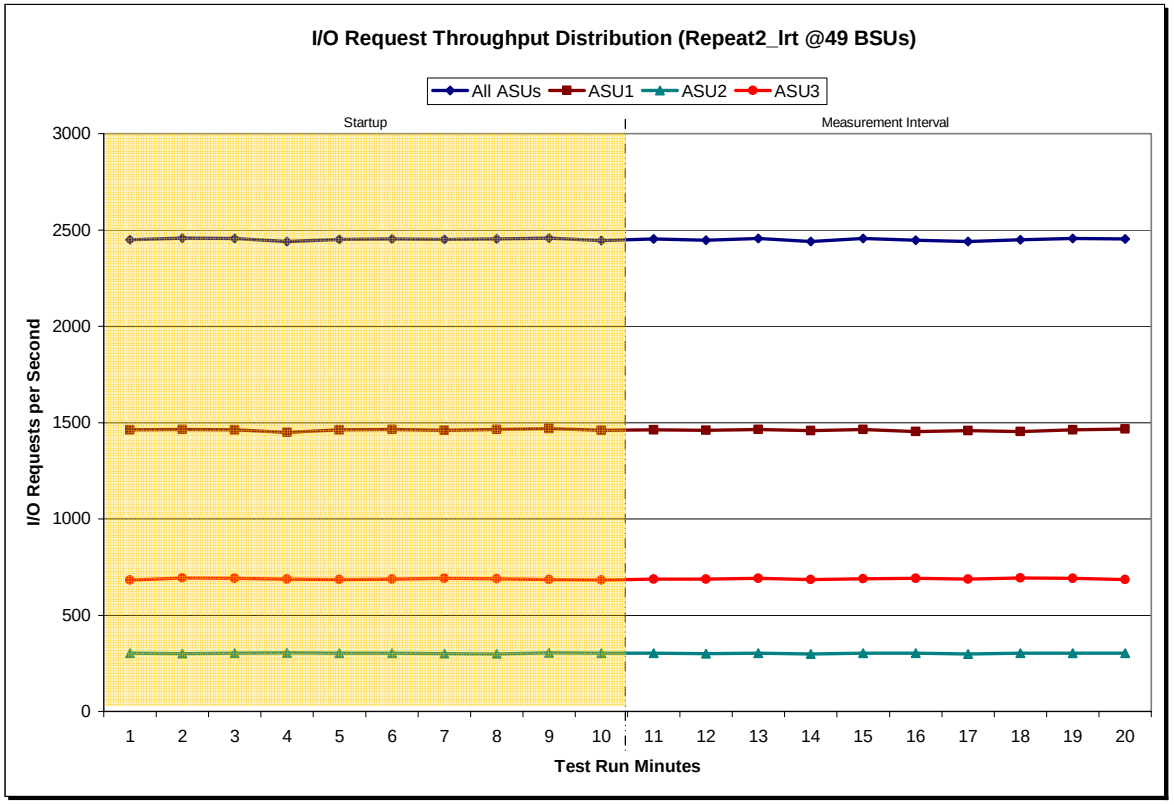


Repeatability 2 LRT – I/O Request Throughput Distribution Data

49 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	21:19:50	21:29:50	0-9	0:10:00
Measurement Interval	21:29:50	21:39:50	10-19	0:10:00

60 second intervals	All ASUs	ASU1	ASU2	ASU3
0	2,448.25	1,462.05	303.15	683.05
1	2,457.82	1,463.30	300.38	694.13
2	2,454.77	1,462.45	301.93	690.38
3	2,439.60	1,448.73	304.53	686.33
4	2,451.30	1,463.23	303.12	684.95
5	2,453.17	1,463.83	302.45	686.88
6	2,450.85	1,459.47	301.02	690.37
7	2,452.77	1,464.63	298.60	689.53
8	2,458.55	1,469.75	303.63	685.17
9	2,445.98	1,459.77	302.67	683.55
10	2,453.03	1,462.72	302.72	687.60
11	2,446.30	1,459.02	299.90	687.38
12	2,455.95	1,464.33	301.55	690.07
13	2,439.68	1,458.15	297.43	684.10
14	2,455.05	1,463.75	301.55	689.75
15	2,448.00	1,453.05	303.12	691.83
16	2,441.12	1,457.32	297.02	686.78
17	2,448.45	1,453.40	302.38	692.67
18	2,454.73	1,462.63	301.78	690.32
19	2,453.73	1,466.70	301.75	685.28
Average	2,449.61	1,460.11	300.92	688.58

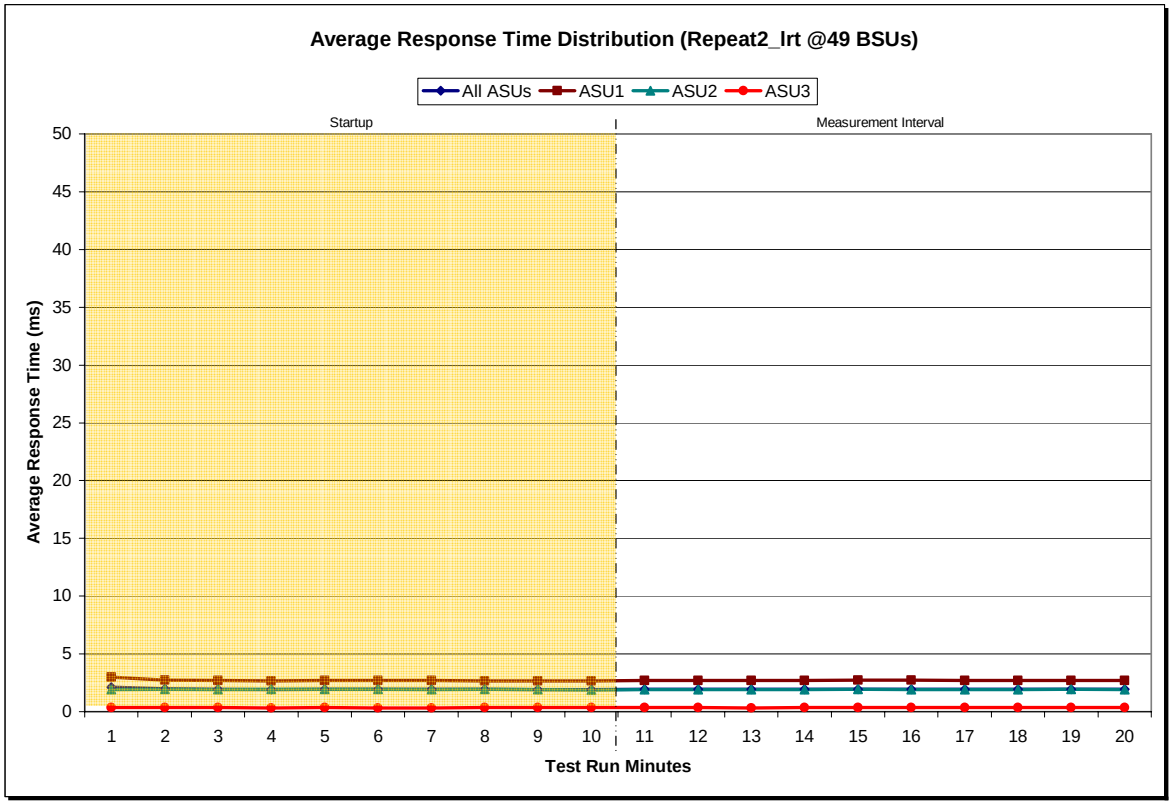
Repeatability 2 LRT – I/O Request Throughput Distribution Graph



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

49 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	21:19:50	21:29:50	0-9	0:10:00
Measurement Interval	21:29:50	21:39:50	9-19	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	2.11	2.97	1.91	0.35
1	1.97	2.74	1.93	0.35
2	1.95	2.71	1.91	0.35
3	1.92	2.66	1.96	0.34
4	1.95	2.70	1.96	0.35
5	1.95	2.70	1.96	0.34
6	1.93	2.69	1.90	0.34
7	1.93	2.67	1.94	0.35
8	1.92	2.65	1.93	0.35
9	1.92	2.67	1.89	0.34
10	1.93	2.69	1.90	0.35
11	1.95	2.71	1.91	0.35
12	1.95	2.72	1.92	0.34
13	1.94	2.69	1.91	0.35
14	1.96	2.72	1.93	0.35
15	1.95	2.72	1.91	0.35
16	1.95	2.71	1.91	0.34
17	1.94	2.70	1.90	0.34
18	1.96	2.72	1.94	0.35
19	1.94	2.70	1.92	0.35
Average	1.95	2.71	1.92	0.35

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

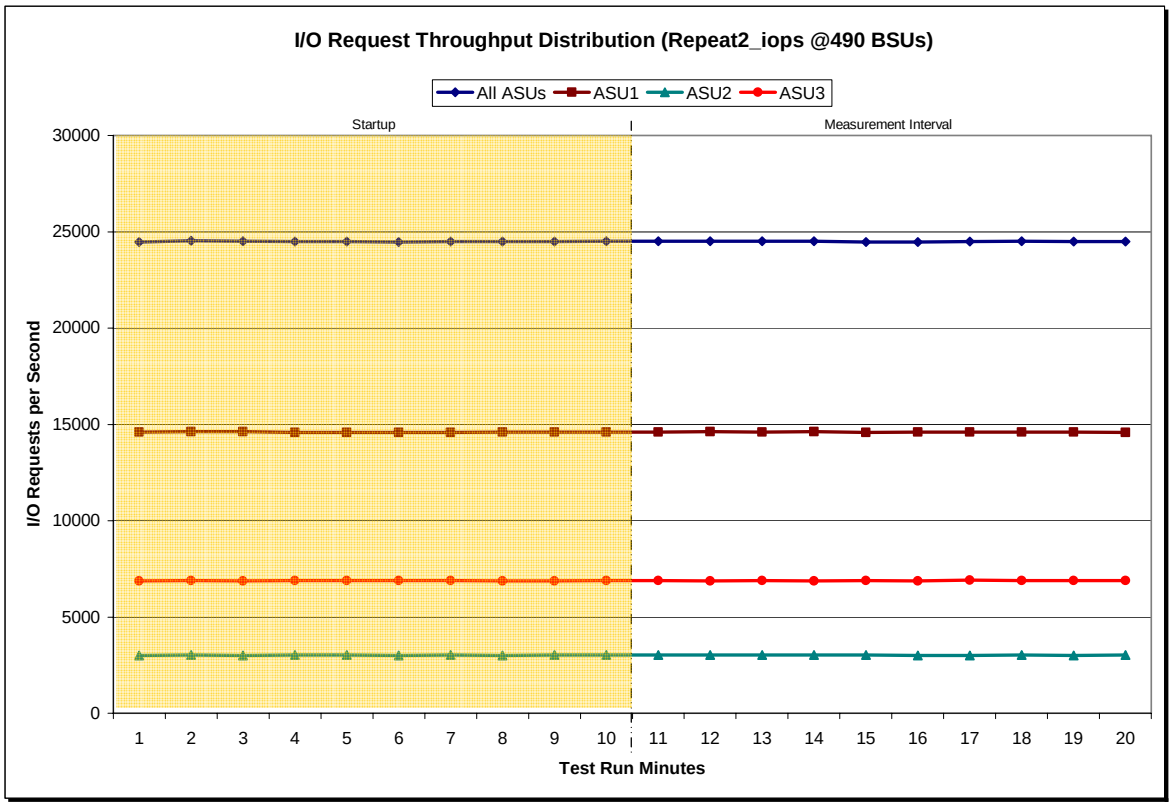


Repeatability 2 IOPS – I/O Request Throughput Distribution Data

490 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	21:39:58	21:49:59	0-9	0:10:01
Measurement Interval	21:49:59	21:59:59	10-19	0:10:00

60 second intervals	All ASUs	ASU1	ASU2	ASU3
0	24,476.53	14,591.13	3,010.18	6,875.22
1	24,543.25	14,629.57	3,018.63	6,895.05
2	24,511.57	14,629.82	3,009.72	6,872.03
3	24,493.12	14,577.60	3,019.75	6,895.77
4	24,485.02	14,584.83	3,016.68	6,883.50
5	24,478.47	14,575.58	3,008.40	6,894.48
6	24,481.75	14,569.27	3,016.73	6,895.75
7	24,489.40	14,606.98	3,005.13	6,877.28
8	24,493.80	14,596.87	3,022.28	6,874.65
9	24,521.25	14,611.05	3,015.15	6,895.05
10	24,523.00	14,605.68	3,024.33	6,892.98
11	24,518.22	14,632.17	3,021.98	6,864.07
12	24,511.10	14,603.15	3,017.62	6,890.33
13	24,513.62	14,625.48	3,014.70	6,873.43
14	24,475.32	14,568.73	3,014.22	6,892.37
15	24,471.25	14,597.98	3,009.72	6,863.55
16	24,500.27	14,590.05	3,008.78	6,901.43
17	24,508.70	14,600.18	3,026.53	6,881.98
18	24,484.80	14,593.28	2,998.02	6,893.50
19	24,500.13	14,587.10	3,024.77	6,888.27
Average	24,500.64	14,600.38	3,016.07	6,884.19

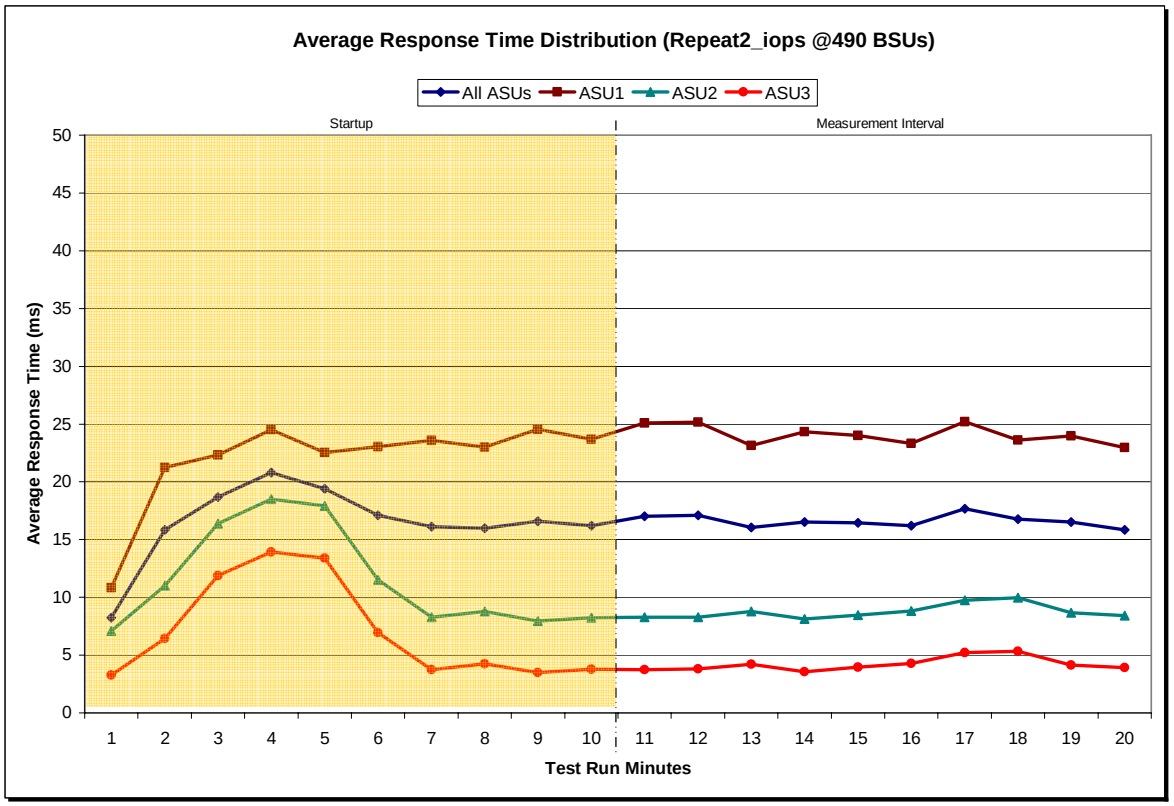
Repeatability 2 IOPS – I/O Request Throughput Distribution Graph



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

490 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	21:39:58	21:49:59	0-9	0:10:01
Measurement Interval	21:49:59	21:59:59	9-19	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	8.26	10.84	7.09	3.29
1	15.82	21.24	11.02	6.44
2	18.67	22.33	16.39	11.86
3	20.80	24.52	18.50	13.93
4	19.40	22.53	17.94	13.40
5	17.09	23.03	11.53	6.94
6	16.11	23.59	8.27	3.73
7	15.99	22.99	8.80	4.25
8	16.60	24.56	7.95	3.50
9	16.20	23.70	8.25	3.80
10	17.03	25.10	8.29	3.76
11	17.09	25.15	8.26	3.80
12	16.06	23.16	8.78	4.21
13	16.52	24.33	8.14	3.57
14	16.46	24.03	8.45	3.97
15	16.20	23.33	8.83	4.27
16	17.68	25.21	9.76	5.21
17	16.78	23.60	9.96	5.32
18	16.51	23.96	8.67	4.12
19	15.82	22.98	8.43	3.91
Average	16.61	24.08	8.76	4.21

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	0.0350	0.2809	0.0701	0.2096	0.0180	0.0705	0.0351	0.2808
COV	0.012	0.004	0.008	0.006	0.018	0.009	0.008	0.004

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.*

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%.*

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	0.0350	0.2810	0.0701	0.2101	0.0180	0.0700	0.0350	0.2808
COV	0.005	0.001	0.004	0.002	0.006	0.003	0.005	0.001

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	0.2812	0.0697	0.2102	0.0180	0.0700	0.0348	0.2811
COV	0.008	0.003	0.008	0.007	0.025	0.009	0.012	0.004

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	0.2808	0.0702	0.2100	0.0180	0.0701	0.0350	0.2810
COV	0.004	0.001	0.005	0.002	0.007	0.004	0.004	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, able 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 Data Persistence Test are listed below.

java -Xmx256m -Xms256m persist1 -b 490

java -Xmx256m -Xms256m persist2

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	58,529,504
Total Number of Logical Blocks Verified	47,919,968
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 StorageTek® D280 Disk System (non-mirrored write cache), as documented in this Full Disclosure Report became available for customer purchase and shipment on September 27, 2002.

PRICING INFORMATION

Clause 9.2.4.11

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

Pricing information may found in the Tested Storage Configuration Pricing section on page 13.

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 Remote Audit of the Sun StorageTek® D280 Disk System.

APPENDIX A: SPC-1 WORKLOAD GENERATOR STORAGE CONFIGURATION COMMANDS AND PARAMETERS

Master Host System:

```
host=master
slaves=(bm6650a_1,bm6650a_2,bm6650a_3,bm6650c_1,bm6650c_2,bm6650c_3)

javaparms="-Xmx64m -Xms64m"

sd=asu1_1,lun=\\.\PhysicalDrive1,size=13456048128
sd=asu1_2,lun=\\.\PhysicalDrive21,size=13456048128
sd=asu1_3,lun=\\.\PhysicalDrive2,size=13456048128
sd=asu1_4,lun=\\.\PhysicalDrive22,size=13456048128
sd=asu1_5,lun=\\.\PhysicalDrive3,size=13456048128
sd=asu1_6,lun=\\.\PhysicalDrive23,size=13456048128
sd=asu1_7,lun=\\.\PhysicalDrive4,size=13456048128
sd=asu1_8,lun=\\.\PhysicalDrive24,size=13456048128
sd=asu1_9,lun=\\.\PhysicalDrive5,size=13456048128
sd=asu1_10,lun=\\.\PhysicalDrive25,size=13456048128

sd=asu1_11,lun=\\.\PhysicalDrive6,size=13456048128
sd=asu1_12,lun=\\.\PhysicalDrive26,size=13456048128
sd=asu1_13,lun=\\.\PhysicalDrive7,size=13456048128
sd=asu1_14,lun=\\.\PhysicalDrive27,size=13456048128
sd=asu1_15,lun=\\.\PhysicalDrive8,size=13456048128
sd=asu1_16,lun=\\.\PhysicalDrive28,size=13456048128
sd=asu1_17,lun=\\.\PhysicalDrive9,size=13456048128
sd=asu1_18,lun=\\.\PhysicalDrive29,size=13456048128
sd=asu1_19,lun=\\.\PhysicalDrive10,size=13456048128
sd=asu1_20,lun=\\.\PhysicalDrive30,size=13456048128

sd=asu1_21,lun=\\.\PhysicalDrive11,size=13456048128
sd=asu1_22,lun=\\.\PhysicalDrive31,size=13456048128
sd=asu1_23,lun=\\.\PhysicalDrive12,size=13456048128
sd=asu1_24,lun=\\.\PhysicalDrive32,size=13456048128
sd=asu1_25,lun=\\.\PhysicalDrive13,size=13456048128
sd=asu1_26,lun=\\.\PhysicalDrive33,size=13456048128
sd=asu1_27,lun=\\.\PhysicalDrive14,size=13456048128
sd=asu1_28,lun=\\.\PhysicalDrive34,size=13456048128
sd=asu1_29,lun=\\.\PhysicalDrive15,size=13456048128
sd=asu1_30,lun=\\.\PhysicalDrive35,size=13456048128

sd=asu1_31,lun=\\.\PhysicalDrive16,size=13456048128
sd=asu1_32,lun=\\.\PhysicalDrive36,size=13456048128
sd=asu1_33,lun=\\.\PhysicalDrive17,size=13456048128
sd=asu1_34,lun=\\.\PhysicalDrive37,size=13456048128
sd=asu1_35,lun=\\.\PhysicalDrive18,size=13456048128
sd=asu1_36,lun=\\.\PhysicalDrive38,size=13456048128
sd=asu1_37,lun=\\.\PhysicalDrive19,size=13456048128
sd=asu1_38,lun=\\.\PhysicalDrive39,size=13456048128
sd=asu1_39,lun=\\.\PhysicalDrive20,size=13456048128
sd=asu1_40,lun=\\.\PhysicalDrive40,size=13456048128
```

```
sd=asu2_1,lun=\\.\PhysicalDrive41,size=538241925120

sd=asu3_1,lun=\\.\PhysicalDrive42,size=119609316693
```

Slave Host System 1:

The SPC-1 Workload Generator commands and parameters listed below were used for all three instances executing on the Slave Host System. The only difference in the commands for each instance was the "host=…" command, which differed for each individual instance.

```
host=bm6650c_1
master=bm6650c

javaparms="-Xmx64m -Xms64m"

sd=asu1_1,lun=\\.\PhysicalDrive1,size=13456048128
sd=asu1_2,lun=\\.\PhysicalDrive21,size=13456048128
sd=asu1_3,lun=\\.\PhysicalDrive2,size=13456048128
sd=asu1_4,lun=\\.\PhysicalDrive22,size=13456048128
sd=asu1_5,lun=\\.\PhysicalDrive3,size=13456048128
sd=asu1_6,lun=\\.\PhysicalDrive23,size=13456048128
sd=asu1_7,lun=\\.\PhysicalDrive4,size=13456048128
sd=asu1_8,lun=\\.\PhysicalDrive24,size=13456048128
sd=asu1_9,lun=\\.\PhysicalDrive5,size=13456048128
sd=asu1_10,lun=\\.\PhysicalDrive25,size=13456048128

sd=asu1_11,lun=\\.\PhysicalDrive6,size=13456048128
sd=asu1_12,lun=\\.\PhysicalDrive26,size=13456048128
sd=asu1_13,lun=\\.\PhysicalDrive7,size=13456048128
sd=asu1_14,lun=\\.\PhysicalDrive27,size=13456048128
sd=asu1_15,lun=\\.\PhysicalDrive8,size=13456048128
sd=asu1_16,lun=\\.\PhysicalDrive28,size=13456048128
sd=asu1_17,lun=\\.\PhysicalDrive9,size=13456048128
sd=asu1_18,lun=\\.\PhysicalDrive29,size=13456048128
sd=asu1_19,lun=\\.\PhysicalDrive10,size=13456048128
sd=asu1_20,lun=\\.\PhysicalDrive30,size=13456048128

sd=asu1_21,lun=\\.\PhysicalDrive11,size=13456048128
sd=asu1_22,lun=\\.\PhysicalDrive31,size=13456048128
sd=asu1_23,lun=\\.\PhysicalDrive12,size=13456048128
sd=asu1_24,lun=\\.\PhysicalDrive32,size=13456048128
sd=asu1_25,lun=\\.\PhysicalDrive13,size=13456048128
sd=asu1_26,lun=\\.\PhysicalDrive33,size=13456048128
sd=asu1_27,lun=\\.\PhysicalDrive14,size=13456048128
sd=asu1_28,lun=\\.\PhysicalDrive34,size=13456048128
sd=asu1_29,lun=\\.\PhysicalDrive15,size=13456048128
sd=asu1_30,lun=\\.\PhysicalDrive35,size=13456048128

sd=asu1_31,lun=\\.\PhysicalDrive16,size=13456048128
sd=asu1_32,lun=\\.\PhysicalDrive36,size=13456048128
sd=asu1_33,lun=\\.\PhysicalDrive17,size=13456048128
sd=asu1_34,lun=\\.\PhysicalDrive37,size=13456048128
```

```
sd=asu1_35,lun=\\.\PhysicalDrive18,size=13456048128
sd=asu1_36,lun=\\.\PhysicalDrive38,size=13456048128
sd=asu1_37,lun=\\.\PhysicalDrive19,size=13456048128
sd=asu1_38,lun=\\.\PhysicalDrive39,size=13456048128
sd=asu1_39,lun=\\.\PhysicalDrive20,size=13456048128
sd=asu1_40,lun=\\.\PhysicalDrive40,size=13456048128

sd=asu2_1,lun=\\.\PhysicalDrive41,size=538241925120

sd=asu3_1,lun=\\.\PhysicalDrive42,size=119609316693
```

Slave Host System 2:

The SPC-1 Workload Generator commands and parameters listed below were used for all three instances executing on the Slave Host System. The only difference in the commands for each instance was the "host=…" command, which differed for each individual instance.

```
host=bm6650a_1
master=bm6650a

javaparms="-Xmx64m -Xms64m"

sd=asu1_1,lun=\\.\PhysicalDrive1,size=13456048128
sd=asu1_2,lun=\\.\PhysicalDrive21,size=13456048128
sd=asu1_3,lun=\\.\PhysicalDrive2,size=13456048128
sd=asu1_4,lun=\\.\PhysicalDrive22,size=13456048128
sd=asu1_5,lun=\\.\PhysicalDrive3,size=13456048128
sd=asu1_6,lun=\\.\PhysicalDrive23,size=13456048128
sd=asu1_7,lun=\\.\PhysicalDrive4,size=13456048128
sd=asu1_8,lun=\\.\PhysicalDrive24,size=13456048128
sd=asu1_9,lun=\\.\PhysicalDrive5,size=13456048128
sd=asu1_10,lun=\\.\PhysicalDrive25,size=13456048128

sd=asu1_11,lun=\\.\PhysicalDrive6,size=13456048128
sd=asu1_12,lun=\\.\PhysicalDrive26,size=13456048128
sd=asu1_13,lun=\\.\PhysicalDrive7,size=13456048128
sd=asu1_14,lun=\\.\PhysicalDrive27,size=13456048128
sd=asu1_15,lun=\\.\PhysicalDrive8,size=13456048128
sd=asu1_16,lun=\\.\PhysicalDrive28,size=13456048128
sd=asu1_17,lun=\\.\PhysicalDrive9,size=13456048128
sd=asu1_18,lun=\\.\PhysicalDrive29,size=13456048128
sd=asu1_19,lun=\\.\PhysicalDrive10,size=13456048128
sd=asu1_20,lun=\\.\PhysicalDrive30,size=13456048128

sd=asu1_21,lun=\\.\PhysicalDrive11,size=13456048128
sd=asu1_22,lun=\\.\PhysicalDrive31,size=13456048128
sd=asu1_23,lun=\\.\PhysicalDrive12,size=13456048128
sd=asu1_24,lun=\\.\PhysicalDrive32,size=13456048128
sd=asu1_25,lun=\\.\PhysicalDrive13,size=13456048128
sd=asu1_26,lun=\\.\PhysicalDrive33,size=13456048128
sd=asu1_27,lun=\\.\PhysicalDrive14,size=13456048128
sd=asu1_28,lun=\\.\PhysicalDrive34,size=13456048128
sd=asu1_29,lun=\\.\PhysicalDrive15,size=13456048128
sd=asu1_30,lun=\\.\PhysicalDrive35,size=13456048128
```

```
sd=asu1_31,lun=\\.\PhysicalDrive16,size=13456048128
sd=asu1_32,lun=\\.\PhysicalDrive36,size=13456048128
sd=asu1_33,lun=\\.\PhysicalDrive17,size=13456048128
sd=asu1_34,lun=\\.\PhysicalDrive37,size=13456048128
sd=asu1_35,lun=\\.\PhysicalDrive18,size=13456048128
sd=asu1_36,lun=\\.\PhysicalDrive38,size=13456048128
sd=asu1_37,lun=\\.\PhysicalDrive19,size=13456048128
sd=asu1_38,lun=\\.\PhysicalDrive39,size=13456048128
sd=asu1_39,lun=\\.\PhysicalDrive20,size=13456048128
sd=asu1_40,lun=\\.\PhysicalDrive40,size=13456048128

sd=asu2_1,lun=\\.\PhysicalDrive41,size=538241925120

sd=asu3_1,lun=\\.\PhysicalDrive42,size=119609316693
```

APPENDIX B: TESTED STORAGE CONFIGURATION (TSC) CREATION/CONFIGURATION SCRIPT

```
/* SPC-1 configuration script     */
/* 108 drives - 8/14/03          */

set controller[a] mode = active;
set controller[b] mode = active;

create volume drives[ 0,1  0,2 10,1  10,2  0,3  0,4  10,3  10,4   0,5  0,6  10,5  10,6   0,7  0,8 10,7
                      10,8 0,9 0,10  10,9 10,10 0,11  0,12 10,11 10,12 0,13  0,14 10,13 10,14 2,1 12,1 ]
RAIDLevel=1
segmentSize=128
userLabel="LUN 0"
capacity=13456048128
owner = A;
create volume volumeGroup=1  RAIDLevel=1  segmentSize=128  userLabel="LUN 1"  capacity=13456048128  owner = A;
create volume volumeGroup=1  RAIDLevel=1  segmentSize=128  userLabel="LUN 2"  capacity=13456048128  owner = A;
create volume volumeGroup=1  RAIDLevel=1  segmentSize=128  userLabel="LUN 3"  capacity=13456048128  owner = A;
create volume volumeGroup=1  RAIDLevel=1  segmentSize=512  userLabel="LUN 4"  capacity=13456048128  owner = A;
create volume volumeGroup=1  RAIDLevel=1  segmentSize=512  userLabel="LUN 5"  capacity=13456048128  owner = A;
create volume volumeGroup=1  RAIDLevel=1  segmentSize=512  userLabel="LUN 6"  capacity=13456048128  owner = A;
create volume volumeGroup=1  RAIDLevel=1  segmentSize=512  userLabel="LUN 7"  capacity=13456048128  owner = A;
create volume volumeGroup=1  RAIDLevel=1  segmentSize=512  userLabel="LUN 8"  capacity=13456048128  owner = A;
create volume volumeGroup=1  RAIDLevel=1  segmentSize=512  userLabel="LUN 9"  capacity=13456048128  owner = A;
create volume volumeGroup=1  RAIDLevel=1  segmentSize=512  userLabel="LUN 10"  capacity=13456048128  owner = A;
create volume volumeGroup=1  RAIDLevel=1  segmentSize=512  userLabel="LUN 11"  capacity=13456048128  owner = A;
create volume volumeGroup=1  RAIDLevel=1  segmentSize=128  userLabel="LUN 12"  capacity=13456048128  owner = A;
create volume volumeGroup=1  RAIDLevel=1  segmentSize=128  userLabel="LUN 13"  capacity=13456048128  owner = A;
create volume volumeGroup=1  RAIDLevel=1  segmentSize=128  userLabel="LUN 14"  capacity=13456048128  owner = A;
create volume volumeGroup=1  RAIDLevel=1  segmentSize=128  userLabel="LUN 15"  capacity=13456048128  owner = A;
create volume volumeGroup=1  RAIDLevel=1  segmentSize=128  userLabel="LUN 16"  capacity=13456048128  owner = A;
create volume volumeGroup=1  RAIDLevel=1  segmentSize=128  userLabel="LUN 17"  capacity=13456048128  owner = A;
create volume volumeGroup=1  RAIDLevel=1  segmentSize=128  userLabel="LUN 18"  capacity=13456048128  owner = A;
create volume volumeGroup=1  RAIDLevel=1  segmentSize=128  userLabel="LUN 19"  capacity=13456048128  owner = A;

create volume drives[ 1,1  1,2  11,1  11,2   1,3  1,4  11,3  11,4   1,5   1,6  11,5  11,6   1,7  1,8
                      11,7 11,8  1,9   1,10 11,9 11,10  1,11  1,12 11,11 11,12  1,13  1,14 11,13 11,14 2,10 12,10 ]
RAIDLevel=1
segmentSize=128
userLabel="LUN 20"
capacity=13456048128
owner = A;
create volume volumeGroup=2  RAIDLevel=1  segmentSize=128  userLabel="LUN 21"  capacity=13456048128  owner = A;
create volume volumeGroup=2  RAIDLevel=1  segmentSize=128  userLabel="LUN 22"  capacity=13456048128  owner = A;
create volume volumeGroup=2  RAIDLevel=1  segmentSize=128  userLabel="LUN 23"  capacity=13456048128  owner = A;
create volume volumeGroup=2  RAIDLevel=1  segmentSize=512  userLabel="LUN 24"  capacity=13456048128  owner = A;
create volume volumeGroup=2  RAIDLevel=1  segmentSize=512  userLabel="LUN 25"  capacity=13456048128  owner = A;
create volume volumeGroup=2  RAIDLevel=1  segmentSize=512  userLabel="LUN 26"  capacity=13456048128  owner = A;
create volume volumeGroup=2  RAIDLevel=1  segmentSize=512  userLabel="LUN 27"  capacity=13456048128  owner = A;
create volume volumeGroup=2  RAIDLevel=1  segmentSize=512  userLabel="LUN 28"  capacity=13456048128  owner = A;
create volume volumeGroup=2  RAIDLevel=1  segmentSize=512  userLabel="LUN 29"  capacity=13456048128  owner = A;
create volume volumeGroup=2  RAIDLevel=1  segmentSize=512  userLabel="LUN 30"  capacity=13456048128  owner = A;
create volume volumeGroup=2  RAIDLevel=1  segmentSize=512  userLabel="LUN 31"  capacity=13456048128  owner = A;
create volume volumeGroup=2  RAIDLevel=1  segmentSize=128  userLabel="LUN 32"  capacity=13456048128  owner = A;
create volume volumeGroup=2  RAIDLevel=1  segmentSize=128  userLabel="LUN 33"  capacity=13456048128  owner = A;
create volume volumeGroup=2  RAIDLevel=1  segmentSize=128  userLabel="LUN 34"  capacity=13456048128  owner = A;
create volume volumeGroup=2  RAIDLevel=1  segmentSize=128  userLabel="LUN 35"  capacity=13456048128  owner = A;
create volume volumeGroup=2  RAIDLevel=1  segmentSize=128  userLabel="LUN 36"  capacity=13456048128  owner = A;
```

```
create volume volumeGroup=2  RAIDLevel=1  segmentSize=128  userLabel="LUN 37"  capacity=13456048128  owner = A;
create volume volumeGroup=2  RAIDLevel=1  segmentSize=128  userLabel="LUN 38"  capacity=13456048128  owner = A;
create volume volumeGroup=2  RAIDLevel=1  segmentSize=128  userLabel="LUN 39"  capacity=13456048128  owner = A;

create volume drives[ 2,2 12,2  2,3   2,4  12,3  12,4  2,5   2,6  12,5 12,6  2,7  2,8 12,7  12,8  2,9
                12,9  2,11 2,12 12,11 12,12  2,13 2,14 12,13 12,14 3,1  3,2  13,1 13,2  3,3  13,3 ]
RAIDLevel=1
segmentSize=512
userLabel="LUN 40"
capacity=538241925120
owner = b;

create volume drives[ 3,4  13,4  3,5 3,6  13,5 13,6  3,7 3,8  13,7 13,8  3,9 3,10  13,9 13,10  3,11 3,12  13,11 13,12 ]

RAIDLevel=1
segmentSize=64
userLabel="LUN 41"
capacity=119609316864
owner = b;

set volume["LUN 0"]  mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 1"]  mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 2"]  mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 3"]  mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 4"]  mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 5"]  mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 6"]  mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 7"]  mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 8"]  mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 9"]  mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 10"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 11"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 12"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 13"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 14"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 15"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 16"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 17"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 18"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 19"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 20"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 21"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 22"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 23"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 24"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 25"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 26"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 27"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 28"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 29"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 30"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 31"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 32"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 33"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 34"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 35"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 36"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 37"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 38"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 39"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
set volume["LUN 40"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;
```

```
set volume["LUN 41"] mirrorEnabled = False writeCacheEnabled = True cacheWithoutBatteryEnabled = False readAheadMultiplier = 0;

set storageArray cacheFlushStop  = 70 cacheFlushStart = 70;

set storageArray defaultHostType = "Windows 2000/Server 2003 Non-Clustered";

set controller[a] HostNVSRAMByte[0x01, 0x17]=0x01;
set controller[b] HostNVSRAMByte[0x01, 0x17]=0x01;

/* Setup for RDAC failover environment */

set controller[a] HostNVSRAMByte[0x00, 0x24]=0x00;
set controller[a] HostNVSRAMByte[0x01, 0x24]=0x00;
set controller[a] HostNVSRAMByte[0x02, 0x24]=0x00;
set controller[a] HostNVSRAMByte[0x03, 0x24]=0x00;
set controller[a] HostNVSRAMByte[0x04, 0x24]=0x00;
set controller[a] HostNVSRAMByte[0x05, 0x24]=0x00;
set controller[a] HostNVSRAMByte[0x06, 0x24]=0x00;
set controller[a] HostNVSRAMByte[0x07, 0x24]=0x00;
set controller[a] HostNVSRAMByte[0x08, 0x24]=0x00;
set controller[a] HostNVSRAMByte[0x09, 0x24]=0x00;
set controller[a] HostNVSRAMByte[0x0a, 0x24]=0x00;
set controller[a] HostNVSRAMByte[0x0b, 0x24]=0x00;
set controller[a] HostNVSRAMByte[0x0c, 0x24]=0x00;
set controller[a] HostNVSRAMByte[0x0d, 0x24]=0x00;
set controller[a] HostNVSRAMByte[0x0e, 0x24]=0x00;
set controller[a] HostNVSRAMByte[0x0f, 0x24]=0x00;

set controller[b] HostNVSRAMByte[0x00, 0x24]=0x00;
set controller[b] HostNVSRAMByte[0x01, 0x24]=0x00;
set controller[b] HostNVSRAMByte[0x02, 0x24]=0x00;
set controller[b] HostNVSRAMByte[0x03, 0x24]=0x00;
set controller[b] HostNVSRAMByte[0x04, 0x24]=0x00;
set controller[b] HostNVSRAMByte[0x05, 0x24]=0x00;
set controller[b] HostNVSRAMByte[0x06, 0x24]=0x00;
set controller[b] HostNVSRAMByte[0x07, 0x24]=0x00;
set controller[b] HostNVSRAMByte[0x08, 0x24]=0x00;
set controller[b] HostNVSRAMByte[0x09, 0x24]=0x00;
set controller[b] HostNVSRAMByte[0x0a, 0x24]=0x00;
set controller[b] HostNVSRAMByte[0x0b, 0x24]=0x00;
set controller[b] HostNVSRAMByte[0x0c, 0x24]=0x00;
set controller[b] HostNVSRAMByte[0x0d, 0x24]=0x00;
set controller[b] HostNVSRAMByte[0x0e, 0x24]=0x00;
set controller[b] HostNVSRAMByte[0x0f, 0x24]=0x00;
```