SPC BENCHMARK 1™
FULL DISCLOSURE REPORT

FUJITSU LIMITED
FUJITSU STORAGE SYSTEMS
ETERNUS8000 MODEL 1100

SPC-1 V1.10.1

Submitted for Review: August 20, 2007
Submission Identifier: A00053

First Edition – August 2007

Trademarks

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AUDIT CERTIFICATION

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Fujitsu Limited
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August 20, 2007

The SPC Benchmark 1™ results listed below for the Fujitsu Storage Systems ETERNUS8000 Model 1100 were produced in compliance with the SPC Benchmark 1™ V1.10.1 Remote Audit requirements.

SPC Benchmark 1™ V1.10.1 Results	
Tested Storage Configuration (TSC) Name: Fujitsu Storage Systems ETERNUS8000 Model 1100	
Metric	**Reported Result**
SPC-1 IOPS™	115,090.06
SPC-1 Price-Performance	$16.12/SPC-1 IOPS™
Total ASU Capacity	10,854.400 GB
Data Protection Level	Mirroring
Total TSC Price (including three-year maintenance)	$1,855,100

The following SPC Benchmark 1™ Remote Audit requirements were reviewed and found compliant with V1.10.1 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 Fujitsu Limited:
  - ✓ 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).

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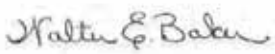
AUDIT CERTIFICATION *(CONT.)*

- 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 requirements, for each Host System, were reviewed using documentation supplied by Fujitsu Limited:
  - ✓ 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 from Fujitsu Limited for each of following were authentic, accurate, and compliant with all of the requirements and constraints of Clauses 4 and 5 of the SPC-1 Benchmark Specification:
  - ✓ Data Persistence Test
  - ✓ Sustainability Test Phase
  - ✓ IOPS Test Phase
  - ✓ Response Time Ramp Test Phase
  - ✓ Repeatability Test
- The differences between the Tested Storage Configuration (TSC) used for the benchmark and Priced Storage Configuration were documented and, if applied to the TSC, would not have a negative impact on the reported SPC-1 performance.
- The submitted pricing information 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 audit notes or exceptions.

Respectfully,



Walter E. Baker
SPC Auditor

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LETTER OF GOOD FAITH

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Kanagawa-ken, Kawasaki-shi, Nakahara-ku, Kamikodanaka,4-1-1,JAPAN 211-8588
TEL: 044-754-3240, FAX: 044-754-3719

From: FujitsuLimited,Test Sponsor

Submittedby: Tetsuro Kudo ,
General Manager, Storage Systems Division
Kanagawa-ken,Kawasaki-shi,Nakahara-ku,Kamikodanaka4-1-1
Japan211-8588

Contact Information: Carrel A. (Sandy)Wilson
Fujitsu Computer SystemsCorp.
1250EastArquesAvePO Box 3470
Sunnyvale,CA 94088, U.S.A.

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

Subject: SPC-1 Letter of Good Faith for the ETERNUS8000 Model 1100

Fujitsu Limited is the SPC-1 Test Sponsor for the above listed product. To the best of our knowledge and belief, the required SPC-1 benchmark results and materials we have submitted for that product are complete, accurate, and in full compliance with V1.10.0 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: Tetsuro Kudo Date: 7/10/2007

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

Test Sponsor and Contact Information	
Test Sponsor Primary Contact	Fujitsu Limited – http://www.fujitsu.com/services/computing/storage/ Fujitsu Computer Systems Corp. C.A. (Sandy) Wilson Sandy_Wilson@us.fujitsu.com 1250 East Arques Ave PO Box 3470 Sunnyvale, CA 94088-3470 Phone: (916) 434-8593
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Test Sponsor Alternate Contact	Fujitsu Limited – http://www.fujitsu.com/services/computing/storage/ Tetsuro Kudo kudo@jp.fujitsu.com Kanagawa-ken, Kawasaki-shi, Nakahara-ku, Kamikodanaka 4-1-1 Japan 211-8588 Phone: 044- 754-3240 FAX: 044-754-3719
Auditor	Storage Performance Council – http://www.storageperformance.org Walter E. Baker – AuditService@StoragePerformance.org 643 Bair Island Road, Suite 103 Redwood City, CA 94063 Phone: (650) 556-9384 FAX: (650) 556-9385

Revision Information and Key Dates

Revision Information and Key Dates	
SPC-1 Specification revision number	V1.10.1
SPC-1 Workload Generator revision number	V2.00.04a
Date Results were first used publicly	August 20, 2007
Date the FDR was submitted to the SPC	August 20, 2007
Date the TSC is available for shipment to customers	September 30, 2007
Date the TSC completed audit certification	August 20, 2007

Tested Storage Product (TSP) Description

The Fujitsu ETERNUS8000 Model 1100 is a flexible, highly reliable storage array, equipped with redundant components to provide uncompromised availability. Any mixture of disk drives ranging from 73GB/15krpm to 300GB/15krpm Fibre Channel drives as well as 500GB/7.2krpm Nearline FC drives are supported in the form of RAID1, 0+1 (10), 5 and 6. Up to 64 FC Host Interface channels can be configured, with options for iSCSI Interface channels as well. On top of these, it supports a variety of snapshot and replication capabilities, both local and remote; native disk data encryption; and MAID capability, where drives can be spun down when not needed to save power.

Summary of Results

SPC-1 Results	
Tested Storage Configuration (TSC) Name: Fujitsu Storage Systems ETERNUS8000 Model 1100	
Metric	**Reported Result**
SPC-1 IOPS™	115,090.06
SPC-1 Price-Performance	$16.12/SPC-1 IOPS™
Total ASU Capacity	10,854.400 GB
Data Protection Level	Mirroring
Total TSC Price (including three-year maintenance)	$1,855,100

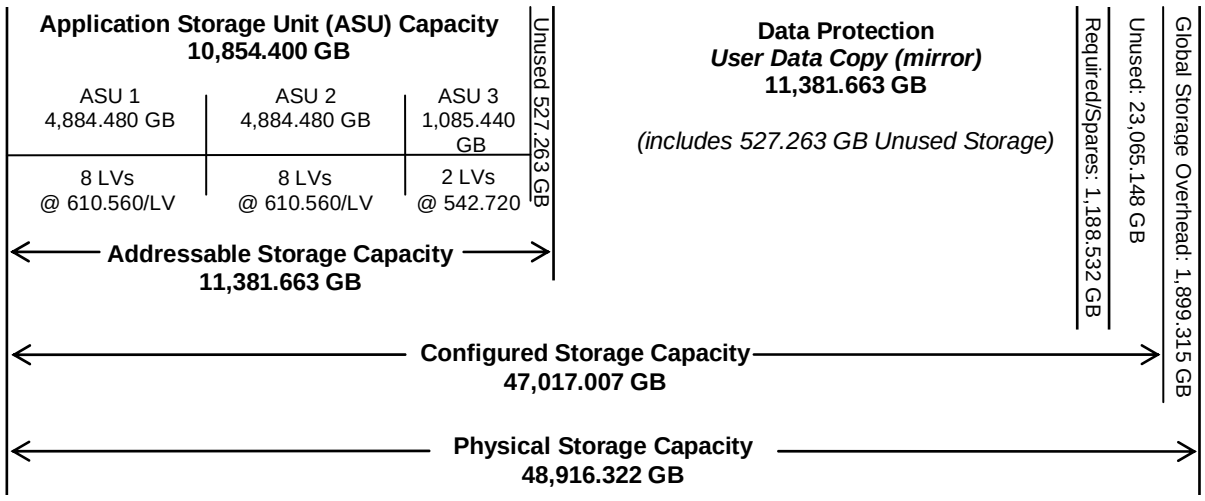
SPC-1 IOPS™ represents the maximum I/O Request Throughput at the 100% load point.

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

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

Storage Capacities and Relationships

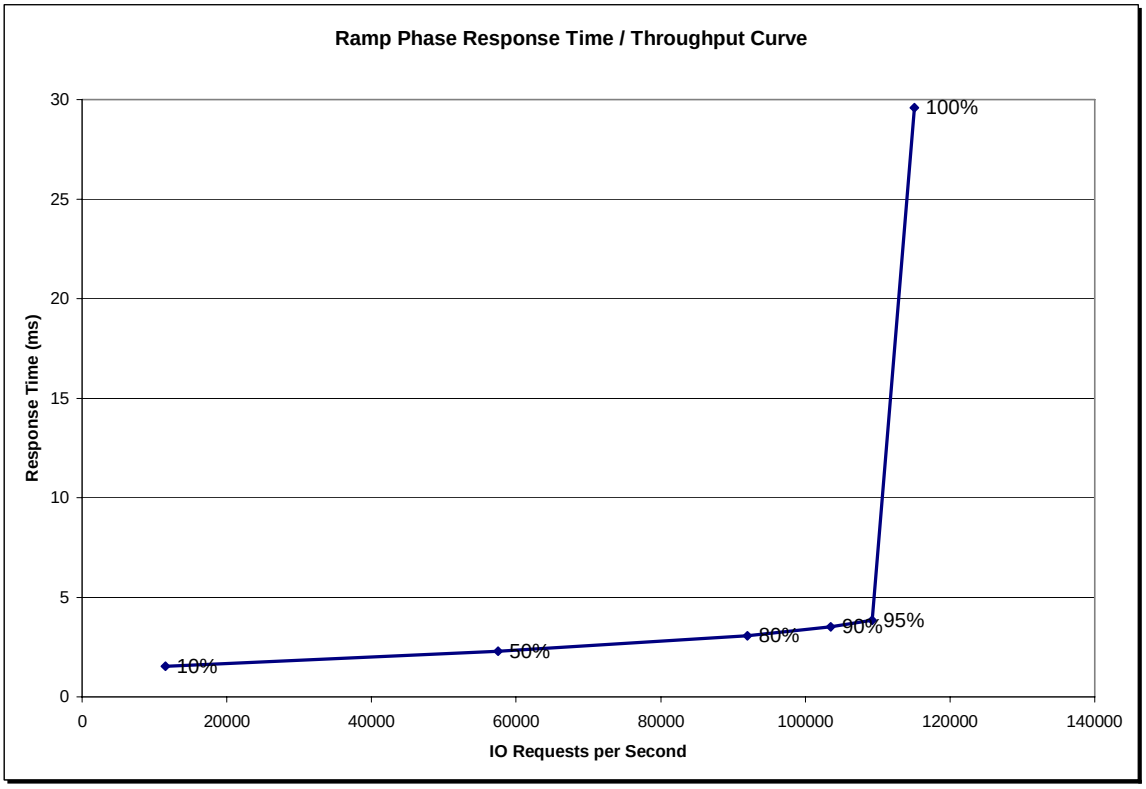
The following diagram documents the various storage capacities, used in this benchmark, and their relationships.



Response Time – Throughput Curve

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

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



Response Time – Throughput Data

	10% Load	50% Load	80% Load	90% Load	95% Load	100% Load
I/O Request Throughput	11,498.20	57,491.32	91,973.06	103,476.94	109,246.30	115,090.06
Average Response Time (ms):						
All ASUs	1.53	2.29	3.08	3.51	3.84	29.60
ASU-1	2.00	2.91	3.79	4.28	4.64	39.10
ASU-2	1.38	2.08	2.90	3.35	3.69	6.64
ASU-3	0.59	1.08	1.65	1.97	2.22	19.50
Reads	3.05	4.24	5.37	5.99	6.45	33.59
Writes	0.53	1.02	1.59	1.90	2.15	26.99

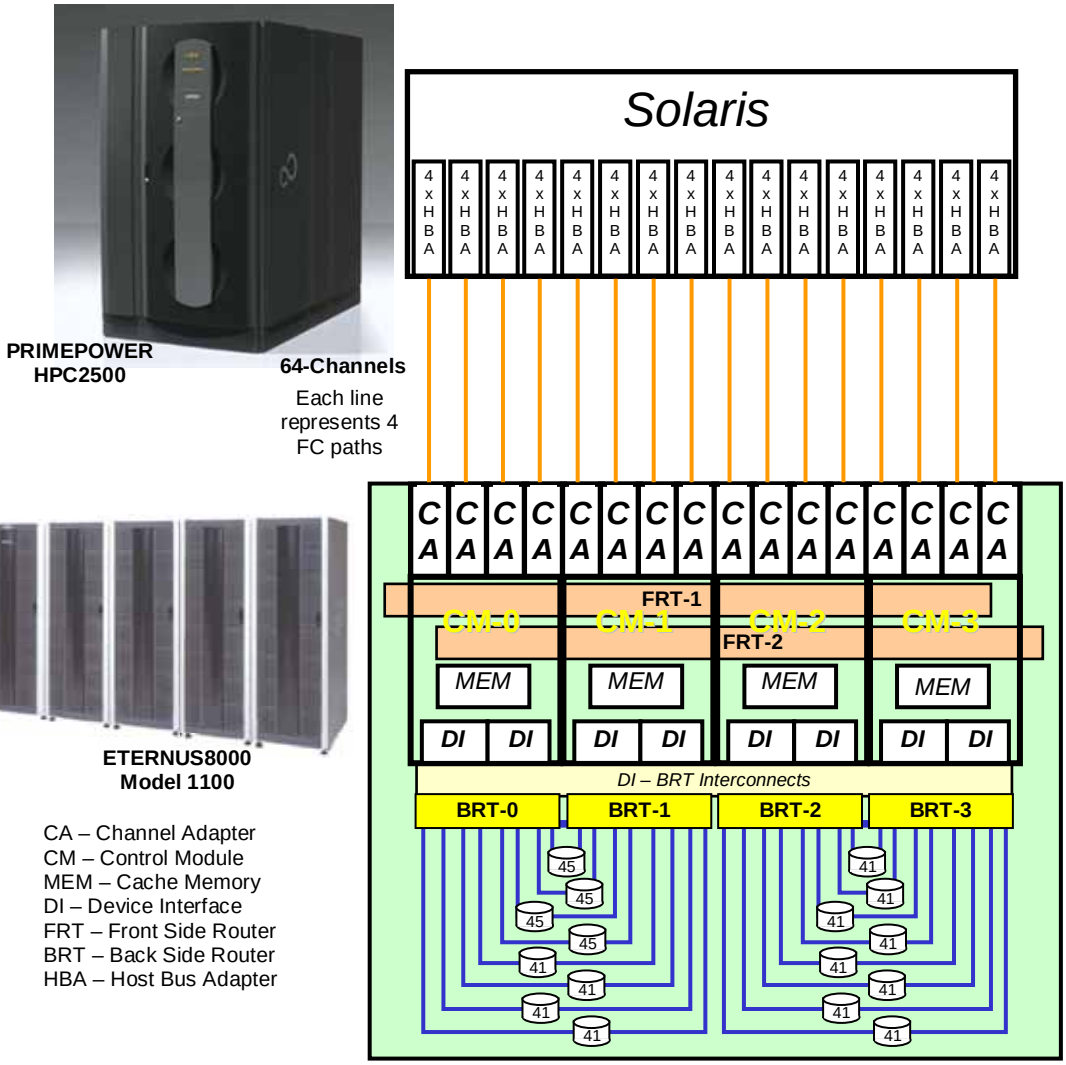
Tested Storage Configuration Pricing *(Priced Storage Configuration)*

Fujitsu ETERNUS8000 Model 1100					
Item	Product Id	Description	Qty	Unit $	Extd $
1	E8B0S20AU	ETERNUS8000 M1100 Base Unit (floor stand) Includes: - 1x 1800mm rack - 2x 1800mm expansion rack - 1x controller enclosure - 4x controller module (CM) - 6x power supply unit (PSU) - 2x service controller (SVC) - 2x frontside router (FRT) - 4x backside router (BRT) - 6x battery unit - 24x drive enclosure (DE) - no cache memory - no host interface - 16x system disk drive - 14x Power distribution unit (AC200V) - 4x AC 200V power cord (NEMA:L6-30P 4m) - 1x ETERNUSmgr and drivers Note: Min. 112 disk drives (not including system disk drives) are required.	1		
2	E800CE21U	Additional drive enclosure for Expansion Rack - 4x drive enclosure (DE) Note: Up to three sets can be mounted in each Expansion Rack.	11		
3	E800CR1U	ETERNUS8000 Expansion Rack provides 1800mm (36U) rack holds up to 12 DEs 2x power distribution (200 VAC)	3		
4	E800CM44U	32GB Cache Memory (2x 4GB x 4CM) E8kM900/M1100/M2100 - 8x 4GB DIMM Total 32GB (2x 4GB DIMM x4CM)	4		
5	E800CH28U	FC (4Gbps) host interface (4-port x 2CA) E8K - 2x 4-port FC (4Gbps) CA	8		
6	E800CC3U	73GB/15Krpm (4Gbps) disk drive(set of 8) RAID1+0 E8K - Pre-formatted as RAID10(4D+4M) Only available when ordered with a base unit	80		
7	E800CA3U	73GB/15Krpm (4Gbps) disk drive (single) E8K - Defined as a hot-spare Only available when ordered with a base unit	16		
8	Item #1 through #7 total	E8000 M1100 storage system	1	$2,232,588	$2,232,588
9	61-343827-015	Fibre Channel Cable - LC-LC, 15 m	64	$125	$7,993
10	LP10000-M2	Emulex 2Gb PCI-X Single HBA	16	$1,036	$16,576
11	LP11000-M4	Emulex 4Gb PCI-X Single HBA	48	$1,236	$59,328
12	ETE811-W004240-K003104	ETE8000 M1100 Standard Warranty, 24 Months (24 x 7 Phone Support; 24 x 7 4-hour On-Site Resp)	1	$0	
13	ETE811-P004122-K003104	ETE8000 M1100 Enhanced +, 24 x 7 Phone Support; 24 x 7, 4-hour On-Site Resp.(Sev-1), Post-Warranty Maintenance, 12 Months	1	$247,332	$247,332
14	ETE811-N067005-K003104	ETE8000 M1100 Eternus Installation, during normal business hours, One Time billing	1	$3,500	$3,500
15	FTSPS-ET-QS81100	Professional Services-ETERNUS 8000 Model1100 QuickStart	1	$12,075	$12,075
16	FTSPS-ET-TE	ETERNUS Consulting Services Travel and Expenses	1	$2,000	$2,000
		Total Fujitsu Product List Price			$2,232,588
		Product Discount		30%	
		Total Non Fujitsu Product List Price			$83,897
		Product Discount		20%	
		Net Product Price			$1,629,929
		Total Service List Price			$264,907
		Service Discount		15%	
		Net Service Price			$225,171
		Total Sell Price, including 3 years Service			$1,855,100

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

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

Benchmark Configuration/Tested Storage Configuration Diagram



Benchmark Configuration/Tested Storage Configuration Components

<table>
<tr><th>Host System:</th><th>Tested Storage Configuration (TSC):</th></tr>
<tr><td>UID=HS-1, HS-2
Fujitsu PRIMEPOWER 2500</td><td>48 – Emulex LP11000 Fibre Channel HBAs (4 Gbit)
16 – Emulex LP11000 Fibre Channel HBAs (2 Gbit)</td></tr>
<tr><td>128 - SPARC64 V (1.3 GHz) CPUs, each with:
128 KB L1 instruction cache,
128 KB L1 data cache, and 2 MB L2 cache</td><td>UID=SC-1:
Fujitsu ETERNUS8000 Model 1100</td></tr>
<tr><td>Partitioned into two logical Host Systems, each with 64 CPUs and a full view of all of the storage</td><td rowspan="4">4 – Controller Modules (CM) each with:
32 GB cache
4 – Channel Adapter Modules (CA)
4 Fiber Channel ports per CA
2 – Drive Interfaces (DI)
4 Fiber Channel Ports per DI</td></tr>
<tr><td>512 GB main memory</td></tr>
<tr><td>Solaris 9</td></tr>
<tr><td>PCI</td></tr>
<tr><td>WG</td><td>64 – Front side Fibre Channels
(4 Gbps capable, set to 2 Gbit each)</td></tr>
<tr><td></td><td>32 – Back side Fibre Channels
(switched FC-AL set to 4 Gbit each)</td></tr>
<tr><td></td><td>68 – Drive Enclosure Modules, each with
dual switched FC-AL interfaces
15 Hot Swap drive slots</td></tr>
<tr><td></td><td>672 – 73 GB 15K RPM disk drives
(640 drives in RAID Groups,
plus 16 reserved for system use
and 16 Hot Spares)</td></tr>
</table>

In each of the following sections of this document, the appropriate Full Disclosure Report requirement, from the SPC-1 benchmark specification, is stated in italics followed by the information to fulfill the stated requirement.

CONFIGURATION INFORMATION

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

Clause 9.2.4.4.1

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

The Benchmark Configuration (BC)/Tested Storage Configuration (TSC) is illustrated on page 14 *(Benchmark Configuration/Tested Storage Configuration Diagram).*

Storage Network Configuration

Clause 9.2.4.4.1

…

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

Clause 9.2.4.4.2

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

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

Host System Configuration

Clause 9.2.4.4.3

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

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

The details of the Host System configuration may be found on page 14 *(Benchmark Configuration/Tested Storage Configuration Diagram).*

Customer Tunable Parameters and Options

Clause 9.2.4.5.1

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

"Appendix B: Customer Tunable Parameters and Options" on page 61 contains the customer tunable parameters and options that have been altered from their default values for this benchmark.

Tested Storage Configuration (TSC) Description

Clause 9.2.4.5.2

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

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

"Appendix C: Tested Storage Configuration (TSC) Creation" on page 74 contains the detailed information that describes how to create and configure the logical TSC.

SPC-1 Workload Generator Storage Configuration

Clause 9.2.4.5.3

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

The SPC-1 Workload Generator storage configuration commands and parameters for this measurement appear in "Appendix D: SPC-1 Workload Generator Storage Commands and Parameters" on page 169.

SPC-1 DATA REPOSITORY

This portion of the Full Disclosure Report presents the detailed information that fully documents the various SPC-1 storage capacities and mappings used in the Tested Storage Configuration. "SPC-1 Data Repository Definitions" on page 57 contains definitions of terms specific to the SPC-1 Data Repository.

Storage Capacities and Relationships

Clause 9.2.4.6.1

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)	10,854.400
Addressable Storage Capacity	Gigabytes (GB)	11,381.663
Configured Storage Capacity	Gigabytes (GB)	47,017.007
Physical Storage Capacity	Gigabytes (GB)	48,916.322
Data Protection *(Mirroring)*	Gigabytes (GB)	11,381.663
Required Storage *(spares and metadata)*	Gigabytes (GB)	1,188.532
Global Storage Overhead	Gigabytes (GB)	1,899.315
Total Unused Storage	Gigabytes (GB)	24,119.675

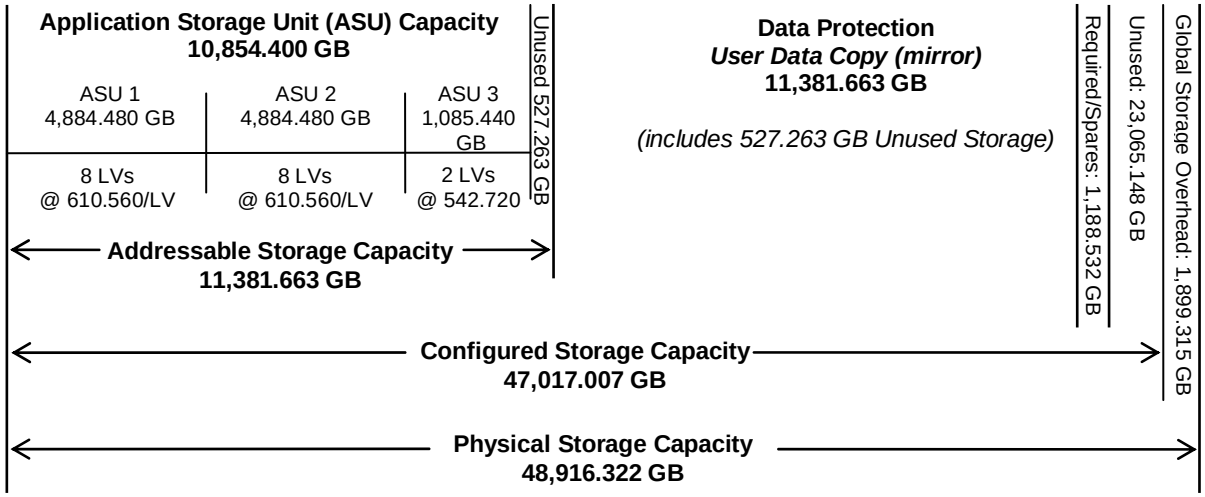
SPC-1 Storage Hierarchy Ratios

	Addressable Storage Capacity	**Configured Storage Capacity**	**Physical Storage Capacity**
Total ASU Capacity	95.37%	23.09%	22.19%
Required for Data Protection (Mirroring)		24.21%	23.27%
Addressable Storage Capacity		24.21%	23.27%
Required Storage		2.53%	2.43%
Configured Storage Capacity			96.12%
Global Storage Overhead			3.88%
Unused Storage:			
Addressable	4.63%		
Configured		49.06%	
Physical			0.00%

The Physical Storage Capacity consisted of 48,916.322 GB distributed over 672 disk drives each with a formatted capacity of 72.792 GB. There was 0.000 GB (0.00%) of Unused Storage within the Physical Storage Capacity. Global Storage Overhead consisted of 1,899.315 GB (3.88%) of Physical Storage Capacity. There was 23,065.148 GB (49.06%) of Unused Storage within the Configured Storage Capacity. The Total ASU Capacity utilized 95.37% of the Addressable Storage Capacity resulting in 527.263 GB (4.63%) of Unused Storage within the Addressable Storage Capacity.

SPC-1 Storage Capacities and Relationships Illustration

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



Logical Volume Capacity and ASU Mapping

Clause 9.2.4.6.2

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

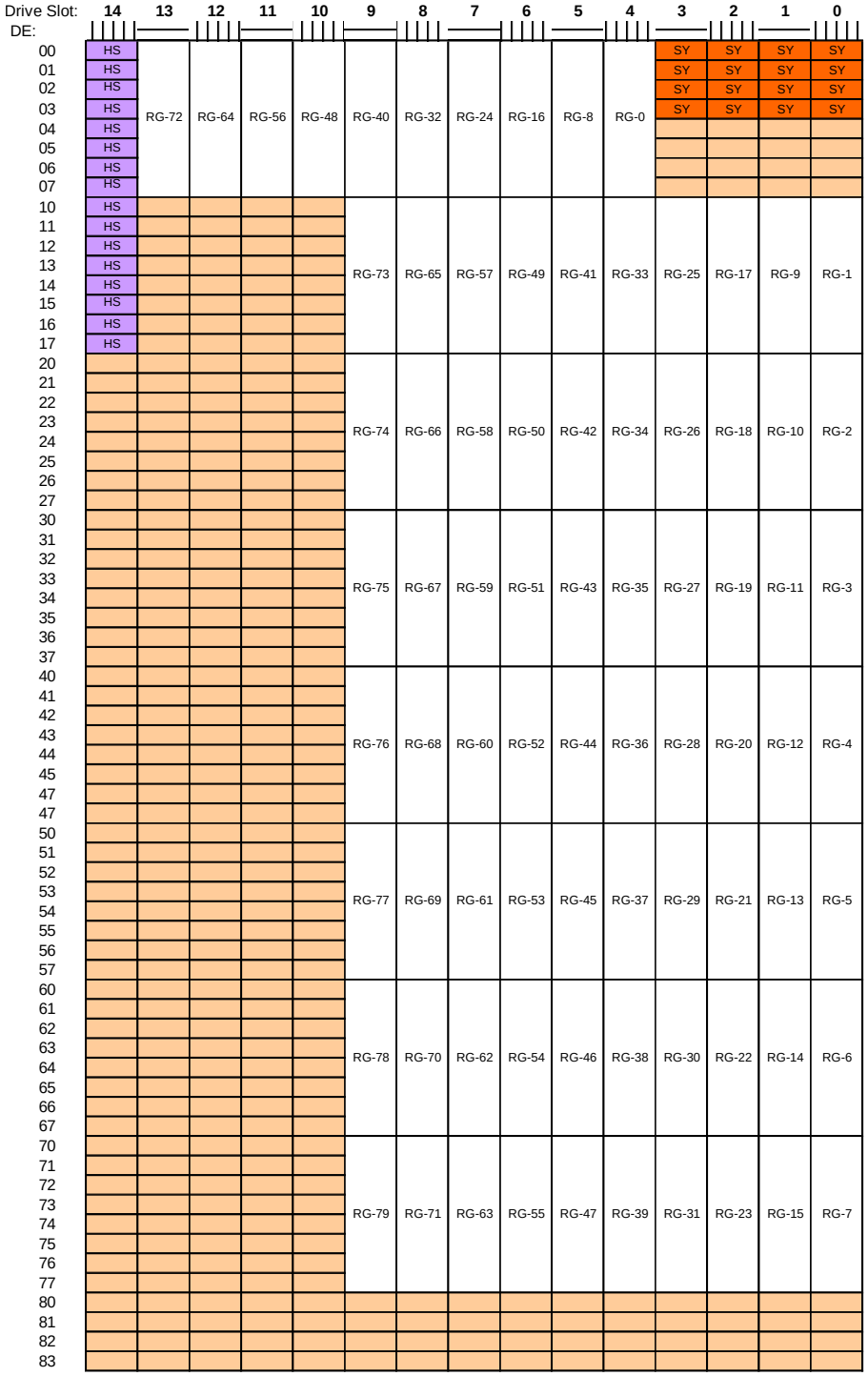
Logical Volume Capacity and Mapping		
ASU-1 (4,884.480 GB)	**ASU-2 (4,884.480 GB)**	**ASU-3 (1,085.440 GB)**
8 Logical Volumes 640.219 GB per Logical Volume (610.560 GB used per Logical Volume)	8 Logical Volumes 640.219 GB per Logical Volume (610.560 GB used per Logical Volume)	2 Logical Volumes 569.083 GB per Logical Volume (542.720 GB used per 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.

Assignment of RAID Groups and LUNs

The 80 RAID Group Assignments are RAID10(4+4) sets, each divided into 18 Logical Volumes, for a total of 1440 LVs.

The RAID Group assignments to drives in the array are illustrated by the following chart.



The RAID Groups and LUN assignments are set up through a series of actions on the GUI Management Interface (ETERNUSmgr). The task of setting up the configuration for each customer is provided as part of the base system price by Fujitsu. Different techniques are applied, depending upon the needs of the customer. This configuration reflects the customary techniques that are applied when a high performance requirement dominates the customer environment. Other techniques are applied when the primary requirement is for maximum capacity. In the case of high performance, it is customary to define RAID Groups arranged in RAID10 configurations. In this configuration, all of the RAID Groups are 4+4 arrangements. Please see Appendix C: Tested Storage Configuration (TSC) Creation for further details on preparing the configuration.

There are Sixteen (16) of the drives reserved exclusively for system use, and Sixteen (16) Hot Spare drives have been included in the configuration. There are three hundred forty eight (348) empty drive slots in this configuration, as well.

The 1440 Logical Volumes are grouped into thirty-two separate sets of LUNs, using Host Affinity grouping, each with 45 LUNs. These are connected to the two logical host servers through the 64 CA ports and directly connected HBA ports, with each LUN seen on two ports – one for each logical host. The LUNs, seen through the sixty four HBAs by Solaris, are grouped into Solaris Volume Groups, and used with 8 MB stripe unit depths across the sets. Eight Logical Volumes, each with 80 LUNs are used for ASU1 and another eight for ASU2, while two Volumes, also each with 80 LUNs are used for ASU3. The sizes are reflected in the ASU Logical Volume Mapping chart.

Two optional facilities in the ETERNUS8000 (GRPM and Trace), which are used for collection information during operation, were turned off during this benchmark run. They are normally not enabled during operations. Two secondary enhanced reliability features (Patrol and sampled Read after Write compare), which may be optionally enabled by a customer, were turned off during this benchmark run. The optional encryption feature was turned off during this benchmark, as well. Due to the transaction nature of the workload, as is customary for such workloads, the write sequential feature was turned off. In addition, the cache prefetch level was limited to four.

SPC-1 BENCHMARK EXECUTION RESULTS

This portion of the Full Disclosure Report documents the results of the various SPC-1 Tests, Test Phases, and Test Runs. "SPC-1 Test Execution Definitions" on page 58 contains definitions of terms specific to the SPC-1 Tests, Test Phases, and Test Runs.

Clause 5.4.3

The Tests must be executed in the following sequence: Primary Metrics, Repeatability, and Data Persistence. That required sequence must be uninterrupted from the start of Primary Metrics to the completion of Persistence Test Run 1. Uninterrupted means the Benchmark Configuration shall not be power cycled, restarted, disturbed, altered, or adjusted during the above measurement sequence. If the required sequence is interrupted other than for the Host System/TSC power cycle between the two Persistence Test Runs, the measurement is invalid.

SPC-1 Tests, Test Phases, and Test Runs

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

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

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

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

Primary Metrics Test – Sustainability Test Phase

Clause 5.4.4.1.1

The Sustainability Test Phase has exactly one Test Run and shall demonstrate the maximum sustainable I/O Request Throughput within at least a continuous three (3) hour Measurement Interval. This Test Phase also serves to insure that the TSC has reached Steady State prior to reporting the final maximum I/O Request Throughput result (SPC-1 IOPS™).

Clause 5.4.4.1.2

The computed I/O Request Throughput of the Sustainability Test must be within 5% of the reported SPC-1 IOPS™ result.

Clause 5.4.4.1.4

The Average Response Time, as defined in Clause 5.1.1, will be computed and reported for the Sustainability Test Run and cannot exceed 30 milliseconds. If the Average Response time exceeds that 30-milliseconds constraint, the measurement is invalid.

Clause 9.2.4.7.1

For the Sustainability Test Phase the FDR shall contain:

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

SPC-1 Workload Generator Input Parameters

The SPC-1 Workload Generator input parameters for the Sustainability, IOPS, Response Time Ramp, Repeatability, and Persistence Test Runs are documented in "Appendix E: SPC-1 Workload Generator Input Parameters" on Page 170.

Sustainability Test Results File

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

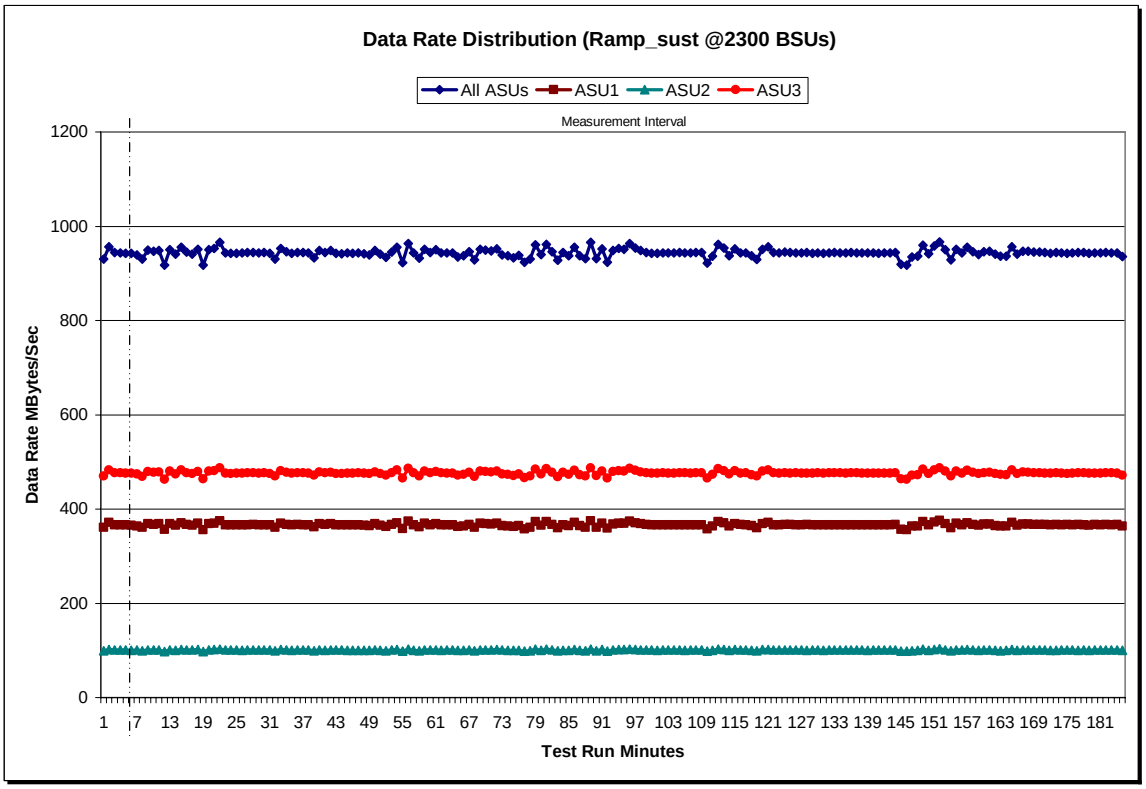
Sustainability Test Results File

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

	Start	Stop	Interval	Duration
Ramp-Up/Start-Up	9:21:10	9:26:10	0-4	0:05:00
Measurement Interval	9:26:10	12:26:10	5-184	3:00:00

Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3
0	930.57	361.11	99.12	470.33	63	943.16	366.51	100.93	475.72	126	943.02	366.18	100.75	476.09
1	956.61	371.70	102.01	482.91	64	934.72	362.43	100.15	472.14	127	944.07	367.22	100.64	476.22
2	944.70	366.71	100.93	477.06	65	937.39	364.01	100.05	473.33	128	942.95	366.50	100.81	475.64
3	943.65	366.00	100.86	476.79	66	945.87	367.59	100.91	477.38	129	943.84	366.46	100.86	476.52
4	942.88	366.23	100.68	475.97	67	929.15	361.18	99.26	468.70	130	942.66	366.42	100.62	475.62
5	942.13	365.59	100.52	476.02	68	951.48	369.61	101.33	480.54	131	943.75	366.16	100.75	476.84
6	939.10	364.14	100.74	474.22	69	949.32	368.72	101.36	479.23	132	944.06	366.55	100.88	476.63
7	930.26	361.39	99.37	469.51	70	947.94	368.16	101.38	478.40	133	943.78	366.43	100.70	476.65
8	949.06	368.61	101.11	479.34	71	951.92	369.98	101.93	480.01	134	943.14	366.27	100.79	476.08
9	946.79	367.54	101.34	477.90	72	939.45	364.49	100.74	474.22	135	944.41	366.34	100.76	477.31
10	948.23	368.77	101.27	478.19	73	937.60	363.91	100.08	473.61	136	943.78	366.32	100.76	476.70
11	917.42	356.40	97.64	463.38	74	933.32	362.56	99.80	470.97	137	943.20	366.01	100.74	476.45
12	950.00	368.96	101.02	480.02	75	938.57	364.20	100.36	474.02	138	943.15	366.69	100.51	475.95
13	940.60	365.27	100.62	474.72	76	923.23	357.97	98.86	466.40	139	943.50	366.47	100.82	476.20
14	955.32	370.61	102.13	482.58	77	930.47	360.88	99.20	470.38	140	942.85	366.33	100.81	475.70
15	944.97	366.80	101.27	476.90	78	960.30	373.07	102.76	484.47	141	942.98	366.67	100.72	475.59
16	941.24	365.45	100.86	474.93	79	940.28	365.23	100.51	474.54	142	943.56	366.67	100.78	476.11
17	951.04	369.51	101.66	479.86	80	961.40	373.00	102.45	485.95	143	944.44	366.85	100.78	476.82
18	917.53	355.91	97.89	463.74	81	946.22	367.46	100.98	477.77	144	918.94	356.92	98.15	463.87
19	950.47	368.89	101.28	480.31	82	927.60	360.32	99.03	468.25	145	917.32	356.23	98.28	462.81
20	952.62	369.94	101.55	481.12	83	944.34	366.09	100.51	477.74	146	934.43	363.31	99.62	471.50
21	965.67	375.29	102.93	487.45	84	937.75	364.15	100.32	473.27	147	936.25	363.88	100.12	472.24
22	943.02	366.39	100.73	475.90	85	955.67	371.38	102.06	482.23	148	959.76	373.07	102.40	484.29
23	942.63	366.59	100.88	475.16	86	937.28	364.39	100.12	472.77	149	941.81	366.09	100.63	475.10
24	942.67	366.20	100.69	475.77	87	930.95	361.50	99.25	470.20	150	958.11	372.53	102.29	483.29
25	943.49	366.57	100.52	476.40	88	965.47	375.16	102.95	487.35	151	966.65	375.67	103.57	487.41
26	944.21	366.71	100.71	476.79	89	931.61	361.33	99.44	470.83	152	950.52	369.15	101.32	480.05
27	944.33	366.90	100.80	476.64	90	951.84	369.51	101.72	480.61	153	928.74	360.08	99.00	469.66
28	943.38	366.31	100.86	476.21	91	923.90	359.11	98.91	465.89	154	950.81	369.41	101.47	479.93
29	944.29	366.56	100.66	477.07	92	949.03	368.31	101.49	479.22	155	943.31	366.24	100.70	476.37
30	942.42	366.11	100.81	475.50	93	952.97	369.91	102.02	481.03	156	955.35	370.65	102.27	482.43
31	930.71	361.41	99.63	469.66	94	951.47	369.53	101.75	480.19	157	945.92	367.28	101.21	477.42
32	953.00	369.99	101.83	481.17	95	962.85	373.76	102.66	486.43	158	940.30	365.16	100.35	474.80
33	946.30	367.24	101.18	477.88	96	954.08	370.27	101.86	481.95	159	946.26	367.89	101.36	477.02
34	942.87	366.15	100.64	476.07	97	948.26	368.51	101.15	478.60	160	946.59	367.70	101.26	477.63
35	944.61	366.81	101.00	476.80	98	944.24	366.78	100.69	476.77	161	940.47	364.81	100.51	475.15
36	944.38	366.50	100.95	476.93	99	942.51	366.11	100.67	475.73	162	936.92	363.64	99.76	473.52
37	943.07	366.41	100.69	475.97	100	942.74	366.52	100.37	475.84	163	936.86	363.84	100.29	472.73
38	932.92	362.12	99.46	471.34	101	943.77	366.31	100.79	476.67	164	956.53	371.48	102.37	482.68
39	948.36	368.52	101.24	478.60	102	943.12	366.31	100.77	476.04	165	940.91	365.66	100.44	474.81
40	944.37	366.92	100.61	476.83	103	943.45	366.54	100.70	476.21	166	947.30	367.85	101.12	478.33
41	948.21	368.63	101.39	478.19	104	944.25	366.73	100.70	476.81	167	946.60	367.86	100.87	477.87
42	942.77	366.68	100.96	475.14	105	943.17	365.92	100.57	476.68	168	944.78	367.07	101.15	476.56
43	941.80	365.94	100.75	475.11	106	943.08	366.16	100.87	476.05	169	944.76	366.97	101.21	476.59
44	943.52	366.72	100.53	476.27	107	944.12	366.53	100.66	476.92	170	943.87	366.96	100.65	476.27
45	942.87	366.22	100.56	476.09	108	944.19	366.58	100.81	476.80	171	942.35	366.32	100.39	475.64
46	943.11	366.11	100.35	476.65	109	922.14	358.08	98.67	465.40	172	944.08	366.75	100.48	476.86
47	941.50	365.23	100.39	475.88	110	936.58	363.32	100.17	473.09	173	943.68	366.40	100.90	476.39
48	939.10	364.38	99.96	474.77	111	961.33	373.17	102.67	485.49	174	942.98	366.91	100.66	475.41
49	948.81	368.79	101.50	478.52	112	953.86	370.47	101.91	481.48	175	943.20	366.47	100.90	475.83
50	941.01	365.25	100.41	475.35	113	937.24	363.50	99.80	473.94	176	944.02	366.77	100.59	476.66
51	933.59	362.67	99.36	471.56	114	951.87	369.03	101.97	480.86	177	944.14	366.42	101.07	476.66
52	945.55	367.34	101.03	477.19	115	943.62	366.80	100.76	476.06	178	942.70	365.84	100.64	476.22
53	955.79	370.61	102.18	483.00	116	943.50	365.93	100.73	476.83	179	943.21	366.76	100.66	475.79
54	922.64	358.21	98.36	466.08	117	937.64	364.22	100.45	472.97	180	943.70	366.56	100.82	476.32
55	963.67	374.33	102.75	486.59	118	929.73	360.49	99.35	469.89	181	944.35	366.92	100.73	476.69
56	943.64	366.38	100.64	476.62	119	950.97	369.25	101.58	480.14	182	943.67	366.34	100.75	476.58
57	932.04	362.15	99.54	470.36	120	956.44	371.34	102.26	482.83	183	943.81	367.04	100.67	476.10
58	951.47	369.58	101.47	480.42	121	944.06	366.69	100.84	476.54	184	935.84	363.76	100.15	471.93
59	944.42	366.25	101.06	477.11	122	943.06	366.33	100.77	475.97					
60	950.00	368.60	101.49	479.91	123	944.72	366.97	101.11	476.64					
61	943.37	366.15	100.56	476.67	124	944.33	366.84	101.37	476.12					
62	943.03	366.27	100.76	476.00	125	943.56	365.92	100.86	476.78					

Sustainability – Data Rate Distribution Graph

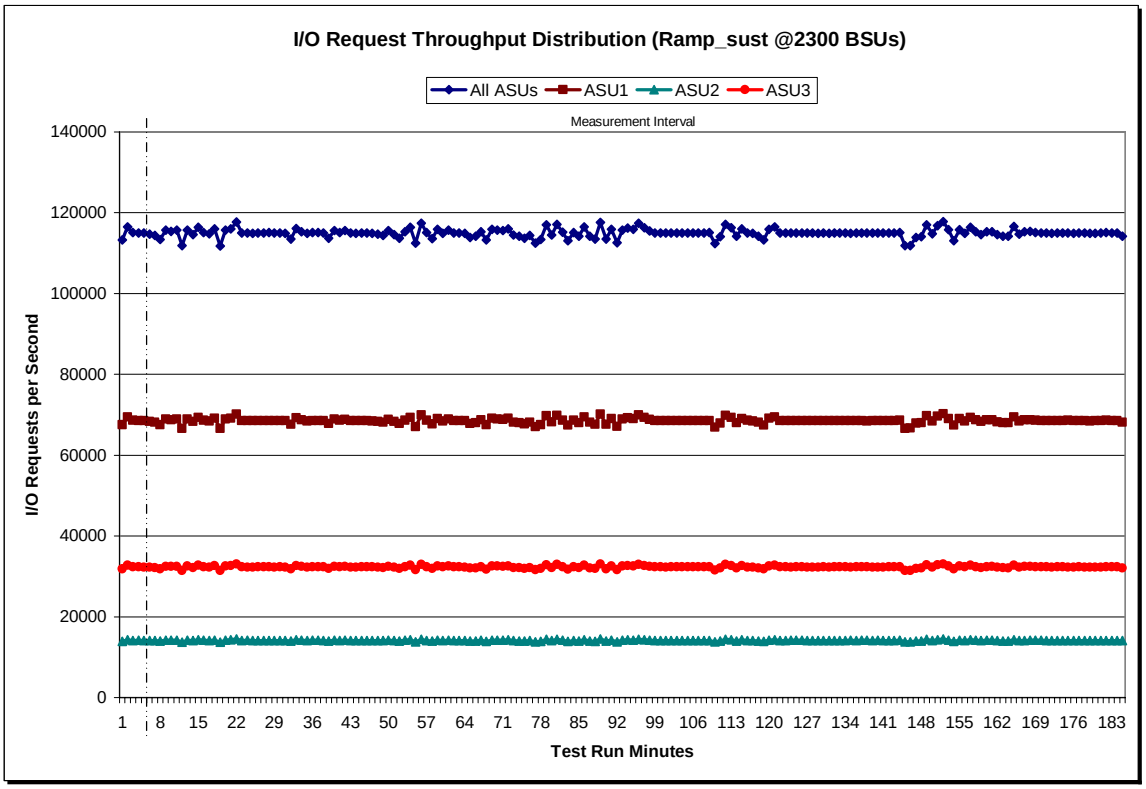


Sustainability – I/O Request Throughput Distribution Data

	Start	Stop	Interval	Duration
Ramp-Up/Start-Up	9:21:10	9:26:10	0-4	0:05:00
Measurement Interval	9:26:10	12:26:10	5-184	3:00:00

Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3
0	113,293.57	67,523.50	13,932.17	31,837.90	63	114,934.62	68,500.85	14,155.07	32,278.70	126	114,994.62	68,567.72	14,147.60	32,279.30
1	116,500.00	69,436.80	14,343.52	32,719.68	64	113,904.20	67,868.97	14,025.53	32,009.70	127	114,978.98	68,550.72	14,137.17	32,291.10
2	115,112.03	68,604.07	14,158.18	32,349.78	65	114,168.95	68,056.33	14,026.25	32,086.37	128	114,951.28	68,547.07	14,141.48	32,262.73
3	115,016.82	68,526.03	14,170.13	32,320.65	66	115,317.25	68,762.65	14,170.65	32,383.95	129	115,028.23	68,553.22	14,150.57	32,324.45
4	114,988.43	68,540.90	14,146.87	32,300.67	67	113,299.22	67,551.88	13,952.33	31,795.00	130	114,943.62	68,535.18	14,134.08	32,274.35
5	114,699.32	68,334.50	14,119.95	32,244.87	68	115,884.20	69,094.35	14,225.07	32,564.78	131	114,971.70	68,503.05	14,148.25	32,320.40
6	114,352.22	68,116.25	14,086.88	32,149.08	69	115,721.60	68,962.38	14,237.48	32,521.73	132	115,021.37	68,542.77	14,150.52	32,328.08
7	113,350.73	67,546.93	13,962.18	31,841.62	70	115,568.28	68,866.47	14,225.32	32,476.50	133	115,028.93	68,514.22	14,159.77	32,354.95
8	115,664.00	68,919.73	14,241.45	32,502.82	71	116,014.27	69,169.05	14,274.12	32,571.10	134	114,944.55	68,510.33	14,164.50	32,269.72
9	115,356.65	68,758.60	14,179.53	32,418.52	72	114,468.10	68,180.50	14,121.98	32,165.62	135	115,039.03	68,556.18	14,134.17	32,348.68
10	115,692.12	68,981.37	14,221.12	32,489.63	73	114,188.75	68,035.37	14,047.25	32,106.13	136	115,032.60	68,536.65	14,168.85	32,327.10
11	111,853.58	66,672.37	13,735.48	31,445.73	74	113,716.05	67,766.88	14,006.83	31,942.33	137	114,962.73	68,470.22	14,186.03	32,306.48
12	115,743.60	68,989.95	14,230.62	32,523.03	75	114,350.87	68,134.25	14,073.12	32,143.50	138	115,007.18	68,575.58	14,131.98	32,299.62
13	114,587.42	68,308.40	14,097.52	32,181.50	76	112,458.18	66,992.27	13,852.73	31,613.18	139	115,010.85	68,552.68	14,163.57	32,294.60
14	116,401.30	69,378.13	14,307.80	32,715.37	77	113,418.10	67,577.67	13,926.93	31,913.50	140	114,972.20	68,523.38	14,151.23	32,297.58
15	115,134.58	68,609.45	14,174.07	32,351.07	78	117,010.52	69,724.03	14,399.72	32,886.77	141	115,000.62	68,547.35	14,138.32	32,314.95
16	114,836.77	68,429.10	14,137.67	32,270.00	79	114,512.72	68,244.15	14,100.23	32,168.33	142	115,015.32	68,551.05	14,142.88	32,321.38
17	116,032.40	69,165.60	14,259.60	32,607.20	80	117,127.20	69,814.33	14,383.05	32,929.82	143	115,102.08	68,612.78	14,164.10	32,325.20
18	111,730.25	66,586.62	13,743.42	31,400.22	81	115,196.17	68,637.28	14,166.93	32,391.95	144	111,868.82	66,670.03	13,772.47	31,426.32
19	115,744.43	68,970.73	14,232.30	32,541.40	82	113,074.98	67,426.10	13,909.27	31,739.62	145	111,880.13	66,698.80	13,763.45	31,417.88
20	116,049.22	69,156.85	14,276.20	32,616.17	83	115,130.95	68,594.33	14,155.00	32,381.62	146	113,894.20	67,899.87	13,993.92	32,000.42
21	117,722.78	70,160.90	14,484.67	33,077.22	84	114,214.97	68,056.72	14,054.83	32,103.42	147	114,125.05	68,037.02	14,036.82	32,051.22
22	114,996.25	68,537.40	14,125.08	32,333.77	85	116,490.73	69,452.15	14,304.58	32,734.00	148	116,985.30	69,718.08	14,376.38	32,890.83
23	115,013.78	68,561.90	14,172.72	32,279.17	86	114,220.60	68,088.72	14,053.63	32,078.25	149	114,800.43	68,461.75	14,097.68	32,241.00
24	114,949.27	68,507.82	14,156.48	32,284.97	87	113,503.97	67,648.52	13,945.68	31,909.77	150	116,792.80	69,632.03	14,349.25	32,811.52
25	114,973.00	68,510.05	14,140.98	32,321.97	88	117,671.98	70,133.42	14,473.62	33,064.95	151	117,818.12	70,216.53	14,525.98	33,075.60
26	115,047.02	68,580.73	14,137.13	32,329.15	89	113,446.23	67,583.85	13,964.57	31,897.82	152	115,840.25	69,034.43	14,235.77	32,570.05
27	115,084.93	68,581.00	14,146.70	32,357.23	90	115,888.35	69,050.68	14,251.03	32,586.63	153	113,118.33	67,388.62	13,910.22	31,819.50
28	114,992.13	68,538.47	14,151.23	32,302.43	91	112,612.08	67,138.08	13,843.82	31,630.18	154	115,848.23	69,069.65	14,243.07	32,535.52
29	115,026.48	68,553.87	14,124.58	32,348.03	92	115,726.57	68,976.88	14,234.87	32,514.82	155	114,891.95	68,440.62	14,144.77	32,306.57
30	114,918.57	68,498.55	14,135.23	32,284.78	93	116,194.85	69,235.50	14,302.90	32,656.45	156	116,420.67	69,344.95	14,361.72	32,714.00
31	113,487.25	67,627.90	13,968.25	31,891.10	94	115,922.52	69,087.30	14,258.68	32,576.53	157	115,287.60	68,712.68	14,182.45	32,392.47
32	116,102.22	69,196.60	14,289.92	32,615.70	95	117,407.57	69,993.25	14,435.77	32,978.55	158	114,637.80	68,324.90	14,112.55	32,200.35
33	115,354.00	68,732.33	14,199.73	32,421.93	96	116,284.72	69,307.30	14,304.98	32,672.43	159	115,320.97	68,752.33	14,196.20	32,372.43
34	114,905.97	68,454.73	14,152.67	32,298.57	97	115,557.13	68,886.18	14,199.80	32,471.15	160	115,341.65	68,733.90	14,194.57	32,413.18
35	115,083.63	68,569.48	14,169.43	32,344.72	98	114,991.92	68,531.95	14,150.03	32,309.93	161	114,603.52	68,265.82	14,096.45	32,241.25
36	115,066.23	68,572.40	14,170.07	32,323.77	99	114,964.63	68,501.68	14,145.10	32,317.85	162	114,174.97	68,020.98	14,047.58	32,106.40
37	114,971.98	68,520.80	14,135.92	32,315.27	100	114,959.63	68,529.47	14,133.45	32,296.72	163	114,156.52	68,057.95	14,036.67	32,061.90
38	113,740.82	67,786.23	13,991.55	31,963.03	101	115,005.20	68,540.70	14,150.37	32,314.13	164	116,600.10	69,481.17	14,354.83	32,764.10
39	115,599.15	68,919.25	14,221.32	32,458.58	102	115,023.15	68,557.03	14,130.87	32,335.25	165	114,713.50	68,404.40	14,066.50	32,242.60
40	115,103.45	68,596.45	14,141.60	32,365.40	103	114,993.88	68,549.57	14,121.75	32,322.57	166	115,311.47	68,734.60	14,159.68	32,417.18
41	115,573.78	68,870.35	14,218.02	32,485.42	104	115,014.50	68,572.07	14,118.65	32,323.78	167	115,359.70	68,754.17	14,164.85	32,440.68
42	114,998.00	68,576.18	14,142.37	32,279.45	105	114,969.58	68,497.05	14,133.05	32,339.48	168	115,143.43	68,632.80	14,177.05	32,333.58
43	114,927.53	68,500.47	14,143.42	32,283.65	106	114,973.25	68,526.82	14,141.07	32,305.37	169	115,032.82	68,532.60	14,165.60	32,334.62
44	115,006.13	68,553.40	14,143.32	32,309.42	107	115,024.67	68,545.62	14,148.55	32,330.50	170	115,005.85	68,536.87	14,148.70	32,320.28
45	114,981.37	68,516.17	14,125.13	32,340.07	108	115,060.40	68,576.62	14,145.20	32,338.58	171	114,946.98	68,510.48	14,155.37	32,281.13
46	114,934.05	68,467.13	14,123.75	32,343.17	109	112,362.27	66,953.45	13,842.60	31,566.22	172	115,041.02	68,554.97	14,145.47	32,340.58
47	114,655.82	68,310.10	14,092.60	32,253.12	110	114,110.75	67,978.27	14,056.18	32,076.30	173	115,008.27	68,548.53	14,142.62	32,317.12
48	114,398.42	68,144.40	14,066.63	32,187.38	111	117,150.75	69,811.17	14,410.93	32,928.65	174	115,002.73	68,598.98	14,131.33	32,272.42
49	115,605.77	68,882.15	14,227.98	32,495.63	112	116,363.18	69,349.98	14,322.43	32,690.77	175	114,934.98	68,516.97	14,138.95	32,279.07
50	114,614.70	68,310.08	14,094.88	32,209.73	113	114,179.88	68,060.93	14,018.88	32,100.07	176	115,050.00	68,588.53	14,154.07	32,307.40
51	113,728.77	67,798.18	13,966.42	31,964.17	114	116,007.53	69,068.33	14,307.50	32,631.70	177	114,966.87	68,517.15	14,147.57	32,302.15
52	115,266.08	68,674.92	14,191.75	32,399.42	115	115,046.97	68,593.32	14,154.85	32,298.80	178	114,913.25	68,486.43	14,129.03	32,297.78
53	116,443.07	69,369.85	14,321.08	32,752.13	116	114,898.28	68,458.02	14,154.43	32,285.83	179	114,946.50	68,553.92	14,120.17	32,272.42
54	112,442.17	66,987.58	13,816.47	31,638.12	117	114,235.58	68,100.12	14,057.27	32,078.20	180	115,022.23	68,576.13	14,144.58	32,301.52
55	117,413.15	69,965.18	14,450.82	32,997.15	118	113,281.93	67,467.43	13,954.37	31,860.13	181	115,117.60	68,621.33	14,153.15	32,343.12
56	115,136.75	68,624.42	14,155.82	32,356.52	119	115,879.43	69,098.67	14,232.68	32,548.08	182	115,028.75	68,530.30	14,153.18	32,345.27
57	113,639.32	67,742.00	13,985.98	31,911.33	120	116,550.27	69,493.70	14,343.88	32,712.68	183	115,018.38	68,550.35	14,141.52	32,326.52
58	115,887.05	69,072.75	14,255.40	32,558.90	121	115,000.67	68,536.10	14,153.80	32,310.77	184	114,238.85	68,088.18	14,085.25	32,065.42
59	114,948.17	68,470.98	14,156.97	32,320.22	122	115,001.48	68,534.68	14,141.30	32,325.50	Average	114,992.37	68,533.55	14,145.61	32,313.21
60	115,736.23	68,959.37	14,246.77	32,530.10	123	115,043.73	68,578.70	14,165.65	32,299.38					
61	114,982.88	68,549.05	14,128.53	32,305.30	124	115,035.38	68,541.82	14,173.97	32,319.60					
62	114,963.53	68,519.25	14,124.42	32,319.87	125	115,022.93	68,541.63	14,165.35	32,315.95					

Sustainability – I/O Request Throughput Distribution Graph

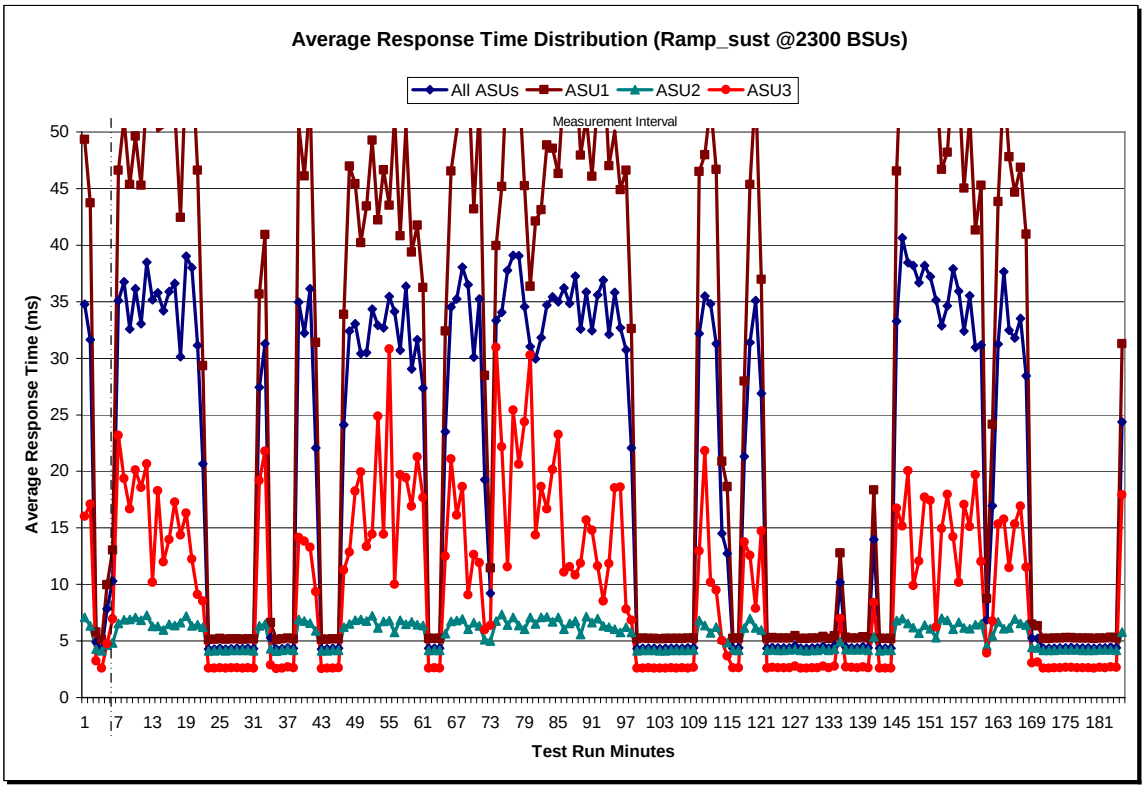


Sustainability – Average Response Time (ms) Distribution Data

	Start	Stop	Interval	Duration
Ramp-Up/Start-Up	9:21:10	9:26:10	0-4	0:05:00
Measurement Interval	9:26:10	12:26:10	5-184	3:00:00

Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3
0	34.78	49.35	7.11	16.02	63	4.34	5.20	4.16	2.59	126	4.57	5.48	4.26	2.76
1	31.65	43.73	6.33	17.10	64	23.51	32.41	5.63	12.48	127	4.36	5.23	4.18	2.60
2	4.89	5.79	4.30	3.23	65	34.51	46.56	6.74	21.09	128	4.35	5.21	4.15	2.60
3	4.30	5.13	4.16	2.60	66	35.24	50.11	6.80	16.11	129	4.38	5.25	4.18	2.62
4	7.85	9.97	4.64	4.75	67	38.04	53.59	6.93	18.66	130	4.38	5.24	4.19	2.63
5	10.30	13.02	4.82	6.95	68	36.51	55.73	6.03	9.06	131	4.52	5.40	4.28	2.76
6	35.09	46.61	6.55	23.17	69	30.10	43.19	6.61	12.63	132	4.37	5.23	4.19	2.61
7	36.76	51.14	6.86	19.37	70	35.24	52.21	6.33	11.92	133	4.57	5.47	4.30	2.78
8	32.56	45.36	6.90	16.67	71	19.27	28.46	5.12	5.97	134	10.17	12.77	4.92	6.97
9	36.13	49.66	7.08	20.13	72	9.21	11.43	5.01	6.36	135	4.45	5.32	4.24	2.69
10	33.05	45.28	6.82	18.57	73	33.34	39.94	6.78	30.97	136	4.40	5.26	4.22	2.65
11	38.48	53.31	7.26	20.67	74	34.06	45.18	7.34	22.18	137	4.39	5.25	4.19	2.63
12	35.19	52.92	6.31	10.20	75	37.76	56.61	6.40	11.54	138	4.49	5.37	4.25	2.71
13	35.78	50.11	6.30	18.27	76	39.11	52.19	7.11	25.40	139	4.38	5.25	4.19	2.62
14	34.19	50.48	5.98	11.99	77	39.07	54.52	6.39	20.61	140	13.96	18.36	5.36	8.40
15	35.88	52.29	6.48	13.97	78	34.55	45.24	6.06	24.36	141	4.35	5.22	4.15	2.60
16	36.61	51.97	6.39	17.28	79	31.04	36.35	7.09	30.27	142	4.35	5.22	4.16	2.60
17	30.15	42.43	6.64	14.37	80	29.94	42.13	6.50	14.35	143	4.36	5.23	4.19	2.60
18	39.03	56.32	7.20	16.30	81	31.82	43.14	7.10	18.65	144	33.27	46.53	6.81	16.74
19	38.00	56.69	6.34	12.24	82	34.68	48.84	7.14	16.67	145	40.63	59.59	6.98	15.14
20	31.14	46.63	6.44	9.10	83	35.42	48.55	6.70	20.17	146	38.46	53.70	6.54	20.07
21	20.65	29.34	6.22	8.54	84	35.01	46.31	7.11	23.25	147	38.19	58.13	6.18	9.89
22	4.29	5.12	4.13	2.58	85	36.23	54.29	6.05	11.09	148	36.67	54.67	5.70	12.06
23	4.30	5.13	4.14	2.59	86	34.85	51.67	6.56	11.55	149	38.21	54.41	6.41	17.70
24	4.36	5.21	4.18	2.64	87	37.24	55.98	6.76	10.83	150	37.21	52.95	6.08	17.42
25	4.30	5.14	4.14	2.58	88	32.59	47.94	5.56	11.86	151	35.13	54.92	5.28	6.22
26	4.33	5.17	4.18	2.62	89	35.85	51.30	7.15	15.69	152	32.88	46.69	7.02	14.93
27	4.34	5.19	4.19	2.63	90	32.44	46.08	6.64	14.80	153	34.61	48.21	6.84	17.97
28	4.32	5.16	4.16	2.59	91	35.60	52.79	6.99	11.64	154	37.89	55.61	6.05	14.22
29	4.34	5.19	4.18	2.61	92	36.90	56.57	6.35	8.53	155	35.93	54.12	6.67	10.20
30	4.32	5.17	4.15	2.59	93	32.11	47.02	6.24	11.83	156	32.38	45.03	6.17	17.07
31	27.44	35.68	6.35	19.19	94	35.80	50.09	6.06	18.53	157	35.54	51.25	6.07	15.12
32	31.30	40.92	6.48	21.76	95	32.70	44.90	5.75	18.62	158	30.95	41.33	6.45	19.68
33	5.29	6.63	4.33	2.87	96	30.74	46.61	6.22	7.80	159	31.18	45.29	6.52	12.03
34	4.29	5.13	4.12	2.57	97	22.07	32.61	5.75	6.86	160	6.89	8.75	4.58	3.94
35	4.33	5.18	4.16	2.61	98	4.33	5.20	4.15	2.58	161	16.95	24.14	5.42	6.78
36	4.41	5.25	4.23	2.69	99	4.36	5.24	4.18	2.59	162	31.25	43.84	6.69	15.34
37	4.35	5.19	4.18	2.63	100	4.37	5.23	4.19	2.63	163	37.67	54.51	6.08	15.75
38	34.94	50.55	6.90	14.13	101	4.36	5.22	4.18	2.60	164	32.47	47.80	6.16	11.48
39	32.21	46.12	6.75	13.82	102	4.32	5.19	4.14	2.57	165	31.79	44.67	6.94	15.32
40	36.13	53.01	6.60	13.27	103	4.34	5.20	4.15	2.60	166	33.50	46.89	6.55	16.90
41	22.07	31.40	5.90	9.35	104	4.37	5.23	4.19	2.61	167	28.45	40.97	6.40	11.52
42	4.29	5.14	4.13	2.57	105	4.36	5.23	4.18	2.61	168	5.26	6.47	4.41	3.05
43	4.31	5.16	4.15	2.58	106	4.37	5.24	4.18	2.62	169	5.20	6.35	4.39	3.14
44	4.34	5.19	4.17	2.61	107	4.37	5.25	4.18	2.61	170	4.36	5.24	4.18	2.60
45	4.34	5.19	4.18	2.62	108	4.40	5.27	4.21	2.65	171	4.36	5.23	4.18	2.60
46	24.11	33.86	6.22	11.26	109	32.20	46.51	6.80	12.97	172	4.37	5.24	4.18	2.62
47	32.41	46.99	6.50	12.85	110	35.50	47.98	6.36	21.82	173	4.40	5.27	4.20	2.64
48	33.05	45.45	6.83	18.26	111	34.83	52.47	5.71	10.17	174	4.41	5.28	4.20	2.65
49	30.42	40.22	6.90	19.95	112	31.27	46.70	6.24	9.50	175	4.43	5.30	4.22	2.67
50	30.49	43.47	6.75	13.35	113	14.50	20.89	5.17	5.03	176	4.39	5.26	4.21	2.62
51	34.34	49.30	7.25	14.45	114	12.74	18.65	4.86	3.68	177	4.39	5.27	4.19	2.63
52	32.91	42.22	6.15	24.88	115	4.37	5.23	4.18	2.62	178	4.38	5.25	4.18	2.63
53	32.69	46.66	6.74	14.44	116	4.38	5.25	4.19	2.63	179	4.36	5.23	4.16	2.60
54	35.44	43.53	6.81	30.83	117	21.30	27.98	6.16	13.74	180	4.40	5.27	4.20	2.65
55	34.14	51.37	5.76	10.01	118	31.40	45.35	6.98	12.57	181	4.40	5.27	4.21	2.64
56	30.70	40.82	6.84	19.68	119	35.09	53.85	6.16	7.89	182	4.45	5.33	4.22	2.69
57	36.35	50.49	6.47	19.42	120	26.90	36.96	5.96	14.70	183	4.40	5.26	4.19	2.65
58	29.04	39.38	6.69	16.90	121	4.37	5.24	4.17	2.60	184	24.38	31.27	5.78	17.93
59	31.66	41.77	6.46	21.28	122	4.42	5.28	4.22	2.66	Average	20.87	29.13	5.51	10.07
60	27.36	36.26	6.37	17.68	123	4.38	5.25	4.18	2.62					
61	4.35	5.22	4.17	2.60	124	4.37	5.24	4.18	2.62					
62	4.36	5.22	4.19	2.62	125	4.38	5.25	4.19	2.62					

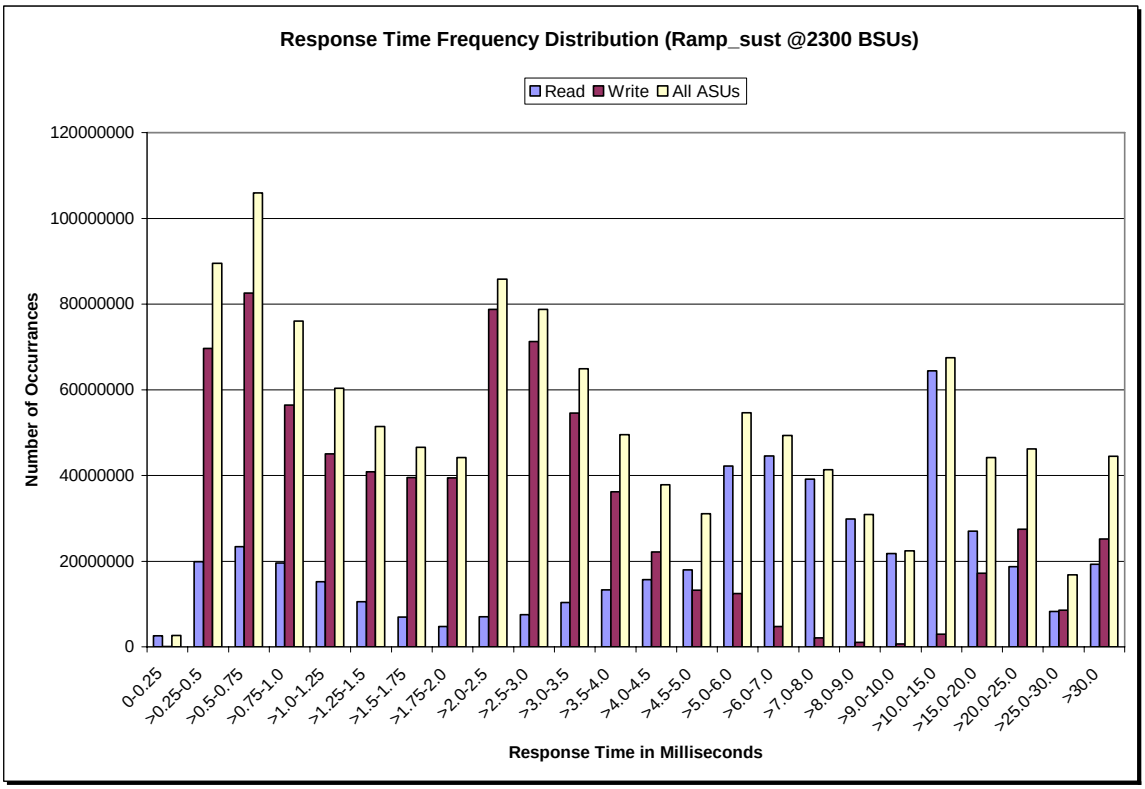
Sustainability – Average Response Time (ms) Distribution Graph



Sustainability – Response Time Frequency Distribution Data

Response Time (ms)	0-0.25	>0.25-0.5	>0.5-0.75	>0.75-1.0	>1.0-1.25	>1.25-1.5	>1.5-1.75	>1.75-2.0
Read	2,547,636	19,894,945	23,338,726	19,542,858	15,220,606	10,558,630	6,975,050	4,773,667
Write	69,790	69,603,674	82,587,756	56,442,788	45,076,224	40,833,036	39,558,258	39,448,746
All ASUs	2,617,426	89,498,619	105,926,482	75,985,646	60,296,830	51,391,666	46,533,308	44,222,413
ASU1	1,941,572	49,615,918	54,804,857	38,083,437	29,828,465	24,718,062	21,801,915	20,350,438
ASU2	651,521	13,457,496	15,506,921	11,253,158	8,839,953	7,097,327	5,943,072	5,255,219
ASU3	24,333	26,425,205	35,614,704	26,649,051	21,628,412	19,576,277	18,788,321	18,616,756
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	7,018,255	7,548,484	10,330,614	13,305,956	15,661,448	17,913,449	42,176,893	44,588,507
Write	78,734,490	71,259,262	54,516,902	36,226,141	22,177,670	13,202,474	12,443,492	4,724,835
All ASUs	85,752,745	78,807,746	64,847,516	49,532,097	37,839,118	31,115,923	54,620,385	49,313,342
ASU1	39,036,316	36,391,384	31,735,386	26,757,407	23,083,353	21,381,691	42,514,534	41,373,277
ASU2	9,474,690	8,237,589	6,563,287	4,945,955	3,806,280	3,211,208	5,929,347	5,570,113
ASU3	37,241,739	34,178,773	26,548,843	17,828,735	10,949,485	6,523,024	6,176,504	2,369,952
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	39,173,571	29,860,879	21,747,412	64,430,827	26,947,664	18,691,118	8,273,120	19,272,660
Write	2,111,982	1,064,414	644,332	2,981,757	17,191,445	27,495,271	8,515,962	25,210,693
All ASUs	41,285,553	30,925,293	22,391,744	67,412,584	44,139,109	46,186,389	16,789,082	44,483,353
ASU1	35,450,145	26,744,927	19,357,032	57,578,193	31,132,390	26,675,843	8,573,894	31,230,252
ASU2	4,793,474	3,675,008	2,734,010	8,508,947	5,792,263	6,912,109	2,878,187	1,735,363
ASU3	1,041,934	505,358	300,702	1,325,444	7,214,456	12,598,437	5,337,001	11,517,738

Sustainability – Response Time Frequency Distribution Graph



Sustainability – Measured Intensity Multiplier and Coefficient of Variation

	ASU1-1	ASU1-2	ASU1-3	ASU1-4	ASU2-1	ASU2-2	ASU2-3	ASU3-1
IM	***0.0350***	***0.2810***	***0.0700***	***0.2100***	***0.0180***	***0.0700***	***0.0350***	***0.2810***
MIM	0.0350	0.1810	0.0700	0.2100	0.0180	0.0700	0.0350	0.2810
COV	0.002	0.001	0.001	0.001	0.003	0.001	0.002	0.001

Clause 3.4.3

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

Clauses 5.1.0 and 5.3.13.2

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

Clause 5.3.13.3

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

Primary Metrics Test – IOPS Test Phase

Clause 5.4.2.2

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

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

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

Clause 9.2.4.7.2

For the IOPS Test Phase the FDR shall contain:

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

SPC-1 Workload Generator Input Parameters

The SPC-1 Workload Generator input parameters for the Sustainability, IOPS, Response Time Ramp, Repeatability, and Persistence Test Runs are documented in "Appendix E: SPC-1 Workload Generator Input Parameters" on Page 170.

IOPS Test Results File

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

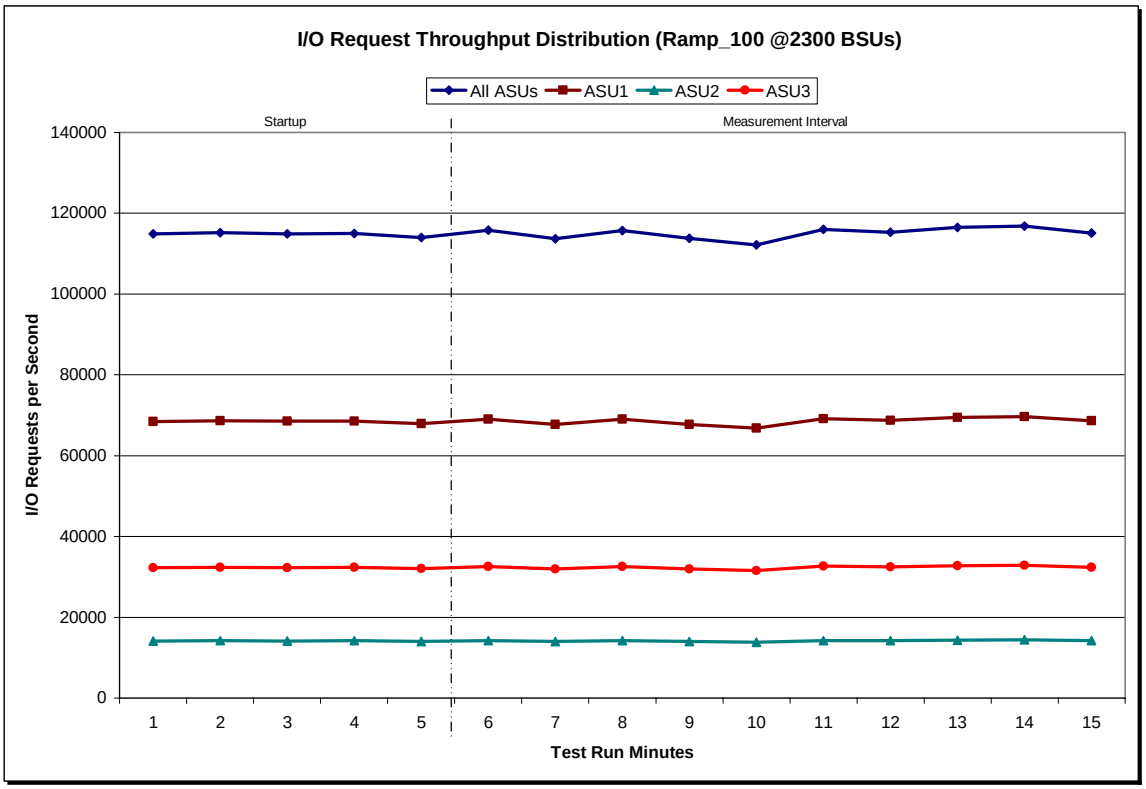
IOPS Test Results File

IOPS Test Run – I/O Request Throughput Distribution Data

2300 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	12:28:12	12:33:13	0-4	0:05:01
Measurement Interval	12:33:13	12:43:13	5-14	0:10:00

60 second intervals	All ASUs	ASU1	ASU2	ASU3
0	114,893.12	68,473.30	14,140.80	32,279.02
1	115,197.93	68,689.48	14,176.83	32,331.62
2	114,951.32	68,546.52	14,124.77	32,280.03
3	115,005.22	68,530.43	14,170.73	32,304.05
4	114,000.70	67,938.45	14,027.35	32,034.90
5	115,769.55	68,998.13	14,251.58	32,519.83
6	113,670.45	67,766.48	13,977.15	31,926.82
7	115,752.88	68,995.65	14,230.70	32,526.53
8	113,771.82	67,782.10	13,989.72	32,000.00
9	112,166.63	66,863.50	13,794.52	31,508.62
10	116,039.87	69,171.68	14,254.90	32,613.28
11	115,322.95	68,729.08	14,181.60	32,412.27
12	116,466.42	69,395.98	14,334.60	32,735.83
13	116,809.23	69,597.72	14,388.43	32,823.08
14	115,130.80	68,619.33	14,167.27	32,344.20
Average	115,090.06	68,591.97	14,157.05	32,341.05

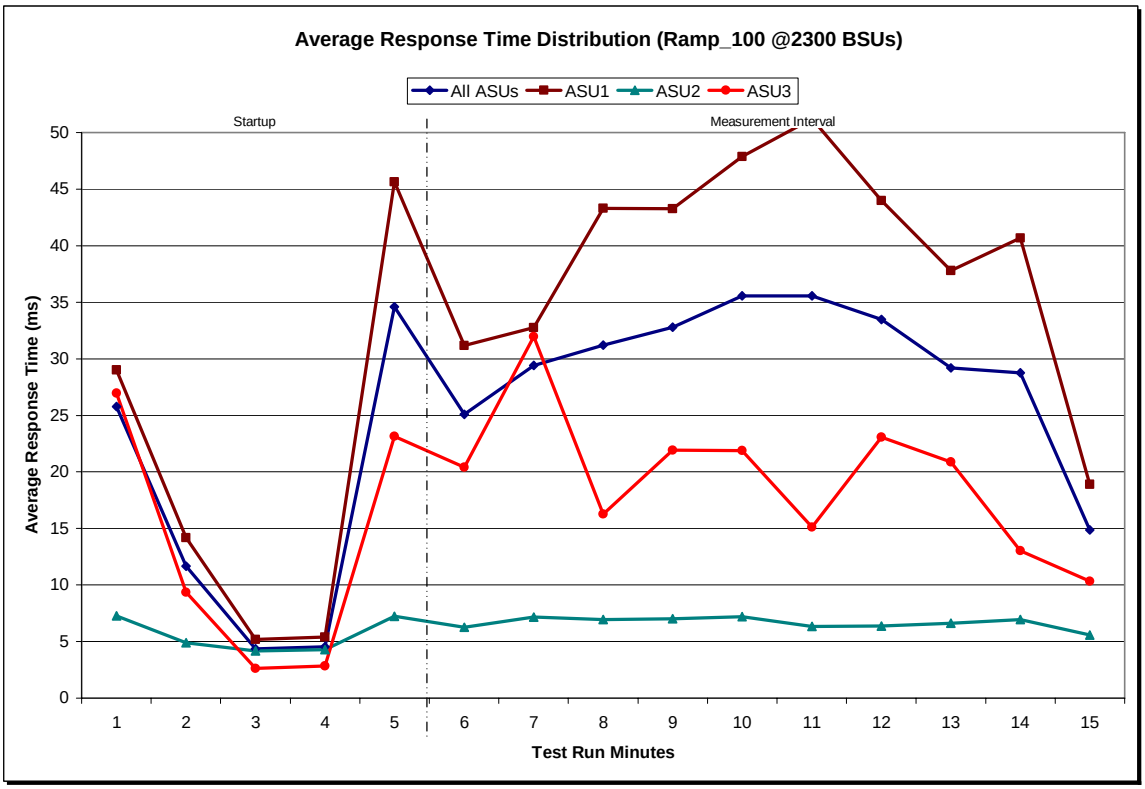
IOPS Test Run – I/O Request Throughput Distribution Graph



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

2300 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	12:28:12	12:33:13	0-4	0:05:01
Measurement Interval	12:33:13	12:43:13	5-14	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	25.76	29.01	7.28	26.96
1	11.68	14.17	4.90	9.36
2	4.35	5.19	4.18	2.64
3	4.55	5.41	4.28	2.84
4	34.59	45.63	7.23	23.14
5	25.08	31.16	6.26	20.43
6	29.40	32.77	7.17	31.97
7	31.23	43.29	6.93	16.25
8	32.81	43.27	7.04	21.91
9	35.58	47.88	7.21	21.90
10	35.57	51.23	6.32	15.13
11	33.49	44.00	6.37	23.08
12	29.20	37.79	6.63	20.88
13	28.77	40.69	6.96	13.04
14	14.86	18.90	5.57	10.35
Average	29.60	39.10	6.64	19.50

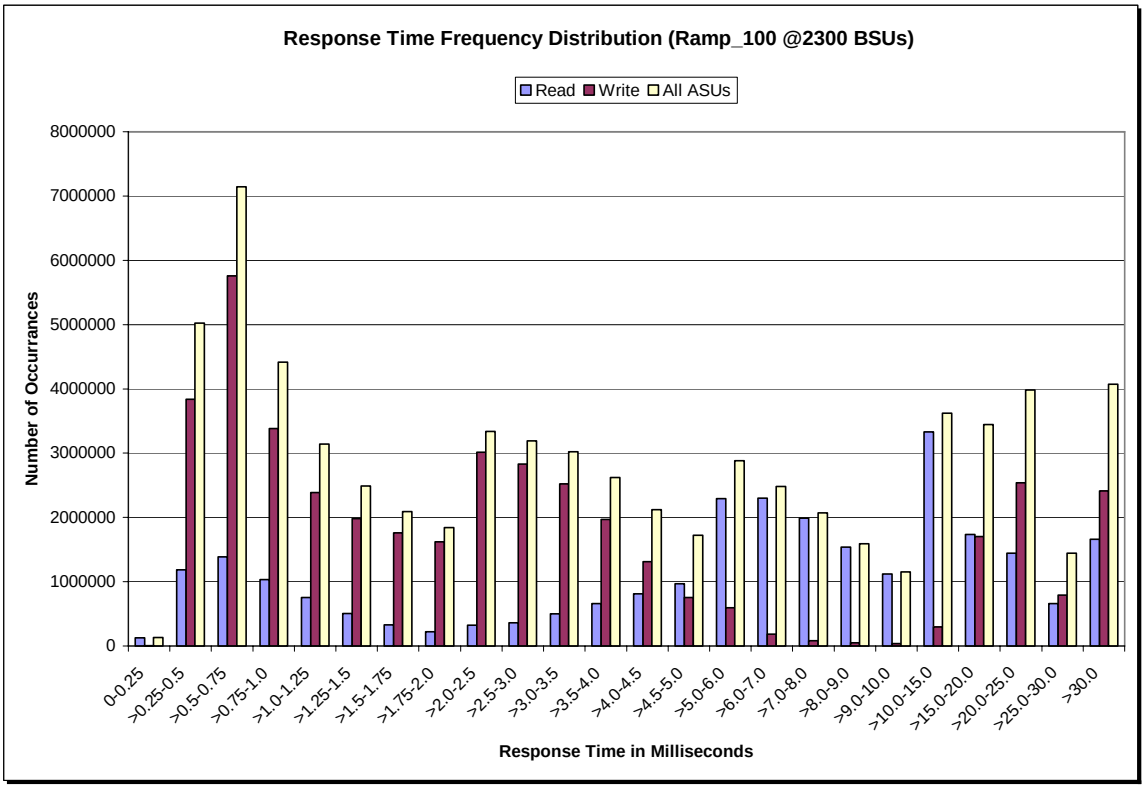
IOPS Test Run – Average Response Time (ms) Distribution Graph



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	128,779	1,185,819	1,387,204	1,029,914	752,666	507,748	330,815	221,045
Write	3,544	3,835,842	5,758,187	3,383,392	2,385,984	1,983,211	1,760,752	1,621,092
All ASUs	132,323	5,021,661	7,145,391	4,413,306	3,138,650	2,490,959	2,091,567	1,842,137
ASU1	100,233	2,847,275	3,670,708	2,152,090	1,514,264	1,166,407	958,877	839,189
ASU2	30,846	756,483	1,011,303	621,280	440,579	332,952	262,198	215,688
ASU3	1,244	1,417,903	2,463,380	1,639,936	1,183,807	991,600	870,492	787,260
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	324,925	361,852	500,683	657,649	811,864	970,359	2,290,759	2,299,044
Write	3,016,315	2,828,896	2,518,746	1,967,146	1,310,003	753,106	592,903	181,236
All ASUs	3,341,240	3,190,748	3,019,429	2,624,795	2,121,867	1,723,465	2,883,662	2,480,280
ASU1	1,530,733	1,507,844	1,504,691	1,408,851	1,262,577	1,165,694	2,251,777	2,090,756
ASU2	364,697	333,346	309,988	268,042	217,806	184,235	335,430	300,263
ASU3	1,445,810	1,349,558	1,204,750	947,902	641,484	373,536	296,455	89,261
Response Time (ms)	**>7.0-8.0**	**>8.0-9.0**	**>9.0-10.0**	**>10.0-15.0**	**>15.0-20.0**	**>20.0-25.0**	**>25.0-30.0**	**>30.0**
Read	1,991,278	1,542,197	1,118,829	3,331,057	1,738,639	1,443,866	656,552	1,656,453
Write	82,565	48,862	36,663	295,150	1,706,367	2,539,427	790,323	2,413,841
All ASUs	2,073,843	1,591,059	1,155,492	3,626,207	3,445,006	3,983,293	1,446,875	4,070,294
ASU1	1,780,500	1,369,984	990,895	3,019,814	2,292,555	2,245,844	717,196	2,766,071
ASU2	253,563	198,192	147,728	475,219	448,617	599,448	246,139	140,125
ASU3	39,780	22,883	16,869	131,174	703,834	1,138,001	483,540	1,164,098

IOPS Test Run –Response Time Frequency 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
69,053,549	64,983,255	4,070,294

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	0.2810	0.0700	0.2100	0.0180	0.0700	0.0350	0.2810
COV	0.002	0.000	0.001	0.001	0.003	0.001	0.002	0.000

Clause 3.4.3

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

Clauses 5.1.0 and 5.3.13.2

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

Clause 5.3.13.3

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

Primary Metrics Test – Response Time Ramp Test Phase

Clause 5.4.2.3

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

The five Response Time Ramp Test Runs, in conjunction with the IOPS Test Run (100%), demonstrate the relationship between Average Response Time and I/O Request Throughput for the Tested Storage Configuration (TSC) as illustrated in the response time/throughput curve on page 12.

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

Clause 9.2.4.7.3

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

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

SPC-1 Workload Generator Input Parameters

The SPC-1 Workload Generator input parameters for the Sustainability, IOPS, Response Time Ramp, Repeatability, and Persistence Test Runs are documented in "Appendix E: SPC-1 Workload Generator Input Parameters" on Page 170.

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 - 2300 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	12:28:12	12:33:13	0-4	0:05:01
Measurement Interval	12:33:13	12:43:13	5-14	0:10:00

(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	114,893.12	68,473.30	14,140.80	32,279.02
1	115,197.93	68,689.48	14,176.83	32,331.62
2	114,951.32	68,546.52	14,124.77	32,280.03
3	115,005.22	68,530.43	14,170.73	32,304.05
4	114,000.70	67,938.45	14,027.35	32,034.90
5	115,769.55	68,998.13	14,251.58	32,519.83
6	113,670.45	67,766.48	13,977.15	31,926.82
7	115,752.88	68,995.65	14,230.70	32,526.53
8	113,771.82	67,782.10	13,989.72	32,000.00
9	112,166.63	66,863.50	13,794.52	31,508.62
10	116,039.87	69,171.68	14,254.90	32,613.28
11	115,322.95	68,729.08	14,181.60	32,412.27
12	116,466.42	69,395.98	14,334.60	32,735.83
13	116,809.23	69,597.72	14,388.43	32,823.08
14	115,130.80	68,619.33	14,167.27	32,344.20
Average	115,090.06	68,591.97	14,157.05	32,341.05

95% Load Level - 2185 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	12:44:43	12:49:44	0-4	0:05:01
Measurement Interval	12:49:44	12:59:44	5-14	0:10:00

(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	109,390.42	65,190.77	13,457.33	30,742.32
1	109,217.53	65,053.98	13,453.65	30,709.90
2	109,267.20	65,135.45	13,430.80	30,700.95
3	109,288.55	65,110.12	13,440.43	30,738.00
4	109,296.72	65,164.47	13,424.17	30,708.08
5	109,284.28	65,117.37	13,445.10	30,721.82
6	109,220.93	65,104.92	13,442.72	30,673.30
7	109,269.27	65,162.93	13,427.42	30,678.92
8	109,260.17	65,144.70	13,425.33	30,690.13
9	109,211.98	65,085.17	13,429.87	30,696.95
10	109,238.42	65,076.38	13,443.52	30,718.52
11	109,259.08	65,097.40	13,462.67	30,699.02
12	109,234.97	65,126.62	13,437.15	30,671.20
13	109,221.62	65,108.88	13,431.60	30,681.13
14	109,262.27	65,124.32	13,432.07	30,705.88
Average	109,246.30	65,114.87	13,437.74	30,693.69

90% Load Level - 2070 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	13:01:13	13:06:14	0-4	0:05:01
Measurement Interval	13:06:14	13:16:14	5-14	0:10:00

(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	103,571.85	61,731.20	12,734.20	29,106.45
1	103,503.73	61,697.35	12,741.00	29,065.38
2	103,479.55	61,662.68	12,745.75	29,071.12
3	103,507.00	61,670.12	12,736.35	29,100.53
4	103,510.20	61,710.48	12,726.33	29,073.38
5	103,490.25	61,684.98	12,746.25	29,059.02
6	103,611.07	61,747.88	12,730.87	29,132.32
7	103,390.05	61,630.35	12,717.85	29,041.85
8	103,495.57	61,664.15	12,735.80	29,095.62
9	103,445.62	61,651.25	12,719.48	29,074.88
10	103,446.85	61,719.77	12,713.62	29,013.47
11	103,464.87	61,696.70	12,738.70	29,029.47
12	103,454.17	61,668.22	12,712.67	29,073.28
13	103,430.25	61,615.08	12,721.93	29,093.23
14	103,540.72	61,739.42	12,729.70	29,071.60
Average	103,476.94	61,681.78	12,726.69	29,068.47

80% Load Level - 1840 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	13:17:34	13:22:35	0-4	0:05:01
Measurement Interval	13:22:35	13:32:35	5-14	0:10:00

(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	92,076.42	54,862.20	11,331.65	25,882.57
1	92,060.37	54,881.52	11,307.13	25,871.72
2	91,994.10	54,803.52	11,320.67	25,869.92
3	92,023.27	54,853.25	11,325.55	25,844.47
4	91,988.22	54,798.78	11,322.17	25,867.27
5	92,024.12	54,857.70	11,311.07	25,855.35
6	91,959.57	54,813.93	11,278.83	25,866.80
7	91,987.88	54,840.72	11,323.35	25,823.82
8	91,976.67	54,829.03	11,291.33	25,856.30
9	91,964.12	54,811.10	11,292.17	25,860.85
10	91,965.45	54,792.33	11,305.82	25,867.30
11	91,995.32	54,859.20	11,298.22	25,837.90
12	91,946.18	54,783.07	11,308.10	25,855.02
13	91,961.63	54,799.73	11,295.32	25,866.58
14	91,949.68	54,794.02	11,313.83	25,841.83
Average	91,973.06	54,818.08	11,301.80	25,853.18

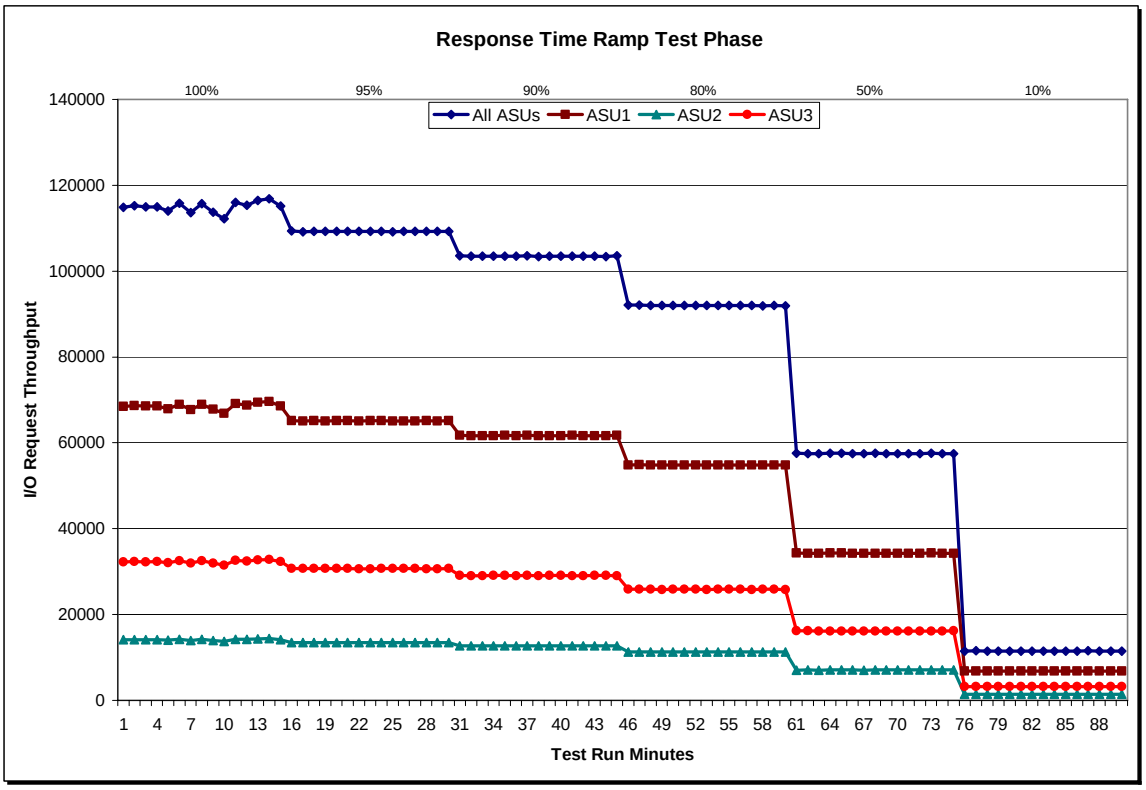
50% Load Level - 1150 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	13:33:46	13:38:47	0-4	0:05:01
Measurement Interval	13:38:47	13:48:47	5-14	0:10:00

(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	57,550.52	34,292.15	7,062.53	16,195.83
1	57,487.80	34,233.22	7,071.27	16,183.32
2	57,459.48	34,279.80	7,056.33	16,123.35
3	57,535.65	34,301.10	7,073.28	16,161.27
4	57,538.12	34,308.48	7,075.70	16,153.93
5	57,470.52	34,254.58	7,070.98	16,144.95
6	57,478.80	34,255.18	7,060.52	16,163.10
7	57,534.13	34,288.43	7,074.88	16,170.82
8	57,484.47	34,275.75	7,070.38	16,138.33
9	57,440.53	34,233.05	7,069.40	16,138.08
10	57,488.25	34,258.90	7,080.55	16,148.80
11	57,473.97	34,240.32	7,076.70	16,156.95
12	57,561.13	34,324.82	7,073.22	16,163.10
13	57,477.28	34,254.33	7,088.08	16,134.87
14	57,504.12	34,257.32	7,066.63	16,180.17
Average	57,491.32	34,264.27	7,073.14	16,153.92

10% Load Level - 230 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	13:49:47	13:54:48	0-4	0:05:01
Measurement Interval	13:54:48	14:04:48	5-14	0:10:00

(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	11,514.37	6,852.42	1,419.95	3,242.00
1	11,532.72	6,865.10	1,421.28	3,246.33
2	11,502.63	6,861.07	1,419.80	3,221.77
3	11,479.35	6,836.28	1,413.12	3,229.95
4	11,496.20	6,847.48	1,408.08	3,240.63
5	11,482.50	6,839.02	1,414.32	3,229.17
6	11,489.10	6,841.53	1,419.67	3,227.90
7	11,482.53	6,843.15	1,417.35	3,222.03
8	11,499.98	6,846.37	1,420.85	3,232.77
9	11,509.32	6,863.43	1,412.85	3,233.03
10	11,496.67	6,851.35	1,411.90	3,233.42
11	11,529.05	6,869.75	1,420.88	3,238.42
12	11,489.63	6,849.08	1,418.17	3,222.38
13	11,498.20	6,854.63	1,411.27	3,232.30
14	11,505.00	6,859.63	1,407.58	3,237.78
Average	11,498.20	6,851.80	1,415.48	3,230.92

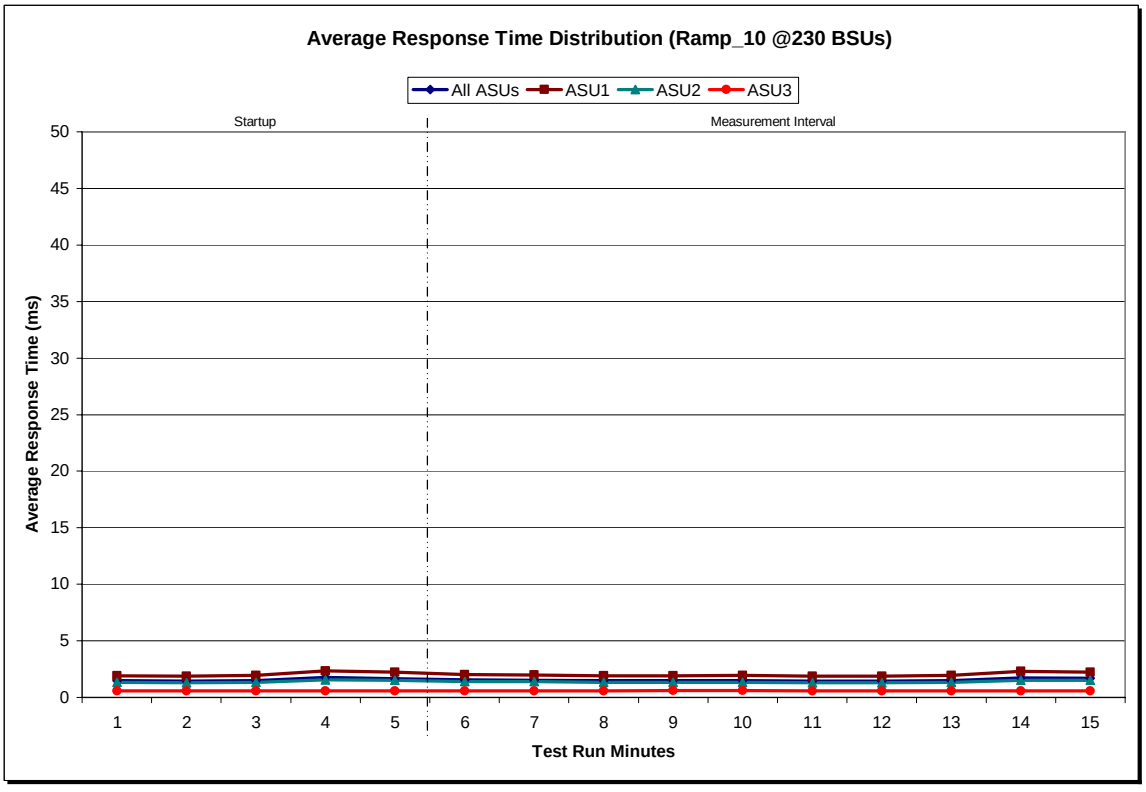
Response Time Ramp Distribution (IOPS) Graph



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

230 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	13:49:47	13:54:48	0-4	0:05:01
Measurement Interval	13:54:48	14:04:48	5-14	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	1.46	1.89	1.34	0.59
1	1.45	1.88	1.31	0.59
2	1.49	1.94	1.34	0.59
3	1.76	2.36	1.55	0.59
4	1.67	2.22	1.50	0.59
5	1.54	2.02	1.40	0.59
6	1.51	1.97	1.39	0.59
7	1.48	1.92	1.35	0.59
8	1.47	1.92	1.32	0.59
9	1.48	1.93	1.33	0.60
10	1.45	1.88	1.31	0.59
11	1.45	1.88	1.31	0.59
12	1.49	1.94	1.33	0.59
13	1.73	2.32	1.51	0.59
14	1.68	2.23	1.51	0.59
Average	1.53	2.00	1.38	0.59

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	0.0351	0.2808	0.0700	0.2099	0.0179	0.0701	0.0351	0.2810
COV	0.006	0.002	0.004	0.003	0.008	0.004	0.006	0.001

Clause 3.4.3

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

Clauses 5.1.0 and 5.3.13.2

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

Clause 5.3.13.3

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

Repeatability Test

Clause 5.4.5

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

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

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

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

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

Clause 9.2.4.7.4

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

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

SPC-1 Workload Generator Input Parameters

The SPC-1 Workload Generator input parameters for the Sustainability, IOPS, Response Time Ramp, Repeatability, and Persistence Test Runs are documented in "Appendix E: SPC-1 Workload Generator Input Parameters" on Page 170.

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	***115,090.06***	***1.53***
Repeatability Test Phase 1	115,010.67	1.53
Repeatability Test Phase 2	114,805.48	1.53

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

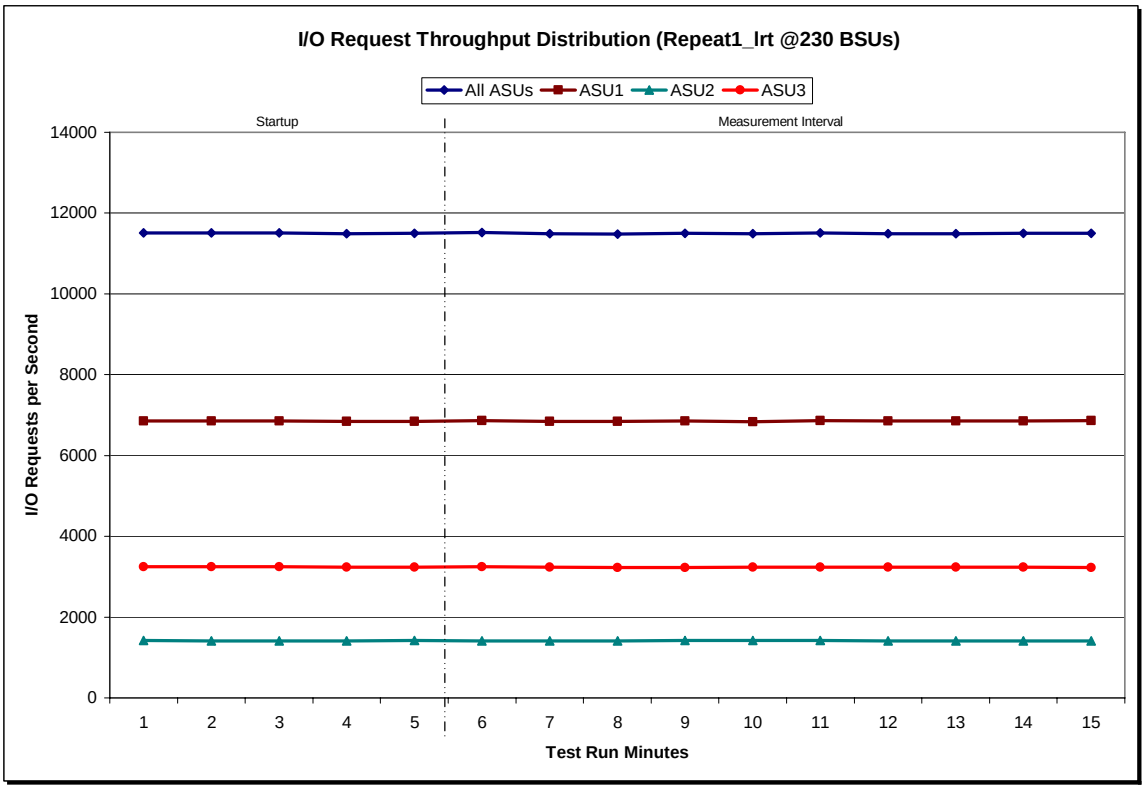
Repeatability Test Phase 1, Test Run 1 (LRT)
Repeatability Test Phase 1, Test Run 2 (IOPS)
Repeatability Test Phase 2, Test Run 1 (LRT)
Repeatability Test Phase 2, Test Run 2 (IOPS)

Repeatability 1 LRT – I/O Request Throughput Distribution Data

230 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	14:06:44	14:11:44	0-4	0:05:00
Measurement Interval	14:11:44	14:21:44	5-14	0:10:00

60 second intervals	All ASUs	ASU1	ASU2	ASU3
0	11,510.75	6,852.17	1,417.83	3,240.75
1	11,510.72	6,857.52	1,410.67	3,242.53
2	11,511.57	6,856.95	1,412.28	3,242.33
3	11,491.33	6,839.33	1,415.10	3,236.90
4	11,495.97	6,847.53	1,417.35	3,231.08
5	11,516.47	6,862.38	1,412.68	3,241.40
6	11,492.38	6,846.43	1,414.28	3,231.67
7	11,484.00	6,848.12	1,407.93	3,227.95
8	11,499.77	6,857.42	1,419.90	3,222.45
9	11,490.85	6,835.57	1,423.72	3,231.57
10	11,513.18	6,861.80	1,418.53	3,232.85
11	11,495.27	6,850.55	1,408.70	3,236.02
12	11,494.52	6,851.00	1,411.17	3,232.35
13	11,498.25	6,849.07	1,414.02	3,235.17
14	11,499.40	6,861.60	1,410.32	3,227.48
Average	11,498.41	6,852.39	1,414.13	3,231.89

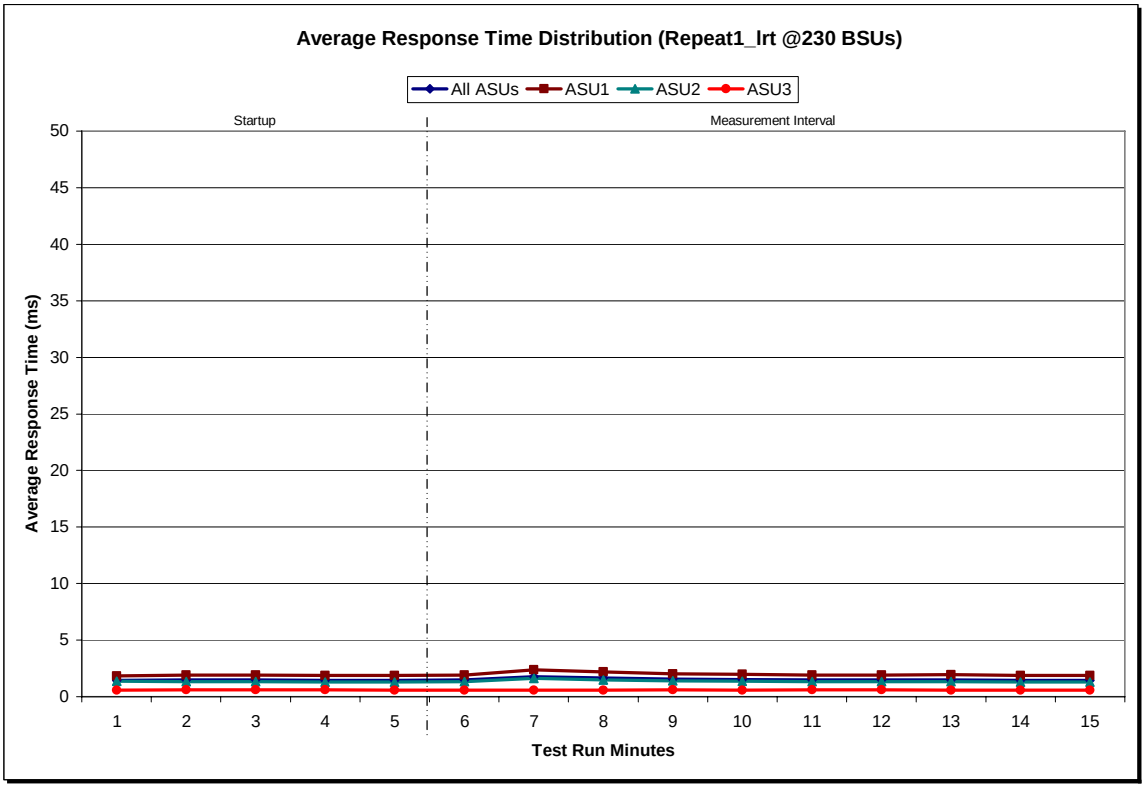
Repeatability 1 LRT – I/O Request Throughput Distribution Graph



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

230 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	14:06:44	14:11:44	0-4	0:05:00
Measurement Interval	14:11:44	14:21:44	5-14	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	1.42	1.83	1.35	0.59
1	1.47	1.91	1.32	0.60
2	1.48	1.92	1.33	0.60
3	1.45	1.88	1.31	0.60
4	1.44	1.87	1.31	0.59
5	1.47	1.91	1.32	0.59
6	1.78	2.37	1.62	0.59
7	1.67	2.21	1.48	0.59
8	1.55	2.03	1.41	0.60
9	1.51	1.97	1.38	0.59
10	1.47	1.91	1.33	0.60
11	1.48	1.92	1.33	0.60
12	1.48	1.93	1.33	0.59
13	1.45	1.89	1.31	0.59
14	1.45	1.88	1.31	0.59
Average	1.53	2.00	1.38	0.59

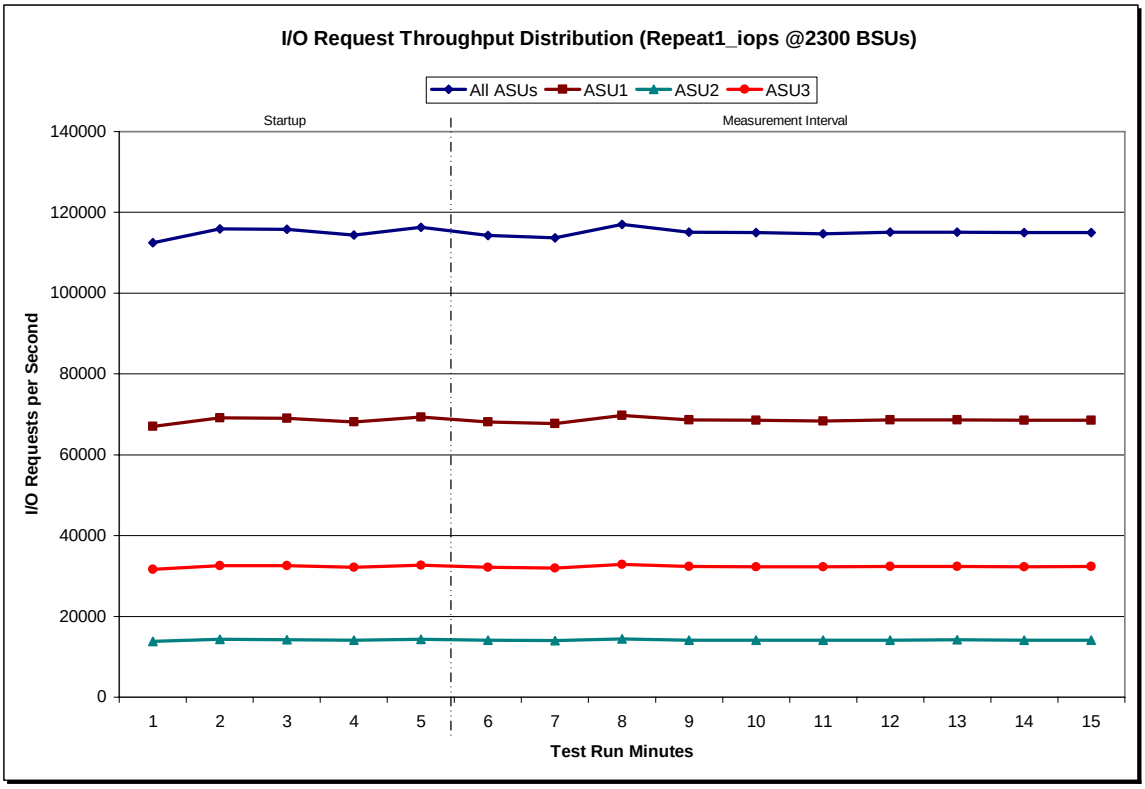
Repeatability 1 LRT –Average Response Time (ms) Distribution Graph



Repeatability 1 IOPS – I/O Request Throughput Distribution Data

2300 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	14:23:12	14:28:13	0-4	0:05:01
Measurement Interval	14:28:13	14:38:13	5-14	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	112,485.07	67,061.57	13,820.02	31,603.48
1	115,921.20	69,094.07	14,270.83	32,556.30
2	115,825.38	69,024.87	14,255.95	32,544.57
3	114,377.03	68,167.62	14,075.03	32,134.38
4	116,319.83	69,310.37	14,305.85	32,703.62
5	114,340.30	68,125.68	14,068.97	32,145.65
6	113,672.38	67,741.72	13,975.87	31,954.80
7	117,042.82	69,764.57	14,378.83	32,899.42
8	115,090.72	68,592.08	14,142.30	32,356.33
9	114,980.73	68,536.87	14,157.47	32,286.40
10	114,716.82	68,358.93	14,114.32	32,243.57
11	115,129.80	68,632.28	14,151.03	32,346.48
12	115,107.97	68,617.23	14,185.52	32,305.22
13	114,991.75	68,546.90	14,143.50	32,301.35
14	115,033.38	68,558.35	14,154.33	32,320.70
Average	115,010.67	68,547.46	14,147.21	32,315.99

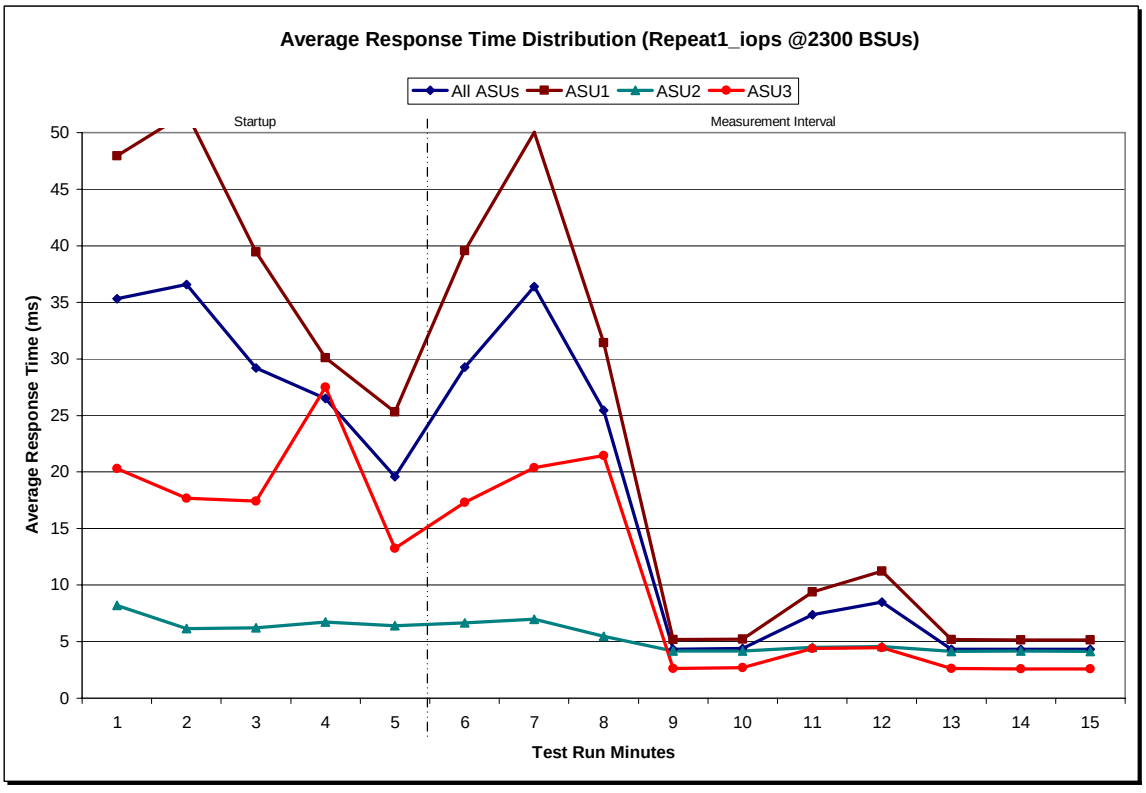
Repeatability 1 IOPS – I/O Request Throughput Distribution Graph



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

2300 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	14:23:12	14:28:13	0-4	0:05:01
Measurement Interval	14:28:13	14:38:13	5-14	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	35.31	47.96	8.21	20.31
1	36.57	51.76	6.15	17.66
2	29.18	39.46	6.24	17.43
3	26.49	30.09	6.73	27.51
4	19.59	25.31	6.40	13.24
5	29.27	39.57	6.68	17.33
6	36.41	50.04	6.97	20.37
7	25.43	31.42	5.46	21.47
8	4.33	5.17	4.17	2.63
9	4.39	5.23	4.19	2.69
10	7.38	9.39	4.49	4.40
11	8.51	11.23	4.58	4.45
12	4.33	5.17	4.16	2.62
13	4.32	5.15	4.16	2.61
14	4.30	5.15	4.15	2.58
Average	12.87	16.75	4.90	8.11

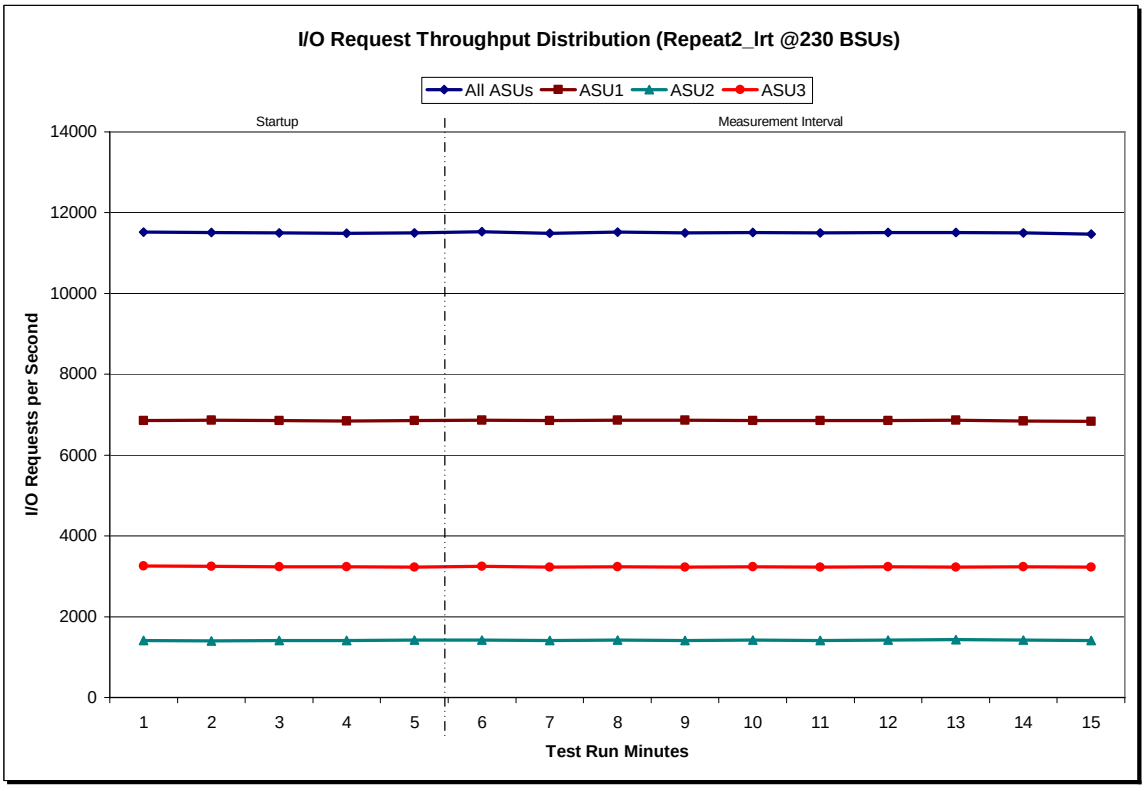
Repeatability 1 IOPS –Average Response Time (ms) Distribution Graph



Repeatability 2 LRT – I/O Request Throughput Distribution Data

230 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	14:40:08	14:45:08	0-4	0:05:00
Measurement Interval	14:45:08	14:55:08	5-14	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	11,517.20	6,852.57	1,412.53	3,252.10
1	11,511.65	6,860.65	1,405.15	3,245.85
2	11,503.88	6,856.33	1,414.57	3,232.98
3	11,489.75	6,841.58	1,410.78	3,237.38
4	11,497.08	6,850.75	1,421.70	3,224.63
5	11,534.72	6,865.28	1,418.95	3,250.48
6	11,489.42	6,849.48	1,415.13	3,224.80
7	11,517.48	6,865.95	1,416.97	3,234.57
8	11,497.20	6,859.07	1,415.72	3,222.42
9	11,515.02	6,855.48	1,421.62	3,237.92
10	11,496.47	6,852.78	1,414.07	3,229.62
11	11,506.90	6,849.27	1,420.50	3,237.13
12	11,514.28	6,862.80	1,426.53	3,224.95
13	11,501.45	6,845.45	1,425.02	3,230.98
14	11,470.92	6,838.17	1,411.23	3,221.52
Average	11,504.39	6,854.37	1,418.57	3,231.44

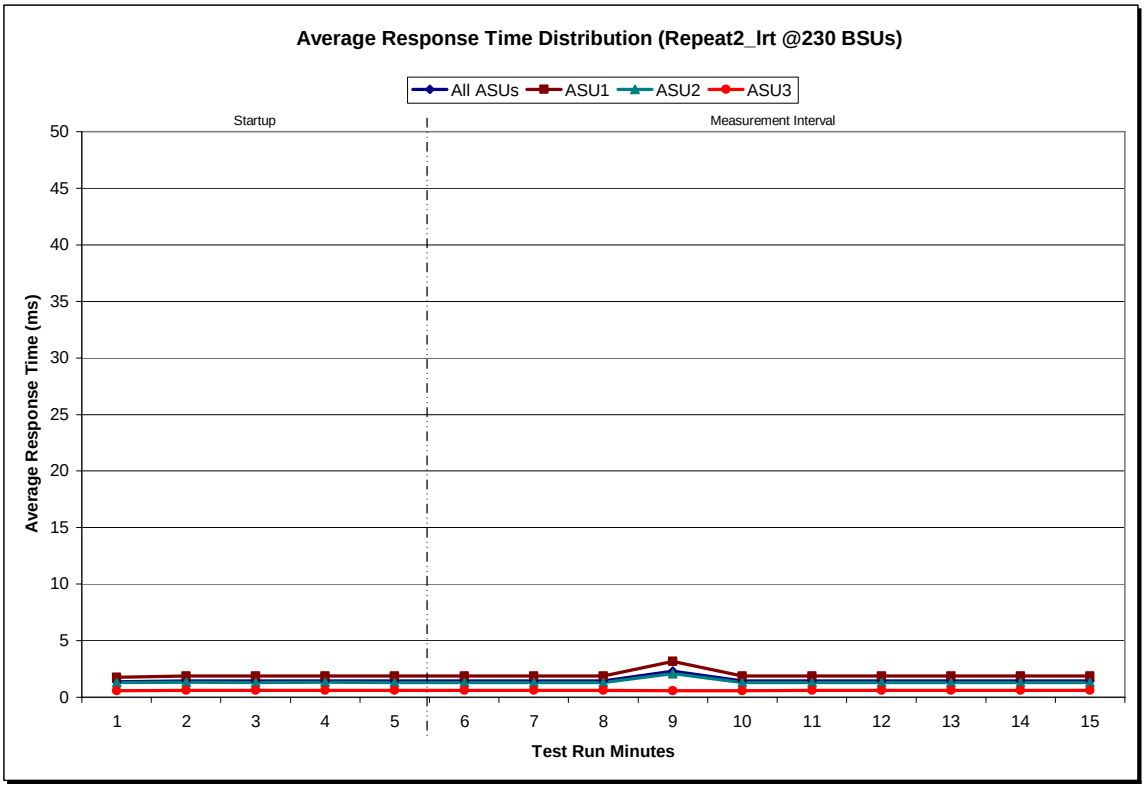
Repeatability 2 LRT – I/O Request Throughput Distribution Graph



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

230 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	14:40:08	14:45:08	0-4	0:05:00
Measurement Interval	14:45:08	14:55:08	5-14	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	1.37	1.75	1.30	0.59
1	1.45	1.88	1.32	0.60
2	1.45	1.88	1.31	0.60
3	1.45	1.88	1.31	0.60
4	1.45	1.88	1.31	0.60
5	1.45	1.89	1.31	0.60
6	1.45	1.88	1.30	0.60
7	1.45	1.87	1.31	0.60
8	2.31	3.16	2.10	0.59
9	1.44	1.88	1.31	0.59
10	1.44	1.88	1.30	0.59
11	1.45	1.88	1.30	0.60
12	1.45	1.89	1.31	0.60
13	1.45	1.88	1.31	0.60
14	1.45	1.88	1.31	0.60
Average	1.53	2.01	1.39	0.60

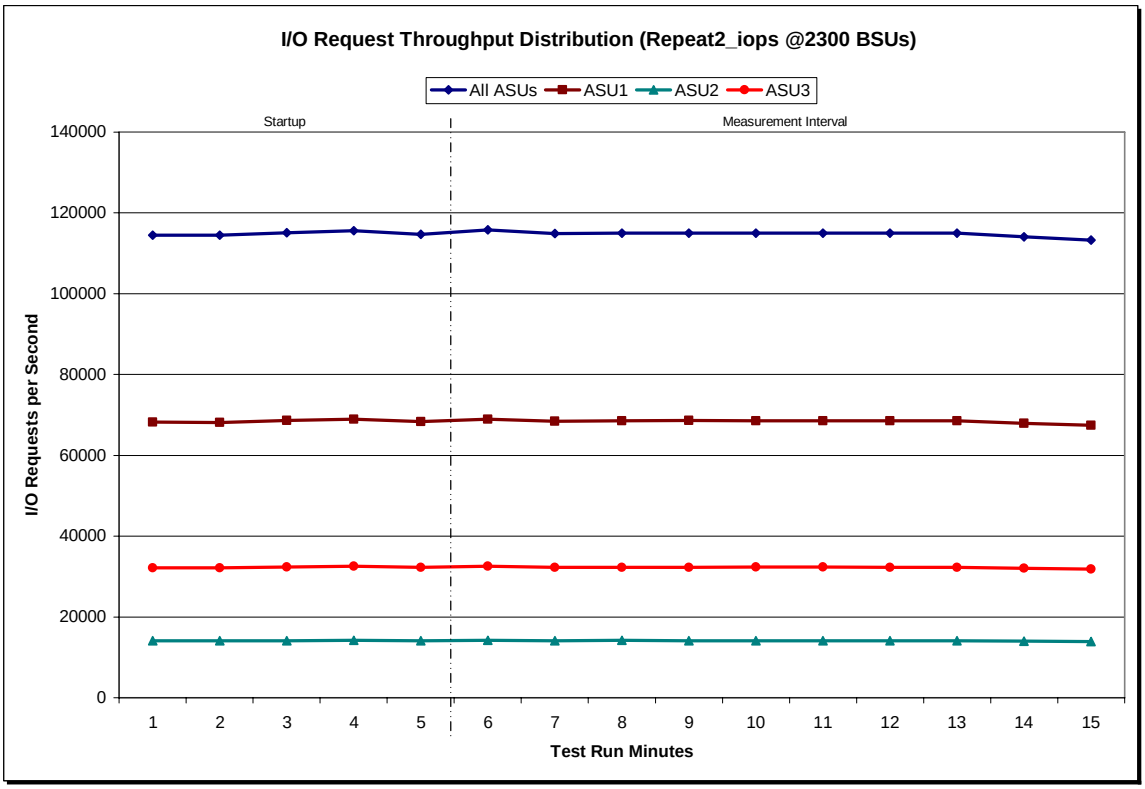
Repeatability 2 LRT –Average Response Time (ms) Distribution Graph



Repeatability 2 IOPS – I/O Request Throughput Distribution Data

2300 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	14:56:35	15:01:36	0-4	0:05:01
Measurement Interval	15:01:36	15:11:38	5-14	0:10:02
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	114,468.63	68,258.98	14,073.78	32,135.87
1	114,450.97	68,179.38	14,086.53	32,185.05
2	115,111.88	68,656.88	14,132.98	32,322.02
3	115,657.60	68,925.75	14,225.40	32,506.45
4	114,667.77	68,311.05	14,106.08	32,250.63
5	115,787.77	68,987.70	14,243.45	32,556.62
6	114,918.40	68,484.22	14,151.15	32,283.03
7	115,015.67	68,544.45	14,172.62	32,298.60
8	115,043.27	68,598.05	14,145.75	32,299.47
9	115,014.13	68,548.03	14,160.43	32,305.67
10	114,970.22	68,525.08	14,121.93	32,323.20
11	115,015.32	68,576.92	14,150.28	32,288.12
12	114,955.23	68,517.72	14,142.60	32,294.92
13	114,085.03	67,967.15	14,047.78	32,070.10
14	113,249.78	67,474.97	13,931.58	31,843.23
Average	114,805.48	68,422.43	14,126.76	32,256.30

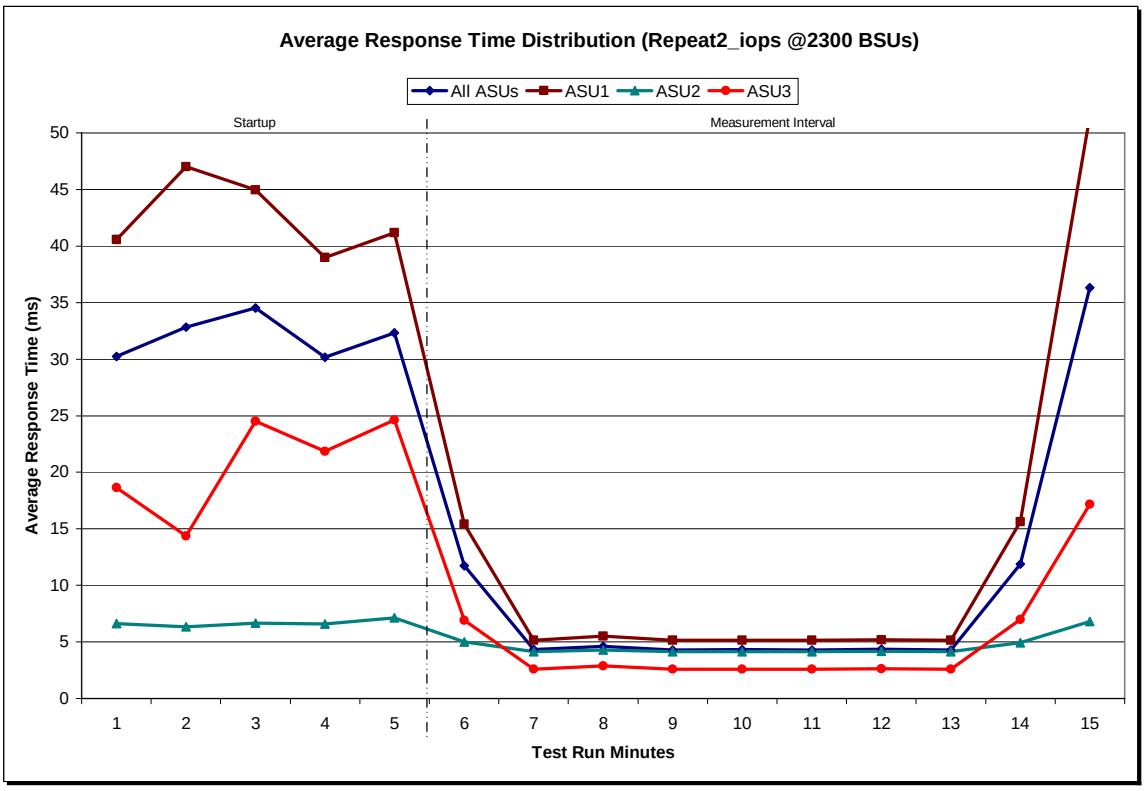
Repeatability 2 IOPS – I/O Request Throughput Distribution Graph



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

2300 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	14:56:35	15:01:36	0-4	0:05:01
Measurement Interval	15:01:36	15:11:38	5-14	0:10:02
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	30.24	40.58	6.62	18.64
1	32.81	47.00	6.33	14.36
2	34.53	44.97	6.68	24.52
3	30.18	38.97	6.58	21.86
4	32.33	41.18	7.13	24.62
5	11.73	15.40	5.02	6.90
6	4.31	5.14	4.15	2.60
7	4.62	5.51	4.29	2.88
8	4.30	5.14	4.13	2.60
9	4.31	5.15	4.14	2.59
10	4.30	5.14	4.15	2.59
11	4.34	5.17	4.18	2.64
12	4.29	5.13	4.12	2.59
13	11.88	15.64	4.93	6.97
14	36.33	51.47	6.82	17.18
Average	9.04	11.89	4.59	4.95

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	0.2810	0.0701	0.2100	0.0181	0.0700	0.0348	0.2811
COV	0.006	0.001	0.004	0.002	0.012	0.004	0.006	0.001

Clause 3.4.3

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

Clauses 5.1.0 and 5.3.13.2

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

Clause 5.3.13.3

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

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

	ASU1-1	ASU1-2	ASU1-3	ASU1-4	ASU2-1	ASU2-2	ASU2-3	ASU3-1
IM	***0.0350***	***0.2810***	***0.0700***	***0.2100***	***0.0180***	***0.0700***	***0.0350***	***0.2810***
MIM	0.0350	0.2810	0.0700	0.2101	0.0180	0.0700	0.0350	0.2810
COV	0.002	0.000	0.002	0.001	0.003	0.001	0.002	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	0.2808	0.0699	0.2101	0.0180	0.0701	0.0351	0.2809
COV	0.006	0.002	0.003	0.002	0.010	0.005	0.005	0.002

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

	ASU1-1	ASU1-2	ASU1-3	ASU1-4	ASU2-1	ASU2-2	ASU2-3	ASU3-1
IM	***0.0350***	***0.2810***	***0.0700***	***0.2100***	***0.0180***	***0.0700***	***0.0350***	***0.2810***
MIM	0.0350	0.2810	0.0700	0.2100	0.0180	0.0700	0.0350	0.2810
COV	0.002	0.000	0.001	0.001	0.002	0.001	0.001	0.001

Data Persistence Test

Clause 6

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

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

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

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

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

Clause 9.2.4.8

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

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

SPC-1 Workload Generator Input Parameters

The SPC-1 Workload Generator input parameters for the Sustainability, IOPS, Response Time Ramp, Repeatability, and Persistence Test Runs are documented in "Appendix E: SPC-1 Workload Generator Input Parameters" on Page 170.

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	47,230,160
Total Number of Logical Blocks Verified	42,796,992
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 Fujitsu Storage Systems ETERNUS8000 Model 1100 as documented in this Full Disclosure Report will become available on September 30, 2007 for customer purchase and shipment. *[Note: The ETERNUS8000 Model 1100 is currently available, but the firmware used in the benchmark will become available on September 30, 2007.]*

PRICING INFORMATION

Clause 9.2.4.11

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

Clause 9.2.4.11.3

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

Pricing information may found in the Tested Storage Configuration Pricing section on page 13. A list of all differences between the Tested Storage Configuration (TSC) and Priced Storage Configuration may be found in the Executive Summary portion of this document on page 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 Fujitsu Storage Systems ETERNUS8000 Model 1100.

APPENDIX A: SPC-1 GLOSSARY

"Decimal" *(powers of ten)* Measurement Units

In the storage industry, the terms "kilo", "mega", "giga", "tera", "peta", and "exa" are commonly used prefixes for computing performance and capacity. For the purposes of the SPC workload definitions, all of the following terms are defined in "powers of ten" measurement units.

- A kilobyte (KB) is equal to 1,000 (10^3) bytes.
- A megabyte (MB) is equal to 1,000,000 (10^6) bytes.
- A gigabyte (GB) is equal to 1,000,000,000 (10^9) bytes.
- A terabyte (TB) is equal to 1,000,000,000,000 (10^{12}) bytes.
- A petabyte (PB) is equal to 1,000,000,000,000,000 (10^{15}) bytes
- An exabyte (EB) is equal to 1,000,000,000,000,000,000 (10^{18}) bytes

"Binary" *(powers of two)* Measurement Units

The sizes reported by many operating system components use "powers of two" measurement units rather than "power of ten" units. The following standardized definitions and terms are also valid and may be used in this document.

- A kibibyte (KiB) is equal to 1,024 (2^{10}) bytes.
- A mebibyte (MiB) is equal to 1,048,576 (2^{20}) bytes.
- A gigibyte (GiB) is equal to 1,073,741,824 (2^{30}) bytes.
- A tebibyte (TiB) is equal to 1,099,511,627,776 (2^{40}) bytes.
- A pebibyte (PiB) is equal to 1,125,899,906,842,624 (2^{50}) bytes.
- An exbibyte (EiB) is equal to 1,152,921,504,606,846,967 (2^{60}) bytes.

SPC-1 Data Repository Definitions

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

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

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

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

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

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

Data Protection Overhead: The storage capacity required to implement the selected level of data protection.

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

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

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

SPC-1 Data Protection Levels

RAID5: User data is distributed across the disks in the array. Check data corresponding to user data is distributed across multiple disks in the form of bit-by-bit parity.

Mirroring: Two or more identical copies of user data are maintained on separate disks.

Other Protection Level: Any data protection other than **RAID5** or **Mirroring**.

Unprotected: There is no data protection provided.

SPC-1 Test Execution 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.

Completed I/O Request: An I/O Request with a Start Time and a Completion Time (see "I/O Completion Types" below).

Completion Time: The time recorded by the Workload Generator when an I/O Request is satisfied by the TSC as signaled by System Software.

Data Rate: The data transferred in all Measured I/O Requests in an SPC-1 Test Run divided by the length of the Test Run in seconds.

Expected I/O Count: For any given I/O Stream and Test Phase, the product of 50 times the BSU level, the duration of the Test Phase in seconds, and the Intensity Multiplier for that I/O Stream.

Failed I/O Request: Any I/O Request issued by the Workload Generator that could not be completed or was signaled as failed by System Software. A Failed I/O Request has no Completion Time (see "I/O Completion Types" below).

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.

In-Flight I/O Request: An I/O Request issued by the I/O Command Generator to the TSC that has a recorded Start Time, but does not complete within the Measurement Interval (see "I/O Completion Types" below).

Measured I/O Request: A Completed I/O Request with a Completion Time occurring within the Measurement Interval (see "I/O Completion Types" below).

Measured Intensity Multiplier: The percentage of all Measured I/O Requests that were issued by a given I/O Stream.

Measurement Interval: The finite and contiguous time period, after the 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.

Ramp-Up: The time required for the Benchmark Configuration (BC) to produce Steady State throughput after the Workload Generator begins submitting I/O Requests to the TSC for execution.

Ramp-Down: The time required for the BC to complete all I/O Requests issued by the Workload Generator. The Ramp-Down period begins when the Workload Generator ceases to issue new I/O Requests to the TSC.

Response Time: The Response Time of a Measured I/O Request is its Completion Time minus its Start Time.

Start Time: The time recorded by the Workload Generator when an I/O Request is submitted, by the Workload Generator, to the System Software for execution on the Tested Storage Configuration (TSC).

Start-Up: The period that begins after the Workload Generator starts to submit I/O requests to the TSC and ends at the beginning of the Measurement Interval.

Shut-Down: The period between the end of the Measurement Interval and the time when all I/O Requests issued by the Workload Generator have completed or failed.

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.

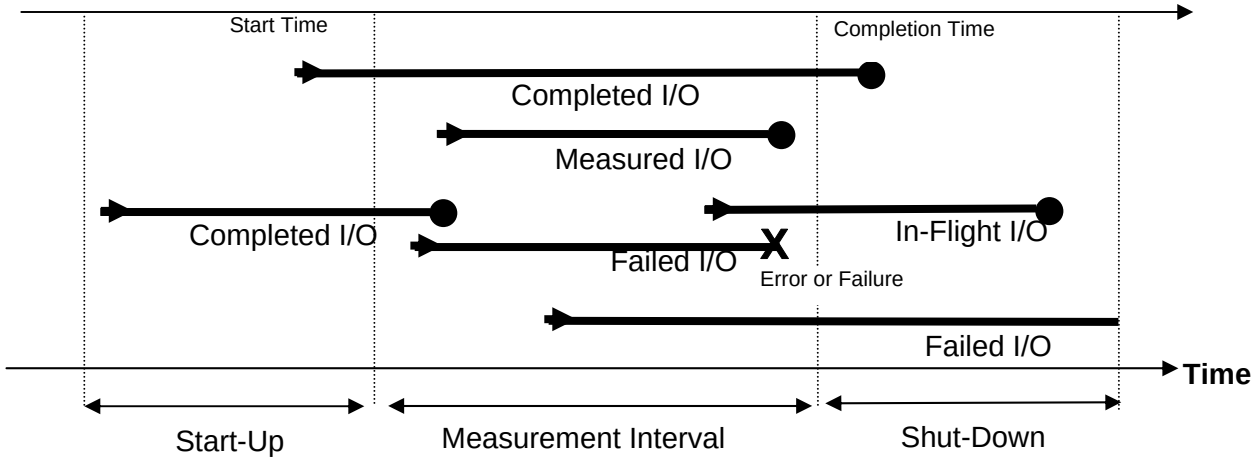
Test: A collection of Test Phases and or Test Runs sharing a common objective.

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

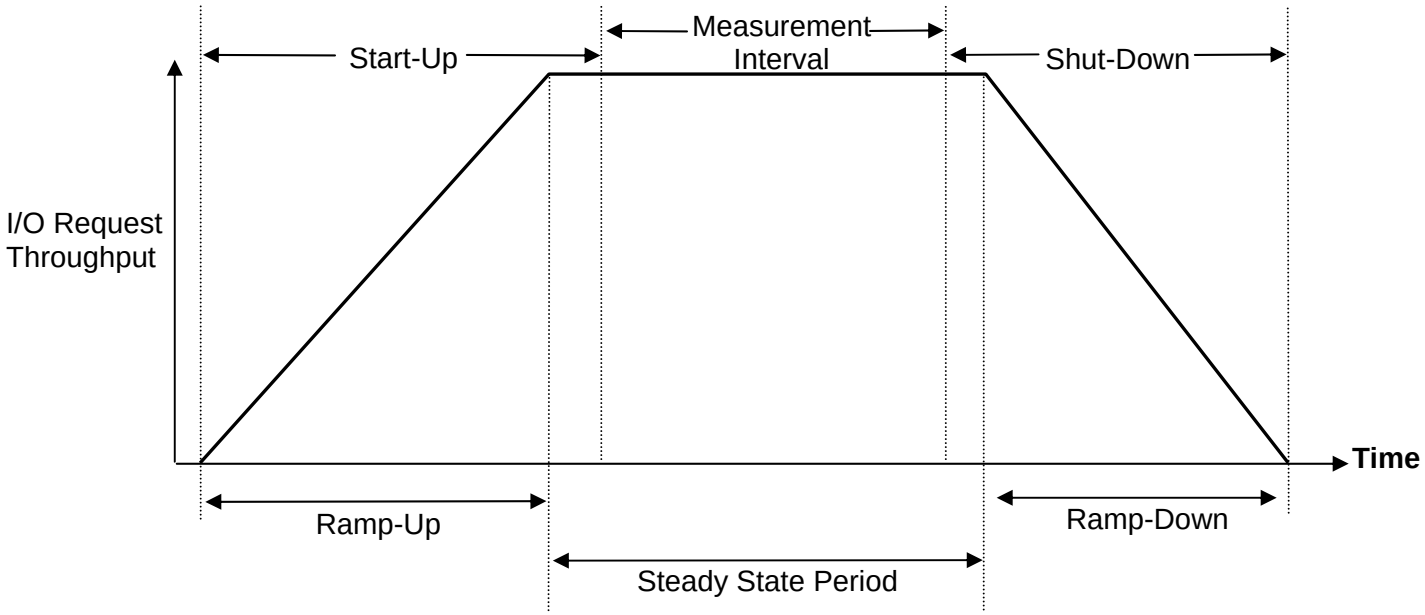
period, Shut-Down period, and Ramp-Down period as illustrated in the "SPC-1 Test Run Components" below. All SPC-1 Test Runs shall have a Steady State period and a Measurement Interval.

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.

I/O Completion Types



SPC-1 Test Run Components



APPENDIX B: CUSTOMER TUNABLE PARAMETERS AND OPTIONS

Solaris Parameter Adjustments

The following settings were made in the Solaris /etc/system control file information for execution of the Workload Generator on the PRIMEPOWER2500:

HS-1 (Logical Host System 1)

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

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



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



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



* forceload:
```

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



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

* Begin FJSVscd3 (do not edit)
forceload: drv/FJSVscf3
* End FJSVscd3 (do not edit)
* Begin FJSVssf (do not edit)
set ftrace_atboot = 1
set kmem_flags = 0x100
set kmem_lite_maxalign = 8192
set disable_memscrub = 1
* End FJSVssf (do not edit)
* Begin FJSVpnl (do not edit)
forceload: drv/FJSVpanel
* End FJSVpnl (do not edit)
forceload: drv/se
forceload: drv/fjmse

* The forceload of drv/clone is required for successful
* IP operation of Emulex fibre channel drivers lpfc / lpfs
* and for the diagnostics (dfc) interface.
forceload: drv/clone
```

HS-2 (Logical Host System 2)

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

* moddir:
*
*    Set the search path for modules.  This has a format similar to the
*    csh path variable. If the module isn't found in the first directory
```

```
*    it tries the second and so on. The default is /kernel /usr/kernel
*
*    Example:
*           moddir: /kernel /usr/kernel /other/modules



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



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



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



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

```
*           set maxusers=40
*
*    To set a variable named 'debug' in the module named 'test_module'
*
*           set test_module:debug = 0x13

* Begin FJSVscd3 (do not edit)
forceload: drv/FJSVscf3
* End FJSVscd3 (do not edit)
* Begin FJSVssf (do not edit)
set ftrace_atboot = 1
set kmem_flags = 0x100
set kmem_lite_maxalign = 8192
set disable_memscrub = 1
* End FJSVssf (do not edit)
* Begin FJSVpnl (do not edit)
forceload: drv/FJSVpanel
* End FJSVpnl (do not edit)
forceload: drv/se
forceload: drv/fjmse

* The forceload of drv/clone is required for successful
* IP operation of Emulex fibre channel drivers lpfc / lpfs
* and for the diagnostics (dfc) interface.
forceload: drv/clone
```

Emulex HBA Configuration Parameters

These parameters are set in "lpfc.conf" for controlling the operation of the Emulex Fibre Channel HBAs. The following values have been changed from their default values for accessing the ETERNUS8000 Model 1100 Storage System:

OS-View1-lpfc.conf *(Logical Host System 1)*

```
#

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# program without the express written consent of Emulex Design & Manufacturing
# Corporation is a violation of the copyright laws and may subject you to
# criminal prosecution.
#
#
# Solaris LightPulse lpfc (SCSI) / lpfn (IP) driver: global initialized data.
#
# lpfc.conf 1.29 2005/01/18 11:58:16PST

# Verbosity:  only turn this flag on if you are willing to risk being
# deluged with LOTS of information.
# You can set a bit mask to record specific types of verbose messages:
#
# 0x1    ELS events
# 0x2    Device Discovery events
# 0x4    Mailbox Command events
# 0x8    Initialization events
# 0x10   Link Attention events
# 0x20   IP events
# 0x40   FCP events
# 0x80   Node table events
# 0x400  Miscellaneous events
# 0x800  SLI events
# 0x2000 IOCtl events
# 0xffff Log All Events
log-verbose=0x0;

# Setting log-only to 0 causes log messages to be printed on the
# console and to be logged to syslog (which may send them to the
# console again if it's configured to do so).
# Setting log-only to 1 causes log messages to go to syslog only.
log-only=1;

#
# +++ Variables relating to FCP (SCSI) support. +++
#
# specifies the method of binding to be used. This
# binding method is used for persistent binding and automaped
# binding. A value of 1 will force WWNN binding, value
```

```
  # of 2 will force WWPN binding, value of 3 will force
  # DID binding and value of 4 will force the driver to derive
  # binding from ALPA (hard addressed) in a private loop environment.
  # Any persistent binding whose type does not match with the
  # bind method of the port will be ignored.
  fcp-bind-method=4;


  # Setup FCP persistent bindings,
  # fcp-bind-WWPN binds a specific WorldWide PortName to a target id,
  # fcp-bind-WWNN binds a specific WorldWide NodeName to a target id,
  # fcp-bind-DID binds a specific DID to a target id.
  # Binding method must match with the bind method of that HBA, else the
  # binding will be ignored.
  # fcp-bind-method should NOT be set to 4 when one of these binding methods
  # is used.
  # WWNN, WWPN and DID are hexadecimal values.
  # WWNN must be 16 digit BCD with leading 0s.
  # WWPN must be 16 digit BCD with leading 0s.
  # DID must be 6 digit BCD with leading 0s.
  # The SCSI ID to bind to consists of two parts, the lpfc interface
  # to bind to, and the target number for that interface.
  # Thus lpfc0t2 specifies target 2 on interface lpfc0.
  # NOTE: Target ids, with all luns supported, must also be in sd.conf.

  # Here are some examples:
  #                WWNN             SCSI ID
  # fcp-bind-WWNN="2000123456789abc:lpfc1t0",
  #               "20000020370c27f7:lpfc0t2";
  #
  #                WWPN             SCSI ID
  # fcp-bind-WWPN="2100123456789abc:lpfc0t0",
  #               "21000020370c2855:lpfc0t1",
  #               "2100122222222222:lpfc2t2";
  #
  #                DID   SCSI ID
  # fcp-bind-DID="0000ef:lpfc0t3";
  # BEGIN: LPUTIL-managed Persistent Bindings

  # If automap is set, SCSI IDs for all FCP nodes without
  # persistent bindings will be automatically generated.
  # If new FCP devices are added to the network when the system is down,
  # there is no guarantee that these SCSI IDs will remain the same
  # when the system is booted again.
  # The bind method of the port is used as the binding method of
  # automap devices to preserve SCSI IDs between link down and link up.
  # If automap is 0, only devices with persistent bindings will be
  # recognized by the system.
  automap=1;

  # lun-queue-depth [1 to 128] - The default value lpfc will use to
  # limit the number of outstanding commands per FCP LUN.  This value
  # is global, affecting each LUN recognized by the driver, but may be
  # overridden on a per-LUN basis (see below). RAID arrays may want
  # to be configured using the per-LUN tunable throttles.
  lun-queue-depth=10;

  # tgt-queue-depth [0 to 10240] - The default value lpfc will use to
  # limit the number of outstanding commands per FCP target.  This value
  # is global, affecting each target recognized by the driver, but may be
  # overridden on a per-target basis (see below). RAID arrays may want
  # to be configured using the per-target tunable throttles. A value
  # of 0 means don't throttle the target.
```

```
tgt-queue-depth=45;

# lpfcNtM-lun-throttle:  the maximum number of outstanding commands to
# permit for each LUN of an FCP target that supports multiple LUNs.
# The default throttle for the number of commands outstanding to a single
# LUN of a multiple-LUN target is lun-queue-depth. For a target that
# can support multiple LUNs, it may be useful to specify a LUN throttle
# that differs from the default.
# Example: lpfc0t17-lun-throttle=48;
# says that each LUN on target 17, interface lpfc0 should be allowed
# up to 48 simultaneously outstanding commands.
#lpfc1t39-lun-throttle=10;
#lpfc0t40-lun-throttle=30;

# lpfcNtM-tgt-throttle:  the maximum number of outstanding commands to
# permit for a FCP target.
# By default, target throttle is diabled.
# Example: lpfc0t17-tgt-throttle=48;
# says that target 17, interface lpfc0 should be allowed
# up to 48 simultaneously outstanding commands.
#lpfc1t39-tgt-throttle=10;
#lpfc0t40-tgt-throttle=30;

# no-device-delay [0 to 30] - determines the length of
# the interval between deciding to fail back an I/O because there is no way
# to communicate with its particular FCP device (e.g., due to device failure)
# and the actual fail back.  A value of zero implies no delay whatsoever.
# Cautions:  (1)  This value is in seconds.
# (2)  Setting a long delay value may permit I/O to build up,
# each with a pending timeout, which could result in the exhaustion of
# critical Solaris kernel resources.  In this case, you may see a fatal
# message such as
#           PANIC:  Timeout table overflow
#
# Note that this value can have an impact on the speed with which a
# system can shut down with I/Os pending and with the HBA not able to
# communicate with the loop or fabric, e.g., with a cable pulled.
no-device-delay=0;

#
# +++ Variables relating to IP networking support. +++
#

# network-on:  true (1) if networking is enabled, false (0) if not
# This variable will be set during the installation of the driver
# via pkgadd.
network-on=0;

# xmt-que-size [128 to 10240] - size of the transmit queue for mbufs
xmt-que-size=256;

#
# +++ Variables common to both SCSI (FCP) and IP networking support. +++
#

#
# If scan-down = 0, scan the devices on the private loop in increasing
# order of ALPA. If scan-down = 1, scan the devices on the private loop
# in decreasing order of ALPA.
# NOTE: scan-down does not apply if a loop map is obtained.
#
scan-down=1;
```

```
  # If set, nodev-holdio will hold all I/O errors on FCP devices that disappear
  # until they come back. Default is 0, return errors with no-device-delay.
  # This parameter is ignored, if scsi commands are issued in polled mode.
  nodev-holdio=0;

  # If set, nodev-tmo will hold all I/O errors on devices that disappear
  # until the timer [0 to 255 secs] expires. Default is 30, return errors
  # with no-device-delay.
  nodev-tmo=30;

  # Use no-device-delay to delay FCP RSP errors and certain check conditions.
  delay-rsp-err=0;

  # num-iocbs [128 to 10240] - number of iocb buffers to allocate
  num-iocbs=1024;

  # num-bufs [64 to 4096] - number of buffers to allocate
  # Buffers are needed to support Fibre channel Extended Link Services.
  # Also used for SLI-2 FCP buffers, one per FCP command, and Mailbox commands.
  num-bufs=1024;

  # topology:  link topology for initializing the Fibre Channel connection.
  #          0 = attempt loop mode, if it fails attempt point-to-point mode
  #          2 = attempt point-to-point mode only
  #          4 = attempt loop mode only
  #          6 = attempt point-to-point mode, if it fails attempt loop mode
  # Set point-to-point mode if you want to run as an N_Port.
  # Set loop mode if you want to run as an NL_Port.
  topology=4;

  # Set a preferred ALPA for the adapter, only valid if topology is loop.
  # lpfc0-assign-alpa=2;  Request ALPA 2 for lpfc0

  # ip-class:  FC class (2 or 3) to use for the IP protocol.
  ip-class=3;

  # fcp-class:  FC class (2 or 3) to use for the FCP protocol.
  fcp-class=3;

  # Use ADISC for FCP rediscovery instead of PLOGI.
  use-adisc=0;

  # Extra IO timeout [0 to 255 secs] for fabrics
  extra-io-tmo=0;

  # Number of 4k STREAMS buffers [64 to 1024] to post to IP ring.
  post-ip-buf=128;

  # Use dqfull-throttle-up-time [0 to 30 secs] to specify when to increment
  # the current Q depth.
  dqfull-throttle-up-time=1;

  # Increment the current Q depth by dqfull-throttle-up-inc [0 to 128]
  dqfull-throttle-up-inc=1;

  # Use ACK0, instead of ACK1 for class 2 acknowledgement.
  ack0=0;

  # cr-delay: Coalesce Response Delay
  # This value specifies a count of milliseconds [0 to 63] after which an
  # interrupt response is generated if cr-count has not been satisfied.
  # This value is set to 0 to disable the Coalesce Response feature.
  cr-delay=0;
```

```
# cr-count: Coalesce Response Count
# This value specifies a count of I/O completions [1 to 255] after which an
# interrupt response is generated. This feature is disabled if cr-delay is
# set to 0.
cr-count=0;

# discovery-threads [1 to 32] - This value specifies the maximum number of
# ELS commands during discovery
discovery-threads=1;

# link-speed:  link speed selection for initializing the Fibre Channel connection.
#       0 = auto select (default)
#       1 = 1 Gigabaud
#       2 = 2 Gigabaud
#       4 = 4 Gigabaud
link-speed=0;

# fdmi-on:  0 = disable fdmi
#           1 = enable fdmi without registration of "host name" port attribute
#           2 = enable fdmi and "host name" port attribute
fdmi-on=0;

# Used only by i386 FCP (SCSI)
# flow_control="duplx" queue="qfifo" disk="scdk" tape="sctp";
```

OS-View2-lpfc.conf *(Logical Host System 2)*

```
#
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# its use, copying, distribution and decompilation. This computer
# program and its documentation are CONFIDENTIAL and a TRADE SECRET
# of Emulex Design & Manufacturing Corporation. The receipt or possession
# of this program or its documentation does not convey rights to reproduce
# or disclose its contents, or to manufacture, use, or sell anything that
# it may describe, in whole or in part, without the specific written consent
# of Emulex Design & Manufacturing Corporation. Any reproduction of this
# program without the express written consent of Emulex Design & Manufacturing
# Corporation is a violation of the copyright laws and may subject you to
# criminal prosecution.
#
#
# Solaris LightPulse lpfc (SCSI) / lpfn (IP) driver: global initialized data.
#
# lpfc.conf 1.29 2005/01/18 11:58:16PST

# Verbosity:  only turn this flag on if you are willing to risk being
# deluged with LOTS of information.
# You can set a bit mask to record specific types of verbose messages:
#
# 0x1    ELS events
# 0x2    Device Discovery events
# 0x4    Mailbox Command events
# 0x8    Initialization events
# 0x10   Link Attention events
# 0x20   IP events
# 0x40   FCP events
```

```
  # 0x80   Node table events
  # 0x400  Miscellaneous events
  # 0x800  SLI events
  # 0x2000 IOCtl events
  # 0xffff Log All Events
  log-verbose=0x0;

  # Setting log-only to 0 causes log messages to be printed on the
  # console and to be logged to syslog (which may send them to the
  # console again if it's configured to do so).
  # Setting log-only to 1 causes log messages to go to syslog only.
  log-only=1;

  #
  # +++ Variables relating to FCP (SCSI) support. +++
  #
  # specifies the method of binding to be used. This
  # binding method is used for persistent binding and automaped
  # binding. A value of 1 will force WWNN binding, value
  # of 2 will force WWPN binding, value of 3 will force
  # DID binding and value of 4 will force the driver to derive
  # binding from ALPA (hard addressed) in a private loop environment.
  # Any persistent binding whose type does not match with the
  # bind method of the port will be ignored.
  fcp-bind-method=4;


  # Setup FCP persistent bindings,
  # fcp-bind-WWPN binds a specific WorldWide PortName to a target id,
  # fcp-bind-WWNN binds a specific WorldWide NodeName to a target id,
  # fcp-bind-DID binds a specific DID to a target id.
  # Binding method must match with the bind method of that HBA, else the
  # binding will be ignored.
  # fcp-bind-method should NOT be set to 4 when one of these binding methods
  # is used.
  # WWNN, WWPN and DID are hexadecimal values.
  # WWNN must be 16 digit BCD with leading 0s.
  # WWPN must be 16 digit BCD with leading 0s.
  # DID must be 6 digit BCD with leading 0s.
  # The SCSI ID to bind to consists of two parts, the lpfc interface
  # to bind to, and the target number for that interface.
  # Thus lpfc0t2 specifies target 2 on interface lpfc0.
  # NOTE: Target ids, with all luns supported, must also be in sd.conf.

  # Here are some examples:
  #                WWNN             SCSI ID
  # fcp-bind-WWNN="2000123456789abc:lpfc1t0",
  #               "20000020370c27f7:lpfc0t2";
  #
  #                WWPN             SCSI ID
  # fcp-bind-WWPN="2100123456789abc:lpfc0t0",
  #               "21000020370c2855:lpfc0t1",
  #               "2100122222222222:lpfc2t2";
  #
  #                DID   SCSI ID
  # fcp-bind-DID="0000ef:lpfc0t3";
  # BEGIN: LPUTIL-managed Persistent Bindings

  # If automap is set, SCSI IDs for all FCP nodes without
  # persistent bindings will be automatically generated.
  # If new FCP devices are added to the network when the system is down,
  # there is no guarantee that these SCSI IDs will remain the same
  # when the system is booted again.
```

```
  # The bind method of the port is used as the binding method of
  # automap devices to preserve SCSI IDs between link down and link up.
  # If automap is 0, only devices with persistent bindings will be
  # recognized by the system.
  automap=1;

  # lun-queue-depth [1 to 128] - The default value lpfc will use to
  # limit the number of outstanding commands per FCP LUN.  This value
  # is global, affecting each LUN recognized by the driver, but may be
  # overridden on a per-LUN basis (see below). RAID arrays may want
  # to be configured using the per-LUN tunable throttles.
  lun-queue-depth=10;

  # tgt-queue-depth [0 to 10240] - The default value lpfc will use to
  # limit the number of outstanding commands per FCP target.  This value
  # is global, affecting each target recognized by the driver, but may be
  # overridden on a per-target basis (see below). RAID arrays may want
  # to be configured using the per-target tunable throttles. A value
  # of 0 means don't throttle the target.
  tgt-queue-depth=45;

  # lpfcNtM-lun-throttle:  the maximum number of outstanding commands to
  # permit for each LUN of an FCP target that supports multiple LUNs.
  # The default throttle for the number of commands outstanding to a single
  # LUN of a multiple-LUN target is lun-queue-depth. For a target that
  # can support multiple LUNs, it may be useful to specify a LUN throttle
  # that differs from the default.
  # Example: lpfc0t17-lun-throttle=48;
  # says that each LUN on target 17, interface lpfc0 should be allowed
  # up to 48 simultaneously outstanding commands.
  #lpfc1t39-lun-throttle=10;
  #lpfc0t40-lun-throttle=30;

  # lpfcNtM-tgt-throttle:  the maximum number of outstanding commands to
  # permit for a FCP target.
  # By default, target throttle is diabled.
  # Example: lpfc0t17-tgt-throttle=48;
  # says that target 17, interface lpfc0 should be allowed
  # up to 48 simultaneously outstanding commands.
  #lpfc1t39-tgt-throttle=10;
  #lpfc0t40-tgt-throttle=30;

  # no-device-delay [0 to 30] - determines the length of
  # the interval between deciding to fail back an I/O because there is no way
  # to communicate with its particular FCP device (e.g., due to device failure)
  # and the actual fail back.  A value of zero implies no delay whatsoever.
  # Cautions:  (1)  This value is in seconds.
  # (2)  Setting a long delay value may permit I/O to build up,
  # each with a pending timeout, which could result in the exhaustion of
  # critical Solaris kernel resources.  In this case, you may see a fatal
  # message such as
  #           PANIC:  Timeout table overflow
  #
  # Note that this value can have an impact on the speed with which a
  # system can shut down with I/Os pending and with the HBA not able to
  # communicate with the loop or fabric, e.g., with a cable pulled.
  no-device-delay=0;

  #
  # +++ Variables relating to IP networking support. +++
  #

  # network-on:  true (1) if networking is enabled, false (0) if not
```

```
  # This variable will be set during the installation of the driver
  # via pkgadd.
  network-on=0;

  # xmt-que-size [128 to 10240] - size of the transmit queue for mbufs
  xmt-que-size=256;

  #
  # +++ Variables common to both SCSI (FCP) and IP networking support. +++
  #

  #
  # If scan-down = 0, scan the devices on the private loop in increasing
  # order of ALPA. If scan-down = 1, scan the devices on the private loop
  # in decreasing order of ALPA.
  # NOTE: scan-down does not apply if a loop map is obtained.
  #
  scan-down=1;

  # If set, nodev-holdio will hold all I/O errors on FCP devices that disappear
  # until they come back. Default is 0, return errors with no-device-delay.
  # This parameter is ignored, if scsi commands are issued in polled mode.
  nodev-holdio=0;

  # If set, nodev-tmo will hold all I/O errors on devices that disappear
  # until the timer [0 to 255 secs] expires. Default is 30, return errors
  # with no-device-delay.
  nodev-tmo=30;

  # Use no-device-delay to delay FCP RSP errors and certain check conditions.
  delay-rsp-err=0;

  # num-iocbs [128 to 10240] - number of iocb buffers to allocate
  num-iocbs=1024;

  # num-bufs [64 to 4096] - number of buffers to allocate
  # Buffers are needed to support Fibre channel Extended Link Services.
  # Also used for SLI-2 FCP buffers, one per FCP command, and Mailbox commands.
  num-bufs=1024;

  # topology:  link topology for initializing the Fibre Channel connection.
  #          0 = attempt loop mode, if it fails attempt point-to-point mode
  #          2 = attempt point-to-point mode only
  #          4 = attempt loop mode only
  #          6 = attempt point-to-point mode, if it fails attempt loop mode
  # Set point-to-point mode if you want to run as an N_Port.
  # Set loop mode if you want to run as an NL_Port.
  topology=4;

  # Set a preferred ALPA for the adapter, only valid if topology is loop.
  # lpfc0-assign-alpa=2;  Request ALPA 2 for lpfc0

  # ip-class:  FC class (2 or 3) to use for the IP protocol.
  ip-class=3;

  # fcp-class:  FC class (2 or 3) to use for the FCP protocol.
  fcp-class=3;

  # Use ADISC for FCP rediscovery instead of PLOGI.
  use-adisc=0;

  # Extra IO timeout [0 to 255 secs] for fabrics
  extra-io-tmo=0;
```

```
# Number of 4k STREAMS buffers [64 to 1024] to post to IP ring.
post-ip-buf=128;

# Use dqfull-throttle-up-time [0 to 30 secs] to specify when to increment
# the current Q depth.
dqfull-throttle-up-time=1;

# Increment the current Q depth by dqfull-throttle-up-inc [0 to 128]
dqfull-throttle-up-inc=1;

# Use ACK0, instead of ACK1 for class 2 acknowledgement.
ack0=0;

# cr-delay: Coalesce Response Delay
# This value specifies a count of milliseconds [0 to 63] after which an
# interrupt response is generated if cr-count has not been satisfied.
# This value is set to 0 to disable the Coalesce Response feature.
cr-delay=0;

# cr-count: Coalesce Response Count
# This value specifies a count of I/O completions [1 to 255] after which an
# interrupt response is generated. This feature is disabled if cr-delay is
# set to 0.
cr-count=0;

# discovery-threads [1 to 32] - This value specifies the maximum number of
# ELS commands during discovery
discovery-threads=1;

# link-speed:  link speed selection for initializing the Fibre Channel connection.
#       0 = auto select (default)
#       1 = 1 Gigabaud
#       2 = 2 Gigabaud
#       4 = 4 Gigabaud
link-speed=0;

# fdmi-on:  0 = disable fdmi
#           1 = enable fdmi without registration of "host name" port attribute
#           2 = enable fdmi and "host name" port attribute
fdmi-on=0;

# Used only by i386 FCP (SCSI)
# flow_control="duplx" queue="qfifo" disk="scdk" tape="sctp";
```

APPENDIX C: TESTED STORAGE CONFIGURATION (TSC) CREATION

Configuring the ETERNUS8000 Storage Array

The ETERNUS8000 Storage Array is configured using an interactive on-line tool called ETERNUSmgr. When an ETERNUS8000 unit is delivered from the factory, there are a set of default RAID Groups and LUNs defined, and the tool is used to modify the configuration to that needed in the customer environment. The following paragraphs outline use of this tool to define the configuration outlined within this FDR. The primary definitions for use in making the configuration are provided through an Excel spreadsheet, called a Design Sheet. The Design sheet for the TSC may be accessed via the following URLs:

Design Sheet/Configuration Plan

This design sheet is developed by the Fujitsu SE, in consultation with the customer, and is provided to the Fujitsu factory when the order for the system is placed. The factory will configure the system according to this design, using internal Fujitsu tools.

Should a customer need to change the delivered configuration, then a series of steps must be followed, using ETERNUSmgr. The User Guide for the ETERNUSmgr is available for download from:

http://www.fujitsu.com/downloads/STRSYS/system/e8kmgrm700m1100-e4kmgrm300m500_setting.pdf

To define a new RAID Group the following steps are used:

1. Assuming that there are available drives to assign to a new RAID Group, select "Setting RAID / Setting Host" in the Main menu.
2. Select "Create RAID Group" in the Setting RAID / Setting Host menu
3. The Create RAID Group screen will be presented, with the available drives shown. Select the drives to be included in the RAID Group and the desired RAID Level, leaving the Assigned CM selection to Auto, and click the "Set" button. A confirmation screen is provided before the action is committed.
4. Additional RAID Groups can be defined by repeating the process, or the user may move directly to the Create Logical Volume screen noted below.

It is necessary to define one or more Logical Volumes within each of the defined RAID Groups, using the following steps:

1. Again, select "Setting RAID / Setting Host" in the Main menu.
2. Select "Create Logical Volume" in the Setting RAID / Setting Host menu.
3. The Create Logical Volume screen will be presented, with the current Logical Volume List shown. Select "Register Logical volume".
4. The Create Logical Volume Screen (Volume Creation) screen will be presented, with a list of the RAID Groups defined, and the capacity of each (in MiB). Select the RAID Group in which a Logical Volume is to be defined.

5. Select an Open type of volume with the Capacity desired. Up to the entire RAID Group may be used by putting in the capacity listed for the selected RAID Group, and click the "Set" button. A confirmation screen is provided before the action is committed.
6. Additional Logical Volumes can be defined by repeating the process for other RAID Groups, or the user may return to the Main menu to continue.

The configuration plan for the SPC-1 Benchmark configuration has a PRIMEPOWER 2500 server directly connected from sixty-four HBAs to Channel Adapter ports, 64 CA port connections in all. Each port was set up using the following

1. Again, select "Setting RAID / Setting Host" in the Main menu. Select "Set CA Parameters' in the Setting RAID / Setting Host menu.
2. The Set CA Parameters CA Selection screen will be presented. Select the CA Port for which the parameters are to be set, based on the configuration plan.
3. The Set CA Parameters screen will be presented. As this is a direct connection from the server HBA port to the storage CA port, the default selection of FC-AL Connection, Loop-Id (Manual), 0x00, Class 3, and Affinity Mode Off with default Host Response apply. The only item that was changed for the benchmark was the selection of 2Gbit for the Transfer Rate.
4. With the selections complete, click the "Set" button to reach the confirmation screen – click "OK" to apply the selection for the port.

The configuration plan for the SPC-1 Benchmark configuration assigns the 45 Logical Volumes as LUNs 0-44 on each of the Channel Adapter ports. There are 1440 Logical Volumes in the defined configuration, 18 on each of the 80 RAID Groups, according to the configuration plan. The following steps are used to set the LUN mapping for each of the CA ports:

1. Again, select "Setting RAID / Setting Host" in the Main menu.
2. Select "Set LUN Mapping" in the Setting RAID / Setting Host menu.
3. The Set LUN Mapping CA Selection screen will be presented. Select the CA Port that needs the LUNs to be mapped.
4. The Set LUN Mapping Volume Selection screen will be presented. Using the information on the configuration planning sheets, the "Set Range" mode should be selected, the range of LUN#s to be mapped, and the starting Logical Volume# specified, to define the set of mapping to be applied.
5. The "Open Volume List" facility can be used to identify the Logical Volumes that are defined, and which can be mapped within the CA port. Once the mapping parameters are set, click the "Execute" button to set up this part of the mapping. Additional ranges can be selected and set up for mapping on the port. Once all of the desired mapping has been set up in the list provided, click on the "Set" button to proceed to the confirmation screen – click "OK" to apply the mapping to the port definitions.

The configuration plan also includes Hot Spare drives, which are defined in much the same way as RAID Groups, using the following steps:

1. Select "Setting RAID / Setting Host" in the Main menu
2. Select "Create Hot Spare" in the Setting RAID / Setting Host menu
3. The Create Hot Spare selection screen will be presented. Select the drives to be designated as Hot Spare drives, according to the configuration plan, and click the "Set" button to proceed to the confirmation screen – click "OK" to apply the designations of Hot Spare to the selected drives.

Each step along the way to completing the configuration does a small part, and the configuration plan provides the details of the specific entries that are defined, using the ETERNUSmgr interface. For most customer systems, where the design sheets provide the complete configuration plan, the ETERNUS8000 system is pre-configured at the factory. However, when the plan is not complete or not supplied with an order, a default configuration will be applied by the factory, based on the complement of components ordered.

Tested Storage Configuration (TSC) Creation/Configuration Scripts and Commands

The following script (**makesol**), files and commands were used to create and configure the logical representation of the TSC used in the benchmark measurement for the ETERNUS8000 Model 1100.

1. makesol

The **makesol** script is used to create the Solaris Volume Manager (SVM) logical volumes based on a configuration description file for each logical Host System. This script is invoked for each logical Host System as follows:

./makesol Test_I02_Views_I02-5-1_view-1_svmake.txt

./makesol Test_I02_Views_I02-5-1_view-2_svmake.txt

The configuration description files are created by a macro within the Configuration Plan Excel workbook and contain the list of the raw disks that are used to create the SVM logical volumes assigned to ASU1, ASU2, and ASU3.

The content of the **makesol** script two configuration description files, **Test_I02_Views_I02-5-1_view-1_svmake.txt** and **Test_I02_Views_I02-5-1_view-2_svmake.txt**, appear below.

makesol

```
#!/bin/ksh
# Usage: usage
#         makesol configFile
#
LABELFILE="/tmp/makesollabel"
STATFILE="/tmp/makesolstat"
AWK=nawk
usage()
{
        echo "\nUsage: $0 configFile\n"
        exit 1
}
```

```
labelDisk()
{
   echo "l" > $LABELFILE
   echo "q" >> $LABELFILE
   format -s -f $LABELFILE $1
}

checkStat()
{
   typeset -i i=0
   del1=`grep $1 $STATFILE|$AWK '{ print $1 }'`
   if [ "$del1" != "" ] ; then
          for del in $del1
          do
                 i=0
                 while (( $i < $delete ))
                 do
                        if [ ${DELETE[(($i+1))]} == $del ] ; then
                               break
                        fi
                        i=$i+1
                 done
                 if (( $i == $delete )) ; then
                        delete=$delete+1
                        DELETE[$delete]=$del
                 fi
          done
   fi
}

getDiskSlice()
{
   vDisks=""
   for disk in ${DISKS[$1]}
   do
          ndisk=`echo $disk|$AWK 'BEGIN { FS="s"} ; { print $1 }'`
          vDisks=$vDisks$ndisk"s"$2" "
   done
}

makevol()
{
   typeset -i count=0
   typeset -i i=0
   typeset -i vcount
        tmp=`/usr/sbin/metastat -p|$AWK '{ print substr( $1, 2, length($1)-1 )}'`
   if [ "$tmp" == "" ] ; then
          i=0
   else
          for dgroup in $tmp
          do
                 if (( $dgroup > $i )) ; then
```

```
                        i=$dgroup
                fi
        done
        i=$i+1
    fi
    while (( $count < $groups ))
    do
        count=$count+1
#echo "/usr/sbin/metainit d$i 1 ${DISK_COUNT[$count]} ${DISKS[$count]}
${STRIPE[$count]}"
        tmp=`/usr/sbin/metainit d$i 1 ${DISK_COUNT[$count]} ${DISKS[$count]}
${STRIPE[$count]}`
        i=$i+1
        if [ "${VCOUNT[$count]}" != "" ] ; then
                vcount=1
                while (( $vcount < ${VCOUNT[$count]} ))
                do
                        getSlice $vcount
                        getDiskSlice $count $num
                        tmp=`/usr/sbin/metainit d$i 1 ${DISK_COUNT[$count]} $vDisks
${STRIPE[$count]}`
                        i=$i+1
                        vcount=$vcount+1
                done
        fi
    done
}

checkDisk()
{
    typeset -i i=0
    tmp=$1"s"
    test=`grep $tmp /etc/vfstab`
    if [ "$test" != "" ] ; then
        echo "Found disk $1 in /etc/vfstab, we really shouldn't use it here"
        exit 4
    fi
    while (( $i < $groups ))
    do
        i=$i+1
        for disk in ${DISKS[$i]}
        do
                tmp=$1"s0"
                if [ "$disk" == $tmp ] ; then
                        echo "disk $1 repeated at line $lineno"
                        exit 4
                fi
        done
      done
      disks=$disks+1
    part=$1"s0"
    DISKS[$groups]=${DISKS[$groups]}$part" "
    tmp=`prtvtoc -h /dev/dsk/$part 2>/dev/null`
```

```
      if [ $? != 0 ] ; then
             labelDisk $part
             tmp=`prtvtoc -h /dev/dsk/$part 2>/dev/null`
             if [ $? != 0 ] ; then
                    echo "prtvtoc failed for $part"
                    exit 4
             fi
      fi
      checkStat $1"s"
   }

   getSlice()
   {
      num=0
           case $1 in
           0)
             num=0
                    ;;
           1)
                    num=1
                    ;;
           2|3|4|5|6)
                    (( num=$1+1 ))
                    ;;
           esac
   }

   setVtoc()
   {
      typeset -i count=0
           typeset -i i=0
           while (( $i < $groups ))
           do
                    i=$i+1
                    for disk in ${DISKS[$i]}
                    do
                     if [ "${VCOUNT[$i]}" != "" ] ; then
                            sectors=`prtvtoc /dev/dsk/$disk 2>/dev/null|grep
   "accessible cylinders"|$AWK '{ print $2 }'`
                            seccyl=`prtvtoc /dev/dsk/$disk 2>/dev/null|grep
   "sectors/cylinder"|$AWK '{ print $2 }'`
                            (( sectors=$sectors-1 ))
                     fi
                     tmp=`prtvtoc -h /dev/dsk/$disk 2>/dev/null`
                     set $tmp
                     while (( $# > 5 ))
                     do
                            if (( $1 == 2 )) ; then
                                   if [ "${VCOUNT[$i]}" == "" ] ; then
                                                echo "0 4 $3 $4 $5 $6" > $LABELFILE
                                   else
                                          echo "* labelfile" > $LABELFILE
                                          (( secCount=$sectors/${VCOUNT[$i]} ))
```

```
                                        count=0
                                                (( sc=$secCount*$seccyl ))
                                                fs=$seccyl
                                        while (( $count < ${VCOUNT[$i]} ))
                                        do
                                               (( ls=$fs+$sc ))
                                               getSlice $count
                                               echo "$num 4 $3 $fs $sc $ls" >>
   $LABELFILE
                                                            count=$count+1
                                               (( fs=$fs+$sc ))
                                        done
                                fi
                                        echo "$1 $2 $3 $4 $5 $6" >> $LABELFILE
                                        tmp=`fmthard -s $LABELFILE /dev/rdsk/$disk`
                                        break
                        fi
                        shift 6
                done
                done
        done
   }

   delGroups()
   {
      typeset -i i=0
      if [ $DELETE_ALL == "yes" ] ; then
             tmp=`/usr/sbin/metastat -p |$AWK '{ print $1 }'`
             for del in $tmp
             do
                    tmp=`/usr/sbin/metaclear $del`
                    if [ $? != 0 ] ; then
                                  echo "Failed to delete volume $del"
                                  exit 4
                    fi
             done
             return
      fi
      while (( $i < $delete ))
      do
             i=$i+1
             tmp=`/usr/sbin/metaclear ${DELETE[$i]}`
             if [ $? != 0 ] ; then
                    echo "Failed to delete volume ${DELETE[$i]}"
                    exit 4
             fi
      done
   }

   addDisks()
   {
          typeset -i diskNum=0
          typeset -i count=$name
```

```
        typeset -i jump=1
        diskNum=${label#*d}
        if (( $diskNum < 10 ))
        then
                diskPrefix=`echo $label|awk '{ print substr( $1, 0, length($1)-1 )
}'`
        elif (( $diskNum < 100 ))
        then
                diskPrefix=`echo $label|awk '{ print substr( $1, 0, length($1)-2 )
}'`
        else
                diskPrefix=`echo $label|awk '{ print substr( $1, 0, length($1)-3 )
}'`
        fi
        if [ "$skip" != "" ]
        then
                jump=$skip
        fi
        count=$count-1
        while [ $count != 0 ]
        do
                count=$count-1
                diskNum=$diskNum+$jump
                diskName=$diskPrefix$diskNum
                checkDisk $diskName
        done

}

checkConfig()
{
        typeset -i lineno=1
        invg="no"
   DELETE_ALL="no"
        while read -r label name skip
        do
                case $label in
                "VOLUME_GROUP:")
                        VGNAME=$VGNAME$name" "
                        invg="yes"
                        groups=$groups+1
                        getSize="yes"
                        ;;
                "#")
                        ;;
                "")
                        ;;
          "VOLUME")
                        if [ "$invg" != "yes" ]
                        then
                                echo "invalid line in config file line=$lineno
data=\"$label $name\""
                       echo "VOLUME line must be in a volume_group definition"
```

```
                                exit 4
                        fi
                tmp=`echo $name|grep ^[1-7]$`
                if [ "$tmp" == "" ] ; then
                        echo "invalid line in config file line=$lineno
data=\"$label $name\""
                        echo "VOLUME count must be from 1-7"
                        exit 4
                fi
                VCOUNT[groups]=$name
                ;;
               "STRIPE")
                        if [ "$invg" != "yes" ]
                        then
                                echo "invalid line in config file line=$lineno
data=\"$label $name\""
                                echo "STRIPE line must be in a volume_group
definition"
                                exit 4
                        fi
                        STRIPE[groups]="-i $name"
                        ;;
          "DELETE_ALL")
                DELETE_ALL="yes"
                ;;
               "END")
                DISK_COUNT[$groups]=$disks
                disks=0
                        invg="no"
                        ;;
                *)
                        if [ "$invg" != "yes" ]
                        then
                                echo "invalid line in config file line=$lineno
data=\"$label $name\""
                                exit 4
                        fi
                        diskName=$label
                        checkDisk $diskName
                        if [ "$name" != "" ]
                        then
                                addDisks
                        fi
                esac
                lineno=$lineno+1
        done < $CONFIG
}


# main()

        typeset -i delete=0
        typeset -i groups=0
```

```
        typeset -i disks=0
        test=`uname -a|grep "Linux"`
        if [ "$test" != "" ]
        then
                AWK=awk
        fi
    case $# in
    1)
          CONFIG=$1
          echo "Doing solvm config from $1"
          ;;
    *)
          usage
          ;;
    esac
    tmp=`/usr/sbin/metadb`
    if [ "$tmp" == "" ] ; then
          echo "No replica database is defined"
          exit 4
    fi
    tmp=`/usr/sbin/metastat -p > $STATFILE`
    checkConfig
    delGroups
    setVtoc
    makevol
```

Test_I02_Views_I02-5-1_view-1_svmake.txt

```
DELETE_ALL
VOLUME_GROUP: asu1-1 (d0)
STRIPE 8m
VOLUME 1
c120t16d4
c122t17d4
c163t18d4
c166t19d4
c96t16d4
c98t17d4
c101t18d4
c103t19d4
c35t16d4
c37t17d4
c38t18d4
c40t19d4
c27t16d4
c29t17d4
c30t18d4
c32t19d4
c120t16d13
c122t17d13
c163t18d13
c166t19d13
c96t16d13
```

```
c98t17d13
c101t18d13
c103t19d13
c35t16d13
c37t17d13
c38t18d13
c40t19d13
c27t16d13
c29t17d13
c30t18d13
c32t19d13
c120t16d22
c122t17d22
c163t18d22
c166t19d22
c96t16d22
c98t17d22
c101t18d22
c103t19d22
c35t16d22
c37t17d22
c38t18d22
c40t19d22
c27t16d22
c29t17d22
c30t18d22
c32t19d22
c120t16d31
c122t17d31
c163t18d31
c166t19d31
c96t16d31
c98t17d31
c101t18d31
c103t19d31
c35t16d31
c37t17d31
c38t18d31
c40t19d31
c27t16d31
c29t17d31
c30t18d31
c32t19d31
c120t16d40
c122t17d40
c163t18d40
c166t19d40
c96t16d40
c98t17d40
c101t18d40
c103t19d40
c35t16d40
c37t17d40
```

```
c38t18d40
c40t19d40
c27t16d40
c29t17d40
c30t18d40
c32t19d40
END
VOLUME_GROUP: asu1-2 (d1)
STRIPE 8m
VOLUME 1
c120t16d5
c122t17d5
c163t18d5
c166t19d5
c96t16d5
c98t17d5
c101t18d5
c103t19d5
c35t16d5
c37t17d5
c38t18d5
c40t19d5
c27t16d5
c29t17d5
c30t18d5
c32t19d5
c120t16d14
c122t17d14
c163t18d14
c166t19d14
c96t16d14
c98t17d14
c101t18d14
c103t19d14
c35t16d14
c37t17d14
c38t18d14
c40t19d14
c27t16d14
c29t17d14
c30t18d14
c32t19d14
c120t16d23
c122t17d23
c163t18d23
c166t19d23
c96t16d23
c98t17d23
c101t18d23
c103t19d23
c35t16d23
c37t17d23
c38t18d23
```

```
c40t19d23
c27t16d23
c29t17d23
c30t18d23
c32t19d23
c120t16d32
c122t17d32
c163t18d32
c166t19d32
c96t16d32
c98t17d32
c101t18d32
c103t19d32
c35t16d32
c37t17d32
c38t18d32
c40t19d32
c27t16d32
c29t17d32
c30t18d32
c32t19d32
c120t16d41
c122t17d41
c163t18d41
c166t19d41
c96t16d41
c98t17d41
c101t18d41
c103t19d41
c35t16d41
c37t17d41
c38t18d41
c40t19d41
c27t16d41
c29t17d41
c30t18d41
c32t19d41
END
VOLUME_GROUP: asu1-3 (d2)
STRIPE 8m
VOLUME 1
c120t16d6
c122t17d6
c163t18d6
c166t19d6
c96t16d6
c98t17d6
c101t18d6
c103t19d6
c35t16d6
c37t17d6
c38t18d6
c40t19d6
```

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c27t16d6
c29t17d6
c30t18d6
c32t19d6
c120t16d15
c122t17d15
c163t18d15
c166t19d15
c96t16d15
c98t17d15
c101t18d15
c103t19d15
c35t16d15
c37t17d15
c38t18d15
c40t19d15
c27t16d15
c29t17d15
c30t18d15
c32t19d15
c120t16d24
c122t17d24
c163t18d24
c166t19d24
c96t16d24
c98t17d24
c101t18d24
c103t19d24
c35t16d24
c37t17d24
c38t18d24
c40t19d24
c27t16d24
c29t17d24
c30t18d24
c32t19d24
c120t16d33
c122t17d33
c163t18d33
c166t19d33
c96t16d33
c98t17d33
c101t18d33
c103t19d33
c35t16d33
c37t17d33
c38t18d33
c40t19d33
c27t16d33
c29t17d33
c30t18d33
c32t19d33
c120t16d42
```

```
c122t17d42
c163t18d42
c166t19d42
c96t16d42
c98t17d42
c101t18d42
c103t19d42
c35t16d42
c37t17d42
c38t18d42
c40t19d42
c27t16d42
c29t17d42
c30t18d42
c32t19d42
END
VOLUME_GROUP: asu1-4 (d3)
STRIPE 8m
VOLUME 1
c120t16d7
c122t17d7
c163t18d7
c166t19d7
c96t16d7
c98t17d7
c101t18d7
c103t19d7
c35t16d7
c37t17d7
c38t18d7
c40t19d7
c27t16d7
c29t17d7
c30t18d7
c32t19d7
c120t16d16
c122t17d16
c163t18d16
c166t19d16
c96t16d16
c98t17d16
c101t18d16
c103t19d16
c35t16d16
c37t17d16
c38t18d16
c40t19d16
c27t16d16
c29t17d16
c30t18d16
c32t19d16
c120t16d25
c122t17d25
```

```
c163t18d25
c166t19d25
c96t16d25
c98t17d25
c101t18d25
c103t19d25
c35t16d25
c37t17d25
c38t18d25
c40t19d25
c27t16d25
c29t17d25
c30t18d25
c32t19d25
c120t16d34
c122t17d34
c163t18d34
c166t19d34
c96t16d34
c98t17d34
c101t18d34
c103t19d34
c35t16d34
c37t17d34
c38t18d34
c40t19d34
c27t16d34
c29t17d34
c30t18d34
c32t19d34
c120t16d43
c122t17d43
c163t18d43
c166t19d43
c96t16d43
c98t17d43
c101t18d43
c103t19d43
c35t16d43
c37t17d43
c38t18d43
c40t19d43
c27t16d43
c29t17d43
c30t18d43
c32t19d43
END
VOLUME_GROUP: asu1-5 (d4)
STRIPE 8m
VOLUME 1
c157t16d1
c160t17d1
c124t18d1
```

```
c126t19d1
c97t16d1
c99t17d1
c100t18d1
c102t19d1
c34t16d1
c36t17d1
c39t18d1
c41t19d1
c26t16d1
c28t17d1
c31t18d1
c33t19d1
c157t16d10
c160t17d10
c124t18d10
c126t19d10
c97t16d10
c99t17d10
c100t18d10
c102t19d10
c34t16d10
c36t17d10
c39t18d10
c41t19d10
c26t16d10
c28t17d10
c31t18d10
c33t19d10
c157t16d19
c160t17d19
c124t18d19
c126t19d19
c97t16d19
c99t17d19
c100t18d19
c102t19d19
c34t16d19
c36t17d19
c39t18d19
c41t19d19
c26t16d19
c28t17d19
c31t18d19
c33t19d19
c157t16d28
c160t17d28
c124t18d28
c126t19d28
c97t16d28
c99t17d28
c100t18d28
c102t19d28
```

```
c34t16d28
c36t17d28
c39t18d28
c41t19d28
c26t16d28
c28t17d28
c31t18d28
c33t19d28
c157t16d37
c160t17d37
c124t18d37
c126t19d37
c97t16d37
c99t17d37
c100t18d37
c102t19d37
c34t16d37
c36t17d37
c39t18d37
c41t19d37
c26t16d37
c28t17d37
c31t18d37
c33t19d37
END
VOLUME_GROUP: asu1-6 (d5)
STRIPE 8m
VOLUME 1
c157t16d2
c160t17d2
c124t18d2
c126t19d2
c97t16d2
c99t17d2
c100t18d2
c102t19d2
c34t16d2
c36t17d2
c39t18d2
c41t19d2
c26t16d2
c28t17d2
c31t18d2
c33t19d2
c157t16d11
c160t17d11
c124t18d11
c126t19d11
c97t16d11
c99t17d11
c100t18d11
c102t19d11
c34t16d11
```

```
c36t17d11
c39t18d11
c41t19d11
c26t16d11
c28t17d11
c31t18d11
c33t19d11
c157t16d20
c160t17d20
c124t18d20
c126t19d20
c97t16d20
c99t17d20
c100t18d20
c102t19d20
c34t16d20
c36t17d20
c39t18d20
c41t19d20
c26t16d20
c28t17d20
c31t18d20
c33t19d20
c157t16d29
c160t17d29
c124t18d29
c126t19d29
c97t16d29
c99t17d29
c100t18d29
c102t19d29
c34t16d29
c36t17d29
c39t18d29
c41t19d29
c26t16d29
c28t17d29
c31t18d29
c33t19d29
c157t16d38
c160t17d38
c124t18d38
c126t19d38
c97t16d38
c99t17d38
c100t18d38
c102t19d38
c34t16d38
c36t17d38
c39t18d38
c41t19d38
c26t16d38
c28t17d38
```

```
c31t18d38
c33t19d38
END
VOLUME_GROUP: asu1-7 (d6)
STRIPE 8m
VOLUME 1
c157t16d3
c160t17d3
c124t18d3
c126t19d3
c97t16d3
c99t17d3
c100t18d3
c102t19d3
c34t16d3
c36t17d3
c39t18d3
c41t19d3
c26t16d3
c28t17d3
c31t18d3
c33t19d3
c157t16d12
c160t17d12
c124t18d12
c126t19d12
c97t16d12
c99t17d12
c100t18d12
c102t19d12
c34t16d12
c36t17d12
c39t18d12
c41t19d12
c26t16d12
c28t17d12
c31t18d12
c33t19d12
c157t16d21
c160t17d21
c124t18d21
c126t19d21
c97t16d21
c99t17d21
c100t18d21
c102t19d21
c34t16d21
c36t17d21
c39t18d21
c41t19d21
c26t16d21
c28t17d21
c31t18d21
```

```
c33t19d21
c157t16d30
c160t17d30
c124t18d30
c126t19d30
c97t16d30
c99t17d30
c100t18d30
c102t19d30
c34t16d30
c36t17d30
c39t18d30
c41t19d30
c26t16d30
c28t17d30
c31t18d30
c33t19d30
c157t16d39
c160t17d39
c124t18d39
c126t19d39
c97t16d39
c99t17d39
c100t18d39
c102t19d39
c34t16d39
c36t17d39
c39t18d39
c41t19d39
c26t16d39
c28t17d39
c31t18d39
c33t19d39
END
VOLUME_GROUP: asu1-8 (d7)
STRIPE 8m
VOLUME 1
c157t16d4
c160t17d4
c124t18d4
c126t19d4
c97t16d4
c99t17d4
c100t18d4
c102t19d4
c34t16d4
c36t17d4
c39t18d4
c41t19d4
c26t16d4
c28t17d4
c31t18d4
c33t19d4
```

```
c157t16d13
c160t17d13
c124t18d13
c126t19d13
c97t16d13
c99t17d13
c100t18d13
c102t19d13
c34t16d13
c36t17d13
c39t18d13
c41t19d13
c26t16d13
c28t17d13
c31t18d13
c33t19d13
c157t16d22
c160t17d22
c124t18d22
c126t19d22
c97t16d22
c99t17d22
c100t18d22
c102t19d22
c34t16d22
c36t17d22
c39t18d22
c41t19d22
c26t16d22
c28t17d22
c31t18d22
c33t19d22
c157t16d31
c160t17d31
c124t18d31
c126t19d31
c97t16d31
c99t17d31
c100t18d31
c102t19d31
c34t16d31
c36t17d31
c39t18d31
c41t19d31
c26t16d31
c28t17d31
c31t18d31
c33t19d31
c157t16d40
c160t17d40
c124t18d40
c126t19d40
c97t16d40
```

```
c99t17d40
c100t18d40
c102t19d40
c34t16d40
c36t17d40
c39t18d40
c41t19d40
c26t16d40
c28t17d40
c31t18d40
c33t19d40
END
VOLUME_GROUP: asu2-1 (d8)
STRIPE 8m
VOLUME 1
c120t16d0
c122t17d0
c163t18d0
c166t19d0
c96t16d0
c98t17d0
c101t18d0
c103t19d0
c35t16d0
c37t17d0
c38t18d0
c40t19d0
c27t16d0
c29t17d0
c30t18d0
c32t19d0
c120t16d9
c122t17d9
c163t18d9
c166t19d9
c96t16d9
c98t17d9
c101t18d9
c103t19d9
c35t16d9
c37t17d9
c38t18d9
c40t19d9
c27t16d9
c29t17d9
c30t18d9
c32t19d9
c120t16d18
c122t17d18
c163t18d18
c166t19d18
c96t16d18
c98t17d18
```

```
c101t18d18
c103t19d18
c35t16d18
c37t17d18
c38t18d18
c40t19d18
c27t16d18
c29t17d18
c30t18d18
c32t19d18
c120t16d27
c122t17d27
c163t18d27
c166t19d27
c96t16d27
c98t17d27
c101t18d27
c103t19d27
c35t16d27
c37t17d27
c38t18d27
c40t19d27
c27t16d27
c29t17d27
c30t18d27
c32t19d27
c120t16d36
c122t17d36
c163t18d36
c166t19d36
c96t16d36
c98t17d36
c101t18d36
c103t19d36
c35t16d36
c37t17d36
c38t18d36
c40t19d36
c27t16d36
c29t17d36
c30t18d36
c32t19d36
END
VOLUME_GROUP: asu2-2 (d9)
STRIPE 8m
VOLUME 1
c120t16d1
c122t17d1
c163t18d1
c166t19d1
c96t16d1
c98t17d1
c101t18d1
```

```
c103t19d1
c35t16d1
c37t17d1
c38t18d1
c40t19d1
c27t16d1
c29t17d1
c30t18d1
c32t19d1
c120t16d10
c122t17d10
c163t18d10
c166t19d10
c96t16d10
c98t17d10
c101t18d10
c103t19d10
c35t16d10
c37t17d10
c38t18d10
c40t19d10
c27t16d10
c29t17d10
c30t18d10
c32t19d10
c120t16d19
c122t17d19
c163t18d19
c166t19d19
c96t16d19
c98t17d19
c101t18d19
c103t19d19
c35t16d19
c37t17d19
c38t18d19
c40t19d19
c27t16d19
c29t17d19
c30t18d19
c32t19d19
c120t16d28
c122t17d28
c163t18d28
c166t19d28
c96t16d28
c98t17d28
c101t18d28
c103t19d28
c35t16d28
c37t17d28
c38t18d28
c40t19d28
```

```
c27t16d28
c29t17d28
c30t18d28
c32t19d28
c120t16d37
c122t17d37
c163t18d37
c166t19d37
c96t16d37
c98t17d37
c101t18d37
c103t19d37
c35t16d37
c37t17d37
c38t18d37
c40t19d37
c27t16d37
c29t17d37
c30t18d37
c32t19d37
END
VOLUME_GROUP: asu2-3 (d10)
STRIPE 8m
VOLUME 1
c120t16d2
c122t17d2
c163t18d2
c166t19d2
c96t16d2
c98t17d2
c101t18d2
c103t19d2
c35t16d2
c37t17d2
c38t18d2
c40t19d2
c27t16d2
c29t17d2
c30t18d2
c32t19d2
c120t16d11
c122t17d11
c163t18d11
c166t19d11
c96t16d11
c98t17d11
c101t18d11
c103t19d11
c35t16d11
c37t17d11
c38t18d11
c40t19d11
c27t16d11
```

```
    c29t17d11
    c30t18d11
    c32t19d11
    c120t16d20
    c122t17d20
    c163t18d20
    c166t19d20
    c96t16d20
    c98t17d20
    c101t18d20
    c103t19d20
    c35t16d20
    c37t17d20
    c38t18d20
    c40t19d20
    c27t16d20
    c29t17d20
    c30t18d20
    c32t19d20
    c120t16d29
    c122t17d29
    c163t18d29
    c166t19d29
    c96t16d29
    c98t17d29
    c101t18d29
    c103t19d29
    c35t16d29
    c37t17d29
    c38t18d29
    c40t19d29
    c27t16d29
    c29t17d29
    c30t18d29
    c32t19d29
    c120t16d38
    c122t17d38
    c163t18d38
    c166t19d38
    c96t16d38
    c98t17d38
    c101t18d38
    c103t19d38
    c35t16d38
    c37t17d38
    c38t18d38
    c40t19d38
    c27t16d38
    c29t17d38
    c30t18d38
    c32t19d38
    END
    VOLUME_GROUP: asu2-4 (d11)
```

```
STRIPE 8m
VOLUME 1
c120t16d3
c122t17d3
c163t18d3
c166t19d3
c96t16d3
c98t17d3
c101t18d3
c103t19d3
c35t16d3
c37t17d3
c38t18d3
c40t19d3
c27t16d3
c29t17d3
c30t18d3
c32t19d3
c120t16d12
c122t17d12
c163t18d12
c166t19d12
c96t16d12
c98t17d12
c101t18d12
c103t19d12
c35t16d12
c37t17d12
c38t18d12
c40t19d12
c27t16d12
c29t17d12
c30t18d12
c32t19d12
c120t16d21
c122t17d21
c163t18d21
c166t19d21
c96t16d21
c98t17d21
c101t18d21
c103t19d21
c35t16d21
c37t17d21
c38t18d21
c40t19d21
c27t16d21
c29t17d21
c30t18d21
c32t19d21
c120t16d30
c122t17d30
c163t18d30
```

```
c166t19d30
c96t16d30
c98t17d30
c101t18d30
c103t19d30
c35t16d30
c37t17d30
c38t18d30
c40t19d30
c27t16d30
c29t17d30
c30t18d30
c32t19d30
c120t16d39
c122t17d39
c163t18d39
c166t19d39
c96t16d39
c98t17d39
c101t18d39
c103t19d39
c35t16d39
c37t17d39
c38t18d39
c40t19d39
c27t16d39
c29t17d39
c30t18d39
c32t19d39
END
VOLUME_GROUP: asu2-5 (d12)
STRIPE 8m
VOLUME 1
c157t16d5
c160t17d5
c124t18d5
c126t19d5
c97t16d5
c99t17d5
c100t18d5
c102t19d5
c34t16d5
c36t17d5
c39t18d5
c41t19d5
c26t16d5
c28t17d5
c31t18d5
c33t19d5
c157t16d14
c160t17d14
c124t18d14
c126t19d14
```

```
c97t16d14
c99t17d14
c100t18d14
c102t19d14
c34t16d14
c36t17d14
c39t18d14
c41t19d14
c26t16d14
c28t17d14
c31t18d14
c33t19d14
c157t16d23
c160t17d23
c124t18d23
c126t19d23
c97t16d23
c99t17d23
c100t18d23
c102t19d23
c34t16d23
c36t17d23
c39t18d23
c41t19d23
c26t16d23
c28t17d23
c31t18d23
c33t19d23
c157t16d32
c160t17d32
c124t18d32
c126t19d32
c97t16d32
c99t17d32
c100t18d32
c102t19d32
c34t16d32
c36t17d32
c39t18d32
c41t19d32
c26t16d32
c28t17d32
c31t18d32
c33t19d32
c157t16d41
c160t17d41
c124t18d41
c126t19d41
c97t16d41
c99t17d41
c100t18d41
c102t19d41
c34t16d41
```

```
c36t17d41
c39t18d41
c41t19d41
c26t16d41
c28t17d41
c31t18d41
c33t19d41
END
VOLUME_GROUP: asu2-6 (d13)
STRIPE 8m
VOLUME 1
c157t16d6
c160t17d6
c124t18d6
c126t19d6
c97t16d6
c99t17d6
c100t18d6
c102t19d6
c34t16d6
c36t17d6
c39t18d6
c41t19d6
c26t16d6
c28t17d6
c31t18d6
c33t19d6
c157t16d15
c160t17d15
c124t18d15
c126t19d15
c97t16d15
c99t17d15
c100t18d15
c102t19d15
c34t16d15
c36t17d15
c39t18d15
c41t19d15
c26t16d15
c28t17d15
c31t18d15
c33t19d15
c157t16d24
c160t17d24
c124t18d24
c126t19d24
c97t16d24
c99t17d24
c100t18d24
c102t19d24
c34t16d24
c36t17d24
```

```
c39t18d24
c41t19d24
c26t16d24
c28t17d24
c31t18d24
c33t19d24
c157t16d33
c160t17d33
c124t18d33
c126t19d33
c97t16d33
c99t17d33
c100t18d33
c102t19d33
c34t16d33
c36t17d33
c39t18d33
c41t19d33
c26t16d33
c28t17d33
c31t18d33
c33t19d33
c157t16d42
c160t17d42
c124t18d42
c126t19d42
c97t16d42
c99t17d42
c100t18d42
c102t19d42
c34t16d42
c36t17d42
c39t18d42
c41t19d42
c26t16d42
c28t17d42
c31t18d42
c33t19d42
END
VOLUME_GROUP: asu2-7 (d14)
STRIPE 8m
VOLUME 1
c157t16d7
c160t17d7
c124t18d7
c126t19d7
c97t16d7
c99t17d7
c100t18d7
c102t19d7
c34t16d7
c36t17d7
c39t18d7
```

```
c41t19d7
c26t16d7
c28t17d7
c31t18d7
c33t19d7
c157t16d16
c160t17d16
c124t18d16
c126t19d16
c97t16d16
c99t17d16
c100t18d16
c102t19d16
c34t16d16
c36t17d16
c39t18d16
c41t19d16
c26t16d16
c28t17d16
c31t18d16
c33t19d16
c157t16d25
c160t17d25
c124t18d25
c126t19d25
c97t16d25
c99t17d25
c100t18d25
c102t19d25
c34t16d25
c36t17d25
c39t18d25
c41t19d25
c26t16d25
c28t17d25
c31t18d25
c33t19d25
c157t16d34
c160t17d34
c124t18d34
c126t19d34
c97t16d34
c99t17d34
c100t18d34
c102t19d34
c34t16d34
c36t17d34
c39t18d34
c41t19d34
c26t16d34
c28t17d34
c31t18d34
c33t19d34
```

```
c157t16d43
c160t17d43
c124t18d43
c126t19d43
c97t16d43
c99t17d43
c100t18d43
c102t19d43
c34t16d43
c36t17d43
c39t18d43
c41t19d43
c26t16d43
c28t17d43
c31t18d43
c33t19d43
END
VOLUME_GROUP: asu2-8 (d15)
STRIPE 8m
VOLUME 1
c157t16d8
c160t17d8
c124t18d8
c126t19d8
c97t16d8
c99t17d8
c100t18d8
c102t19d8
c34t16d8
c36t17d8
c39t18d8
c41t19d8
c26t16d8
c28t17d8
c31t18d8
c33t19d8
c157t16d17
c160t17d17
c124t18d17
c126t19d17
c97t16d17
c99t17d17
c100t18d17
c102t19d17
c34t16d17
c36t17d17
c39t18d17
c41t19d17
c26t16d17
c28t17d17
c31t18d17
c33t19d17
c157t16d26
```

```
c160t17d26
c124t18d26
c126t19d26
c97t16d26
c99t17d26
c100t18d26
c102t19d26
c34t16d26
c36t17d26
c39t18d26
c41t19d26
c26t16d26
c28t17d26
c31t18d26
c33t19d26
c157t16d35
c160t17d35
c124t18d35
c126t19d35
c97t16d35
c99t17d35
c100t18d35
c102t19d35
c34t16d35
c36t17d35
c39t18d35
c41t19d35
c26t16d35
c28t17d35
c31t18d35
c33t19d35
c157t16d44
c160t17d44
c124t18d44
c126t19d44
c97t16d44
c99t17d44
c100t18d44
c102t19d44
c34t16d44
c36t17d44
c39t18d44
c41t19d44
c26t16d44
c28t17d44
c31t18d44
c33t19d44
END
VOLUME_GROUP: asu3-1 (d16)
STRIPE 8m
VOLUME 1
c120t16d8
c122t17d8
```

```
c163t18d8
c166t19d8
c96t16d8
c98t17d8
c101t18d8
c103t19d8
c35t16d8
c37t17d8
c38t18d8
c40t19d8
c27t16d8
c29t17d8
c30t18d8
c32t19d8
c120t16d17
c122t17d17
c163t18d17
c166t19d17
c96t16d17
c98t17d17
c101t18d17
c103t19d17
c35t16d17
c37t17d17
c38t18d17
c40t19d17
c27t16d17
c29t17d17
c30t18d17
c32t19d17
c120t16d26
c122t17d26
c163t18d26
c166t19d26
c96t16d26
c98t17d26
c101t18d26
c103t19d26
c35t16d26
c37t17d26
c38t18d26
c40t19d26
c27t16d26
c29t17d26
c30t18d26
c32t19d26
c120t16d35
c122t17d35
c163t18d35
c166t19d35
c96t16d35
c98t17d35
c101t18d35
```

```
c103t19d35
c35t16d35
c37t17d35
c38t18d35
c40t19d35
c27t16d35
c29t17d35
c30t18d35
c32t19d35
c120t16d44
c122t17d44
c163t18d44
c166t19d44
c96t16d44
c98t17d44
c101t18d44
c103t19d44
c35t16d44
c37t17d44
c38t18d44
c40t19d44
c27t16d44
c29t17d44
c30t18d44
c32t19d44
END
VOLUME_GROUP: asu3-2 (d17)
STRIPE 8m
VOLUME 1
c157t16d0
c160t17d0
c124t18d0
c126t19d0
c97t16d0
c99t17d0
c100t18d0
c102t19d0
c34t16d0
c36t17d0
c39t18d0
c41t19d0
c26t16d0
c28t17d0
c31t18d0
c33t19d0
c157t16d9
c160t17d9
c124t18d9
c126t19d9
c97t16d9
c99t17d9
c100t18d9
c102t19d9
```

```
c34t16d9
c36t17d9
c39t18d9
c41t19d9
c26t16d9
c28t17d9
c31t18d9
c33t19d9
c157t16d18
c160t17d18
c124t18d18
c126t19d18
c97t16d18
c99t17d18
c100t18d18
c102t19d18
c34t16d18
c36t17d18
c39t18d18
c41t19d18
c26t16d18
c28t17d18
c31t18d18
c33t19d18
c157t16d27
c160t17d27
c124t18d27
c126t19d27
c97t16d27
c99t17d27
c100t18d27
c102t19d27
c34t16d27
c36t17d27
c39t18d27
c41t19d27
c26t16d27
c28t17d27
c31t18d27
c33t19d27
c157t16d36
c160t17d36
c124t18d36
c126t19d36
c97t16d36
c99t17d36
c100t18d36
c102t19d36
c34t16d36
c36t17d36
c39t18d36
c41t19d36
c26t16d36
```

```
c28t17d36
c31t18d36
c33t19d36
END
```

Test_I02_Views_I02-5-1_view-2_svmake.txt

```
DELETE_ALL
VOLUME_GROUP: asu1-1 (d0)
STRIPE 8m
VOLUME 1
c49t16d4
c53t17d4
c58t18d4
c62t19d4
c65t16d4
c69t17d4
c74t18d4
c78t19d4
c51t16d4
c55t17d4
c56t18d4
c60t19d4
c67t16d4
c71t17d4
c72t18d4
c76t19d4
c49t16d13
c53t17d13
c58t18d13
c62t19d13
c65t16d13
c69t17d13
c74t18d13
c78t19d13
c51t16d13
c55t17d13
c56t18d13
c60t19d13
c67t16d13
c71t17d13
c72t18d13
c76t19d13
c49t16d22
c53t17d22
c58t18d22
c62t19d22
c65t16d22
c69t17d22
c74t18d22
c78t19d22
c51t16d22
c55t17d22
```

```
c56t18d22
c60t19d22
c67t16d22
c71t17d22
c72t18d22
c76t19d22
c49t16d31
c53t17d31
c58t18d31
c62t19d31
c65t16d31
c69t17d31
c74t18d31
c78t19d31
c51t16d31
c55t17d31
c56t18d31
c60t19d31
c67t16d31
c71t17d31
c72t18d31
c76t19d31
c49t16d40
c53t17d40
c58t18d40
c62t19d40
c65t16d40
c69t17d40
c74t18d40
c78t19d40
c51t16d40
c55t17d40
c56t18d40
c60t19d40
c67t16d40
c71t17d40
c72t18d40
c76t19d40
END
VOLUME_GROUP: asu1-2 (d1)
STRIPE 8m
VOLUME 1
c49t16d5
c53t17d5
c58t18d5
c62t19d5
c65t16d5
c69t17d5
c74t18d5
c78t19d5
c51t16d5
c55t17d5
c56t18d5
```

```
c60t19d5
c67t16d5
c71t17d5
c72t18d5
c76t19d5
c49t16d14
c53t17d14
c58t18d14
c62t19d14
c65t16d14
c69t17d14
c74t18d14
c78t19d14
c51t16d14
c55t17d14
c56t18d14
c60t19d14
c67t16d14
c71t17d14
c72t18d14
c76t19d14
c49t16d23
c53t17d23
c58t18d23
c62t19d23
c65t16d23
c69t17d23
c74t18d23
c78t19d23
c51t16d23
c55t17d23
c56t18d23
c60t19d23
c67t16d23
c71t17d23
c72t18d23
c76t19d23
c49t16d32
c53t17d32
c58t18d32
c62t19d32
c65t16d32
c69t17d32
c74t18d32
c78t19d32
c51t16d32
c55t17d32
c56t18d32
c60t19d32
c67t16d32
c71t17d32
c72t18d32
c76t19d32
```

```
c49t16d41
c53t17d41
c58t18d41
c62t19d41
c65t16d41
c69t17d41
c74t18d41
c78t19d41
c51t16d41
c55t17d41
c56t18d41
c60t19d41
c67t16d41
c71t17d41
c72t18d41
c76t19d41
END
VOLUME_GROUP: asu1-3 (d2)
STRIPE 8m
VOLUME 1
c49t16d6
c53t17d6
c58t18d6
c62t19d6
c65t16d6
c69t17d6
c74t18d6
c78t19d6
c51t16d6
c55t17d6
c56t18d6
c60t19d6
c67t16d6
c71t17d6
c72t18d6
c76t19d6
c49t16d15
c53t17d15
c58t18d15
c62t19d15
c65t16d15
c69t17d15
c74t18d15
c78t19d15
c51t16d15
c55t17d15
c56t18d15
c60t19d15
c67t16d15
c71t17d15
c72t18d15
c76t19d15
c49t16d24
```

```
c53t17d24
c58t18d24
c62t19d24
c65t16d24
c69t17d24
c74t18d24
c78t19d24
c51t16d24
c55t17d24
c56t18d24
c60t19d24
c67t16d24
c71t17d24
c72t18d24
c76t19d24
c49t16d33
c53t17d33
c58t18d33
c62t19d33
c65t16d33
c69t17d33
c74t18d33
c78t19d33
c51t16d33
c55t17d33
c56t18d33
c60t19d33
c67t16d33
c71t17d33
c72t18d33
c76t19d33
c49t16d42
c53t17d42
c58t18d42
c62t19d42
c65t16d42
c69t17d42
c74t18d42
c78t19d42
c51t16d42
c55t17d42
c56t18d42
c60t19d42
c67t16d42
c71t17d42
c72t18d42
c76t19d42
END
VOLUME_GROUP: asu1-4 (d3)
STRIPE 8m
VOLUME 1
c49t16d7
c53t17d7
```

```
c58t18d7
c62t19d7
c65t16d7
c69t17d7
c74t18d7
c78t19d7
c51t16d7
c55t17d7
c56t18d7
c60t19d7
c67t16d7
c71t17d7
c72t18d7
c76t19d7
c49t16d16
c53t17d16
c58t18d16
c62t19d16
c65t16d16
c69t17d16
c74t18d16
c78t19d16
c51t16d16
c55t17d16
c56t18d16
c60t19d16
c67t16d16
c71t17d16
c72t18d16
c76t19d16
c49t16d25
c53t17d25
c58t18d25
c62t19d25
c65t16d25
c69t17d25
c74t18d25
c78t19d25
c51t16d25
c55t17d25
c56t18d25
c60t19d25
c67t16d25
c71t17d25
c72t18d25
c76t19d25
c49t16d34
c53t17d34
c58t18d34
c62t19d34
c65t16d34
c69t17d34
c74t18d34
```

```
c78t19d34
c51t16d34
c55t17d34
c56t18d34
c60t19d34
c67t16d34
c71t17d34
c72t18d34
c76t19d34
c49t16d43
c53t17d43
c58t18d43
c62t19d43
c65t16d43
c69t17d43
c74t18d43
c78t19d43
c51t16d43
c55t17d43
c56t18d43
c60t19d43
c67t16d43
c71t17d43
c72t18d43
c76t19d43
END
VOLUME_GROUP: asu1-5 (d4)
STRIPE 8m
VOLUME 1
c50t16d1
c54t17d1
c57t18d1
c61t19d1
c66t16d1
c70t17d1
c73t18d1
c77t19d1
c48t16d1
c52t17d1
c59t18d1
c63t19d1
c64t16d1
c68t17d1
c75t18d1
c79t19d1
c50t16d10
c54t17d10
c57t18d10
c61t19d10
c66t16d10
c70t17d10
c73t18d10
c77t19d10
```

```
c48t16d10
c52t17d10
c59t18d10
c63t19d10
c64t16d10
c68t17d10
c75t18d10
c79t19d10
c50t16d19
c54t17d19
c57t18d19
c61t19d19
c66t16d19
c70t17d19
c73t18d19
c77t19d19
c48t16d19
c52t17d19
c59t18d19
c63t19d19
c64t16d19
c68t17d19
c75t18d19
c79t19d19
c50t16d28
c54t17d28
c57t18d28
c61t19d28
c66t16d28
c70t17d28
c73t18d28
c77t19d28
c48t16d28
c52t17d28
c59t18d28
c63t19d28
c64t16d28
c68t17d28
c75t18d28
c79t19d28
c50t16d37
c54t17d37
c57t18d37
c61t19d37
c66t16d37
c70t17d37
c73t18d37
c77t19d37
c48t16d37
c52t17d37
c59t18d37
c63t19d37
c64t16d37
```

```
c68t17d37
c75t18d37
c79t19d37
END
VOLUME_GROUP: asu1-6 (d5)
STRIPE 8m
VOLUME 1
c50t16d2
c54t17d2
c57t18d2
c61t19d2
c66t16d2
c70t17d2
c73t18d2
c77t19d2
c48t16d2
c52t17d2
c59t18d2
c63t19d2
c64t16d2
c68t17d2
c75t18d2
c79t19d2
c50t16d11
c54t17d11
c57t18d11
c61t19d11
c66t16d11
c70t17d11
c73t18d11
c77t19d11
c48t16d11
c52t17d11
c59t18d11
c63t19d11
c64t16d11
c68t17d11
c75t18d11
c79t19d11
c50t16d20
c54t17d20
c57t18d20
c61t19d20
c66t16d20
c70t17d20
c73t18d20
c77t19d20
c48t16d20
c52t17d20
c59t18d20
c63t19d20
c64t16d20
c68t17d20
```

```
c75t18d20
c79t19d20
c50t16d29
c54t17d29
c57t18d29
c61t19d29
c66t16d29
c70t17d29
c73t18d29
c77t19d29
c48t16d29
c52t17d29
c59t18d29
c63t19d29
c64t16d29
c68t17d29
c75t18d29
c79t19d29
c50t16d38
c54t17d38
c57t18d38
c61t19d38
c66t16d38
c70t17d38
c73t18d38
c77t19d38
c48t16d38
c52t17d38
c59t18d38
c63t19d38
c64t16d38
c68t17d38
c75t18d38
c79t19d38
END
VOLUME_GROUP: asu1-7 (d6)
STRIPE 8m
VOLUME 1
c50t16d3
c54t17d3
c57t18d3
c61t19d3
c66t16d3
c70t17d3
c73t18d3
c77t19d3
c48t16d3
c52t17d3
c59t18d3
c63t19d3
c64t16d3
c68t17d3
c75t18d3
```

```
c79t19d3
c50t16d12
c54t17d12
c57t18d12
c61t19d12
c66t16d12
c70t17d12
c73t18d12
c77t19d12
c48t16d12
c52t17d12
c59t18d12
c63t19d12
c64t16d12
c68t17d12
c75t18d12
c79t19d12
c50t16d21
c54t17d21
c57t18d21
c61t19d21
c66t16d21
c70t17d21
c73t18d21
c77t19d21
c48t16d21
c52t17d21
c59t18d21
c63t19d21
c64t16d21
c68t17d21
c75t18d21
c79t19d21
c50t16d30
c54t17d30
c57t18d30
c61t19d30
c66t16d30
c70t17d30
c73t18d30
c77t19d30
c48t16d30
c52t17d30
c59t18d30
c63t19d30
c64t16d30
c68t17d30
c75t18d30
c79t19d30
c50t16d39
c54t17d39
c57t18d39
c61t19d39
```

```
c66t16d39
c70t17d39
c73t18d39
c77t19d39
c48t16d39
c52t17d39
c59t18d39
c63t19d39
c64t16d39
c68t17d39
c75t18d39
c79t19d39
END
VOLUME_GROUP: asu1-8 (d7)
STRIPE 8m
VOLUME 1
c50t16d4
c54t17d4
c57t18d4
c61t19d4
c66t16d4
c70t17d4
c73t18d4
c77t19d4
c48t16d4
c52t17d4
c59t18d4
c63t19d4
c64t16d4
c68t17d4
c75t18d4
c79t19d4
c50t16d13
c54t17d13
c57t18d13
c61t19d13
c66t16d13
c70t17d13
c73t18d13
c77t19d13
c48t16d13
c52t17d13
c59t18d13
c63t19d13
c64t16d13
c68t17d13
c75t18d13
c79t19d13
c50t16d22
c54t17d22
c57t18d22
c61t19d22
c66t16d22
```

```
c70t17d22
c73t18d22
c77t19d22
c48t16d22
c52t17d22
c59t18d22
c63t19d22
c64t16d22
c68t17d22
c75t18d22
c79t19d22
c50t16d31
c54t17d31
c57t18d31
c61t19d31
c66t16d31
c70t17d31
c73t18d31
c77t19d31
c48t16d31
c52t17d31
c59t18d31
c63t19d31
c64t16d31
c68t17d31
c75t18d31
c79t19d31
c50t16d40
c54t17d40
c57t18d40
c61t19d40
c66t16d40
c70t17d40
c73t18d40
c77t19d40
c48t16d40
c52t17d40
c59t18d40
c63t19d40
c64t16d40
c68t17d40
c75t18d40
c79t19d40
END
VOLUME_GROUP: asu2-1 (d8)
STRIPE 8m
VOLUME 1
c49t16d0
c53t17d0
c58t18d0
c62t19d0
c65t16d0
c69t17d0
```

```
c74t18d0
c78t19d0
c51t16d0
c55t17d0
c56t18d0
c60t19d0
c67t16d0
c71t17d0
c72t18d0
c76t19d0
c49t16d9
c53t17d9
c58t18d9
c62t19d9
c65t16d9
c69t17d9
c74t18d9
c78t19d9
c51t16d9
c55t17d9
c56t18d9
c60t19d9
c67t16d9
c71t17d9
c72t18d9
c76t19d9
c49t16d18
c53t17d18
c58t18d18
c62t19d18
c65t16d18
c69t17d18
c74t18d18
c78t19d18
c51t16d18
c55t17d18
c56t18d18
c60t19d18
c67t16d18
c71t17d18
c72t18d18
c76t19d18
c49t16d27
c53t17d27
c58t18d27
c62t19d27
c65t16d27
c69t17d27
c74t18d27
c78t19d27
c51t16d27
c55t17d27
c56t18d27
```

```
c60t19d27
c67t16d27
c71t17d27
c72t18d27
c76t19d27
c49t16d36
c53t17d36
c58t18d36
c62t19d36
c65t16d36
c69t17d36
c74t18d36
c78t19d36
c51t16d36
c55t17d36
c56t18d36
c60t19d36
c67t16d36
c71t17d36
c72t18d36
c76t19d36
END
VOLUME_GROUP: asu2-2 (d9)
STRIPE 8m
VOLUME 1
c49t16d1
c53t17d1
c58t18d1
c62t19d1
c65t16d1
c69t17d1
c74t18d1
c78t19d1
c51t16d1
c55t17d1
c56t18d1
c60t19d1
c67t16d1
c71t17d1
c72t18d1
c76t19d1
c49t16d10
c53t17d10
c58t18d10
c62t19d10
c65t16d10
c69t17d10
c74t18d10
c78t19d10
c51t16d10
c55t17d10
c56t18d10
c60t19d10
```

```
    c67t16d10
    c71t17d10
    c72t18d10
    c76t19d10
    c49t16d19
    c53t17d19
    c58t18d19
    c62t19d19
    c65t16d19
    c69t17d19
    c74t18d19
    c78t19d19
    c51t16d19
    c55t17d19
    c56t18d19
    c60t19d19
    c67t16d19
    c71t17d19
    c72t18d19
    c76t19d19
    c49t16d28
    c53t17d28
    c58t18d28
    c62t19d28
    c65t16d28
    c69t17d28
    c74t18d28
    c78t19d28
    c51t16d28
    c55t17d28
    c56t18d28
    c60t19d28
    c67t16d28
    c71t17d28
    c72t18d28
    c76t19d28
    c49t16d37
    c53t17d37
    c58t18d37
    c62t19d37
    c65t16d37
    c69t17d37
    c74t18d37
    c78t19d37
    c51t16d37
    c55t17d37
    c56t18d37
    c60t19d37
    c67t16d37
    c71t17d37
    c72t18d37
    c76t19d37
    END
```

```
VOLUME_GROUP: asu2-3 (d10)
STRIPE 8m
VOLUME 1
c49t16d2
c53t17d2
c58t18d2
c62t19d2
c65t16d2
c69t17d2
c74t18d2
c78t19d2
c51t16d2
c55t17d2
c56t18d2
c60t19d2
c67t16d2
c71t17d2
c72t18d2
c76t19d2
c49t16d11
c53t17d11
c58t18d11
c62t19d11
c65t16d11
c69t17d11
c74t18d11
c78t19d11
c51t16d11
c55t17d11
c56t18d11
c60t19d11
c67t16d11
c71t17d11
c72t18d11
c76t19d11
c49t16d20
c53t17d20
c58t18d20
c62t19d20
c65t16d20
c69t17d20
c74t18d20
c78t19d20
c51t16d20
c55t17d20
c56t18d20
c60t19d20
c67t16d20
c71t17d20
c72t18d20
c76t19d20
c49t16d29
c53t17d29
```

```
c58t18d29
c62t19d29
c65t16d29
c69t17d29
c74t18d29
c78t19d29
c51t16d29
c55t17d29
c56t18d29
c60t19d29
c67t16d29
c71t17d29
c72t18d29
c76t19d29
c49t16d38
c53t17d38
c58t18d38
c62t19d38
c65t16d38
c69t17d38
c74t18d38
c78t19d38
c51t16d38
c55t17d38
c56t18d38
c60t19d38
c67t16d38
c71t17d38
c72t18d38
c76t19d38
END
VOLUME_GROUP: asu2-4 (d11)
STRIPE 8m
VOLUME 1
c49t16d3
c53t17d3
c58t18d3
c62t19d3
c65t16d3
c69t17d3
c74t18d3
c78t19d3
c51t16d3
c55t17d3
c56t18d3
c60t19d3
c67t16d3
c71t17d3
c72t18d3
c76t19d3
c49t16d12
c53t17d12
c58t18d12
```

```
c62t19d12
c65t16d12
c69t17d12
c74t18d12
c78t19d12
c51t16d12
c55t17d12
c56t18d12
c60t19d12
c67t16d12
c71t17d12
c72t18d12
c76t19d12
c49t16d21
c53t17d21
c58t18d21
c62t19d21
c65t16d21
c69t17d21
c74t18d21
c78t19d21
c51t16d21
c55t17d21
c56t18d21
c60t19d21
c67t16d21
c71t17d21
c72t18d21
c76t19d21
c49t16d30
c53t17d30
c58t18d30
c62t19d30
c65t16d30
c69t17d30
c74t18d30
c78t19d30
c51t16d30
c55t17d30
c56t18d30
c60t19d30
c67t16d30
c71t17d30
c72t18d30
c76t19d30
c49t16d39
c53t17d39
c58t18d39
c62t19d39
c65t16d39
c69t17d39
c74t18d39
c78t19d39
```

```
c51t16d39
c55t17d39
c56t18d39
c60t19d39
c67t16d39
c71t17d39
c72t18d39
c76t19d39
END
VOLUME_GROUP: asu2-5 (d12)
STRIPE 8m
VOLUME 1
c50t16d5
c54t17d5
c57t18d5
c61t19d5
c66t16d5
c70t17d5
c73t18d5
c77t19d5
c48t16d5
c52t17d5
c59t18d5
c63t19d5
c64t16d5
c68t17d5
c75t18d5
c79t19d5
c50t16d14
c54t17d14
c57t18d14
c61t19d14
c66t16d14
c70t17d14
c73t18d14
c77t19d14
c48t16d14
c52t17d14
c59t18d14
c63t19d14
c64t16d14
c68t17d14
c75t18d14
c79t19d14
c50t16d23
c54t17d23
c57t18d23
c61t19d23
c66t16d23
c70t17d23
c73t18d23
c77t19d23
c48t16d23
```

```
c52t17d23
c59t18d23
c63t19d23
c64t16d23
c68t17d23
c75t18d23
c79t19d23
c50t16d32
c54t17d32
c57t18d32
c61t19d32
c66t16d32
c70t17d32
c73t18d32
c77t19d32
c48t16d32
c52t17d32
c59t18d32
c63t19d32
c64t16d32
c68t17d32
c75t18d32
c79t19d32
c50t16d41
c54t17d41
c57t18d41
c61t19d41
c66t16d41
c70t17d41
c73t18d41
c77t19d41
c48t16d41
c52t17d41
c59t18d41
c63t19d41
c64t16d41
c68t17d41
c75t18d41
c79t19d41
END
VOLUME_GROUP: asu2-6 (d13)
STRIPE 8m
VOLUME 1
c50t16d6
c54t17d6
c57t18d6
c61t19d6
c66t16d6
c70t17d6
c73t18d6
c77t19d6
c48t16d6
c52t17d6
```

```
c59t18d6
c63t19d6
c64t16d6
c68t17d6
c75t18d6
c79t19d6
c50t16d15
c54t17d15
c57t18d15
c61t19d15
c66t16d15
c70t17d15
c73t18d15
c77t19d15
c48t16d15
c52t17d15
c59t18d15
c63t19d15
c64t16d15
c68t17d15
c75t18d15
c79t19d15
c50t16d24
c54t17d24
c57t18d24
c61t19d24
c66t16d24
c70t17d24
c73t18d24
c77t19d24
c48t16d24
c52t17d24
c59t18d24
c63t19d24
c64t16d24
c68t17d24
c75t18d24
c79t19d24
c50t16d33
c54t17d33
c57t18d33
c61t19d33
c66t16d33
c70t17d33
c73t18d33
c77t19d33
c48t16d33
c52t17d33
c59t18d33
c63t19d33
c64t16d33
c68t17d33
c75t18d33
```

```
c79t19d33
c50t16d42
c54t17d42
c57t18d42
c61t19d42
c66t16d42
c70t17d42
c73t18d42
c77t19d42
c48t16d42
c52t17d42
c59t18d42
c63t19d42
c64t16d42
c68t17d42
c75t18d42
c79t19d42
END
VOLUME_GROUP: asu2-7 (d14)
STRIPE 8m
VOLUME 1
c50t16d7
c54t17d7
c57t18d7
c61t19d7
c66t16d7
c70t17d7
c73t18d7
c77t19d7
c48t16d7
c52t17d7
c59t18d7
c63t19d7
c64t16d7
c68t17d7
c75t18d7
c79t19d7
c50t16d16
c54t17d16
c57t18d16
c61t19d16
c66t16d16
c70t17d16
c73t18d16
c77t19d16
c48t16d16
c52t17d16
c59t18d16
c63t19d16
c64t16d16
c68t17d16
c75t18d16
c79t19d16
```

```
c50t16d25
c54t17d25
c57t18d25
c61t19d25
c66t16d25
c70t17d25
c73t18d25
c77t19d25
c48t16d25
c52t17d25
c59t18d25
c63t19d25
c64t16d25
c68t17d25
c75t18d25
c79t19d25
c50t16d34
c54t17d34
c57t18d34
c61t19d34
c66t16d34
c70t17d34
c73t18d34
c77t19d34
c48t16d34
c52t17d34
c59t18d34
c63t19d34
c64t16d34
c68t17d34
c75t18d34
c79t19d34
c50t16d43
c54t17d43
c57t18d43
c61t19d43
c66t16d43
c70t17d43
c73t18d43
c77t19d43
c48t16d43
c52t17d43
c59t18d43
c63t19d43
c64t16d43
c68t17d43
c75t18d43
c79t19d43
END
VOLUME_GROUP: asu2-8 (d15)
STRIPE 8m
VOLUME 1
c50t16d8
```

```
c54t17d8
c57t18d8
c61t19d8
c66t16d8
c70t17d8
c73t18d8
c77t19d8
c48t16d8
c52t17d8
c59t18d8
c63t19d8
c64t16d8
c68t17d8
c75t18d8
c79t19d8
c50t16d17
c54t17d17
c57t18d17
c61t19d17
c66t16d17
c70t17d17
c73t18d17
c77t19d17
c48t16d17
c52t17d17
c59t18d17
c63t19d17
c64t16d17
c68t17d17
c75t18d17
c79t19d17
c50t16d26
c54t17d26
c57t18d26
c61t19d26
c66t16d26
c70t17d26
c73t18d26
c77t19d26
c48t16d26
c52t17d26
c59t18d26
c63t19d26
c64t16d26
c68t17d26
c75t18d26
c79t19d26
c50t16d35
c54t17d35
c57t18d35
c61t19d35
c66t16d35
c70t17d35
```

```
c73t18d35
c77t19d35
c48t16d35
c52t17d35
c59t18d35
c63t19d35
c64t16d35
c68t17d35
c75t18d35
c79t19d35
c50t16d44
c54t17d44
c57t18d44
c61t19d44
c66t16d44
c70t17d44
c73t18d44
c77t19d44
c48t16d44
c52t17d44
c59t18d44
c63t19d44
c64t16d44
c68t17d44
c75t18d44
c79t19d44
END
VOLUME_GROUP: asu3-1 (d16)
STRIPE 8m
VOLUME 1
c49t16d8
c53t17d8
c58t18d8
c62t19d8
c65t16d8
c69t17d8
c74t18d8
c78t19d8
c51t16d8
c55t17d8
c56t18d8
c60t19d8
c67t16d8
c71t17d8
c72t18d8
c76t19d8
c49t16d17
c53t17d17
c58t18d17
c62t19d17
c65t16d17
c69t17d17
c74t18d17
```

```
c78t19d17
c51t16d17
c55t17d17
c56t18d17
c60t19d17
c67t16d17
c71t17d17
c72t18d17
c76t19d17
c49t16d26
c53t17d26
c58t18d26
c62t19d26
c65t16d26
c69t17d26
c74t18d26
c78t19d26
c51t16d26
c55t17d26
c56t18d26
c60t19d26
c67t16d26
c71t17d26
c72t18d26
c76t19d26
c49t16d35
c53t17d35
c58t18d35
c62t19d35
c65t16d35
c69t17d35
c74t18d35
c78t19d35
c51t16d35
c55t17d35
c56t18d35
c60t19d35
c67t16d35
c71t17d35
c72t18d35
c76t19d35
c49t16d44
c53t17d44
c58t18d44
c62t19d44
c65t16d44
c69t17d44
c74t18d44
c78t19d44
c51t16d44
c55t17d44
c56t18d44
c60t19d44
```

```
c67t16d44
c71t17d44
c72t18d44
c76t19d44
END
VOLUME_GROUP: asu3-2 (d17)
STRIPE 8m
VOLUME 1
c50t16d0
c54t17d0
c57t18d0
c61t19d0
c66t16d0
c70t17d0
c73t18d0
c77t19d0
c48t16d0
c52t17d0
c59t18d0
c63t19d0
c64t16d0
c68t17d0
c75t18d0
c79t19d0
c50t16d9
c54t17d9
c57t18d9
c61t19d9
c66t16d9
c70t17d9
c73t18d9
c77t19d9
c48t16d9
c52t17d9
c59t18d9
c63t19d9
c64t16d9
c68t17d9
c75t18d9
c79t19d9
c50t16d18
c54t17d18
c57t18d18
c61t19d18
c66t16d18
c70t17d18
c73t18d18
c77t19d18
c48t16d18
c52t17d18
c59t18d18
c63t19d18
c64t16d18
```

```
c68t17d18
c75t18d18
c79t19d18
c50t16d27
c54t17d27
c57t18d27
c61t19d27
c66t16d27
c70t17d27
c73t18d27
c77t19d27
c48t16d27
c52t17d27
c59t18d27
c63t19d27
c64t16d27
c68t17d27
c75t18d27
c79t19d27
c50t16d36
c54t17d36
c57t18d36
c61t19d36
c66t16d36
c70t17d36
c73t18d36
c77t19d36
c48t16d36
c52t17d36
c59t18d36
c63t19d36
c64t16d36
c68t17d36
c75t18d36
c79t19d36
END
```

HBA to LUN Access – *Entries in "sd.conf"*

The following entries in **sd.conf** were defined to enable the Emulex HBAs for accessing the LUNs defined in the ETERNUS8000 Model 1100.

OS-View1-sd.conf (Logical Host System 1)

```
# Copyright (c) 1992, by Sun Microsystems, Inc.
#
#ident     "@(#)sd.conf 1.9    98/01/11 SMI"

name="sd" class="scsi" class_prop="atapi"
     target=0 lun=0;

name="sd" class="scsi" class_prop="atapi"
     target=1 lun=0;

name="sd" class="scsi" class_prop="atapi"
     target=2 lun=0;

name="sd" class="scsi" class_prop="atapi"
     target=3 lun=0;

name="sd" class="scsi"
     target=4 lun=0;

name="sd" class="scsi"
     target=5 lun=0;

name="sd" class="scsi"
     target=6 lun=0;

name="sd" class="scsi"
     target=8 lun=0;

name="sd" class="scsi"
     target=9 lun=0;

name="sd" class="scsi"
     target=10 lun=0;

name="sd" class="scsi"
     target=11 lun=0;

name="sd" class="scsi"
     target=12 lun=0;

name="sd" class="scsi"
     target=13 lun=0;

name="sd" class="scsi"
     target=14 lun=0;

name="sd" class="scsi"
     target=15 lun=0;

name="sd" class="scsi"
     target=16 lun=0;

name="sd" class="scsi"
     target=17 lun=0;
```

```
name="sd" class="scsi"
     target=18 lun=0;

name="sd" class="scsi"
     target=19 lun=0;

# Start lpfc auto-generated configuration -- do NOT alter or delete this line
# WARNING:  anything you put within this auto-generated section will
# be DELETED if you execute pkgrm to remove the lpfc driver package.
# You may need to add additional lines to probe for additional LUNs
# or targets. You SHOULD delete any lines that represent lpfc targets
# or LUNs that are not used.
# You should add any new entries between this line
# and the End lpfc auto generated configuration line
# name="sd" parent="lpfc" target=16 lun=0;
# name="sd" parent="lpfc" target=17 lun=0;
# A small number of LUNs for a RAID array
# name="sd" parent="lpfc" target=17 lun=1;
# name="sd" parent="lpfc" target=17 lun=2;
# name="sd" parent="lpfc" target=17 lun=3;
name="sd" parent="lpfc" target=16 lun=0;
name="sd" parent="lpfc" target=16 lun=1;
name="sd" parent="lpfc" target=16 lun=2;
name="sd" parent="lpfc" target=16 lun=3;
name="sd" parent="lpfc" target=16 lun=4;
name="sd" parent="lpfc" target=16 lun=5;
name="sd" parent="lpfc" target=16 lun=6;
name="sd" parent="lpfc" target=16 lun=7;
name="sd" parent="lpfc" target=16 lun=8;
name="sd" parent="lpfc" target=16 lun=9;
name="sd" parent="lpfc" target=16 lun=10;
name="sd" parent="lpfc" target=16 lun=11;
name="sd" parent="lpfc" target=16 lun=12;
name="sd" parent="lpfc" target=16 lun=13;
name="sd" parent="lpfc" target=16 lun=14;
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  name="sd" parent="lpfc" target=18 lun=95;
  name="sd" parent="lpfc" target=18 lun=96;
```

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name="sd" parent="lpfc" target=19 lun=187;
name="sd" parent="lpfc" target=19 lun=188;
name="sd" parent="lpfc" target=19 lun=189;
name="sd" parent="lpfc" target=19 lun=190;
name="sd" parent="lpfc" target=19 lun=191;
name="sd" parent="lpfc" target=19 lun=192;
# End lpfc auto-generated configuration -- do NOT alter or delete this line
```

OS-View2-sd.conf (Logical Host System 2)

```
# Copyright (c) 1992, by Sun Microsystems, Inc.
#
#ident     "@(#)sd.conf 1.9    98/01/11 SMI"

name="sd" class="scsi" class_prop="atapi"
     target=0 lun=0;

name="sd" class="scsi" class_prop="atapi"
     target=1 lun=0;

name="sd" class="scsi" class_prop="atapi"
     target=2 lun=0;

name="sd" class="scsi" class_prop="atapi"
     target=3 lun=0;

name="sd" class="scsi"
     target=4 lun=0;

name="sd" class="scsi"
     target=5 lun=0;
```

```
name="sd" class="scsi"
     target=6 lun=0;

name="sd" class="scsi"
     target=8 lun=0;

name="sd" class="scsi"
     target=9 lun=0;

name="sd" class="scsi"
     target=10 lun=0;

name="sd" class="scsi"
     target=11 lun=0;

name="sd" class="scsi"
     target=12 lun=0;

name="sd" class="scsi"
     target=13 lun=0;

name="sd" class="scsi"
     target=14 lun=0;

name="sd" class="scsi"
     target=15 lun=0;

name="sd" class="scsi"
     target=16 lun=0;

name="sd" class="scsi"
     target=17 lun=0;

name="sd" class="scsi"
     target=18 lun=0;

name="sd" class="scsi"
     target=19 lun=0;

# Start lpfc auto-generated configuration -- do NOT alter or delete this line
# WARNING:  anything you put within this auto-generated section will
# be DELETED if you execute pkgrm to remove the lpfc driver package.
# You may need to add additional lines to probe for additional LUNs
# or targets. You SHOULD delete any lines that represent lpfc targets
# or LUNs that are not used.
# You should add any new entries between this line
# and the End lpfc auto generated configuration line
# name="sd" parent="lpfc" target=16 lun=0;
# name="sd" parent="lpfc" target=17 lun=0;
# A small number of LUNs for a RAID array
# name="sd" parent="lpfc" target=17 lun=1;
# name="sd" parent="lpfc" target=17 lun=2;
# name="sd" parent="lpfc" target=17 lun=3;
name="sd" parent="lpfc" target=16 lun=0;
name="sd" parent="lpfc" target=16 lun=1;
name="sd" parent="lpfc" target=16 lun=2;
name="sd" parent="lpfc" target=16 lun=3;
name="sd" parent="lpfc" target=16 lun=4;
name="sd" parent="lpfc" target=16 lun=5;
name="sd" parent="lpfc" target=16 lun=6;
name="sd" parent="lpfc" target=16 lun=7;
name="sd" parent="lpfc" target=16 lun=8;
```

```
  name="sd" parent="lpfc" target=16 lun=9;
  name="sd" parent="lpfc" target=16 lun=10;
  name="sd" parent="lpfc" target=16 lun=11;
  name="sd" parent="lpfc" target=16 lun=12;
  name="sd" parent="lpfc" target=16 lun=13;
  name="sd" parent="lpfc" target=16 lun=14;
  name="sd" parent="lpfc" target=16 lun=15;
  name="sd" parent="lpfc" target=16 lun=16;
  name="sd" parent="lpfc" target=16 lun=17;
  name="sd" parent="lpfc" target=16 lun=18;
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  name="sd" parent="lpfc" target=16 lun=68;
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  name="sd" parent="lpfc" target=18 lun=124;
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  name="sd" parent="lpfc" target=18 lun=126;
```

```
  name="sd" parent="lpfc" target=18 lun=127;
  name="sd" parent="lpfc" target=18 lun=128;
  name="sd" parent="lpfc" target=18 lun=129;
  name="sd" parent="lpfc" target=18 lun=130;
  name="sd" parent="lpfc" target=18 lun=131;
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  name="sd" parent="lpfc" target=18 lun=146;
  name="sd" parent="lpfc" target=18 lun=147;
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  name="sd" parent="lpfc" target=18 lun=164;
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  name="sd" parent="lpfc" target=18 lun=167;
  name="sd" parent="lpfc" target=18 lun=168;
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  name="sd" parent="lpfc" target=18 lun=183;
  name="sd" parent="lpfc" target=18 lun=184;
  name="sd" parent="lpfc" target=18 lun=185;
  name="sd" parent="lpfc" target=18 lun=186;
  name="sd" parent="lpfc" target=18 lun=187;
  name="sd" parent="lpfc" target=18 lun=188;
  name="sd" parent="lpfc" target=18 lun=189;
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  name="sd" parent="lpfc" target=19 lun=120;
  name="sd" parent="lpfc" target=19 lun=121;
  name="sd" parent="lpfc" target=19 lun=122;
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  name="sd" parent="lpfc" target=19 lun=123;
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  name="sd" parent="lpfc" target=19 lun=181;
  name="sd" parent="lpfc" target=19 lun=182;
  name="sd" parent="lpfc" target=19 lun=183;
  name="sd" parent="lpfc" target=19 lun=184;
  name="sd" parent="lpfc" target=19 lun=185;
```

```
  name="sd" parent="lpfc" target=19 lun=186;
  name="sd" parent="lpfc" target=19 lun=187;
  name="sd" parent="lpfc" target=19 lun=188;
  name="sd" parent="lpfc" target=19 lun=189;
  name="sd" parent="lpfc" target=19 lun=190;
  name="sd" parent="lpfc" target=19 lun=191;
  name="sd" parent="lpfc" target=19 lun=192;
  # End lpfc auto-generated configuration -- do NOT alter or delete this line
```

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

The SPC-1 Workload Generator command and parameter files used in this benchmark are listed below.

Primary Metrics Test and Repeatability Test

```
javaparms="-Xmx1024m -Xms1024m -Xss512k"
host=master
slaves=(h1,h2,h3,h4,h5,h6,h7,h8,h9,h10,h11,h12,h13,h14,h15,h16,h17,h18,h19,h20,h21,
h22,h23,h24,h25,h26,h27,h28,h29,h30,h31,h32)
sd=asu1_1,lun=/dev/md/rdsk/d0,size=610.560g
sd=asu1_2,lun=/dev/md/rdsk/d1,size=610.560g
sd=asu1_3,lun=/dev/md/rdsk/d2,size=610.560g
sd=asu1_4,lun=/dev/md/rdsk/d3,size=610.560g
sd=asu1_5,lun=/dev/md/rdsk/d4,size=610.560g
sd=asu1_6,lun=/dev/md/rdsk/d5,size=610.560g
sd=asu1_7,lun=/dev/md/rdsk/d6,size=610.560g
sd=asu1_8,lun=/dev/md/rdsk/d7,size=610.560g
sd=asu2_1,lun=/dev/md/rdsk/d8,size=610.560g
sd=asu2_2,lun=/dev/md/rdsk/d9,size=610.560g
sd=asu2_3,lun=/dev/md/rdsk/d10,size=610.560g
sd=asu2_4,lun=/dev/md/rdsk/d11,size=610.560g
sd=asu2_5,lun=/dev/md/rdsk/d12,size=610.560g
sd=asu2_6,lun=/dev/md/rdsk/d13,size=610.560g
sd=asu2_7,lun=/dev/md/rdsk/d14,size=610.560g
sd=asu2_8,lun=/dev/md/rdsk/d15,size=610.560g
sd=asu3_1,lun=/dev/md/rdsk/d16,size=542.720g
sd=asu3_2,lun=/dev/md/rdsk/d17,size=542.720g
```

Persistence Test

```
javaparms="-Xmx1024m -Xms1024m -Xss512k"
sd=asu1_1,lun=/dev/md/rdsk/d0,size=610.560g
sd=asu1_2,lun=/dev/md/rdsk/d1,size=610.560g
sd=asu1_3,lun=/dev/md/rdsk/d2,size=610.560g
sd=asu1_4,lun=/dev/md/rdsk/d3,size=610.560g
sd=asu1_5,lun=/dev/md/rdsk/d4,size=610.560g
sd=asu1_6,lun=/dev/md/rdsk/d5,size=610.560g
sd=asu1_7,lun=/dev/md/rdsk/d6,size=610.560g
sd=asu1_8,lun=/dev/md/rdsk/d7,size=610.560g
sd=asu2_1,lun=/dev/md/rdsk/d8,size=610.560g
sd=asu2_2,lun=/dev/md/rdsk/d9,size=610.560g
sd=asu2_3,lun=/dev/md/rdsk/d10,size=610.560g
sd=asu2_4,lun=/dev/md/rdsk/d11,size=610.560g
sd=asu2_5,lun=/dev/md/rdsk/d12,size=610.560g
sd=asu2_6,lun=/dev/md/rdsk/d13,size=610.560g
sd=asu2_7,lun=/dev/md/rdsk/d14,size=610.560g
sd=asu2_8,lun=/dev/md/rdsk/d15,size=610.560g
sd=asu3_1,lun=/dev/md/rdsk/d16,size=542.720g
sd=asu3_2,lun=/dev/md/rdsk/d17,size=542.720g
```

APPENDIX E: SPC-1 WORKLOAD GENERATOR INPUT PARAMETERS

Primary Metrics Test, Repeatability Test, and Persistence Test Run 1

The following script was used to execute the Primary Metrics Test *(Sustainability Test Phase, IOPS Test Phase, and Response Time Ramp Test Phase)*, Repeatability Test *(Repeatability Test Phase 1 and Repeatability Test Phase 2)*, and Persistence Test Run 1 in an uninterrupted sequence.

e8k_070706_fdr_1.sh

```
sleep 3600

#metric
java -Xms1024m -Xmx1024m -Xss512k metrics -b 2300 -s 300
#repeat-1
java -Xms1024m -Xmx1024m -Xss512k repeat1 -b 2300 -s 300
#repeat-2
java -Xms1024m -Xmx1024m -Xss512k repeat2 -b 2300 -s 300
#persist1
./killslaves.sh
./killslaves_1.sh

cp -f fdr_persist_1_2_SPC1.cfg SPC1.cfg
java -Xmx1024m -Xms1024m -Xss512k persist1 -b 2300
```

Persistence Test Run 2

The following script was used to execute Persistence Test Run 2:

e8k_070706_fdr_2.sh

```
#persist-2
java -Xmx1024m -Xms1024m -Xss512k persist2

mv metrics metrics_070706_2300
mv repeatability1 repeat1_070706_2300
mv repeatability2 repeat2_070706_2300
mv persistence1 persist1_070706_2300
mv persistence2 persist2_070706_2300
mv SPCOut SPCOut_070706_2300

zip -r metrics_070706_2300.zip metrics_070706_2300
zip -r repeat1_070706_2300.zip repeat1_070706_2300
zip -r repeat2_070706_2300.zip repeat2_070706_2300
zip -r persist1_070706_2300.zip persist1_070706_2300
zip -r persist2_070706_2300.zip persist2_070706_2300
zip -r SPCOut_070706_2300.zip SPCOut_070706_2300
```