SPC BENCHMARK 1™
FULL DISCLOSURE REPORT

SUN MICROSYSTEMS, INC.
SUN STORAGETEK® 9990V SYSTEM

SPC-1 V1.10.1

Submitted for Review: October 1, 2007
Submission Identifier: A00055

First Edition – October 2007

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Table of Contents

AUDIT CERTIFICATION

Storage Performance Council

Gradient SYSTEMS

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

October 1, 2007

The SPC Benchmark 1™ results listed below for the Sun StorageTek® 9990V System were produced in compliance with the SPC Benchmark 1™ V1.10.1 Onsite Audit requirements.

SPC Benchmark 1™ V1.10.1 Results	
Tested Storage Configuration (TSC) Name:	
Sun StorageTek® 9990V System	
Metric	**Reported Result**
SPC-1 IOPS™	200,245.73
SPC-1 Price-Performance	$17.31/SPC-1 IOPS™
Total ASU Capacity	26,000.000 GB
Data Protection Level	Mirroring
Total TSC Price (including three-year maintenance)	$3,466,309

The following SPC Benchmark 1™ Onsite 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 by physical inspection and information supplied by Sun Microsystems, Inc.:
    - ✓ Physical Storage Capacity and requirements.
    - ✓ Configured Storage Capacity and requirements.
    - ✓ Addressable Storage Capacity and requirements.
    - ✓ Capacity of each Logical Volume and requirements.
    - ✓ Capacity of each Application Storage Unit (ASU) and requirements.
- An appropriate diagram of the Benchmark Configuration (BC)/Tested Storage Configuration (TSC).
- Physical verification of the components to mach the above diagram.

Storage Performance Council
643 Bair Island Road, Suite 103
Redwood City, CA 94062
AuditService@storageperformance.org
650.556.9384

AUDIT CERTIFICATION *(CONT.)*

Sun StorageTek® 9990V System
SPC-1 Audit Certification

Page 2

- Listings and commands to configure the Benchmark Configuration/Tested Storage Configuration, including customer tunable parameters.

- Commands and parameters used to configure the SPC-1 Workload Generator.

- The following Host System requirements were verified by physical inspection and information supplied by Sun Microsystems, Inc.:

  ✓ The type of Host System including the number of processors and main memory.
  ✓ The presence and version number of the Workload Generator on the Host System.
  ✓ The TSC boundary within the Host System.

- The execution of each Test, Test Phase, and Test Run was observed and found compliant with all of the requirements and constraints of Clauses 4 and 5 of the SPC-1 Benchmark Specification.

- The Test Results Files and resultant Summary Results Files received from Sun Microsystems, Inc. for each of following were authentic, accurate, and compliant with all of the requirements and constraints of Clauses 4 and 5 of the SPC-1 Benchmark Specification:

  ✓ Data Persistence Test
  ✓ Sustainability Test Phase
  ✓ IOPS Test Phase
  ✓ Response Time Ramp Test Phase
  ✓ Repeatability Test

- There were no differences between the Tested Storage Configuration (TSC) used for the benchmark and Priced Storage Configuration.

- The 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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AuditService@storageperformance.org
650.556.9384

LETTER OF GOOD FAITH

Sun Microsystems, Inc.
500 Howard Street, Suite 300, San Francisco, CA 94105

❖ Sun
microsystems

10 September 2007

Walter Baker
Gradient Systems
643 Bair Island Rd. Suite 103
Redwood City, CA 94063-2755

To: Walter Baker

Subject: SPC-1 Letter of Good Faith for the Sun StorageTek® 9990V

Sun Microsystems Inc. is the SPC-1 Test Sponsor for the above listed product. To the best of our knowledge and belief, the required SPC-1 benchmark results and materials we have submitted for that product are complete, accurate, and in full compliance with V1.10.1 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.

Thank you,

Nigel Dessau

Nigel Dessau
Senior Vice President
Storage Marketing and Business Operations

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

Test Sponsor and Contact Information	
Test Sponsor Primary Contact	Sun Microsystems, Inc. – http://www.sun.com Leah Schoeb – leah.schoeb@sun.com 5300 Riata Park Court AUS08 Austin, TX 78721 Phone: (877) 319-0457 FAX: (512) 266-2523
Test Sponsor Alternate Contact	Sun Microsystems, Inc. – http://www.sun.com Jason Schaffer – jason.schaffer@sun.com 500 Eldorado Blvd. Broomfield, CO 80021 Phone: (303) 272-4743 FAX: (303) 272-9704
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	October 1, 2007
Date the FDR was submitted to the SPC	October 1, 2007
Date the TSC is available for shipment to customers	July 10, 2007
Date the TSC completed audit certification	October 1, 2007

Tested Storage Product (TSP) Description

The Sun StorageTek™ 9990V with its market proven crossbar switch architecture shows enterprise-class functionality and performance. This massive-capacity system further assists storage managers in their mission to simplify storage administration, improve performance, and reduce overall costs. Virtualization of external storage, Thin Provisioning, logical partitioning, and universal replication are available features

Simplifying management saves time and money and improves utilization and flexibility of legacy systems by aggregating internal storage and externally attached Sun and third-party storage system into a single, flexible virtual pool. Increase efficiency (improved use of personnel and technology) through massive consolidation or aggregation of heterogeneous storage platforms.

Summary of Results

SPC-1 Results	
Tested Storage Configuration (TSC) Name: Sun StorageTek® 9990V System	
Metric	**Reported Result**
SPC-1 IOPS™	200,245.73
SPC-1 Price-Performance	$17.31/SPC-1 IOPS™
Total ASU Capacity	26,000 GB
Data Protection Level	Mirroring
Total TSC Price (including three-year maintenance)	$3,466,309
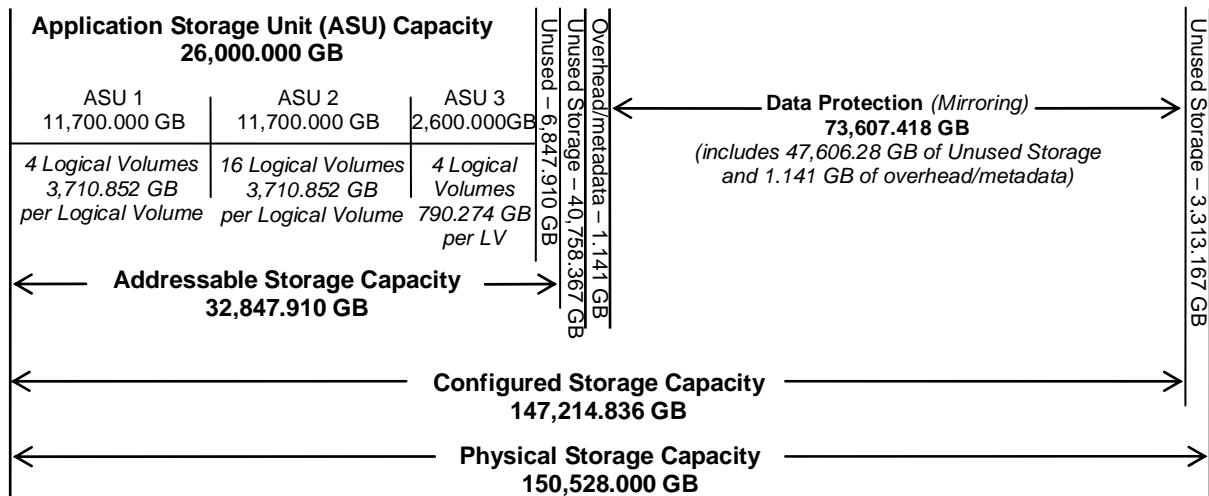
SPC-1 IOPS™ represents the maximum I/O Request Throughput at the 100% load point.

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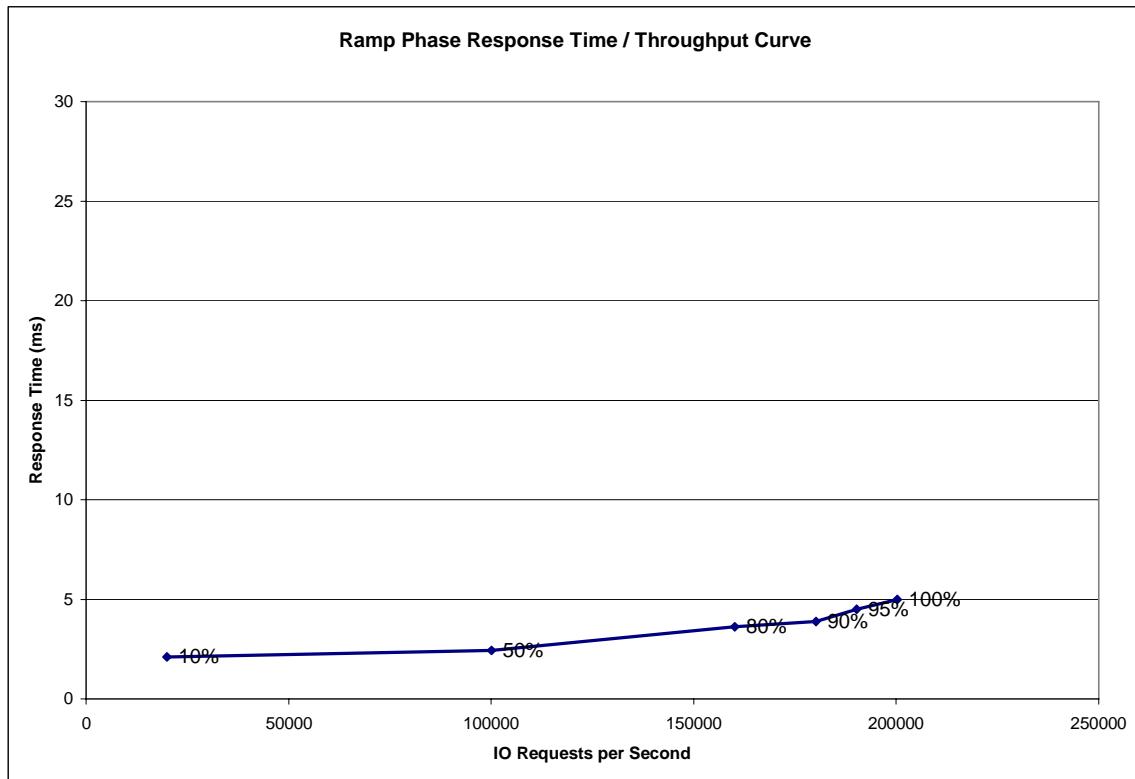
The following diagram documents the various storage capacities, used in this benchmark, and their relationships.

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	19,994.33	100,105.69	160,170.55	180,202.31	190,196.63	200,245.73
Average Response Time (ms):						
All ASUs	2.10	2.43	3.62	3.89	4.50	4.99
ASU-1	2.92	3.20	4.68	4.92	5.54	6.10
ASU-2	2.11	2.63	3.75	4.23	4.82	5.37
ASU-3	0.34	0.70	1.31	1.58	2.15	2.47
Reads	4.82	5.10	6.99	7.46	8.12	8.89
Writes	0.33	0.69	1.43	1.57	2.14	2.45

Tested Storage Configuration Pricing *(Priced Storage Configuration)*
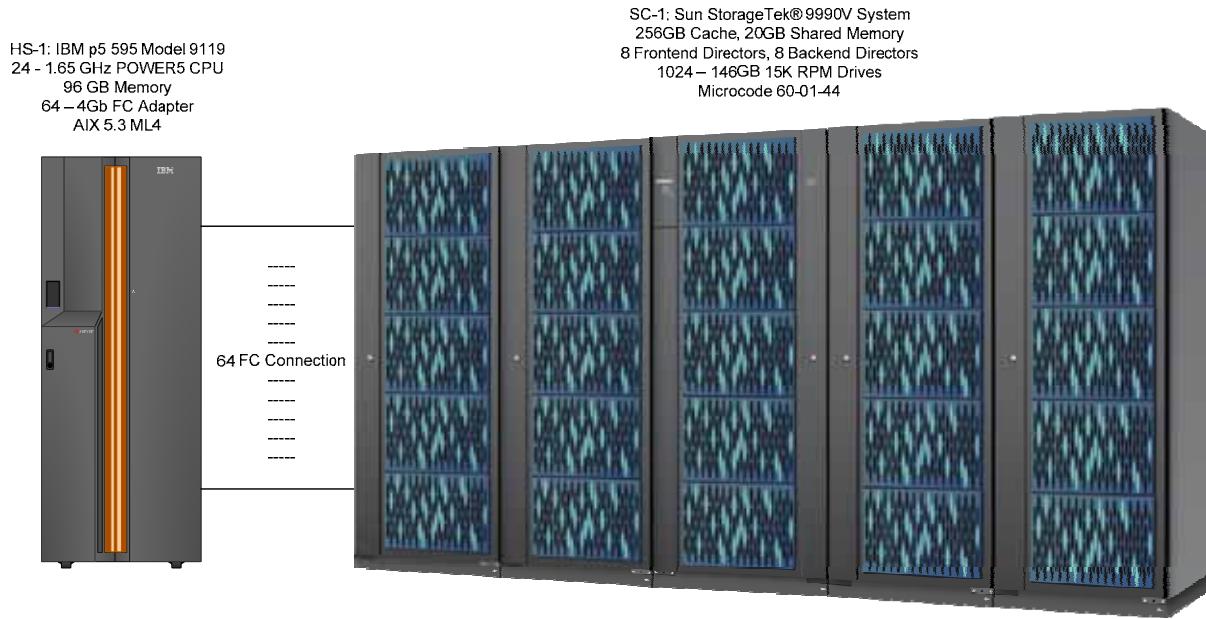
Bill of Materials Product: Product Code	Sun StorageTek 9990V System Product Description	Quantity	US List Unit List Price	US List Extended Price	Discount	Net Price
TV9DKC-F605I-146KS	1 HDD Canister (DKS2F-K146FC)	1016	$ 3,245.00	$ 3,296,920.00	44%	$ 1,846,275.20
TV9DKC-F605I-18	Disk Array Frame	4	$ 33,795.00	$ 135,180.00	44%	$ 75,700.80
TV9DKC-F605I-AKT	DKU Expansion Kit	4	$ 17,295.00	$ 69,180.00	44%	$ 38,740.80
TV9DKC-F605I-EXC	DEV Interface Cable (DKU-DKU)	4	$ 635.00	$ 2,540.00	44%	$ 1,422.40
TV9DKC-F610I-16FS	Fibre 16-Port Adapter(4Gbps)	8	$ 33,595.00	$ 268,760.00	44%	$ 150,505.60
TV9DKC-F610I-3PS	AC Box Kit (3 Phase 30A)	5	$ 1,565.00	$ 7,825.00	44%	$ 4,382.00
TV9DKC-F610I-3UC	Power Cable Kit (3Phase 30A for USA)	5	$ 1,005.00	$ 5,025.00	44%	$ 2,814.00
TV9DKC-F610I-AB	Additional Battery-1	3	$ 4,095.00	$ 12,285.00	44%	$ 6,879.60
TV9DKC-F610I-APC	Additional Power Supply	2	$ 5,025.00	$ 10,050.00	44%	$ 5,628.00
TV9DKC-F610I-C8G	Cache Memory Module (8GB)	32	$ 32,600.00	$ 1,043,200.00	44%	$ 584,192.00
TV9DKC-F610I-CSW	Data Path Expansion Kit	3	$ 26,795.00	$ 80,385.00	44%	$ 45,015.60
TV9DKC-F610I-CX	Cache Memory Adapter	4	$ 2,795.00	$ 11,180.00	44%	$ 6,260.80
TV9DKC-F610I-DKA	Disk Adapter	8	$ 43,995.00	$ 351,960.00	44%	$ 197,097.60
TV9DKC-F610I-L1DC	Device Interface Cable (DKC to DKU-L1	1	$ 715.00	$ 715.00	44%	$ 400.40
TV9DKC-F610I-L1UC	Device Interface Cable (DKC to DKU-L1	1	$ 715.00	$ 715.00	44%	$ 400.40
TV9DKC-F610I-R1DC	Device Interface Cable (DKC to DKU-R1	1	$ 715.00	$ 715.00	44%	$ 400.40
TV9DKC-F610I-R1UC	Device Interface Cable (DKC to DKU-R1	1	$ 715.00	$ 715.00	44%	$ 400.40
TV9DKC-F610I-S4GQ	Shared Memory Module (4GB)	5	$ 25,495.00	$ 127,475.00	44%	$ 71,386.00
TV9DKC-F610I-SX	Shared Memory Adapter	2	$ 2,995.00	$ 5,990.00	44%	$ 3,354.40
TV9DKC610I-5	Disk Control Frame	1	$ 55,000.00	$ 55,000.00	44%	$ 30,800.00
ST9990V-STRGFAMILY	ST9990V Product - Order Structuring Reference Or	1	$ -	$ -	44%	$ -
TV9DKC-F605I-146K1	1 HDD Canister (DKS2F-K146FC)	8	$ 3,245.00	$ 25,960.00	44%	$ 14,537.60
TV9044-220001-01	ST9900 BOS Ste Media Kit	1	$ -	$ -	44%	$ -
TV9044-220001-03	ST9900 BOS Ste Base Lic	1	$ 7,595.00	$ 7,595.00	44%	$ 4,253.20
TV9044-220001-03F	ST9900 BOS Ste Above 100TB Lic	146	$ 1,845.00	$ 269,370.00	44%	$ 150,847.20
ST9990V-STRGFAMILY	ST9990V Product - Order Structuring Reference Or	1	$ -	$ -	44%	$ -
TV9-220001-03-3ST	Support-Standard 3 Year ST9900 BOS Ste Base Lic	1	$ 3,228.00	$ 3,228.00	30%	$ 2,259.60
TV9-220001-03F-3ST	Support-Standard 3 Year ST9900 BOS Ste Above 1	146	$ 864.00	$ 126,144.00	30%	$ 88,300.80
TV9-220001-3MED	Support-Base 3 Years ST9900 BOS Ste Media Kit-M	1	$ 180.00	$ 180.00	30%	$ 126.00
Included with Rack BOM	Modem Card Kit	1	$0.00	$0.00		$0.00
Included with Rack BOM	LAN Cable 14ft	1	$0.00	$0.00		$0.00
Included with Rack BOM	Phone Cable 12ft	1	$0.00	$0.00		$0.00
Included with Rack BOM	RJ-11 Modular In-Line Coupler 4 Conductor	1	$0.00	$0.00		$0.00
Included with Rack BOM	RJ-45 Modular In-Line Coupler 6 Conductor	1	$0.00	$0.00		$0.00
TJ9FICSMLCLC025MR	LC/LC Fibre Sngl Mode 9UM Cbl 25M	64	$345.00	$ 22,080.00	44%	$ 12,364.80
TOTAL				$ 5,940,372.00		**$ 3,344,745.60**

	ST9990V Hardware			$5,533,855.00	44%	$ 3,098,958.80
	ST9985V Hardware Maintenance			$0.00		
	-- Includes 3-years (24x7) warranty support and installation			$0.00		
	ST9990V Software			$ 276,965.00	44%	$ 155,100.40
	ST9990V Software Maintenance			$ 129,552.00	30%	$ 90,686.40
	-- Includes 3-years of Service (24x7)					**$ 3,344,745.60**

3rd Party Components (sed for this test)

	64 IBM 5758 4 Gb Single-Port Fibre Channel PCI-X 2.0 DDR Adapter		$121,539.20	$121,539.20	0%	$ 121,539.20
	512MB USB memory stick		$ 25.00	$ 25.00	0%	$ 25.00
						$ 3,466,309.80

The above pricing provides maintenance/support for 24 hours per day, 7 days per week for three years with four hour acknowledgement and four hour subsequent response (support engineer onsite or customer replaceable part available).

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

HS-1: IBM p5 595 Model 9119
24 - 1.65 GHz POWER5 CPU
96 GB Memory
64 – 4Gb FC Adapter
AIX 5.3 ML4

SC-1: Sun StorageTek® 9990V System
256GB Cache, 20GB Shared Memory
8 Frontend Directors, 8 Backend Directors
1024 – 146GB 15K RPM Drives
Microcode 60-01-44

64 FC Connection

Benchmark Configuration/Tested Storage Configuration Components

Host System:	Tested Storage Configuration (TSC):
UID=HS-1 IBM P5 595 Model 9119	64 – 4 Gb P5 595 FC PCI-X 2.0 DDR Adapters

24 - 1.65 GHz CPUs – 2 CPUs/POWER5 chip
    32 KB L1 cache, 960 KB L2 cache,
    and 18 MB L3 cache per CPU
	UID=SC-1:
	Sun StorageTek® 9990 System

96 GB main memory	256 GB cache *(data)*, 22 GB shared memory *(metadata)*
AIX 5.3 ML4	
PCI-X/RIO	8 pair *(16 ports/pair)* 4 Gb FC Front-End Directors *(128 ports total, 64 ports used)*
WG	9 pair 4 Gb Backend Directors supporting 64 FC disk loops
	1024 – 146 GB 15K RPM disk drives

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 58 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 59 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 91.

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 54 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)	26,000.000
Addressable Storage Capacity	Gigabytes (GB)	32,847.910
Configured Storage Capacity	Gigabytes (GB)	147,214.836
Physical Storage Capacity	Gigabytes (GB)	150,528.000
Data Protection *(Mirroring)*	Gigabytes (GB)	73,607.418
Required Storage *(metadata)*	Gigabytes (GB)	1.141
Global Storage Overhead	Gigabytes (GB)	0.000
Total Unused Storage	Gigabytes (GB)	98,525.718
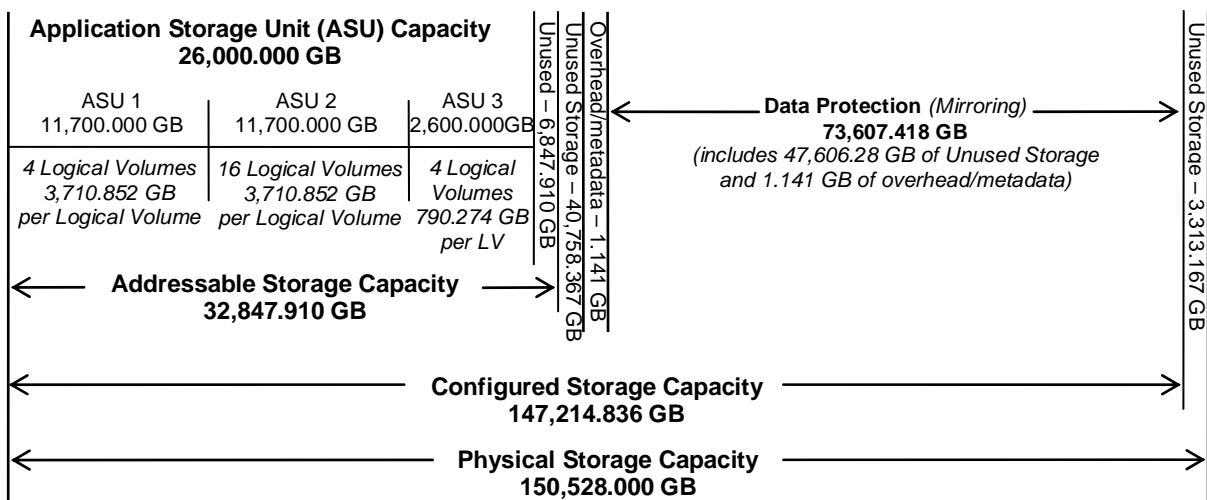
SPC-1 Storage Hierarchy Ratios

	Addressable Storage Capacity	Configured Storage Capacity	Physical Storage Capacity
Total ASU Capacity	79.15%	17.66%	17.27%
Required for Data Protection (Mirroring)		50.00%	48.90%
Addressable Storage Capacity		22.31%	21.82%
Required Storage		0.00%	0.00%
Configured Storage Capacity			97.80%
Global Storage Overhead			0.000%
Unused Storage:			
Addressable	20.85%		
Configured		64.68%	
Physical			2.20%

The Physical Storage Capacity consisted of 150,528.000 GB distributed over 1024 disk drives each with a formatted capacity of 147.000 GB. There was 3,313.164 GB (2.20%) of Unused Storage within the Physical Storage Capacity. Global Storage Overhead consisted of 0.000 GB (0.00%) of Physical Storage Capacity. There was 95,212.554 GB (64.68%) of Unused Storage within the Configured Storage Capacity. The Total ASU Capacity utilized 79.15% of the Addressable Storage Capacity resulting in 6,847.910 GB (20.85%) 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 (11,700.000 GB)	**ASU-2 (11,700.000 GB)**	**ASU-3 (2,600.000 GB)**
4 Logical Volumes 3,710.852 GB per Logical Volume (2,925.000 GB used per Logical Volume)	4 Logical Volumes 3,710.852 GB per Logical Volume (2,925.000 GB used per Logical Volume)	4 Logical Volumes 790.274 GB per Logical Volume (650.000 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.

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 55 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 92.

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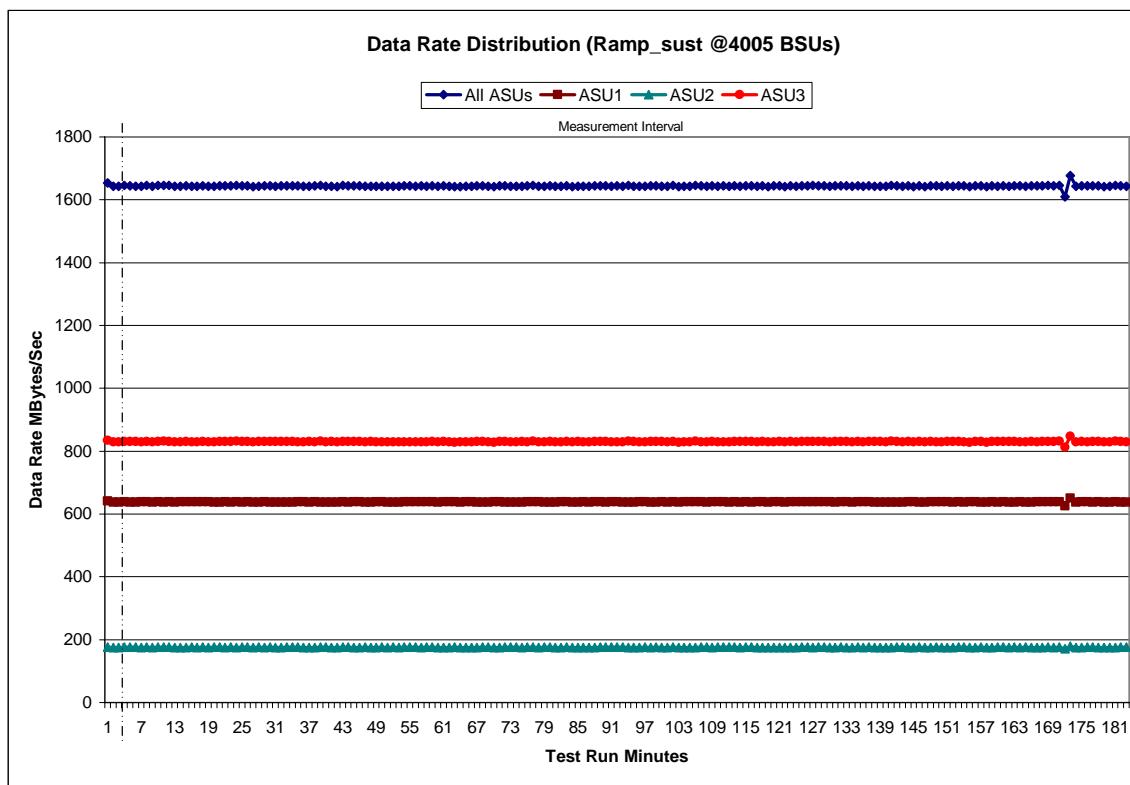
A link to the test results file generated from the Sustainability Test Run is listed below.

Sustainability Test Results File

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

	Start	Stop	Interval	Duration
Ramp-Up/Start-Up	10:16:09	10:19:09	0-2	0:03:00
Measurement Interval	10:19:09	13:19:09	3-182	3:00:00

Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3
0	1,653.14	641.57	176.85	834.72	63	1,641.93	637.90	175.29	828.74	126	1,645.43	638.94	175.57	830.92
1	1,643.16	637.93	175.59	829.65	64	1,642.93	638.29	175.25	829.39	127	1,644.50	638.24	175.69	830.57
2	1,643.15	638.17	175.37	829.61	65	1,643.67	638.55	175.48	829.64	128	1,644.89	638.36	175.83	830.70
3	1,645.58	638.56	176.01	831.00	66	1,644.44	637.76	175.56	831.13	129	1,643.32	638.62	175.47	829.23
4	1,643.92	637.68	175.60	830.64	67	1,644.49	637.86	175.75	830.89	130	1,644.23	638.11	175.53	830.60
5	1,643.55	637.64	175.60	830.31	68	1,643.15	637.44	175.74	829.96	131	1,644.65	638.33	175.62	830.70
6	1,643.45	638.47	175.56	829.42	69	1,642.15	638.31	175.19	828.65	132	1,644.00	638.44	175.33	830.24
7	1,645.39	638.88	176.09	830.42	70	1,644.45	638.35	175.34	830.76	133	1,643.08	637.81	175.26	830.01
8	1,642.85	637.99	175.49	829.38	71	1,644.01	638.06	175.77	830.18	134	1,645.12	638.81	175.77	830.55
9	1,645.52	638.33	176.13	831.06	72	1,643.77	638.08	175.77	829.93	135	1,643.70	638.98	175.32	829.40
10	1,645.24	638.00	175.78	831.47	73	1,643.53	637.95	175.99	829.60	136	1,644.21	638.45	175.68	830.09
11	1,645.20	638.56	175.92	830.73	74	1,643.56	637.99	175.38	830.19	137	1,643.34	637.92	175.38	830.04
12	1,643.27	638.22	175.39	829.66	75	1,644.11	638.40	175.92	829.79	138	1,643.63	638.10	175.37	830.17
13	1,643.25	638.56	175.29	829.40	76	1,645.91	638.44	175.74	831.73	139	1,642.92	637.52	175.56	829.84
14	1,643.86	638.62	174.94	830.30	77	1,643.76	638.39	175.55	829.82	140	1,645.14	638.12	175.47	831.55
15	1,643.32	638.47	175.84	829.00	78	1,643.10	637.89	175.62	829.59	141	1,644.09	638.02	175.87	830.21
16	1,643.52	638.34	175.32	829.87	79	1,643.97	637.86	175.83	830.29	142	1,643.50	638.13	175.67	829.71
17	1,644.50	638.35	175.83	830.32	80	1,642.62	637.57	175.48	829.57	143	1,644.72	638.33	175.38	831.01
18	1,643.20	638.40	175.20	829.60	81	1,643.16	638.69	175.15	829.32	144	1,642.34	638.38	175.10	828.86
19	1,643.50	638.10	175.75	829.65	82	1,644.84	638.80	175.84	830.20	145	1,644.49	637.79	176.10	830.60
20	1,644.74	637.84	176.03	830.87	83	1,642.33	637.63	175.40	829.30	146	1,641.84	637.60	175.39	828.85
21	1,645.02	638.67	175.51	830.84	84	1,643.15	637.46	175.29	830.40	147	1,644.90	638.74	175.50	830.66
22	1,643.92	637.70	175.72	830.51	85	1,643.34	638.53	175.26	829.56	148	1,643.90	638.42	175.71	829.78
23	1,645.64	638.76	175.44	831.44	86	1,642.82	638.01	175.49	829.32	149	1,643.60	638.35	175.43	829.81
24	1,645.13	638.19	175.87	831.07	87	1,644.12	638.31	175.46	830.35	150	1,644.11	638.33	175.26	830.51
25	1,644.30	638.48	175.61	830.21	88	1,644.55	638.37	175.84	830.35	151	1,643.38	637.66	175.49	830.23
26	1,641.66	637.41	175.44	828.82	89	1,644.13	638.20	175.68	830.25	152	1,644.90	638.39	175.76	830.75
27	1,643.74	637.65	175.66	830.44	90	1,643.54	638.32	175.61	829.61	153	1,644.07	638.07	175.98	830.02
28	1,644.21	638.38	175.54	830.28	91	1,643.97	638.45	175.80	829.72	154	1,642.23	638.25	175.30	828.68
29	1,644.62	638.05	175.61	830.96	92	1,643.73	638.13	175.68	829.92	155	1,644.25	638.37	175.53	830.35
30	1,643.35	637.61	175.48	830.27	93	1,645.57	638.15	175.50	831.92	156	1,644.49	637.94	175.89	830.66
31	1,644.61	638.17	175.46	830.98	94	1,643.72	638.12	175.50	830.10	157	1,641.86	637.86	175.36	828.64
32	1,644.78	637.77	175.93	831.08	95	1,643.52	638.35	175.25	829.92	158	1,644.99	638.85	175.45	830.69
33	1,643.86	637.79	175.92	830.15	96	1,643.60	638.73	175.64	829.23	159	1,643.32	637.33	175.68	830.31
34	1,644.26	638.72	175.63	829.91	97	1,644.01	637.72	175.54	830.75	160	1,644.91	638.50	175.89	830.51
35	1,643.61	638.29	175.54	829.79	98	1,644.41	637.73	175.99	830.69	161	1,643.64	637.64	175.51	830.50
36	1,643.72	637.75	175.22	830.75	99	1,643.65	638.32	175.17	830.16	162	1,644.27	638.14	175.70	830.43
37	1,644.33	638.94	175.58	829.80	100	1,643.28	638.13	175.29	829.85	163	1,643.88	638.34	175.57	829.97
38	1,645.33	638.22	175.73	831.38	101	1,645.75	638.71	175.92	831.12	164	1,643.63	637.81	175.88	829.94
39	1,643.30	637.94	176.00	829.36	102	1,641.95	638.16	175.53	828.26	165	1,644.25	638.04	175.53	830.68
40	1,643.40	637.61	175.52	830.27	103	1,643.61	638.51	175.50	829.60	166	1,644.21	639.02	175.59	829.60
41	1,642.39	638.00	175.23	829.16	104	1,643.39	638.51	175.20	829.68	167	1,643.89	638.37	175.48	830.04
42	1,645.56	638.56	175.89	831.11	105	1,645.24	638.42	175.44	831.38	168	1,645.19	639.09	175.74	830.37
43	1,644.33	638.21	175.78	830.35	106	1,644.11	638.54	175.83	829.75	169	1,644.65	638.56	175.15	830.94
44	1,644.51	638.36	175.56	830.59	107	1,643.54	637.97	175.68	829.89	170	1,646.14	638.44	176.16	831.54
45	1,644.50	638.27	175.26	830.98	108	1,643.58	638.25	175.51	830.80	171	1,609.77	625.43	171.69	812.66
46	1,643.55	638.04	176.04	829.47	109	1,643.58	638.48	175.69	829.41	172	1,677.02	650.64	178.83	847.55
47	1,643.49	638.04	175.37	830.07	110	1,643.98	638.38	175.67	829.93	173	1,642.93	638.07	175.45	829.41
48	1,642.72	638.49	175.13	829.09	111	1,643.58	637.90	175.73	829.95	174	1,644.90	638.69	175.43	830.78
49	1,643.84	638.47	175.99	829.37	112	1,645.07	638.42	176.00	830.64	175	1,644.11	638.54	175.81	829.76
50	1,643.46	638.13	175.43	829.90	113	1,643.40	637.97	175.10	830.33	176	1,644.13	637.81	176.09	830.23
51	1,642.86	637.84	175.70	829.32	114	1,644.57	638.45	175.70	830.42	177	1,644.35	638.76	175.48	830.10
52	1,642.88	637.48	175.50	829.90	115	1,644.24	638.02	175.67	830.54	178	1,641.88	637.45	175.54	828.89
53	1,644.26	638.78	175.64	829.84	116	1,643.65	638.74	175.38	829.53	179	1,643.08	637.70	175.38	829.99
54	1,644.49	638.56	176.12	829.82	117	1,645.06	638.73	175.33	831.00	180	1,645.17	638.25	175.28	831.63
55	1,643.27	638.46	175.60	829.21	118	1,642.53	637.16	175.36	830.02	181	1,644.15	638.03	175.82	830.30
56	1,643.97	638.75	175.31	829.91	119	1,644.06	638.64	175.49	829.93	182	1,643.30	637.75	175.76	829.79
57	1,643.76	638.62	175.95	829.19	120	1,644.48	638.30	174.91	831.27					
58	1,644.44	638.32	175.98	830.14	121	1,641.86	637.15	175.52	829.19					
59	1,643.12	638.14	175.34	829.64	122	1,644.61	638.62	175.24	830.75					
60	1,644.55	638.30	175.44	830.82	123	1,643.30	638.54	175.36	829.40					
61	1,642.91	638.31	175.41	829.20	124	1,644.42	638.41	175.99	830.02					
62	1,642.15	638.24	175.63	828.28	125	1,644.82	638.57	175.99	830.26					
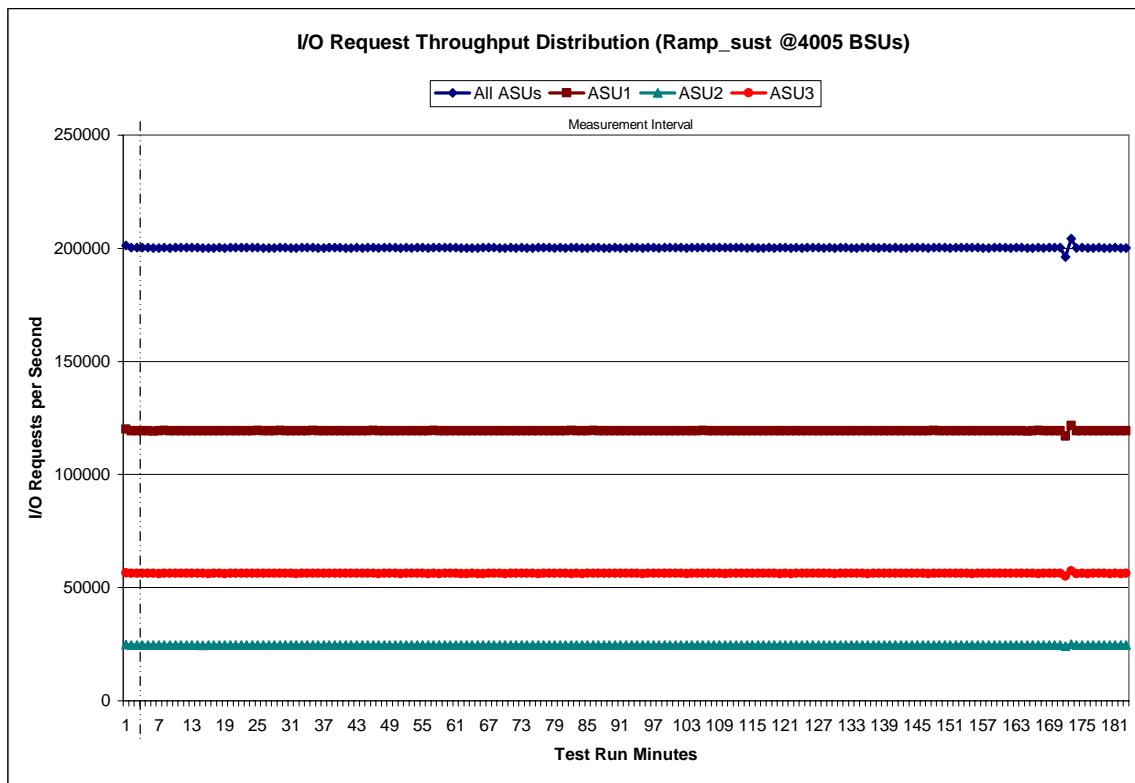
Sustainability – Data Rate Distribution Graph

Sustainability – I/O Request Throughput Distribution Data

	Start	Stop	Interval	Duration
Ramp-Up/Start-Up	10:16:09	10:19:09	0-2	0:03:00
Measurement Interval	10:19:09	13:19:09	3-182	3:00:00

Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3
0	201,263.67	119,991.67	24,754.55	56,517.45	63	200,204.87	119,354.80	24,603.13	56,246.93	126	200,317.08	119,391.67	24,645.75	56,279.67
1	200,250.93	119,363.93	24,635.62	56,251.38	64	200,198.20	119,349.83	24,612.72	56,235.65	127	200,171.87	119,300.25	24,611.22	56,260.40
2	200,291.05	119,360.83	24,629.67	56,300.55	65	200,254.07	119,383.32	24,640.13	56,230.62	128	200,338.72	119,361.63	24,671.33	56,305.75
3	200,291.13	119,367.13	24,623.60	56,300.40	66	200,270.98	119,284.18	24,659.90	56,326.90	129	200,199.77	119,365.83	24,625.33	56,208.60
4	200,300.73	119,387.88	24,640.50	56,272.35	67	200,291.77	119,349.20	24,647.68	56,294.88	130	200,288.95	119,350.75	24,625.85	56,312.35
5	200,102.65	119,212.20	24,632.60	56,257.85	68	200,187.62	119,303.07	24,614.12	56,270.43	131	200,315.87	119,332.22	24,650.52	56,333.13
6	200,209.48	119,379.80	24,626.07	56,203.62	69	200,146.02	119,300.05	24,605.30	56,240.67	132	200,228.95	119,315.47	24,616.62	56,296.87
7	200,329.33	119,425.05	24,649.05	56,255.23	70	200,279.52	119,411.40	24,592.17	56,275.95	133	200,153.70	119,254.42	24,633.58	56,265.70
8	200,199.57	119,321.50	24,624.37	56,253.70	71	200,221.75	119,322.38	24,630.72	56,268.65	134	200,290.32	119,378.12	24,653.25	56,258.95
9	200,304.18	119,377.13	24,656.97	56,270.08	72	200,244.15	119,312.88	24,661.37	56,269.90	135	200,262.50	119,378.58	24,639.57	56,244.35
10	200,271.45	119,350.48	24,608.88	56,312.08	73	200,205.10	119,269.78	24,663.95	56,271.37	136	200,281.80	119,349.27	24,656.85	56,275.68
11	200,298.28	119,337.95	24,657.48	56,302.85	74	200,158.17	119,291.85	24,611.13	56,255.18	137	200,141.90	119,305.42	24,578.85	56,257.63
12	200,302.40	119,367.43	24,616.95	56,318.02	75	200,286.32	119,386.80	24,671.68	56,227.83	138	200,237.77	119,372.83	24,606.82	56,258.12
13	200,270.25	119,389.07	24,618.12	56,263.07	76	200,344.65	119,374.45	24,649.83	56,320.37	139	200,193.48	119,335.65	24,597.17	56,260.67
14	200,198.65	119,373.75	24,564.58	56,260.32	77	200,259.65	119,291.17	24,614.67	56,258.05	140	200,295.83	119,389.82	24,615.27	56,290.75
15	200,208.45	119,351.33	24,621.93	56,235.18	78	200,174.30	119,291.17	24,631.47	56,251.67	141	200,233.52	119,344.60	24,636.87	56,252.05
16	200,230.77	119,350.92	24,633.88	56,245.97	79	200,245.82	119,332.05	24,630.12	56,283.65	142	200,146.45	119,296.90	24,595.80	56,253.75
17	200,241.75	119,329.90	24,633.37	56,278.48	80	200,229.77	119,328.67	24,632.38	56,268.72	143	200,291.62	119,360.73	24,642.30	56,288.58
18	200,225.27	119,388.33	24,613.30	56,223.63	81	200,313.78	119,489.00	24,597.83	56,226.95	144	200,248.57	119,363.40	24,633.97	56,251.20
19	200,293.17	119,355.13	24,677.05	56,260.98	82	200,340.40	119,383.65	24,688.33	56,268.42	145	200,273.18	119,315.02	24,670.10	56,288.07
20	200,292.15	119,321.50	24,658.25	56,312.40	83	200,210.77	119,348.33	24,633.18	56,229.25	146	200,129.65	119,282.82	24,622.13	56,224.70
21	200,250.17	119,378.88	24,581.05	56,290.23	84	200,195.93	119,300.80	24,594.43	56,300.70	147	200,335.12	119,426.42	24,627.35	56,281.35
22	200,251.27	119,303.33	24,678.82	56,269.12	85	200,337.78	119,433.62	24,626.53	56,277.63	148	200,268.28	119,324.68	24,636.62	56,306.98
23	200,279.37	119,372.58	24,614.65	56,292.13	86	200,212.57	119,331.18	24,601.15	56,280.23	149	200,256.97	119,377.80	24,608.75	56,270.42
24	200,360.55	119,421.62	24,648.73	56,290.20	87	200,212.57	119,331.18	24,601.15	56,280.23	150	200,224.95	119,311.72	24,621.82	56,291.42
25	200,225.67	119,347.42	24,612.70	56,265.55	88	200,191.48	119,289.25	24,625.60	56,276.63	151	200,286.07	119,356.07	24,640.03	56,289.97
26	200,232.47	119,345.08	24,616.95	56,270.43	89	200,246.42	119,321.50	24,614.60	56,310.32	152	200,341.43	119,378.55	24,645.73	56,317.15
27	200,227.55	119,292.75	24,627.52	56,307.28	90	200,206.55	119,314.93	24,618.80	56,272.82	153	200,279.63	119,358.52	24,645.40	56,275.72
28	200,375.28	119,433.07	24,641.55	56,300.67	91	200,202.58	119,319.27	24,610.63	56,272.68	154	200,270.83	119,376.52	24,659.48	56,234.83
29	200,297.57	119,361.73	24,626.53	56,309.30	92	200,193.47	119,332.28	24,652.30	56,297.20	155	200,246.83	119,325.18	24,629.47	56,292.18
30	200,224.37	119,322.98	24,622.48	56,278.90	93	200,315.12	119,359.33	24,644.78	56,311.00	156	200,225.13	119,307.88	24,660.58	56,256.67
31	200,224.77	119,345.12	24,641.20	56,238.45	94	200,195.00	119,354.23	24,601.47	56,239.30	157	200,200.88	119,323.15	24,608.73	56,269.00
32	200,340.27	119,370.02	24,627.02	56,343.23	95	200,350.50	119,408.43	24,638.75	56,303.32	158	200,251.47	119,332.02	24,609.13	56,310.32
33	200,279.32	119,304.32	24,675.20	56,299.80	96	200,338.58	119,406.83	24,645.88	56,285.87	159	200,282.52	119,330.68	24,660.48	56,291.35
34	200,361.93	119,442.58	24,628.17	56,291.18	97	200,178.12	119,282.72	24,623.13	56,272.27	160	200,260.05	119,331.82	24,654.97	56,273.27
35	200,218.27	119,337.38	24,631.50	56,249.38	98	200,297.95	119,326.68	24,701.22	56,270.05	161	200,191.20	119,300.63	24,637.98	56,252.58
36	200,230.35	119,324.88	24,615.42	56,290.05	99	200,240.08	119,329.65	24,608.07	56,302.37	162	200,331.00	119,365.52	24,670.08	56,295.40
37	200,283.82	119,400.98	24,594.08	56,288.75	100	200,282.97	119,375.83	24,594.90	56,312.23	163	200,268.85	119,361.98	24,633.20	56,273.67
38	200,279.08	119,319.53	24,650.75	56,308.80	101	200,362.40	119,386.72	24,657.83	56,317.85	164	200,136.35	119,226.43	24,664.28	56,245.63
39	200,238.87	119,320.98	24,657.22	56,260.67	102	200,193.47	119,348.35	24,619.62	56,225.50	165	200,222.08	119,280.98	24,650.70	56,290.40
40	200,170.73	119,288.68	24,635.97	56,246.08	103	200,250.28	119,348.57	24,610.60	56,291.12	166	200,293.50	119,458.38	24,621.32	56,213.80
41	200,196.08	119,329.20	24,618.88	56,248.00	104	200,280.18	119,375.05	24,627.08	56,278.05	167	200,210.72	119,324.15	24,637.57	56,249.00
42	200,241.60	119,304.47	24,656.88	56,280.25	105	200,365.43	119,423.03	24,618.05	56,324.35	168	200,282.75	119,347.23	24,644.92	56,290.60
43	200,228.07	119,321.07	24,642.40	56,264.60	106	200,242.03	119,363.37	24,620.97	56,257.70	169	200,274.17	119,396.88	24,605.25	56,272.03
44	200,246.95	119,345.98	24,620.93	56,280.03	107	200,315.95	119,420.40	24,631.50	56,264.05	170	200,335.50	119,370.62	24,655.92	56,308.97
45	200,398.23	119,450.93	24,616.17	56,331.13	108	200,280.67	119,344.82	24,640.63	56,295.22	171	196,181.50	116,937.25	24,134.50	55,109.75
46	200,218.97	119,341.02	24,636.43	56,241.52	109	200,253.73	119,361.25	24,652.48	56,240.00	172	204,233.33	121,746.87	25,092.18	57,394.28
47	200,240.18	119,356.85	24,622.88	56,260.45	110	200,252.53	119,361.07	24,628.32	56,263.15	173	200,148.98	119,291.90	24,635.73	56,221.35
48	200,270.60	119,378.85	24,620.87	56,270.88	111	200,307.33	119,350.52	24,652.55	56,304.27	174	200,355.22	119,404.32	24,636.92	56,313.98
49	200,235.85	119,310.62	24,658.98	56,266.25	112	200,288.98	119,397.72	24,627.62	56,263.65	175	200,216.60	119,336.42	24,662.03	56,218.15
50	200,193.67	119,342.10	24,614.10	56,237.47	113	200,140.63	119,258.23	24,604.10	56,278.30	176	200,216.75	119,286.25	24,645.65	56,284.85
51	200,285.47	119,329.93	24,694.62	56,260.92	114	200,291.92	119,326.22	24,636.40	56,329.30	177	200,297.20	119,408.72	24,632.30	56,256.18
52	200,228.47	119,313.18	24,641.50	56,273.78	115	200,164.80	119,264.67	24,646.35	56,253.78	178	200,214.80	119,292.15	24,634.77	56,287.88
53	200,289.13	119,369.77	24,658.15	56,261.22	116	200,189.55	119,290.67	24,628.73	56,270.15	179	200,142.38	119,275.88	24,632.62	56,233.88
54	200,321.22	119,403.80	24,637.50	56,279.92	117	200,249.22	119,341.87	24,614.93	56,292.42	180	200,265.65	119,358.35	24,597.03	56,310.27
55	200,189.45	119,306.08	24,640.98	56,242.38	118	200,212.40	119,327.93	24,607.30	56,277.17	181	200,197.62	119,306.95	24,647.90	56,242.77
56	200,333.83	119,435.33	24,624.78	56,273.72	119	200,256.88	119,395.83	24,635.20	56,225.85	182	200,230.75	119,354.90	24,596.05	56,279.80
57	200,281.65	119,401.57	24,644.65	56,235.43	120	200,239.30	119,339.80	24,614.00	56,285.50	Average	200,251.42	119,347.36	24,631.94	56,272.13
58	200,258.97	119,350.40	24,637.12	56,271.45	121	200,177.55	119,285.37	24,660.90	56,231.28					
59	200,255.50	119,357.83	24,623.92	56,273.75	122	200,259.10	119,360.07	24,619.58	56,279.45					
60	200,319.95	119,420.37	24,614.50	56,285.08	123	200,200.57	119,329.62	24,604.05	56,266.90					
61	200,147.23	119,334.72	24,592.58	56,219.93	124	200,250.80	119,341.33	24,652.08	56,257.38					
62	200,190.28	119,342.98	24,650.52	56,196.78	125	200,319.73	119,390.55	24,638.30	56,290.88					

Sustainability – I/O Request Throughput Distribution Graph

Sustainability – Average Response Time (ms) Distribution Data

|	Start	Stop	Interval	Duration
Ramp-Up/Start-Up	10:16:09	10:19:09	0-2	0:03:00
Measurement Interval	10:19:09	13:19:09	3-182	3:00:00

| Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3	Interval	All ASUs	ASU1	ASU2	ASU3
0	4.54	5.54	4.92	2.24	63	4.89	6.02	5.26	2.33	126	5.14	6.27	5.51	2.57
1	4.78	5.85	5.16	2.34	64	4.97	6.10	5.35	2.41	127	5.03	6.15	5.39	2.50
2	4.84	5.91	5.21	2.41	65	5.07	6.20	5.45	2.51	128	5.12	6.24	5.48	2.58
3	4.86	5.93	5.22	2.43	66	5.13	6.26	5.49	2.58	129	5.07	6.19	5.42	2.56
4	4.94	6.04	5.33	2.44	67	5.08	6.20	5.44	2.53	130	5.08	6.21	5.44	2.54
5	5.04	6.16	5.43	2.50	68	5.07	6.19	5.46	2.54	131	5.06	6.20	5.43	2.48
6	5.04	6.18	5.40	2.47	69	5.09	6.20	5.46	2.58	132	5.08	6.22	5.44	2.49
7	5.00	6.12	5.38	2.43	70	5.02	6.14	5.39	2.50	133	5.07	6.19	5.44	2.54
8	5.10	6.22	5.48	2.57	71	5.09	6.21	5.46	2.56	134	5.06	6.19	5.42	2.52
9	5.10	6.23	5.49	2.55	72	5.15	6.28	5.52	2.59	135	5.03	6.16	5.40	2.45
10	5.14	6.26	5.51	2.61	73	5.16	6.30	5.53	2.60	136	5.03	6.17	5.39	2.48
11	4.99	6.11	5.38	2.43	74	5.04	6.17	5.40	2.50	137	5.14	6.27	5.50	2.59
12	5.02	6.15	5.40	2.46	75	5.05	6.18	5.43	2.47	138	5.02	6.14	5.37	2.49
13	5.17	6.30	5.54	2.61	76	5.16	6.29	5.53	2.60	139	5.04	6.16	5.41	2.50
14	5.11	6.23	5.49	2.57	77	5.11	6.23	5.48	2.57	140	4.98	6.11	5.34	2.41
15	5.11	6.23	5.47	2.56	78	5.02	6.13	5.39	2.51	141	5.01	6.14	5.37	2.44
16	5.12	6.25	5.50	2.57	79	5.01	6.12	5.38	2.50	142	5.15	6.28	5.52	2.60
17	5.07	6.19	5.45	2.52	80	5.05	6.17	5.42	2.51	143	5.07	6.21	5.43	2.51
18	5.05	6.17	5.43	2.51	81	5.08	6.20	5.45	2.52	144	5.05	6.18	5.40	2.48
19	4.93	6.04	5.30	2.40	82	5.15	6.27	5.52	2.60	145	5.20	6.34	5.57	2.63
20	4.93	6.05	5.31	2.40	83	5.13	6.27	5.50	2.57	146	5.18	6.32	5.54	2.62
21	5.04	6.16	5.41	2.51	84	5.13	6.26	5.50	2.57	147	5.04	6.17	5.40	2.47
22	5.01	6.13	5.38	2.49	85	5.19	6.32	5.57	2.62	148	5.02	6.15	5.38	2.46
23	4.99	6.09	5.36	2.51	86	5.18	6.31	5.54	2.64	149	4.98	6.11	5.35	2.42
24	5.03	6.12	5.40	2.54	87	5.05	6.19	5.43	2.48	150	4.99	6.13	5.34	2.43
25	5.07	6.18	5.44	2.56	88	5.12	6.25	5.48	2.57	151	5.12	6.24	5.48	2.58
26	5.06	6.18	5.45	2.54	89	5.09	6.23	5.46	2.52	152	5.09	6.21	5.43	2.54
27	5.11	6.23	5.48	2.57	90	5.13	6.25	5.50	2.58	153	5.12	6.26	5.48	2.54
28	5.01	6.13	5.38	2.48	91	5.11	6.24	5.47	2.54	154	5.07	6.22	5.43	2.48
29	5.04	6.16	5.41	2.49	92	5.09	6.21	5.45	2.55	155	5.11	6.25	5.48	2.52
30	5.11	6.24	5.48	2.57	93	4.98	6.09	5.35	2.44	156	5.12	6.26	5.48	2.56
31	5.16	6.29	5.53	2.59	94	5.06	6.19	5.43	2.52	157	5.18	6.32	5.54	2.61
32	5.02	6.12	5.39	2.51	95	5.10	6.23	5.46	2.55	158	5.13	6.28	5.50	2.52
33	5.09	6.20	5.45	2.58	96	5.21	6.37	5.55	2.61	159	5.17	6.30	5.54	2.60
34	5.04	6.14	5.40	2.54	97	5.16	6.29	5.52	2.62	160	5.07	6.18	5.41	2.55
35	5.05	6.16	5.43	2.54	98	5.06	6.19	5.43	2.49	161	5.09	6.21	5.44	2.54
36	5.03	6.15	5.40	2.51	99	5.10	6.23	5.47	2.55	162	5.11	6.24	5.46	2.55
37	5.01	6.13	5.38	2.49	100	5.19	6.33	5.56	2.62	163	5.44	6.70	5.82	2.60
38	5.07	6.18	5.44	2.55	101	5.13	6.26	5.49	2.57	164	5.19	6.36	5.53	2.54
39	5.11	6.23	5.48	2.58	102	5.04	6.16	5.39	2.50	165	5.14	6.30	5.50	2.52
40	5.14	6.26	5.50	2.59	103	5.11	6.23	5.46	2.58	166	5.17	6.32	5.54	2.58
41	5.04	6.16	5.42	2.50	104	5.10	6.22	5.46	2.55	167	5.21	6.35	5.57	2.63
42	5.09	6.21	5.46	2.53	105	5.04	6.17	5.41	2.49	168	5.07	6.22	5.40	2.49
43	5.17	6.30	5.52	2.63	106	5.13	6.26	5.49	2.57	169	5.07	6.19	5.44	2.54
44	5.13	6.25	5.51	2.57	107	5.05	6.18	5.41	2.49	170	5.03	6.15	5.38	2.50
45	5.06	6.18	5.43	2.52	108	5.17	6.37	5.46	2.49	171	6.61	8.75	5.58	2.51
46	5.10	6.21	5.48	2.57	109	5.02	6.14	5.38	2.48	172	6.46	8.16	5.89	3.12
47	5.17	6.30	5.54	2.62	110	5.04	6.15	5.40	2.54	173	4.73	5.87	5.10	2.15
48	5.17	6.29	5.54	2.61	111	5.09	6.21	5.46	2.57	174	4.79	5.93	5.17	2.20
49	5.07	6.21	5.45	2.50	112	5.03	6.16	5.39	2.49	175	4.79	5.95	5.16	2.19
50	5.12	6.25	5.49	2.57	113	5.10	6.22	5.45	2.57	176	4.87	6.02	5.23	2.26
51	5.14	6.30	5.47	2.54	114	5.05	6.17	5.41	2.50	177	4.83	5.98	5.19	2.23
52	5.13	6.24	5.51	2.61	115	5.00	6.13	5.37	2.43	178	4.71	5.85	5.08	2.13
53	5.11	6.22	5.48	2.59	116	5.11	6.25	5.49	2.54	179	4.73	5.87	5.08	2.15
54	5.09	6.20	5.46	2.56	117	5.10	6.23	5.47	2.53	180	4.74	5.88	5.11	2.16
55	5.14	6.25	5.50	2.62	118	5.15	6.28	5.50	2.59	181	4.77	5.91	5.14	2.21
56	5.05	6.17	5.42	2.50	119	5.15	6.28	5.52	2.60	182	4.79	5.91	5.15	2.24
57	5.09	6.23	5.44	2.53	120	5.15	6.28	5.52	2.59	Average	5.08	6.22	5.44	2.52
58	5.22	6.40	5.54	2.56	121	5.21	6.33	5.56	2.66					
59	5.05	6.19	5.42	2.47	122	5.13	6.26	5.49	2.57					
60	5.13	6.26	5.50	2.58	123	5.11	6.24	5.48	2.57					
61	5.09	6.21	5.46	2.55	124	5.07	6.18	5.43	2.54					
62	4.94	6.06	5.31	2.41	125	5.06	6.19	5.43	2.53					
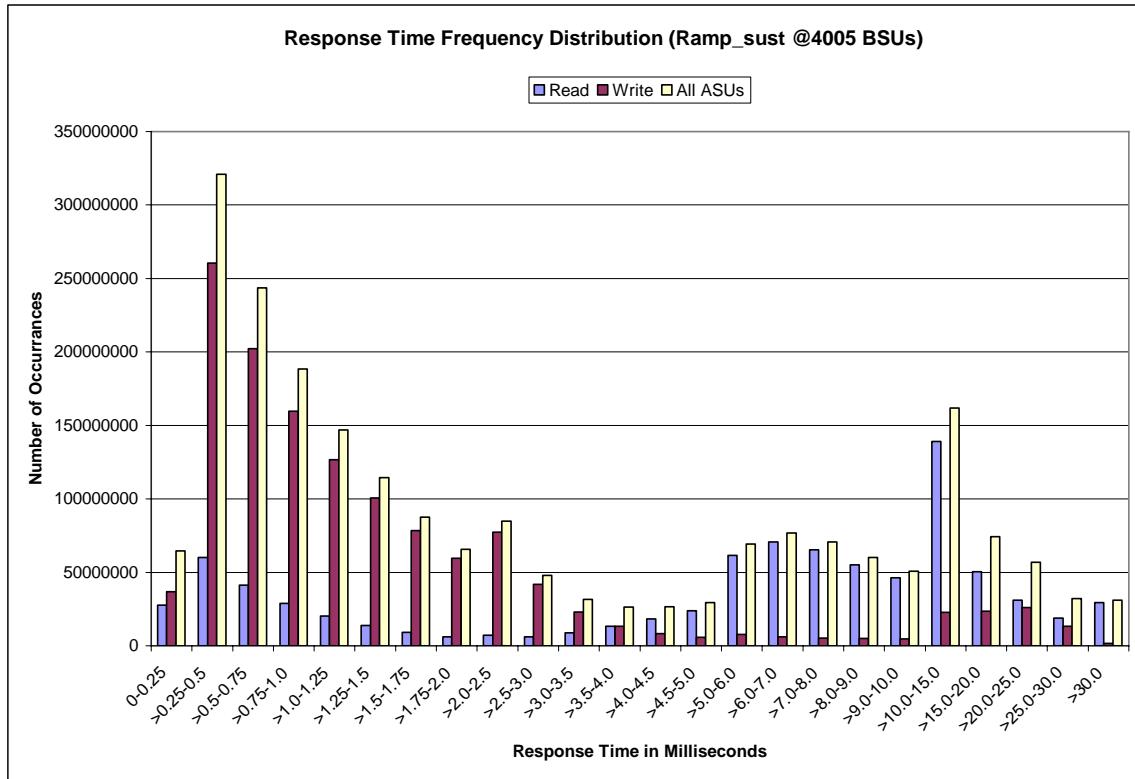
Sustainability – Average Response Time (ms) Distribution Graph

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	27,717,239	60,219,422	41,317,755	28,861,963	20,216,513	13,922,864	9,269,430	6,065,074
Write	36,746,730	260,571,644	202,394,575	159,540,238	126,683,136	100,595,982	78,396,641	59,629,936
All ASUs	64,463,969	320,791,066	243,712,330	188,402,201	146,899,649	114,518,846	87,666,071	65,695,010
ASU1	34,361,890	162,002,195	117,944,409	89,283,079	69,097,731	53,388,313	40,471,266	30,088,512
ASU2	9,833,219	44,210,082	32,262,871	24,156,450	18,489,231	14,116,162	10,567,406	7,749,458
ASU3	20,268,860	114,578,789	93,505,050	74,962,672	59,312,687	47,014,371	36,627,399	27,857,040

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	7,246,039	6,157,098	8,779,464	13,184,771	18,381,195	23,695,718	61,474,678	70,757,045
Write	77,437,283	41,890,057	22,878,693	13,226,189	8,322,145	5,715,684	7,843,276	6,039,174
All ASUs	84,683,322	48,047,155	31,658,157	26,410,960	26,703,340	29,411,402	69,317,954	76,796,219
ASU1	38,871,523	23,406,447	18,101,575	18,331,325	21,204,997	25,025,729	61,088,448	67,787,394
ASU2	9,670,413	5,122,034	2,908,986	1,918,527	1,616,180	1,709,974	4,545,595	6,158,178
ASU3	36,141,386	19,518,674	10,647,596	6,161,108	3,882,163	2,675,699	3,683,911	2,850,647

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	65,317,711	55,113,667	46,224,784	139,067,600	50,535,166	30,917,379	18,941,404	29,287,437
Write	5,344,207	4,907,326	4,623,490	22,684,351	23,603,373	25,945,329	13,258,555	1,764,966
All ASUs	70,661,918	60,020,993	50,848,274	161,751,951	74,138,539	56,862,708	32,199,959	31,052,403
ASU1	61,082,680	50,662,141	42,238,887	129,012,318	52,456,830	37,293,039	21,585,547	24,164,469
ASU2	7,049,345	7,031,807	6,411,065	21,981,001	10,624,185	7,476,640	4,387,719	6,028,297
ASU3	2,529,893	2,327,045	2,198,322	10,758,632	11,057,524	12,093,029	6,226,693	859,637

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	0.1405	0.2810	0.2100	0.0180	0.0700	0.0350	0.2810
COV	0.001	0.000	0.001	0.001	0.002	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 – 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 92.

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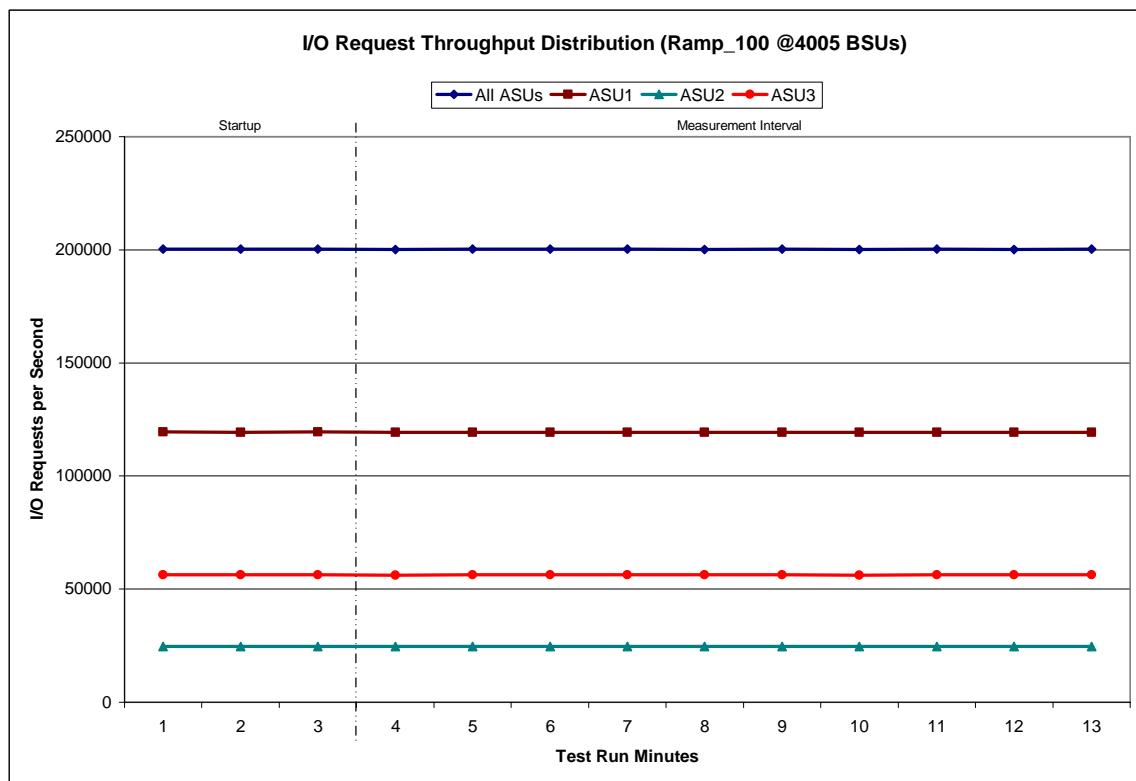
A link to the test results file generated from the IOPS Test Run is listed below.

IOPS Test Results File

IOPS Test Run – I/O Request Throughput Distribution Data

4005 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	13:20:58	13:23:59	0-2	0:03:01
Measurement Interval	13:23:59	13:33:59	3-12	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	200,364.53	119,437.93	24,639.10	56,287.50
1	200,299.00	119,351.32	24,642.12	56,305.57
2	200,334.62	119,431.82	24,639.27	56,263.53
3	200,194.98	119,357.12	24,599.78	56,238.08
4	200,276.50	119,285.15	24,659.97	56,331.38
5	200,238.00	119,344.07	24,633.90	56,260.03
6	200,300.85	119,344.77	24,644.45	56,311.63
7	200,233.63	119,358.68	24,610.37	56,264.58
8	200,260.08	119,337.77	24,635.42	56,286.90
9	200,202.45	119,391.38	24,611.93	56,199.13
10	200,287.85	119,409.17	24,596.48	56,282.20
11	200,228.82	119,312.37	24,628.75	56,287.70
12	200,234.08	119,309.48	24,596.33	56,328.27
Average	200,245.73	119,345.00	24,621.74	56,278.99
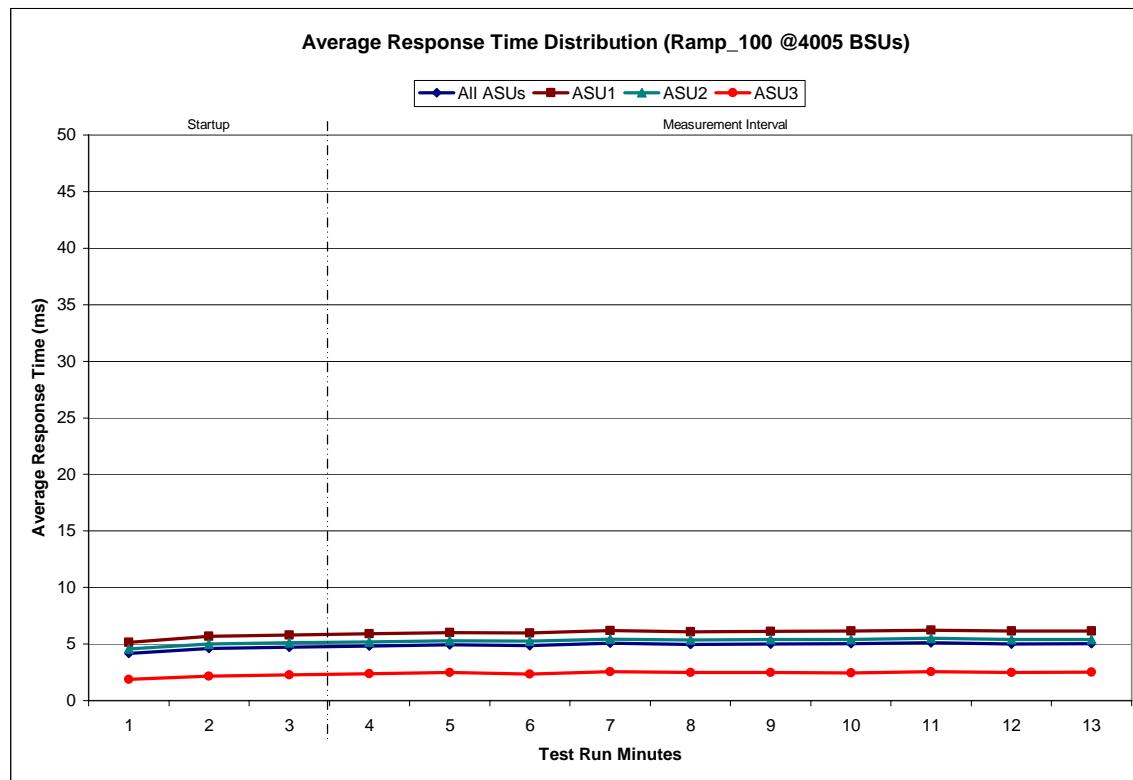
IOPS Test Run – I/O Request Throughput Distribution Graph

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

4005 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	13:20:58	13:23:59	0-2	0:03:01
Measurement Interval	13:23:59	13:33:59	3-12	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	4.17	5.16	4.56	1.88
1	4.62	5.69	4.99	2.17
2	4.73	5.80	5.12	2.28
3	4.82	5.89	5.20	2.39
4	4.93	6.01	5.29	2.48
5	4.86	5.97	5.25	2.33
6	5.08	6.19	5.45	2.56
7	4.98	6.09	5.36	2.47
8	5.01	6.13	5.39	2.47
9	5.02	6.15	5.40	2.47
10	5.12	6.24	5.50	2.57
11	5.02	6.14	5.41	2.47
12	5.04	6.15	5.41	2.52
Average	4.99	6.10	5.37	2.47
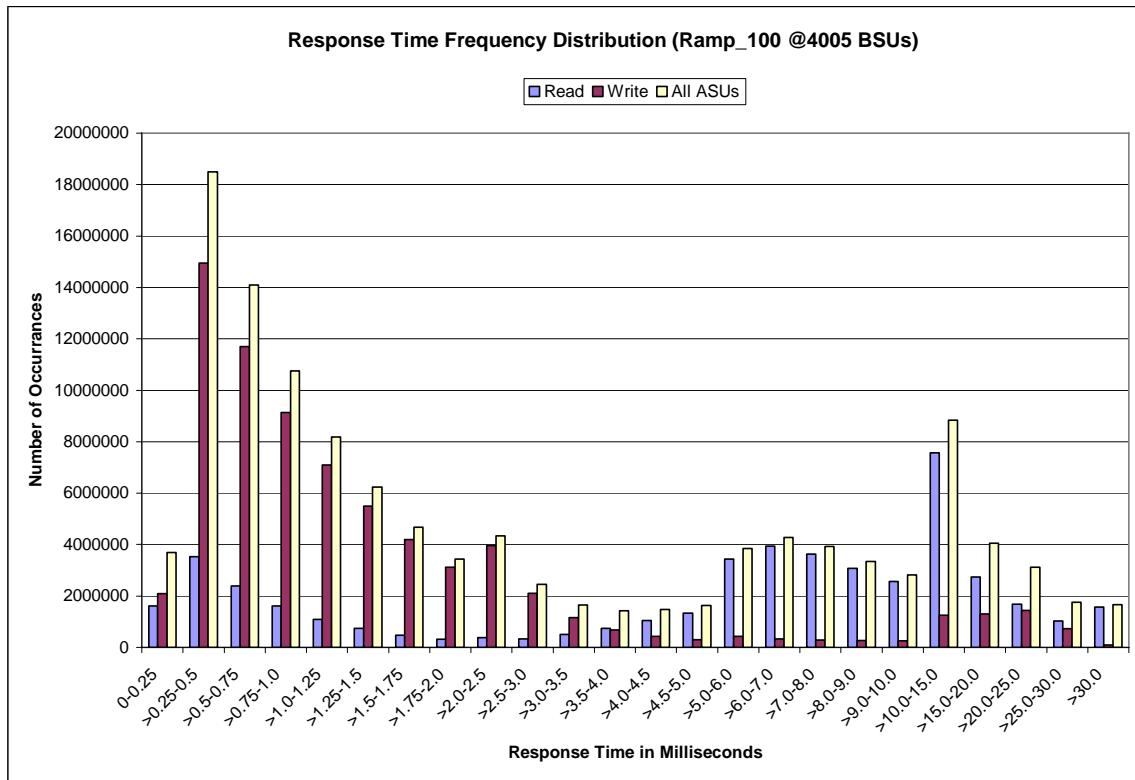
IOPS Test Run – Average Response Time (ms) Distribution Graph

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	1608848	3,534,341	2,394,605	1,617,453	1,095,521	736,428	481,922	311,015
Write	2083888	14,955,722	11,699,707	9,137,441	7,097,744	5,498,069	4,188,513	3,123,400
All ASUs	3692736	18,490,063	14,094,312	10,754,894	8,193,265	6,234,497	4,670,435	3,434,415
ASU1	1982269	9,367,054	6,832,556	5,093,916	3,848,128	2,901,264	2,154,361	1,572,676
ASU2	557316	2,541,091	1,856,752	1,366,564	1,020,898	762,476	559,234	401,622
ASU3	1153151	6,581,918	5,405,004	4,294,414	3,324,239	2,570,757	1,956,840	1,460,117

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	375,175	340,251	500,070	750,909	1,039,932	1,330,616	3,434,572	3,939,394
Write	3,964,235	2,107,750	1,150,166	674,095	431,580	301,208	419,780	328,805
All ASUs	4,339,410	2,448,001	1,650,236	1,425,004	1,471,512	1,631,824	3,854,352	4,268,199
ASU1	1,998,037	1,207,563	967,376	1,010,731	1,182,757	1,396,202	3,402,878	3,767,095
ASU2	493,226	258,412	147,624	100,796	87,899	94,740	255,121	345,925
ASU3	1,848,147	982,026	535,236	313,477	200,856	140,882	196,353	155,179

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	3,633,001	3,069,522	2,565,078	7,573,979	2,745,298	1,678,889	1,027,831	1,571,900
Write	292,110	270,116	256,978	1,254,437	1,305,008	1,436,245	724,510	88,370
All ASUs	3,925,111	3,339,638	2,822,056	8,828,416	4,050,306	3,115,134	1,752,341	1,660,270
ASU1	3,390,473	2,815,017	2,339,075	7,023,196	2,854,189	2,036,415	1,172,322	1,290,726
ASU2	396,266	396,637	360,239	1,210,657	584,286	409,994	240,217	324,920
ASU3	138,372	127,984	122,742	594,563	611,831	668,725	339,802	44,624

IOPS Test Run –Response Time Frequency Distribution Graph

Response Time Frequency Distribution (Ramp_100 @4005 BSUs)

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
120,146,427	118,486,157	1,660,270

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	0.001	0.001	0.000	0.002	0.001	0.001	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 – 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 92.

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
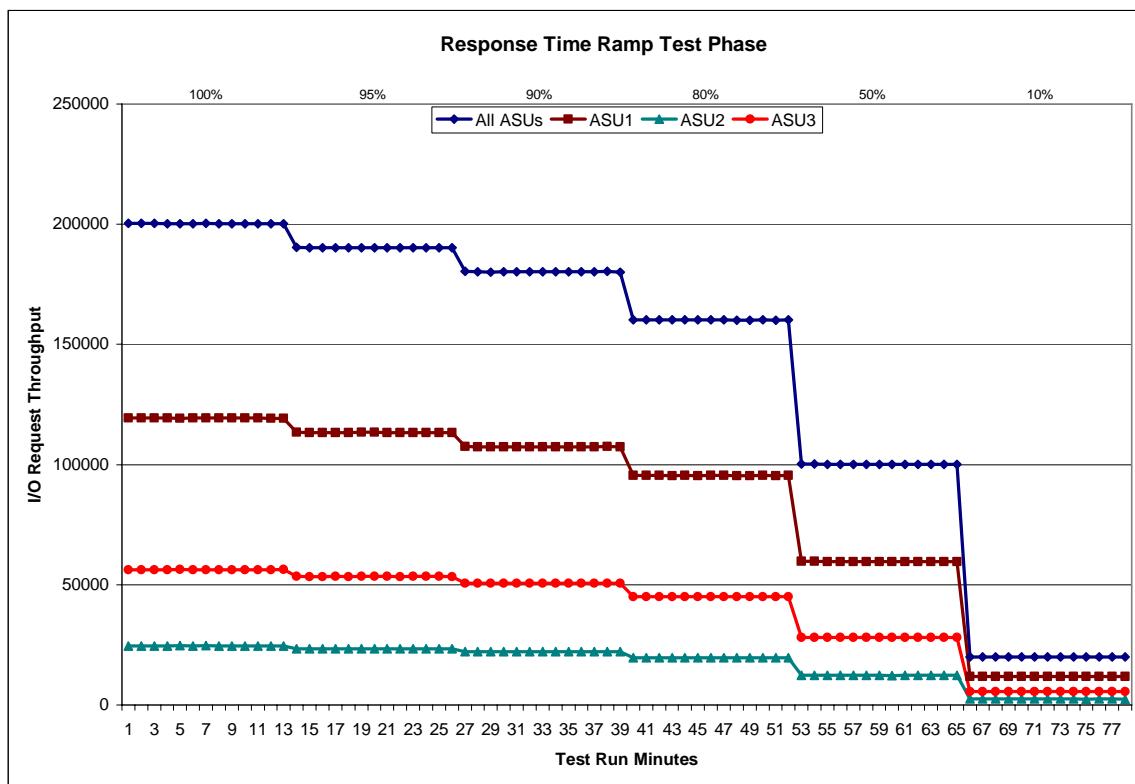
10% Load Level

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 - 4005 BSUs	Start	Stop	Interval	Duration	95% Load Level - 3804 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	13:20:58	13:23:59	0-2	0:03:01	Start-Up/Ramp-Up	13:35:15	13:38:16	0-2	0:03:01
Measurement Interval	13:23:59	13:33:59	3-12	0:10:00	Measurement Interval	13:38:16	13:48:16	3-12	0:10:00
(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3	(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	200,364.53	119,437.93	24,639.10	56,287.50	0	190,403.22	113,530.07	23,397.20	53,475.95
1	200,299.00	119,351.32	24,642.12	56,305.57	1	190,198.05	113,355.35	23,409.10	53,433.60
2	200,334.62	119,431.82	24,639.27	56,263.53	2	190,216.43	113,383.37	23,407.48	53,425.58
3	200,194.98	119,357.12	24,599.78	56,238.08	3	190,165.53	113,304.68	23,389.25	53,471.60
4	200,276.50	119,285.15	24,659.97	56,331.38	4	190,241.65	113,366.52	23,441.87	53,433.27
5	200,238.00	119,344.07	24,633.90	56,260.03	5	190,232.40	113,407.10	23,361.30	53,464.00
6	200,300.85	119,344.77	24,644.45	56,311.63	6	190,215.97	113,405.53	23,366.25	53,444.18
7	200,233.63	119,358.68	24,610.37	56,264.58	7	190,144.40	113,286.97	23,388.07	53,469.37
8	200,260.08	119,337.77	24,635.42	56,286.90	8	190,179.83	113,360.08	23,390.07	53,429.68
9	200,202.45	119,391.38	24,611.93	56,199.13	9	190,266.02	113,380.08	23,392.05	53,493.88
10	200,287.85	119,409.17	24,596.48	56,282.20	10	190,210.47	113,382.22	23,383.87	53,444.38
11	200,228.82	119,312.37	24,628.75	56,287.70	11	190,140.65	113,286.08	23,391.98	53,462.58
12	200,234.08	119,309.48	24,596.33	56,328.27	12	190,169.42	113,368.00	23,391.08	53,410.33
Average	200,245.73	119,345.00	24,621.74	56,278.99	Average	190,196.63	113,354.73	23,389.58	53,452.33

90% Load Level - 3604 BSUs	Start	Stop	Interval	Duration	80% Load Level - 3204 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	13:49:30	13:52:31	0-2	0:03:01	Start-Up/Ramp-Up	14:03:40	14:06:41	0-2	0:03:01
Measurement Interval	13:52:31	14:02:31	3-12	0:10:00	Measurement Interval	14:06:41	14:16:41	3-12	0:10:00
(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3	(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	180,384.92	107,513.37	22,195.25	50,676.30	0	160,254.77	95,499.57	19,703.25	45,051.95
1	180,246.85	107,403.40	22,188.13	50,655.32	1	160,269.70	95,511.70	19,723.78	45,034.22
2	180,082.97	107,313.67	22,126.95	50,642.35	2	160,230.13	95,503.55	19,713.83	45,012.75
3	180,243.73	107,419.80	22,190.90	50,633.03	3	160,176.07	95,427.63	19,690.85	45,057.58
4	180,134.92	107,356.58	22,169.20	50,609.13	4	160,237.22	95,485.72	19,705.60	45,045.90
5	180,248.05	107,442.73	22,159.80	50,645.52	5	160,152.03	95,443.48	19,719.30	44,989.25
6	180,140.70	107,333.80	22,156.02	50,650.88	6	160,152.65	95,493.92	19,673.62	44,985.12
7	180,194.43	107,373.43	22,134.37	50,686.63	7	160,228.85	95,458.33	19,700.98	45,069.53
8	180,227.73	107,401.45	22,137.68	50,688.60	8	160,142.58	95,396.05	19,710.13	45,036.40
9	180,158.15	107,409.57	22,161.02	50,587.57	9	160,083.92	95,376.77	19,713.55	44,993.60
10	180,241.72	107,436.95	22,167.43	50,637.33	10	160,202.58	95,476.23	19,698.20	45,028.15
11	180,310.03	107,500.02	22,163.57	50,646.45	11	160,106.77	95,441.78	19,680.68	44,984.30
12	180,123.63	107,325.87	22,151.38	50,646.38	12	160,222.82	95,493.07	19,705.60	45,024.15
Average	180,202.31	107,400.02	22,159.14	50,643.15	Average	160,170.55	95,449.30	19,699.85	45,021.40

50% Load Level - 2002 BSUs	Start	Stop	Interval	Duration	10% Load Level - 400 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	14:17:36	14:20:37	0-2	0:03:01	Start-Up/Ramp-Up	14:31:17	14:34:18	0-2	0:03:01
Measurement Interval	14:20:37	14:30:37	3-12	0:10:00	Measurement Interval	14:34:18	14:44:18	3-12	0:10:00
(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3	(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	100,191.03	59,719.12	12,313.37	28,158.55	0	19,990.90	11,910.52	2,461.53	5,618.85
1	100,195.20	59,763.45	12,324.55	28,107.20	1	19,994.60	11,920.65	2,457.97	5,615.98
2	100,164.58	59,701.17	12,312.13	28,151.28	2	19,982.65	11,912.58	2,457.18	5,612.88
3	100,065.43	59,657.70	12,299.90	28,107.83	3	20,002.18	11,902.33	2,465.78	5,634.07
4	100,124.22	59,691.38	12,337.88	28,094.95	4	20,010.87	11,908.30	2,465.12	5,637.45
5	100,133.22	59,691.92	12,322.12	28,119.18	5	20,032.03	11,928.77	2,473.35	5,629.92
6	100,170.18	59,689.98	12,349.57	28,130.63	6	19,970.30	11,890.43	2,457.23	5,622.63
7	100,053.18	59,657.37	12,277.78	28,118.03	7	19,984.47	11,914.90	2,465.45	5,604.12
8	100,082.30	59,624.98	12,338.27	28,119.05	8	20,020.18	11,935.87	2,459.40	5,624.92
9	100,135.80	59,670.13	12,312.73	28,152.93	9	19,971.35	11,892.00	2,455.37	5,623.98
10	100,050.62	59,595.40	12,316.83	28,138.38	10	19,996.68	11,915.52	2,461.47	5,619.70
11	100,110.75	59,681.57	12,311.17	28,118.02	11	19,985.95	11,900.27	2,461.53	5,624.15
12	100,131.15	59,699.92	12,305.90	28,125.33	12	19,969.27	11,915.35	2,452.90	5,601.02
Average	100,105.69	59,666.04	12,317.22	28,122.44	Average	19,994.33	11,910.37	2,461.76	5,622.20
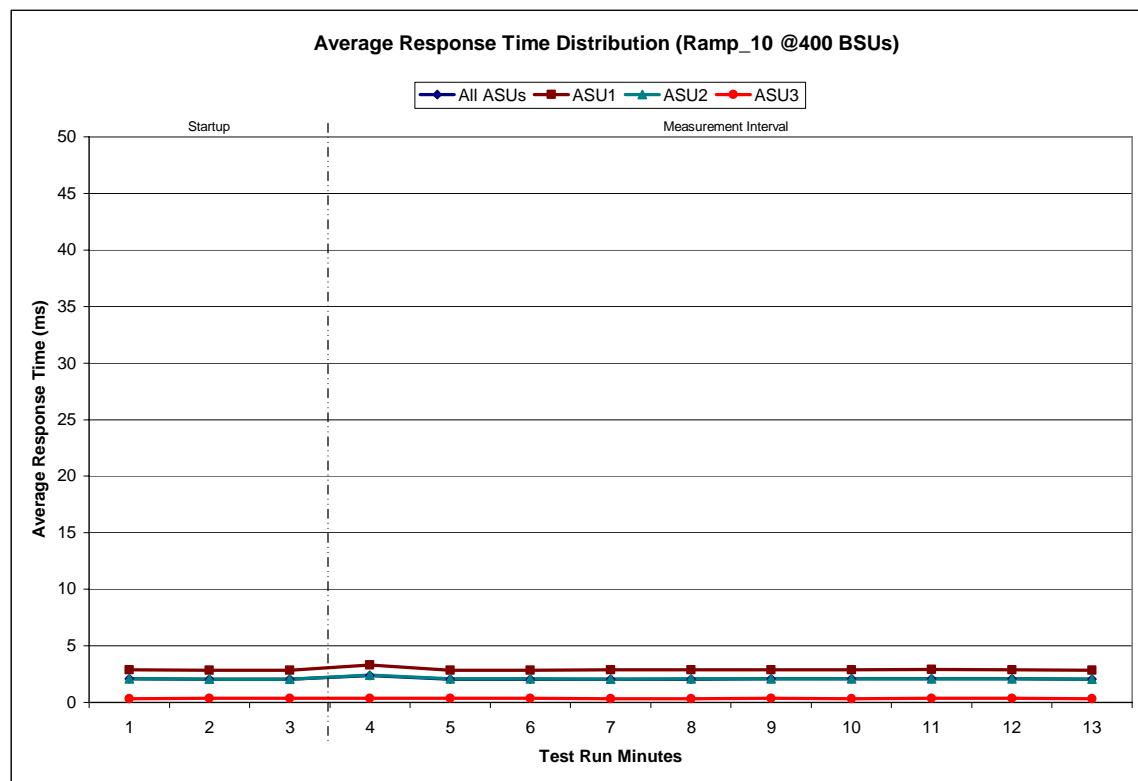
Response Time Ramp Distribution (IOPS) Graph

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

400 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	14:31:17	14:34:18	0-2	0:03:01
Measurement Interval	14:34:18	14:44:18	3-12	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	2.07	2.89	2.10	0.33
1	2.05	2.85	2.06	0.35
2	2.05	2.86	2.06	0.35
3	2.37	3.33	2.40	0.34
4	2.05	2.86	2.07	0.34
5	2.05	2.86	2.07	0.34
6	2.06	2.87	2.07	0.34
7	2.06	2.87	2.08	0.34
8	2.07	2.89	2.09	0.34
9	2.07	2.89	2.09	0.34
10	2.08	2.90	2.08	0.34
11	2.08	2.90	2.09	0.34
12	2.05	2.86	2.07	0.34
Average	2.10	2.92	2.11	0.34

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	0.0349	0.2808	0.0699	0.2100	0.0180	0.0700	0.0351	0.2812
COV	0.005	0.001	0.003	0.002	0.008	0.003	0.003	0.002

Clause 3.4.3

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

Clauses 5.1.0 and 5.3.13.2

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

Clause 5.3.13.3

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

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 92.

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	*200,245.73*	*2.10*
Repeatability Test Phase 1	200,257.00	2.07
Repeatability Test Phase 2	200,272.94	2.08

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)
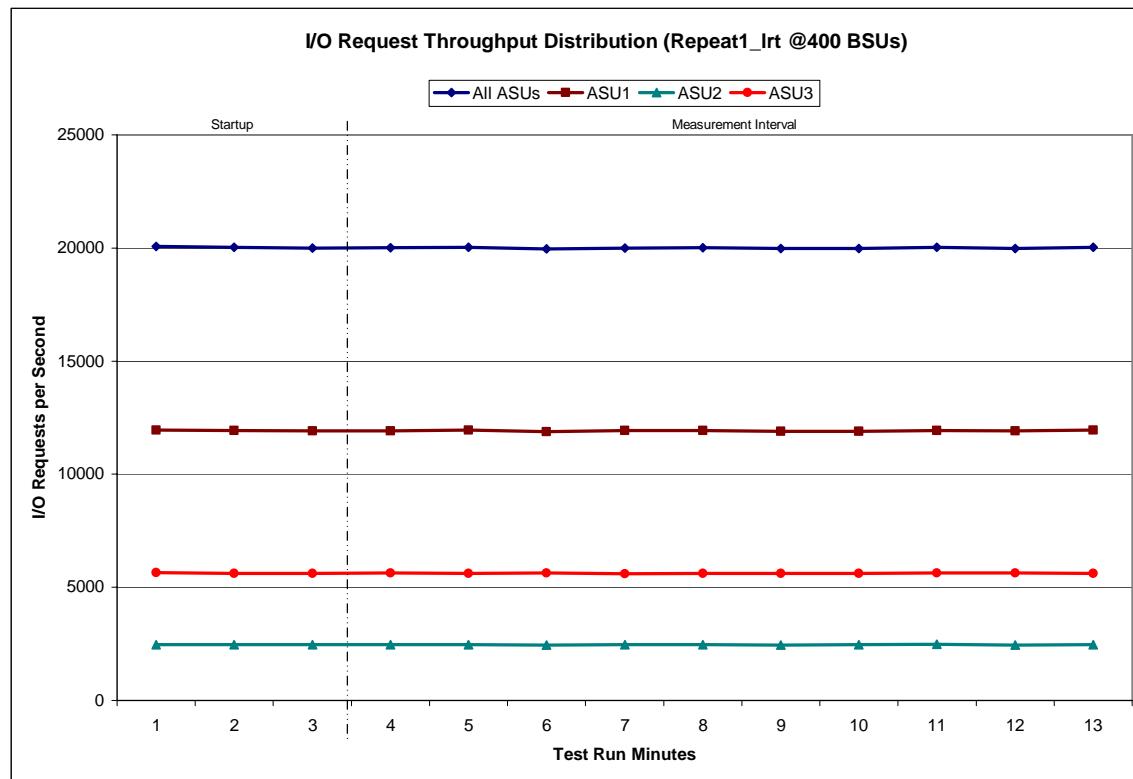
Repeatability 1 LRT – I/O Request Throughput Distribution Data

400 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	14:45:58	14:48:58	0-2	0:03:00
Measurement Interval	14:48:58	14:58:58	3-12	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	20,062.20	11,945.63	2,465.02	5,651.55
1	20,027.98	11,940.30	2,464.33	5,623.35
2	19,999.02	11,917.28	2,466.68	5,615.05
3	20,008.25	11,916.27	2,461.50	5,630.48
4	20,033.27	11,944.70	2,474.15	5,614.42
5	19,963.85	11,874.70	2,451.45	5,637.70
6	20,002.03	11,931.52	2,467.00	5,603.52
7	20,012.72	11,924.32	2,468.98	5,619.42
8	19,975.88	11,899.15	2,456.60	5,620.13
9	19,987.22	11,899.55	2,467.80	5,619.87
10	20,033.08	11,924.98	2,477.60	5,630.50
11	19,985.52	11,907.97	2,449.97	5,627.58
12	20,034.12	11,947.98	2,472.25	5,613.88
Average	20,003.59	11,917.11	2,464.73	5,621.75
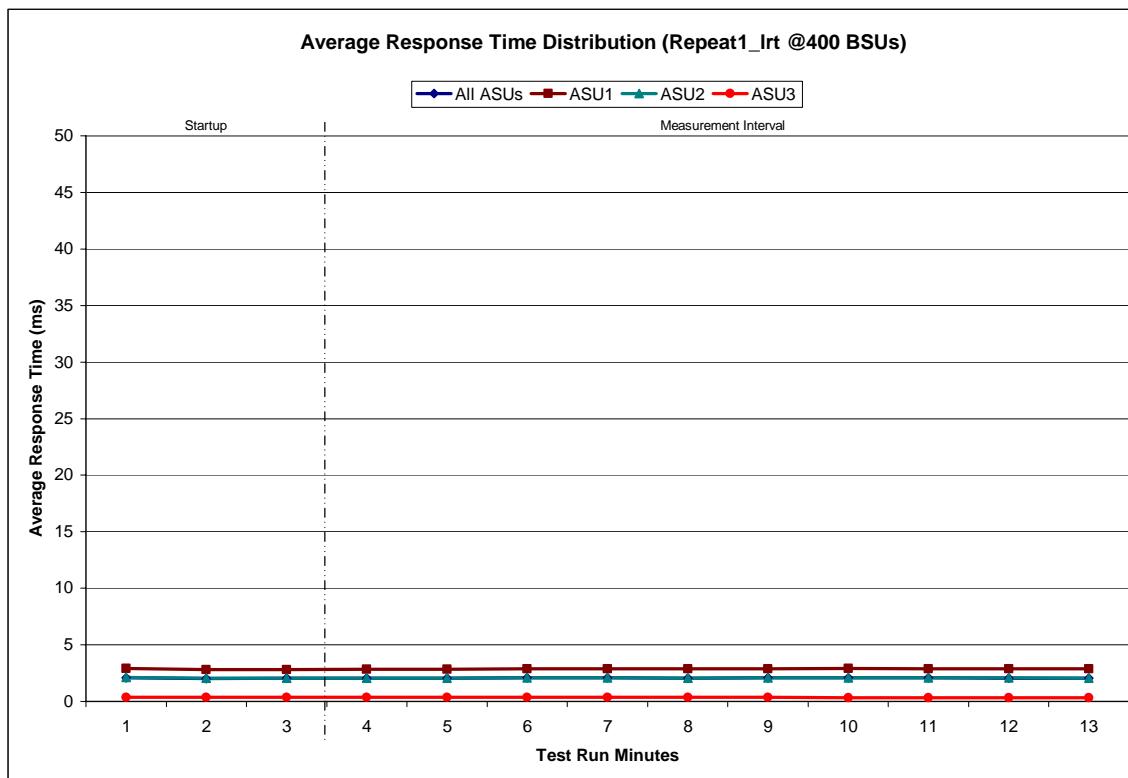
Repeatability 1 LRT – I/O Request Throughput Distribution Graph

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

400 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	14:45:58	14:48:58	0-2	0:03:00
Measurement Interval	14:48:58	14:58:58	3-12	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	2.10	2.92	2.13	0.35
1	2.02	2.80	2.06	0.34
2	2.03	2.82	2.06	0.34
3	2.04	2.84	2.07	0.34
4	2.06	2.86	2.07	0.34
5	2.07	2.89	2.08	0.34
6	2.08	2.89	2.08	0.34
7	2.07	2.88	2.07	0.34
8	2.07	2.88	2.09	0.34
9	2.08	2.90	2.10	0.34
10	2.08	2.89	2.09	0.34
11	2.06	2.87	2.08	0.34
12	2.06	2.87	2.06	0.34
Average	2.07	2.88	2.08	0.34
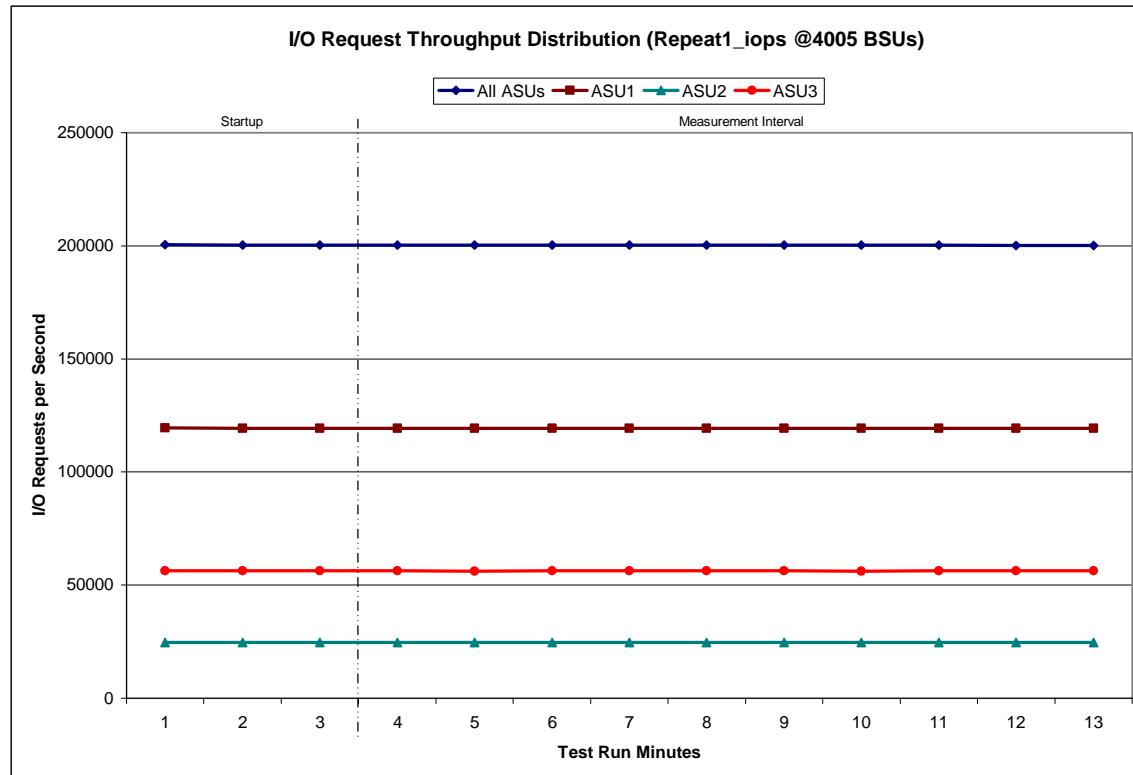
Repeatability 1 LRT –Average Response Time (ms) Distribution Graph

Repeatability 1 IOPS – I/O Request Throughput Distribution Data

4005 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	15:00:23	15:03:24	0-2	0:03:01
Measurement Interval	15:03:24	15:13:24	3-12	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	200,493.60	119,530.63	24,702.95	56,260.02
1	200,339.53	119,416.30	24,627.53	56,295.70
2	200,294.43	119,395.08	24,648.30	56,251.05
3	200,235.60	119,250.18	24,686.40	56,299.02
4	200,256.17	119,375.62	24,658.12	56,222.43
5	200,247.78	119,355.07	24,613.30	56,279.42
6	200,267.28	119,379.88	24,625.35	56,262.05
7	200,347.60	119,392.25	24,661.77	56,293.58
8	200,307.25	119,359.07	24,642.68	56,305.50
9	200,240.80	119,368.23	24,632.25	56,240.32
10	200,278.78	119,312.13	24,666.95	56,299.70
11	200,196.17	119,301.42	24,625.67	56,269.08
12	200,192.57	119,274.65	24,632.12	56,285.80
Average	200,257.00	119,336.85	24,644.46	56,275.69
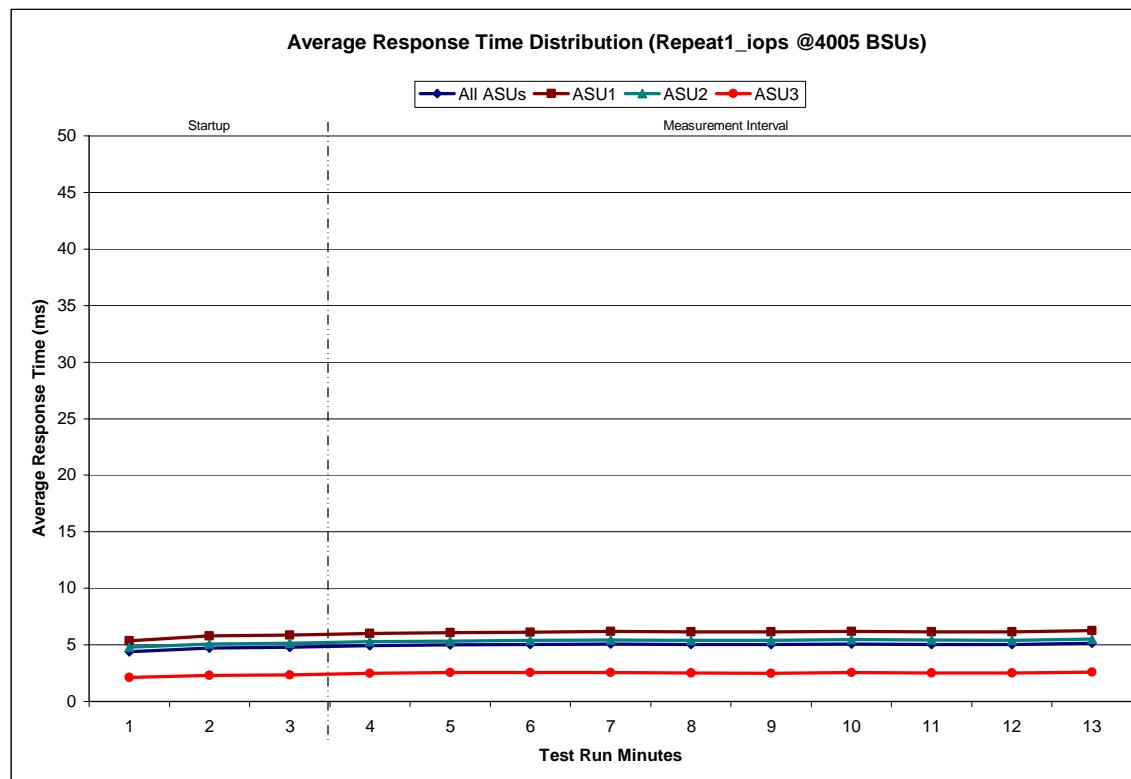
Repeatability 1 IOPS – I/O Request Throughput Distribution Graph

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

4005 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	15:00:23	15:03:24	0-2	0:03:01
Measurement Interval	15:03:24	15:13:24	3-12	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	4.39	5.37	4.80	2.13
1	4.72	5.78	5.08	2.29
2	4.78	5.85	5.14	2.34
3	4.93	6.00	5.30	2.50
4	4.99	6.07	5.33	2.54
5	5.02	6.12	5.39	2.55
6	5.08	6.19	5.45	2.56
7	5.04	6.15	5.41	2.50
8	5.04	6.16	5.42	2.49
9	5.09	6.20	5.46	2.57
10	5.04	6.16	5.42	2.51
11	5.04	6.16	5.41	2.52
12	5.13	6.25	5.51	2.59
Average	5.04	6.15	5.41	2.53
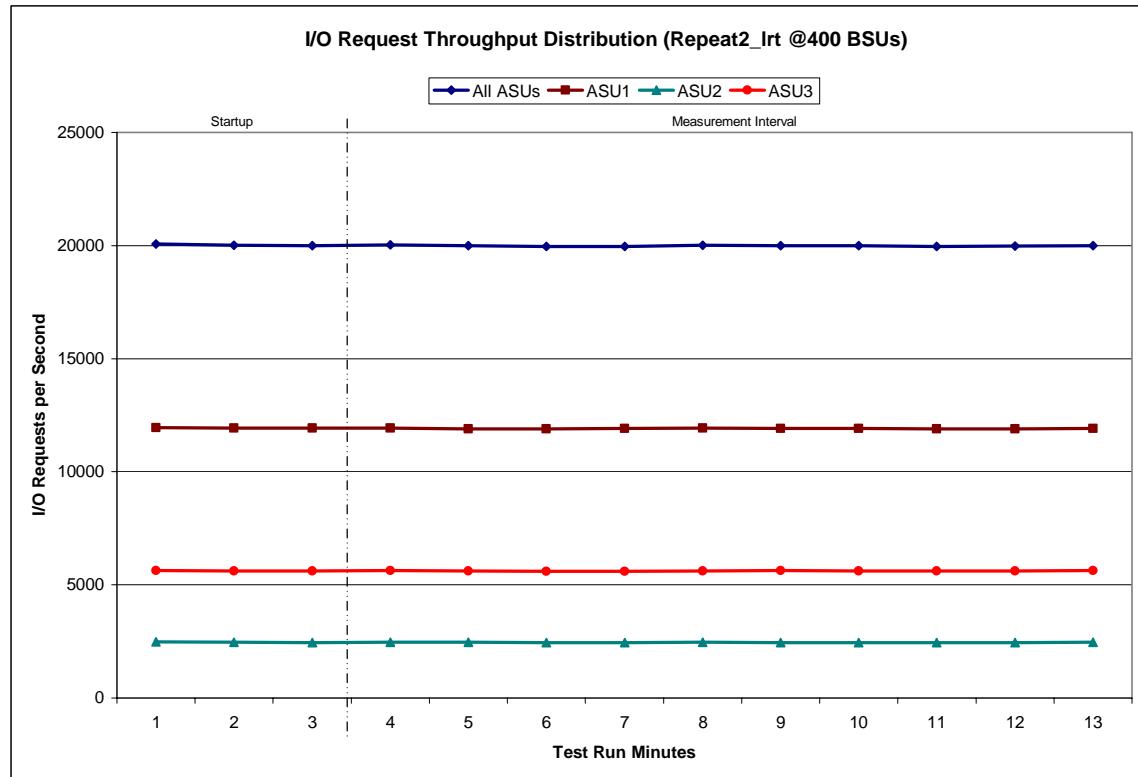
Repeatability 1 IOPS –Average Response Time (ms) Distribution Graph

Repeatability 2 LRT – I/O Request Throughput Distribution Data

400 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	15:15:00	15:18:00	0-2	0:03:00
Measurement Interval	15:18:00	15:28:00	3-12	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	20,072.00	11,959.35	2,476.60	5,636.05
1	20,021.17	11,938.55	2,458.77	5,623.85
2	19,997.37	11,928.08	2,454.87	5,614.42
3	20,029.05	11,939.20	2,458.88	5,630.97
4	19,989.90	11,903.00	2,466.68	5,620.22
5	19,959.08	11,899.83	2,456.42	5,602.83
6	19,964.42	11,907.32	2,452.70	5,604.40
7	20,010.73	11,927.20	2,469.13	5,614.40
8	20,002.37	11,920.80	2,454.20	5,627.37
9	19,989.45	11,923.02	2,452.20	5,614.23
10	19,964.08	11,903.98	2,448.62	5,611.48
11	19,973.25	11,899.87	2,456.13	5,617.25
12	19,998.73	11,908.12	2,459.97	5,630.65
Average	19,988.11	11,913.23	2,457.49	5,617.38
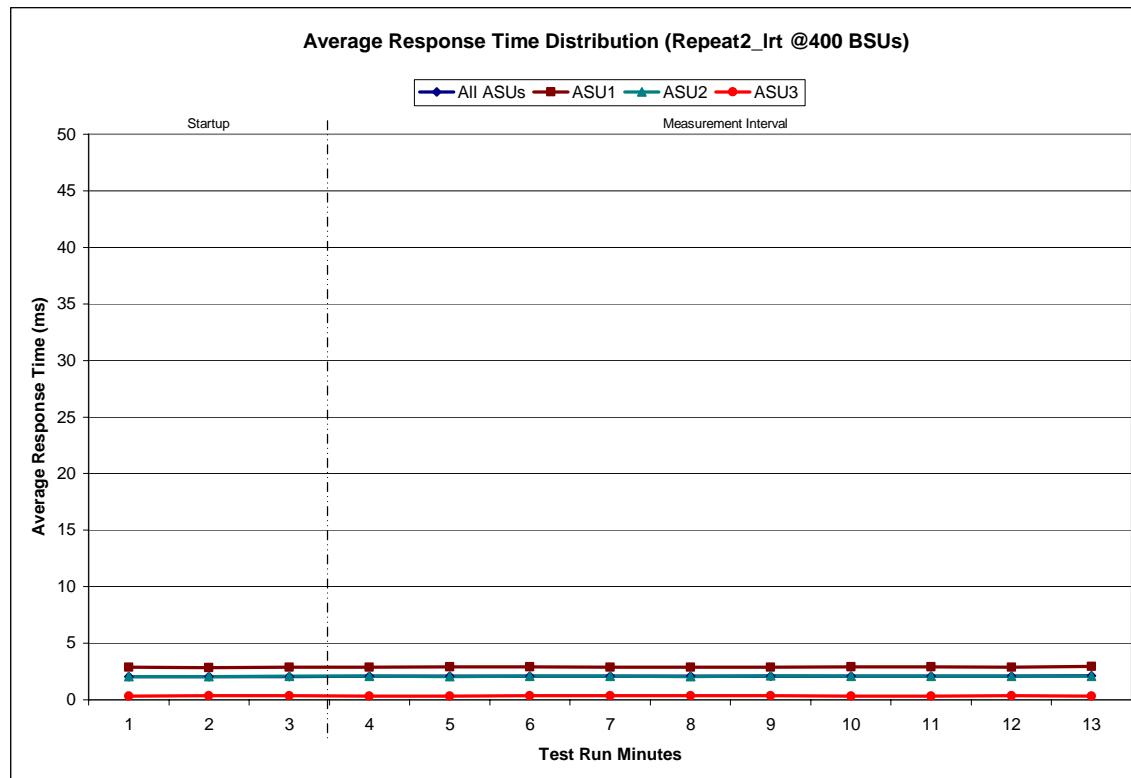
Repeatability 2 LRT – I/O Request Throughput Distribution Graph

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

400 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	15:15:00	15:18:00	0-2	0:03:00
Measurement Interval	15:18:00	15:28:00	3-12	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	2.06	2.89	2.06	0.31
1	2.04	2.83	2.06	0.35
2	2.07	2.88	2.08	0.35
3	2.08	2.89	2.09	0.34
4	2.08	2.90	2.06	0.34
5	2.09	2.91	2.09	0.35
6	2.08	2.90	2.09	0.34
7	2.07	2.89	2.06	0.34
8	2.08	2.89	2.11	0.35
9	2.08	2.90	2.09	0.34
10	2.09	2.91	2.08	0.34
11	2.07	2.89	2.08	0.34
12	2.11	2.95	2.10	0.34
Average	2.08	2.90	2.09	0.34
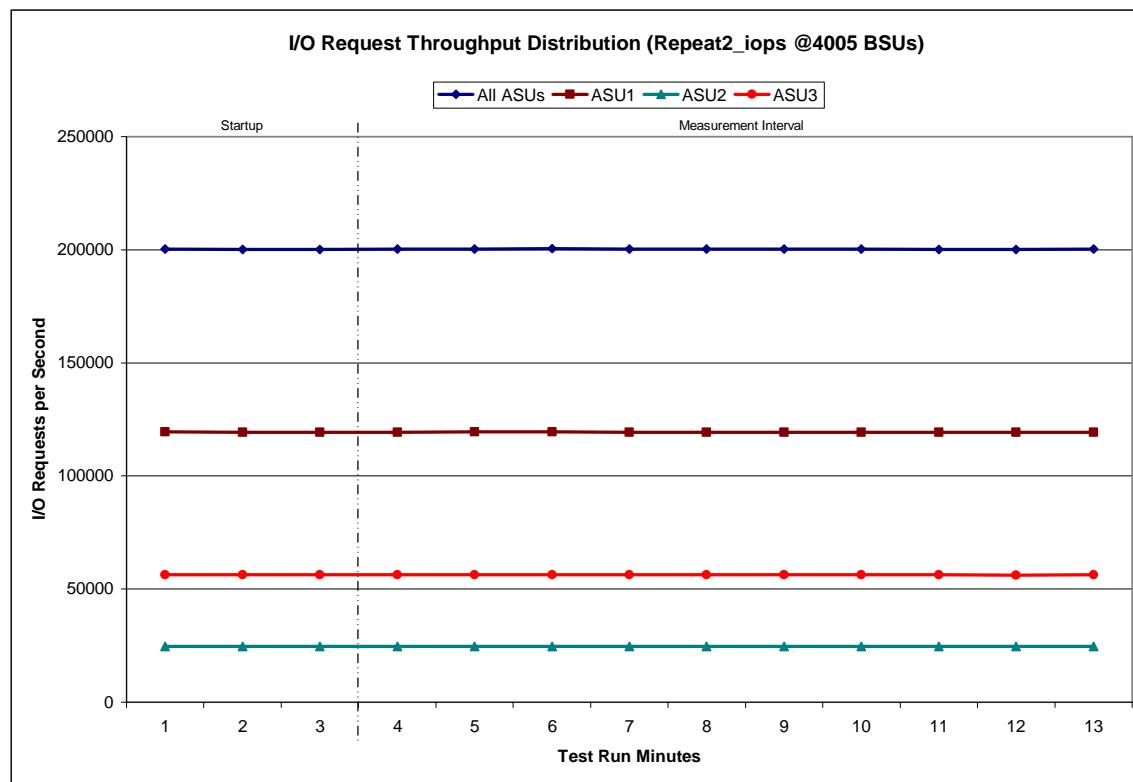
Repeatability 2 LRT –Average Response Time (ms) Distribution Graph

Repeatability 2 IOPS – I/O Request Throughput Distribution Data

4005 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	15:29:25	15:32:26	0-2	0:03:01
Measurement Interval	15:32:26	15:42:26	3-12	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	200,373.82	119,468.85	24,646.02	56,258.95
1	200,154.73	119,295.43	24,608.92	56,250.38
2	200,162.82	119,291.72	24,624.95	56,246.15
3	200,280.90	119,358.70	24,608.40	56,313.80
4	200,335.87	119,434.87	24,607.95	56,293.05
5	200,432.55	119,450.52	24,652.68	56,329.35
6	200,266.72	119,368.70	24,645.15	56,252.87
7	200,290.85	119,376.88	24,656.30	56,257.67
8	200,236.25	119,290.55	24,651.73	56,293.97
9	200,293.68	119,381.38	24,612.97	56,299.33
10	200,180.02	119,293.10	24,614.77	56,272.15
11	200,156.08	119,304.60	24,627.65	56,223.83
12	200,256.52	119,333.28	24,642.75	56,280.48
Average	200,272.94	119,359.26	24,632.04	56,281.65
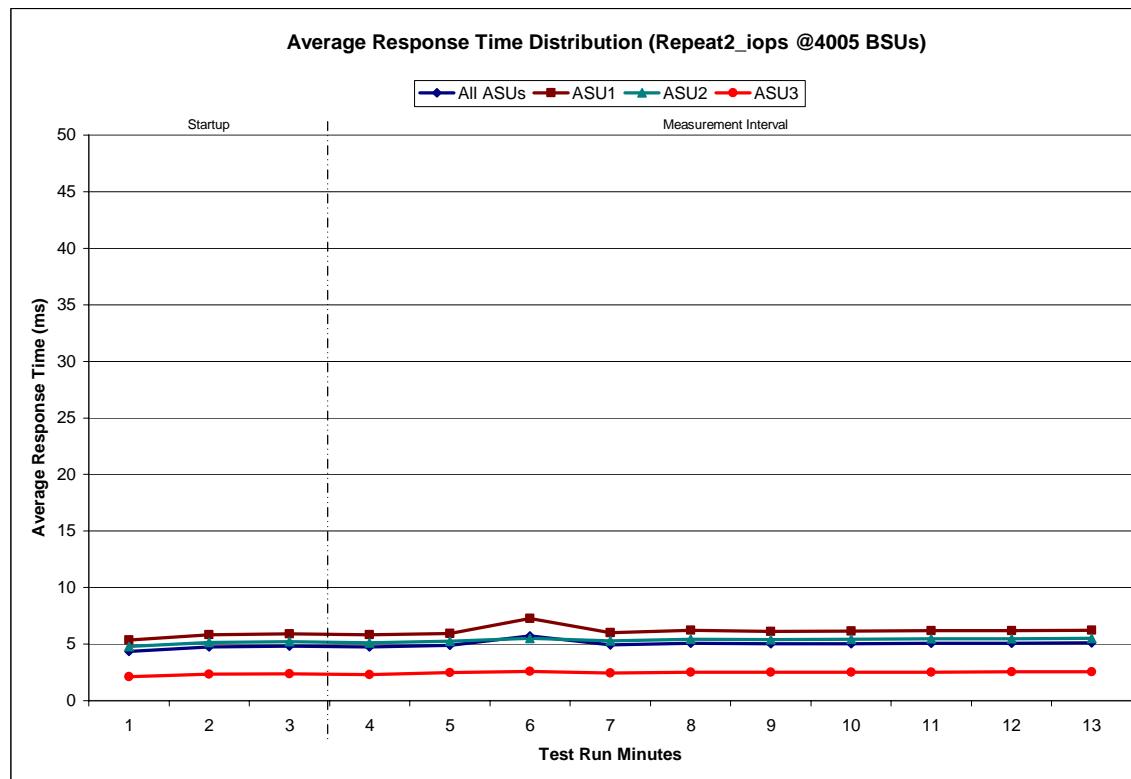
Repeatability 2 IOPS – I/O Request Throughput Distribution Graph

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

4005 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	15:29:25	15:32:26	0-2	0:03:01
Measurement Interval	15:32:26	15:42:26	3-12	0:10:00
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	4.37	5.35	4.78	2.11
1	4.77	5.83	5.13	2.34
2	4.83	5.90	5.22	2.38
3	4.74	5.82	5.12	2.30
4	4.90	5.96	5.27	2.48
5	5.73	7.26	5.51	2.58
6	4.92	6.02	5.30	2.43
7	5.09	6.22	5.44	2.53
8	5.03	6.13	5.40	2.52
9	5.06	6.17	5.44	2.53
10	5.07	6.19	5.46	2.54
11	5.09	6.21	5.47	2.56
12	5.10	6.21	5.49	2.56
Average	5.07	6.22	5.39	2.50

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	0.0699	0.2099	0.0180	0.0701	0.0351	0.2810
COV	0.005	0.002	0.002	0.001	0.007	0.005	0.007	0.003

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	0.2099	0.0180	0.0701	0.0350	0.2810
COV	0.001	0.001	0.001	0.001	0.002	0.001	0.002	0.000

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	0.2809	0.0700	0.2101	0.0180	0.0700	0.0350	0.2810
COV	0.004	0.001	0.003	0.001	0.007	0.003	0.004	0.001

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	0.001	0.000	0.001	0.000	0.002	0.001	0.001	0.000

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 92.

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	110,563,040
Total Number of Logical Blocks Verified	88,044,560
Total Number of Logical Blocks that Failed Verification	0
Time Duration for Writing Test Logical Blocks	10 minutes
Size in Bytes of each Logical Block	512
Number of Failed I/O Requests in the process of the Test	0

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

PRICED STORAGE CONFIGURATION AVAILABILITY DATE

Clause 9.2.4.9

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

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

The Sun StorageTek® 9990V System as documented in this Full Disclosure Report became available July 10, 2007 for customer purchase and shipment.

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 Onsite Audit of the Sun StorageTek® 9990V System.

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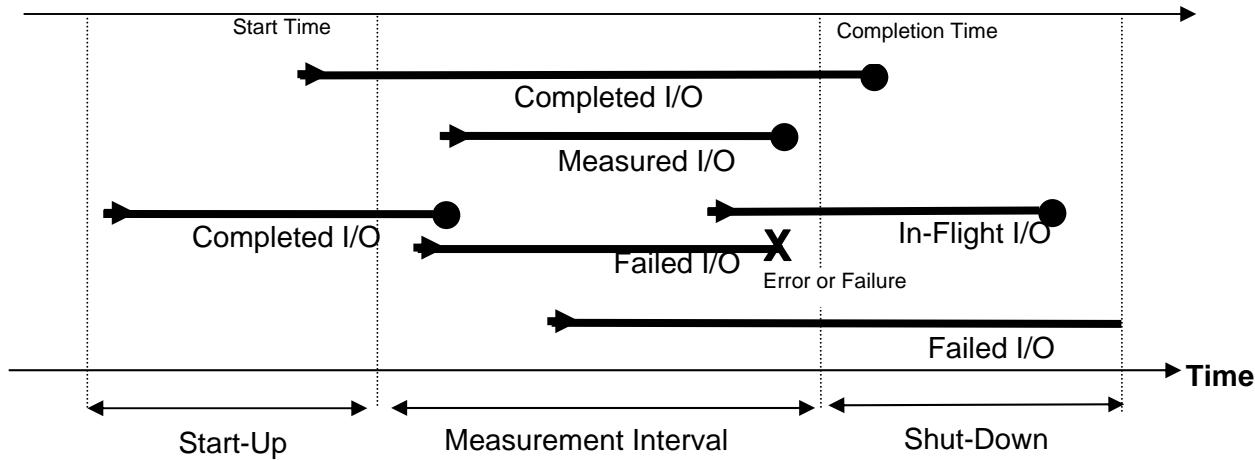
Test: A collection of Test Phases and or Test Runs sharing a common objective.

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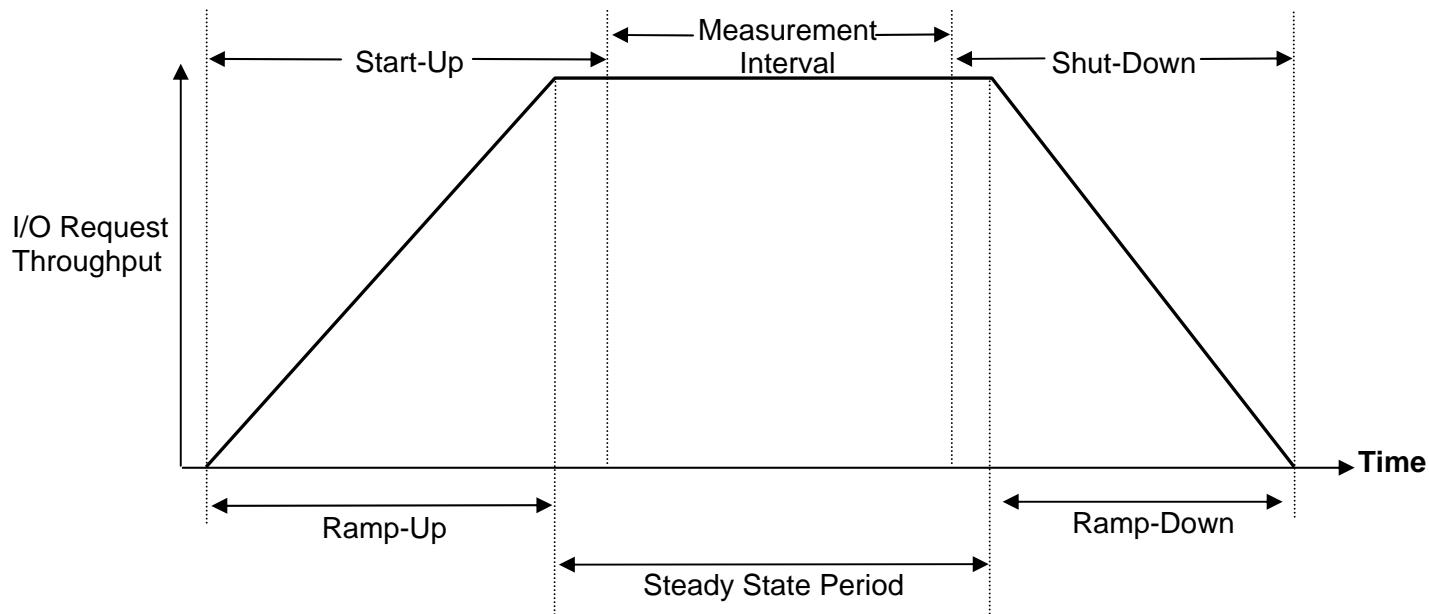
period, Shut-Down period, and Ramp-Down period as illustrated in the "SPC-1 Test Run Components" below. All SPC-1 Test Runs shall have a Steady State period and a Measurement Interval.

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

There were no customer tunable parameters or options changed from their default values for any of the benchmark measurements.

APPENDIX C: TESTED STORAGE CONFIGURATION (TSC) CREATION

Hitachi Data Systems delivers the USP V with a factory pre-configured RAID10 (2D+2D) storage configuration.   In pre-configuration, a total of 256 parity groups are created, utilizing a total of 1024 146GB 15K RPM physical drives. Please refer to the following table for a list of the pre-configured parity groups.

3-1	3-2	3-3	3-4	3-5	3-6	3-7	3-8	3-9	3-10	3-11	3-12	3-13	3-14	3-15	3-16
4-1	4-2	4-3	4-4	4-5	4-6	4-7	4-8	4-9	4-10	4-11	4-12	4-13	4-14	4-15	4-16
5-1	5-2	5-3	5-4	5-5	5-6	5-7	5-8	5-9	5-10	5-11	5-12	5-13	5-14	5-15	5-16
6-1	6-2	6-3	6-4	6-5	6-6	6-7	6-8	6-9	6-10	6-11	6-12	6-13	6-14	6-15	6-16
7-1	7-2	7-3	7-4	7-5	7-6	7-7	7-8	7-9	7-10	7-11	7-12	7-13	7-14	7-15	7-16
8-1	8-2	8-3	8-4	8-5	8-6	8-7	8-8	8-9	8-10	8-11	8-12	8-13	8-14	8-15	8-16
9-1	9-2	9-3	9-4	9-5	9-6	9-7	9-8	9-9	9-10	9-11	9-12	9-13	9-14	9-15	9-16
10-1	10-2	10-3	10-4	10-5	10-6	10-7	10-8	10-9	10-10	10-11	10-12	10-13	10-14	10-15	10-16
11-1	11-2	11-3	11-4	11-5	11-6	11-7	11-8	11-9	11-10	11-11	11-12	11-13	11-14	11-15	11-16
12-1	12-2	12-3	12-4	12-5	12-6	12-7	12-8	12-9	12-10	12-11	12-12	12-13	12-14	12-15	12-16
13-1	13-2	13-3	13-4	13-5	13-6	13-7	13-8	13-9	13-10	13-11	13-12	13-13	13-14	13-15	13-16
14-1	14-2	14-3	14-4	14-5	14-6	14-7	14-8	14-9	14-10	14-11	14-12	14-13	14-14	14-15	14-16
15-1	15-2	15-3	15-4	15-5	15-6	15-7	15-8	15-9	15-10	15-11	15-12	15-13	15-14	15-15	15-16
16-1	16-2	16-3	16-4	16-5	16-6	16-7	16-8	16-9	16-10	16-11	16-12	16-13	16-14	16-15	16-16
17-1	17-2	17-3	17-4	17-5	17-6	17-7	17-8	17-9	17-10	17-11	17-12	17-13	17-14	17-15	17-16
18-1	18-2	18-3	18-4	18-5	18-6	18-7	18-8	18-9	18-10	18-11	18-12	18-13	18-14	18-15	18-16
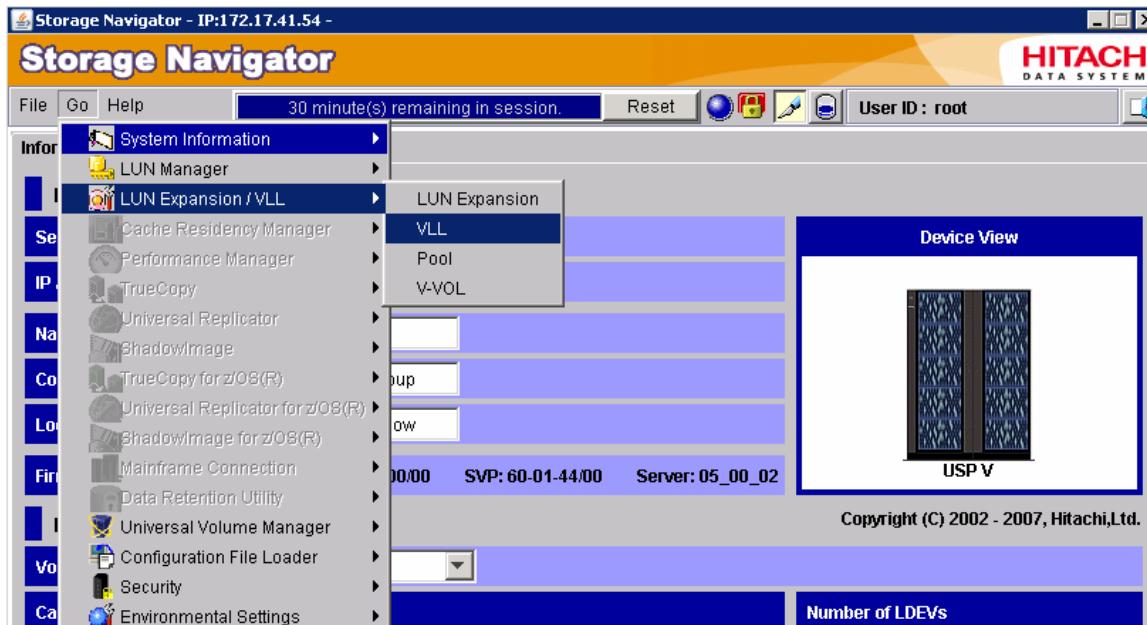
Create Logical Device:

From the USP V Storage Navigator, manual steps were taken to create the logical devices. This manual process created 1536 logical devices (LUNs) on 256 parity groups. Each parity group has 6 logical devices (LUNs) with 2 logical devices for ASU1, 2 logical devices for ASU2, and 2 logical devices for ASU3.
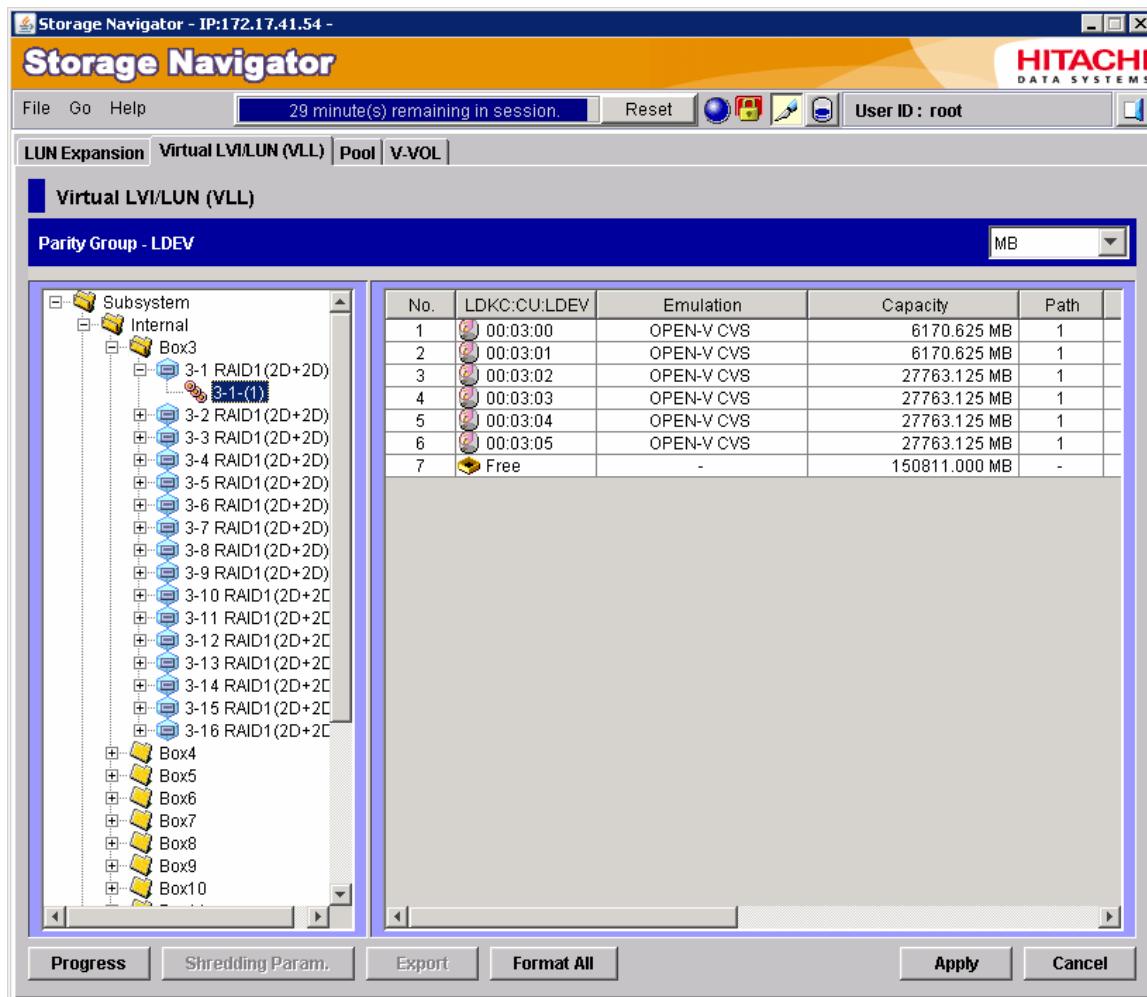
Use the following manual procedure to create logical device:

1. Login into Storage Navigator.

2. Click on the "Go" menu.

3. Roll down to "LUN Expansion / VLL" and then click on "VLL".

4. Expand the "Internal" folder. Click on "Box 3" and Parity Group "3-1".

5. Right Click on Parity Group "3-1" and Select "**Install CV**".

6. In "Install CV", Type in "**6170**" as capacity and "**2**" for No. for ASU3 and click "**Set**".

7. In "Install CV", Type in "**27763**" as capacity and "**2**" for No. for ASU1 and click "**Set**".

8. In "Install CV", Type in "**27763**" as capacity and "**2**" for No. for ASU2 and click "**Set**".

9. Clicking "**Next**", will bring you to the "Install CV, Assign Logical Device to Control Unit" screen.

10. Highlight each logical device and assign it to the control unit indicated by the "Logical Device - Control Unit Mapping" Table.

11. Click "**OK**" to confirm logical device creation.

12. Repeat Steps 4-11 based on the "Logical Device – Control Unit Mapping" Table.
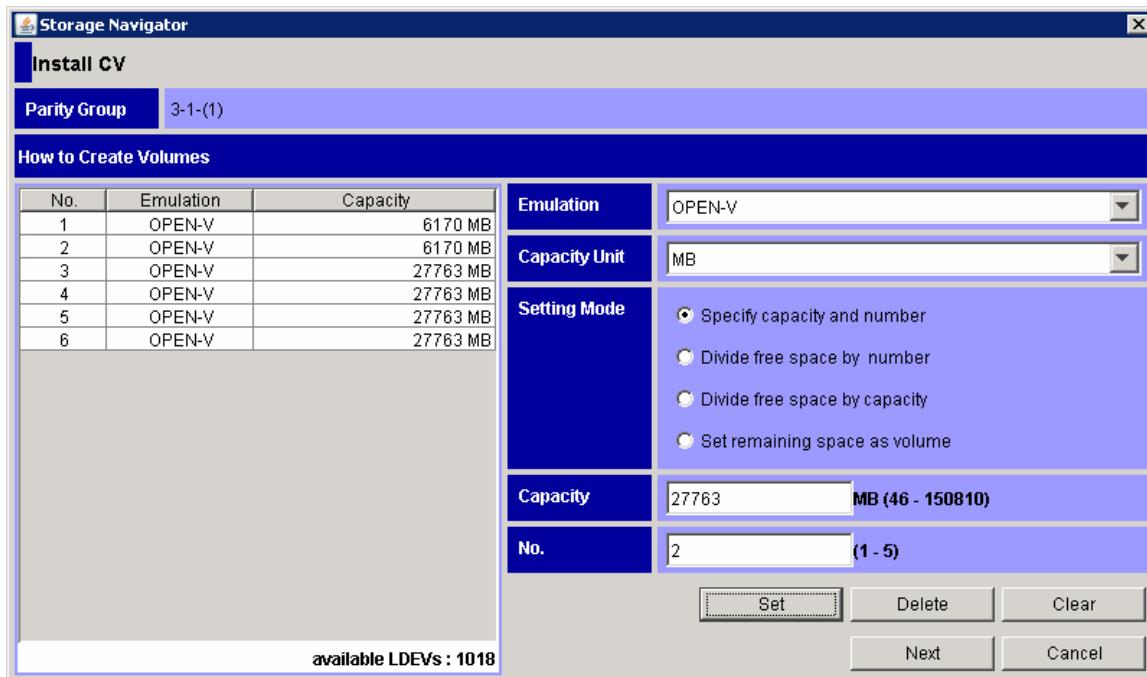
VLL Menu Location
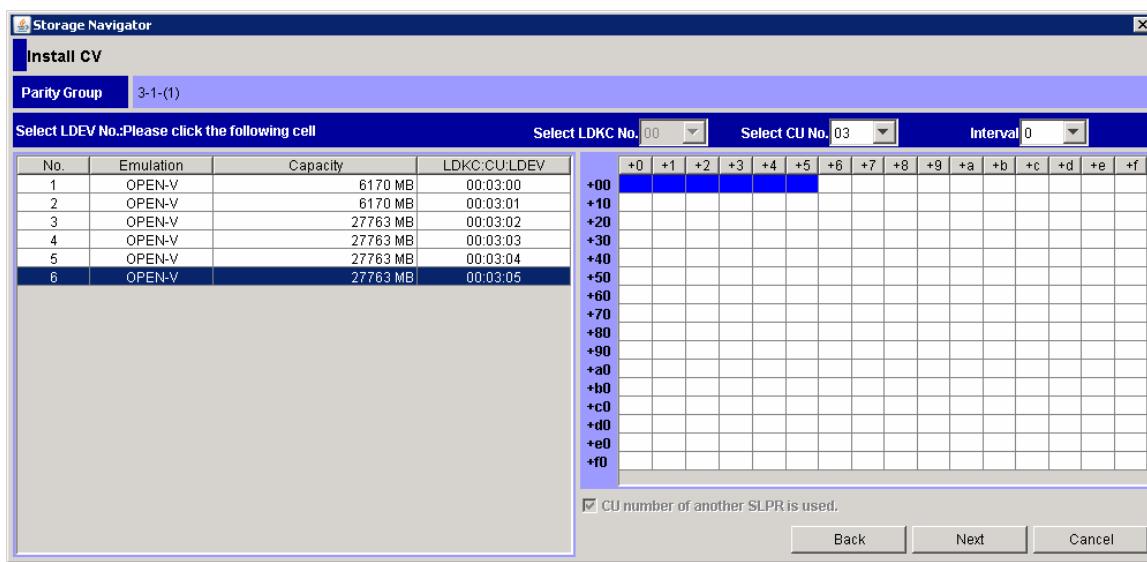
Storage Navigator view to create logical devices

Install CV (Customized Volume) Screen

Install CV, Assign Logical Device to Control Unit

Logical Device - Control Unit Mapping Table

BED 1 RAID10 2D+2D 146GB 15K RPM HDDs							
3-1	3-2	3-3	3-4	3-5	3-6	3-7	3-8
03:00	03:06	03:0C	03:12	03:18	03:1E	03:24	03:2A
03:01	03:07	03:0D	03:13	03:19	03:1F	03:25	03:2B
03:02	03:08	03:0E	03:14	03:1A	03:20	03:26	03:2C
03:03	03:09	03:0F	03:15	03:1B	03:21	03:27	03:2D
03:04	03:0A	03:10	03:16	03:1C	03:22	03:28	03:2E
03:05	03:0B	03:11	03:17	03:1D	03:23	03:29	03:2F

BED 1 RAID10 2D+2D 146GB 15K RPM HDDs							
3-9	3-10	3-11	3-12	3-13	3-14	3-15	3-16
03:30	03:36	03:3C	03:42	03:48	03:4E	03:54	03:5A
03:31	03:37	03:3D	03:43	03:49	03:4F	03:55	03:5B
03:32	03:38	03:3E	03:44	03:4A	03:50	03:56	03:5C
03:33	03:39	03:3F	03:45	03:4B	03:51	03:57	03:5D
03:34	03:3A	03:40	03:46	03:4C	03:52	03:58	03:5E
03:35	03:3B	03:41	03:47	03:4D	03:53	03:59	03:5F

BED 2 RAID10 2D+2D 146GB 15K RPM HDDs							
4-1	4-2	4-3	4-4	4-5	4-6	4-8	4-8
04:00	04:06	04:0C	04:12	04:18	04:1E	04:24	04:2A
04:01	04:07	04:0D	04:13	04:19	04:1F	04:25	04:2B
04:02	04:08	04:0E	04:14	04:1A	04:20	04:26	04:2C
04:03	04:09	04:0F	04:15	04:1B	04:21	04:27	04:2D
04:04	04:0A	04:10	04:16	04:1C	04:22	04:28	04:2E
04:05	04:0B	04:11	04:17	04:1D	04:23	04:29	04:2F

BED 2 RAID10 2D+2D 146GB 15K RPM HDDs							
4-9	4-10	4-11	4-12	4-13	4-14	4-15	4-16
04:30	04:36	04:3C	04:42	04:48	04:4E	04:54	04:5A
04:31	04:37	04:3D	04:43	04:49	04:4F	04:55	04:5B

04:32	04:38	04:3E	04:44	04:4A	04:50	04:56	04:5C
04:33	04:39	04:3F	04:45	04:4B	04:51	04:57	04:5D
04:34	04:3A	04:40	04:46	04:4C	04:52	04:58	04:5E
04:35	04:3B	04:41	04:47	04:4D	04:53	04:59	04:5F

BED 3 RAID10 2D+2D 146GB 15K RPM HDDs

5-1	5-2	5-3	5-4	5-5	5-6	5-7	5-8
05:00	05:06	05:0C	05:12	05:18	05:1E	05:24	05:2A
05:01	05:07	05:0D	05:13	05:19	05:1F	05:25	05:2B
05:02	05:08	05:0E	05:14	05:1A	05:20	05:26	05:2C
05:03	05:09	05:0F	05:15	05:1B	05:21	05:27	05:2D
05:04	05:0A	05:10	05:16	05:1C	05:22	05:28	05:2E
05:05	05:0B	05:11	05:17	05:1D	05:23	05:29	05:2F

BED 3 RAID10 2D+2D 146GB 15K RPM HDDs

5-9	5-10	5-11	5-12	5-13	5-14	5-15	5-16
05:30	05:36	05:3C	05:42	05:48	05:4E	05:54	05:5A
05:31	05:37	05:3D	05:43	05:49	05:4F	05:55	05:5B
05:32	05:38	05:3E	05:44	05:4A	05:50	05:56	05:5C
05:33	05:39	05:3F	05:45	05:4B	05:51	05:57	05:5D
05:34	05:3A	05:40	05:46	05:4C	05:52	05:58	05:5E
05:35	05:3B	05:41	05:47	05:4D	05:53	05:59	05:5F

BED 4 RAID10 2D+2D 146GB 15K RPM HDDs

6-1	6-2	6-3	6-4	6-5	6-6	6-7	6-8
06:00	06:06	06:0C	06:12	06:18	06:1E	06:24	06:2A
06:01	06:07	06:0D	06:13	06:19	06:1F	06:25	06:2B
06:02	06:08	06:0E	06:14	06:1A	06:20	06:26	06:2C
06:03	06:09	06:0F	06:15	06:1B	06:21	06:27	06:2D
06:04	06:0A	06:10	06:16	06:1C	06:22	06:28	06:2E
06:05	06:0B	06:11	06:17	06:1D	06:23	06:29	06:2F

BED 4 RAID10 2D+2D 146GB 15K RPM HDDs

6-9	6-10	6-11	6-12	6-13	6-14	6-15	6-16
06:30	06:36	06:3C	06:42	06:48	06:4E	06:54	06:5A
06:31	06:37	06:3D	06:43	06:49	06:4F	06:55	06:5B
06:32	06:38	06:3E	06:44	06:4A	06:50	06:56	06:5C
06:33	06:39	06:3F	06:45	06:4B	06:51	06:57	06:5D
06:34	06:3A	06:40	06:46	06:4C	06:52	06:58	06:5E
06:35	06:3B	06:41	06:47	06:4D	06:53	06:59	06:5F

BED 5 RAID10 2D+2D 146GB 15K RPM HDDs

7-8	7-7	7-6	7-5	7-4	7-3	7-2	7-1
07:00	07:06	07:0C	07:12	07:18	07:1E	07:24	07:2A
07:01	07:07	07:0D	07:13	07:19	07:1F	07:25	07:2B
07:02	07:08	07:0E	07:14	07:1A	07:20	07:26	07:2C
07:03	07:09	07:0F	07:15	07:1B	07:21	07:27	07:2D
07:04	07:0A	07:10	07:16	07:1C	07:22	07:28	07:2E
07:05	07:0B	07:11	07:17	07:1D	07:23	07:29	07:2F

BED 5 RAID10 2D+2D 146GB 15K RPM HDDs

7-9	7-10	7-11	7-12	7-13	7-14	7-15	7-16
07:30	07:36	07:3C	07:42	07:48	07:4E	07:54	07:5A
07:31	07:37	07:3D	07:43	07:49	07:4F	07:55	07:5B
07:32	07:38	07:3E	07:44	07:4A	07:50	07:56	07:5C
07:33	07:39	07:3F	07:45	07:4B	07:51	07:57	07:5D
07:34	07:3A	07:40	07:46	07:4C	07:52	07:58	07:5E
07:35	07:3B	07:41	07:47	07:4D	07:53	07:59	07:5F

BED 6 RAID10 2D+2D 146GB 15K RPM HDDs

8-1	8-2	8-3	8-4	8-5	8-6	8-7	8-8
08:00	08:06	08:0C	08:12	08:18	08:1E	08:24	08:2A
08:01	08:07	08:0D	08:13	08:19	08:1F	08:25	08:2B
08:02	08:08	08:0E	08:14	08:1A	08:20	08:26	08:2C
08:03	08:09	08:0F	08:15	08:1B	08:21	08:27	08:2D
08:04	08:0A	08:10	08:16	08:1C	08:22	08:28	08:2E

| 08:05 | 08:0B | 08:11 | 08:17 | 08:1D | 08:23 | 08:29 | 08:2F |

BED 6 RAID10 2D+2D 146GB 15K RPM HDDs

8-9	8-10	8-11	8-12	8-13	8-14	8-15	8-16
08:30	08:36	08:3C	08:42	08:48	08:4E	08:54	08:5A
08:31	08:37	08:3D	08:43	08:49	08:4F	08:55	08:5B
08:32	08:38	08:3E	08:44	08:4A	08:50	08:56	08:5C
08:33	08:39	08:3F	08:45	08:4B	08:51	08:57	08:5D
08:34	08:3A	08:40	08:46	08:4C	08:52	08:58	08:5E
08:35	08:3B	08:41	08:47	08:4D	08:53	08:59	08:5F

BED 7 RAID10 2D+2D 146GB 15K RPM HDDs

9-1	9-2	9-3	9-4	9-5	9-6	9-7	9-8
09:00	09:06	09:0C	09:12	09:18	09:1E	09:24	09:2A
09:01	09:07	09:0D	09:13	09:19	09:1F	09:25	09:2B
09:02	09:08	09:0E	09:14	09:1A	09:20	09:26	09:2C
09:03	09:09	09:0F	09:15	09:1B	09:21	09:27	09:2D
09:04	09:0A	09:10	09:16	09:1C	09:22	09:28	09:2E
09:05	09:0B	09:11	09:17	09:1D	09:23	09:29	09:2F

BED 7 RAID10 2D+2D 146GB 15K RPM HDDs

9-9	9-10	9-11	9-12	9-13	9-14	9-15	9-16
09:30	09:36	09:3C	09:42	09:48	09:4E	09:54	09:5A
09:31	09:37	09:3D	09:43	09:49	09:4F	09:55	09:5B
09:32	09:38	09:3E	09:44	09:4A	09:50	09:56	09:5C
09:33	09:39	09:3F	09:45	09:4B	09:51	09:57	09:5D
09:34	09:3A	09:40	09:46	09:4C	09:52	09:58	09:5E
09:35	09:3B	09:41	09:47	09:4D	09:53	09:59	09:5F

BED 8 RAID10 2D+2D 146GB 15K RPM HDDs

10-1	10-2	10-3	10-4	10-5	10-6	10-7	10-8
0A:00	0A:06	0A:0C	0A:12	0A:18	0A:1E	0A:24	0A:2A
0A:01	0A:07	0A:0D	0A:13	0A:19	0A:1F	0A:25	0A:2B

OA:02	OA:08	OA:0E	OA:14	OA:1A	OA:20	OA:26	OA:2C
OA:03	OA:09	OA:0F	OA:15	OA:1B	OA:21	OA:27	OA:2D
OA:04	OA:0A	OA:10	OA:16	OA:1C	OA:22	OA:28	OA:2E
OA:05	OA:0B	OA:11	OA:17	OA:1D	OA:23	OA:29	OA:2F

BED 8 RAID10 2D+2D 146GB 15K RPM HDDs

10-9	10-10	10-11	10-12	10-13	10-14	10-15	10-16
OA:30	OA:36	OA:3C	OA:42	OA:48	OA:4E	OA:54	OA:5A
OA:31	OA:37	OA:3D	OA:43	OA:49	OA:4F	OA:55	OA:5B
OA:32	OA:38	OA:3E	OA:44	OA:4A	OA:50	OA:56	OA:5C
OA:33	OA:39	OA:3F	OA:45	OA:4B	OA:51	OA:57	OA:5D
OA:34	OA:3A	OA:40	OA:46	OA:4C	OA:52	OA:58	OA:5E
OA:35	OA:3B	OA:41	OA:47	OA:4D	OA:53	OA:59	OA:5F

BED 1 RAID10 2D+2D 146GB 15K RPM HDDs

11-1	11-2	11-3	11-4	11-5	11-6	11-7	11-8
OB:00	OB:06	OB:0C	OB:12	OB:18	OB:1E	OB:24	OB:2A
OB:01	OB:07	OB:0D	OB:13	OB:19	OB:1F	OB:25	OB:2B
OB:02	OB:08	OB:0E	OB:14	OB:1A	OB:20	OB:26	OB:2C
OB:03	OB:09	OB:0F	OB:15	OB:1B	OB:21	OB:27	OB:2D
OB:04	OB:0A	OB:10	OB:16	OB:1C	OB:22	OB:28	OB:2E
OB:05	OB:0B	OB:11	OB:17	OB:1D	OB:23	OB:29	OB:2F

BED 1 RAID10 2D+2D 146GB 15K RPM HDDs

11-9	11-10	11-11	11-12	11-13	11-14	11-15	11-16
OB:30	OB:36	OB:3C	OB:42	OB:48	OB:4E	OB:54	OB:5A
OB:31	OB:37	OB:3D	OB:43	OB:49	OB:4F	OB:55	OB:5B
OB:32	OB:38	OB:3E	OB:44	OB:4A	OB:50	OB:56	OB:5C
OB:33	OB:39	OB:3F	OB:45	OB:4B	OB:51	OB:57	OB:5D
OB:34	OB:3A	OB:40	OB:46	OB:4C	OB:52	OB:58	OB:5E
OB:35	OB:3B	OB:41	OB:47	OB:4D	OB:53	OB:59	OB:5F

BED 2 RAID10 2D+2D 146GB 15K RPM HDDs

12-1	12-2	12-3	12-4	12-5	12-6	12-7	12-8
0C:00	0C:06	0C:0C	0C:12	0C:18	0C:1E	0C:24	0C:2A
0C:01	0C:07	0C:0D	0C:13	0C:19	0C:1F	0C:25	0C:2B
0C:02	0C:08	0C:0E	0C:14	0C:1A	0C:20	0C:26	0C:2C
0C:03	0C:09	0C:0F	0C:15	0C:1B	0C:21	0C:27	0C:2D
0C:04	0C:0A	0C:10	0C:16	0C:1C	0C:22	0C:28	0C:2E
0C:05	0C:0B	0C:11	0C:17	0C:1D	0C:23	0C:29	0C:2F

BED 2 RAID10 2D+2D 146GB 15K RPM HDDs

12-1	12-2	12-3	12-4	12-5	12-6	12-7	12-8
0C:30	0C:36	0C:3C	0C:42	0C:48	0C:4E	0C:54	0C:5A
0C:31	0C:37	0C:3D	0C:43	0C:49	0C:4F	0C:55	0C:5B
0C:32	0C:38	0C:3E	0C:44	0C:4A	0C:50	0C:56	0C:5C
0C:33	0C:39	0C:3F	0C:45	0C:4B	0C:51	0C:57	0C:5D
0C:34	0C:3A	0C:40	0C:46	0C:4C	0C:52	0C:58	0C:5E
0C:35	0C:3B	0C:41	0C:47	0C:4D	0C:53	0C:59	0C:5F

BED 3 RAID10 2D+2D 146GB 15K RPM HDDs

13-1	13-2	13-3	13-4	13-5	13-6	13-7	13-8
0D:00	0D:06	0D:0C	0D:12	0D:18	0D:1E	0D:24	0D:2A
0D:01	0D:07	0D:0D	0D:13	0D:19	0D:1F	0D:25	0D:2B
0D:02	0D:08	0D:0E	0D:14	0D:1A	0D:20	0D:26	0D:2C
0D:03	0D:09	0D:0F	0D:15	0D:1B	0D:21	0D:27	0D:2D
0D:04	0D:0A	0D:10	0D:16	0D:1C	0D:22	0D:28	0D:2E
0D:05	0D:0B	0D:11	0D:17	0D:1D	0D:23	0D:29	0D:2F

BED 3 RAID10 2D+2D 146GB 15K RPM HDDs

13-9	13-10	13-11	13-12	13-13	13-14	13-15	13-16
0D:30	0D:36	0D:3C	0D:42	0D:48	0D:4E	0D:54	0D:5A
0D:31	0D:37	0D:3D	0D:43	0D:49	0D:4F	0D:55	0D:5B
0D:32	0D:38	0D:3E	0D:44	0D:4A	0D:50	0D:56	0D:5C
0D:33	0D:39	0D:3F	0D:45	0D:4B	0D:51	0D:57	0D:5D
0D:34	0D:3A	0D:40	0D:46	0D:4C	0D:52	0D:58	0D:5E

0D:35	0D:3B	0D:41	0D:47	0D:4D	0D:53	0D:59	0D:5F

BED 4 RAID10 2D+2D 146GB 15K RPM HDDs

14-1	14-2	14-3	14-4	14-5	14-6	14-7	14-8
0E:00	0E:06	0E:0C	0E:12	0E:18	0E:1E	0E:24	0E:2A
0E:01	0E:07	0E:0D	0E:13	0E:19	0E:1F	0E:25	0E:2B
0E:02	0E:08	0E:0E	0E:14	0E:1A	0E:20	0E:26	0E:2C
0E:03	0E:09	0E:0F	0E:15	0E:1B	0E:21	0E:27	0E:2D
0E:04	0E:0A	0E:10	0E:16	0E:1C	0E:22	0E:28	0E:2E
0E:05	0E:0B	0E:11	0E:17	0E:1D	0E:23	0E:29	0E:2F

BED 4 RAID10 2D+2D 146GB 15K RPM HDDs

14-9	14-10	14-11	14-12	14-13	14-14	14-15	14-16
0E:30	0E:36	0E:3C	0E:42	0E:48	0E:4E	0E:54	0E:5A
0E:31	0E:37	0E:3D	0E:43	0E:49	0E:4F	0E:55	0E:5B
0E:32	0E:38	0E:3E	0E:44	0E:4A	0E:50	0E:56	0E:5C
0E:33	0E:39	0E:3F	0E:45	0E:4B	0E:51	0E:57	0E:5D
0E:34	0E:3A	0E:40	0E:46	0E:4C	0E:52	0E:58	0E:5E
0E:35	0E:3B	0E:41	0E:47	0E:4D	0E:53	0E:59	0E:5F

BED 5 RAID10 2D+2D 146GB 15K RPM HDDs

15-1	15-2	15-3	15-4	15-5	15-6	15-7	15-8
0F:00	0F:06	0F:0C	0F:12	0F:18	0F:1E	0F:24	0F:2A
0F:01	0F:07	0F:0D	0F:13	0F:19	0F:1F	0F:25	0F:2B
0F:02	0F:08	0F:0E	0F:14	0F:1A	0F:20	0F:26	0F:2C
0F:03	0F:09	0F:0F	0F:15	0F:1B	0F:21	0F:27	0F:2D
0F:04	0F:0A	0F:10	0F:16	0F:1C	0F:22	0F:28	0F:2E
0F:05	0F:0B	0F:11	0F:17	0F:1D	0F:23	0F:29	0F:2F

BED 5 RAID10 2D+2D 146GB 15K RPM HDDs

15-9	15-10	15-11	15-12	15-13	15-14	15-15	15-16
0F:30	0F:36	0F:3C	0F:42	0F:48	0F:4E	0F:54	0F:5A
0F:31	0F:37	0F:3D	0F:43	0F:49	0F:4F	0F:55	0F:5B

OF:32	OF:38	OF:3E	OF:44	OF:4A	OF:50	OF:56	OF:5C
OF:33	OF:39	OF:3F	OF:45	OF:4B	OF:51	OF:57	OF:5D
OF:34	OF:3A	OF:40	OF:46	OF:4C	OF:52	OF:58	OF:5E
OF:35	OF:3B	OF:41	OF:47	OF:4D	OF:53	OF:59	OF:5F

BED 6 RAID10 2D+2D 146GB 15K RPM HDDs

16-1	16-2	16-3	16-4	16-5	16-6	16-7	16-8
10:00	10:06	10:0C	10:12	10:18	10:1E	10:24	10:2A
10:01	10:07	10:0D	10:13	10:19	10:1F	10:25	10:2B
10:02	10:08	10:0E	10:14	10:1A	10:20	10:26	10:2C
10:03	10:09	10:0F	10:15	10:1B	10:21	10:27	10:2D
10:04	10:0A	10:10	10:16	10:1C	10:22	10:28	10:2E
10:05	10:0B	10:11	10:17	10:1D	10:23	10:29	10:2F

BED 6 RAID10 2D+2D 146GB 15K RPM HDDs

16-9	16-10	16-11	16-12	16-13	16-14	16-15	16-16
10:30	10:36	10:3C	10:42	10:48	10:4E	10:54	10:5A
10:31	10:37	10:3D	10:43	10:49	10:4F	10:55	10:5B
10:32	10:38	10:3E	10:44	10:4A	10:50	10:56	10:5C
10:33	10:39	10:3F	10:45	10:4B	10:51	10:57	10:5D
10:34	10:3A	10:40	10:46	10:4C	10:52	10:58	10:5E
10:35	10:3B	10:41	10:47	10:4D	10:53	10:59	10:5F

BED 7 RAID10 2D+2D 146GB 15K RPM HDDs

17-1	17-2	17-3	17-4	17-5	17-6	17-7	17-8
11:00	11:06	11:0C	11:12	11:18	11:1E	11:24	11:2A
11:01	11:07	11:0D	11:13	11:19	11:1F	11:25	11:2B
11:02	11:08	11:0E	11:14	11:1A	11:20	11:26	11:2C
11:03	11:09	11:0F	11:15	11:1B	11:21	11:27	11:2D
11:04	11:0A	11:10	11:16	11:1C	11:22	11:28	11:2E
11:05	11:0B	11:11	11:17	11:1D	11:23	11:29	11:2F

BED 7 RAID10 2D+2D 146GB 15K RPM HDDs

17-9	17-10	17-11	17-12	17-13	17-14	17-15	17-16
11:30	11:36	11:3C	11:42	11:48	11:4E	11:54	11:5A
11:31	11:37	11:3D	11:43	11:49	11:4F	11:55	11:5B
11:32	11:38	11:3E	11:44	11:4A	11:50	11:56	11:5C
11:33	11:39	11:3F	11:45	11:4B	11:51	11:57	11:5D
11:34	11:3A	11:40	11:46	11:4C	11:52	11:58	11:5E
11:35	11:3B	11:41	11:47	11:4D	11:53	11:59	11:5F

BED 8 RAID10 2D+2D 146GB 15K RPM HDDs							
18-1	18-2	18-3	18-4	18-5	18-6	18-7	18-8
12:00	12:06	12:0C	12:12	12:18	12:1E	12:24	12:2A
12:01	12:07	12:0D	12:13	12:19	12:1F	12:25	12:2B
12:02	12:08	12:0E	12:14	12:1A	12:20	12:26	12:2C
12:03	12:09	12:0F	12:15	12:1B	12:21	12:27	12:2D
12:04	12:0A	12:10	12:16	12:1C	12:22	12:28	12:2E
12:05	12:0B	12:11	12:17	12:1D	12:23	12:29	12:2F

BED 8 RAID10 2D+2D 146GB 15K RPM HDDs							
18-9	18-10	18-11	18-12	18-13	18-14	18-15	18-16
12:30	12:36	12:3C	12:42	12:48	12:4E	12:54	12:5A
12:31	12:37	12:3D	12:43	12:49	12:4F	12:55	12:5B
12:32	12:38	12:3E	12:44	12:4A	12:50	12:56	12:5C
12:33	12:39	12:3F	12:45	12:4B	12:51	12:57	12:5D
12:34	12:3A	12:40	12:46	12:4C	12:52	12:58	12:5E
12:35	12:3B	12:41	12:47	12:4D	12:53	12:59	12:5F

APPENDIX C:
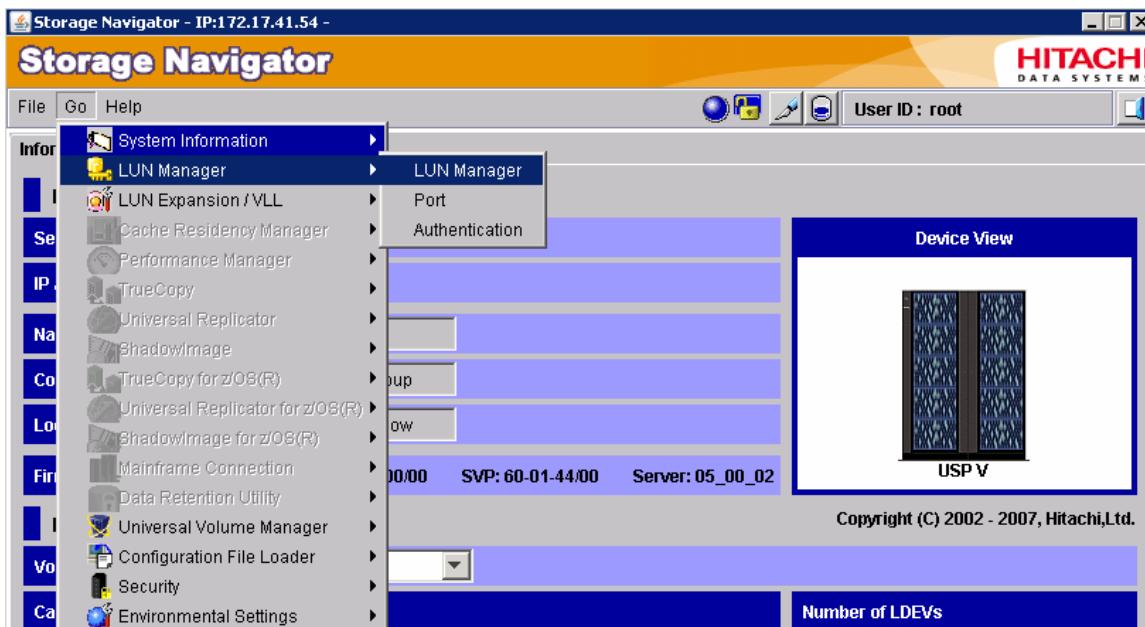
Map Logical Device to Front end ports:

From the USP V Storage Navigator, manual steps were taken to map the logical devices to front end ports. Each front end port is assigned 24 logical devices with 8 logical devices for ASU1, 8 logical devices for ASU2, and 8 logical devices for ASU3.
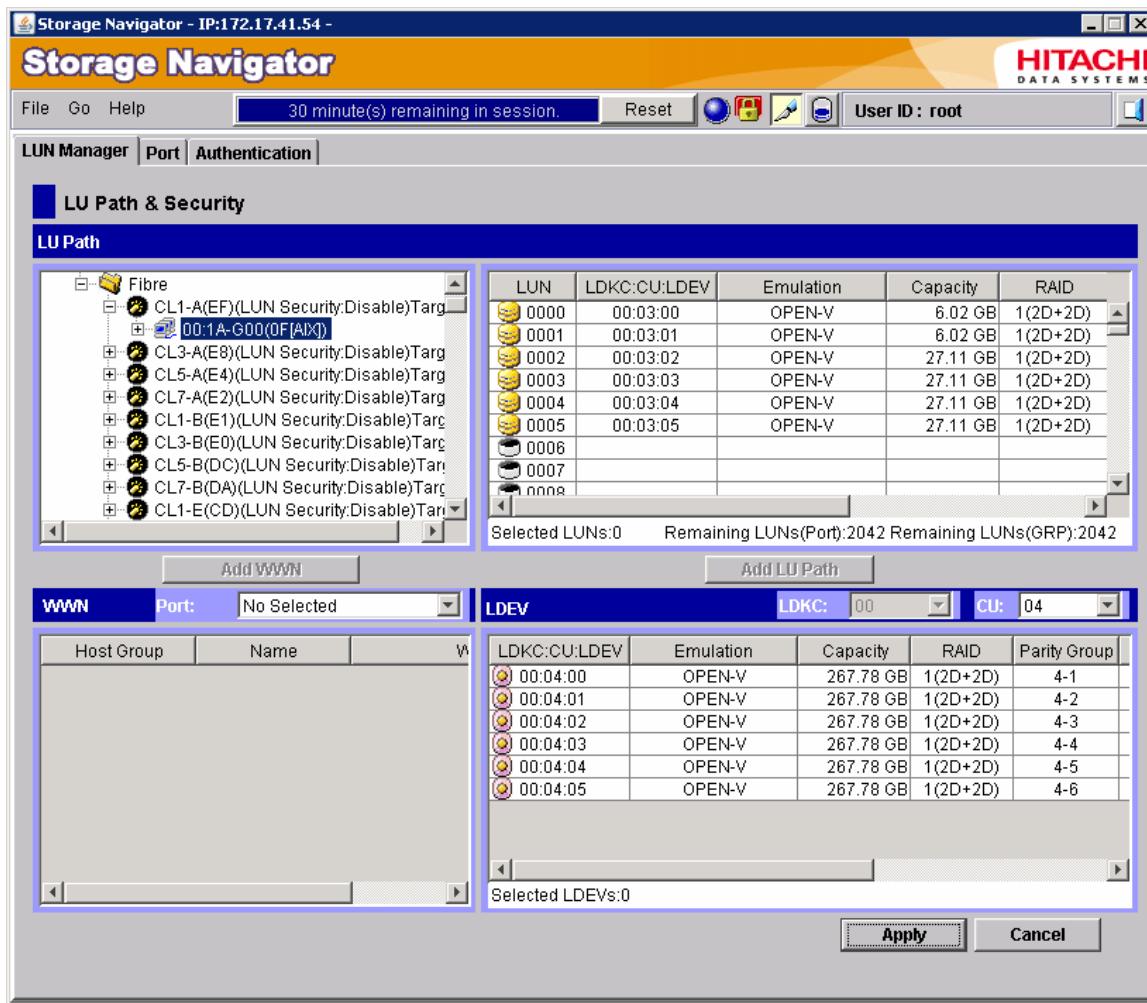
Use the following manual procedure to create logical device:

1. Login into Storage Navigator.

2. Click on the "Go" menu.

3. Roll down to "LUN Manager" and then click on "LUN Manager".

4. Expand the "Fibre" folder.

5. Expand the "CL1-A(EF)" folder.

6. Click on the "00:1A-G00" host group.

7. Select the LUN and LDEV based on the "LDEV to Port Mapping" Table and click on "**Add LU Path**".

8. Repeat Steps 5-7 based on the "LDEV to Port Mapping" Table

9. Click "**Apply**" to apply mapping of LDEV to port.

LUN Manager menu location

Storage Navigator view to map logical devices to front end ports

LDEV to Port Mapping Table

ASU	ASU3		ASU3		ASU1		ASU1		ASU2		ASU2	
Port	LUN	LDEV	LUN	LDEV	LUN	LDEV	LUN	LDEV	LUN	LDEV	LUN	LDEV
1A	0000	03:00	0001	03:01	0002	03:02	0003	03:03	0004	03:04	0005	03:05
	0180	03:18	0181	03:19	0182	03:1A	0183	03:1B	0184	03:1C	0185	03:1D
	0300	03:30	0301	03:31	0302	03:32	0303	03:33	0304	03:34	0305	03:35
	0480	03:48	0481	03:49	0482	03:4A	0483	03:4B	0484	03:4C	0485	03:4D
1E	0006	04:00	0007	04:01	0008	04:02	0009	04:03	000A	04:04	000B	04:05
	0186	04:18	0187	04:19	0188	04:1A	0189	04:1B	018A	04:1C	018B	04:1D
	0306	04:30	0307	04:31	0308	04:32	0309	04:33	030A	04:34	030B	04:35
	0486	04:48	0487	04:49	0488	04:4A	0489	04:4B	048A	04:4C	048B	04:4D

1J	000C	05:00	000D	05:01	000E	05:02	000F	05:03	0010	05:04	0011	05:05
	018C	05:18	018D	05:19	018E	05:1A	018F	05:1B	0190	05:1C	0191	05:1D
	030C	05:30	030D	05:31	030E	05:32	030F	05:33	0310	05:34	0311	05:35
	048C	05:48	048D	05:49	048E	05:4A	048F	05:4B	0490	05:4C	0491	05:4D
1N	0012	06:00	0013	06:01	0014	06:02	0015	06:03	0016	06:04	0017	06:05
	0192	06:18	0193	06:19	0194	06:1A	0195	06:1B	0196	06:1C	0197	06:1D
	0312	06:30	0313	06:31	0314	06:32	0315	06:33	0316	06:34	0317	06:35
	0492	06:48	0493	06:49	0494	06:4A	0495	06:4B	0496	06:4C	0497	06:4D
2A	0018	07:00	0019	07:01	001A	07:02	001B	07:03	001C	07:04	001D	07:05
	0198	07:18	0199	07:19	019A	07:1A	019B	07:1B	019C	07:1C	019D	07:1D
	0318	07:30	0319	07:31	031A	07:32	031B	07:33	031C	07:34	031D	07:35
	0498	07:48	0499	07:49	049A	07:4A	049B	07:4B	049C	07:4C	049D	07:4D
2E	001E	08:00	001F	08:01	002A	08:02	002B	08:03	002C	08:04	002D	08:05
	019E	08:18	019F	08:19	01A0	08:1A	01A1	08:1B	01A2	08:1C	01A3	08:1D
	031E	08:30	031F	08:31	0320	08:32	0321	08:33	0322	08:34	0323	08:35
	049E	08:48	049F	08:49	04A0	08:4A	04A1	08:4B	04A2	08:4C	04A3	08:4D
2J	0024	09:00	0025	09:01	0026	09:02	0027	09:03	0028	09:04	0029	09:05
	01A4	09:18	01A5	09:19	01A6	09:1A	01A7	09:1B	01A8	09:1C	01A9	09:1D
	0324	09:30	0325	09:31	0326	09:32	0327	09:33	0328	09:34	0329	09:35
	04A4	09:48	04A5	09:49	04A6	09:4A	04A7	09:4B	04A8	09:4C	04A9	09:4D
2N	002A	0A:00	002B	0A:01	002C	0A:02	002D	0A:03	002E	0A:04	002F	0A:05
	01AA	0A:18	01AB	0A:19	01AC	0A:1A	01AD	0A:1B	01AE	0A:1C	01AF	0A:1D
	032A	0A:30	032B	0A:31	032C	0A:32	032D	0A:33	032E	0A:34	032F	0A:35
	04AA	0A:48	04AB	0A:49	04AC	0A:4A	04AD	0A:4B	04AE	0A:4C	04AF	0A:4D
1C	0030	0B:00	0031	0B:01	0032	0B:02	0033	0B:03	0034	0B:04	0035	0B:05
	01B0	0B:18	01B1	0B:19	01B2	0B:1A	01B3	0B:1B	01B4	0B:1C	01B5	0B:1D
	0330	0B:30	0331	0B:31	0332	0B:32	0333	0B:33	0334	0B:34	0335	0B:35
	04B0	0B:48	04B1	0B:49	04B2	0B:4A	04B3	0B:4B	04B4	0B:4C	04B5	0B:4D
1G	0036	0C:00	0037	0C:01	0038	0C:02	0039	0C:03	003A	0C:04	003B	0C:05
	01B6	0C:18	01B7	0C:19	01B8	0C:1A	01B9	0C:1B	01BA	0C:1C	01BB	0C:1D
	0336	0C:30	0337	0C:31	0338	0C:32	0339	0C:33	033A	0C:34	033B	0C:35
	04B6	0C:48	04B7	0C:49	04B8	0C:4A	04B9	0C:4B	04BA	0C:4C	04BB	0C:4D
1L	003C	0D:00	003D	0D:01	003E	0D:02	003F	0D:03	0040	0D:04	0041	0D:05
	01BC	0D:18	01BD	0D:19	01BE	0D:1A	01BF	0D:1B	01C0	0D:1C	01C1	0D:1D
	033C	0D:30	033D	0D:31	033E	0D:32	033F	0D:33	0340	0D:34	0341	0D:35
	04BC	0D:48	04BD	0D:49	04BE	0D:4A	04BF	0D:4B	04C0	0D:4C	04C1	0D:4D

1Q	0042	0E:00	0043	0E:01	0044	0E:02	0045	0E:03	0046	0E:04	0047	0E:05
	01C2	0E:18	01C3	0E:19	01C4	0E:1A	01C5	0E:1B	01C6	0E:1C	01C7	0E:1D
	0342	0E:30	0343	0E:31	0344	0E:32	0345	0E:33	0346	0E:34	0347	0E:35
	04C2	0E:48	04C3	0E:49	04C4	0E:4A	04C5	0E:4B	04C6	0E:4C	04C7	0E:4D
2C	0048	0F:00	0049	0F:01	004A	0F:02	004B	0F:03	004C	0F:04	004D	0F:05
	01C8	0F:18	01C9	0F:19	01CA	0F:1A	01CB	0F:1B	01CC	0F:1C	01CD	0F:1D
	0348	0F:30	0349	0F:31	034A	0F:32	034B	0F:33	034C	0F:34	034D	0F:35
	04C8	0F:48	04C9	0F:49	04CA	0F:4A	04CB	0F:4B	04CC	0F:4C	04CD	0F:4D
2G	004E	10:00	004F	10:01	0050	10:02	0051	10:03	0052	10:04	0053	10:05
	01CE	10:18	01CF	10:19	01D0	10:1A	01D1	10:1B	01D2	10:1C	01D3	10:1D
	034E	10:30	034F	10:31	0350	10:32	0351	10:33	0352	10:34	0353	10:35
	04CE	10:48	04CF	10:49	04D0	10:4A	04D1	10:4B	04D2	10:4C	04D3	10:4D
2L	0054	11:00	0055	11:01	0056	11:02	0057	11:03	0058	11:04	0059	11:05
	01D4	11:18	01D5	11:19	01D6	11:1A	01D7	11:1B	01D8	11:1C	01D9	11:1D
	0354	11:30	0355	11:31	0356	11:32	0357	11:33	0358	11:34	0359	11:35
	04D4	11:48	04D5	11:49	04D6	11:4A	04D7	11:4B	04D8	11:4C	04D9	11:4D
2Q	005A	12:00	005B	12:01	005C	12:02	005D	12:03	005E	12:04	005F	12:05
	01DA	12:18	01DB	12:19	01DC	12:1A	01DD	12:1B	01DE	12:1C	01DF	12:1D
	035A	12:30	035B	12:31	035C	12:32	035D	12:33	035E	12:34	035F	12:35
	04DA	12:48	04DB	12:49	04DC	12:4A	04DD	12:4B	04DE	12:4C	04DF	12:4D
3A	0060	03:06	0061	03:07	0062	03:08	0063	03:09	0064	03:0A	0065	03:0B
	01E0	03:1E	01E1	03:1F	01E2	03:20	01E3	03:21	01E4	03:22	01E5	03:23
	0360	03:36	0361	03:37	0362	03:38	0363	03:39	0364	03:3A	0365	03:3B
	04E0	03:4E	04E1	03:4F	04E2	03:50	04E3	03:51	04E4	03:52	04E5	03:53
3E	0066	04:06	0067	04:07	0068	04:08	0069	04:09	006A	04:0A	006B	04:0B
	01E6	04:1E	01E7	04:1F	01E8	04:20	01E9	04:21	01EA	04:22	01EB	04:23
	0366	04:36	0367	04:37	0368	04:38	0369	04:39	036A	04:3A	036B	04:3B
	04E6	04:4E	04E7	04:4F	04E8	04:50	04E9	04:51	04EA	04:52	04EB	04:53
3J	006C	05:06	006D	05:07	006E	05:08	006F	05:09	0070	05:0A	0071	05:0B
	01EC	05:1E	01ED	05:1F	01EE	05:20	01EF	05:21	01F0	05:22	01F1	05:23
	036C	05:36	036D	05:37	036E	05:38	036F	05:39	0370	05:3A	0371	05:3B
	04EC	05:4E	04ED	05:4F	04EE	05:50	04EF	05:51	04F0	05:52	04F1	05:53
3N	0072	06:06	0073	06:07	0074	06:08	0075	06:09	0076	06:0A	0077	06:0B
	01F2	06:1E	01F3	06:1F	01F4	06:20	01F5	06:21	01F6	06:22	01F7	06:23
	0372	06:36	0373	06:37	0374	06:38	0375	06:39	0376	06:3A	0377	06:3B
	04F2	06:4E	04F3	06:4F	04F4	06:50	04F5	06:51	04F6	06:52	04F7	06:53

4A	0078	07:06	0079	07:07	007A	07:08	007B	07:09	007C	07:0A	007D	07:0B
	01F8	07:1E	01F9	07:1F	01FA	07:20	01FB	07:21	01FC	07:22	01FD	07:23
	0378	07:36	0379	07:37	037A	07:38	037B	07:39	037C	07:3A	037D	07:3B
	04F8	07:4E	04F9	07:4F	04FA	07:50	04FB	07:51	04FC	07:52	04FD	07:53
4E	007E	08:06	007F	08:07	0080	08:08	0081	08:09	0082	08:0A	0083	08:0B
	01FE	08:1E	01FF	08:1F	0200	08:20	0201	08:21	0202	08:22	0203	08:23
	037E	08:36	037F	08:37	0380	08:38	0381	08:39	0382	08:3A	0383	08:3B
	04FE	08:4E	04FF	08:4F	0500	08:50	0501	08:51	0502	08:52	0503	08:53
4J	0084	09:06	0085	09:07	0086	09:08	0087	09:09	0088	09:0A	0089	09:0B
	0204	09:1E	0205	09:1F	0206	09:20	0207	09:21	0208	09:22	0209	09:23
	0384	09:36	0385	09:37	0386	09:38	0387	09:39	0388	09:3A	0389	09:3B
	0504	09:4E	0505	09:4F	0506	09:50	0507	09:51	0508	09:52	0509	09:53
4N	008A	0A:06	008B	0A:07	008C	0A:08	008D	0A:09	008E	0A:0A	008F	0A:0B
	020A	0A:1E	020B	0A:1F	020C	0A:20	020D	0A:21	020E	0A:22	020F	0A:23
	038A	0A:36	038B	0A:37	038C	0A:38	038D	0A:39	038E	0A:3A	038F	0A:3B
	050A	0A:4E	050B	0A:4F	050C	0A:50	050D	0A:51	050E	0A:52	050F	0A:53
3C	0090	0B:06	0091	0B:07	0092	0B:08	0093	0B:09	0094	0B:0A	0095	0B:0B
	0210	0B:1E	0211	0B:1F	0212	0B:20	0213	0B:21	0214	0B:22	0215	0B:23
	0390	0B:36	0391	0B:37	0392	0B:38	0393	0B:39	0394	0B:3A	0395	0B:3B
	0510	0B:4E	0511	0B:4F	0512	0B:50	0513	0B:51	0514	0B:52	0515	0B:53
3G	0096	0C:06	0097	0C:07	0098	0C:08	0099	0C:09	009A	0C:0A	009B	0C:0B
	0216	0C:1E	0217	0C:1F	0218	0C:20	0219	0C:21	021A	0C:22	021B	0C:23
	0396	0C:36	0397	0C:37	0398	0C:38	0399	0C:39	039A	0C:3A	039B	0C:3B
	0516	0C:4E	0517	0C:4F	0518	0C:50	0519	0C:51	051A	0C:52	051B	0C:53
3L	009C	0D:06	009D	0D:07	009E	0D:08	009F	0D:09	00A0	0D:0A	00A1	0D:0B
	021C	0D:1E	021D	0D:1F	021E	0D:20	021F	0D:21	0220	0D:22	0221	0D:23
	039C	0D:36	039D	0D:37	039E	0D:38	039F	0D:39	03A0	0D:3A	03A1	0D:3B
	051C	0D:4E	051D	0D:4F	051E	0D:50	051F	0D:51	0520	0D:52	0521	0D:53
3Q	00A2	0E:06	00A3	0E:07	00A4	0E:08	00A5	0E:09	00A6	0E:0A	00A7	0E:0B
	0222	0E:1E	0223	0E:1F	0224	0E:20	0225	0E:21	0226	0E:22	0227	0E:23
	03A2	0E:36	03A3	0E:37	03A4	0E:38	03A5	0E:39	03A6	0E:3A	03A7	0E:3B
	0522	0E:4E	0523	0E:4F	0524	0E:50	0525	0E:51	0526	0E:52	0527	0E:53
4C	00A8	0F:06	00A9	0F:07	00AA	0F:08	00AB	0F:09	00AC	0F:0A	00AD	0F:0B
	0228	0F:1E	0229	0F:1F	022A	0F:20	022B	0F:21	022C	0F:22	022D	0F:23
	03A8	0F:36	03A9	0F:37	03AA	0F:38	03AB	0F:39	03AC	0F:3A	03AD	0F:3B
	0528	0F:4E	0529	0F:4F	052A	0F:50	052B	0F:51	052C	0F:52	052D	0F:53

4G	00AE	10:06	00AF	10:07	00B0	10:08	00B1	10:09	00B2	10:0A	00B3	10:0B
	022E	10:1E	022F	10:1F	0230	10:20	0231	10:21	0232	10:22	0233	10:23
	03AE	10:36	03AF	10:37	03B0	10:38	03B1	10:39	03B2	10:3A	03B3	10:3B
	052E	10:4E	052F	10:4F	0530	10:50	0531	10:51	0532	10:52	0533	10:53
4L	00B4	11:06	00B5	11:07	00B6	11:08	00B7	11:09	00B8	11:0A	00B9	11:0B
	0234	11:1E	0235	11:1F	0236	11:20	0237	11:21	0238	11:22	0239	11:23
	03B4	11:36	03B5	11:37	03B6	11:38	03B7	11:39	03B8	11:3A	03B9	11:3B
	0534	11:4E	0535	11:4F	0536	11:50	0537	11:51	0538	11:52	0539	11:53
4Q	00BA	12:06	00BB	12:07	00BC	12:08	00BD	12:09	00BE	12:0A	00BF	12:0B
	023A	12:1E	023B	12:1F	023C	12:20	023D	12:21	023E	12:22	023F	12:23
	03BA	12:36	03BB	12:37	03BC	12:38	03BD	12:39	03BE	12:3A	03BF	12:3B
	053A	12:4E	053B	12:4F	053C	12:50	053D	12:51	053E	12:52	053F	12:53
1B	00C0	03:0C	00C1	03:0D	00C2	03:0E	00C3	03:0F	00C4	03:10	00C5	03:11
	0240	03:24	0241	03:25	0242	03:26	0243	03:27	0244	03:28	0245	03:29
	03C0	03:3C	03C1	03:3D	03C2	03:3E	03C3	03:3F	03C4	03:40	03C5	03:41
	0540	03:54	0541	03:55	0542	03:56	0543	03:57	0544	03:58	0545	03:59
1F	00C6	04:0C	00C7	04:0D	00C8	04:0E	00C9	04:0F	00CA	04:10	00CB	04:11
	0246	04:24	0247	04:25	0248	04:26	0249	04:27	024A	04:28	024B	04:29
	03C6	04:3C	03C7	04:3D	03C8	04:3E	03C9	04:3F	03CA	04:40	03CB	04:41
	0546	04:54	0547	04:55	0548	04:56	0549	04:57	054A	04:58	054B	04:59
1K	00CC	05:0C	00CD	05:0D	00CE	05:0E	00CF	05:0F	00D0	05:10	00D1	05:11
	024C	05:24	024D	05:25	024E	05:26	024F	05:27	0250	05:28	0251	05:29
	03CC	05:3C	03CD	05:3D	03CE	05:3E	03CF	05:3F	03D0	05:40	03D1	05:41
	054C	05:54	054D	05:55	054E	05:56	054F	05:57	0550	05:58	0551	05:59
1P	00D2	06:0C	00D3	06:0D	00D4	06:0E	00D5	06:0F	00D6	06:10	00D7	06:11
	0252	06:24	0253	06:25	0254	06:26	0255	06:27	0256	06:28	0257	06:29
	03D2	06:3C	03D3	06:3D	03D4	06:3E	03D5	06:3F	03D6	06:40	03D7	06:41
	0552	06:54	0553	06:55	0554	06:56	0555	06:57	0556	06:58	0557	06:59
2B	00D8	07:0C	00D9	07:0D	00DA	07:0E	00DB	07:0F	00DC	07:10	00DD	07:11
	0258	07:24	0259	07:25	025A	07:26	025B	07:27	025C	07:28	025D	07:29
	03D8	07:3C	03D9	07:3D	03DA	07:3E	03DB	07:3F	03DC	07:40	03DD	07:41
	0558	07:54	0559	07:55	055A	07:56	055B	07:57	055C	07:58	055D	07:59
2F	00DE	08:0C	00DF	08:0D	00E0	08:0E	00E1	08:0F	00E2	08:10	00E3	08:11
	025E	08:24	025F	08:25	0260	08:26	0261	08:27	0262	08:28	0263	08:29
	03DE	08:3C	03DF	08:3D	03E0	08:3E	03E1	08:3F	03E2	08:40	03E3	08:41
	055E	08:54	055F	08:55	0560	08:56	0561	08:57	0562	08:58	0563	08:59

2K	00E4	09:0C	00E5	09:0D	00E6	09:0E	00E7	09:0F	00E8	09:10	00E9	09:11
	0264	09:24	0265	09:25	0266	09:26	0267	09:27	0268	09:28	0269	09:29
	03E4	09:3C	03E5	09:3D	03E6	09:3E	03E7	09:3F	03E8	09:40	03E9	09:41
	0564	09:54	0565	09:55	0566	09:56	0567	09:57	0568	09:58	0569	09:59
2P	00EA	0A:0C	00EB	0A:0D	00EC	0A:0E	00ED	0A:0F	00EE	0A:10	00EF	0A:11
	026A	0A:24	026B	0A:25	026C	0A:26	026D	0A:27	026E	0A:28	026F	0A:29
	03EA	0A:3C	03EB	0A:3D	03EC	0A:3E	03ED	0A:3F	03EE	0A:40	03EF	0A:41
	056A	0A:54	056B	0A:55	056C	0A:56	056D	0A:57	056E	0A:58	056F	0A:59
1D	00F0	0B:0C	00F1	0B:0D	00F2	0B:0E	00F3	0B:0F	00F4	0B:10	00F5	0B:11
	0270	0B:24	0271	0B:25	0272	0B:26	0273	0B:27	0274	0B:28	0275	0B:29
	03F0	0B:3C	03F1	0B:3D	03F2	0B:3E	03F3	0B:3F	03F4	0B:40	03F5	0B:41
	0570	0B:54	0571	0B:55	0572	0B:56	0573	0B:57	0574	0B:58	0575	0B:59
1H	00F6	0C:0C	00F7	0C:0D	00F8	0C:0E	00F9	0C:0F	00FA	0C:10	00FB	0C:11
	0276	0C:24	0277	0C:25	0278	0C:26	0279	0C:27	027A	0C:28	027B	0C:29
	03F6	0C:3C	03F7	0C:3D	03F8	0C:3E	03F9	0C:3F	03FA	0C:40	03FB	0C:41
	0576	0C:54	0577	0C:55	0578	0C:56	0579	0C:57	057A	0C:58	057B	0C:59
1M	00FC	0D:0C	00FD	0D:0D	00FE	0D:0E	00FF	0D:0F	0100	0D:10	0101	0D:11
	027C	0D:24	027D	0D:25	027E	0D:26	027F	0D:27	0280	0D:28	0281	0D:29
	03FC	0D:3C	03FD	0D:3D	03FE	0D:3E	03FF	0D:3F	0400	0D:40	0401	0D:41
	057C	0D:54	057D	0D:55	057E	0D:56	057F	0D:57	0580	0D:58	0581	0D:59
1R	0102	0E:0C	0103	0E:0D	0104	0E:0E	0105	0E:0F	0106	0E:10	0107	0E:11
	0282	0E:24	0283	0E:25	0284	0E:26	0285	0E:27	0286	0E:28	0287	0E:29
	0402	0E:3C	0403	0E:3D	0404	0E:3E	0405	0E:3F	0406	0E:40	0407	0E:41
	0582	0E:54	0583	0E:55	0584	0E:56	0585	0E:57	0586	0E:58	0587	0E:59
2D	0108	0F:0C	0109	0F:0D	010A	0F:0E	010B	0F:0F	010C	0F:10	010D	0F:11
	0288	0F:24	0289	0F:25	028A	0F:26	028B	0F:27	028C	0F:28	028D	0F:29
	0408	0F:3C	0409	0F:3D	040A	0F:3E	040B	0F:3F	040C	0F:40	040D	0F:41
	0588	0F:54	0589	0F:55	058A	0F:56	058B	0F:57	058C	0F:58	058D	0F:59
2H	010E	10:0C	010F	10:0D	0110	10:0E	0111	10:0F	0112	10:10	0113	10:11
	028E	10:24	028F	10:25	0290	10:26	0291	10:27	0292	10:28	0293	10:29
	040E	10:3C	040F	10:3D	0410	10:3E	0411	10:3F	0412	10:40	0413	10:41
	058E	10:54	058F	10:55	0590	10:56	0591	10:57	0592	10:58	0593	10:59
2M	0114	11:0C	0115	11:0D	0116	11:0E	0117	11:0F	0118	11:10	0119	11:11
	0294	11:24	0295	11:25	0296	11:26	0297	11:27	0298	11:28	0299	11:29
	0414	11:3C	0415	11:3D	0416	11:3E	0417	11:3F	0418	11:40	0419	11:41
	0594	11:54	0595	11:55	0596	11:56	0597	11:57	0598	11:58	0599	11:59

2R	011A	12:0C	011B	12:0D	011C	12:0E	011D	12:0F	011E	12:10	011F	12:11
	029A	12:24	029B	12:25	029C	12:26	029D	12:27	029E	12:28	029F	12:29
	041A	12:3C	041B	12:3D	041C	12:3E	041D	12:3F	041E	12:40	041F	12:41
	059A	12:54	059B	12:55	059C	12:56	059D	12:57	059E	12:58	059F	12:59
3B	0120	03:12	0121	03:13	0122	03:14	0123	03:15	0124	03:16	0125	03:17
	02A0	03:2A	02A1	03:2B	02A2	03:2C	02A3	03:2D	02A4	03:2E	02A5	03:2F
	0420	03:42	0421	03:43	0422	03:44	0423	03:45	0424	03:46	0425	03:47
	05A0	03:5A	05A1	03:5B	05A2	03:5C	05A3	03:5D	05A4	03:5E	05A5	03:5F
3F	0126	04:12	0127	04:13	0128	04:14	0129	04:15	012A	04:16	012B	04:17
	02A6	04:2A	02A7	04:2B	02A8	04:2C	02A9	04:2D	02AA	04:2E	02AB	04:2F
	0426	04:42	0427	04:43	0428	04:44	0429	04:45	042A	04:46	042B	04:47
	05A6	04:5A	05A7	04:5B	05A8	04:5C	05A9	04:5D	05AA	04:5E	05AB	04:5F
3K	012C	05:12	012D	05:13	012E	05:14	012F	05:15	0130	05:16	0131	05:17
	02AC	05:2A	02AD	05:2B	02AE	05:2C	02AF	05:2D	02B0	05:2E	02B1	05:2F
	042C	05:42	042D	05:43	042E	05:44	042F	05:45	0430	05:46	0431	05:47
	05AC	05:5A	05AD	05:5B	05AE	05:5C	05AF	05:5D	05B0	05:5E	05B1	05:5F
3P	0132	06:12	0133	06:13	0134	06:14	0135	06:15	0136	06:16	0137	06:17
	02B2	06:2A	02B3	06:2B	02B4	06:2C	02B5	06:2D	02B6	06:2E	02B7	06:2F
	0432	06:42	0433	06:43	0434	06:44	0435	06:45	0436	06:46	0437	06:47
	05B2	06:5A	05B3	06:5B	05B4	06:5C	05B5	06:5D	05B6	06:5E	05B7	06:5F
4B	0138	07:12	0139	07:13	013A	07:14	013B	07:15	013C	07:16	013D	07:17
	02B8	07:2A	02B9	07:2B	02BA	07:2C	02BB	07:2D	02BC	07:2E	02BD	07:2F
	0438	07:42	0439	07:43	043A	07:44	043B	07:45	043C	07:46	043D	07:47
	05B8	07:5A	05B9	07:5B	05BA	07:5C	05BB	07:5D	05BC	07:5E	05BD	07:5F
4F	013E	08:12	013F	08:13	0140	08:14	0141	08:15	0142	08:16	0143	08:17
	02BE	08:2A	02BF	08:2B	02C0	08:2C	02C1	08:2D	02C2	08:2E	02C3	08:2F
	043E	08:42	043F	08:43	0440	08:44	0441	08:45	0442	08:46	0443	08:47
	05BE	08:5A	05BF	08:5B	05C0	08:5C	05C1	08:5D	05C2	08:5E	05C3	08:5F
4K	0144	09:12	0145	09:13	0146	09:14	0147	09:15	0148	09:16	0149	09:17
	02C4	09:2A	02C5	09:2B	02C6	09:2C	02C7	09:2D	02C8	09:2E	02C9	09:2F
	0444	09:42	0445	09:43	0446	09:44	0447	09:45	0448	09:46	0449	09:47
	05C4	09:5A	05C5	09:5B	05C6	09:5C	05C7	09:5D	05C8	09:5E	05C9	09:5F
4P	014A	0A:12	014B	0A:13	014C	0A:14	014D	0A:15	014E	0A:16	014F	0A:17
	02CA	0A:2A	02CB	0A:2B	02CC	0A:2C	02CD	0A:2D	02CE	0A:2E	02CF	0A:2F
	044A	0A:42	044B	0A:43	044C	0A:44	044D	0A:45	044E	0A:46	044F	0A:47
	05CA	0A:5A	05CB	0A:5B	05CC	0A:5C	05CD	0A:5D	05CE	0A:5E	05CF	0A:5F

3D	0150	0B:12	0151	0B:13	0152	0B:14	0153	0B:15	0154	0B:16	0155	0B:17
	02D0	0B:2A	02D1	0B:2B	02D2	0B:2C	02D3	0B:2D	02D4	0B:2E	02D5	0B:2F
	0450	0B:42	0451	0B:43	0452	0B:44	0453	0B:45	0454	0B:46	0455	0B:47
	05D0	0B:5A	05D1	0B:5B	05D2	0B:5C	05D3	0B:5D	05D4	0B:5E	05D5	0B:5F
3H	0156	0C:12	0157	0C:13	0158	0C:14	0159	0C:15	015A	0C:16	015B	0C:17
	02D6	0C:2A	02D7	0C:2B	02D8	0C:2C	02D9	0C:2D	02DA	0C:2E	02DB	0C:2F
	0456	0C:42	0457	0C:43	0458	0C:44	0459	0C:45	045A	0C:46	045B	0C:47
	05D6	0C:5A	05D7	0C:5B	05D8	0C:5C	05D9	0C:5D	05DA	0C:5E	05DB	0C:5F
3M	015C	0D:12	015D	0D:13	015E	0D:14	015F	0D:15	0160	0D:16	0161	0D:17
	02DC	0D:2A	02DD	0D:2B	02DE	0D:2C	02DF	0D:2D	02E0	0D:2E	02E1	0D:2F
	045C	0D:42	045D	0D:43	045E	0D:44	045F	0D:45	0460	0D:46	0461	0D:47
	05DC	0D:5A	05DD	0D:5B	05DE	0D:5C	05DF	0D:5D	05E0	0D:5E	05E1	0D:5F
3R	0162	0E:12	0163	0E:13	0164	0E:14	0165	0E:15	0166	0E:16	0167	0E:17
	02E2	0E:2A	02E3	0E:2B	02E4	0E:2C	02E5	0E:2D	02E6	0E:2E	02E7	0E:2F
	0462	0E:42	0463	0E:43	0464	0E:44	0465	0E:45	0466	0E:46	0467	0E:47
	05E2	0E:5A	05E3	0E:5B	05E4	0E:5C	05E5	0E:5D	05E6	0E:5E	05E7	0E:5F
4D	0168	0F:12	0169	0F:13	016A	0F:14	016B	0F:15	016C	0F:16	016D	0F:17
	02E8	0F:2A	02E9	0F:2B	02EA	0F:2C	02EB	0F:2D	02EC	0F:2E	02ED	0F:2F
	0468	0F:42	0469	0F:43	046A	0F:44	046B	0F:45	046C	0F:46	046D	0F:47
	05E8	0F:5A	05E9	0F:5B	05EA	0F:5C	05EB	0F:5D	05EC	0F:5E	05ED	0F:5F
4H	016E	10:12	016F	10:13	0170	10:14	0171	10:15	0172	10:16	0173	10:17
	02EE	10:2A	02EF	10:2B	02F0	10:2C	02F1	10:2D	02F2	10:2E	02F3	10:2F
	046E	10:42	046F	10:43	0470	10:44	0471	10:45	0472	10:46	0473	10:47
	05EE	10:5A	05EF	10:5B	05F0	10:5C	05F1	10:5D	05F2	10:5E	05F3	10:5F
4M	0174	11:12	0175	11:13	0176	11:14	0177	11:15	0178	11:16	0179	11:17
	02F4	11:2A	02F5	11:2B	02F6	11:2C	02F7	11:2D	02F8	11:2E	02F9	11:2F
	0474	11:42	0475	11:43	0476	11:44	0477	11:45	0478	11:46	0479	11:47
	05F4	11:5A	05F5	11:5B	05F6	11:5C	05F7	11:5D	05F8	11:5E	05F9	11:5F
4R	017A	12:12	017B	12:13	017C	12:14	017D	12:15	017E	12:16	017F	12:17
	02FA	12:2A	02FB	12:2B	02FC	12:2C	02FD	12:2D	02FE	12:2E	02FF	12:2F
	047A	12:42	047B	12:43	047C	12:44	047D	12:45	047E	12:46	047F	12:47
	05FA	12:5A	05FB	12:5B	05FC	12:5C	05FD	12:5D	05FE	12:5E	05FF	12:5F

Discover the LUNs in AIX:

Use AIX OS Command: **cfgmgr** to discover the LUNs in AIX.

Create logical volume group and logical volume:

Volume groups are created using the native AIX Logical Volume Manager. The first step is
to edit **env.cfg.per54.uspv.256gb.146g.1024hdd.6vg.1** and
env.cfg.per54.uspv.256gb.146g.1024hdd.6vg.2. These files are used as an environment file
which identifies the name of the volume group, the hdisks which belong to each volume
group, the names of the logical volumes, the size of the logical volumes, and the number of
logical partitions. After editing the environment files, rename
env.cfg.per54.uspv.256gb.146g.1024hdd.6vg.1 to **env.cfg** and execute the **mkvg.ksh** script to
create the volume groups, then execute **mklv.ksh** to create the logical volumes. Afterward,
rename **env.cfg.per54.uspv.256gb.146g.1024hdd.6vg.2** to **env.cfg** and execute the **mkvg.ksh**
script to create the volume groups, then execute **mklv.ksh** to create the logical volumes.

env.cfg.per54.uspv.256gb.146g.1024hdd.6vg.1

```
# Volume Group Naming Stems
ASU1FS=asu1
ASU2FS=asu2
ASU3FS=asu3

# Logical Volume Naming Stems
ASU11FS=asu11
ASU12FS=asu12
ASU21FS=asu21
ASU22FS=asu22
ASU31FS=asu31
ASU32FS=asu32

# List of hdisks to create volume group for ASU3.
VG3DISK="hdisk1012  hdisk148  hdisk772  hdisk76  hdisk1396  hdisk532  hdisk1156
hdisk100  hdisk796  hdisk964  hdisk988  hdisk556  hdisk1180  hdisk1348  hdisk1420
hdisk412  hdisk220  hdisk364  hdisk868  hdisk124  hdisk604  hdisk748  hdisk1252
hdisk172  hdisk892  hdisk196  hdisk1444  hdisk340  hdisk1276  hdisk580  hdisk1468
hdisk724  hdisk52  hdisk844  hdisk1036  hdisk28  hdisk436  hdisk1228  hdisk1060
hdisk460  hdisk1108  hdisk4  hdisk1516  hdisk820  hdisk1492  hdisk388  hdisk1372
hdisk1204  hdisk316  hdisk940  hdisk1084  hdisk484  hdisk700  hdisk1324  hdisk1132
hdisk508  hdisk268  hdisk292  hdisk244  hdisk916  hdisk652  hdisk676  hdisk628
hdisk1300  hdisk1018  hdisk154  hdisk778  hdisk82  hdisk1402  hdisk538  hdisk1162
hdisk106  hdisk802  hdisk970  hdisk994  hdisk562  hdisk1186  hdisk1354  hdisk1426
hdisk418  hdisk226  hdisk370  hdisk874  hdisk130  hdisk610  hdisk754  hdisk1258
hdisk178  hdisk898  hdisk202  hdisk1450  hdisk346  hdisk1282  hdisk586  hdisk1474
hdisk730  hdisk58  hdisk850  hdisk1042  hdisk34  hdisk442  hdisk1234  hdisk1066
hdisk466  hdisk1114  hdisk10  hdisk1522  hdisk826  hdisk1498  hdisk394  hdisk1378
hdisk1210  hdisk322  hdisk946  hdisk1090  hdisk490  hdisk706  hdisk1330  hdisk1138
hdisk514  hdisk274  hdisk298  hdisk250  hdisk922  hdisk658  hdisk682  hdisk634
hdisk1306  hdisk1013  hdisk149  hdisk773  hdisk77  hdisk1397  hdisk533  hdisk1157
hdisk101  hdisk797  hdisk965  hdisk989  hdisk557  hdisk1181  hdisk1349  hdisk1421
hdisk413  hdisk221  hdisk365  hdisk869  hdisk125  hdisk605  hdisk749  hdisk1253
hdisk173  hdisk893  hdisk197  hdisk1445  hdisk341  hdisk1277  hdisk581  hdisk1469
hdisk725  hdisk53  hdisk845  hdisk1037  hdisk29  hdisk437  hdisk1229  hdisk1061
hdisk461  hdisk1109  hdisk5  hdisk1517  hdisk821  hdisk1493  hdisk389  hdisk1373
hdisk1205  hdisk317  hdisk941  hdisk1085  hdisk485  hdisk701  hdisk1325  hdisk1133
hdisk509  hdisk269  hdisk293  hdisk245  hdisk917  hdisk653  hdisk677  hdisk629
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     hdisk1301  hdisk1019  hdisk155  hdisk779  hdisk83  hdisk1403  hdisk539  hdisk1163
     hdisk107  hdisk803  hdisk971  hdisk995  hdisk563  hdisk1187  hdisk1355  hdisk1427
     hdisk419  hdisk227  hdisk371  hdisk875  hdisk131  hdisk611  hdisk755  hdisk1259
     hdisk179  hdisk899  hdisk203  hdisk1451  hdisk347  hdisk1283  hdisk587  hdisk1475
     hdisk731  hdisk59  hdisk851  hdisk1043  hdisk35  hdisk443  hdisk1235  hdisk1067
     hdisk467  hdisk1115  hdisk11  hdisk1523  hdisk827  hdisk1499  hdisk395  hdisk1379
     hdisk1211  hdisk323  hdisk947  hdisk1091  hdisk491  hdisk707  hdisk1331  hdisk1139
     hdisk515  hdisk275  hdisk299  hdisk251  hdisk923  hdisk659  hdisk683  hdisk635
     hdisk1307"

     # List of hdisks to create first logical volume for ASU3 (half the volume group
     hdisks).
     ASU31DISK="hdisk1012  hdisk148  hdisk772  hdisk76  hdisk1396  hdisk532  hdisk1156
     hdisk100  hdisk796  hdisk964  hdisk988  hdisk556  hdisk1180  hdisk1348  hdisk1420
     hdisk412  hdisk220  hdisk364  hdisk868  hdisk124  hdisk604  hdisk748  hdisk1252
     hdisk172  hdisk892  hdisk196  hdisk1444  hdisk340  hdisk1276  hdisk580  hdisk1468
     hdisk724  hdisk52  hdisk844  hdisk1036  hdisk28  hdisk436  hdisk1228  hdisk1060
     hdisk460  hdisk1108  hdisk4  hdisk1516  hdisk820  hdisk1492  hdisk388  hdisk1372
     hdisk1204  hdisk316  hdisk940  hdisk1084  hdisk484  hdisk700  hdisk1324  hdisk1132
     hdisk508  hdisk268  hdisk292  hdisk244  hdisk916  hdisk652  hdisk676  hdisk628
     hdisk1300  hdisk1018  hdisk154  hdisk778  hdisk82  hdisk1402  hdisk538  hdisk1162
     hdisk106  hdisk802  hdisk970  hdisk994  hdisk562  hdisk1186  hdisk1354  hdisk1426
     hdisk418  hdisk226  hdisk370  hdisk874  hdisk130  hdisk610  hdisk754  hdisk1258
     hdisk178  hdisk898  hdisk202  hdisk1450  hdisk346  hdisk1282  hdisk586  hdisk1474
     hdisk730  hdisk58  hdisk850  hdisk1042  hdisk34  hdisk442  hdisk1234  hdisk1066
     hdisk466  hdisk1114  hdisk10  hdisk1522  hdisk826  hdisk1498  hdisk394  hdisk1378
     hdisk1210  hdisk322  hdisk946  hdisk1090  hdisk490  hdisk706  hdisk1330  hdisk1138
     hdisk514  hdisk274  hdisk298  hdisk250  hdisk922  hdisk658  hdisk682  hdisk634
     hdisk1306"

     # List of hdisks to create second logical volume for ASU3 (the other half of the
     volume group hdisks).
     ASU32DISK="hdisk1013  hdisk149  hdisk773  hdisk77  hdisk1397  hdisk533  hdisk1157
     hdisk101  hdisk797  hdisk965  hdisk989  hdisk557  hdisk1181  hdisk1349  hdisk1421
     hdisk413  hdisk221  hdisk365  hdisk869  hdisk125  hdisk605  hdisk749  hdisk1253
     hdisk173  hdisk893  hdisk197  hdisk1445  hdisk341  hdisk1277  hdisk581  hdisk1469
     hdisk725  hdisk53  hdisk845  hdisk1037  hdisk29  hdisk437  hdisk1229  hdisk1061
     hdisk461  hdisk1109  hdisk5  hdisk1517  hdisk821  hdisk1493  hdisk389  hdisk1373
     hdisk1205  hdisk317  hdisk941  hdisk1085  hdisk485  hdisk701  hdisk1325  hdisk1133
     hdisk509  hdisk269  hdisk293  hdisk245  hdisk917  hdisk653  hdisk677  hdisk629
     hdisk1301  hdisk1019  hdisk155  hdisk779  hdisk83  hdisk1403  hdisk539  hdisk1163
     hdisk107  hdisk803  hdisk971  hdisk995  hdisk563  hdisk1187  hdisk1355  hdisk1427
     hdisk419  hdisk227  hdisk371  hdisk875  hdisk131  hdisk611  hdisk755  hdisk1259
     hdisk179  hdisk899  hdisk203  hdisk1451  hdisk347  hdisk1283  hdisk587  hdisk1475
     hdisk731  hdisk59  hdisk851  hdisk1043  hdisk35  hdisk443  hdisk1235  hdisk1067
     hdisk467  hdisk1115  hdisk11  hdisk1523  hdisk827  hdisk1499  hdisk395  hdisk1379
     hdisk1211  hdisk323  hdisk947  hdisk1091  hdisk491  hdisk707  hdisk1331  hdisk1139
     hdisk515  hdisk275  hdisk299  hdisk251  hdisk923  hdisk659  hdisk683  hdisk635
     hdisk1307"

     # List of hdisks to create volume group for ASU1.
     VG1DISK="hdisk1014  hdisk150  hdisk774  hdisk78  hdisk1398  hdisk534  hdisk1158
     hdisk102  hdisk798  hdisk966  hdisk990  hdisk558  hdisk1182  hdisk1350  hdisk1422
     hdisk414  hdisk222  hdisk366  hdisk870  hdisk126  hdisk606  hdisk750  hdisk1254
     hdisk174  hdisk894  hdisk198  hdisk1446  hdisk342  hdisk1278  hdisk582  hdisk1470
     hdisk726  hdisk54  hdisk846  hdisk1038  hdisk30  hdisk438  hdisk1230  hdisk1062
     hdisk462  hdisk1110  hdisk6  hdisk1518  hdisk822  hdisk1494  hdisk390  hdisk1374
     hdisk1206  hdisk318  hdisk942  hdisk1086  hdisk486  hdisk702  hdisk1326  hdisk1134
     hdisk510  hdisk270  hdisk294  hdisk246  hdisk918  hdisk654  hdisk678  hdisk630
     hdisk1302  hdisk1020  hdisk156  hdisk780  hdisk84  hdisk1404  hdisk540  hdisk1164
     hdisk108  hdisk804  hdisk972  hdisk996  hdisk564  hdisk1188  hdisk1356  hdisk1428
     hdisk420  hdisk228  hdisk372  hdisk876  hdisk132  hdisk612  hdisk756  hdisk1260
     hdisk180  hdisk900  hdisk204  hdisk1452  hdisk348  hdisk1284  hdisk588  hdisk1476
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hdisk732  hdisk60   hdisk852  hdisk1044  hdisk36   hdisk444  hdisk1236  hdisk1068
hdisk468  hdisk1116  hdisk12   hdisk1524  hdisk828  hdisk1500  hdisk396  hdisk1380
hdisk1212  hdisk324  hdisk948  hdisk1092  hdisk492  hdisk708  hdisk1332  hdisk1140
hdisk516  hdisk276  hdisk300  hdisk252  hdisk924  hdisk660  hdisk684  hdisk636
hdisk1308  hdisk1015  hdisk151  hdisk775  hdisk79   hdisk1399  hdisk535  hdisk1159
hdisk103  hdisk799  hdisk967  hdisk991  hdisk559  hdisk1183  hdisk1351  hdisk1423
hdisk415  hdisk223  hdisk367  hdisk871  hdisk127  hdisk607  hdisk751  hdisk1255
hdisk175  hdisk895  hdisk199  hdisk1447  hdisk343  hdisk1279  hdisk583  hdisk1471
hdisk727  hdisk55   hdisk847  hdisk1039  hdisk31   hdisk439  hdisk1231  hdisk1063
hdisk463  hdisk1111  hdisk7   hdisk1519  hdisk823  hdisk1495  hdisk391  hdisk1375
hdisk1207  hdisk319  hdisk943  hdisk1087  hdisk487  hdisk703  hdisk1327  hdisk1135
hdisk511  hdisk271  hdisk295  hdisk247  hdisk919  hdisk655  hdisk679  hdisk631
hdisk1303  hdisk1021  hdisk157  hdisk781  hdisk85   hdisk1405  hdisk541  hdisk1165
hdisk109  hdisk805  hdisk973  hdisk997  hdisk565  hdisk1189  hdisk1357  hdisk1429
hdisk421  hdisk229  hdisk373  hdisk877  hdisk133  hdisk613  hdisk757  hdisk1261
hdisk181  hdisk901  hdisk205  hdisk1453  hdisk349  hdisk1285  hdisk589  hdisk1477
hdisk733  hdisk61   hdisk853  hdisk1045  hdisk37   hdisk445  hdisk1237  hdisk1069
hdisk469  hdisk1117  hdisk13   hdisk1525  hdisk829  hdisk1501  hdisk397  hdisk1381
hdisk1213  hdisk325  hdisk949  hdisk1093  hdisk493  hdisk709  hdisk1333  hdisk1141
hdisk517  hdisk277  hdisk301  hdisk253  hdisk925  hdisk661  hdisk685  hdisk637
hdisk1309"

# List of hdisks to create first logical volume for ASU1 (half the volume group
hdisks).
ASU11DISK="hdisk1014  hdisk150  hdisk774  hdisk78   hdisk1398  hdisk534  hdisk1158
hdisk102  hdisk798  hdisk966  hdisk990  hdisk558  hdisk1182  hdisk1350  hdisk1422
hdisk414  hdisk222  hdisk366  hdisk870  hdisk126  hdisk606  hdisk750  hdisk1254
hdisk174  hdisk894  hdisk198  hdisk1446  hdisk342  hdisk1278  hdisk582  hdisk1470
hdisk726  hdisk54   hdisk846  hdisk1038  hdisk30   hdisk438  hdisk1230  hdisk1062
hdisk462  hdisk1110  hdisk6   hdisk1518  hdisk822  hdisk1494  hdisk390  hdisk1374
hdisk1206  hdisk318  hdisk942  hdisk1086  hdisk486  hdisk702  hdisk1326  hdisk1134
hdisk510  hdisk270  hdisk294  hdisk246  hdisk918  hdisk654  hdisk678  hdisk630
hdisk1302  hdisk1020  hdisk156  hdisk780  hdisk84   hdisk1404  hdisk540  hdisk1164
hdisk108  hdisk804  hdisk972  hdisk996  hdisk564  hdisk1188  hdisk1356  hdisk1428
hdisk420  hdisk228  hdisk372  hdisk876  hdisk132  hdisk612  hdisk756  hdisk1260
hdisk180  hdisk900  hdisk204  hdisk1452  hdisk348  hdisk1284  hdisk588  hdisk1476
hdisk732  hdisk60   hdisk852  hdisk1044  hdisk36   hdisk444  hdisk1236  hdisk1068
hdisk468  hdisk1116  hdisk12   hdisk1524  hdisk828  hdisk1500  hdisk396  hdisk1380
hdisk1212  hdisk324  hdisk948  hdisk1092  hdisk492  hdisk708  hdisk1332  hdisk1140
hdisk516  hdisk276  hdisk300  hdisk252  hdisk924  hdisk660  hdisk684  hdisk636
hdisk1308"

# List of hdisks to create second logical volume for ASU1 (the other half of the
volume group hdisks).
ASU12DISK="hdisk1015  hdisk151  hdisk775  hdisk79   hdisk1399  hdisk535  hdisk1159
hdisk103  hdisk799  hdisk967  hdisk991  hdisk559  hdisk1183  hdisk1351  hdisk1423
hdisk415  hdisk223  hdisk367  hdisk871  hdisk127  hdisk607  hdisk751  hdisk1255
hdisk175  hdisk895  hdisk199  hdisk1447  hdisk343  hdisk1279  hdisk583  hdisk1471
hdisk727  hdisk55   hdisk847  hdisk1039  hdisk31   hdisk439  hdisk1231  hdisk1063
hdisk463  hdisk1111  hdisk7   hdisk1519  hdisk823  hdisk1495  hdisk391  hdisk1375
hdisk1207  hdisk319  hdisk943  hdisk1087  hdisk487  hdisk703  hdisk1327  hdisk1135
hdisk511  hdisk271  hdisk295  hdisk247  hdisk919  hdisk655  hdisk679  hdisk631
hdisk1303  hdisk1021  hdisk157  hdisk781  hdisk85   hdisk1405  hdisk541  hdisk1165
hdisk109  hdisk805  hdisk973  hdisk997  hdisk565  hdisk1189  hdisk1357  hdisk1429
hdisk421  hdisk229  hdisk373  hdisk877  hdisk133  hdisk613  hdisk757  hdisk1261
hdisk181  hdisk901  hdisk205  hdisk1453  hdisk349  hdisk1285  hdisk589  hdisk1477
hdisk733  hdisk61   hdisk853  hdisk1045  hdisk37   hdisk445  hdisk1237  hdisk1069
hdisk469  hdisk1117  hdisk13   hdisk1525  hdisk829  hdisk1501  hdisk397  hdisk1381
hdisk1213  hdisk325  hdisk949  hdisk1093  hdisk493  hdisk709  hdisk1333  hdisk1141
hdisk517  hdisk277  hdisk301  hdisk253  hdisk925  hdisk661  hdisk685  hdisk637
hdisk1309"

# List of hdisks to create volume group for ASU2.
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VG2DISK="hdisk1016  hdisk152  hdisk776  hdisk80  hdisk1400  hdisk536  hdisk1160
hdisk104  hdisk800  hdisk968  hdisk992  hdisk560  hdisk1184  hdisk1352  hdisk1424
hdisk416  hdisk224  hdisk368  hdisk872  hdisk128  hdisk608  hdisk752  hdisk1256
hdisk176  hdisk896  hdisk200  hdisk1448  hdisk344  hdisk1280  hdisk584  hdisk1472
hdisk728  hdisk56  hdisk848  hdisk1040  hdisk32  hdisk440  hdisk1232  hdisk1064
hdisk464  hdisk1112  hdisk8  hdisk1520  hdisk824  hdisk1496  hdisk392  hdisk1376
hdisk1208  hdisk320  hdisk944  hdisk1088  hdisk488  hdisk704  hdisk1328  hdisk1136
hdisk512  hdisk272  hdisk296  hdisk248  hdisk920  hdisk656  hdisk680  hdisk632
hdisk1304  hdisk1022  hdisk158  hdisk782  hdisk86  hdisk1406  hdisk542  hdisk1166
hdisk110  hdisk806  hdisk974  hdisk998  hdisk566  hdisk1190  hdisk1358  hdisk1430
hdisk422  hdisk230  hdisk374  hdisk878  hdisk134  hdisk614  hdisk758  hdisk1262
hdisk182  hdisk902  hdisk206  hdisk1454  hdisk350  hdisk1286  hdisk590  hdisk1478
hdisk734  hdisk62  hdisk854  hdisk1046  hdisk38  hdisk446  hdisk1238  hdisk1070
hdisk470  hdisk1118  hdisk14  hdisk1526  hdisk830  hdisk1502  hdisk398  hdisk1382
hdisk1214  hdisk326  hdisk950  hdisk1094  hdisk494  hdisk710  hdisk1334  hdisk1142
hdisk518  hdisk278  hdisk302  hdisk254  hdisk926  hdisk662  hdisk686  hdisk638
hdisk1310  hdisk1017  hdisk153  hdisk777  hdisk81  hdisk1401  hdisk537  hdisk1161
hdisk105  hdisk801  hdisk969  hdisk993  hdisk561  hdisk1185  hdisk1353  hdisk1425
hdisk417  hdisk225  hdisk369  hdisk873  hdisk129  hdisk609  hdisk753  hdisk1257
hdisk177  hdisk897  hdisk201  hdisk1449  hdisk345  hdisk1281  hdisk585  hdisk1473
hdisk729  hdisk57  hdisk849  hdisk1041  hdisk33  hdisk441  hdisk1233  hdisk1065
hdisk465  hdisk1113  hdisk9  hdisk1521  hdisk825  hdisk1497  hdisk393  hdisk1377
hdisk1209  hdisk321  hdisk945  hdisk1089  hdisk489  hdisk705  hdisk1329  hdisk1137
hdisk513  hdisk273  hdisk297  hdisk249  hdisk921  hdisk657  hdisk681  hdisk633
hdisk1305  hdisk1023  hdisk159  hdisk783  hdisk87  hdisk1407  hdisk543  hdisk1167
hdisk111  hdisk807  hdisk975  hdisk999  hdisk567  hdisk1191  hdisk1359  hdisk1431
hdisk423  hdisk231  hdisk375  hdisk879  hdisk135  hdisk615  hdisk759  hdisk1263
hdisk183  hdisk903  hdisk207  hdisk1455  hdisk351  hdisk1287  hdisk591  hdisk1479
hdisk735  hdisk63  hdisk855  hdisk1047  hdisk39  hdisk447  hdisk1239  hdisk1071
hdisk471  hdisk1119  hdisk15  hdisk1527  hdisk831  hdisk1503  hdisk399  hdisk1383
hdisk1215  hdisk327  hdisk951  hdisk1095  hdisk495  hdisk711  hdisk1335  hdisk1143
hdisk519  hdisk279  hdisk303  hdisk255  hdisk927  hdisk663  hdisk687  hdisk639
hdisk1311"

# List of hdisks to create first logical volume for ASU2 (half the volume group
hdisks).
ASU21DISK="hdisk1016  hdisk152  hdisk776  hdisk80  hdisk1400  hdisk536  hdisk1160
hdisk104  hdisk800  hdisk968  hdisk992  hdisk560  hdisk1184  hdisk1352  hdisk1424
hdisk416  hdisk224  hdisk368  hdisk872  hdisk128  hdisk608  hdisk752  hdisk1256
hdisk176  hdisk896  hdisk200  hdisk1448  hdisk344  hdisk1280  hdisk584  hdisk1472
hdisk728  hdisk56  hdisk848  hdisk1040  hdisk32  hdisk440  hdisk1232  hdisk1064
hdisk464  hdisk1112  hdisk8  hdisk1520  hdisk824  hdisk1496  hdisk392  hdisk1376
hdisk1208  hdisk320  hdisk944  hdisk1088  hdisk488  hdisk704  hdisk1328  hdisk1136
hdisk512  hdisk272  hdisk296  hdisk248  hdisk920  hdisk656  hdisk680  hdisk632
hdisk1304  hdisk1022  hdisk158  hdisk782  hdisk86  hdisk1406  hdisk542  hdisk1166
hdisk110  hdisk806  hdisk974  hdisk998  hdisk566  hdisk1190  hdisk1358  hdisk1430
hdisk422  hdisk230  hdisk374  hdisk878  hdisk134  hdisk614  hdisk758  hdisk1262
hdisk182  hdisk902  hdisk206  hdisk1454  hdisk350  hdisk1286  hdisk590  hdisk1478
hdisk734  hdisk62  hdisk854  hdisk1046  hdisk38  hdisk446  hdisk1238  hdisk1070
hdisk470  hdisk1118  hdisk14  hdisk1526  hdisk830  hdisk1502  hdisk398  hdisk1382
hdisk1214  hdisk326  hdisk950  hdisk1094  hdisk494  hdisk710  hdisk1334  hdisk1142
hdisk518  hdisk278  hdisk302  hdisk254  hdisk926  hdisk662  hdisk686  hdisk638
hdisk1310"

# List of hdisks to create second logical volume for ASU2 (the other half of the
volume group hdisks).
ASU22DISK="hdisk1017  hdisk153  hdisk777  hdisk81  hdisk1401  hdisk537  hdisk1161
hdisk105  hdisk801  hdisk969  hdisk993  hdisk561  hdisk1185  hdisk1353  hdisk1425
hdisk417  hdisk225  hdisk369  hdisk873  hdisk129  hdisk609  hdisk753  hdisk1257
hdisk177  hdisk897  hdisk201  hdisk1449  hdisk345  hdisk1281  hdisk585  hdisk1473
hdisk729  hdisk57  hdisk849  hdisk1041  hdisk33  hdisk441  hdisk1233  hdisk1065
hdisk465  hdisk1113  hdisk9  hdisk1521  hdisk825  hdisk1497  hdisk393  hdisk1377
hdisk1209  hdisk321  hdisk945  hdisk1089  hdisk489  hdisk705  hdisk1329  hdisk1137
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hdisk513   hdisk273   hdisk297   hdisk249   hdisk921   hdisk657   hdisk681   hdisk633
hdisk1305  hdisk1023  hdisk159   hdisk783   hdisk87    hdisk1407  hdisk543   hdisk1167
hdisk111   hdisk807   hdisk975   hdisk999   hdisk567   hdisk1191  hdisk1359  hdisk1431
hdisk423   hdisk231   hdisk375   hdisk879   hdisk135   hdisk615   hdisk759   hdisk1263
hdisk183   hdisk903   hdisk207   hdisk1455  hdisk351   hdisk1287  hdisk591   hdisk1479
hdisk735   hdisk63    hdisk855   hdisk1047  hdisk39    hdisk447   hdisk1239  hdisk1071
hdisk471   hdisk1119  hdisk15    hdisk1527  hdisk831   hdisk1503  hdisk399   hdisk1383
hdisk1215  hdisk327   hdisk951   hdisk1095  hdisk495   hdisk711   hdisk1335  hdisk1143
hdisk519   hdisk279   hdisk303   hdisk255   hdisk927   hdisk663   hdisk687   hdisk639
hdisk1311"

# Volume Group Name
ASU1VG=vg$ASU1FS
ASU2VG=vg$ASU2FS
ASU3VG=vg$ASU3FS

# Logical Volume Name
ASU11LV=lv$ASU11FS
ASU12LV=lv$ASU12FS
ASU21LV=lv$ASU21FS
ASU22LV=lv$ASU22FS
ASU31LV=lv$ASU31FS
ASU32LV=lv$ASU32FS

# Logical Volume Size
ASU11LVSIZE=3456G
ASU12LVSIZE=3456G
ASU21LVSIZE=3456G
ASU22LVSIZE=3456G
ASU31LVSIZE=736G
ASU32LVSIZE=736G

# Maximum Number of Logical Partitions
ASU1LP=128
ASU2LP=128
ASU3LP=128
```

env.cfg.per54.uspv.256gb.146g.1024hdd.6vg.2

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# Volume Group Naming Stems
ASU1FS=asu4
ASU2FS=asu5
ASU3FS=asu6

# Logical Volume Naming Stems
ASU11FS=asu41
ASU12FS=asu42
ASU21FS=asu51
ASU22FS=asu52
ASU31FS=asu61
ASU32FS=asu62

# List of hdisks to create volume group for ASU3.
VG3DISK="hdisk1024  hdisk160   hdisk784   hdisk88    hdisk1408  hdisk544   hdisk1168
hdisk112   hdisk808   hdisk976   hdisk1000  hdisk568   hdisk1192  hdisk1360  hdisk1432
hdisk424   hdisk232   hdisk376   hdisk880   hdisk136   hdisk616   hdisk760   hdisk1264
hdisk184   hdisk904   hdisk208   hdisk1456  hdisk352   hdisk1288  hdisk592   hdisk1480
hdisk736   hdisk64    hdisk856   hdisk1048  hdisk40    hdisk448   hdisk1240  hdisk1072
hdisk472   hdisk1120  hdisk16    hdisk1528  hdisk832   hdisk1504  hdisk400   hdisk1384
hdisk1216  hdisk328   hdisk952   hdisk1096  hdisk496   hdisk712   hdisk1336  hdisk1144
hdisk520   hdisk280   hdisk304   hdisk256   hdisk928   hdisk664   hdisk688   hdisk640
hdisk1312  hdisk1030  hdisk166   hdisk790   hdisk94    hdisk1414  hdisk550   hdisk1174
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   hdisk118  hdisk814  hdisk982  hdisk1006  hdisk574  hdisk1198  hdisk1366  hdisk1438
   hdisk430  hdisk238  hdisk382  hdisk886  hdisk142  hdisk622  hdisk766  hdisk1270
   hdisk190  hdisk910  hdisk214  hdisk1462  hdisk358  hdisk1294  hdisk598  hdisk1486
   hdisk742  hdisk70  hdisk862  hdisk1054  hdisk46  hdisk454  hdisk1246  hdisk1078
   hdisk478  hdisk1126  hdisk22  hdisk1534  hdisk838  hdisk1510  hdisk406  hdisk1390
   hdisk1222  hdisk334  hdisk958  hdisk1102  hdisk502  hdisk718  hdisk1342  hdisk1150
   hdisk526  hdisk286  hdisk310  hdisk262  hdisk934  hdisk670  hdisk694  hdisk646
   hdisk1318  hdisk1025  hdisk161  hdisk785  hdisk89  hdisk1409  hdisk545  hdisk1169
   hdisk113  hdisk809  hdisk977  hdisk1001  hdisk569  hdisk1193  hdisk1361  hdisk1433
   hdisk425  hdisk233  hdisk377  hdisk881  hdisk137  hdisk617  hdisk761  hdisk1265
   hdisk185  hdisk905  hdisk209  hdisk1457  hdisk353  hdisk1289  hdisk593  hdisk1481
   hdisk737  hdisk65  hdisk857  hdisk1049  hdisk41  hdisk449  hdisk1241  hdisk1073
   hdisk473  hdisk1121  hdisk17  hdisk1529  hdisk833  hdisk1505  hdisk401  hdisk1385
   hdisk1217  hdisk329  hdisk953  hdisk1097  hdisk497  hdisk713  hdisk1337  hdisk1145
   hdisk521  hdisk281  hdisk305  hdisk257  hdisk929  hdisk665  hdisk689  hdisk641
   hdisk1313  hdisk1031  hdisk167  hdisk791  hdisk95  hdisk1415  hdisk551  hdisk1175
   hdisk119  hdisk815  hdisk983  hdisk1007  hdisk575  hdisk1199  hdisk1367  hdisk1439
   hdisk431  hdisk239  hdisk383  hdisk887  hdisk143  hdisk623  hdisk767  hdisk1271
   hdisk191  hdisk911  hdisk215  hdisk1463  hdisk359  hdisk1295  hdisk599  hdisk1487
   hdisk743  hdisk71  hdisk863  hdisk1055  hdisk47  hdisk455  hdisk1247  hdisk1079
   hdisk479  hdisk1127  hdisk23  hdisk1535  hdisk839  hdisk1511  hdisk407  hdisk1391
   hdisk1223  hdisk335  hdisk959  hdisk1103  hdisk503  hdisk719  hdisk1343  hdisk1151
   hdisk527  hdisk287  hdisk311  hdisk263  hdisk935  hdisk671  hdisk695  hdisk647
   hdisk1319"

   # List of hdisks to create first logical volume for ASU3 (half the volume group
   hdisks).
   ASU31DISK="hdisk1024  hdisk160  hdisk784  hdisk88  hdisk1408  hdisk544  hdisk1168
   hdisk112  hdisk808  hdisk976  hdisk1000  hdisk568  hdisk1192  hdisk1360  hdisk1432
   hdisk424  hdisk232  hdisk376  hdisk880  hdisk136  hdisk616  hdisk760  hdisk1264
   hdisk184  hdisk904  hdisk208  hdisk1456  hdisk352  hdisk1288  hdisk592  hdisk1480
   hdisk736  hdisk64  hdisk856  hdisk1048  hdisk40  hdisk448  hdisk1240  hdisk1072
   hdisk472  hdisk1120  hdisk16  hdisk1528  hdisk832  hdisk1504  hdisk400  hdisk1384
   hdisk1216  hdisk328  hdisk952  hdisk1096  hdisk496  hdisk712  hdisk1336  hdisk1144
   hdisk520  hdisk280  hdisk304  hdisk256  hdisk928  hdisk664  hdisk688  hdisk640
   hdisk1312  hdisk1030  hdisk166  hdisk790  hdisk94  hdisk1414  hdisk550  hdisk1174
   hdisk118  hdisk814  hdisk982  hdisk1006  hdisk574  hdisk1198  hdisk1366  hdisk1438
   hdisk430  hdisk238  hdisk382  hdisk886  hdisk142  hdisk622  hdisk766  hdisk1270
   hdisk190  hdisk910  hdisk214  hdisk1462  hdisk358  hdisk1294  hdisk598  hdisk1486
   hdisk742  hdisk70  hdisk862  hdisk1054  hdisk46  hdisk454  hdisk1246  hdisk1078
   hdisk478  hdisk1126  hdisk22  hdisk1534  hdisk838  hdisk1510  hdisk406  hdisk1390
   hdisk1222  hdisk334  hdisk958  hdisk1102  hdisk502  hdisk718  hdisk1342  hdisk1150
   hdisk526  hdisk286  hdisk310  hdisk262  hdisk934  hdisk670  hdisk694  hdisk646
   hdisk1318"

   # List of hdisks to create second logical volume for ASU3 (the other half of the
   volume group hdisks).
   ASU32DISK="hdisk1025  hdisk161  hdisk785  hdisk89  hdisk1409  hdisk545  hdisk1169
   hdisk113  hdisk809  hdisk977  hdisk1001  hdisk569  hdisk1193  hdisk1361  hdisk1433
   hdisk425  hdisk233  hdisk377  hdisk881  hdisk137  hdisk617  hdisk761  hdisk1265
   hdisk185  hdisk905  hdisk209  hdisk1457  hdisk353  hdisk1289  hdisk593  hdisk1481
   hdisk737  hdisk65  hdisk857  hdisk1049  hdisk41  hdisk449  hdisk1241  hdisk1073
   hdisk473  hdisk1121  hdisk17  hdisk1529  hdisk833  hdisk1505  hdisk401  hdisk1385
   hdisk1217  hdisk329  hdisk953  hdisk1097  hdisk497  hdisk713  hdisk1337  hdisk1145
   hdisk521  hdisk281  hdisk305  hdisk257  hdisk929  hdisk665  hdisk689  hdisk641
   hdisk1313  hdisk1031  hdisk167  hdisk791  hdisk95  hdisk1415  hdisk551  hdisk1175
   hdisk119  hdisk815  hdisk983  hdisk1007  hdisk575  hdisk1199  hdisk1367  hdisk1439
   hdisk431  hdisk239  hdisk383  hdisk887  hdisk143  hdisk623  hdisk767  hdisk1271
   hdisk191  hdisk911  hdisk215  hdisk1463  hdisk359  hdisk1295  hdisk599  hdisk1487
   hdisk743  hdisk71  hdisk863  hdisk1055  hdisk47  hdisk455  hdisk1247  hdisk1079
   hdisk479  hdisk1127  hdisk23  hdisk1535  hdisk839  hdisk1511  hdisk407  hdisk1391
   hdisk1223  hdisk335  hdisk959  hdisk1103  hdisk503  hdisk719  hdisk1343  hdisk1151
```

```
hdisk527  hdisk287  hdisk311  hdisk263  hdisk935  hdisk671  hdisk695  hdisk647
hdisk1319"

# List of hdisks to create volume group for ASU1.
VG1DISK="hdisk1026  hdisk162  hdisk786  hdisk90  hdisk1410  hdisk546  hdisk1170
hdisk114  hdisk810  hdisk978  hdisk1002  hdisk570  hdisk1194  hdisk1362  hdisk1434
hdisk426  hdisk234  hdisk378  hdisk882  hdisk138  hdisk618  hdisk762  hdisk1266
hdisk186  hdisk906  hdisk210  hdisk1458  hdisk354  hdisk1290  hdisk594  hdisk1482
hdisk738  hdisk66  hdisk858  hdisk1050  hdisk42  hdisk450  hdisk1242  hdisk1074
hdisk474  hdisk1122  hdisk18  hdisk1530  hdisk834  hdisk1506  hdisk402  hdisk1386
hdisk1218  hdisk330  hdisk954  hdisk1098  hdisk498  hdisk714  hdisk1338  hdisk1146
hdisk522  hdisk282  hdisk306  hdisk258  hdisk930  hdisk666  hdisk690  hdisk642
hdisk1314  hdisk1032  hdisk168  hdisk792  hdisk96  hdisk1416  hdisk552  hdisk1176
hdisk120  hdisk816  hdisk984  hdisk1008  hdisk576  hdisk1200  hdisk1368  hdisk1440
hdisk432  hdisk240  hdisk384  hdisk888  hdisk144  hdisk624  hdisk768  hdisk1272
hdisk192  hdisk912  hdisk216  hdisk1464  hdisk360  hdisk1296  hdisk600  hdisk1488
hdisk744  hdisk72  hdisk864  hdisk1056  hdisk48  hdisk456  hdisk1248  hdisk1080
hdisk480  hdisk1128  hdisk24  hdisk1536  hdisk840  hdisk1512  hdisk408  hdisk1392
hdisk1224  hdisk336  hdisk960  hdisk1104  hdisk504  hdisk720  hdisk1344  hdisk1152
hdisk528  hdisk288  hdisk312  hdisk264  hdisk936  hdisk672  hdisk696  hdisk648
hdisk1320  hdisk1027  hdisk163  hdisk787  hdisk91  hdisk1411  hdisk547  hdisk1171
hdisk115  hdisk811  hdisk979  hdisk1003  hdisk571  hdisk1195  hdisk1363  hdisk1435
hdisk427  hdisk235  hdisk379  hdisk883  hdisk139  hdisk619  hdisk763  hdisk1267
hdisk187  hdisk907  hdisk211  hdisk1459  hdisk355  hdisk1291  hdisk595  hdisk1483
hdisk739  hdisk67  hdisk859  hdisk1051  hdisk43  hdisk451  hdisk1243  hdisk1075
hdisk475  hdisk1123  hdisk19  hdisk1531  hdisk835  hdisk1507  hdisk403  hdisk1387
hdisk1219  hdisk331  hdisk955  hdisk1099  hdisk499  hdisk715  hdisk1339  hdisk1147
hdisk523  hdisk283  hdisk307  hdisk259  hdisk931  hdisk667  hdisk691  hdisk643
hdisk1315  hdisk1033  hdisk169  hdisk793  hdisk97  hdisk1417  hdisk553  hdisk1177
hdisk121  hdisk817  hdisk985  hdisk1009  hdisk577  hdisk1201  hdisk1369  hdisk1441
hdisk433  hdisk241  hdisk385  hdisk889  hdisk145  hdisk625  hdisk769  hdisk1273
hdisk193  hdisk913  hdisk217  hdisk1465  hdisk361  hdisk1297  hdisk601  hdisk1489
hdisk745  hdisk73  hdisk865  hdisk1057  hdisk49  hdisk457  hdisk1249  hdisk1081
hdisk481  hdisk1129  hdisk25  hdisk1537  hdisk841  hdisk1513  hdisk409  hdisk1393
hdisk1225  hdisk337  hdisk961  hdisk1105  hdisk505  hdisk721  hdisk1345  hdisk1153
hdisk529  hdisk289  hdisk313  hdisk265  hdisk937  hdisk673  hdisk697  hdisk649
hdisk1321"

# List of hdisks to create first logical volume for ASU1 (half the volume group
hdisks).
ASU11DISK="hdisk1026  hdisk162  hdisk786  hdisk90  hdisk1410  hdisk546  hdisk1170
hdisk114  hdisk810  hdisk978  hdisk1002  hdisk570  hdisk1194  hdisk1362  hdisk1434
hdisk426  hdisk234  hdisk378  hdisk882  hdisk138  hdisk618  hdisk762  hdisk1266
hdisk186  hdisk906  hdisk210  hdisk1458  hdisk354  hdisk1290  hdisk594  hdisk1482
hdisk738  hdisk66  hdisk858  hdisk1050  hdisk42  hdisk450  hdisk1242  hdisk1074
hdisk474  hdisk1122  hdisk18  hdisk1530  hdisk834  hdisk1506  hdisk402  hdisk1386
hdisk1218  hdisk330  hdisk954  hdisk1098  hdisk498  hdisk714  hdisk1338  hdisk1146
hdisk522  hdisk282  hdisk306  hdisk258  hdisk930  hdisk666  hdisk690  hdisk642
hdisk1314  hdisk1032  hdisk168  hdisk792  hdisk96  hdisk1416  hdisk552  hdisk1176
hdisk120  hdisk816  hdisk984  hdisk1008  hdisk576  hdisk1200  hdisk1368  hdisk1440
hdisk432  hdisk240  hdisk384  hdisk888  hdisk144  hdisk624  hdisk768  hdisk1272
hdisk192  hdisk912  hdisk216  hdisk1464  hdisk360  hdisk1296  hdisk600  hdisk1488
hdisk744  hdisk72  hdisk864  hdisk1056  hdisk48  hdisk456  hdisk1248  hdisk1080
hdisk480  hdisk1128  hdisk24  hdisk1536  hdisk840  hdisk1512  hdisk408  hdisk1392
hdisk1224  hdisk336  hdisk960  hdisk1104  hdisk504  hdisk720  hdisk1344  hdisk1152
hdisk528  hdisk288  hdisk312  hdisk264  hdisk936  hdisk672  hdisk696  hdisk648
hdisk1320"

# List of hdisks to create second logical volume for ASU1 (the other half of the
volume group hdisks).
ASU12DISK="hdisk1027  hdisk163  hdisk787  hdisk91  hdisk1411  hdisk547  hdisk1171
hdisk115  hdisk811  hdisk979  hdisk1003  hdisk571  hdisk1195  hdisk1363  hdisk1435
hdisk427  hdisk235  hdisk379  hdisk883  hdisk139  hdisk619  hdisk763  hdisk1267
```

```
    hdisk187   hdisk907   hdisk211   hdisk1459  hdisk355   hdisk1291  hdisk595   hdisk1483
    hdisk739   hdisk67    hdisk859   hdisk1051  hdisk43    hdisk451   hdisk1243  hdisk1075
    hdisk475   hdisk1123  hdisk19    hdisk1531  hdisk835   hdisk1507  hdisk403   hdisk1387
    hdisk1219  hdisk331   hdisk955   hdisk1099  hdisk499   hdisk715   hdisk1339  hdisk1147
    hdisk523   hdisk283   hdisk307   hdisk259   hdisk931   hdisk667   hdisk691   hdisk643
    hdisk1315  hdisk1033  hdisk169   hdisk793   hdisk97    hdisk1417  hdisk553   hdisk1177
    hdisk121   hdisk817   hdisk985   hdisk1009  hdisk577   hdisk1201  hdisk1369  hdisk1441
    hdisk433   hdisk241   hdisk385   hdisk889   hdisk145   hdisk625   hdisk769   hdisk1273
    hdisk193   hdisk913   hdisk217   hdisk1465  hdisk361   hdisk1297  hdisk601   hdisk1489
    hdisk745   hdisk73    hdisk865   hdisk1057  hdisk49    hdisk457   hdisk1249  hdisk1081
    hdisk481   hdisk1129  hdisk25    hdisk1537  hdisk841   hdisk1513  hdisk409   hdisk1393
    hdisk1225  hdisk337   hdisk961   hdisk1105  hdisk505   hdisk721   hdisk1345  hdisk1153
    hdisk529   hdisk289   hdisk313   hdisk265   hdisk937   hdisk673   hdisk697   hdisk649
    hdisk1321"

    # List of hdisks to create volume group for ASU2.
    VG2DISK="hdisk1028  hdisk164   hdisk788   hdisk92    hdisk1412  hdisk548   hdisk1172
    hdisk116   hdisk812   hdisk980   hdisk1004  hdisk572   hdisk1196  hdisk1364  hdisk1436
    hdisk428   hdisk236   hdisk380   hdisk884   hdisk140   hdisk620   hdisk764   hdisk1268
    hdisk188   hdisk908   hdisk212   hdisk1460  hdisk356   hdisk1292  hdisk596   hdisk1484
    hdisk740   hdisk68    hdisk860   hdisk1052  hdisk44    hdisk452   hdisk1244  hdisk1076
    hdisk476   hdisk1124  hdisk20    hdisk1532  hdisk836   hdisk1508  hdisk404   hdisk1388
    hdisk1220  hdisk332   hdisk956   hdisk1100  hdisk500   hdisk716   hdisk1340  hdisk1148
    hdisk524   hdisk284   hdisk308   hdisk260   hdisk932   hdisk668   hdisk692   hdisk644
    hdisk1316  hdisk1034  hdisk170   hdisk794   hdisk98    hdisk1418  hdisk554   hdisk1178
    hdisk122   hdisk818   hdisk986   hdisk1010  hdisk578   hdisk1202  hdisk1370  hdisk1442
    hdisk434   hdisk242   hdisk386   hdisk890   hdisk146   hdisk626   hdisk770   hdisk1274
    hdisk194   hdisk914   hdisk218   hdisk1466  hdisk362   hdisk1298  hdisk602   hdisk1490
    hdisk746   hdisk74    hdisk866   hdisk1058  hdisk50    hdisk458   hdisk1250  hdisk1082
    hdisk482   hdisk1130  hdisk26    hdisk1538  hdisk842   hdisk1514  hdisk410   hdisk1394
    hdisk1226  hdisk338   hdisk962   hdisk1106  hdisk506   hdisk722   hdisk1346  hdisk1154
    hdisk530   hdisk290   hdisk314   hdisk266   hdisk938   hdisk674   hdisk698   hdisk650
    hdisk1322  hdisk1029  hdisk165   hdisk789   hdisk93    hdisk1413  hdisk549   hdisk1173
    hdisk117   hdisk813   hdisk981   hdisk1005  hdisk573   hdisk1197  hdisk1365  hdisk1437
    hdisk429   hdisk237   hdisk381   hdisk885   hdisk141   hdisk621   hdisk765   hdisk1269
    hdisk189   hdisk909   hdisk213   hdisk1461  hdisk357   hdisk1293  hdisk597   hdisk1485
    hdisk741   hdisk69    hdisk861   hdisk1053  hdisk45    hdisk453   hdisk1245  hdisk1077
    hdisk477   hdisk1125  hdisk21    hdisk1533  hdisk837   hdisk1509  hdisk405   hdisk1389
    hdisk1221  hdisk333   hdisk957   hdisk1101  hdisk501   hdisk717   hdisk1341  hdisk1149
    hdisk525   hdisk285   hdisk309   hdisk261   hdisk933   hdisk669   hdisk693   hdisk645
    hdisk1317  hdisk1035  hdisk171   hdisk795   hdisk99    hdisk1419  hdisk555   hdisk1179
    hdisk123   hdisk819   hdisk987   hdisk1011  hdisk579   hdisk1203  hdisk1371  hdisk1443
    hdisk435   hdisk243   hdisk387   hdisk891   hdisk147   hdisk627   hdisk771   hdisk1275
    hdisk195   hdisk915   hdisk219   hdisk1467  hdisk363   hdisk1299  hdisk603   hdisk1491
    hdisk747   hdisk75    hdisk867   hdisk1059  hdisk51    hdisk459   hdisk1251  hdisk1083
    hdisk483   hdisk1131  hdisk27    hdisk1539  hdisk843   hdisk1515  hdisk411   hdisk1395
    hdisk1227  hdisk339   hdisk963   hdisk1107  hdisk507   hdisk723   hdisk1347  hdisk1155
    hdisk531   hdisk291   hdisk315   hdisk267   hdisk939   hdisk675   hdisk699   hdisk651
    hdisk1323"

    # List of hdisks to create first logical volume for ASU2 (half the volume group
    hdisks).
    ASU21DISK="hdisk1028  hdisk164   hdisk788   hdisk92    hdisk1412  hdisk548   hdisk1172
    hdisk116   hdisk812   hdisk980   hdisk1004  hdisk572   hdisk1196  hdisk1364  hdisk1436
    hdisk428   hdisk236   hdisk380   hdisk884   hdisk140   hdisk620   hdisk764   hdisk1268
    hdisk188   hdisk908   hdisk212   hdisk1460  hdisk356   hdisk1292  hdisk596   hdisk1484
    hdisk740   hdisk68    hdisk860   hdisk1052  hdisk44    hdisk452   hdisk1244  hdisk1076
    hdisk476   hdisk1124  hdisk20    hdisk1532  hdisk836   hdisk1508  hdisk404   hdisk1388
    hdisk1220  hdisk332   hdisk956   hdisk1100  hdisk500   hdisk716   hdisk1340  hdisk1148
    hdisk524   hdisk284   hdisk308   hdisk260   hdisk932   hdisk668   hdisk692   hdisk644
    hdisk1316  hdisk1034  hdisk170   hdisk794   hdisk98    hdisk1418  hdisk554   hdisk1178
    hdisk122   hdisk818   hdisk986   hdisk1010  hdisk578   hdisk1202  hdisk1370  hdisk1442
    hdisk434   hdisk242   hdisk386   hdisk890   hdisk146   hdisk626   hdisk770   hdisk1274
```

```
hdisk194  hdisk914  hdisk218  hdisk1466  hdisk362  hdisk1298  hdisk602  hdisk1490
hdisk746  hdisk74   hdisk866  hdisk1058  hdisk50   hdisk458   hdisk1250 hdisk1082
hdisk482  hdisk1130 hdisk26   hdisk1538  hdisk842  hdisk1514  hdisk410  hdisk1394
hdisk1226 hdisk338  hdisk962  hdisk1106  hdisk506  hdisk722   hdisk1346 hdisk1154
hdisk530  hdisk290  hdisk314  hdisk266   hdisk938  hdisk674   hdisk698  hdisk650
hdisk1322"

# List of hdisks to create second logical volume for ASU2 (the other half of the
volume group hdisks).
ASU22DISK="hdisk1029 hdisk165  hdisk789  hdisk93   hdisk1413 hdisk549  hdisk1173
hdisk117  hdisk813  hdisk981  hdisk1005  hdisk573  hdisk1197  hdisk1365 hdisk1437
hdisk429  hdisk237  hdisk381  hdisk885   hdisk141  hdisk621   hdisk765  hdisk1269
hdisk189  hdisk909  hdisk213  hdisk1461  hdisk357  hdisk1293  hdisk597  hdisk1485
hdisk741  hdisk69   hdisk861  hdisk1053  hdisk45   hdisk453   hdisk1245 hdisk1077
hdisk477  hdisk1125 hdisk21   hdisk1533  hdisk837  hdisk1509  hdisk405  hdisk1389
hdisk1221 hdisk333  hdisk957  hdisk1101  hdisk501  hdisk717   hdisk1341 hdisk1149
hdisk525  hdisk285  hdisk309  hdisk261   hdisk933  hdisk669   hdisk693  hdisk645
hdisk1317 hdisk1035 hdisk171  hdisk795   hdisk99   hdisk1419  hdisk555  hdisk1179
hdisk123  hdisk819  hdisk987  hdisk1011  hdisk579  hdisk1203  hdisk1371 hdisk1443
hdisk435  hdisk243  hdisk387  hdisk891   hdisk147  hdisk627   hdisk771  hdisk1275
hdisk195  hdisk915  hdisk219  hdisk1467  hdisk363  hdisk1299  hdisk603  hdisk1491
hdisk747  hdisk75   hdisk867  hdisk1059  hdisk51   hdisk459   hdisk1251 hdisk1083
hdisk483  hdisk1131 hdisk27   hdisk1539  hdisk843  hdisk1515  hdisk411  hdisk1395
hdisk1227 hdisk339  hdisk963  hdisk1107  hdisk507  hdisk723   hdisk1347 hdisk1155
hdisk531  hdisk291  hdisk315  hdisk267   hdisk939  hdisk675   hdisk699  hdisk651
hdisk1323"

# Volume Group Name
ASU1VG=vg$ASU1FS
ASU2VG=vg$ASU2FS
ASU3VG=vg$ASU3FS

# Logical Volume Name
ASU11LV=lv$ASU11FS
ASU12LV=lv$ASU12FS
ASU21LV=lv$ASU21FS
ASU22LV=lv$ASU22FS
ASU31LV=lv$ASU31FS
ASU32LV=lv$ASU32FS

# Logical Volume Size
ASU11LVSIZE=3456G
ASU12LVSIZE=3456G
ASU21LVSIZE=3456G
ASU22LVSIZE=3456G
ASU31LVSIZE=736G
ASU32LVSIZE=736G

# Maximum Number of Logical Partitions
ASU1LP=128
ASU2LP=128
ASU3LP=128
```

mkvg.ksh

```
#!/bin/ksh

. /scripts/host/aix/spcbuild/env.cfg

# Create scalable VGs to support > 128 PVs per VG
mkvg -S -f -y $ASU1VG -s '256' $VG1DISK
mkvg -S -f -y $ASU2VG -s '256' $VG2DISK
mkvg -S -f -y $ASU3VG -s '256' $VG3DISK
```

mklv.ksh

```
#!/bin/ksh

. /scripts/host/aix/spcbuild/env.cfg

mklv -y $ASU11LV -t 'rawio' -u $ASU1LP -w 'n' -S '1M' $ASU1VG $ASU11LVSIZE
$ASU11DISK
mklv -y $ASU12LV -t 'rawio' -u $ASU1LP -w 'n' -S '1M' $ASU1VG $ASU12LVSIZE
$ASU12DISK
mklv -y $ASU21LV -t 'rawio' -u $ASU2LP -w 'n' -S '1M' $ASU2VG $ASU21LVSIZE
$ASU21DISK
mklv -y $ASU22LV -t 'rawio' -u $ASU2LP -w 'n' -S '1M' $ASU2VG $ASU22LVSIZE
$ASU22DISK
mklv -y $ASU31LV -t 'rawio' -u $ASU3LP -w 'n' -S '1M' $ASU3VG $ASU31LVSIZE
$ASU31DISK
mklv -y $ASU32LV -t 'rawio' -u $ASU3LP -w 'n' -S '1M' $ASU3VG $ASU32LVSIZE
$ASU32DISK
```

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

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

```
# SPC1 uses three different ASUs (Application Storage Unit)
# The storage definition must start with asu1, or asu2 or
# asu3.  Each of the asu luns will be concatenated together for
# for form 1 logical piece of storage.  The storage must be in the
# following proportion.
#     ASU1 = 45%
#     ASU2 = 45%
#     ASU3 = 10%

# The sd statement can have an optional size.  For example:
# Use only the first 30GMs of the storage for each LUN.
#     sd=asu1_1,lun=/dev/rdsk/c2t129d0s6,size=33g

javaparms="-Xms384m -Xmx768m -Xss128k -Xgcpolicy:optavgpause"

sd=asu1_1,lun=/dev/rlvasu11,size=2925g
sd=asu1_2,lun=/dev/rlvasu12,size=2925g
sd=asu1_3,lun=/dev/rlvasu41,size=2925g
sd=asu1_4,lun=/dev/rlvasu42,size=2925g
sd=asu2_1,lun=/dev/rlvasu21,size=2925g
sd=asu2_2,lun=/dev/rlvasu22,size=2925g
sd=asu2_3,lun=/dev/rlvasu51,size=2925g
sd=asu2_4,lun=/dev/rlvasu52,size=2925g
sd=asu3_1,lun=/dev/rlvasu31,size=650g
sd=asu3_2,lun=/dev/rlvasu32,size=650g
sd=asu3_3,lun=/dev/rlvasu61,size=650g
sd=asu3_4,lun=/dev/rlvasu62,size=650g
```

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.**

```ksh
#!/bin/ksh

# Logic when passing arguments from the command line.

if [ $# -ne 1 ];then
   echo "Usage: $0 [BSU]"
   exit 1
   else
   BSU=$1
fi

# Global Variable
DATE=`date +%y%m%d.%H%M`
SPCDIR=/home/benchmark/spc1
OUTDIR=$SPCDIR/output/$DATE.bsu$BSU

# Create Output Directory
mkdir -p $OUTDIR

# SPC Configruation Variable
# MEASURE:
#    Number of seconds for the measurement
#    interval of the Sustainability Test Phase.
# RAMP:
#    Number of seconds for the measurement
#    intervals for the Response Ramp Test Phase.
# STARTUP:
#    Number of seconds of startup time for each
#    measurement interval.
MEASURE=10800
RAMP=600
STARTUP=180

# Need to setup LD_LIBRARY_PATH in .kshrc
export LIBPATH=/home/benchmark/spc1/aix

# Path where java resides:
java=/usr/java14/jre/bin/java

# IBM Java Environment Setting
export CLASSPATH=.
export IBM_JAVADUMP_OUTOFMEMORY=false
export IBM_HEAPDUMP_OUTOFMEMORY=false

##############################################################################
##############################################################################


##############################################################################
#
# Metric Test
# Metric Test Time: 4 Hours and 30 Minutes.
```

```
#
# It is recommened that you restart both the Benchmark Configuration
# and Tested Storage Configuration.  The metrics test actually consists
# of the sustainability test phase and the ramp test phase.
#
################################################################################

# Run Metric Test
$java -Xoptionsfile=javaopts.cfg metrics -b $BSU

################################################################################
#
# Repeatability Test
# Repeatability Test Time: 30 Minutes.
#
# The Repeatability Test may be run before or after the metrics and/or
# persistence test, but it is recommended that the Repeatability Test be
# executed following the Response Time Ramp Test Phase (Metrics).  The two
# Test Phases ('repeat1' and 'repeat2') that comprise the Repeatability Test
# must be executed in an uninterrupted sequence.
#
################################################################################

# Run Repeatability 1 Test
$java -Xoptionsfile=javaopts.cfg repeat1 -b $BSU

# Run Repeatability 2 Test
$java -Xoptionsfile=javaopts.cfg repeat2 -b $BSU

################################################################################
#
# Persistence Test
# Persistence Test Time: 30 Minutes + Time to power off system.
#
# It is recommended to run the Persistence Test as the
# first item of an Audit.  The first stage (persist1), pwer
# off/restart, and second stage (persist2) must be run
# in an uninterrupted sequence.
#
################################################################################

# Run Persistence 1 Test
$java -Xoptionsfile=javaopts.cfg persist1 -b $BSU

# It is now necessary to completely power off and restart
# both the Benchmark COnfiguration and the Tested Storage
# Configuration machine so that all caches are completely
# emptied.

# Run Persistence 2 Test
#$java -Xoptionsfile=javaopts.cfg persist2

################################################################################
#
# Clean up process
#
################################################################################

cp $SPCDIR/SPC1.cfg $OUTDIR
mv $SPCDIR/SPC1.parm $OUTDIR
#mv $SPCDIR/*.jnl $OUTDIR
#mv $SPCDIR/*.map $OUTDIR
mv $SPCDIR/metrics/ $OUTDIR
```

```
    mv $SPCDIR/repeatability1/ $OUTDIR
    mv $SPCDIR/repeatability2/ $OUTDIR
    mv $SPCDIR/persistence1/ $OUTDIR
    #mv $SPCDIR/persistence2/ $OUTDIR
    mv $SPCDIR/SPCOut/ $OUTDIR
```

Persistence Test Run 2

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

```
    #!/bin/ksh

    # Logic when passing arguments from the command line.

    if [ $# -ne 1 ];then
        echo "Usage: $0 [BSU]"
        exit 1
        else
        BSU=$1
    fi

    # Global Variable
    DATE=`date +%y%m%d.%H%M`
    SPCDIR=/home/benchmark/spc1
    OUTDIR=$SPCDIR/output/$DATE.bsu$BSU

    # Create Output Directory
    mkdir -p $OUTDIR

    # SPC Configruation Variable
    # MEASURE:
    #    Number of seconds for the measurement
    #    interval of the Sustainability Test Phase.
    # RAMP:
    #    Number of seconds for the measurement
    #    intervals for the Response Ramp Test Phase.
    # STARTUP:
    #    Number of seconds of startup time for each
    #    measurement interval.
    MEASURE=10800
    RAMP=600
    STARTUP=180

    # Need to setup LD_LIBRARY_PATH in .kshrc
    export LIBPATH=/home/benchmark/spc1/aix

    # Path where java resides:
    java=/usr/java14/jre/bin/java

    # IBM Java Environment Setting
    export CLASSPATH=.
    export IBM_JAVADUMP_OUTOFMEMORY=false
    export IBM_HEAPDUMP_OUTOFMEMORY=false

    ##############################################################################
    ##############################################################################

    ##############################################################################
    #
    # Metric Test
```

```
# Metric Test Time: 4 Hours and 30 Minutes.
#
# It is recommened that you restart both the Benchmark Configuration
# and Tested Storage Configuration.  The metrics test actually consists
# of the sustainability test phase and the ramp test phase.
#
################################################################################

# Run Metric Test
#$java -Xoptionsfile=javaopts.cfg metrics -b $BSU

################################################################################
#
# Repeatability Test
# Repeatability Test Time: 30 Minutes.
#
# The Repeatability Test may be run before or after the metrics and/or
# persistence test, but it is recommended that the Repeatability Test be
# executed following the Response Time Ramp Test Phase (Metrics).  The two
# Test Phases ('repeat1' and 'repeat2') that comprise the Repeatability Test
# must be executed in an uninterrupted sequence.
#
################################################################################

# Run Repeatability 1 Test
#$java -Xoptionsfile=javaopts.cfg repeat1 -b $BSU

# Run Repeatability 2 Test
#$java -Xoptionsfile=javaopts.cfg repeat2 -b $BSU

################################################################################
#
# Persistence Test
# Persistence Test Time: 30 Minutes + Time to power off system.
#
# It is recommended to run the Persistence Test as the
# first item of an Audit.  The first stage (persist1), pwer
# off/restart, and second stage (persist2) must be run
# in an uninterrupted sequence.
#
################################################################################

# Run Persistence 1 Test
#$java -Xoptionsfile=javaopts.cfg persist1 -b $BSU

# It is now necessary to completely power off and restart
# both the Benchmark COnfiguration and the Tested Storage
# Configuration machine so that all caches are completely
# emptied.

# Run Persistence 2 Test
$java -Xoptionsfile=javaopts.cfg persist2

################################################################################
#
# Clean up process
#
################################################################################

cp $SPCDIR/SPC1.cfg $OUTDIR
mv $SPCDIR/SPC1.parm $OUTDIR
#mv $SPCDIR/*.jnl $OUTDIR
#mv $SPCDIR/*.map $OUTDIR
```

SPC BENCHMARK 1™ V1.10.1   FULL DISCLOSURE REPORT   **Submission Identifier: A00055**
Sun Microsystems, Inc.   **Submitted for Review: OCTOBER 1, 2007**
Sun StorageTek® 9990V System

```
#mv $SPCDIR/metrics/ $OUTDIR
#mv $SPCDIR/repeatability1/ $OUTDIR
#mv $SPCDIR/repeatability2/ $OUTDIR
#mv $SPCDIR/persistence1/ $OUTDIR
mv $SPCDIR/persistence2/ $OUTDIR
mv $SPCDIR/SPCOut/ $OUTDIR
```

APPENDIX F: THIRD-PARTY QUOTATIONS

4 Gb Single-Port Fibre Channel PCI-X 2.0 DDR Adapters