



HITACHI
DATA SYSTEMS

SPC BENCHMARK 1™
FULL DISCLOSURE REPORT

HITACHI DATA SYSTEMS CORPORATION
HITACHI UNIVERSAL STORAGE PLATFORM™ V

SPC-1 V1.10.1

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AUDIT CERTIFICATION



Roberto Basilio
Hitachi Data Systems Corporation
750 Central Expressway M/S 3488
Santa Clara, CA 95050

October 1, 2007

The SPC Benchmark 1™ results listed below for the Hitachi Universal Storage Platform™ V 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:	
Hitachi Universal Storage Platform™ V	
Metric	Reported Result
SPC-1 IOPS™	200,245.73
SPC-1 Price-Performance	\$17.61/SPC-1 IOPS™
Total ASU Capacity	26,000,000 GB
Data Protection Level	Mirroring
Total TSC Price (including three-year maintenance)	\$3,525,389

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 Hitachi Data Systems Corporation:
 - ✓ Physical Storage Capacity and requirements.
 - ✓ Configured Storage Capacity and requirements.
 - ✓ Addressable Storage Capacity and requirements.
 - ✓ Capacity of each Logical Volume and requirements.
 - ✓ Capacity of each Application Storage Unit (ASU) and requirements.
- An appropriate diagram of the Benchmark Configuration (BC)/Tested Storage Configuration (TSC).
- Physical verification of the components to match 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.)

Hitachi Universal Storage Platform™ V
SPC-1 Audit Certification

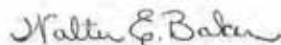
Page 2

- 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 Hitachi Data Systems Corporation:
 - ✓ The type of Host System including the number of processors and main memory.
 - ✓ The presence and version number of the Workload Generator on the Host System.
 - ✓ The TSC boundary within the Host System.
- The 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 Hitachi Data Systems Corporation 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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LETTER OF GOOD FAITH

HITACHI
Inspire the Next

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September 26, 2007

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

Subject: SPC-1 Letter of Good Faith for the Hitachi Data Systems Universal Storage Platform V "USPV"

Hitachi Data Systems 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 Version 1.10.1 of the SPC-1 benchmark specification.

Our disclosure of the Benchmark configuration and execution of the benchmark includes all items that, to the best of our knowledge and belief materially affect the reported results regardless of whether such items are explicitly required to be disclosed by the SPC-1 benchmark specification.

Sincerely,



Steve Fenbarg
Vice President
Global Product Marketing

Partner Beyond Technology

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

Test Sponsor and Contact Information	
Test Sponsor Primary Contact	Hitachi Data Systems Corporation – http://www.hds.com Roberto Basilio – Roberto.Basilio@hds.com 750 Central Expressway M/S 3488 Santa Clara, CA 95050 Phone (408) 970-5990 FAX: (408) 562-5477
Test Sponsor Alternate Contact	Hitachi Data Systems Corporation – http://www.hds.com Mel Boksenbaum – mel.boksenbaum@hds.com 750 Central Expressway M/S 3275 Santa Clara, CA 95050 Phone (408) 970-7922 FAX: (408) 327-3066
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	currently available
Date the TSC completed audit certification	October 1, 2007

Tested Storage Product (TSP) Description

The Hitachi Universal Storage Platform™ V, the world's most advanced storage services platform, provides the foundation for Hitachi Services Oriented Storage Solutions, a new architecture that enables IT departments to tailor and offer a wide range of storage services based on the value to the business. With its powerful controller-based platform, Hitachi Data Systems is in a unique position to package and deliver storage services across heterogeneous storage assets, whether file, object or block-based. Powered by an enhanced Hitachi Universal Star Network™ V crossbar switch architecture with faster internal processors, 4Gb/sec host ports, 4Gb/sec disks, and 4Gb/sec switched-loop back-end directors, it provides 40% more system performance and further extends the scalability and enterprise-class functionality introduced with its predecessor, the Hitachi Universal Storage Platform. This massive-capacity, mega-scalable system assists storage managers in their mission to simplify storage administration, improve performance, and reduce overall costs.

Summary of Results

SPC-1 Results	
Tested Storage Configuration (TSC) Name: Hitachi Universal Storage Platform™ V	
Metric	Reported Result
SPC-1 IOPS™	200,245.73
SPC-1 Price-Performance	\$17.61/SPC-1 IOPS™
Total ASU Capacity	26,000.000 GB
Data Protection Level	Mirroring
Total TSC Price (including three-year maintenance)	\$3,525,389

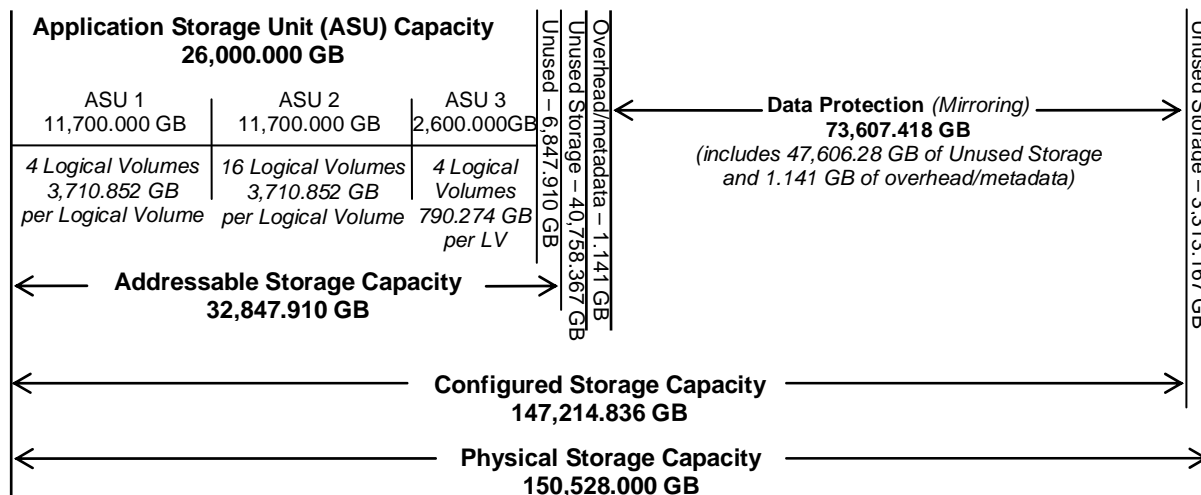
SPC-1 IOPS™ represents the maximum I/O Request Throughput at the 100% load point.

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

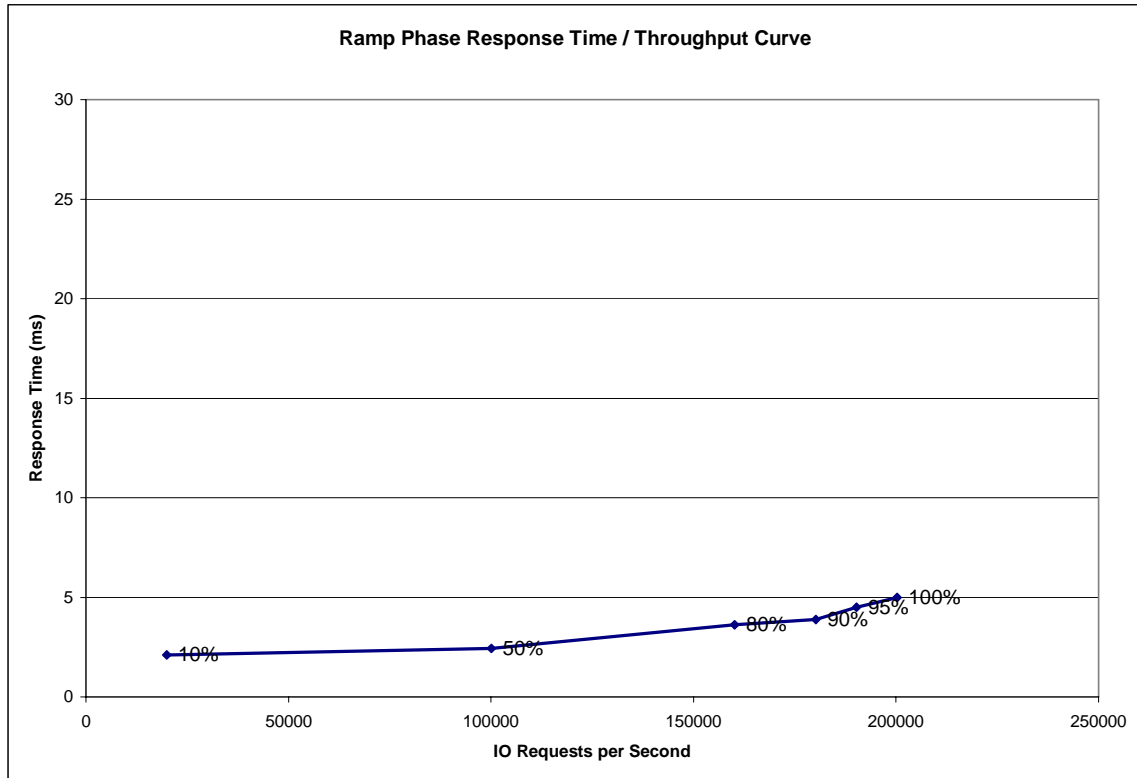
The following diagram documents the various storage capacities, used in this benchmark, and their relationships.



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

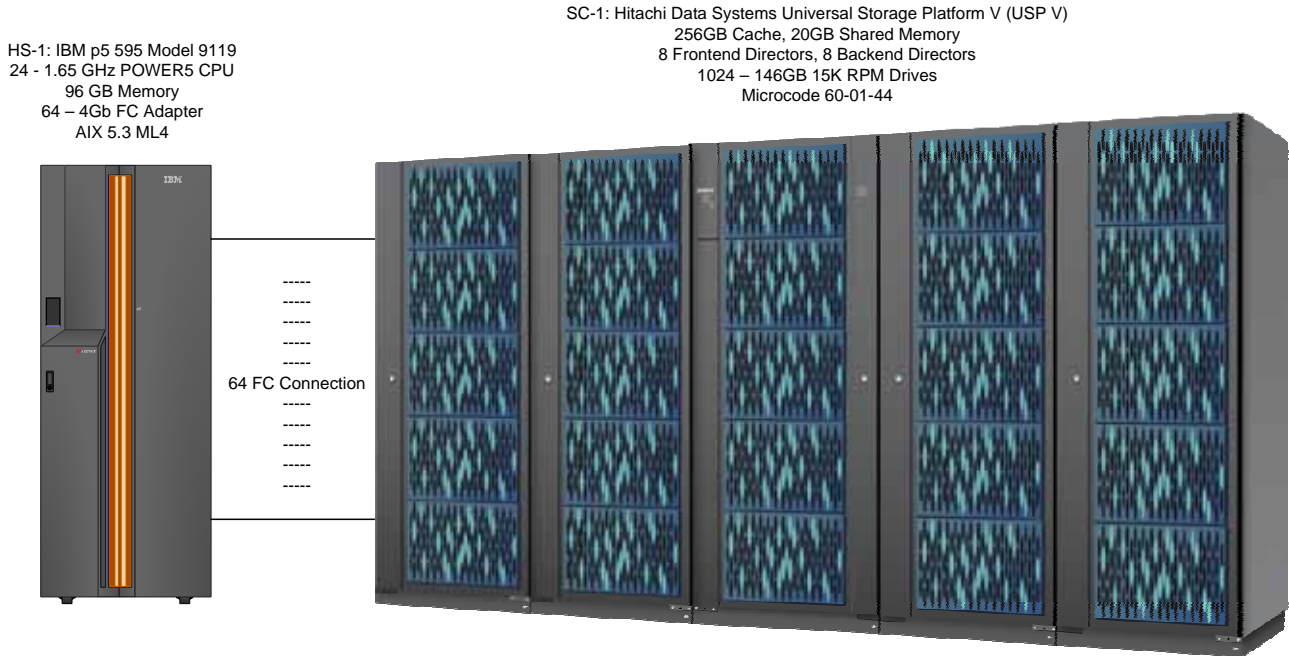
Tested Storage Configuration Pricing (Priced Storage Configuration)

Product Code	Description	Qty	List	List EXT	List MMC	List MMC Ext
041-100056-01.P	USP V Product Documentation Library-HDS	1	0	0	0	0
041-100057-01.P	USP V Microcode Kit	1	0	0	0	0
DKC-F6051-18.P	Disk Array Frame	4	33,800.00	135,200.00	0	0
DKC-F6051-AKT.P	DKU Expansion Kit	4	14,200.00	56,800.00	0	0
DKC-F6051-DH.P	DKU Door Kit for HDS	4	0	0	0	0
DKC-F6051-EXC.P	DEV Interface Cable (DKU-DKU)	4	500.00	2,000.00	0	0
DKC-F6101-16FS.P	Fibre 16-Port Adapter(4Gbps)	8	30,300.00	242,400.00	0	0
DKC-F6101-3PS.P	AC Box Kit (3 Phase 30A)	5	600.00	3,000.00	0	0
DKC-F6101-3UC.P	Power Cable Kit (3Phase 30A for USA)	5	600.00	3,000.00	0	0
DKC-F6101-AB.P	Additional Battery-1	3	2,600.00	7,800.00	0	0
DKC-F6101-APC.P	Additional Power Supply	2	2,100.00	4,200.00	0	0
DKC-F6101-C8G.P	Cache Memory Module (8GB)	32	32,600.00	1,043,200.00	0	0
DKC-F6101-CSW.P	Data Path Expansion Kit	3	26,900.00	80,700.00	0	0
DKC-F6101-CX.P	Cache Memory Adapter	4	2,000.00	8,000.00	0	0
DKC-F6101-DH.P	DKC Door Kit for HDS	1	0	0	0	0
DKC-F6101-DKA.P	Disk Adapter	8	24,100.00	192,800.00	0	0
DKC-F6101-L1DC.P	Device Interface Cable (DKC to DKU-L1)	1	500.00	500.00	0	0
DKC-F6101-L1UC.P	Device Interface Cable (DKC to DKU-L1)	1	500.00	500.00	0	0
DKC-F6101-MDM.P	Modem Card Kit	1	500.00	500.00	0	0
DKC-F6101-R1DC.P	Device Interface Cable (DKC to DKU-R1)	1	500.00	500.00	0	0
DKC-F6101-R1UC.P	Device Interface Cable (DKC to DKU-R1)	1	500.00	500.00	0	0
DKC-F6101-S4GQ.P	Shared Memory Module (4GB)	5	21,200.00	106,000.00	0	0
DKC-F6101-SX.P	Shared Memory Adapter	2	2,300.00	4,600.00	0	0
DKC6101-5.P	Disk Control Frame	1	55,000.00	55,000.00	0	0
DT1512.P	512MB USB memory stick	1	0	0	0	0
IP0662-14.P	LAN Cable 14ft	1	0	0	0	0
IP0664-12.P	Phone Cable 12ft	1	0	0	0	0
IP0665-11.P	RJ-11 Modular In-Line Coupler 4 Conductor	1	0	0	0	0
IP0665-45.P	RJ-45 Modular In-Line Coupler 6 Conductor	1	0	0	0	0
DKC-F6051-146KS.P	1 HDD Canister (DKR2F-K146FC)	1024	3,260.00	3,338,240.00	0	0
Hardware Components				\$5,285,440.00		
Product Code	Description	Qty	List	List EXT	List MMC	List MMC Ext
044-220001-01.P	USP V Basic Operating System Bundle Media Kit	1	0	0	0	0
044-220001-03.P	USP V Basic Operating System Bundle License Base	1	7,200.00	7,200.00	0	0
044-220001-03F.P	USP V Basic Optg Sys Bndl 1TB (Above 100TB) Lic	146	1,750.00	255,500.00	0	0
304-220001-03.P	SVC Mo USP V Basic Operating System Bundle License Base	36	0	0	2,579.00	92,844.00
Software Components				\$262,700.00		\$92,844.00
				List	Discount	Total
	USP V Hardware			\$5,285,440.00	40.00%	\$3,171,264.00
	USP V Hardware Maintenance			\$0.00	0.00%	\$0.00
	-- Includes 3-years of Premium Service (24x7x2 hour response) and installation					
	USP V Software			\$262,700.00	35.00%	\$170,755.00
	USP V Software Maintenance			\$92,844.00	35.00%	\$60,348.60
	-- Includes 3-years of Service (24x7x2 hour response)					
	64 IBM 5758 4 Gb Single-Port Fibre Channel PCI-X 2.0 DDR Adapter			\$121,539.20	0.00%	\$121,539.20
	64 LC-LC FC Cable (*)			\$1,482.24	0.00%	\$1,482.24
	*(Purchased by HDS for test. Not resold by HDS.)					
Total						\$3,525,389.04

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

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

Benchmark Configuration/Tested Storage Configuration Diagram



Benchmark Configuration/Tested Storage Configuration Components

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: Hitachi Data Systems Universal Storage Platform V
96 GB main memory	256 GB cache (<i>data</i>), 22 GB shared memory (<i>metadata</i>)
AIX 5.3 ML4	8 pair (16 ports/pair) 4 Gb FC Front-End Directors (128 ports total, 64 ports used)
PCI-X/RIO	9 pair 4 Gb Backend Directors supporting 64 FC disk loops
WG	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 (<i>Mirroring</i>)	Gigabytes (GB)	73,607.418
Required Storage (<i>metadata</i>)	Gigabytes (GB)	1.141
Global Storage Overhead	Gigabytes (GB)	0.000
Total Unused Storage	Gigabytes (GB)	98,525.718

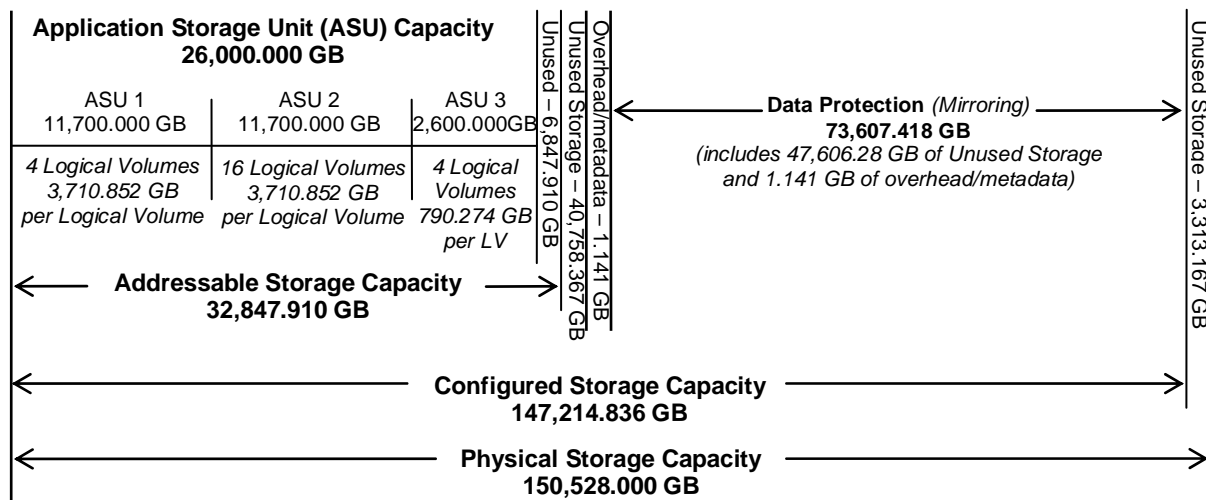
SPC-1 Storage Hierarchy Ratios

	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

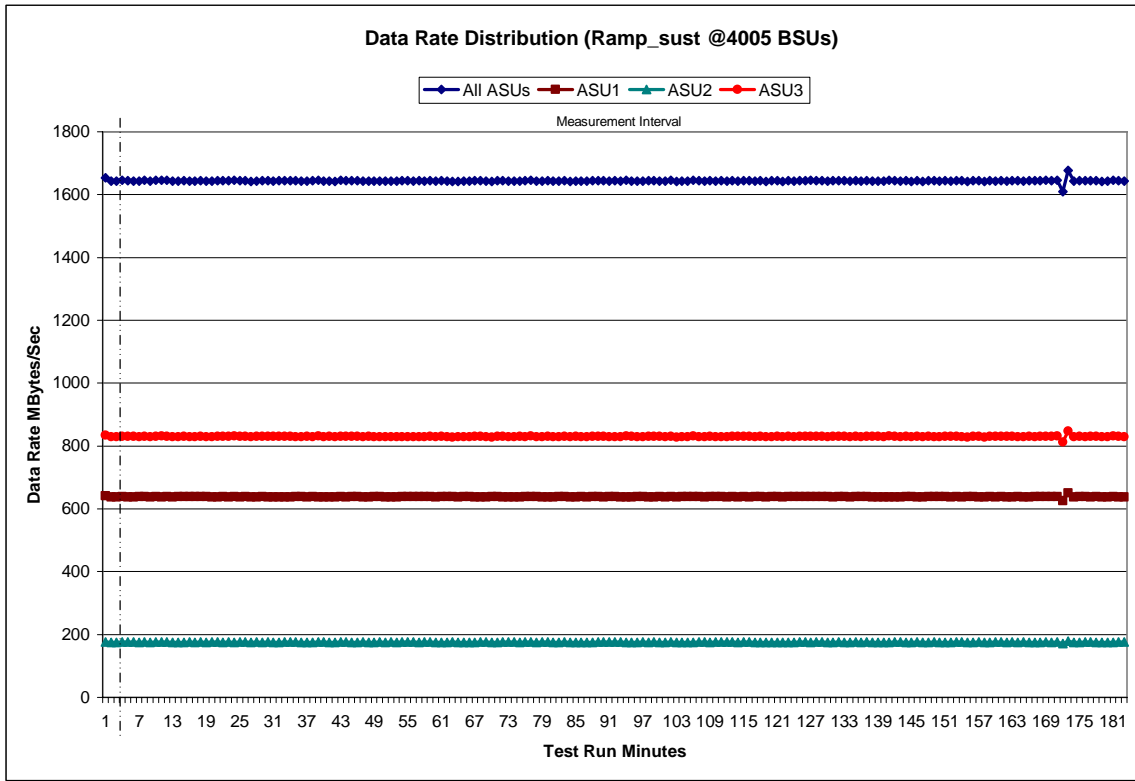
A link to the test results file generated from the Sustainability Test Run is listed below.

[Sustainability Test Results File](#)

Sustainability – Data Rate Distribution Data (MB/second)

Ramp-Up/Start-Up	Start	Stop	Interval	Duration										
Measurement Interval	10:16:09	10:19:09	0-2	0:03:00										
	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	1,644.00	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	1,644.56	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					

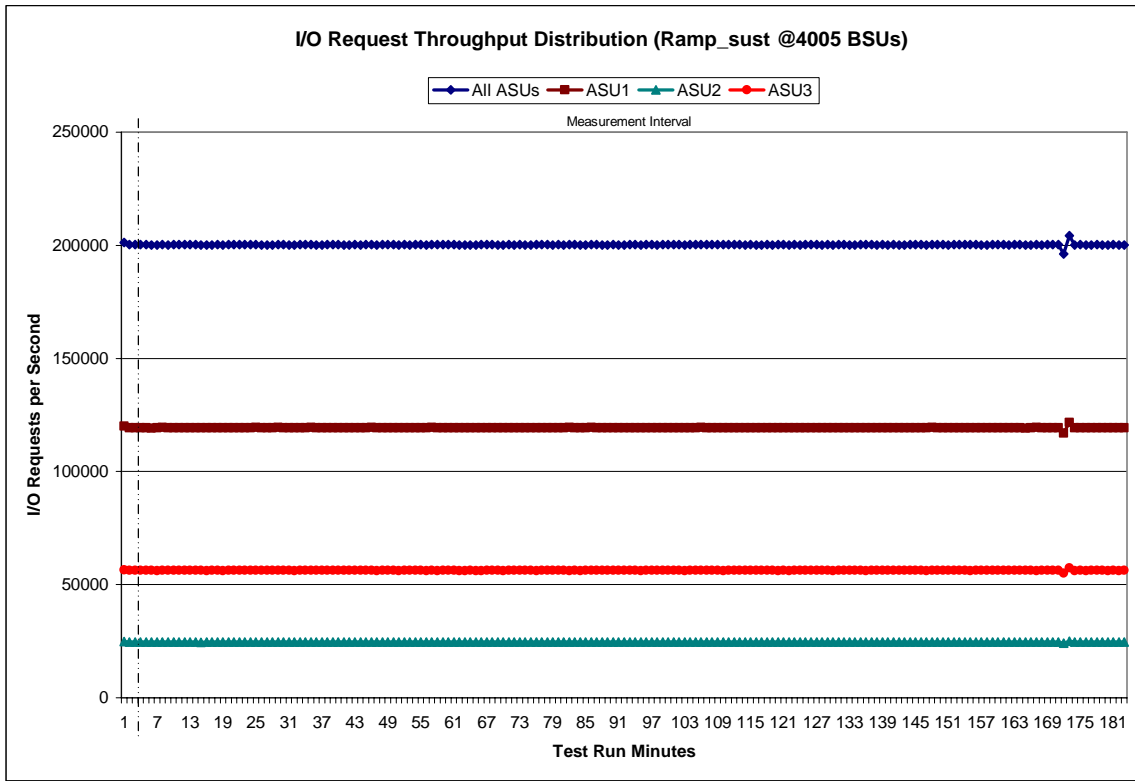
Sustainability – Data Rate Distribution Graph



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	56,285.12	
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	119,386.93	24,614.67	56,258.05	140	200,295.83	119,389.82	24,615.27	56,290.75	
15	200,208.45	119,331.33	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	24,618.82	56,269.12	85	200,337.78	119,433.62	24,626.53	56,277.63	148	200,268.28	119,324.68	24,606.82	56,306.98	
23	200,279.37	119,372.58	24,614.65	56,292.13	86	200,258.17	119,344.00	24,645.53	56,268.63	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	119,329.75	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	200,281.78	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														

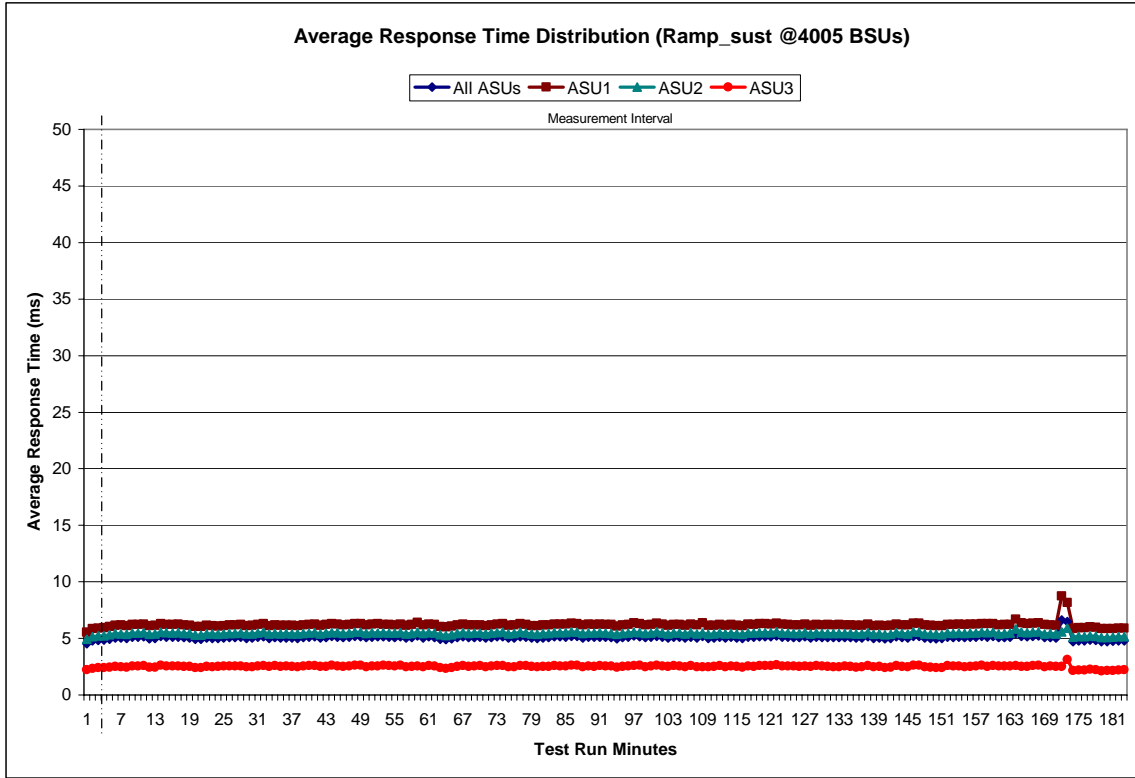
Sustainability – I/O Request Throughput Distribution Graph



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										

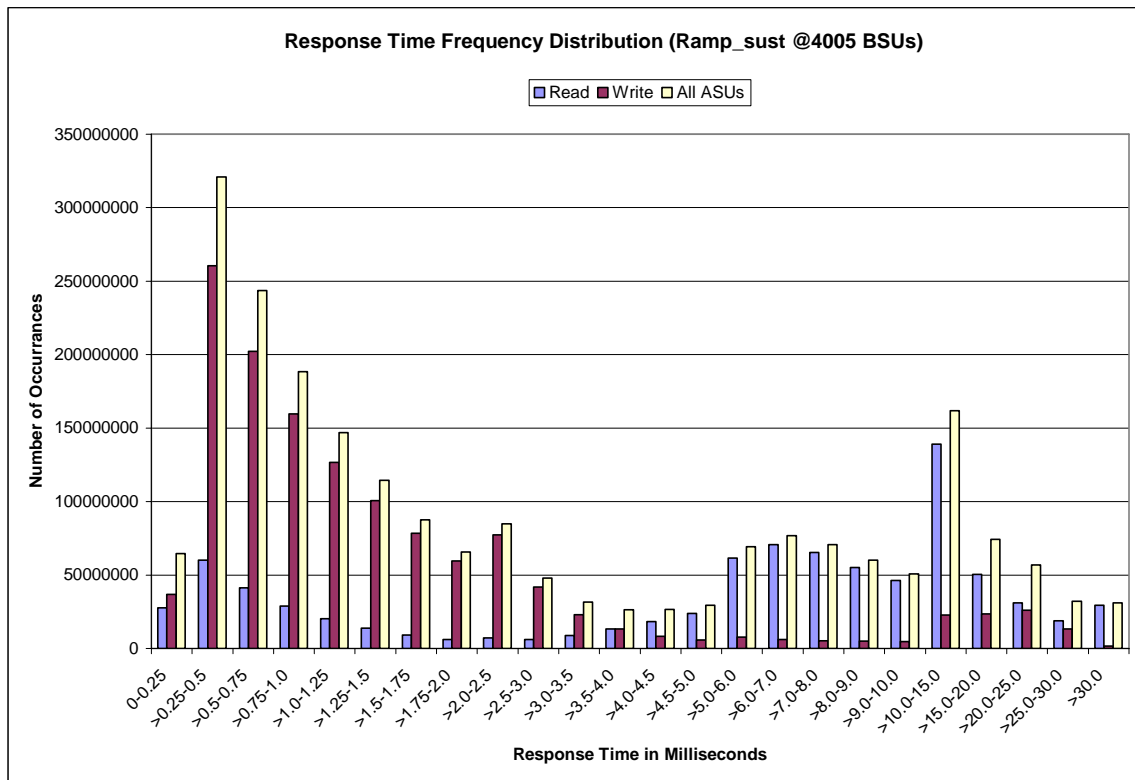
Sustainability – Average Response Time (ms) Distribution Graph



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 to 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

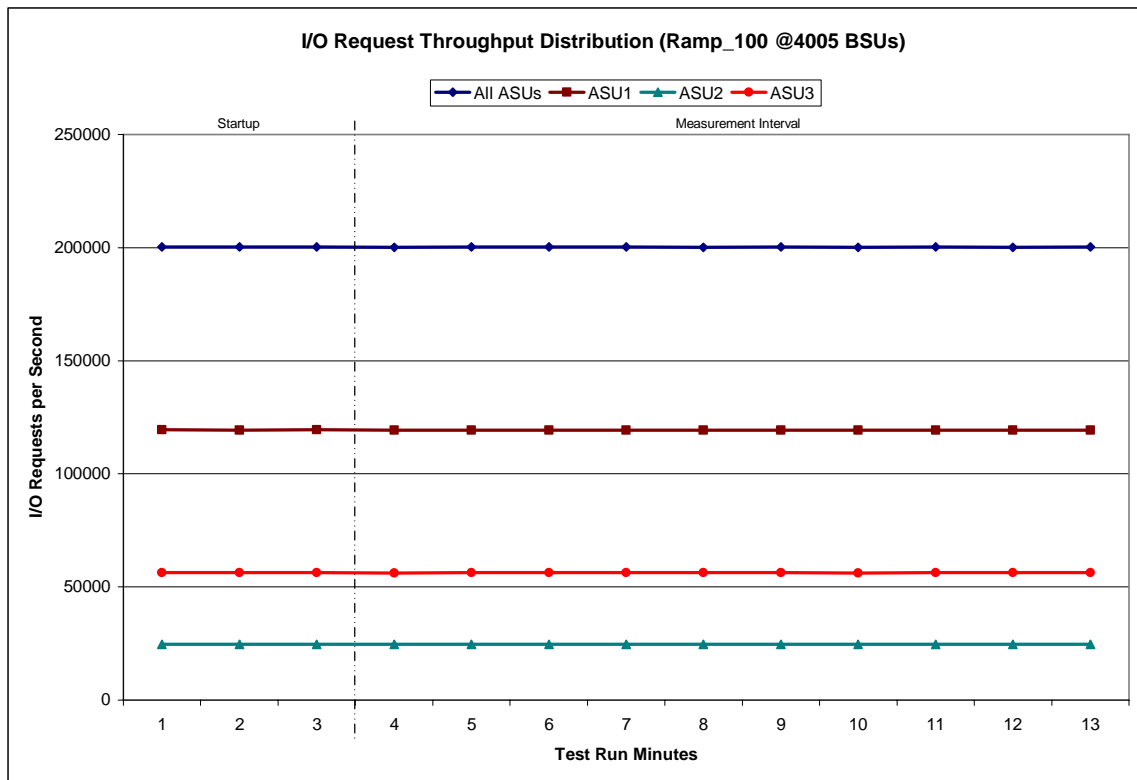
A link to the test results file generated from the IOPS Test Run is listed below.

[IOPS Test Results File](#)

IOPS Test Run – I/O Request Throughput Distribution Data

4005 BSUs	Start	Stop	Interval	Duration
<i>Start-Up/Ramp-Up</i>	13:20:58	13:23:59	0-2	0:03:01
<i>Measurement Interval</i>	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

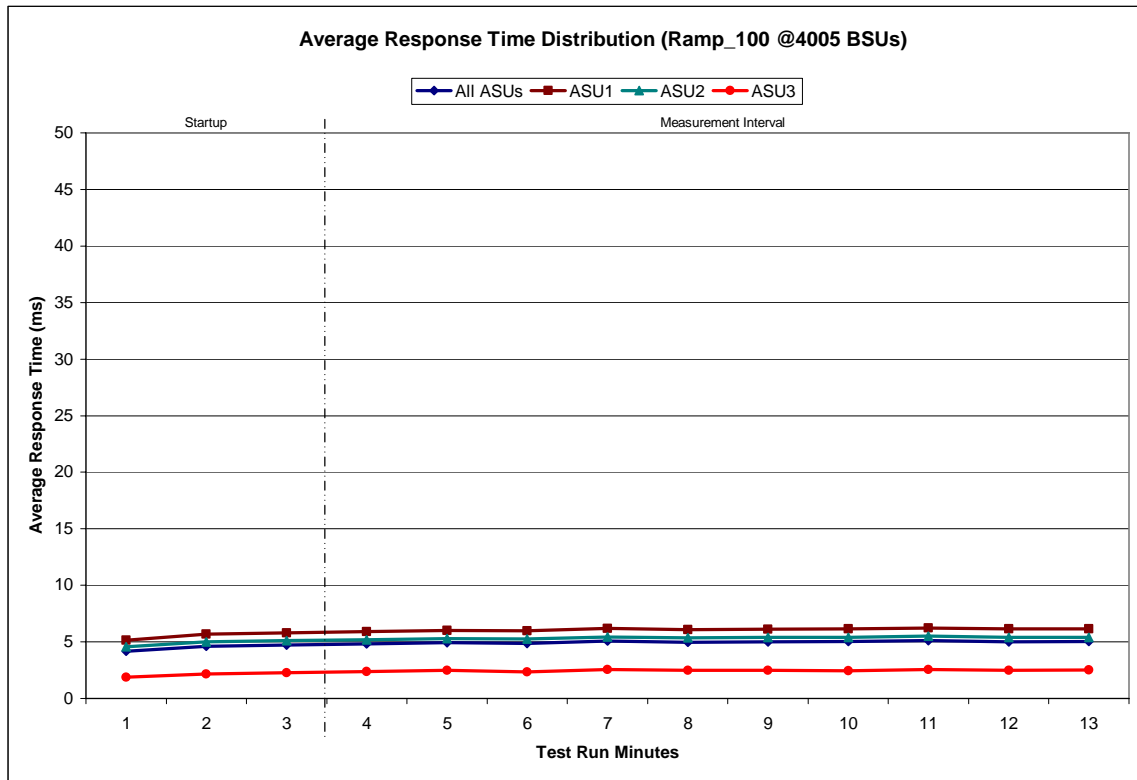
IOPS Test Run – I/O Request Throughput Distribution Graph



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

4005 BSUs	Start	Stop	Interval	Duration
<i>Start-Up/Ramp-Up</i>	13:20:58	13:23:59	0-2	0:03:01
<i>Measurement Interval</i>	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

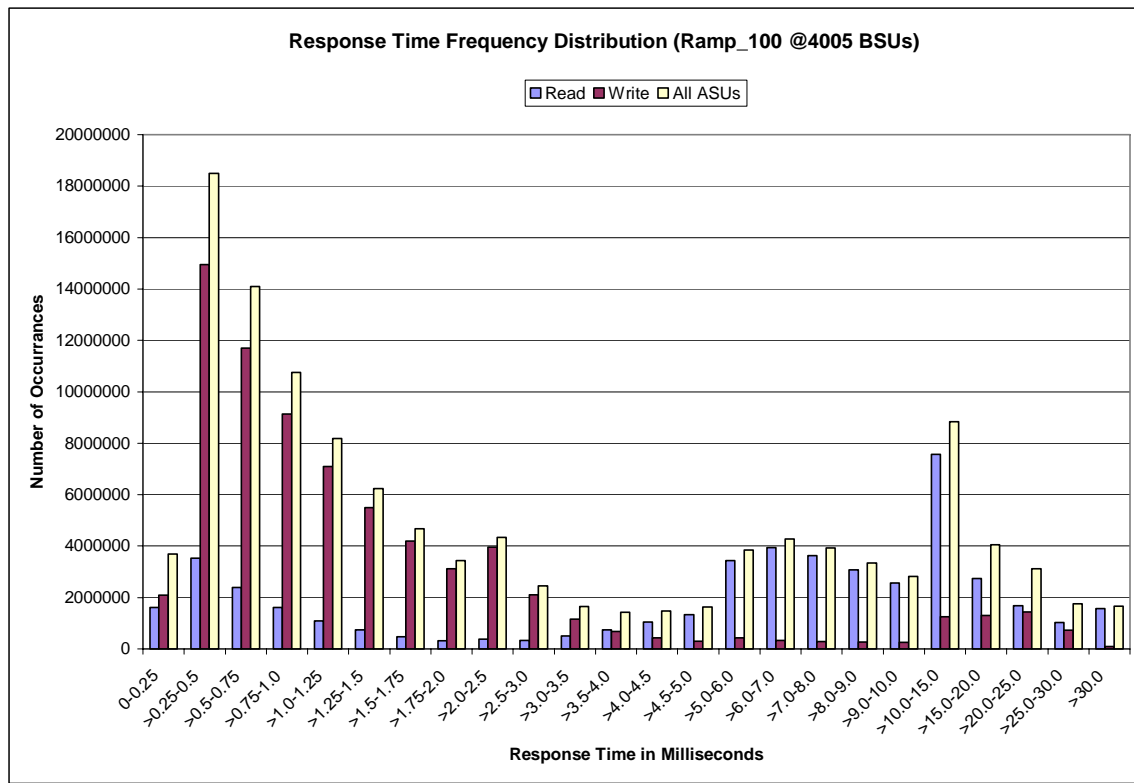
IOPS Test Run – Average Response Time (ms) Distribution Graph



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



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](#)

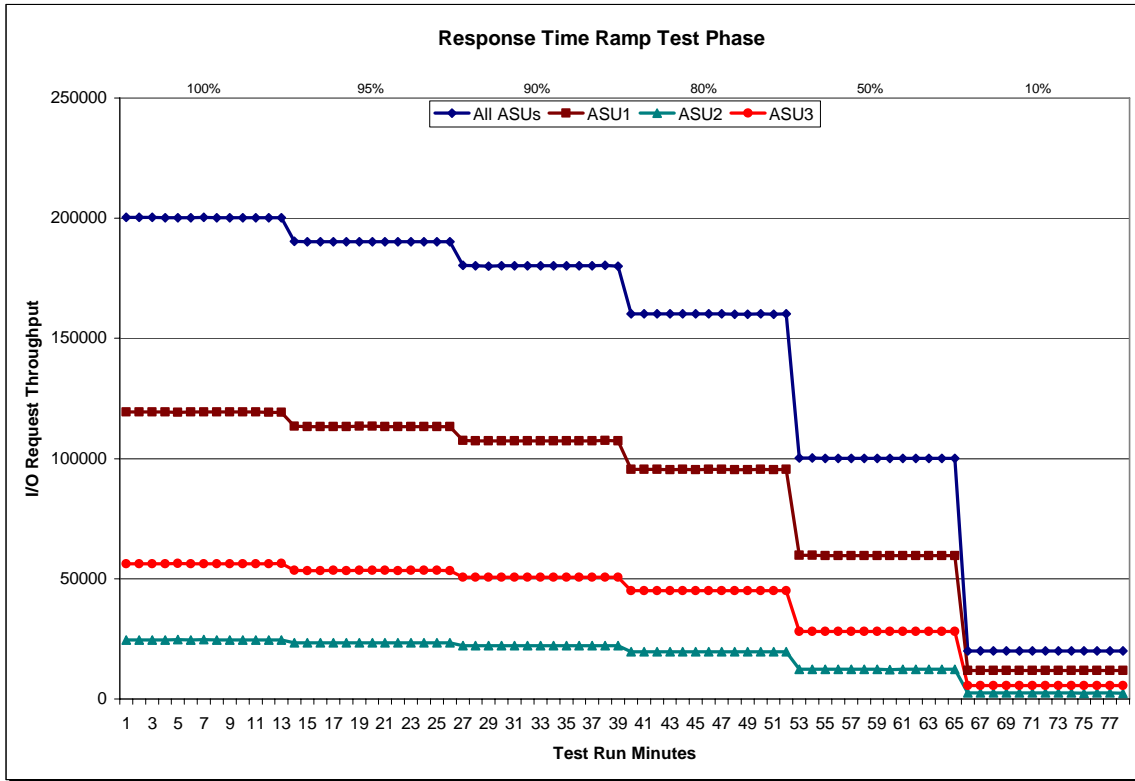
[10% Load Level](#)

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					95% Load Level - 3804 BSUs				
Start	Stop	Interval	Duration		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
<i>(60 second intervals)</i>					<i>(60 second intervals)</i>				
	All ASUs	ASU-1	ASU-2	ASU-3		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					80% Load Level - 3204 BSUs				
Start	Stop	Interval	Duration		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
<i>(60 second intervals)</i>					<i>(60 second intervals)</i>				
	All ASUs	ASU-1	ASU-2	ASU-3		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					10% Load Level - 400 BSUs				
Start	Stop	Interval	Duration		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
<i>(60 second intervals)</i>					<i>(60 second intervals)</i>				
	All ASUs	ASU-1	ASU-2	ASU-3		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

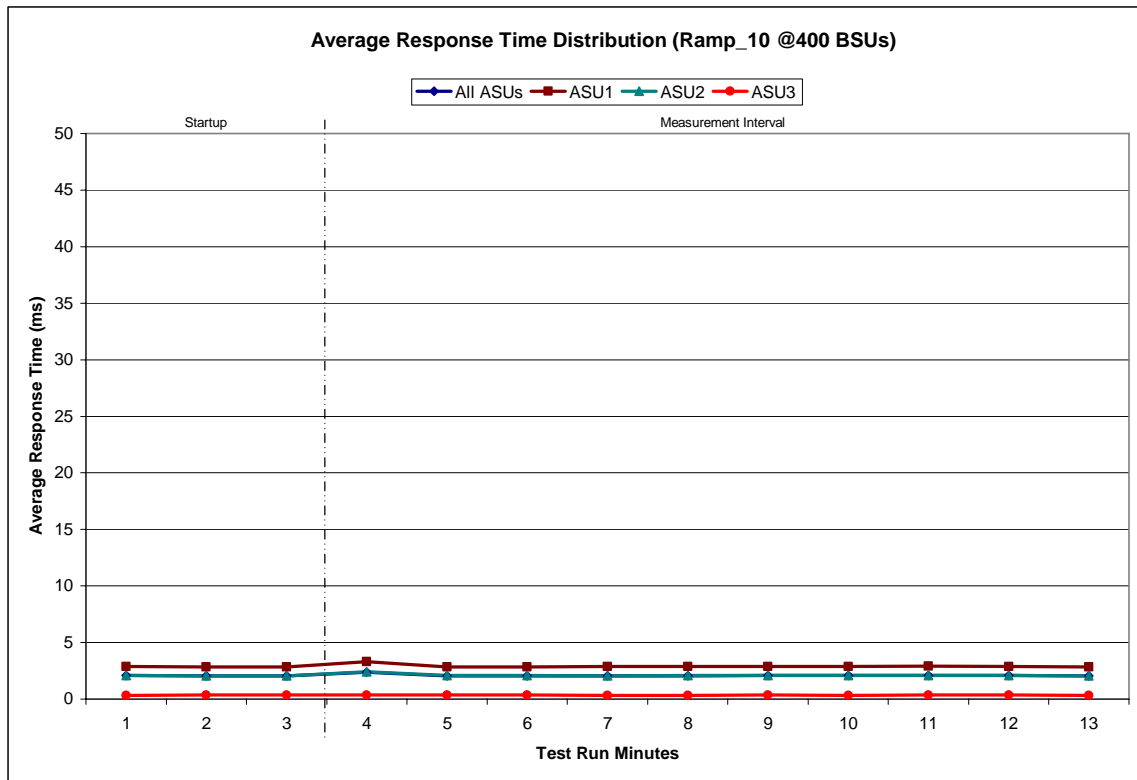
Response Time Ramp Distribution (IOPS) Graph



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

400 BSUs	Start	Stop	Interval	Duration
<i>Start-Up/Ramp-Up</i>	14:31:17	14:34:18	0-2	0:03:01
<i>Measurement Interval</i>	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™
<i>Primary Metrics</i>	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 \(IOPS\)](#)

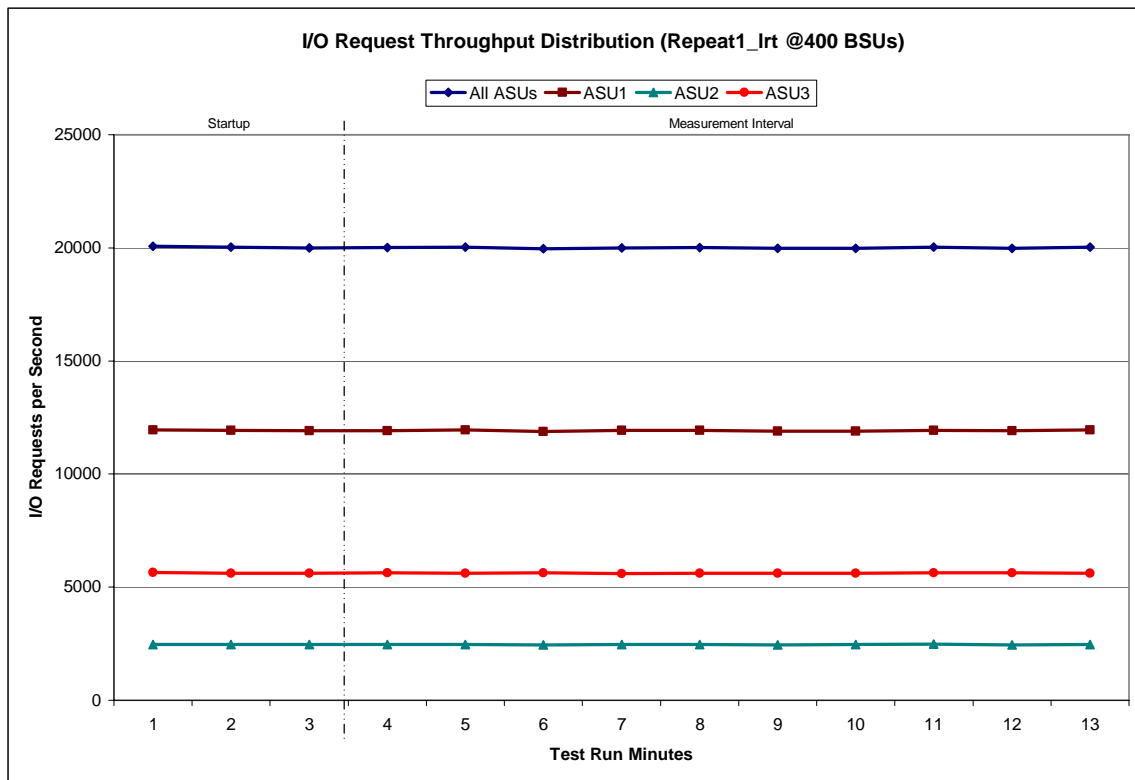
[Repeatability Test Phase 2, Test Run 1 \(LRT\)](#)

[Repeatability Test Phase 2, Test Run 2 \(IOPS\)](#)

Repeatability 1 LRT - I/O Request Throughput Distribution Data

400 BSUs	Start	Stop	Interval	Duration
<i>Start-Up/Ramp-Up</i>	14:45:58	14:48:58	0-2	0:03:00
<i>Measurement Interval</i>	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

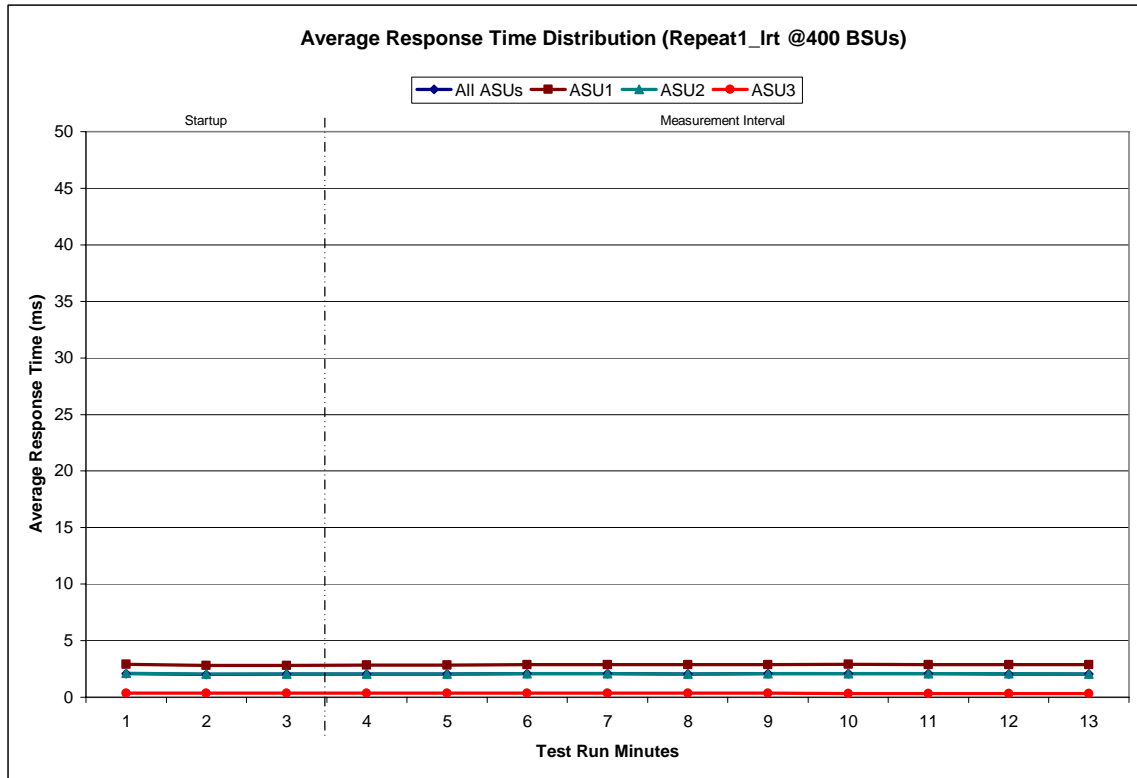
Repeatability 1 LRT - I/O Request Throughput Distribution Graph



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

400 BSUs	Start	Stop	Interval	Duration
<i>Start-Up/Ramp-Up</i>	14:45:58	14:48:58	0-2	0:03:00
<i>Measurement Interval</i>	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

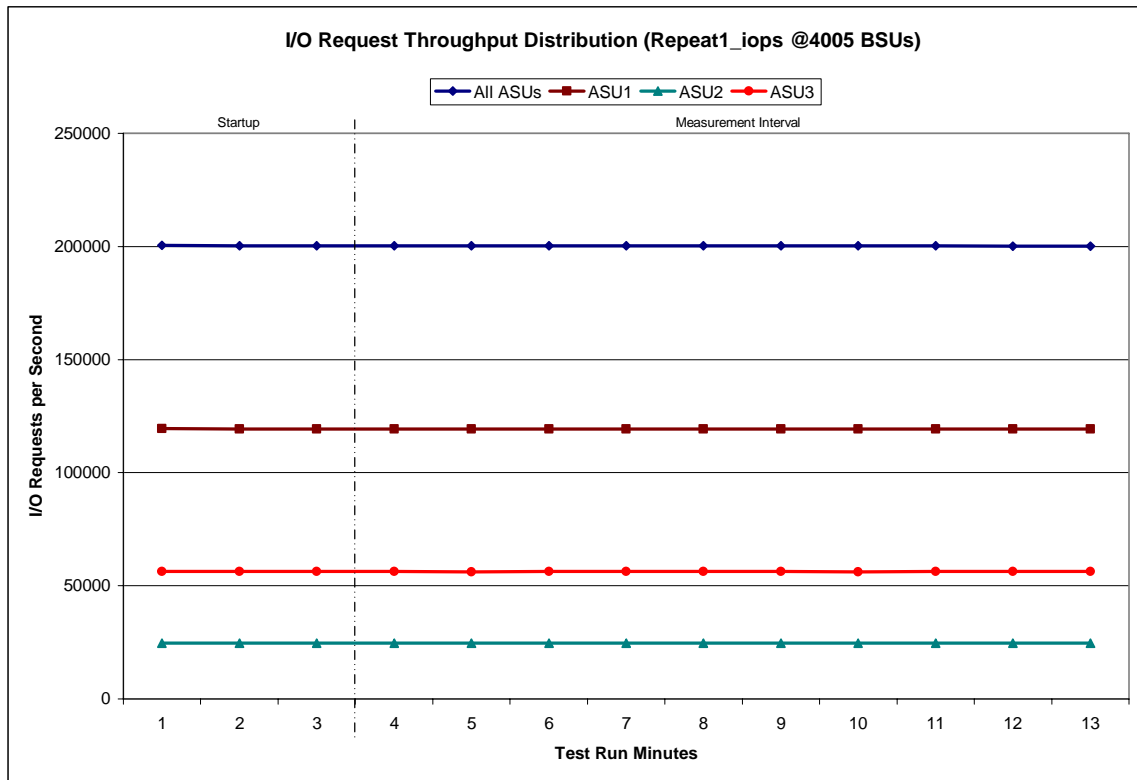
Repeatability 1 LRT –Average Response Time (ms) Distribution Graph



Repeatability 1 IOPS - I/O Request Throughput Distribution Data

4005 BSUs	Start	Stop	Interval	Duration
<i>Start-Up/Ramp-Up</i>	15:00:23	15:03:24	0-2	0:03:01
<i>Measurement Interval</i>	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

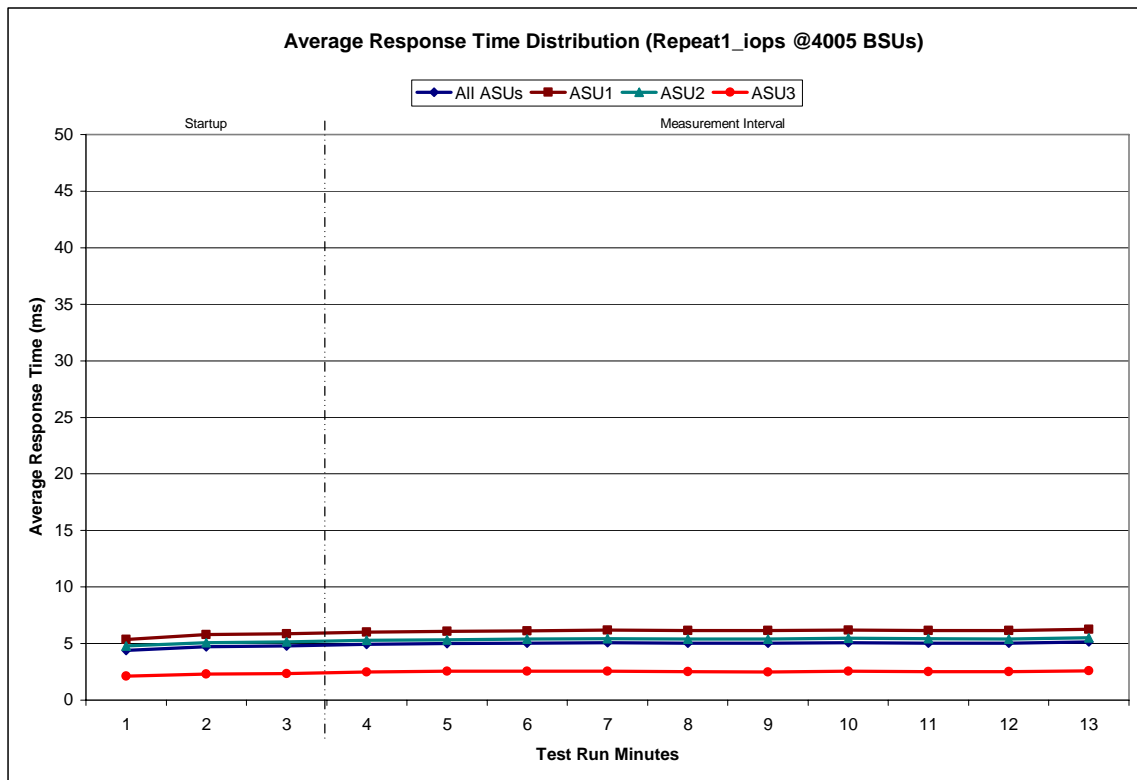
Repeatability 1 IOPS - I/O Request Throughput Distribution Graph



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

4005 BSUs	Start	Stop	Interval	Duration
<i>Start-Up/Ramp-Up</i>	15:00:23	15:03:24	0-2	0:03:01
<i>Measurement Interval</i>	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

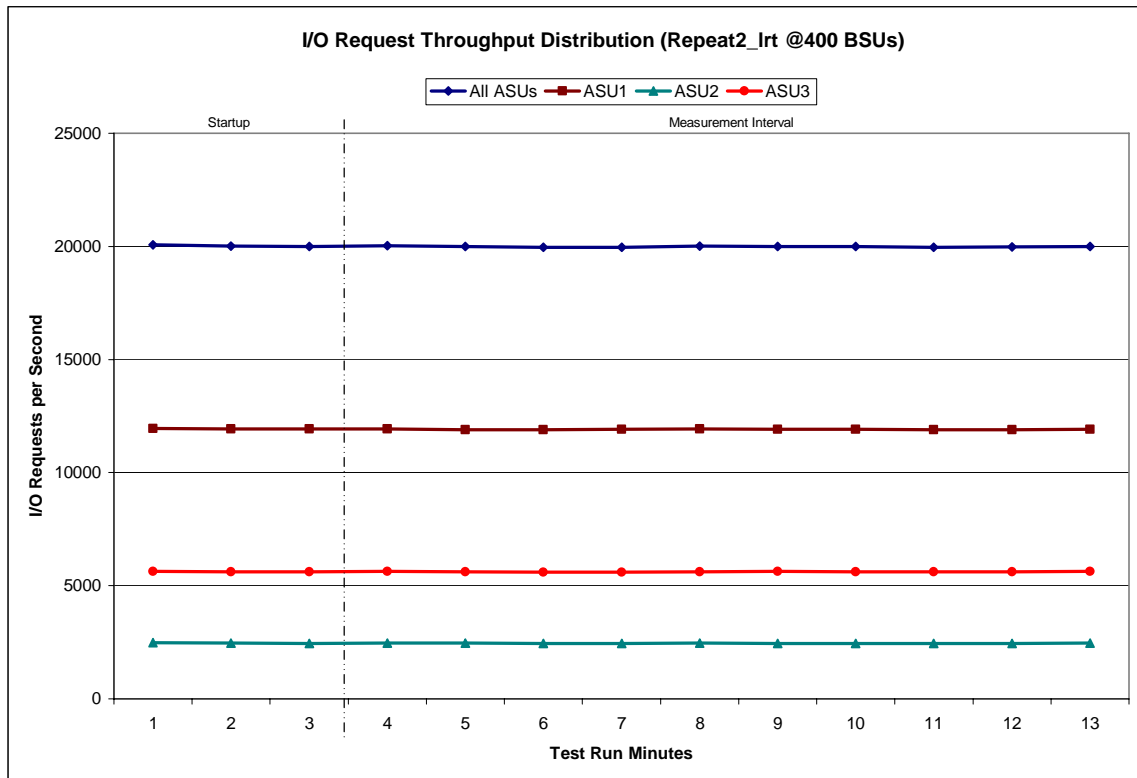
Repeatability 1 IOPS –Average Response Time (ms) Distribution Graph



Repeatability 2 LRT - I/O Request Throughput Distribution Data

400 BSUs	Start	Stop	Interval	Duration
<i>Start-Up/Ramp-Up</i>	15:15:00	15:18:00	0-2	0:03:00
<i>Measurement Interval</i>	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

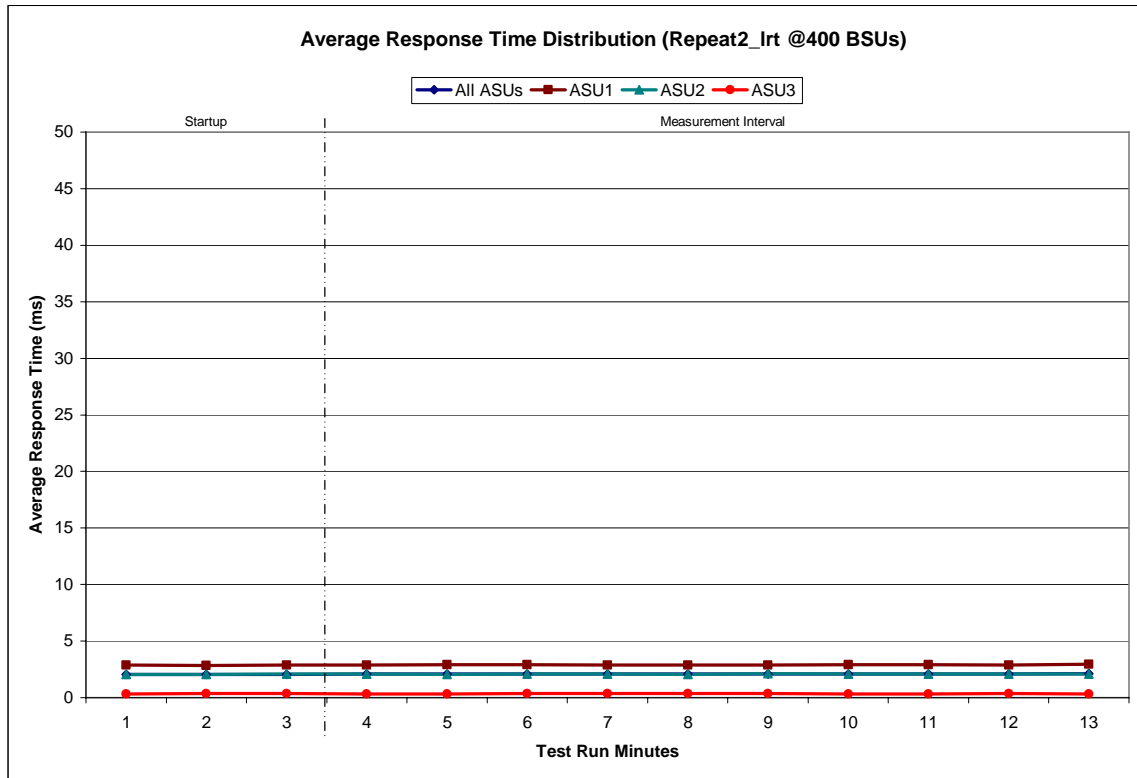
Repeatability 2 LRT - I/O Request Throughput Distribution Graph



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

400 BSUs	Start	Stop	Interval	Duration
<i>Start-Up/Ramp-Up</i>	15:15:00	15:18:00	0-2	0:03:00
<i>Measurement Interval</i>	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

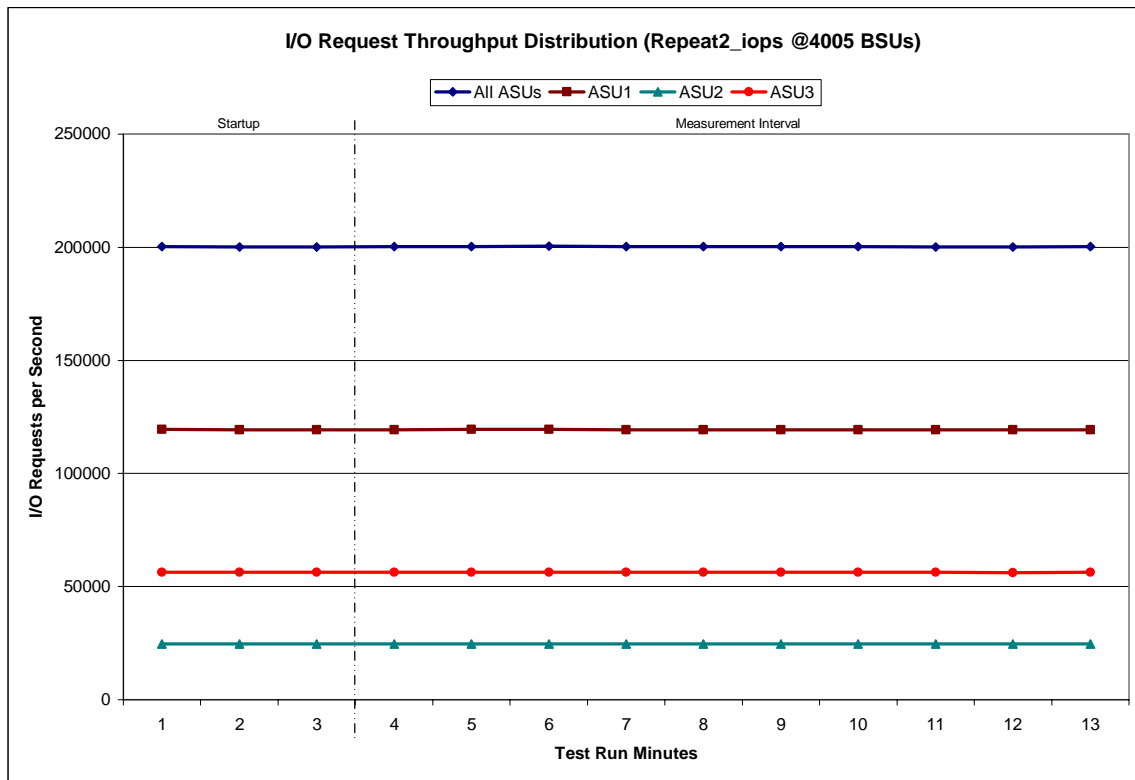
Repeatability 2 LRT –Average Response Time (ms) Distribution Graph



Repeatability 2 IOPS - I/O Request Throughput Distribution Data

4005 BSUs	Start	Stop	Interval	Duration
<i>Start-Up/Ramp-Up</i>	15:29:25	15:32:26	0-2	0:03:01
<i>Measurement Interval</i>	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

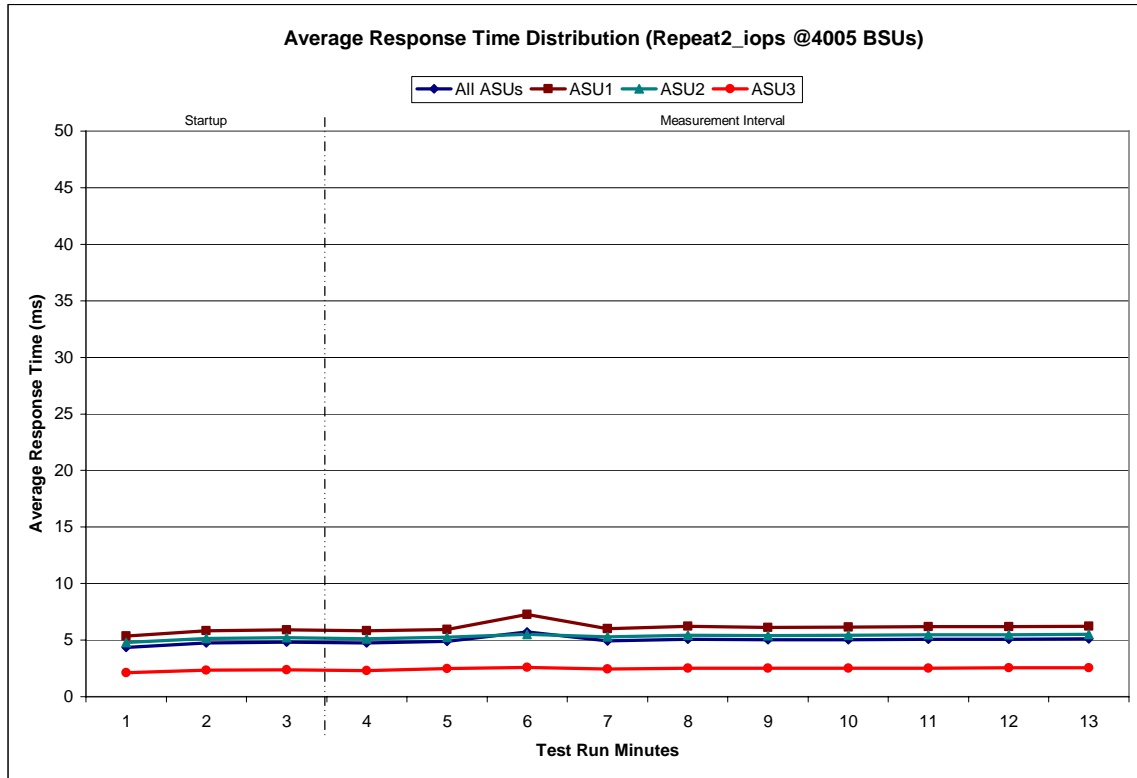
Repeatability 2 IOPS - I/O Request Throughput Distribution Graph



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

4005 BSUs	Start	Stop	Interval	Duration
<i>Start-Up/Ramp-Up</i>	15:29:25	15:32:26	0-2	0:03:01
<i>Measurement Interval</i>	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
<i>IM</i>	<i>0.0350</i>	<i>0.2810</i>	<i>0.0700</i>	<i>0.2100</i>	<i>0.0180</i>	<i>0.0700</i>	<i>0.0350</i>	<i>0.2810</i>
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 Hitachi Universal Storage Platform™ V as documented in this Full Disclosure Report is currently available 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 Hitachi Universal Storage Platform™ V.

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 gibibyte (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.

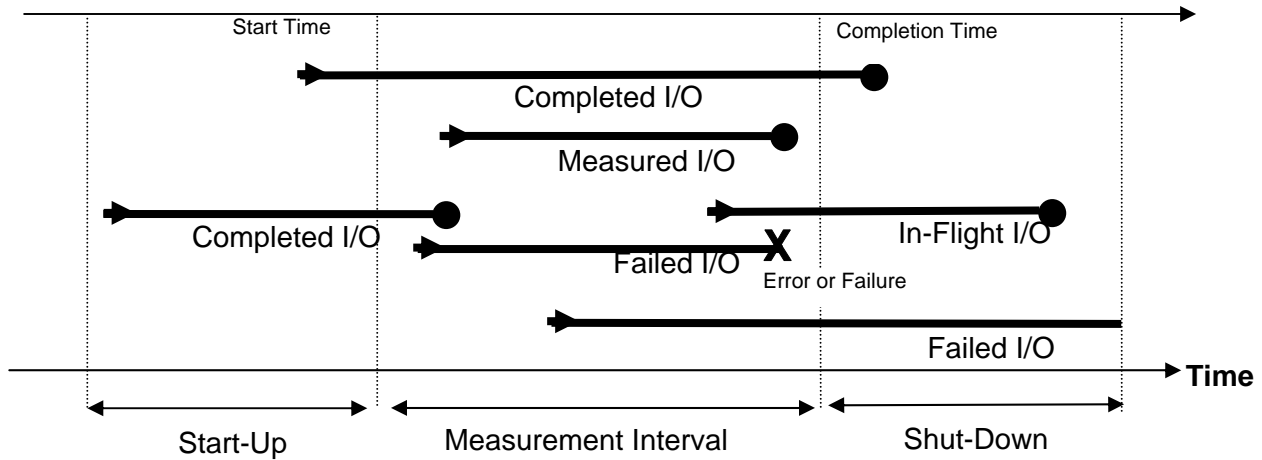
Test: A collection of Test Phases and or Test Runs sharing a common objective.

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

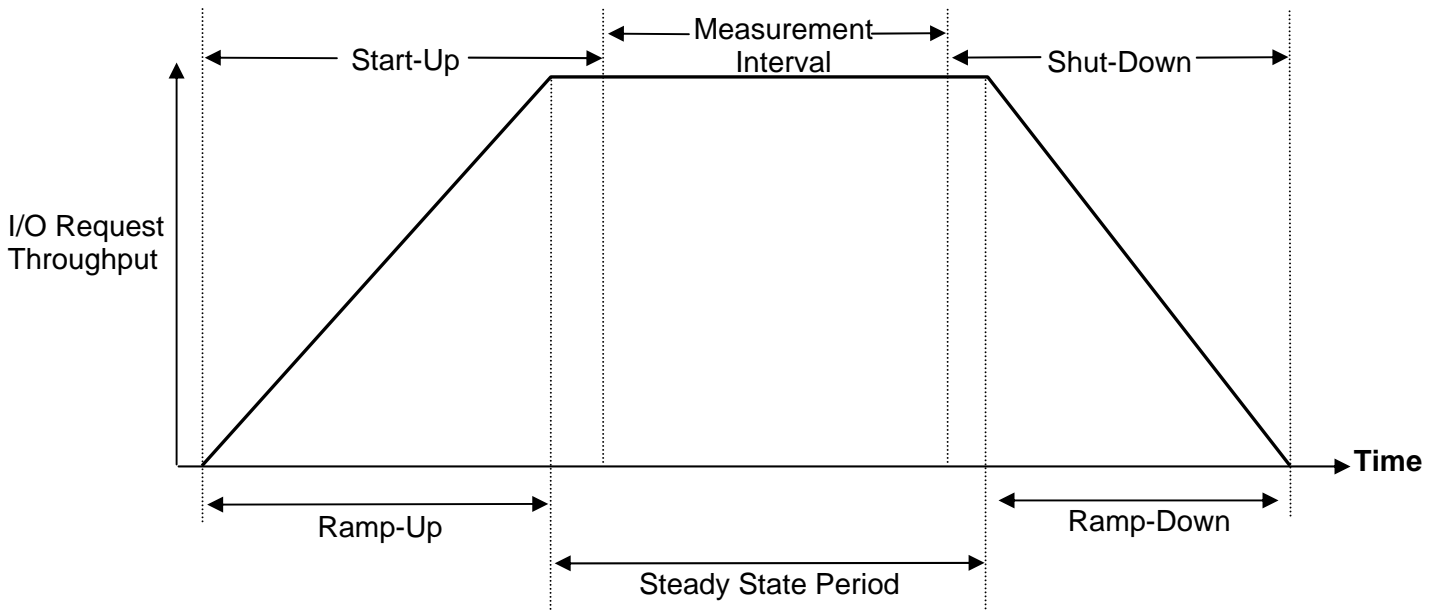
period, Shut-Down period, and Ramp-Down period as illustrated in the “SPC-1 Test Run Components” below. All SPC-1 Test Runs shall have a Steady State period and a Measurement Interval.

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.

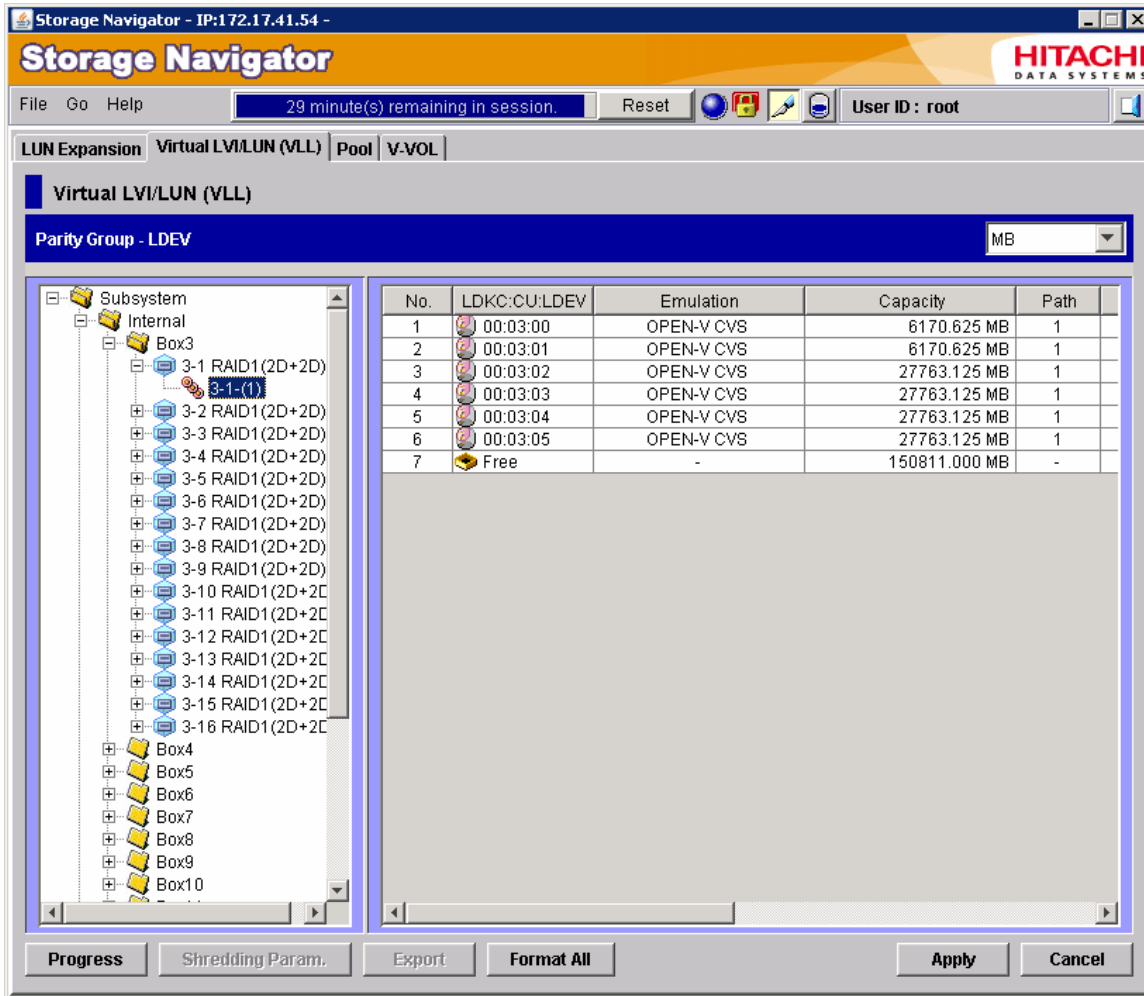
Use the following manual procedure to create logical device:

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

Storage Navigator
Install CV

Parity Group 3-1-(1)

How to Create Volumes

No.	Emulation	Capacity
1	OPEN-V	6170 MB
2	OPEN-V	6170 MB
3	OPEN-V	27763 MB
4	OPEN-V	27763 MB
5	OPEN-V	27763 MB
6	OPEN-V	27763 MB

Emulation: OPEN-V

Capacity Unit: MB

Setting Mode: Specify capacity and number
 Divide free space by number
 Divide free space by capacity
 Set remaining space as volume

Capacity: 27763 MB (46 - 150810)

No.: 2 (1 - 5)

Buttons: Set, Delete, Clear, Next, Cancel

available LDEVs : 1018

Install CV, Assign Logical Device to Control Unit

Storage Navigator
Install CV

Parity Group 3-1-(1)

Select LDEV No.: Please click the following cell

Select LDKC No. 00 Select CU No. 03 Interval 0

No.	Emulation	Capacity	LDKC:CU:LDEV
1	OPEN-V	6170 MB	00:03:00
2	OPEN-V	6170 MB	00:03:01
3	OPEN-V	27763 MB	00:03:02
4	OPEN-V	27763 MB	00:03:03
5	OPEN-V	27763 MB	00:03:04
6	OPEN-V	27763 MB	00:03:05

Grid columns: +0, +1, +2, +3, +4, +5, +6, +7, +8, +9, +a, +b, +c, +d, +e, +f

Grid rows: +00, +10, +20, +30, +40, +50, +60, +70, +80, +90, +a0, +b0, +c0, +d0, +e0, +f0

CU number of another SLPR is used.

Buttons: Back, Next, Cancel

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							
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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
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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

0A:02	0A:08	0A:0E	0A:14	0A:1A	0A:20	0A:26	0A:2C
0A:03	0A:09	0A:0F	0A:15	0A:1B	0A:21	0A:27	0A:2D
0A:04	0A:0A	0A:10	0A:16	0A:1C	0A:22	0A:28	0A:2E
0A:05	0A:0B	0A:11	0A:17	0A:1D	0A:23	0A:29	0A: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
0A:30	0A:36	0A:3C	0A:42	0A:48	0A:4E	0A:54	0A:5A
0A:31	0A:37	0A:3D	0A:43	0A:49	0A:4F	0A:55	0A:5B
0A:32	0A:38	0A:3E	0A:44	0A:4A	0A:50	0A:56	0A:5C
0A:33	0A:39	0A:3F	0A:45	0A:4B	0A:51	0A:57	0A:5D
0A:34	0A:3A	0A:40	0A:46	0A:4C	0A:52	0A:58	0A:5E
0A:35	0A:3B	0A:41	0A:47	0A:4D	0A:53	0A:59	0A: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
0B:00	0B:06	0B:0C	0B:12	0B:18	0B:1E	0B:24	0B:2A
0B:01	0B:07	0B:0D	0B:13	0B:19	0B:1F	0B:25	0B:2B
0B:02	0B:08	0B:0E	0B:14	0B:1A	0B:20	0B:26	0B:2C
0B:03	0B:09	0B:0F	0B:15	0B:1B	0B:21	0B:27	0B:2D
0B:04	0B:0A	0B:10	0B:16	0B:1C	0B:22	0B:28	0B:2E
0B:05	0B:0B	0B:11	0B:17	0B:1D	0B:23	0B:29	0B: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
0B:30	0B:36	0B:3C	0B:42	0B:48	0B:4E	0B:54	0B:5A
0B:31	0B:37	0B:3D	0B:43	0B:49	0B:4F	0B:55	0B:5B
0B:32	0B:38	0B:3E	0B:44	0B:4A	0B:50	0B:56	0B:5C
0B:33	0B:39	0B:3F	0B:45	0B:4B	0B:51	0B:57	0B:5D
0B:34	0B:3A	0B:40	0B:46	0B:4C	0B:52	0B:58	0B:5E
0B:35	0B:3B	0B:41	0B:47	0B:4D	0B:53	0B:59	0B:5F

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

0F:32	0F:38	0F:3E	0F:44	0F:4A	0F:50	0F:56	0F:5C
0F:33	0F:39	0F:3F	0F:45	0F:4B	0F:51	0F:57	0F:5D
0F:34	0F:3A	0F:40	0F:46	0F:4C	0F:52	0F:58	0F:5E
0F:35	0F:3B	0F:41	0F:47	0F:4D	0F:53	0F:59	0F: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							
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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

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.

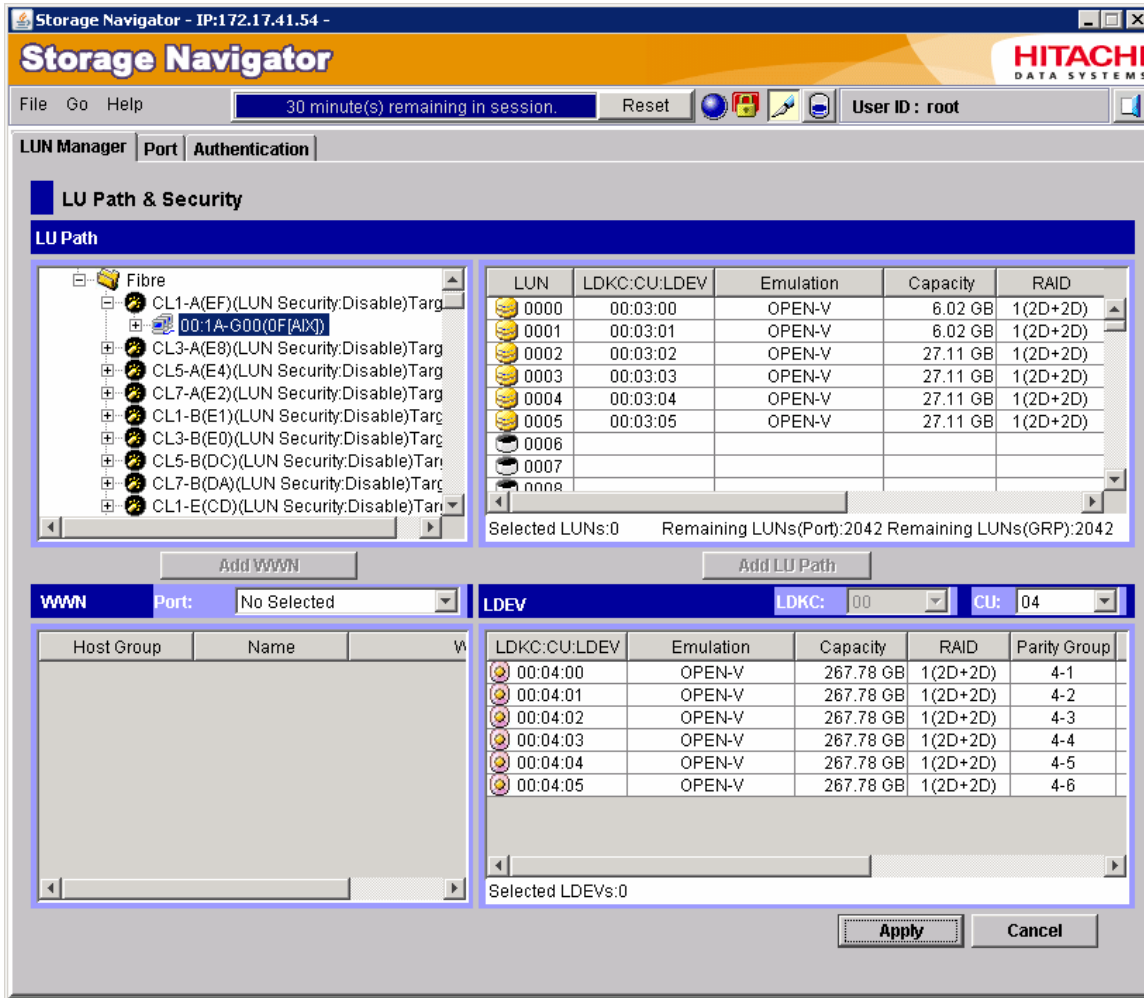
Use the following manual procedure to create logical device:

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
```

```
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).
ASU3L1DISK="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).
ASU3L2DISK="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.
VGLDISK="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 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.
```

```
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"
```

```
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

```
# 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
```

```
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.
VGLDISK="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/rldsk/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.

```
#!/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 Configuration 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 recommended 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/persistencel/ $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 Configuration 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 recommended 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
```

APPENDIX E:
SPC-1 WORKLOAD GENERATOR INPUT PARAMETERS

```
#mv $SPCDIR/metrics/ $OUTDIR  
#mv $SPCDIR/repeatability1/ $OUTDIR  
#mv $SPCDIR/repeatability2/ $OUTDIR  
#mv $SPCDIR/persistencel/ $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

IBM - Your cart items - United States Page 1 of 2

IBM.

Your cart items

Items placed in your shopping cart appear below. You may:

- Add or change products by selecting "Keep shopping" or "Quick order."
- Change the quantity of an item by changing the number in the "Quantity" field and selecting "Update cart."
- Delete an item by selecting the trash can icon next to the quantity.
- Save your cart for future purchase by selecting "Save cart."
- Save your quote by selecting "Save quote." This locks in your current price for this product or configuration for up to 30 days.
- Get help with your shopping by selecting "Call me now" or "Chat Online."

Finished shopping? Select "Check out."

Display currency: National Currency without Tax

Quick order

Enter a part number to add it to your cart.

Find ServicePacs

Find ServicePacs for the following machines

Machine Type*: Model*:
(266) (32U)

Serial number: Purchase date
(mm/dd/yyyy)

Document options

[Empty cart](#)

Your cart items

Quantity	Description	Item price	Line total
Individual Items			
64 <input type="text" value="1"/>	4 Gb Single-Port Fibre Channel PCI-X 2.0 DDR Adapter		
Duplicate ²	Product: 9119-5758	\$1,899.05	\$121,539.20

Enter promotion code:

Subtotal \$121,539.20*

Total savings

You saved **\$6,396.80** off list price due to your relationship with IBM.

[Empty cart](#)

Keep shopping

[Safe Shopping Guarantee](#)

https://www-132.ibm.com/webapp/wcs/stores/servlet/OrderItemDisplay?langId=-1&catalo... 8/28/2007

LC-LC FC Cables



7182 LIBERTY CENTRE DRIVE, UNIT N
WEST CHESTER, OH 45069
Tel: 513-779-5448
Fax: 513-779-4923

HITACHI DATA SYSTEMS
ATTN: ACCOUNTS PAYABLE
750 CENTRAL EXPRESSWAY
SANTA CLARA, CA 95054-0996

Date: 9/6/2007
Quote Number: 1234
Contact: CAS
Email: chris.shoop@conexus-technologies.com
Terms: Net 30
Expiration Date: 10/6/2007

QUOTE

We appreciate your interest and look forward to further discussion in regards to the following:

Item	Description	Qty	Cost	Total
JD-X50BB030PXF	QUOTE IS FOR PERF LC DUPLEX "UNIBOOT" - LC DUPLEX "UNIBOOT" JUMPER, PLENUM, 30-FEET (50/125) AQUA LASER 300	64	23.16	1,482.24T

Notes:

- Purchase prices do not include applicable sales taxes unless specifically listed in the line-items section of this quote. Customers should remit applicable sales/usage taxes directly to their appropriate tax authorities.
- Purchase prices do not include installation. Professional installation is available for an additional charge and will be quoted as a separate line-item above as requested.
- Standard lead-time for manufacture is 7-10 business days ARO.

Subtotal	\$1,482.24
Sales Tax (0.0%)	\$0.00
Total	\$1,482.24

To learn more about Conexus, please visit our website at www.conexus-technologies.com