SPC BENCHMARK 1™
FULL DISCLOSURE REPORT

HUAWEI TECHNOLOGIES CO., LTD.
HUAWEI OCEANSTOR™ 18800

SPC-1 V1.14

Submitted for Review: January 24, 2014
Submission Identifier: A00140
Revised: January 28, 2014

First Edition – January 2014

Trademarks

Table of Contents

AUDIT CERTIFICATION

Eric He
Huawei Technologies Co., Ltd.
Huawei Chengdu Base
No. 1899 Xiyuan Avenue
Chengdu, 611731 P.R. China

January 24, 2014

The SPC Benchmark 1™ Reported Data listed below for the Huawei OceanStor™ 18800 was produced in compliance with the SPC Benchmark 1™ v1.14 Remote Audit requirements.

SPC Benchmark 1™ v1.14 Reported Data	
Tested Storage Product (TSP) Name: Huawei OceanStor™ 18800	
Metric	**Reported Result**
SPC-1 IOPS™	1,005,893.43
SPC-1 Price-Performance	$2.78/SPC-1 IOPS™
Total ASU Capacity	274,877.907 GB
Data Protection Level	Protected 2 *(Mirroring)*
Total Price (including three-year maintenance)	$2,794.971.80
Currency Used	U.S. Dollars
Target Country for availability, sales and support	USA

The following SPC Benchmark 1™ Remote Audit requirements were reviewed and found compliant with 1.14 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 information supplied by Huawei Technologies Co., Ltd.:
  - ✓ 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.
- The total Application Storage Unit (ASU) Capacity was filled with random data, using an auditor approved tool, prior to execution of the SPC-1 Tests.

Storage Performance Council
643 Bair Island Road, Suite 103
Redwood City, CA 94062
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650.556.9384

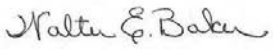
AUDIT CERTIFICATION *(CONT.)*

- An appropriate diagram of the Benchmark Configuration (BC)/Tested Storage Configuration (TSC).
- Listings and commands to configure the Benchmark Configuration/Tested Storage Configuration, including customer tunable parameters that were changed from default values.
- SPC-1 Workload Generator commands and parameters used for the audited SPC Test Runs.
- The following Host System requirements were verified by information supplied by Huawei Technologies Co., Ltd.:
  - ✓ The type of Host Systems including the number of processors and main memory.
  - ✓ The presence and version number of the SPC-1 Workload Generator on each Host System.
  - ✓ The TSC boundary within each Host System.
- The execution of each Test, Test Phase, and Test Run was found compliant with all of the requirements and constraints of Clauses 4, 5, and 11 of the SPC-1 Benchmark Specification.
- The Test Results Files and resultant Summary Results Files received from Huawei Technologies Co., Ltd. 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 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.
- This successfully audited SPC measurement is not subject to an SPC Confidential Review.

Audit Notes:

There were no audit notes or exceptions.

Respectfully,



Walter E. Baker
SPC Auditor

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LETTER OF GOOD FAITH

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Shenzhen city
Guangdong province
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Tel: 0086-755-28780808
http://www.huawei.com/en/

Date: December 23, 2013

From: Huawei Technologies Co., Ltd.

To: 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 Huawei OceanStor 18800

Huawei Technologies Co., Ltd. is the SPC-1 Test Sponsor for the above listed product. To the best of our knowledge and belief, the required SPC-1 benchmark results and materials we have submitted for that product are complete, accurate, and in full compliance with V1.14 of the SPC-1 benchmark specification.

In addition, we have reported any items in the Benchmark Configuration and execution of the benchmark that affected the reported results even if the items are not explicitly required to be disclosed by the SPC-1 benchmark specification.

Signed: Date:

2013.12.23

Fan Ruiqi
President of Storage Product Line

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

Test Sponsor and Contact Information	
Test Sponsor Primary Contact	Huawei Technologies Co., Ltd. – http://www.huawei.com/en/ Eric He – eric.heji@huawei.com Huawei Chengdu Base No. 1899, Xiyuan Avenue Chengdu, 611731 P.R. China Phone: 86 28 65281999 FAX: 86 28 62282516
Test Sponsor Alternate Contact	Huawei Technologies Co., Ltd. – http://www.huawei.com/en/ Li Xingxin – lixingxing@huawei.com Huawei Chengdu Base No. 1899, Xiyuan Avenue Chengdu, 611731 P.R. China Phone: 86 28 65281926 FAX: 86 28 62282516
Test Sponsor Alternate Contact	Huawei Technologies Co., Ltd. – http://www.huawei.com/en/ Xu Zhong – xuzhong@huawei.com Huawei Chengdu Base No. 1899, Xiyuan Avenue Chengdu, 611731 P.R. China Phone: 86 28 65281927 FAX: 86 28 62282516
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	V1.14
SPC-1 Workload Generator revision number	V2.3.0
Date Results were first used publicly	January 24, 2014
Date the FDR was submitted to the SPC	January 24, 2014
Date revised FDR was submitted to the SPC Corrected Audit Certification letter date Minor typographical corrections	January 28, 2014
Date the Priced Storage Configuration is available for shipment to customers	currently available
Date the TSC completed audit certification	January 24, 2014

Tested Storage Product (TSP) Description

Huawei OceanStor™ 18000 Series Enterprise Storage System is an optimum storage platform for next generation data centers that features virtualization, hybrid and simplified IT. Flexible and efficient, OceanStor™ 18000 Series meets the demanding requirements of mission-critical applications in industries including finance, government sector, energy, manufacturing, transportation, education and telecommunications.

The SmartTier feature of OceanStor™ 18000 Series automatically analyzes data access frequency in a finer-grained manner and migrates data to proper disk tiers of SSD, SAS and NL-SAS accordingly. Customers can specify the statistical period (by hour or day), migration data size (from 256 KB to 64 MB), migration mode (automatic or manual), migration period and speed per needs. The SmartTier improves the storage performance of hot data, reduces storage cost of cold data and thus increases the system overall price performance ratio.

Summary of Results

SPC-1 Reported Data	
Tested Storage Product (TSP) Name: Huawei OceanStor™ 18800	
Metric	**Reported Result**
SPC-1 IOPS™	1,005,893.43
SPC-1 Price-Performance™	$2.78/SPC-1 IOPS™
Total ASU Capacity	274,877.907 GB
Data Protection Level	Protected 2 *(Mirroring)*
Total Price	$2,794,971.80
Currency Used	U.S. Dollars
Target Country for availability, sales and support	USA

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

SPC-1 Price-Performance™ is the ratio of **Total Price** to **SPC-1 IOPS™**.

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

A **Data Protection Level** of **Protected 2** using ***Mirroring,*** which configures two or more identical copies of user data.

> ***Protected 2:*** *The single point of failure of any* ***component*** *in the configuration will not result in permanent loss of access to or integrity of the SPC-1 Data Repository.*

Total Price includes the cost of the Priced Storage Configuration plus three years of hardware maintenance and software support as detailed on page 19.

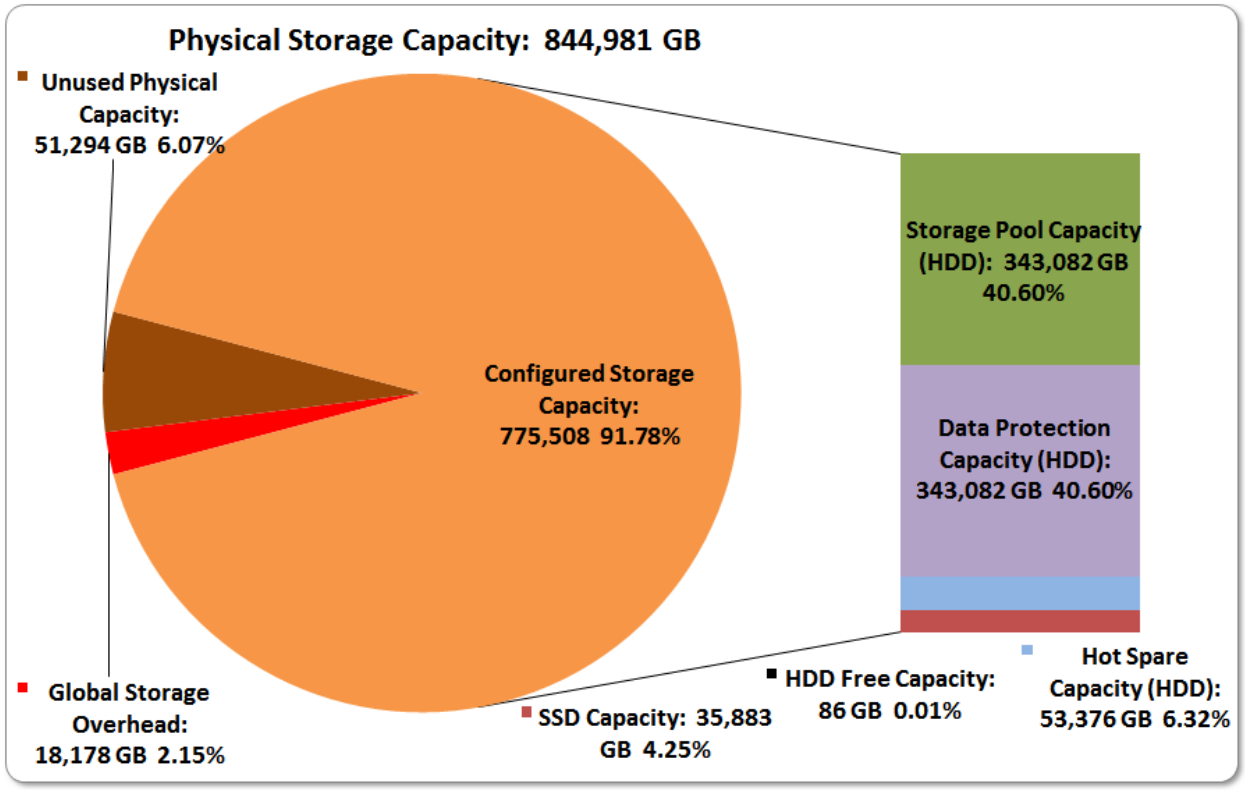
Currency Used is formal name for the currency used in calculating the **Total Price** and **SPC-1 Price-Performance™**. That currency may be the local currency of the **Target Country** or the currency of a difference country *(non-local currency)*.

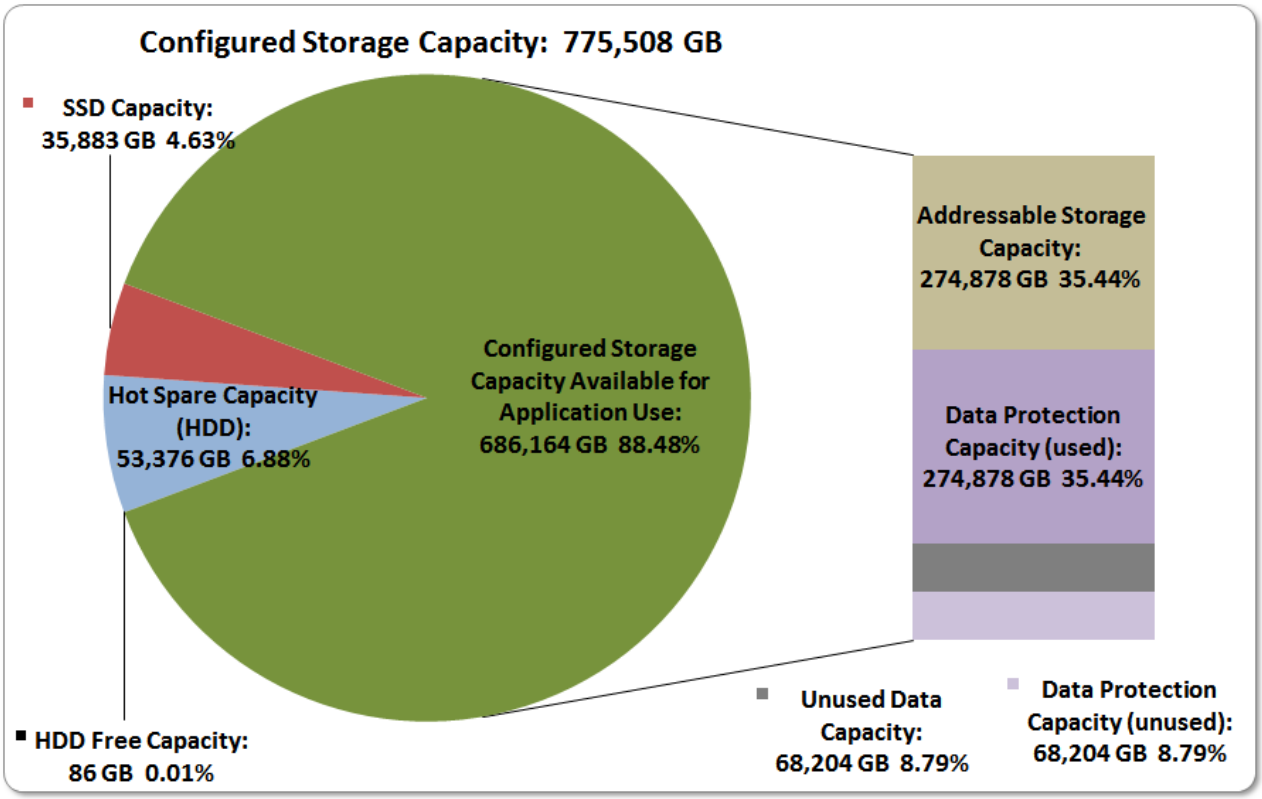
The **Target Country** is the country in which the Priced Storage Configuration is available for sale and in which the required hardware maintenance and software support is provided either directly from the Test Sponsor or indirectly via a third-party supplier.

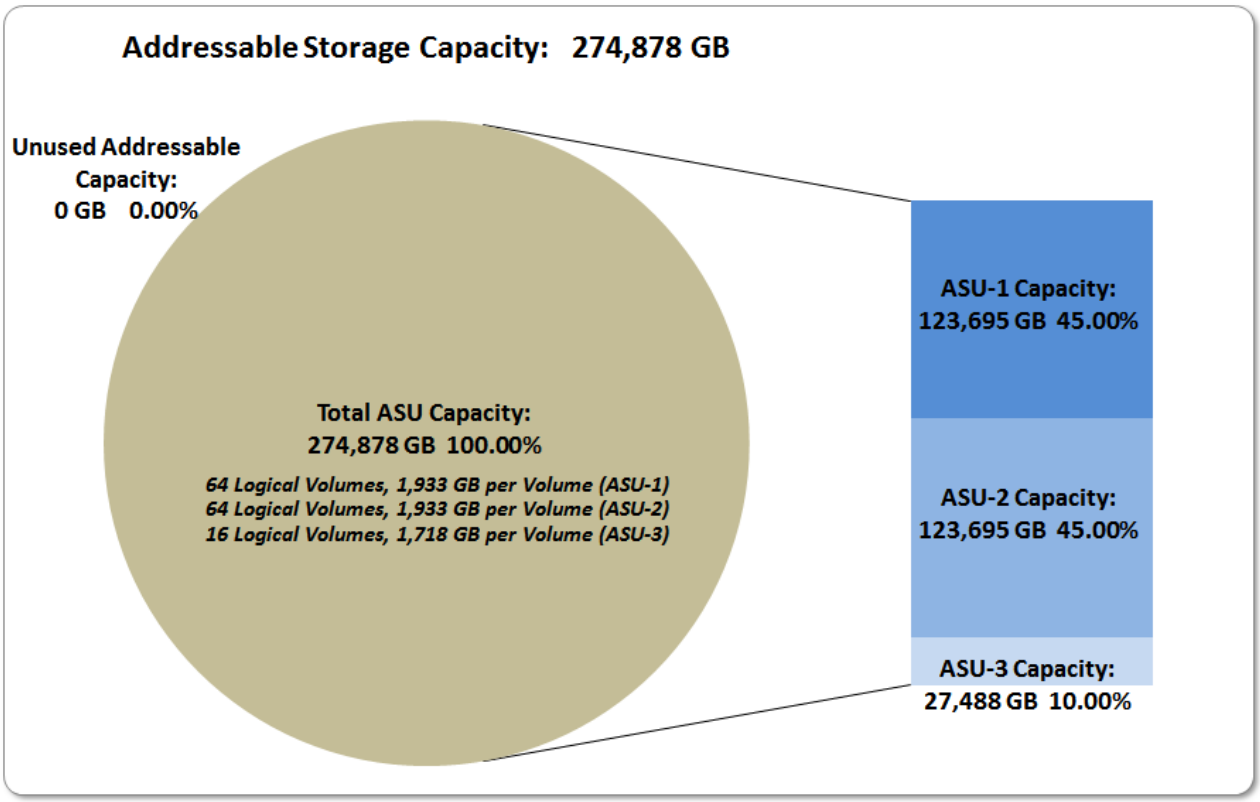
Storage Capacities, Relationships, and Utilization

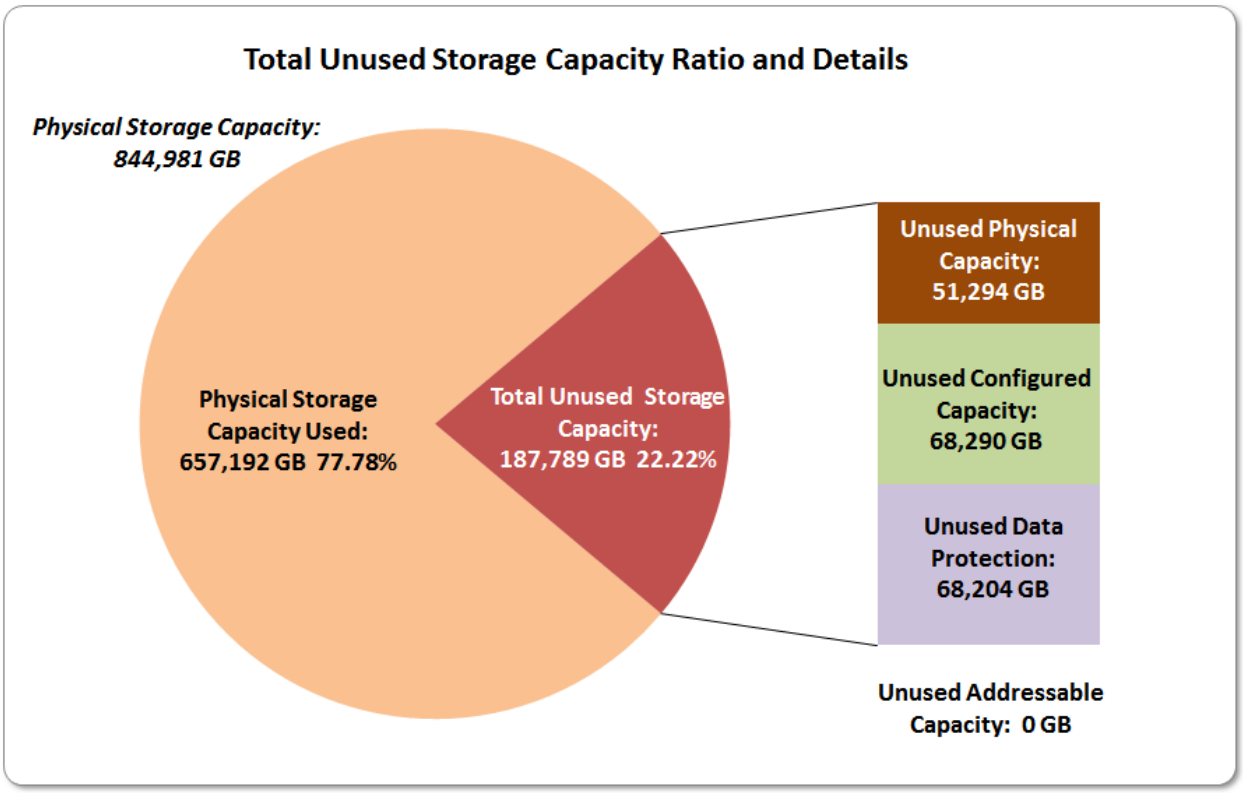
The following four charts and table document the various storage capacities, used in this benchmark, and their relationships, as well as the storage utilization values required to be reported.

The capacity values in each of the following four charts are listed as integer values, for readability, rather than the decimal values listed elsewhere in this document.




Configured Storage Capacity: 775,508 GB
SSD Capacity:
35,883 GB 4.63%
Hot Spare Capacity (HDD):
53,376 GB 6.88%
HDD Free Capacity:
86 GB 0.01%
Configured Storage Capacity Available for Application Use:
686,164 GB 88.48%
Addressable Storage Capacity:
274,878 GB 35.44%
Data Protection Capacity (used):
274,878 GB 35.44%
Unused Data Capacity:
68,204 GB 8.79%
Data Protection Capacity (unused):
68,204 GB 8.79%


Addressable Storage Capacity: 274,878 GB
Unused Addressable Capacity:
0 GB 0.00%
Total ASU Capacity:
274,878 GB 100.00%
64 Logical Volumes, 1,933 GB per Volume (ASU-1)
64 Logical Volumes, 1,933 GB per Volume (ASU-2)
16 Logical Volumes, 1,718 GB per Volume (ASU-3)
ASU-1 Capacity:
123,695 GB 45.00%
ASU-2 Capacity:
123,695 GB 45.00%
ASU-3 Capacity:
27,488 GB 10.00%



SPC-1 Storage Capacity Utilization	
Application Utilization	32.53%
Protected Application Utilization	65.06%
Unused Storage Ratio	22.22%

Application Utilization: Total ASU Capacity *(274,877.907 GB)* divided by Physical Storage Capacity *(844,980.579 GB)*.

Protected Application Utilization: Total ASU Capacity *(274,877.907 GB)* plus total Data Protection Capacity *(343,081.988 GB)* minus unused Data Protection Capacity *(68,204.081 GB)* divided by Physical Storage Capacity *(844,980.579 GB)*.

Unused Storage Ratio: Total Unused Capacity *(187,788.661 GB)* divided by Physical Storage Capacity *(844,980.579 GB)* and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 32-33.

SmartTier Overview

SmartTier analyzes the activity levels of data and matches it with proper storage media accordingly. Active data will be promoted to higher performance storage media such as SSD, and data that is less active will be demoted to cost effective ones.

The SmartTier data migration process consists of performance statistics collection, data analysis and data migration.

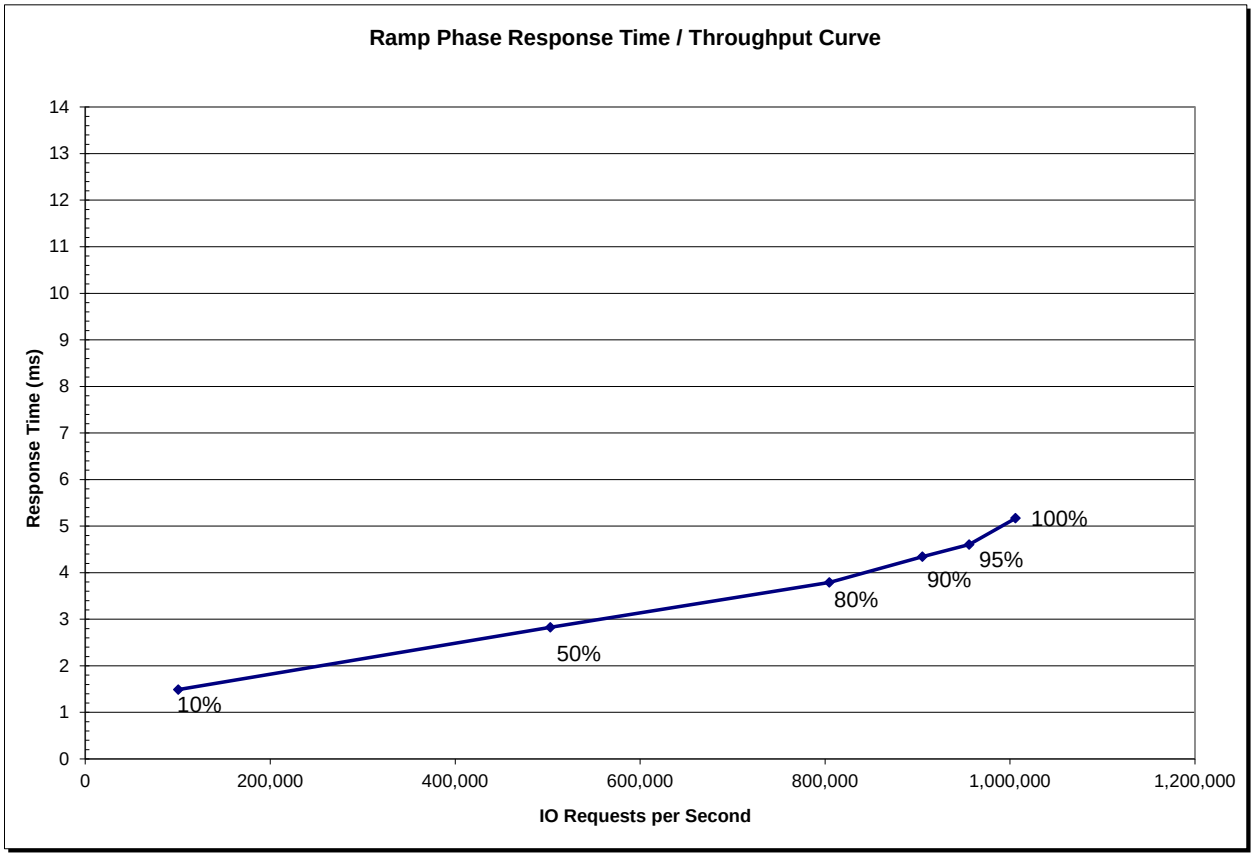
- Performance statistics are collected by an I/O monitoring module, which identifies I/O activities and sizes. User-defined monitoring periods are allowed.
- The data placement analysis module identifies "hot" and "cold" data based on the performance statistics collected during the I/O monitoring.
- The data migration module allocates data to different storage tiers according to data placement analysis. Data migration can be either manual or automatic. Manual migration occurs immediately when necessary, while automatic migration will occur based on the preset migration start time and duration, which is user-definable.

The SPC-1 Application Storage Units *(ASU-1, ASU-2 and ASU-3)* were defined to only utilize the available HDD storage capacity. The SSD storage capacity was utilized by SmartTier for relocation of "hot" data.

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	100,595.53	502,965.70	804,787.27	905,380.23	955,814.41	1,005,893.43
Average Response Time (ms):						
All ASUs	1.49	2.83	3.79	4.34	4.60	5.17
ASU-1	1.33	2.48	3.30	3.78	4.02	4.56
ASU-2	2.70	5.61	8.14	9.26	9.81	10.64
ASU-3	1.28	2.33	2.92	3.38	3.55	4.07
Reads	1.84	3.61	5.15	5.85	6.24	6.88
Writes	1.26	2.31	2.91	3.36	3.54	4.06

Priced Storage Configuration Pricing

No.	Model	Description	Qty	Unit Price($)	Total Price($)
1	**Phase**				
1.1	**Location**				
1.1.1	**OceanStor 18800 Enterprise System**				
1.1.1.1	**Control Module**				**310,345.60**
	C2E384G-AC	OceanStor 18800 - Engine(Dual Controller,AC, 384GB Cache	8	34912.00	279,296.00
	SYSRACK0-AC	Primary Controller Rack	1	4688.00	4,688.00
	SYSRACK1-AC	Second Controller Rack	1	5088.00	5,088.00
	SYSRACKEXP-AC	Controller Rack Exp	6	3545.60	21,273.60
1.1.1.2	**Disk Enclosure**				**100,556.80**
	DAE-4U-AC	DAE12435U4 Disk Enclosure(4U,3.5",AC)	64	1571.20	100,556.80
1.1.1.3	**Hard Disk Drives**				**1,243,545.60**
	SAS600-15K-3	600GB 15K RPM SAS Drive(3.5")	1344	524.80	705,331.20
	SLC200-3	200GB SLC SSD Drive(3.5")	192	2803.20	538,214.40
1.1.1.4	**IO Interface**				**78,848.00**
	LPU-F4X8G	4*8Gbps Fibre Channel I/O modules(Total 4 ports)	16	2662.40	42,598.40
	LPU-S2X24G-BACK	2*24Gbps SAS-wide I/O modules(Total 2 ports)	32	1132.80	36,249.60
1.1.1.5	**Switch**				**18,095.04**
	SN0Z01FCSP	OceanStor SNS2120 FC Switch,Single-Power Supply,AC,20 Ports Enabled(Includes 20*8Gb SFPs,20 Ports(MAX)),4*10Gb Stacking Ports	4	4072.00	16,288.00
	SN0-TOL-RM	Rack Mount Kit,For SNS2120	1	61.12	61.12
	SN0-CAB-228MM	SNS2120 FC Switch,Stacking Cable,228mm	16	109.12	1,745.92
1.1.1.6	**Accessory**				**1,027.00**
	DLC-3	Patch Cord,DLC/PC-DLC/PC,Multimode,2mm Parallel,3m	72	13.00	936.00
	MODEM-56K	Modem,56K/Data/Fax,External,Split Type(DB25 To DB25,DB9) Cable,English/Chinese Documents,AC To 12VAC Transformer	1	91.00	91.00
1.1.1.7	**HBA**				**8,000.00**
	N8GHBA000	QLOGIC QLE2562 HBA Card,PCIE,8Gbps DualPort ,Fiber Channel Multimode LC Optic Interface,English Manual, No Drive CD	8	1000.00	8,000.00
1.1.1.8	**Host Software**				**1,027.20**
	STLUP	UltraPath Software License	1	1027.20	1,027.20

Priced Storage Configuration Pricing *(continued)*

1.1.1.9	Storage Software				790,709.76
	STLSFLIC88T	XVE Software For OceanStor 18800 Base License	1	5254.40	5,254.40
	STLS14S88T	XVE Software For OceanStor 18800, 1TB (0-14TB) ,SSD & SAS	14	484.48	6,782.72
	STLS25S88T	XVE Software For OceanStor 18800, 1TB (15-25TB) ,SSD & SAS	11	474.56	5,220.16
	STLS40S88T	XVE Software For OceanStor 18800, 1TB (26-40TB) ,SSD & SAS	15	465.28	6,979.20
	STLS60S88T	XVE Software For OceanStor 18800, 1TB (41-60TB) ,SSD & SAS	20	456.00	9,120.00
	STLS100S88T	XVE Software For OceanStor 18800, 1TB (61-100TB) ,SSD & SAS	40	446.72	17,868.80
	STLS150S88T	XVE Software For OceanStor 18800, 1TB (101-150TB) ,SSD & SAS	50	437.76	21,888.00
	STLS250S88T	XVE Software For OceanStor 18800, 1TB (151-250TB) ,SSD & SAS	100	429.12	42,912.00
	STLS400S88T	XVE Software For OceanStor 18800, 1TB (251-400TB) ,SSD & SAS	150	420.48	63,072.00
	STLS4BS88T	XVE Software For OceanStor 18800, 1TB (400+TB) ,SSD & SAS	445	412.16	183,411.20
	STLDMC88T	Management Console For OceanStor 18800 Base License	1	5254.40	5,254.40
	STLD14S88T	Management Console For OceanStor 18800, 1TB (0-14TB) ,SSD & SAS	14	322.88	4,520.32
	STLD25S88T	Management Console For OceanStor 18800, 1TB (15-25TB) ,SSD & SAS	11	316.48	3,481.28
	STLD40S88T	Management Console For OceanStor 18800, 1TB (26-40TB) ,SSD & SAS	15	310.08	4,651.20
	STLD60S88T	Management Console For OceanStor 18800, 1TB (41-60TB) ,SSD & SAS	20	304.00	6,080.00
	STLD100S88T	Management Console For OceanStor 18800, 1TB (61-100TB) ,SSD & SAS	40	297.92	11,916.80
	STLD150S88T	Management Console For OceanStor 18800, 1TB (101-150TB) ,SSD & SAS	50	291.84	14,592.00
	STLD250S88T	Management Console For OceanStor 18800, 1TB (151-250TB) ,SSD	100	286.08	28,608.00
	STLD400S88T	Management Console For OceanStor 18800, 1TB (251-400TB) ,SSD & SAS	150	280.32	42,048.00
	STLD4BS88T	Management Console For OceanStor 18800, 1TB (400+TB) ,SSD & SAS	445	274.88	122,321.60

Priced Storage Configuration Pricing *(continued)*

	STLSCT88T	SmartTier Software OceanStor 18800 Base License	1	14011.52	14,011.52
	STLT14S88T	SmartTier Software OceanStor 18800, 1TB (0-14TB) ,SSD & SAS	14	403.84	5,653.76
	STLT25S88T	SmartTier Software OceanStor 18800, 1TB (15-25TB) ,SSD & SAS	11	363.20	3,995.20
	STLT40S88T	SmartTier Software OceanStor 18800, 1TB (26-40TB) ,SSD & SAS	15	327.04	4,905.60
	STLT60S88T	SmartTier Software OceanStor 18800, 1TB (41-60TB) ,SSD & SAS	20	294.40	5,888.00
	STLT100S88T	SmartTier Software OceanStor 18800, 1TB (61-100TB) ,SSD & SAS	40	264.96	10,598.40
	STLT150S88T	SmartTier Software OceanStor 18800, 1TB (101-150TB) ,SSD & SAS	50	238.40	11,920.00
	STLT250S88T	SmartTier Software OceanStor 18800, 1TB (151-250TB) ,SSD & SAS	100	214.40	21,440.00
	STLT400S88T	SmartTier Software OceanStor 18800, 1TB (251-400TB) ,SSD & SAS	150	193.28	28,992.00
	STLT4BS88T	SmartTier Software OceanStor 18800, 1TB (400+TB) ,SSD & SAS	445	173.76	77,323.20
Total of Product					**2,552,155.00**
1.1.1.10	**Maintenance Support Service**				**242,816.80**
		OceanStor 18800 Engineering Service System Rack,Installtion Base Service,per Set	8	6393.31	51,146.48
		Engineering Service System Warranty Upgrade To Hi-Care Onsite Premier 24x7x4H Engineer Onsite Service (Per Set*3Year)	8	8491.00	67,928.00
		Disk Enclosure Warranty Upgrade To Hi-Care Onsite Premier 24x7x4H Engineer Onsite Service(Per Set*3Year)	64	1933.47	123,742.32
Total of Service (3 years)					**242,816.80**
Total Price					**2,794,971.80**

The above pricing includes hardware maintenance and software support for three years, 7 days per week, 24 hours per day. The hardware maintenance and software support provides the following:

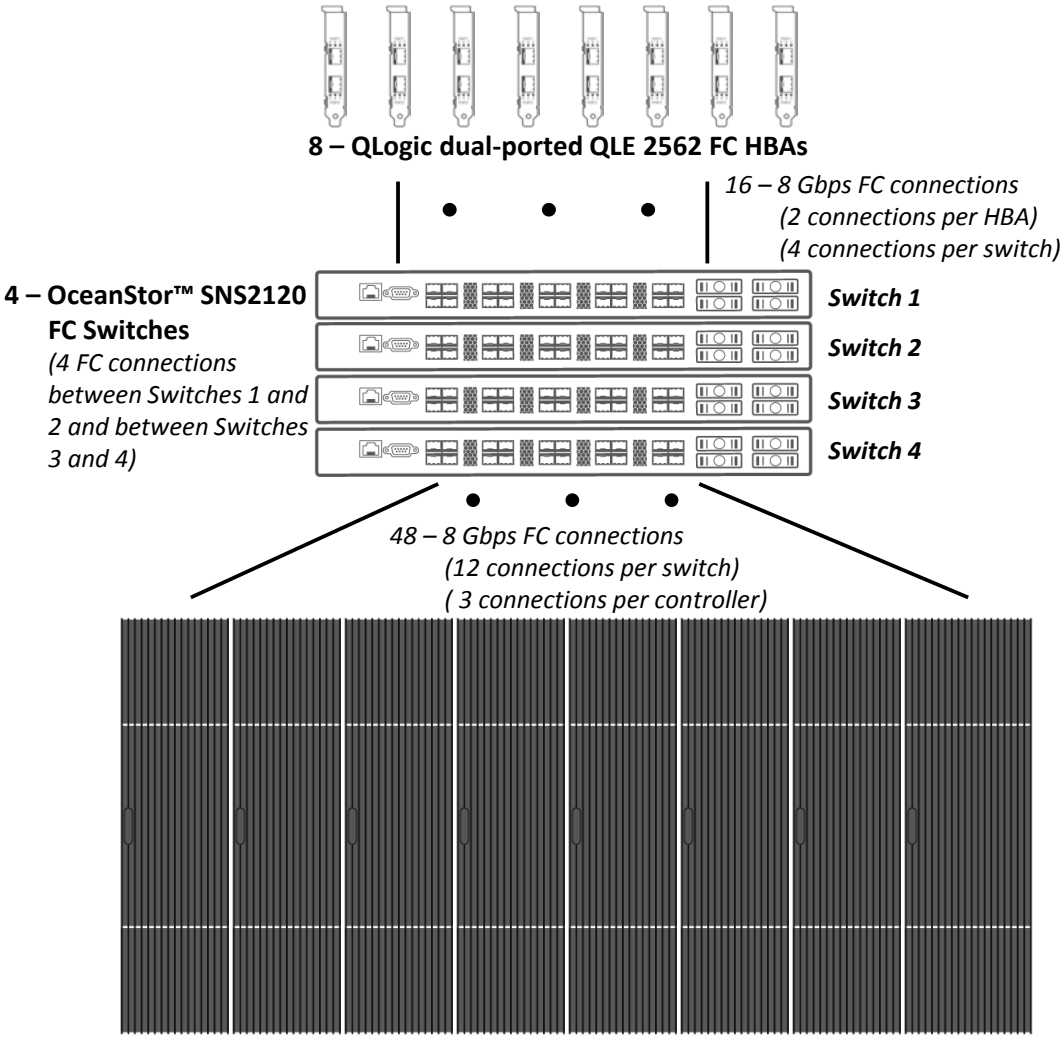
- Acknowledgement of new and existing problems with four (4) hours.
- Onsite presence of a qualified maintenance engineer or provision of a customer replaceable part within four (4) hours of the above acknowledgement for any hardware failure that results in an inoperative Price Storage Configuration that can be remedied by the repair or replacement of a Priced Storage Configuration component.

Huawei Technologies Co., Ltd. only sells its products to third-party resellers, who in turn, sell those products to U.S. customers. The above pricing, which also includes the required three-year maintenance and support, was obtained from one of those third-party resellers. See page 122 *(Appendix F: Third-Party Quotation)* for a copy of the third-party reseller quotation.

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

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

Priced Storage Configuration Diagram



Huawei OceanStor™ 18800

8 – Dual Controllers *(OceanStor™ 18800 Engine)*
(16 controllers total)
each dual controller includes:
384 GB cache (3,072 GB total)
2 – 4-port Fibre Channel I/O modules
(16 modules total, 64 ports total, 48 ports used)
4 – 2-port 24 Gbps SAS-wide I/O modules
(32 modules total, 64 ports total and used
64 – Disk Enclosures
1,344 – 600 GB, 15K RPM SAS drives (HDDs)
192 – 200 GB SLC SSD drives
1 – Primary Controller Rack
1 – Second Controller Rack
6 – Controller Rack Exp.

Priced Storage Configuration Components

Priced Storage Configuration
8 – QLogic QLE2562 dual-port, 8 Gbps, FC HBAs
4 – OceanStor™ SNS2120 FC Switches, each switch includes 20 ports enabled, 20 8Gbps SFPs
Huawei OceanStor™ 18800 8 – Dual Controllers *(OceanStor™ 18800 Engine), (16 controllers total)*, each dual controller includes: 384 GB cache *(192 GB per controller, 3,072 GB total)* 2 – 4 port Fibre Channel I/O modules *(16 modules total, 64 ports total, 48 ports used)* 4 – 2 port 24 Gbps SAS-wide I/O modules *(32 modules total, 64 ports total, 64 ports used)*
1,344 – 600 GB, 15K RPM SAS drives *(HDDs)*
192 – 200 GB SLC SSD drives
64 – Disk Enclosures *(4U, 3.5")* *(56 disk enclosures, each with 24 HDDs)* *(8 disk enclosures, eah with 24 SSDs)*
1 – Primary Controller Rack with 2 PDUs
1 –Second Controller Rack with 2 PDUs
6 –Controller Rack Exp. each 2 PDUs

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 9.4.3.4.1

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

The Benchmark Configuration (BC)/Tested Storage Configuration (TSC) is illustrated on page 28 *(Benchmark Configuration/Tested Storage Configuration Diagram)*.

Storage Network Configuration

Clause 9.4.3.4.1

…

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 9.4.3.4.2.*

Clause 9.4.3.4.2

If a storage network was configured as a part of the Tested Storage Configuration and the Benchmark Configuration diagram described in Clause 9.4.3.4.1 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 includes 8 Host Systems, each of which has 2 HBA ports connected to the Huawei OceanStor™ 18800. One HBA port from each Host System *(total of 8 ports)* is zoned with 24 storage FC ports, 3 ports of each controller 0A, 1A, 2A, 3A, 4A, 5A, 6A and 7A. The second HBA port from each Host System *(total of 8 ports)* is zoned with the remaining 24 storage FC ports, 3 ports of each controller 0B, 1B, 2B, 3B, 4B, 5B, 6B and 7B.

The members of the storage network configuration are as follows:

Zone : A *(32 members)*
21:00:00:24:ff:49:af:6e
21:00:00:24:ff:41:a0:40
21:00:00:24:ff:2c:95:2a
21:00:00:24:ff:49:ae:18
21:00:00:24:ff:37:1e:a4
21:00:00:24:ff:49:af:7a
21:00:00:24:ff:37:29:08
21:00:00:24:ff:4a:54:2a

20:08:d4:b1:10:b5:57:b0(0A)
20:09:d4:b1:10:b5:57:b0(0A)
20:0a:d4:b1:10:b5:57:b0(0A)
20:08:00:22:a1:10:62:c1(1A)
20:09:00:22:a1:10:62:c1(1A)
20:0a:00:22:a1:10:62:c1(1A)
20:08:ac:4e:91:43:08:c6(2A)
20:09:ac:4e:91:43:08:c6(2A)
20:0a:ac:4e:91:43:08:c6(2A)
20:08:00:22:a1:10:62:bf(3A)
20:09:00:22:a1:10:62:bf(3A)
20:0a:00:22:a1:10:62:bf(3A)
20:08:00:22:a1:10:62:c0(4A)
20:09:00:22:a1:10:62:c0(4A)
20:0a:00:22:a1:10:62:c0(4A)
20:08:d4:b1:10:b5:57:ae(5A)
20:09:d4:b1:10:b5:57:ae(5A)
20:0a:d4:b1:10:b5:57:ae(5A)
20:08:d4:b1:10:b5:57:ad(6A)
20:09:d4:b1:10:b5:57:ad(6A)
20:0a:d4:b1:10:b5:57:ad(6A)
20:08:d4:b1:10:b5:57:af(7A)
20:09:d4:b1:10:b5:57:af(7A)
20:0a:d4:b1:10:b5:57:af(7A)

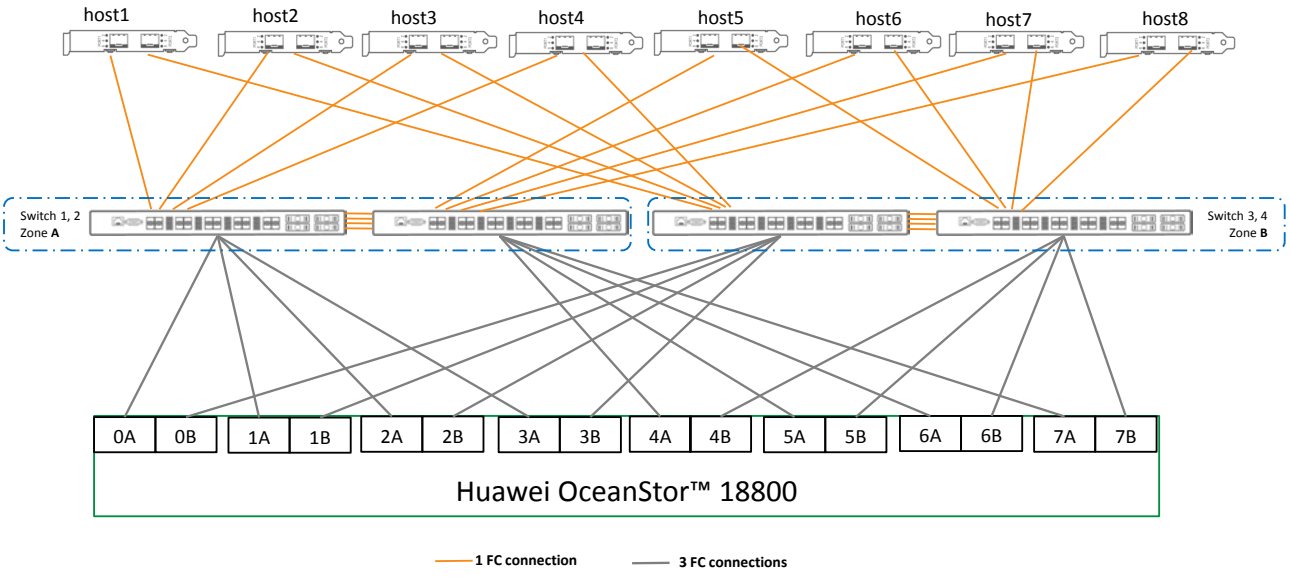
Zone: B *(32 members)*

21:00:00:24:ff:2c:95:2b
21:00:00:24:ff:37:1e:a5
21:00:00:24:ff:37:29:09
21:00:00:24:ff:41:a0:41
21:00:00:24:ff:49:ae:19
21:00:00:24:ff:49:af:6f
21:00:00:24:ff:49:af:7b
21:00:00:24:ff:4a:54:2b

20:18:d4:b1:10:b5:57:b0(0B)
20:19:d4:b1:10:b5:57:b0(0B)
20:1a:d4:b1:10:b5:57:b0(0B)
20:18:00:22:a1:10:62:c1(1B)
20:19:00:22:a1:10:62:c1(1B)
20:1a:00:22:a1:10:62:c1(1B)
20:18:ac:4e:91:43:08:c6(2B)
20:19:ac:4e:91:43:08:c6(2B)
20:1a:ac:4e:91:43:08:c6(2B)
20:18:00:22:a1:10:62:bf(3B)
20:19:00:22:a1:10:62:bf(3B)
20:1a:00:22:a1:10:62:bf(3B)
20:18:00:22:a1:10:62:c0(4B)
20:19:00:22:a1:10:62:c0(4B)
20:1a:00:22:a1:10:62:c0(4B)
20:18:d4:b1:10:b5:57:ae(5B)

20:19:d4:b1:10:b5:57:ae(5B)
20:1a:d4:b1:10:b5:57:ae(5B)
20:18:d4:b1:10:b5:57:ad(6B)
20:19:d4:b1:10:b5:57:ad(6B)
20:1a:d4:b1:10:b5:57:ad(6B)
20:18:d4:b1:10:b5:57:af(7B)
20:19:d4:b1:10:b5:57:af(7B)
20:1a:d4:b1:10:b5:57:af(7B)

Storage Network Diagram



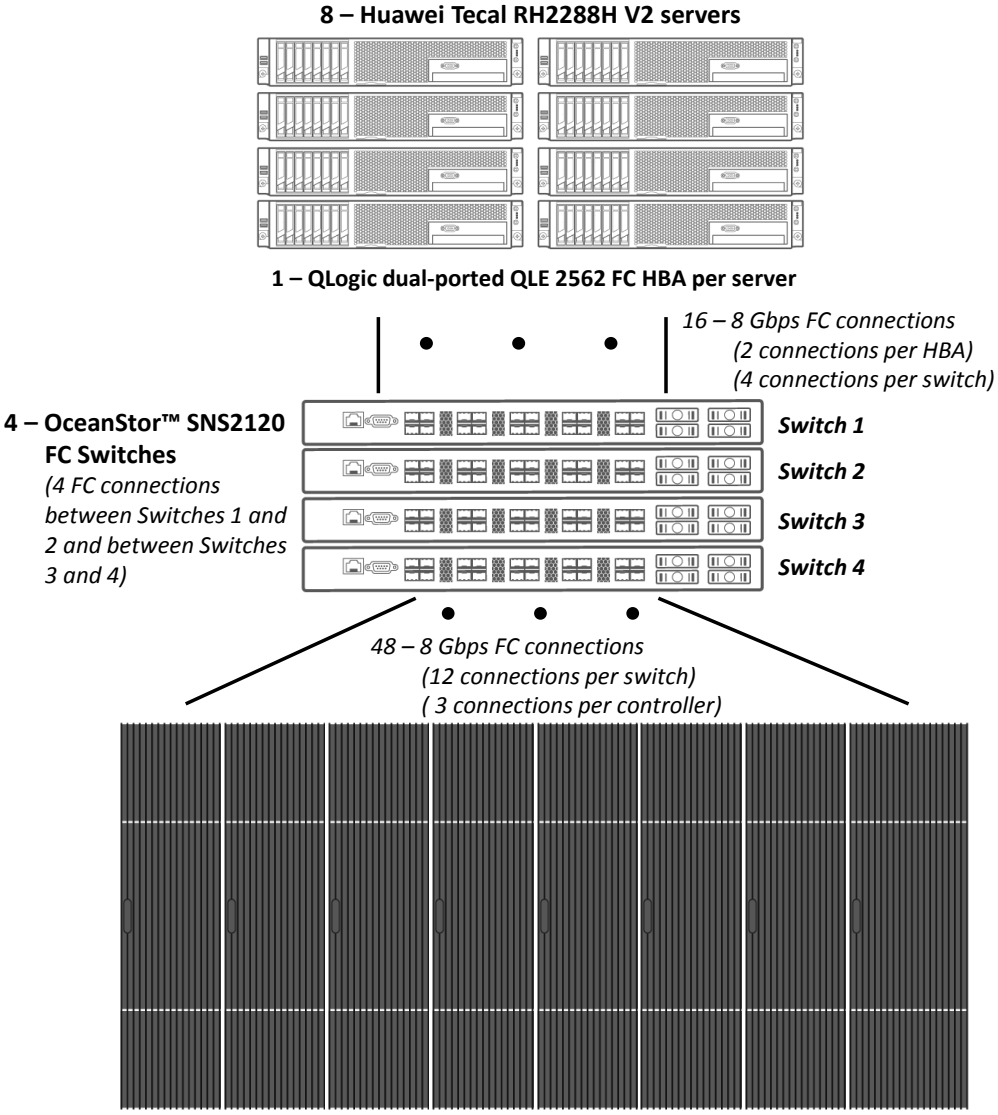
Host System(s) and Tested Storage Configuration (TSC) Table of Components

Clause 9.4.3.4.3

The FDR will contain a table that lists the major components of each Host System and the Tested Storage Configuration (TSC).

The Host System(s) and TSC table of components may be found on page 29 (*Host Systems and Tested Storage Configuration Components*).

Benchmark Configuration/Tested Storage Configuration Diagram



Huawei OceanStor™ 18800

8 – Dual Controllers *(OceanStor™ 18800 Engine)*
(16 controllers total)
each dual controller includes:
384 GB cache (3,072 GB total)
2 – 4-port Fibre Channel I/O modules
(16 modules total, 64 ports total, 48 ports used)
4 – 2-port 24 Gbps SAS-wide I/O modules
(32 modules total, 64 ports total and used
64 – Disk Enclosures
1,344 – 600 GB, 15K RPM SAS drives (HDDs)
192 – 200 GB SLC SSD drives
1 – Primary Controller Rack
1 – Second Controller Rack
6 – Controller Rack Exp.

Host Systems and Tested Storage Configuration Components

Host Systems
3 – Huawei Tecal RH2288 V2 servers, each with: 2 – Intel® Xeon® 2.20 GHz processor E5-2660 each with 8 cores, 20 MB cache 256 GB main memory Red Hat Enterprise Linux Server release 5.5 x86_64 PCIe
5 – Huawei Tecal RH2288 V2 servers, each with: 2 – Intel® Xeon® 2.90 GHz processor E5-2690 each with 8 cores, 20 MB cache 256 GB main memory Red Hat Enterprise Linux Server release 5.5 x86_64 PCIe
Priced Storage Configuration
8 – QLogic QLE2562 dual-port, 8 Gbps, FC HBAs
4 – OceanStor™ SNS2120 FC Switches, each switch includes 20 ports enabled, 20 8Gbps SFPs
Huawei OceanStor™ 18800 8 – Dual Controllers *(OceanStor™ 18800 Engine), (16 controllers total)*, each dual controller includes: 384 GB cache *(192 GB per controller, 3,072 GB total)* 2 – 4 port Fibre Channel I/O modules *(16 modules total, 64 ports total, 48 ports used)* 4 – 2 port 24 Gbps SAS-wide I/O modules *(32 modules total, 64 ports total, 64 ports used)*
1,344 – 600 GB, 15K RPM SAS drives *(HDDs)*
192 – 200 GB SLC SSD drives
64 – Disk Enclosures *(4U, 3.5")* *(56 disk enclosures, each with 24 HDDs)* *(8 disk enclosures, eah with 24 SSDs)*
1 – Primary Controller Rack with 2 PDUs
1 – Second Controller Rack with 2 PDUs
6 – Controller Rack Exp. each 2 PDUs

Customer Tunable Parameters and Options

Clause 9.4.3.5.1

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 74 contains the customer tunable parameters and options that have been altered from their default values for this benchmark.

Tested Storage Configuration (TSC) Description

Clause 9.4.3.5.2

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 75 contains the detailed information that describes how to create and configure the logical TSC.

SPC-1 Workload Generator Storage Configuration

Clause 9.4.3.5.3

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 94.

ASU Pre-Fill

Clause 5.3.3

Each of the three SPC-1 ASUs (ASU-1, ASU-2 and ASU-3) is required to be completely filled with specified content prior to the execution of audited SPC-1 Tests. The content is required to consist of random data pattern such as that produced by an SPC recommended tool.

The configuration file used to complete the required ASU pre-fill appears in Appendix D: SPC-1 Workload Generator Storage Commands and Parameters on page 94.

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 70 contains definitions of terms specific to the SPC-1 Data Repository.

Storage Capacities and Relationships

Clause 9.4.3.6.1

Two tables and four charts documenting the storage capacities and relationships of the SPC-1 Storage Hierarchy (Clause 2.1) shall be included in the FDR. … The capacity value in each chart may be listed as an integer value, for readability, rather than the decimal value listed in the table below.

SPC-1 Storage Capacities

The Physical Storage Capacity consisted of 806,571.047 GB distributed over1,344 disk drive, each with a formatted capacity of 600.177, and 38,409.532 GB distributed over 192 solid state storage devices, each with a formatted capacity of 200.050 GB, for a total of 844,980.579 GB. There was 51,294.471 GB (6.07%) of Unused Storage within the Physical Storage Capacity. Global Storage Overhead consisted of 18,177.622 GB (2.15%) of the Physical Storage Capacity. There was 68,290.109 GB (8.81%) of Unused Storage within the Configured Storage Capacity. The Total ASU Capacity utilized 100% of the Addressable Storage Capacity resulting in 0.000 GB (0.00%) of Unused Storage within the Addressable Storage Capacity. The Data Protection *(mirroring)* capacity was 343,081.988 GB of which 274,877.907 GB was utilized. The total Unused Storage capacity was 187,788.661 GB.

Note: The configured Storage Devices may include additional storage capacity reserved for system overhead, which is not accessible for application use. That storage capacity may not be included in the value presented for Physical Storage Capacity.

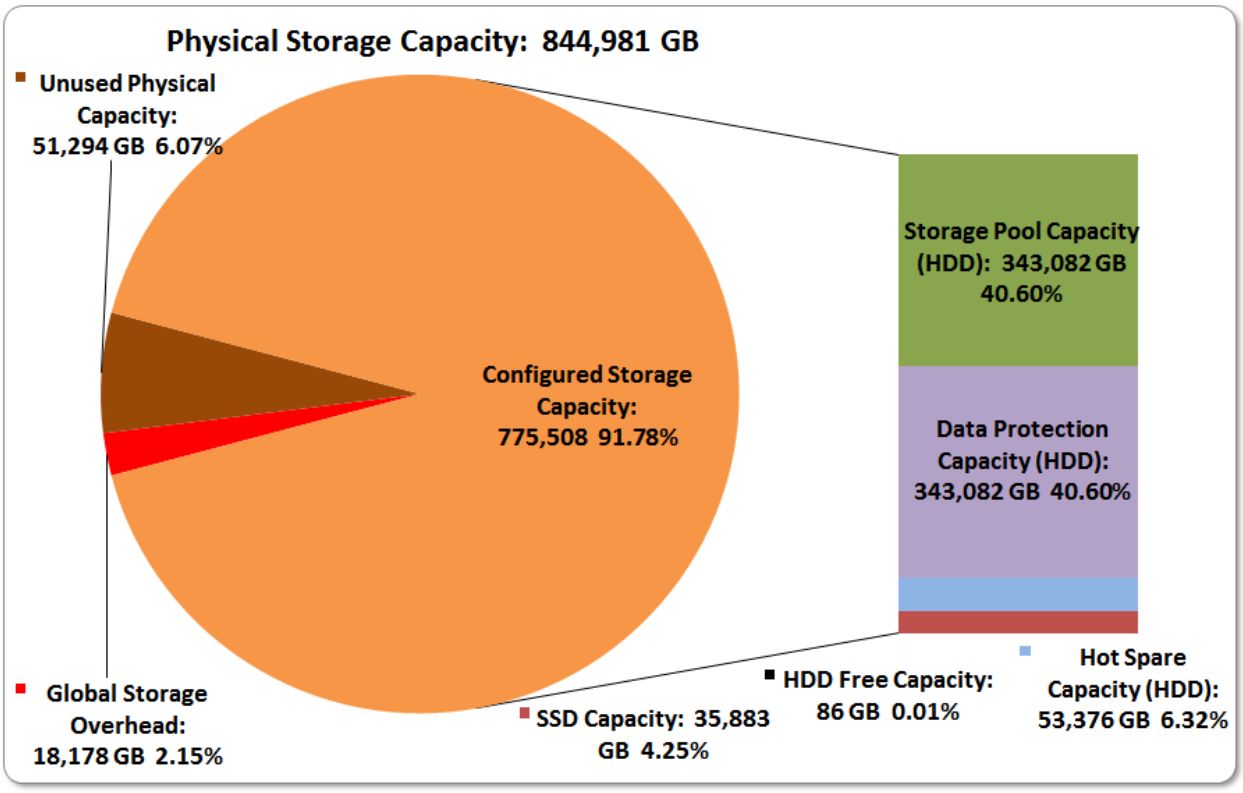
SPC-1 Storage Capacities

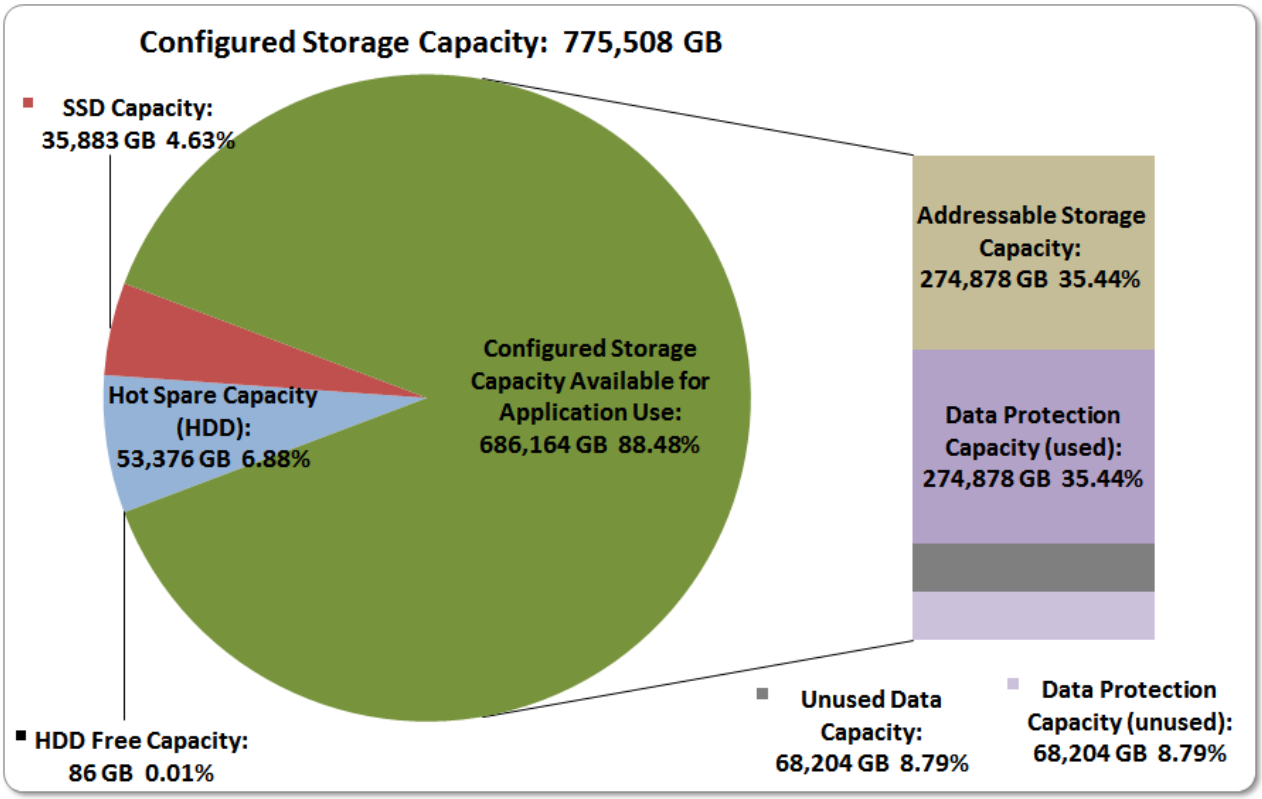
Storage Hierarchy Component	Units	Capacity
Total ASU Capacity	Gigabytes (GB)	274,877.907
Addressable Storage Capacity	Gigabytes (GB)	274,877.907
Configured Storage Capacity	Gigabytes (GB)	775,508.486
Physical Storage Capacity	Gigabytes (GB)	844,980.579
Data Protection *(Mirroring)*	Gigabytes (GB)	343,081988
Required Storage *(SSDs, hot spare)*	Gigabytes (GB)	89,258.483
Global Storage Overhead	Gigabytes (GB)	18,177.622
Total Unused Storage	Gigabytes (GB)	187,788.661

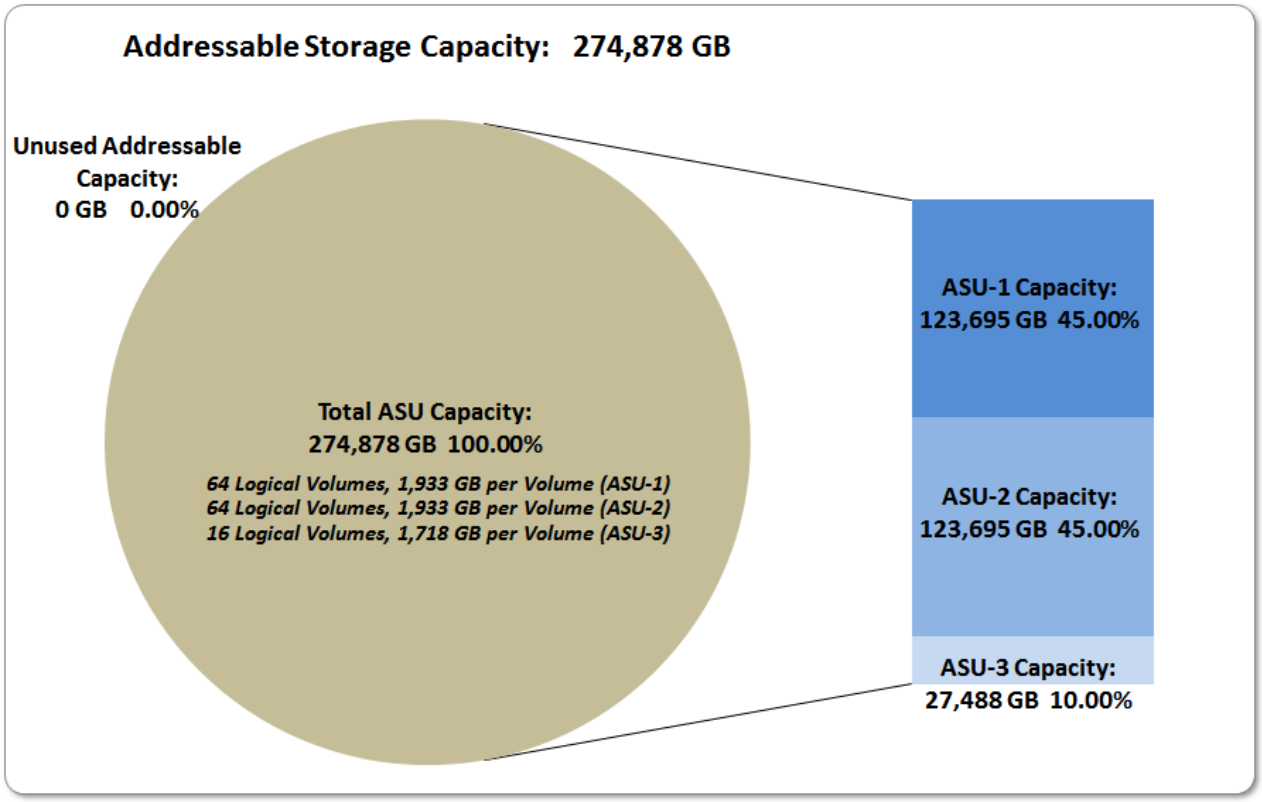
SPC-1 Storage Hierarchy Ratios

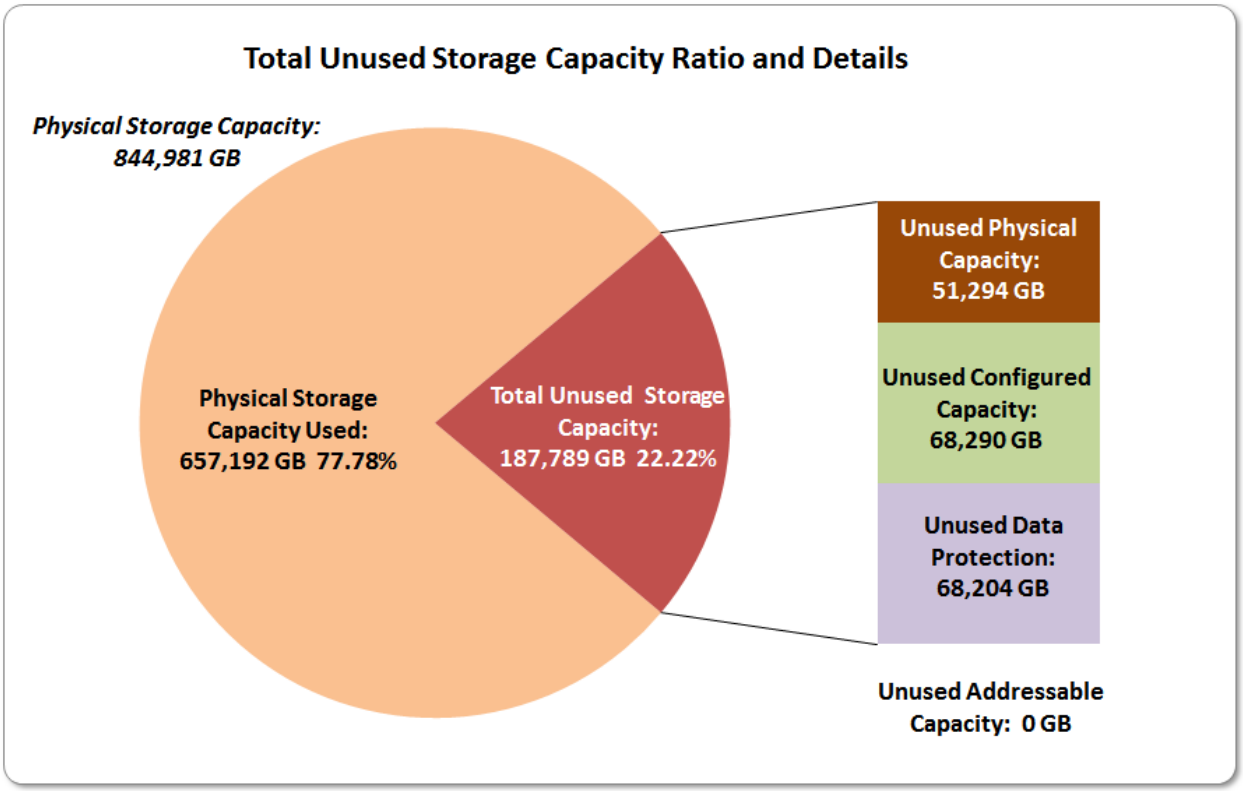
	Addressable Storage Capacity	Configured Storage Capacity	Physical Storage Capacity
Total ASU Capacity	100.00%	35.44%	32.53%
Required for Data Protection *(Mirroring)*		44.24%	40.60%
Addressable Storage Capacity		35.44%	32.53%
Required Storage *(SSDs, hot spare)*		11.51%	10.56%
Configured Storage Capacity			91.78%
Global Storage Overhead			2.15%
Unused Storage:			
Addressable	0.00%		
Configured		8.81%	
Physical			6.07%

SPC-1 Storage Capacity Charts




Configured Storage Capacity: 775,508 GB
SSD Capacity:
35,883 GB 4.63%
Hot Spare Capacity (HDD):
53,376 GB 6.88%
Configured Storage Capacity Available for Application Use:
686,164 GB 88.48%
HDD Free Capacity:
86 GB 0.01%
Addressable Storage Capacity:
274,878 GB 35.44%
Data Protection Capacity (used):
274,878 GB 35.44%
Unused Data Capacity:
68,204 GB 8.79%
Data Protection Capacity (unused):
68,204 GB 8.79%


Addressable Storage Capacity: 274,878 GB
Unused Addressable Capacity:
0 GB 0.00%
Total ASU Capacity:
274,878 GB 100.00%
64 Logical Volumes, 1,933 GB per Volume (ASU-1)
64 Logical Volumes, 1,933 GB per Volume (ASU-2)
16 Logical Volumes, 1,718 GB per Volume (ASU-3)
ASU-1 Capacity:
123,695 GB 45.00%
ASU-2 Capacity:
123,695 GB 45.00%
ASU-3 Capacity:
27,488 GB 10.00%



Storage Capacity Utilization

Clause 9.4.3.6.2

The FDR will include a table illustrating the storage capacity utilization values defined for Application Utilization (Clause 2.8.1), Protected Application Utilization (Clause 2.8.2), and Unused Storage Ratio (Clause 2.8.3).

Clause 2.8.1

Application Utilization is defined as Total ASU Capacity divided by Physical Storage Capacity.

Clause 2.8.2

Protected Application Utilization is defined as (Total ASU Capacity plus total Data Protection Capacity minus unused Data Protection Capacity) divided by Physical Storage Capacity.

Clause 2.8.3

Unused Storage Ratio is defined as Total Unused Capacity divided by Physical Storage Capacity and may not exceed 45%.

SPC-1 Storage Capacity Utilization	
Application Utilization	32.53%
Protected Application Utilization	65.06%
Unused Storage Ratio	22.22%

Logical Volume Capacity and ASU Mapping

Clause 9.4.3.6.3

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 (GB)	**ASU-2 (GB)**	**ASU-3 (GB)**
64 Logical Volumes GB per Logical Volume (GB used per Logical Volume)	64 Logical Volumes GB per Logical Volume (GB used per Logical Volume)	16 Logical Volumes GB per Logical Volume (GB used per Logical Volume)

The Data Protection Level used for all Logical Volumes was **Protected 2** using ***Mirroring*** as described on page 13. 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. An SPC-1 glossary on page 70 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.

"Ramp-Up" Test Runs

Clause 5.3.13

In order to warm-up caches or perform the initial ASU data migration in a multi-tier configuration, a Test Sponsor may perform a series of "Ramp-Up" Test Runs as a substitute for an initial, gradual Ramp-Up.

Clause 5.3.13.3

The "Ramp-Up" Test Runs will immediately precede the Primary Metrics Test as part of the uninterrupted SPC-1 measurement sequence.

Clause 9.4.3.7.1

If a series of "Ramp-Up" Test Runs were included in the SPC-1 measurement sequence, the FDR shall report the duration (ramp-up and measurement interval), BSU level, SPC-1 IOPS and average response time for each "Ramp-Up" Test Run in an appropriate table.

	BSU Level	Duration *(Minutes)*	IOPS	Response Time *(ms)*
Test Run 1	5,030	120	251,511.12	10.69
Test Run 2	10,060	240	503,008.82	2.69
Test Run 3	15,090	360	754,499.54	3.49

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 eight (8) 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 9.4.3.7.2

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 114.

Sustainability Test Results File

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

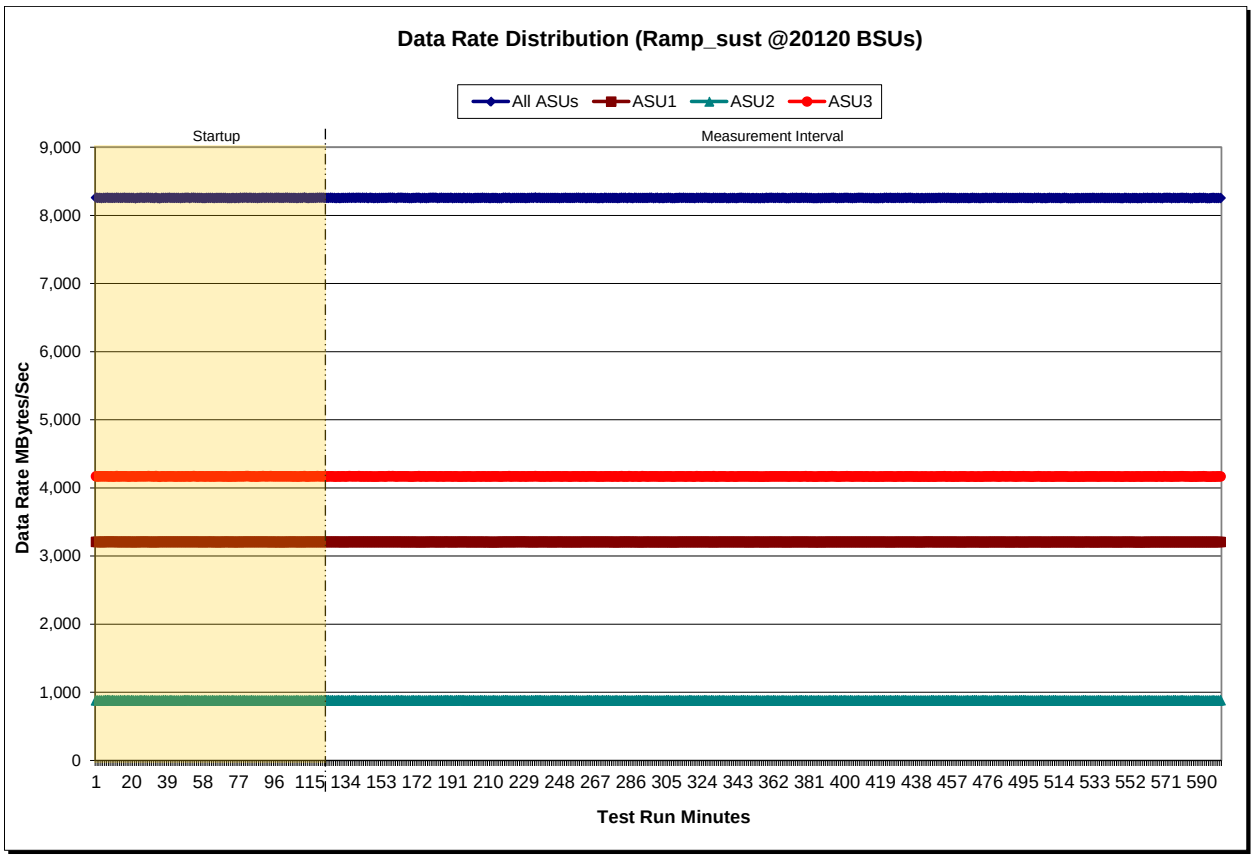
Sustainability Test Results File

Sustainability – Data Rate Distribution Data (MB/second)

The Sustainability Data Rate table of data is not embedded in this document due to its size. The table is available via the following URL:

Sustainability Data Rate Table

Sustainability – Data Rate Distribution Graph

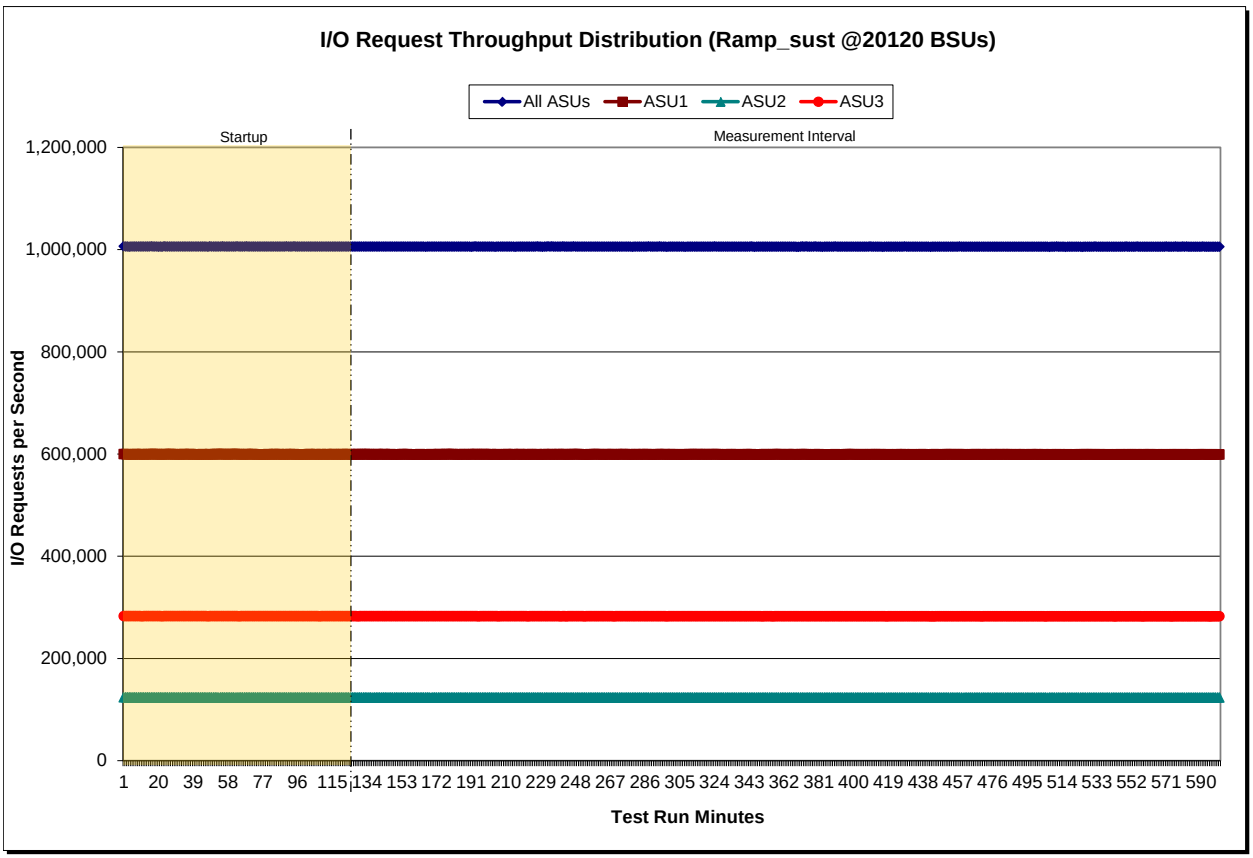


Sustainability – I/O Request Throughput Distribution Data

The Sustainability I/O Request Throughput table of data is not embedded in this document due to its size. The table is available via the following URL:

Sustainability I/O Request Throughput Table

Sustainability – I/O Request Throughput Distribution Graph

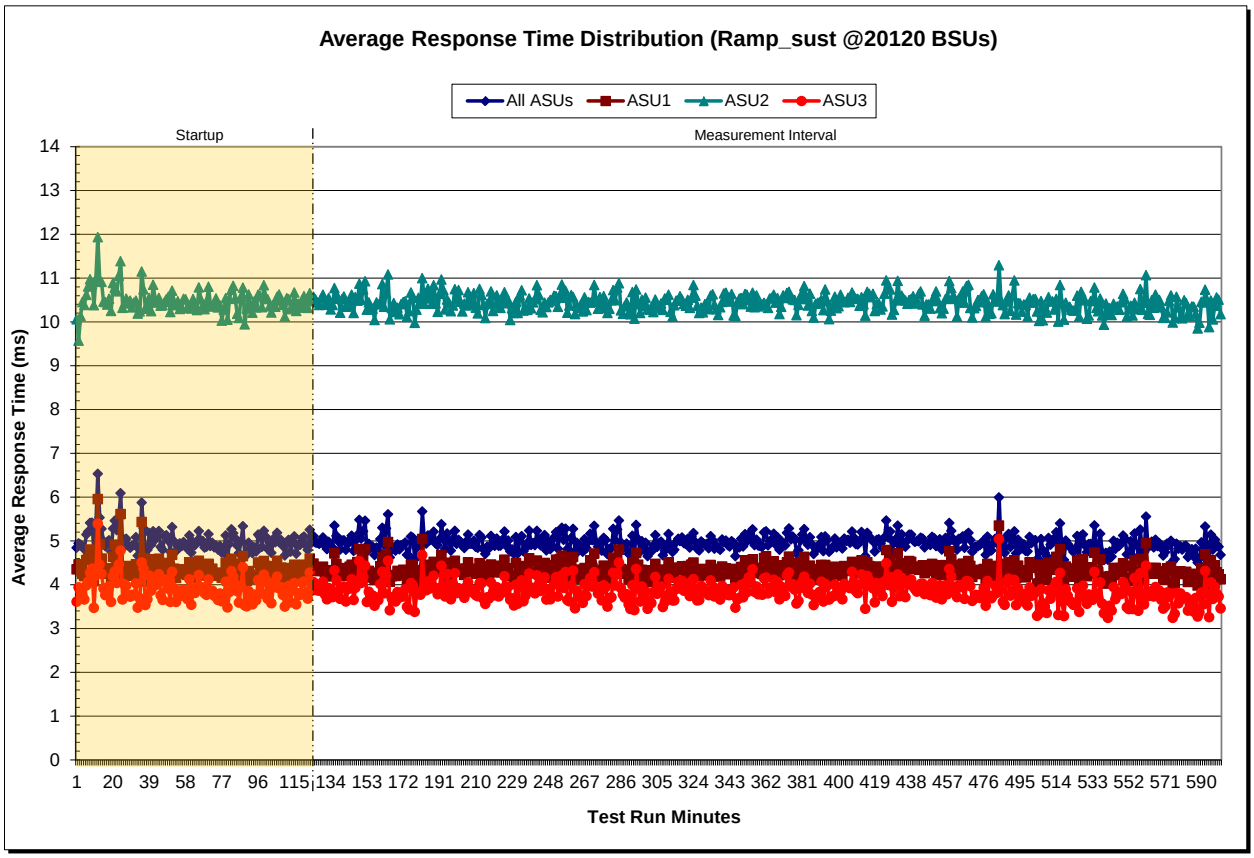


Sustainability – Average Response Time (ms) Distribution Data

The Sustainability Average Response Time table of data is not embedded in this document due to its size. The table is available via the following URL:

Sustainability Average Response Time Table

Sustainability – Average Response Time (ms) Distribution Graph



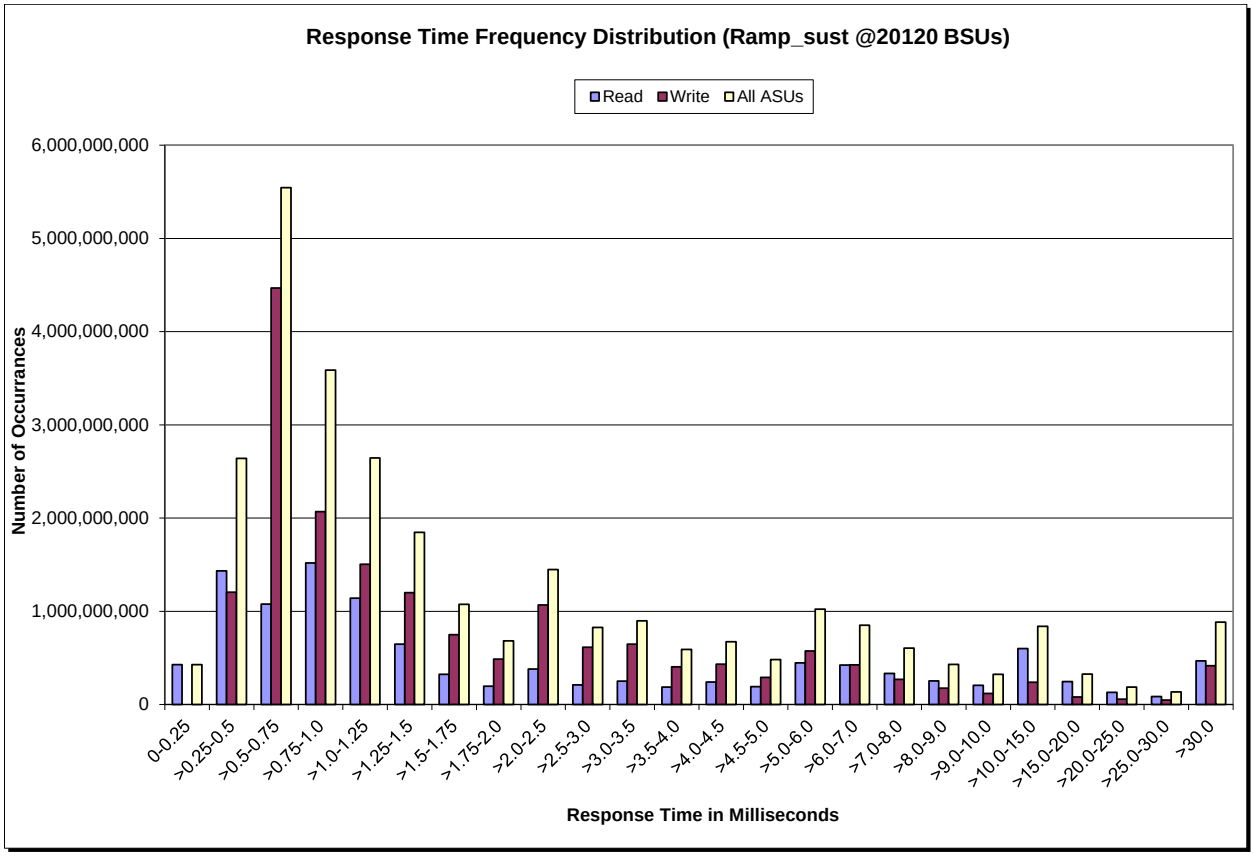
Sustainability – Response Time Frequency Distribution Data

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	428,755,828	1,434,699,419	1,076,321,856	1,519,091,370	1,140,212,406	647,807,733	325,134,329	196,105,703
Write	3	1,205,459,424	4,466,900,680	2,068,059,055	1,504,037,486	1,199,622,782	749,246,396	486,353,187
All ASUs	428,755,831	2,640,158,843	5,543,222,536	3,587,150,425	2,644,249,892	1,847,430,515	1,074,380,725	682,458,890
ASU1	358,451,579	1,725,957,191	3,028,635,436	2,348,948,164	1,739,289,430	1,137,691,663	635,521,596	397,951,526
ASU2	70,304,251	426,607,759	522,219,438	222,198,264	163,302,913	131,883,079	82,881,030	54,926,998
ASU3	1	487,593,893	1,992,367,662	1,016,003,997	741,657,549	577,855,773	355,978,099	229,580,366

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	380,347,749	211,465,422	250,455,745	187,995,760	241,472,338	190,990,025	447,697,806	424,085,756
Write	1,067,679,434	615,426,824	648,074,665	403,991,763	432,310,356	291,355,004	574,184,484	425,561,591
All ASUs	1,448,027,183	826,892,246	898,530,410	591,987,523	673,782,694	482,345,029	1,021,882,290	849,647,347
ASU1	818,478,793	454,780,741	485,678,196	316,587,241	359,499,807	257,671,698	548,029,918	468,157,018
ASU2	128,481,582	84,230,363	110,397,800	86,989,320	112,713,366	88,744,331	205,771,170	182,044,101
ASU3	501,066,808	287,881,142	302,454,414	188,410,962	201,569,521	135,929,000	268,081,202	199,446,228

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	334,418,625	253,628,276	207,026,906	599,675,333	245,232,510	129,853,322	86,194,738	468,069,522
Write	270,621,445	176,236,483	118,174,310	239,709,357	80,735,162	56,984,654	48,968,797	416,145,652
All ASUs	605,040,070	429,864,759	325,201,216	839,384,690	325,967,672	186,837,976	135,163,535	884,215,174
ASU1	349,499,279	258,524,309	201,499,956	549,686,127	213,615,641	113,041,586	76,493,587	423,890,641
ASU2	128,770,273	88,769,749	68,322,886	177,295,237	74,833,776	47,579,769	36,275,314	268,183,176
ASU3	126,770,518	82,570,701	55,378,374	112,403,326	37,518,255	26,216,621	22,394,634	192,141,357

Sustainability – Response Time Frequency Distribution Graph



Sustainability – Measured Intensity Multiplier and Coefficient of Variation

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 5.1.10 and 5.3.15.2

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 5.3.15.3

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

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

Primary Metrics Test – IOPS Test Phase

Clause 5.4.4.2

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 9.4.3.7.3

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 114.

IOPS Test Results File

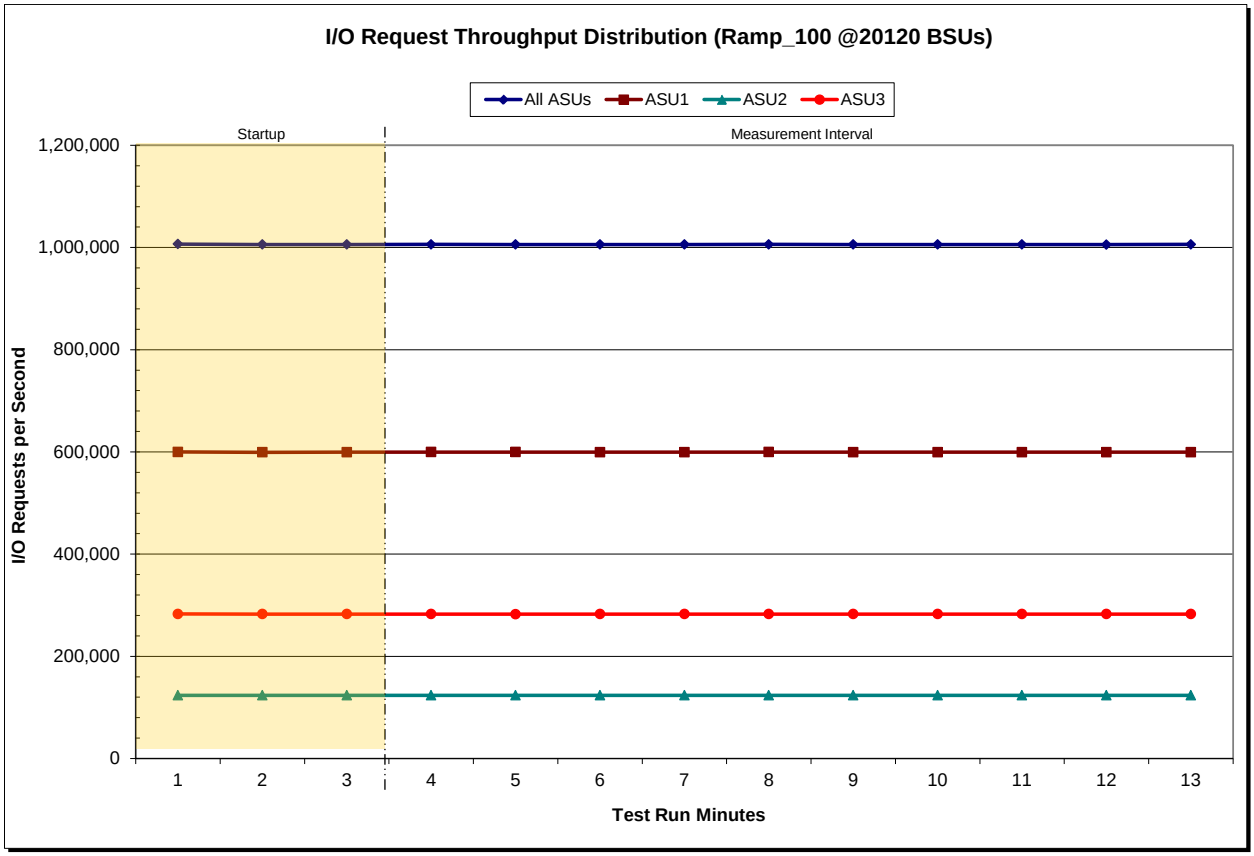
A link to the test results file generated from the IOPS Test Run is listed below.

IOPS Test Results File

IOPS Test Run – I/O Request Throughput Distribution Data

20,120 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	5:52:51	5:55:51	0-2	0:03:00
Measurement Interval	5:55:51	6:05:53	3-12	0:10:02
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	1,006,713.87	600,007.18	123,785.68	282,921.00
1	1,005,808.03	599,359.93	123,759.97	282,688.13
2	1,005,958.57	599,530.70	123,806.97	282,620.90
3	1,006,182.85	599,729.07	123,734.25	282,719.53
4	1,005,875.27	599,621.25	123,724.27	282,529.75
5	1,005,784.12	599,423.00	123,689.00	282,672.12
6	1,005,855.18	599,490.53	123,688.37	282,676.28
7	1,005,991.83	599,638.18	123,665.90	282,687.75
8	1,005,825.13	599,468.75	123,759.37	282,597.02
9	1,005,841.03	599,567.63	123,673.57	282,599.83
10	1,005,847.45	599,481.77	123,783.38	282,582.30
11	1,005,712.85	599,402.28	123,673.70	282,636.87
12	1,006,018.53	599,499.77	123,810.23	282,708.53
Average	***1,005,893.43***	***599,532.22***	***123,720.20***	***282,641.00***

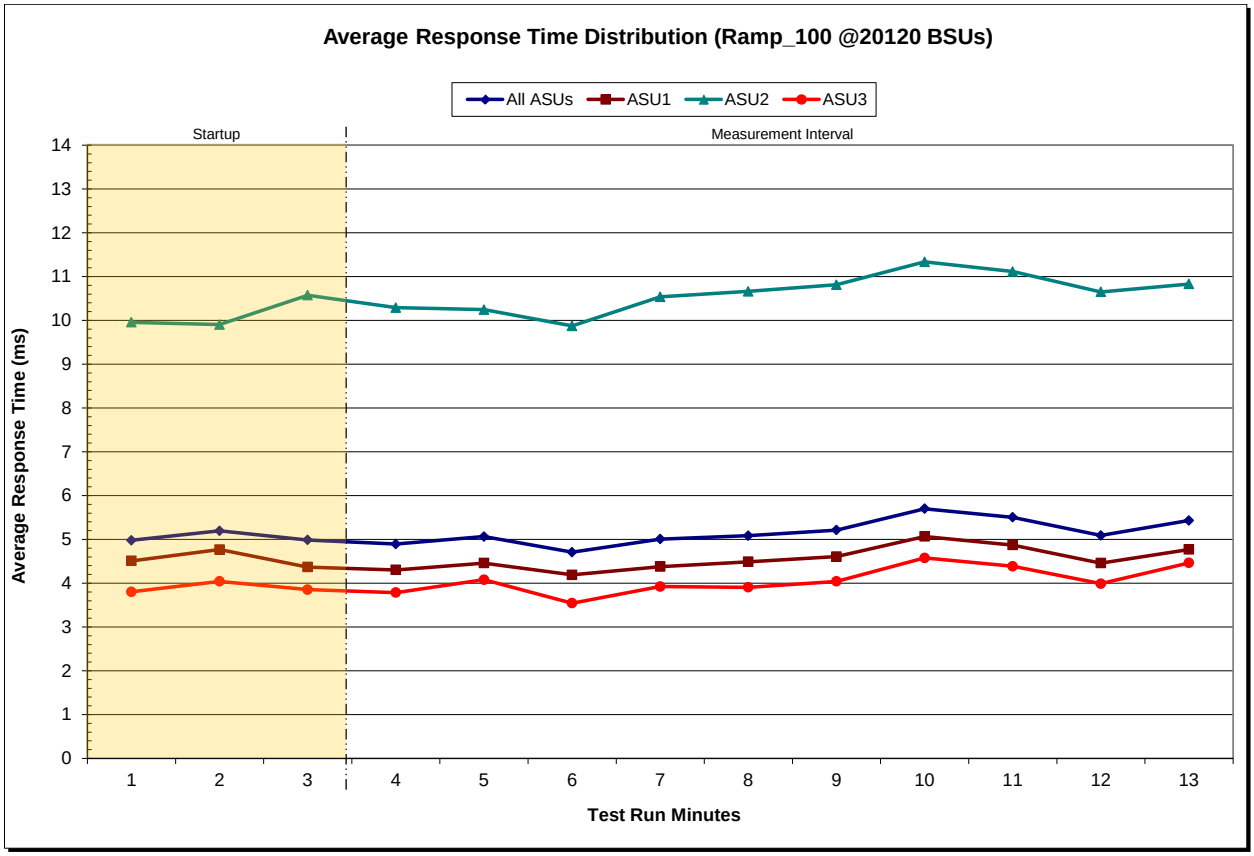
IOPS Test Run – I/O Request Throughput Distribution Graph



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

20,120 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	5:52:51	5:55:51	0-2	0:03:00
Measurement Interval	5:55:51	6:05:53	3-12	0:10:02
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	4.98	4.51	9.96	3.80
1	5.20	4.77	9.90	4.04
2	4.99	4.37	10.57	3.85
3	4.89	4.30	10.29	3.79
4	5.06	4.46	10.25	4.08
5	4.71	4.19	9.87	3.54
6	5.01	4.38	10.54	3.92
7	5.08	4.49	10.66	3.91
8	5.21	4.61	10.81	4.04
9	5.70	5.07	11.33	4.58
10	5.50	4.87	11.12	4.39
11	5.09	4.46	10.65	3.99
12	5.43	4.77	10.83	4.46
Average	***5.17***	***4.56***	***10.64***	***4.07***

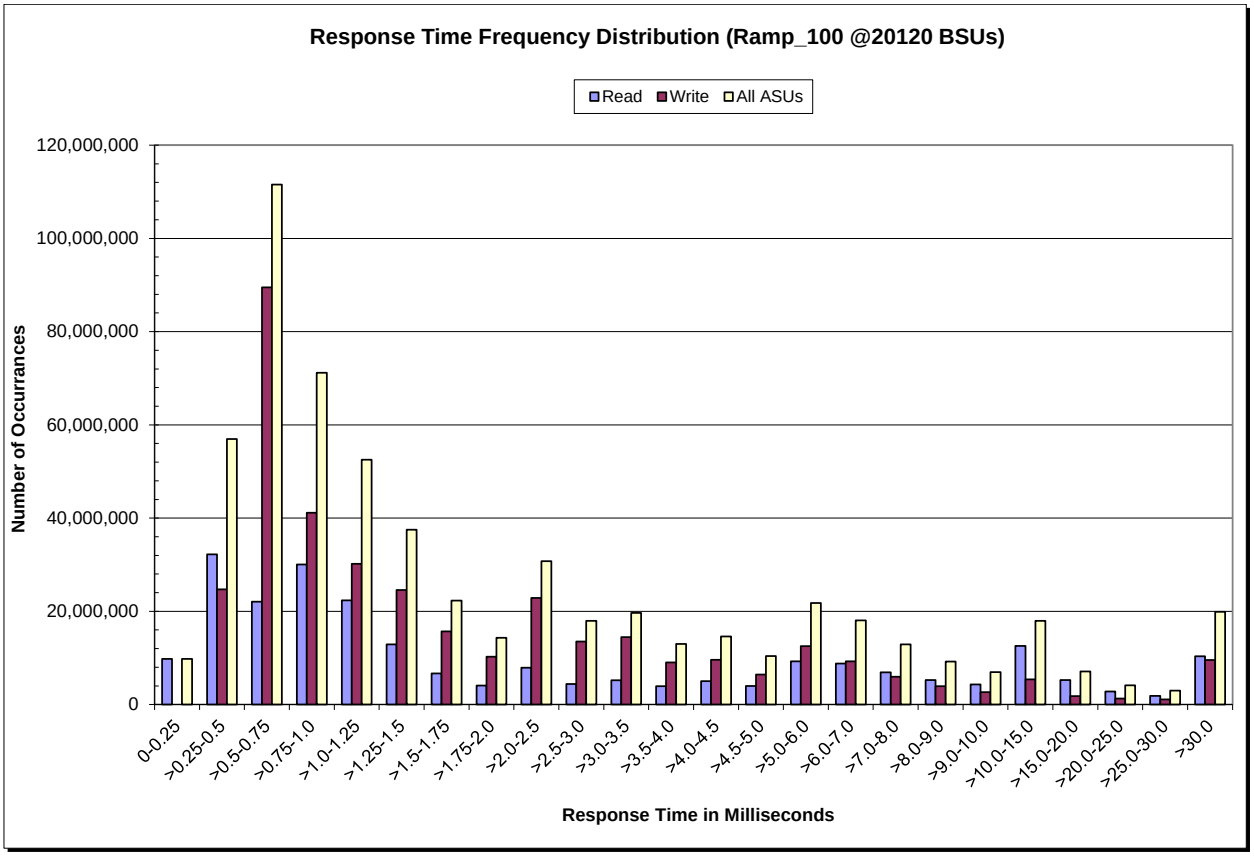
IOPS Test Run – Average Response Time (ms) Distribution Graph



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	9,807,945	32,240,073	22,087,238	30,042,013	22,332,046	12,924,031	6,653,210	4,053,231
Write	0	24,708,492	89,477,843	41,143,363	30,188,916	24,592,407	15,668,450	10,273,418
All ASUs	9,807,945	56,948,565	111,565,081	71,185,376	52,520,962	37,516,438	22,321,660	14,326,649
ASU1	8,341,471	38,151,824	61,050,253	46,476,628	34,349,502	22,986,317	13,157,404	8,326,977
ASU2	1,466,474	8,804,403	10,501,479	4,449,213	3,295,230	2,708,722	1,736,198	1,159,322
ASU3	0	9,992,338	40,013,349	20,259,535	14,876,230	11,821,399	7,428,058	4,840,350
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	7,895,830	4,428,888	5,231,933	3,938,791	5,015,020	3,970,302	9,268,323	8,776,219
Write	22,866,174	13,535,254	14,444,718	9,041,377	9,593,156	6,450,690	12,511,264	9,253,180
All ASUs	30,762,004	17,964,142	19,676,651	12,980,168	14,608,176	10,420,992	21,779,587	18,029,399
ASU1	17,318,828	9,820,154	10,570,467	6,900,465	7,749,788	5,537,614	11,625,069	9,886,361
ASU2	2,739,606	1,827,262	2,389,419	1,870,635	2,392,308	1,878,200	4,317,911	3,811,675
ASU3	10,703,570	6,316,726	6,716,765	4,209,068	4,466,080	3,005,178	5,836,607	4,331,363
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	6,930,159	5,269,633	4,308,370	12,589,372	5,250,680	2,818,087	1,872,108	10,338,851
Write	5,964,732	3,938,060	2,657,954	5,392,366	1,828,817	1,288,150	1,108,141	9,562,722
All ASUs	12,894,891	9,207,693	6,966,324	17,981,738	7,079,497	4,106,237	2,980,249	19,901,573
ASU1	7,399,710	5,490,249	4,278,896	11,715,888	4,651,415	2,506,775	1,704,316	9,720,685
ASU2	2,706,618	1,873,039	1,441,277	3,736,118	1,578,307	1,007,348	768,785	5,771,460
ASU3	2,788,563	1,844,405	1,246,151	2,529,732	849,775	592,114	507,148	4,409,428

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
603,631,997	583,630,424	19,901,573

IOPS Test Run – Measured Intensity Multiplier and Coefficient of Variation

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 5.1.10 and 5.3.15.2

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 5.3.15.3

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

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

Primary Metrics Test – Response Time Ramp Test Phase

Clause 5.4.4.3

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 18.

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 9.4.3.7.4

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 114.

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 table and graph for completeness.

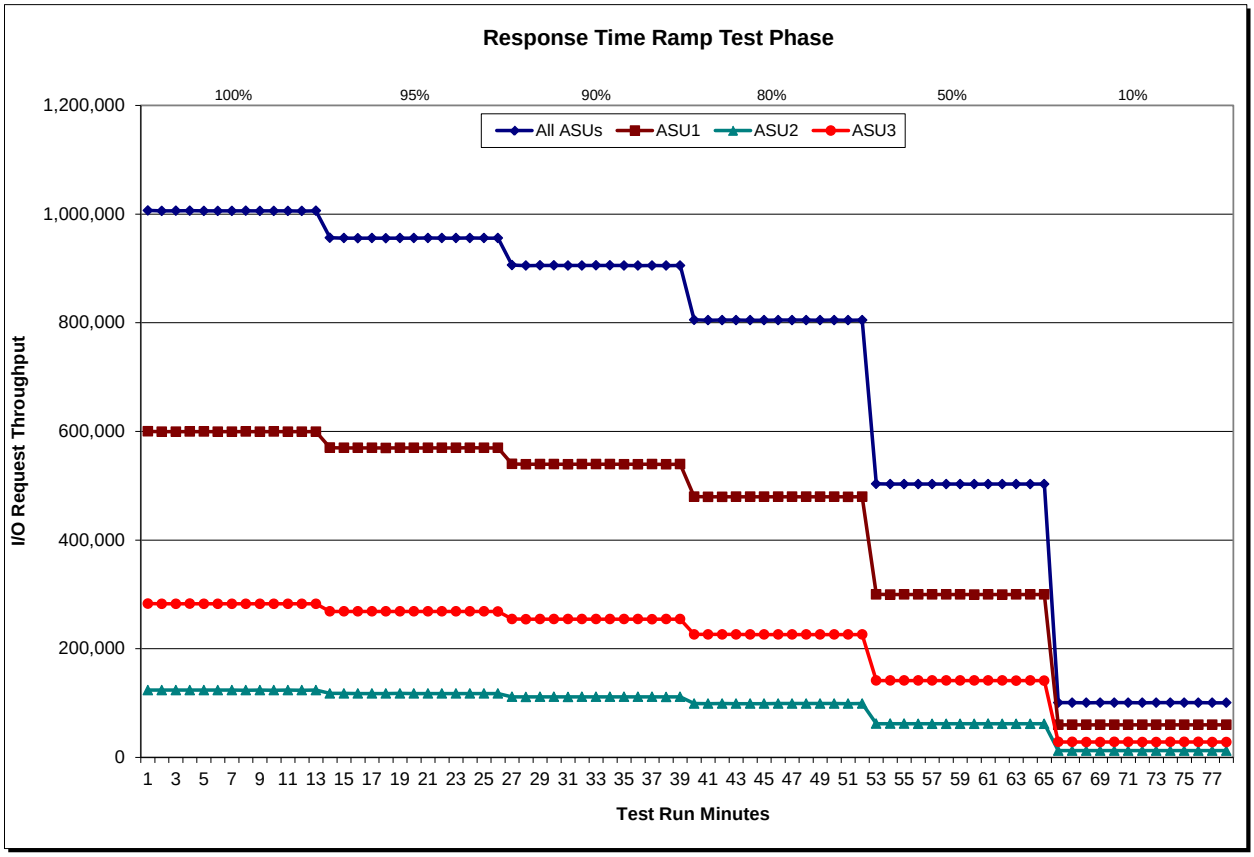
100% Load Level: 20,120 BSUs	Start	Stop	Interval	Duration	95% Load Level: 19,114 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	5:52:51	5:55:51	0-3	0:03:00	Start-Up/Ramp-Up	6:24:59	6:27:59	0-3	0:03:00
Measurement Interval	5:55:51	6:05:53	3-12	0:10:02	Measurement Interval	6:27:59	6:38:01	3-12	0:10:02
(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3	*(60 second intervals)*	All ASUs	ASU-1	ASU-2	ASU-3
0	1,006,713.87	600,007.18	123,785.68	282,921.00	0	956,513.53	570,167.28	117,665.38	268,680.87
1	1,005,808.03	599,359.93	123,759.97	282,688.13	1	955,753.00	569,601.48	117,609.55	268,541.97
2	1,005,958.57	599,530.70	123,806.97	282,620.90	2	955,695.32	569,611.60	117,535.98	268,547.73
3	1,006,182.85	599,729.07	123,734.25	282,719.53	3	955,839.78	569,741.58	117,566.47	268,531.73
4	1,005,875.27	599,621.25	123,724.27	282,529.75	4	955,608.62	569,468.18	117,587.28	268,553.15
5	1,005,784.12	599,423.00	123,689.00	282,672.12	5	955,889.03	569,711.05	117,635.10	268,542.88
6	1,005,855.18	599,490.53	123,688.37	282,676.28	6	955,747.57	569,611.73	117,549.17	268,586.67
7	1,005,991.83	599,638.18	123,665.90	282,687.75	7	955,935.53	569,748.68	117,512.87	268,673.98
8	1,005,825.13	599,468.75	123,759.37	282,597.02	8	955,824.68	569,704.60	117,555.83	268,564.25
9	1,005,841.03	599,567.63	123,673.57	282,599.83	9	955,708.55	569,634.23	117,535.40	268,538.92
10	1,005,847.45	599,481.77	123,783.38	282,582.30	10	955,942.65	569,801.30	117,562.92	268,578.43
11	1,005,712.85	599,402.28	123,673.70	282,636.87	11	955,814.05	569,701.58	117,559.30	268,553.17
12	1,006,018.53	599,499.77	123,810.23	282,708.53	12	955,833.60	569,771.38	117,555.88	268,506.33
Average	***1,005,893.43***	***599,532.22***	***123,720.20***	***282,641.00***	***Average***	***955,814.41***	***569,689.43***	***117,562.02***	***268,562.95***
90% Load Level: 18,108 BSUs	**Start**	**Stop**	**Interval**	**Duration**	**80% Load Level: 16,096 BSUs**	**Start**	**Stop**	**Interval**	**Duration**
Start-Up/Ramp-Up	6:56:55	6:59:55	0-3	0:03:00	Start-Up/Ramp-Up	7:28:02	7:31:02	0-3	0:03:00
Measurement Interval	6:59:55	7:09:57	3-12	0:10:02	Measurement Interval	7:31:02	7:41:04	3-12	0:10:02
(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3	*(60 second intervals)*	All ASUs	ASU-1	ASU-2	ASU-3
0	906,146.40	540,100.60	111,385.25	254,660.55	0	805,270.65	479,925.42	99,095.97	226,249.27
1	905,133.35	539,473.08	111,310.60	254,349.67	1	804,732.38	479,567.77	98,957.25	226,207.37
2	905,509.00	539,678.42	111,435.75	254,394.83	2	804,815.88	479,603.13	99,011.43	226,201.32
3	905,588.30	539,764.22	111,327.80	254,496.28	3	804,886.68	479,689.10	98,940.52	226,257.07
4	905,274.68	539,511.33	111,311.95	254,451.40	4	804,745.13	479,679.50	98,892.17	226,173.47
5	905,412.22	539,691.15	111,350.90	254,370.17	5	804,736.32	479,634.43	98,926.52	226,175.37
6	905,465.77	539,617.27	111,374.17	254,474.33	6	804,817.63	479,660.45	99,093.60	226,063.58
7	905,575.17	539,641.40	111,460.62	254,473.15	7	804,824.57	479,725.00	98,989.73	226,109.83
8	905,374.02	539,579.18	111,352.37	254,442.47	8	804,805.55	479,646.40	98,981.20	226,177.95
9	905,248.37	539,478.70	111,328.92	254,440.75	9	804,720.62	479,635.75	98,991.35	226,093.52
10	905,384.77	539,673.15	111,388.95	254,322.67	10	804,836.67	479,708.82	98,978.40	226,149.45
11	905,113.97	539,381.82	111,305.55	254,426.60	11	804,698.53	479,612.30	98,945.08	226,141.15
12	905,365.08	539,610.35	111,378.38	254,376.35	12	804,801.03	479,677.48	98,988.78	226,134.77
Average	***905,380.23***	***539,594.86***	***111,357.96***	***254,427.42***	***Average***	***804,787.27***	***479,666.92***	***98,972.74***	***226,147.62***

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

50% Load Level: 10,060 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	7:58:42	8:01:42	0-3	0:03:00
Measurement Interval	8:01:42	8:11:43	3-12	0:10:01
(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	503,381.63	299,986.72	61,914.35	141,480.57
1	502,925.50	299,669.03	61,899.45	141,357.02
2	503,109.93	299,837.40	61,896.88	141,375.65
3	503,031.12	299,797.25	61,823.27	141,410.60
4	502,928.88	299,776.05	61,803.18	141,349.65
5	502,946.47	299,752.77	61,861.43	141,332.27
6	502,957.85	299,739.02	61,886.80	141,332.03
7	502,869.00	299,697.47	61,848.03	141,323.50
8	503,033.03	299,764.60	61,932.87	141,335.57
9	502,944.28	299,729.30	61,876.85	141,338.13
10	502,977.53	299,799.22	61,878.72	141,299.60
11	502,992.48	299,775.85	61,874.38	141,342.25
12	502,976.38	299,825.17	61,847.03	141,304.18
Average	***502,965.70***	***299,765.67***	***61,863.26***	***141,336.78***

10% Load Level: 2,012 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	8:28:28	8:31:28	0-3	0:03:00
Measurement Interval	8:31:28	8:41:29	3-12	0:10:01
(60 second intervals)	All ASUs	ASU-1	ASU-2	ASU-3
0	100,670.17	60,003.38	12,401.82	28,264.97
1	100,619.85	59,953.92	12,392.38	28,273.55
2	100,579.07	59,937.53	12,387.03	28,254.50
3	100,606.72	60,004.37	12,343.57	28,258.78
4	100,588.40	59,941.83	12,368.93	28,277.63
5	100,651.73	60,000.05	12,377.87	28,273.82
6	100,535.92	59,922.57	12,379.85	28,233.50
7	100,596.63	59,971.47	12,402.15	28,223.02
8	100,671.50	59,989.63	12,380.48	28,301.38
9	100,617.18	59,971.92	12,381.23	28,264.03
10	100,611.87	59,957.43	12,380.18	28,274.25
11	100,535.70	59,900.95	12,382.57	28,252.18
12	100,539.65	59,938.67	12,348.13	28,252.85
Average	***100,595.53***	***59,959.89***	***12,374.50***	***28,261.15***

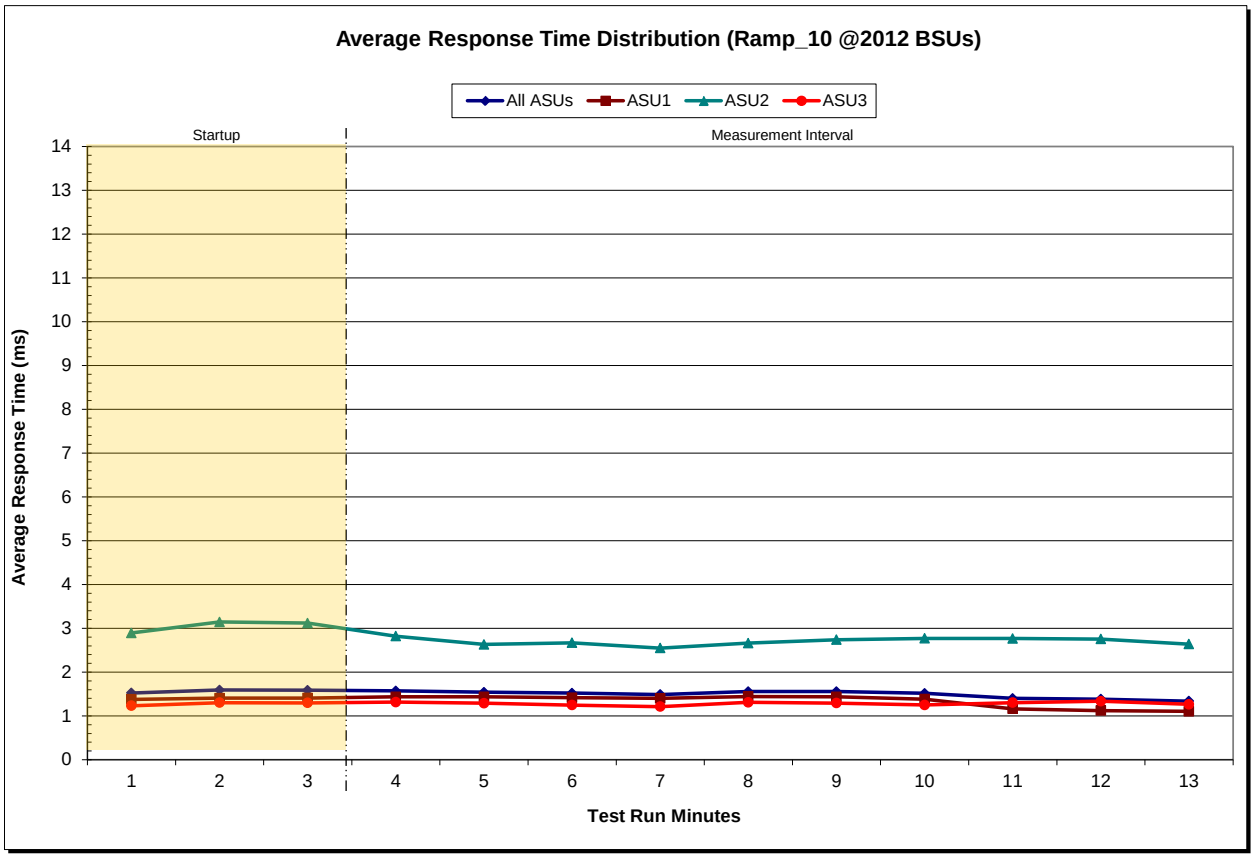
Response Time Ramp Distribution (IOPS) Graph



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

2,012 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	8:28:28	8:31:28	0-2	0:03:00
Measurement Interval	8:31:28	8:41:29	3-12	0:10:01
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	1.52	1.38	2.89	1.23
1	1.59	1.41	3.14	1.30
2	1.59	1.41	3.12	1.30
3	1.57	1.44	2.82	1.32
4	1.54	1.44	2.63	1.29
5	1.52	1.41	2.67	1.25
6	1.49	1.40	2.55	1.21
7	1.56	1.44	2.66	1.31
8	1.56	1.44	2.74	1.29
9	1.52	1.38	2.77	1.25
10	1.40	1.16	2.77	1.30
11	1.38	1.12	2.75	1.34
12	1.34	1.10	2.64	1.27
Average	***1.49***	***1.33***	***2.70***	***1.28***

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



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

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 5.1.10 and 5.3.15.2

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 5.3.15.3

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

	ASU1-1	ASU1-2	ASU1-3	ASU1-4	ASU2-1	ASU2-2	ASU2-3	ASU3-1
IM	***0.0350***	***0.2810***	***0.0700***	***0.2100***	***0.0180***	***0.0700***	***0.0350***	***0.2810***
MIM	0.0350	0.2811	0.0700	0.2100	0.0180	0.0700	0.0350	0.2809
COV	0.002	0.001	0.001	0.001	0.003	0.001	0.003	0.001

Repeatability Test

Clause 5.4.5

The Repeatability Test demonstrates the repeatability and reproducibility of the SPC-1 IOPS™ primary metric and the 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% or less than the SPC-1 LRT™ metric plus one (1) millisecond (ms).

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 9.4.3.7.5

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 114.

Repeatability Test Results File

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

	SPC-1 IOPS™
Primary Metrics	***1,005,89343***
Repeatability Test Phase 1	1,005,910.14
Repeatability Test Phase 2	1,006,016.78

The SPC-1 IOPS™ values in the above table were generated using 100% of the specified Business Scaling Unit (BSU) load level. Each of the Repeatability Test Phase values for SPC-1 IOPS™ must greater than 95% of the reported SPC-1 IOPS™ Primary Metric.

	SPC-1 LRT™
Primary Metrics	***1.49 ms***
Repeatability Test Phase 1	1.51 ms
Repeatability Test Phase 2	1.55 ms

The average response time values in the SPC-1 LRT™ column were generated using 10% of the specified Business Scaling Unit (BSU) load level. Each of the Repeatability Test Phase values for SPC-1 LRT™ must be less than 105% of the reported SPC-1 LRT™ Primary Metric or less than the reported SPC-1 LRT™ Primary Metric plus one (1) millisecond (ms).

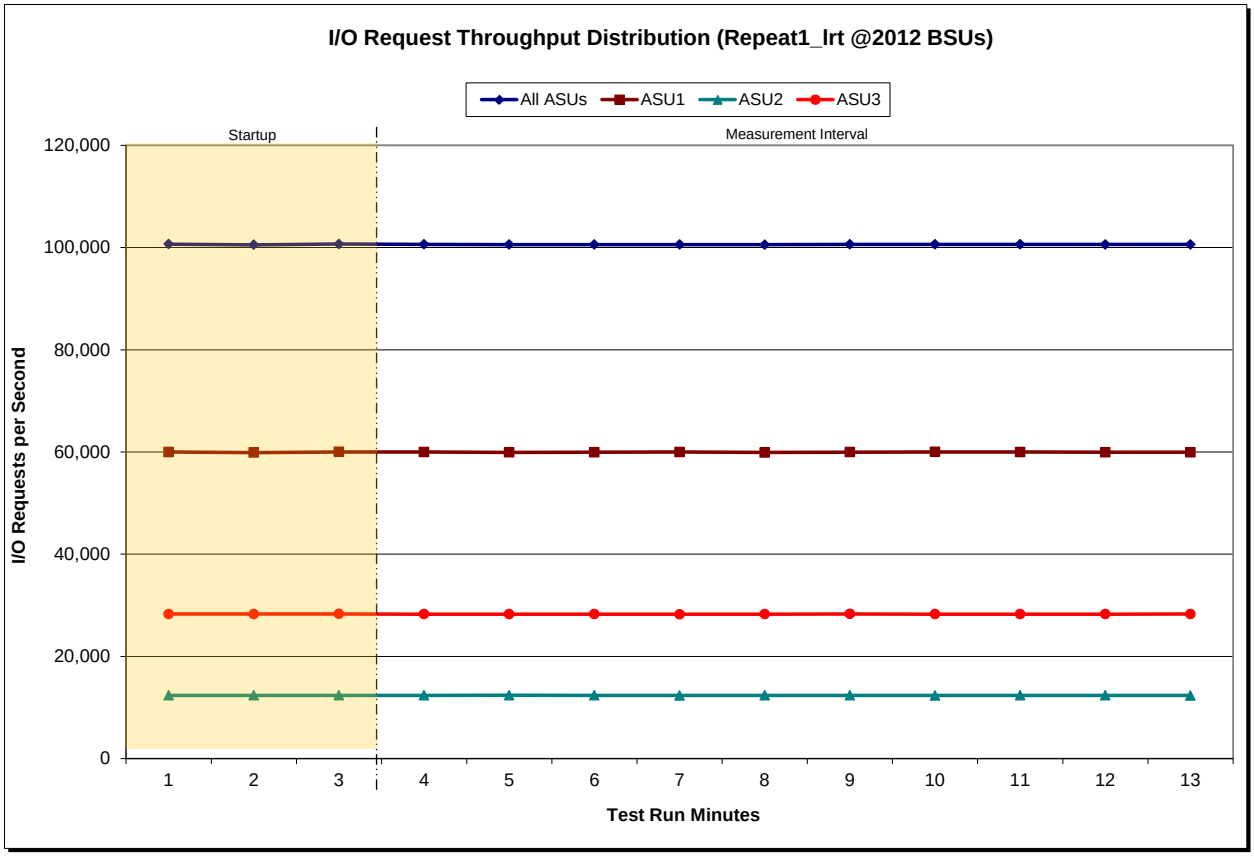
A link to the test result file generated from each Repeatability Test Run is listed below.

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

2,012 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	8:57:43	9:00:43	0-2	0:03:00
Measurement Interval	9:00:43	9:10:44	3-12	0:10:01
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	100,665.72	59,997.95	12,368.10	28,299.67
1	100,545.93	59,892.55	12,366.92	28,286.47
2	100,689.43	60,005.68	12,371.90	28,311.85
3	100,618.95	59,987.42	12,370.55	28,260.98
4	100,585.57	59,927.90	12,387.03	28,270.63
5	100,597.00	59,952.47	12,379.42	28,265.12
6	100,593.23	59,982.40	12,362.63	28,248.20
7	100,558.67	59,910.47	12,383.05	28,265.15
8	100,635.52	59,964.48	12,369.42	28,301.62
9	100,637.67	60,009.17	12,359.75	28,268.75
10	100,629.00	59,983.72	12,375.40	28,269.88
11	100,600.35	59,953.00	12,375.05	28,272.30
12	100,603.93	59,956.20	12,357.67	28,290.07
Average	***100,605.99***	***59,962.72***	***12,372.00***	***28,271.27***

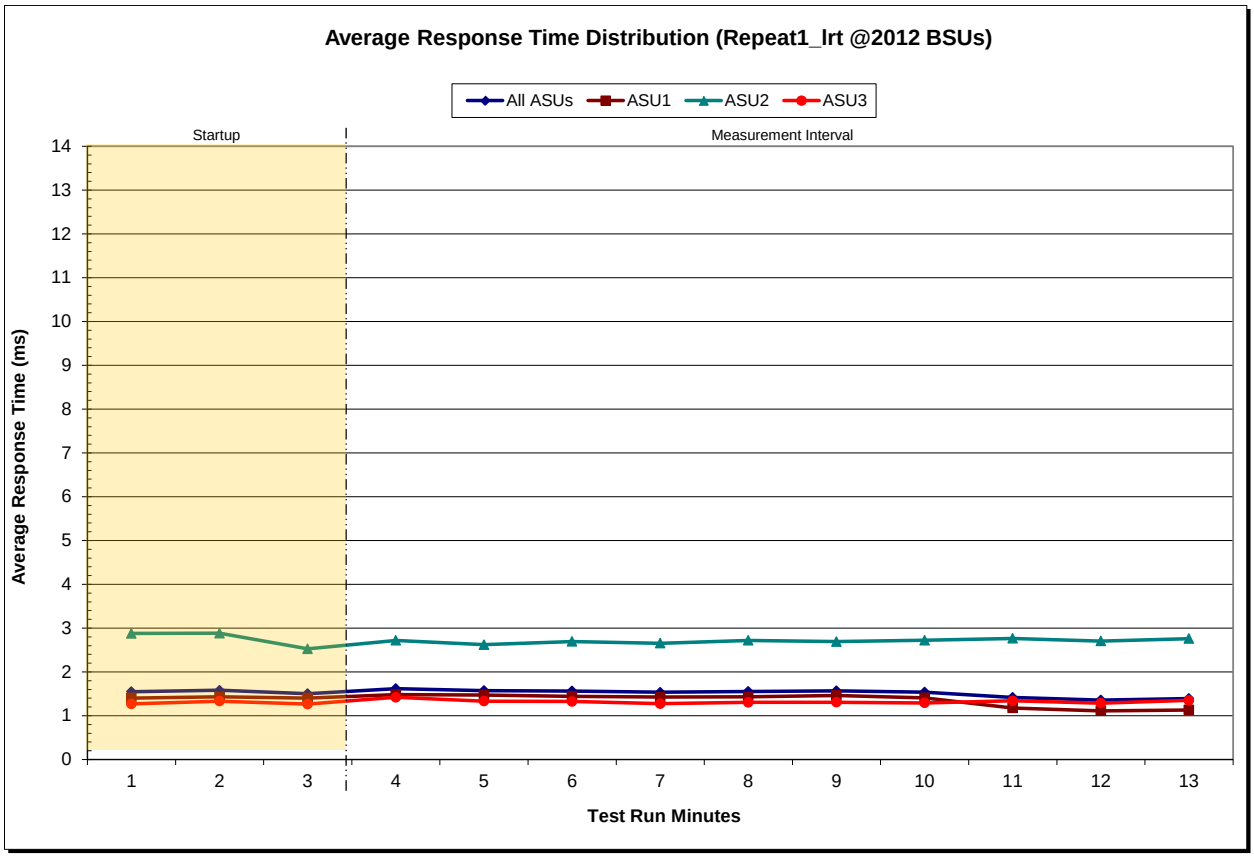
Repeatability 1 LRT – I/O Request Throughput Distribution Graph



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

2,012 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	8:57:43	9:00:43	0-2	0:03:00
Measurement Interval	9:00:43	9:10:44	3-12	0:10:01
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	1.55	1.40	2.88	1.27
1	1.58	1.43	2.88	1.33
2	1.50	1.40	2.53	1.27
3	1.62	1.48	2.72	1.42
4	1.57	1.47	2.62	1.33
5	1.56	1.44	2.69	1.32
6	1.54	1.43	2.65	1.28
7	1.55	1.43	2.72	1.31
8	1.57	1.46	2.69	1.31
9	1.54	1.41	2.72	1.29
10	1.42	1.18	2.76	1.34
11	1.36	1.11	2.70	1.29
12	1.39	1.13	2.76	1.35
Average	***1.51***	***1.36***	***2.71***	***1.32***

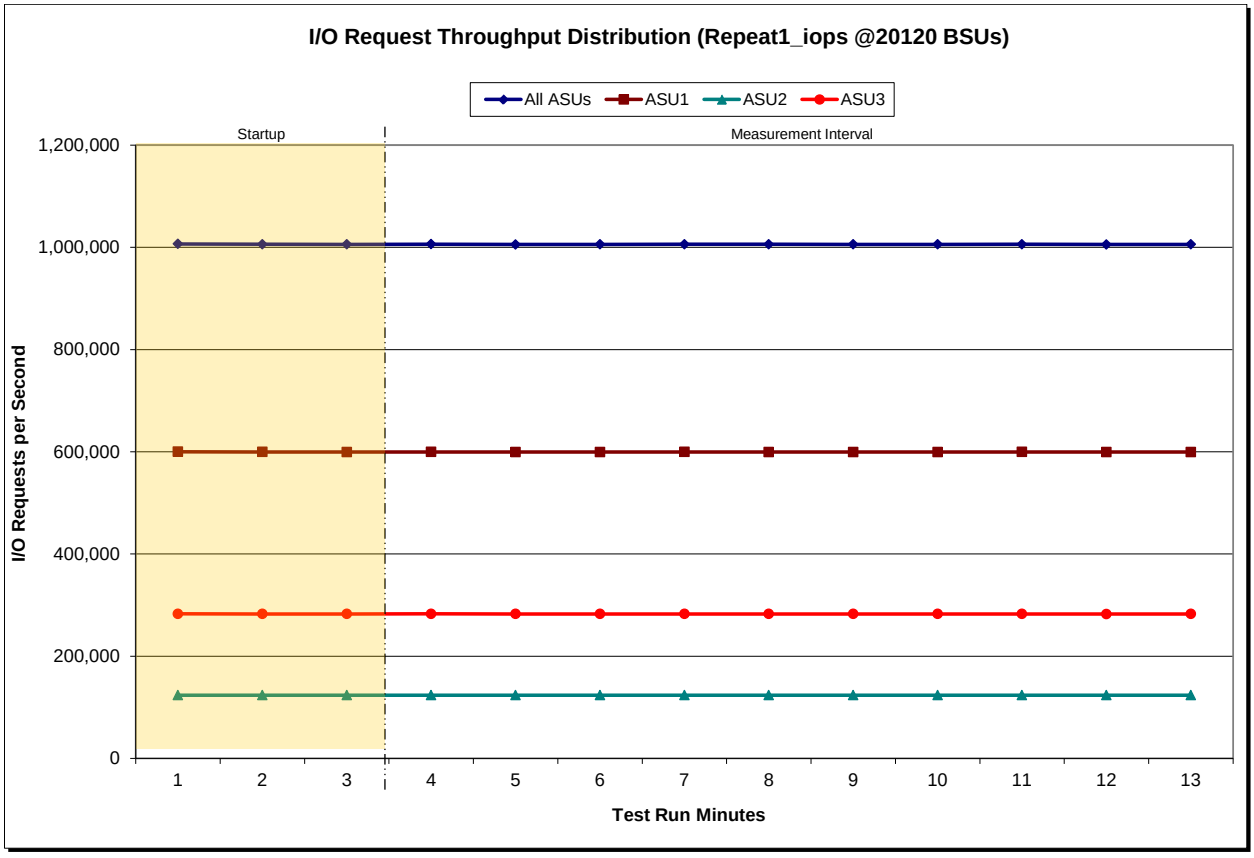
Repeatability 1 LRT –Average Response Time (ms) Distribution Graph



Repeatability 1 IOPS – I/O Request Throughput Distribution Data

20,120 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	9:29:28	9:32:29	0-2	0:03:01
Measurement Interval	9:32:29	9:42:31	3-12	0:10:02
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	1,006,783.50	600,077.63	123,789.23	282,916.63
1	1,006,135.23	599,645.92	123,760.95	282,728.37
2	1,005,926.08	599,470.62	123,833.58	282,621.88
3	1,006,225.42	599,657.02	123,783.05	282,785.35
4	1,005,711.88	599,372.72	123,674.92	282,664.25
5	1,005,920.77	599,477.57	123,787.42	282,655.78
6	1,006,012.77	599,647.35	123,766.93	282,598.48
7	1,006,013.67	599,544.53	123,693.07	282,776.07
8	1,005,868.98	599,511.67	123,677.80	282,679.52
9	1,005,864.68	599,503.17	123,697.00	282,664.52
10	1,006,005.33	599,639.12	123,704.80	282,661.42
11	1,005,658.28	599,482.62	123,677.13	282,498.53
12	1,005,819.60	599,495.52	123,720.60	282,603.48
Average	***1,005,910.14***	***599,533.13***	***123,718.27***	***282,658.74***

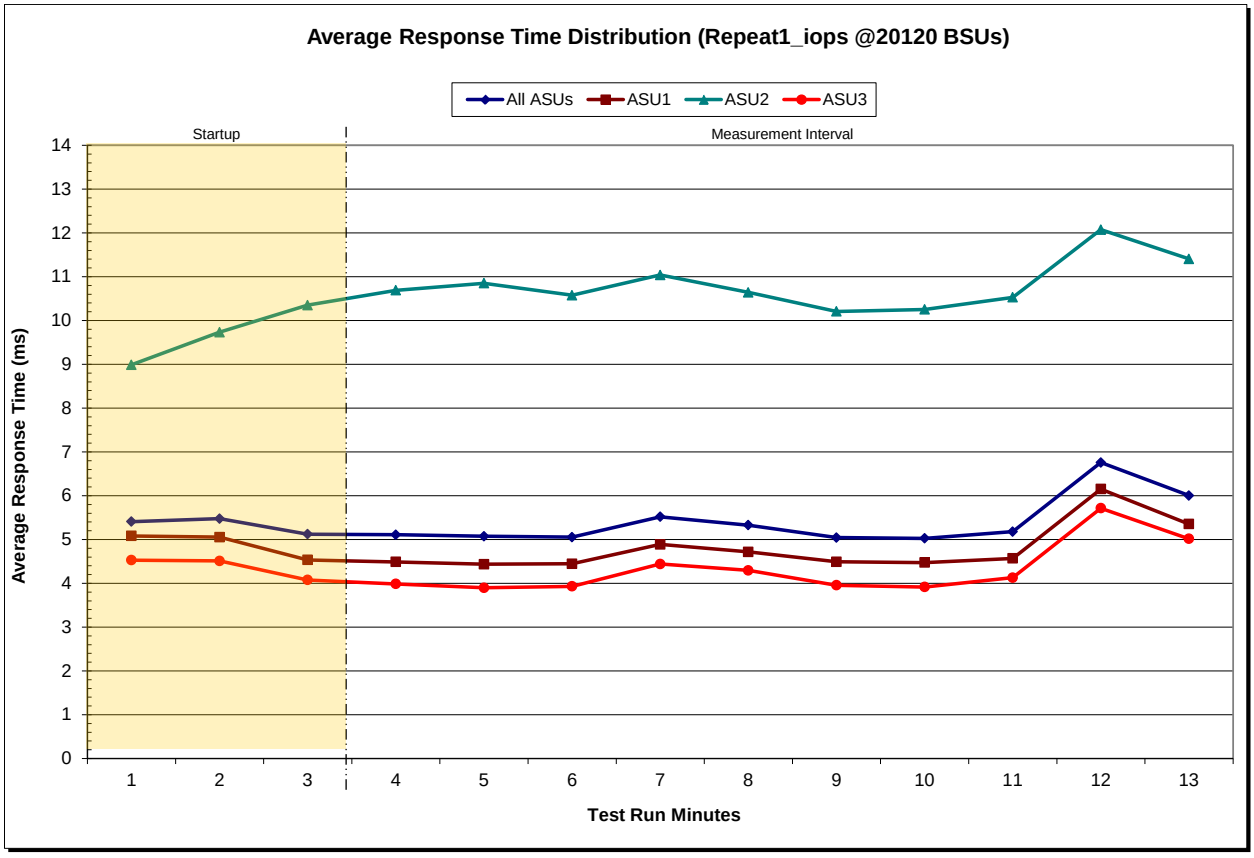
Repeatability 1 IOPS – I/O Request Throughput Distribution Graph



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

20,120 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	9:29:28	9:32:29	0-2	0:03:01
Measurement Interval	9:32:29	9:42:31	3-12	0:10:02
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	5.41	5.08	8.99	4.53
1	5.48	5.05	9.73	4.51
2	5.12	4.53	10.35	4.08
3	5.11	4.49	10.69	3.99
4	5.07	4.44	10.85	3.90
5	5.05	4.44	10.58	3.93
6	5.52	4.89	11.04	4.44
7	5.33	4.72	10.64	4.29
8	5.04	4.49	10.21	3.96
9	5.03	4.47	10.25	3.91
10	5.18	4.57	10.53	4.13
11	6.76	6.15	12.07	5.72
12	6.00	5.35	11.41	5.02
Average	***5.41***	***4.80***	***10.83***	***4.33***

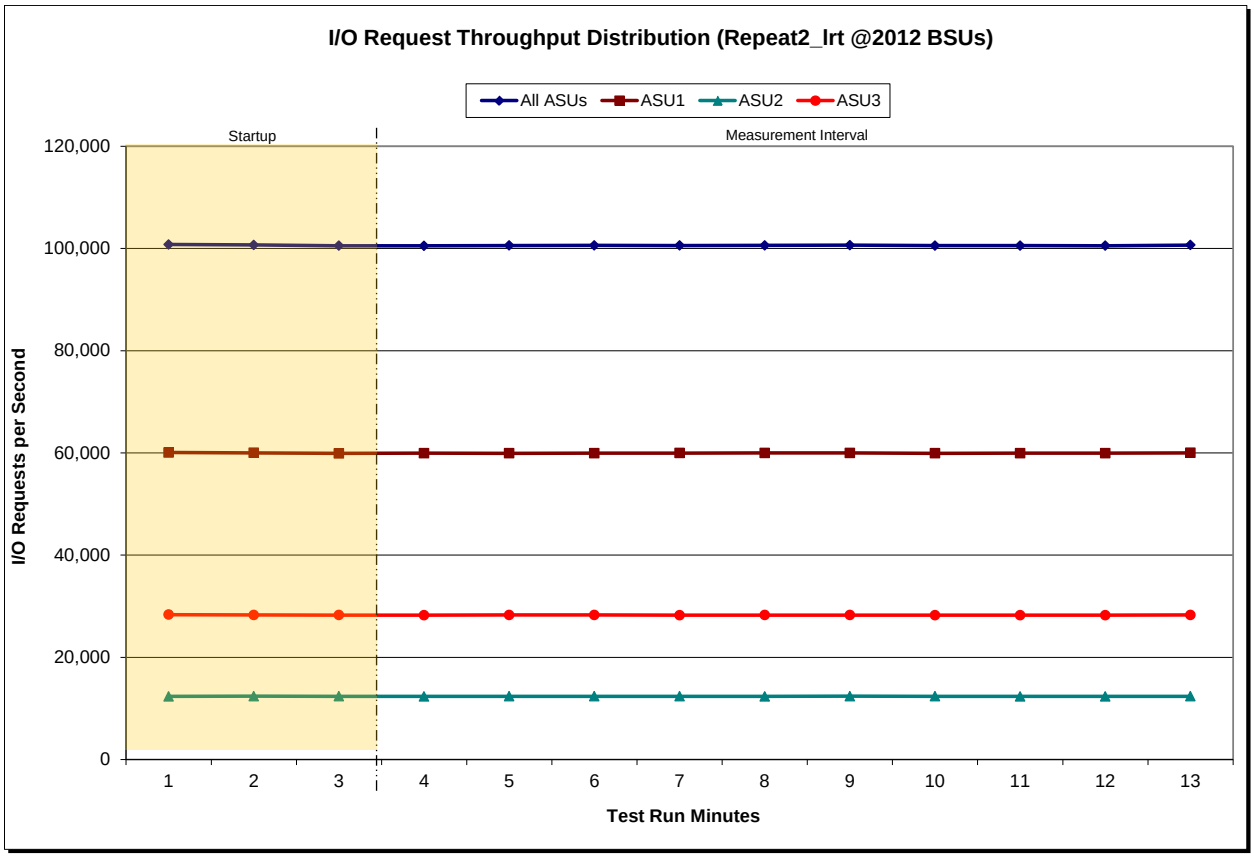
Repeatability 1 IOPS –Average Response Time (ms) Distribution Graph



Repeatability 2 LRT – I/O Request Throughput Distribution Data

2,012 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	9:58:41	10:01:41	0-2	0:03:00
Measurement Interval	10:01:41	10:11:42	3-12	0:10:01
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	100,772.82	60,067.40	12,359.80	28,345.62
1	100,689.68	60,011.75	12,391.83	28,286.10
2	100,552.37	59,913.20	12,379.05	28,260.12
3	100,530.07	59,949.88	12,342.32	28,237.87
4	100,577.13	59,926.20	12,366.93	28,284.00
5	100,609.72	59,952.73	12,377.40	28,279.58
6	100,580.03	59,963.30	12,380.22	28,236.52
7	100,610.53	59,979.90	12,353.88	28,276.75
8	100,655.83	59,988.25	12,400.32	28,267.27
9	100,566.28	59,935.78	12,384.18	28,246.32
10	100,559.32	59,955.67	12,362.28	28,241.37
11	100,549.12	59,939.22	12,356.58	28,253.32
12	100,670.18	60,010.77	12,368.87	28,290.55
Average	***100,590.82***	***59,960.17***	***12,369.30***	***28,261.35***

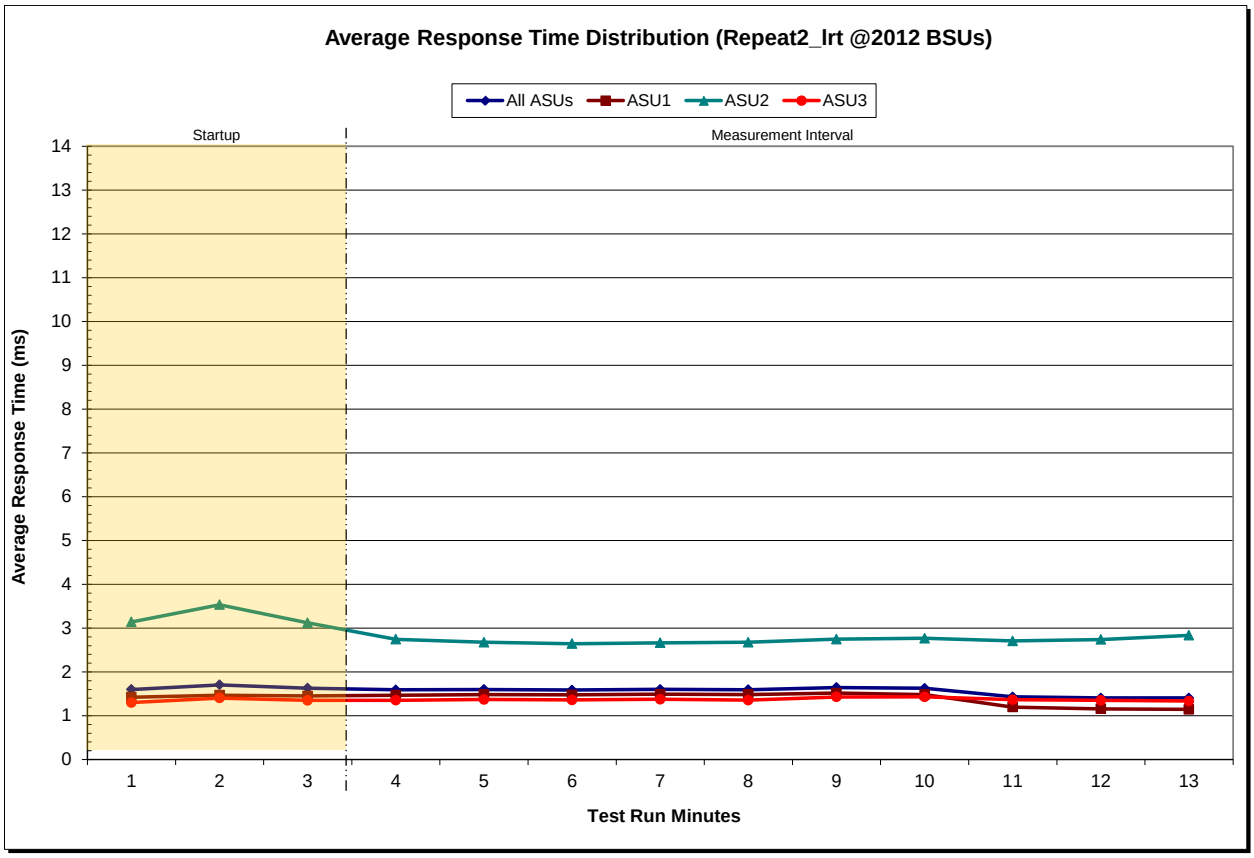
Repeatability 2 LRT – I/O Request Throughput Distribution Graph



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

2,012 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	9:58:41	10:01:41	0-2	0:03:00
Measurement Interval	10:01:41	10:11:42	3-12	0:10:01
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	1.60	1.42	3.14	1.30
1	1.70	1.47	3.53	1.40
2	1.63	1.45	3.12	1.35
3	1.59	1.47	2.74	1.35
4	1.60	1.48	2.68	1.37
5	1.59	1.48	2.65	1.36
6	1.60	1.49	2.67	1.37
7	1.59	1.48	2.68	1.36
8	1.64	1.52	2.75	1.43
9	1.63	1.48	2.77	1.43
10	1.43	1.20	2.71	1.37
11	1.41	1.16	2.74	1.35
12	1.41	1.14	2.83	1.34
Average	***1.55***	***1.39***	***2.72***	***1.37***

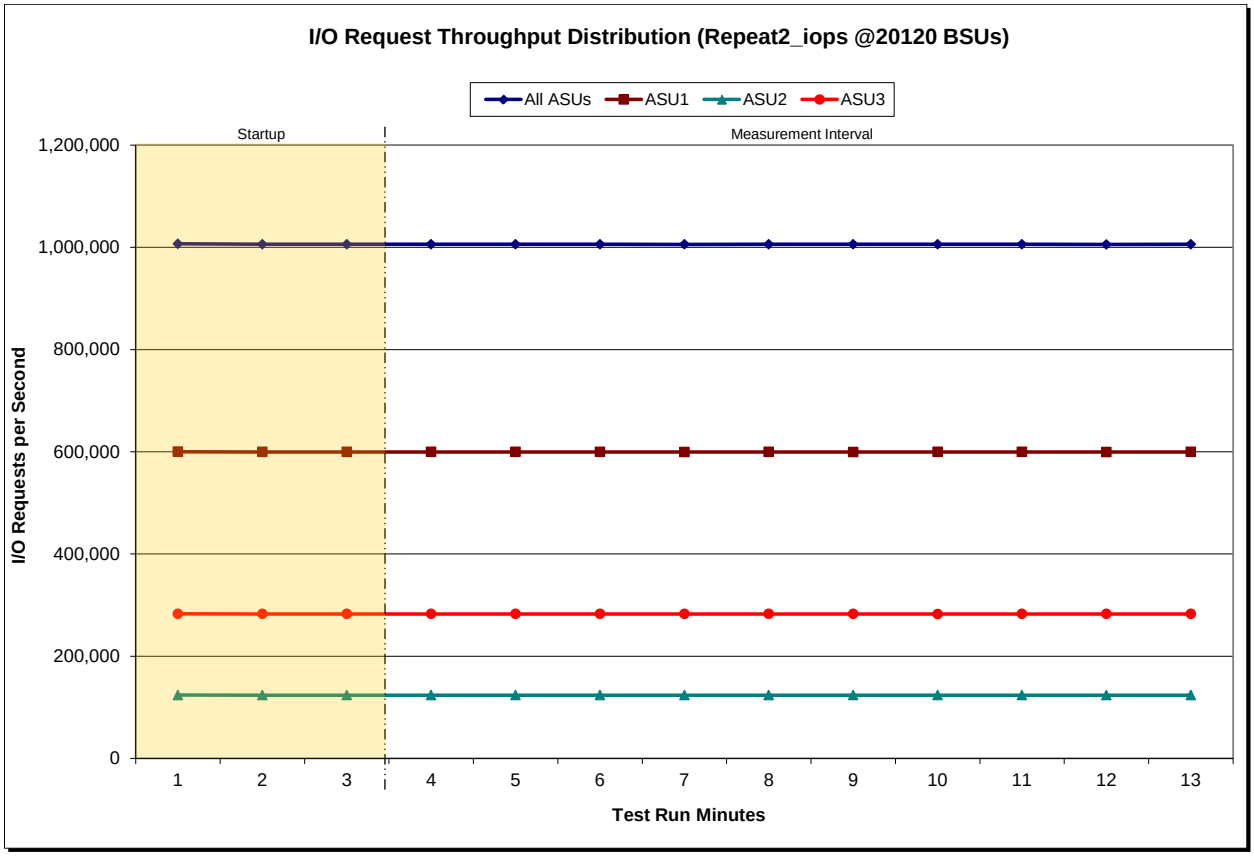
Repeatability 2 LRT –Average Response Time (ms) Distribution Graph



Repeatability 2 IOPS – I/O Request Throughput Distribution Data

2,012 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	10:30:30	10:33:31	0-2	0:03:01
Measurement Interval	10:33:31	10:43:33	3-12	0:10:02
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	1,006,956.12	600,094.47	123,873.23	282,988.42
1	1,006,009.07	599,597.53	123,777.07	282,634.47
2	1,006,092.02	599,710.95	123,774.92	282,606.15
3	1,006,122.87	599,769.25	123,637.63	282,715.98
4	1,006,008.43	599,608.20	123,709.50	282,690.73
5	1,006,107.07	599,665.33	123,804.85	282,636.88
6	1,005,849.42	599,476.28	123,744.05	282,629.08
7	1,006,162.08	599,739.42	123,734.17	282,688.50
8	1,006,026.43	599,551.22	123,698.03	282,777.18
9	1,005,973.05	599,662.18	123,754.63	282,556.23
10	1,006,123.10	599,721.00	123,658.62	282,743.48
11	1,005,734.65	599,399.15	123,670.77	282,664.73
12	1,006,060.72	599,625.72	123,743.77	282,691.23
Average	***1,006,016.78***	***599,621.78***	***123,715.60***	***282,679.41***

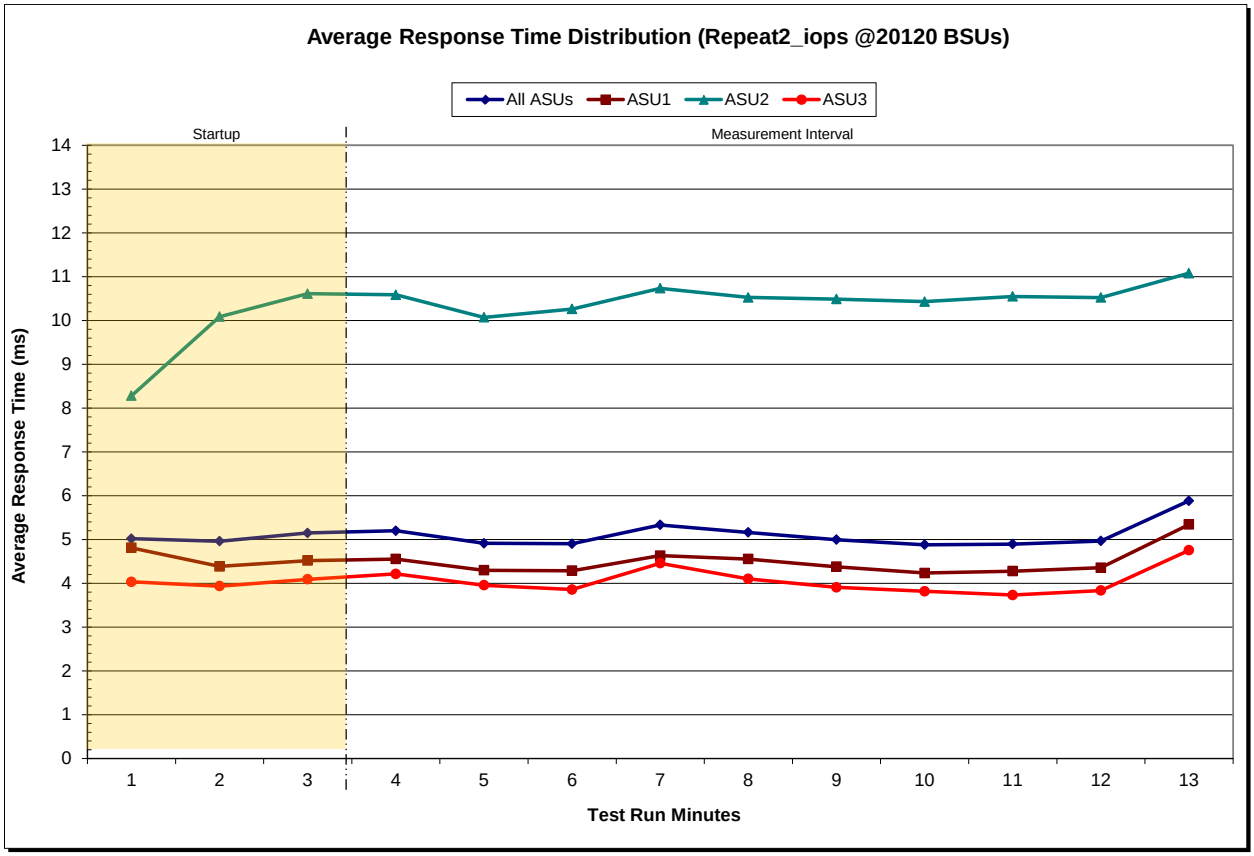
Repeatability 2 IOPS – I/O Request Throughput Distribution Graph



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

2,012 BSUs	Start	Stop	Interval	Duration
Start-Up/Ramp-Up	10:30:30	10:33:31	0-2	0:03:01
Measurement Interval	10:33:31	10:43:33	3-12	0:10:02
60 second intervals	**All ASUs**	**ASU1**	**ASU2**	**ASU3**
0	5.02	4.81	8.28	4.04
1	4.96	4.39	10.09	3.94
2	5.15	4.52	10.61	4.09
3	5.20	4.55	10.59	4.22
4	4.91	4.30	10.07	3.96
5	4.90	4.29	10.26	3.86
6	5.33	4.63	10.73	4.46
7	5.16	4.55	10.53	4.10
8	5.00	4.38	10.49	3.91
9	4.88	4.23	10.43	3.82
10	4.90	4.28	10.55	3.73
11	4.97	4.35	10.52	3.84
12	5.88	5.34	11.08	4.75
Average	***5.11***	***4.49***	***10.53***	***4.06***

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



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

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.*

Clauses5.1.10 and 5.3.15.2

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 5.3.15.3

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

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

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	0.2100	0.0180	0.0700	0.0350	0.2810
COV	0.001	0.000	0.000	0.000	0.001	0.001	0.001	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	0.0701	0.2101	0.0180	0.0700	0.0350	0.2810
COV	0.002	0.001	0.001	0.001	0.003	0.001	0.002	0.001

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

	ASU1-1	ASU1-2	ASU1-3	ASU1-4	ASU2-1	ASU2-2	ASU2-3	ASU3-1
IM	***0.0350***	***0.2810***	***0.0700***	***0.2100***	***0.0180***	***0.0700***	***0.0350***	***0.2810***
MIM	0.0350	0.2810	0.0700	0.2100	0.0180	0.0700	0.0350	0.2810
COV	0.001	0.000	0.000	0.000	0.001	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 IOPS™ 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 Tested Storage Configuration (TSC) 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 9.4.3.8

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 (may be contained in an appendix).*

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 114.

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	3,282,235
Total Number of Logical Blocks Verified	3,259,991
Total Number of Logical Blocks that Failed Verification	0
Time Duration for Writing Test Logical Blocks	5 minutes
Size in bytes of each Logical Block	1024
Number of Failed I/O Requests in the process of the Test	0

If approved by the SPC Auditor, the SPC-2 Persistence Test may be used to meet the SPC-1 persistence requirements. Both the SPC-1 and SPC-2 Persistence Tests provide the same level of functionality and verification of data integrity. The SPC-2 Persistence Test may be easily configured to address an SPC-1 storage configuration. The SPC-2 Persistence Test extends the size of storage configurations that may be tested and significantly reduces the test duration of such configurations.

The SPC-2 Persistence Test was approved for use in this set of audited measurements.

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 9.4.3.9

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 for the Priced Storage Configuration must be the date at which all components are committed to be available.

The Huawei OceanStor™ 18800 as documented in this Full Disclosure Report is currently available for customer purchase and shipment.

PRICING INFORMATION

Clause 9.4.3.3.6

The Executive Summary shall contain a pricing spreadsheet as documented in Clause 8.3.1.

Pricing information may be found in the Priced Storage Configuration Pricing section on page 19.

TESTED STORAGE CONFIGURATION (TSC) AND PRICED STORAGE CONFIGURATION DIFFERENCES

Clause 9.4.3.3.8

The Executive Summary shall contain a list of all differences between the Tested Storage Configuration (TSC) and the Priced Storage Configuration.

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 19.

ANOMALIES OR IRREGULARITIES

Clause 9.4.3.10

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

There were no anomalies or irregularities encountered during the SPC-1 Remote Audit of the Huawei OceanStor™ 18800.

APPENDIX A: SPC-1 GLOSSARY

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

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

A kilobyte (KB) is equal to 1,000 (10^3) bytes.

A megabyte (MB) is equal to 1,000,000 (10^6) bytes.

A gigabyte (GB) is equal to 1,000,000,000 (10^9) bytes.

A terabyte (TB) is equal to 1,000,000,000,000 (10^{12}) bytes.

A petabyte (PB) is equal to 1,000,000,000,000,000 (10^{15}) bytes

An exabyte (EB) is equal to 1,000,000,000,000,000,000 (10^{18}) bytes

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

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

A kibibyte (KiB) is equal to 1,024 (2^{10}) bytes.

A mebibyte (MiB) is equal to 1,048,576 (2^{20}) bytes.

A gigibyte (GiB) is equal to 1,073,741,824 (2^{30}) bytes.

A tebibyte (TiB) is equal to 1,099,511,627,776 (2^{40}) bytes.

A pebibyte (PiB) is equal to 1,125,899,906,842,624 (2^{50}) bytes.

An exbibyte (EiB) is equal to 1,152,921,504,606,846,967 (2^{60}) bytes.

SPC-1 Data Repository Definitions

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

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

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

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

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

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

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

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

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

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

SPC-1 Data Protection Levels

Protected 1: The single point of failure of any ***storage device*** in the configuration will not result in permanent loss of access to or integrity of the SPC-1 Data Repository.

Protected 2: The single point of failure of any ***component*** in the configuration will not result in permanent loss of access to or integrity of the SPC-1 Data Repository.

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.

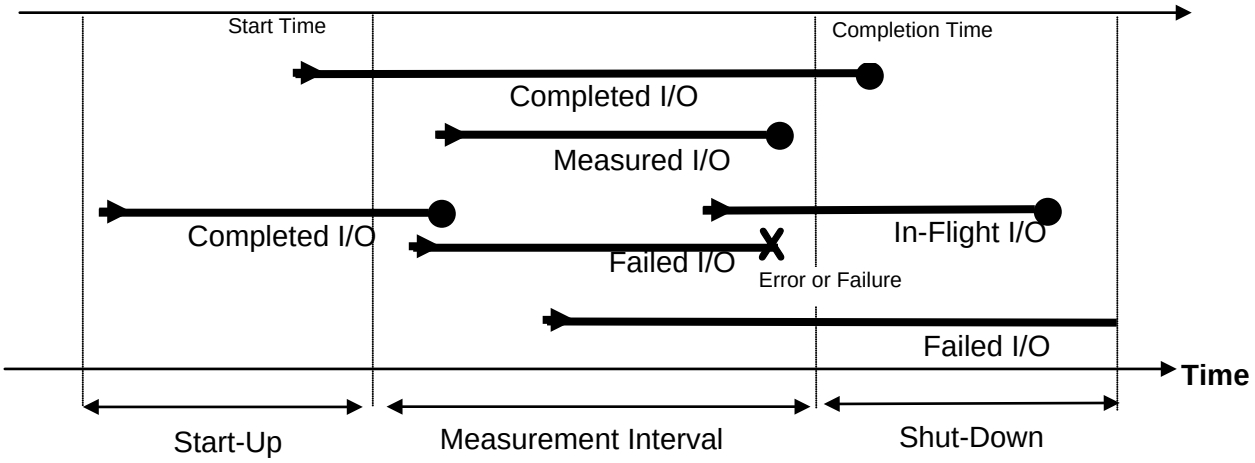
Steady State: The consistent and sustainable throughput of the TSC. During this period the load presented to the TSC by the Workload Generator is constant.

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

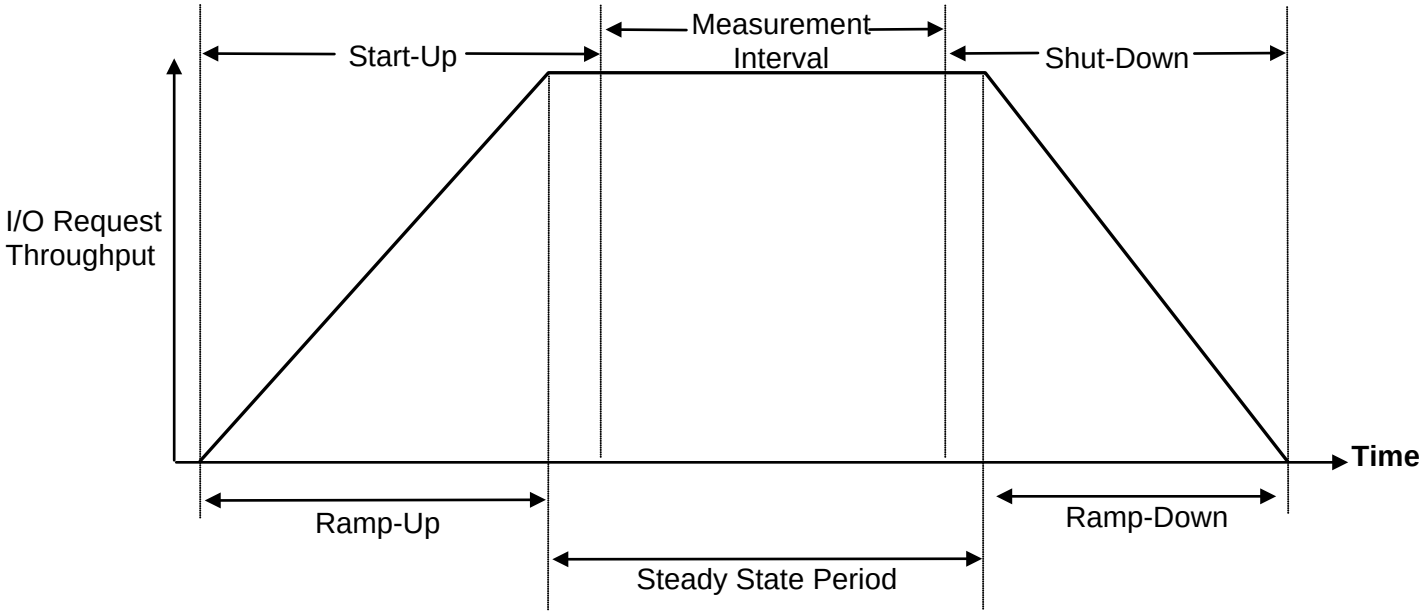
Test Run: The execution of SPC-1 for the purpose of producing or supporting an SPC-1 test result. SPC-1 Test Runs may have a finite and measured Ramp-Up period, Start-Up period, Shut-Down period, and Ramp-Down period as illustrated in the "SPC-1 Test Run Components" below. All SPC-1 Test Runs shall have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

Red Hat Enterprise Linux 5.5 (64-bit)

Change the I/O scheduler from ***cfq*** to ***noop*** on each Host System, which will result in all incoming I/O requests inserted into a simple, unordered FIFO queue. This change was done by the execution of the **scheduler.sh** script as documented in *Appendix C: Tested Storage Configuration (TSC) Creation*.

Huawei Tecal RH2288 V2 Host Systems

The CPU frequency scaling policy was changed on each Host System from ***ondemand*** to ***performance***, which prevents a reduction in the CPU frequency when a server is lightly loaded. This change was done by the execution of the **chg_cpu.sh** script as documented in *Appendix C: Tested Storage Configuration (TSC) Creation*.

APPENDIX C: TESTED STORAGE CONFIGURATION (TSC) CREATION

The scripts referenced in Steps 2-5 appear in the section, Referenced Scripts.

Step 1: Create Disk Domains, Storage Pools, LUNs, Hosts, Mapping View and deploy SSDs

Execute the **mklun.sh** script on one of the Host Systems, which has **expect** installed to complete the following:

- Create 64 disk domains
- Change the disk domains' HDD (tier1) hot spare strategy from **High** to **Low**.
- Create 64 storage pools
  (one storage pool per disk domain using all available capacity)
- Create 160 LUNs
  (4 LUNs in 32 storage pools and 1 LUN in the remaining 32 storage pools)
- Add the SSDs to sixteen of the disk domains for the SmartTier functionality
- Create one Host ***(Host1)***
- Add the FC ports' WWN to ***Host1***
- Create host group ***HostGroup1***
- Add ***Host1*** to ***HostGroup1***
- Create LUN Group ***LunGroup1*** and add all the LUNs to ***LunGroup1***
- Create mapping view ***(MappingView1)***
- Map ***HostGroup1*** and ***LunGroup1*** to the mapping view ***MappingView1***
- Disable the mapping view command device.

*Note: **Expect** is a Unix automation and testing tool, written by Don Libes as an extension to the Tcl scripting language, for interactive applications such as telnet, ftp, passwd, fsck, rlogin, tip, ssh, and others. It uses Unix pseudo terminals to wrap up subprocesses transparently, allowing the automation of arbitrary applications that are accessed over a terminal. Expect is an open source tool can be downloaded at the following location: http://www.nist.gov/el/msid/expect.cfm*

Step 2: Create Volumes on the Master Host System

Execute the **mkvolume.sh** script on the Master Host System to create 144 logical volumes as follows:

1. **Create Physical Volume**
   Create 160 physical volumes using the **pvcreate** command.
2. **Create Volumes Groups**
   Create three volume groups (**vg1**, **vg2** and **vg3**) using the **vgcreate** command as follows:

Create **vg1** using the following physical volumes: /dev/sdb, /dev/sdc, /dev/sdd, /dev/sde, /dev/sdl, /dev/sdm, /dev/sdn, /dev/sdo, /dev/sdv, /dev/sdw, /dev/sdx, /dev/sdy, /dev/sdaf, /dev/sdag, /dev/sdah, /dev/sdai, /dev/sdap, /dev/sdaq, /dev/sdar, /dev/sdas, /dev/sdaz, /dev/sdba, /dev/sdbb, /dev/sdbc, /dev/sdbj, /dev/sdbk, /dev/sdbl, /dev/sdbm, /dev/sdbt, /dev/sdbu, /dev/sdbv, /dev/sdbw, /dev/sdcd, /dev/sdce, /dev/sdcf, /dev/sdcg, /dev/sdcn, /dev/sdco, /dev/sdcp, /dev/sdcq, /dev/sdcx, /dev/sdcy, /dev/sdcz, /dev/sdda, /dev/sddh, /dev/sddi, /dev/sddj, /dev/sddk, /dev/sddr, /dev/sdds, /dev/sddt, /dev/sddu, /dev/sdeb, /dev/sdec, /dev/sded, /dev/sdee, /dev/sdel, /dev/sdem, /dev/sden, /dev/sdeo, /dev/sdev, /dev/sdew, /dev/sdex, /dev/sdey

Create **vg2** using the following physical volumes: /dev/sdf, /dev/sdg, /dev/sdh, /dev/sdi, /dev/sdp, /dev/sdq, /dev/sdr, /dev/sds, /dev/sdz, /dev/sdaa, /dev/sdab, /dev/sdac, /dev/sdaj, /dev/sdak, /dev/sdal, /dev/sdam, /dev/sdat, /dev/sdau, /dev/sdav, /dev/sdaw, /dev/sdbd, /dev/sdbe, /dev/sdbf, /dev/sdbg, /dev/sdbn, /dev/sdbo, /dev/sdbp, /dev/sdbq, /dev/sdbx, /dev/sdby, /dev/sdbz, /dev/sdca, /dev/sdch, /dev/sdci, /dev/sdcj, /dev/sdck, /dev/sdcr, /dev/sdcs, /dev/sdct, /dev/sdcu, /dev/sddb, /dev/sddc, /dev/sddd, /dev/sdde, /dev/sddl, /dev/sddm, /dev/sddn, /dev/sddo, /dev/sddv, /dev/sddw, /dev/sddx, /dev/sddy, /dev/sdef, /dev/sdeg, /dev/sdeh, /dev/sdei, /dev/sdep, /dev/sdeq, /dev/sder, /dev/sdes, /dev/sdez, /dev/sdfa, /dev/sdfb, /dev/sdfc

Create **vg3** using the following physical volumes: /dev/sdj, /dev/sdk, /dev/sdt, /dev/sdu, /dev/sdad, /dev/sdae, /dev/sdan, /dev/sdao, /dev/sdax, /dev/sday, /dev/sdbh, /dev/sdbi, /dev/sdbr, /dev/sdbs, /dev/sdcb, /dev/sdcc, /dev/sdcl, /dev/sdcm, /dev/sdcv, /dev/sdcw, /dev/sddf, /dev/sddg, /dev/sddp, /dev/sddq, /dev/sddz, /dev/sdea, /dev/sdej, /dev/sdek, /dev/sdet, /dev/sdeu, /dev/sdfd, /dev/sdfe

3. **Create Logical Volumes**
   - Create 64 logical volumes, each with a capacity of 1,800 GiB, on **vg1** for ASU-1.
   - Create 64 logical volumes, each with a capacity of 1,800 GiB, on **vg2** for ASU-2.
   - Create 16 logical volumes, each with a capacity of 1,600 GiB, on **vg3** for ASU-3.
4. **Scan Physical Volumes, Volume Groups, Logical Volumes and activate each Logical Volume**

   Execute the **lv_scan.sh** on the Slave Host Systems to scan the physical volumes, volume groups and logical volumes. In addition, the script will make each logical volume available *(activate)*.

Step 3: Change the Scheduler on each Host System

Execute the **scheduler.sh** script on each Host System to change the scheduler of each block device from ***cfq*** to ***noop***.

Step 4: Change the CPU Frequency Scaling Policy

Execute the **chg_cpu.sh** script on each Host System to change the CPU frequency scaling policy from ***ondemand*** to ***performance***, which prevents a reduction in the CPU frequency when a server is lightly loaded.

Referenced Scripts

mklun.sh

```
#!/bin/bash
```

```
stor=100.124.66.41
stor_user=admin
stor_pswd=Admin@storage

export LANG=C

echo "creating LUN ..."

expect <<__END_CREATE_LUN
     spawn ssh $stor_user@$stor
     set timeout 60
     expect {
            -re "assword" { send "$stor_pswd\r" }
            -re "yes/no" { send "yes\r"; exp_continue }
     }
     expect ">"
     foreach EngineId {0 1 2 3 4 5 6 7} {
            # ------create disk_domain--------
                send "create disk_domain name=ASU\${EngineId}1-1
disk_list=DAE\${EngineId}00.0-23,DAE\${EngineId}01.0-7 disk_domain_id=[expr
\$EngineId * 8 + 0]\r"
            expect {
                -re "timeout" { send "create disk_domain name=ASU\${EngineId}1-1
disk_list=DAE\${EngineId}00.0-23,DAE\${EngineId}01.0-7 disk_domain_id=[expr
\$EngineId * 8 + 0]\r" ;exp_continue }
            -re "successfully" { send "\r"}
            }
            expect ">"
            send "create disk_domain name=ASU\${EngineId}1-2
disk_list=DAE\${EngineId}01.8-23,DAE\${EngineId}10.0-15 disk_domain_id=[expr
\$EngineId * 8 + 1]\r"
            expect {
                -re "timeout" { send "create disk_domain name=ASU\${EngineId}1-2
disk_list=DAE\${EngineId}01.8-23,DAE\${EngineId}10.0-15 disk_domain_id=[expr
\$EngineId * 8 + 1]\r"exp_continue }
            -re "successfully" { send "\r"}
            }
            expect ">"
            send "create disk_domain name=ASU\${EngineId}2-1
disk_list=DAE\${EngineId}10.16-23,DAE\${EngineId}11.0-11,DAE\${EngineId}20.0-
11,DAE\${EngineId}21.0-3 disk_domain_id=[expr \$EngineId * 8 + 2]\r"
            expect {
                -re "timeout" { send "create disk_domain name=ASU\${EngineId}2-1
disk_list=DAE\${EngineId}10.16-23,DAE\${EngineId}11.0-11,DAE\${EngineId}20.0-
11,DAE\${EngineId}21.0-3 disk_domain_id=[expr \$EngineId * 8 + 2]\r";exp_continue }
            -re "successfully" { send "\r"}
            }
            expect ">"
            send "create disk_domain name=ASU\${EngineId}2-2
disk_list=DAE\${EngineId}11.12-23,DAE\${EngineId}20.12-23,DAE\${EngineId}21.4-15
disk_domain_id=[expr \$EngineId * 8 + 3]\r"
            expect {
                -re "timeout" { send "create disk_domain name=ASU\${EngineId}2-2
disk_list=DAE\${EngineId}11.12-23,DAE\${EngineId}20.12-23,DAE\${EngineId}21.4-15
disk_domain_id=[expr \$EngineId * 8 + 3]\r";exp_continue }
            -re "successfully" { send "\r"}
            }
            expect ">"
            send "create disk_domain name=ASU\${EngineId}3-1
disk_list=DAE\${EngineId}21.16-23 disk_domain_id=[expr \$EngineId * 8 + 4]\r"
            expect {
```

```
                -re "timeout" { send "create disk_domain name=ASU\${EngineId}3-1
disk_list=DAE\${EngineId}21.16-23 disk_domain_id=[expr \$EngineId * 8 +
4]\r";exp_continue }
            -re "successfully" { send "\r"}
            }
            expect ">"
            send "create disk_domain name=ASU\${EngineId}3-2
disk_list=DAE\${EngineId}30.0-7 disk_domain_id=[expr \$EngineId * 8 + 5]\r"
            expect {
                -re "timeout" { send "create disk_domain name=ASU\${EngineId}3-2
disk_list=DAE\${EngineId}30.0-7 disk_domain_id=[expr \$EngineId * 8 +
5]\r";exp_continue }
            -re "successfully" { send "\r"}
            }
            expect ">"
            send "create disk_domain name=ASU\${EngineId}3-3
disk_list=DAE\${EngineId}30.8-15 disk_domain_id=[expr \$EngineId * 8 + 6]\r"
            expect {
                -re "timeout" { send "create disk_domain name=ASU\${EngineId}3-3
disk_list=DAE\${EngineId}30.8-15 disk_domain_id=[expr \$EngineId * 8 +
6]\r";exp_continue }
            -re "successfully" { send "\r"}
            }
            expect ">"
            send "create disk_domain name=ASU\${EngineId}3-4
disk_list=DAE\${EngineId}30.16-23 disk_domain_id=[expr \$EngineId * 8 + 7]\r"
            expect {
                -re "timeout" { send "create disk_domain name=ASU\${EngineId}3-4
disk_list=DAE\${EngineId}30.16-23 disk_domain_id=[expr \$EngineId * 8 +
7]\r";exp_continue }
            -re "successfully" { send "\r"}
            }
            expect ">"

            # ------change disk_domain tier1_hotspare_strategy from high to low -----
---
            send "change disk_domain general disk_domain_id=[expr \$EngineId * 8 + 0]
tier1_hotspare_strategy=Low\r"
            expect "y/n";send "y\r"
            expect ">"
            send "chang disk_domain general disk_domain_id=[expr \$EngineId * 8 + 1]
tier1_hotspare_strategy=Low\r"
            expect "y/n";send "y\r"
            expect ">"
            send "change disk_domain general disk_domain_id=[expr \$EngineId * 8 + 2]
tier1_hotspare_strategy=Low\r"
            expect "y/n";send "y\r"
            expect ">"
            send "change disk_domain general disk_domain_id=[expr \$EngineId * 8 + 3]
tier1_hotspare_strategy=Low\r"
            expect "y/n";send "y\r"
            expect ">"
            send "change disk_domain general disk_domain_id=[expr \$EngineId * 8 + 4]
tier1_hotspare_strategy=Low\r"
            expect "y/n";send "y\r"
            expect ">"
            send "change disk_domain general disk_domain_id=[expr \$EngineId * 8 + 5]
tier1_hotspare_strategy=Low\r"
            expect "y/n";send "y\r"
            expect ">"
            send "change disk_domain general disk_domain_id=[expr \$EngineId * 8 + 6]
tier1_hotspare_strategy=Low\r"
            expect "y/n";send "y\r"
```

```
            expect ">"
            send "change disk_domain general disk_domain_id=[expr \$EngineId * 8 + 7]
 tier1_hotspare_strategy=Low\r"
            expect "y/n";send "y\r"
            expect ">"

            # ------create storage_pool --------
            send "create storage_pool name=ASU\${EngineId}1-1 disk_type=SAS
 capacity=7674GB raid_level=RAID10 disk_domain_id=[expr \$EngineId * 8 + 0]
 pool_id=[expr \$EngineId * 8 + 0]\r"
            expect ">"
            send "create storage_pool name=ASU\${EngineId}1-2 disk_type=SAS
 capacity=7684GB raid_level=RAID10 disk_domain_id=[expr \$EngineId * 8 + 1]
 pool_id=[expr \$EngineId * 8 + 1]\r"
            expect ">"
            send "create storage_pool name=ASU\${EngineId}2-1 disk_type=SAS
 capacity=8709GB raid_level=RAID10 disk_domain_id=[expr \$EngineId * 8 + 2]
 pool_id=[expr \$EngineId * 8 + 2]\r"
            expect ">"
            send "create storage_pool name=ASU\${EngineId}2-2 disk_type=SAS
 capacity=8709GB raid_level=RAID10 disk_domain_id=[expr \$EngineId * 8 + 3]
 pool_id=[expr \$EngineId * 8 + 3]\r"
            expect ">"
            send "create storage_pool name=ASU\${EngineId}3-1 disk_type=SAS
 capacity=1791GB raid_level=RAID10 disk_domain_id=[expr \$EngineId * 8 + 4]
 pool_id=[expr \$EngineId * 8 + 4]\r"
            expect ">"
            send "create storage_pool name=ASU\${EngineId}3-2 disk_type=SAS
 capacity=1791GB raid_level=RAID10 disk_domain_id=[expr \$EngineId * 8 + 5]
 pool_id=[expr \$EngineId * 8 + 5]\r"
            expect ">"
            send "create storage_pool name=ASU\${EngineId}3-3 disk_type=SAS
 capacity=1791GB raid_level=RAID10 disk_domain_id=[expr \$EngineId * 8 + 6]
 pool_id=[expr \$EngineId * 8 + 6]\r"
            expect ">"
            send "create storage_pool name=ASU\${EngineId}3-4 disk_type=SAS
 capacity=1791GB raid_level=RAID10 disk_domain_id=[expr \$EngineId * 8 + 7]
 pool_id=[expr \$EngineId * 8 + 7]\r"
            expect ">"

            # ------create lun --------
            send "create lun name=asu\${EngineId}11 number=4 pool_id=[expr \$EngineId
 * 8 + 0] capacity=remain owner_controller=\${EngineId}A\r"
            expect ">"
            send "create lun name=asu\${EngineId}21 number=4 pool_id=[expr \$EngineId
 * 8 + 2] capacity=remain owner_controller=\${EngineId}A\r"
            expect ">"
            send "create lun name=asu\${EngineId}31 pool_id=[expr \$EngineId * 8 + 4]
 capacity=remain owner_controller=\${EngineId}A read_cache_policy=High\r"
            expect ">"
            send "create lun name=asu\${EngineId}33 pool_id=[expr \$EngineId * 8 + 6]
 capacity=remain owner_controller=\${EngineId}A read_cache_policy=High\r"
            expect ">"
            send "create lun name=asu\${EngineId}12 number=4 pool_id=[expr \$EngineId
 * 8 + 1] capacity=remain owner_controller=\${EngineId}B\r"
            expect ">"
            send "create lun name=asu\${EngineId}22 number=4 pool_id=[expr \$EngineId
 * 8 + 3] capacity=remain owner_controller=\${EngineId}B\r"
            expect ">"
            send "create lun name=asu\${EngineId}32 pool_id=[expr \$EngineId * 8 + 5]
 capacity=remain owner_controller=\${EngineId}B read_cache_policy=High\r"
            expect ">"
```

```
            send "create lun name=asu\${EngineId}34 pool_id=[expr \$EngineId * 8 + 7]
 capacity=remain owner_controller=\${EngineId}B read_cache_policy=High\r"
            expect ">"

            # ------add ssds to disk_domain--------
            send "add disk_domain disk disk_domain_id=[expr \$EngineId * 8 + 0]
 disk_list=DAE\${EngineId}31.0-11\r"
            expect {
                -re "timeout" { send "add disk_domain disk disk_domain_id=[expr
 \$EngineId * 8 + 0] disk_list=DAE\${EngineId}31.0-11\r";exp_continue }
            -re "y/n" { send "y\r" }
                }
                expect ">"
            send "add disk_domain disk disk_domain_id=[expr \$EngineId * 8 + 1]
 disk_list=DAE\${EngineId}31.12-23\r"
            expect {
                -re "timeout" { send "add disk_domain disk disk_domain_id=[expr
 \$EngineId * 8 + 1] disk_list=DAE\${EngineId}31.12-23\r";exp_continue }
            -re "y/n" { send "y\r" }
                }
                expect ">"
            send "change disk_domain general disk_domain_id=[expr \$EngineId * 8 + 0]
 tier0_hotspare_strategy=low\r"
            expect "y/n";send "y\r"
            expect ">"
            send "change disk_domain general disk_domain_id=[expr \$EngineId * 8 + 1]
 tier0_hotspare_strategy=low\r"
            expect "y/n";send "y\r"
            expect ">"
            send "add storage_pool tier pool_id=[expr \$EngineId * 8 + 0]
 disk_type=SSD capacity=956GB raid_level=RAID10\r"
            expect "y/n";send "y\r"
            expect ">"
            send "add storage_pool tier pool_id=[expr \$EngineId * 8 + 1]
 disk_type=SSD capacity=956GB raid_level=RAID10\r"
            expect "y/n";send "y\r"
            expect ">"
        }
        # ------create host and add initiators--------
        send "create host name=Host1 operating_system=Linux host_id=1\r"
        expect ">"
        send "add host initiator host_id=1 initiator_type=FC wwn=21000024ff41a040\r"
        expect "y/n";send "y\r"
        expect "y/n";send "y\r"
        expect ">"
        send "add host initiator host_id=1 initiator_type=FC wwn=21000024ff41a041\r"
        expect "y/n";send "y\r"
        expect "y/n";send "y\r"
           expect ">"
        send "add host initiator host_id=1 initiator_type=FC wwn=21000024ff2c952a\r"
        expect "y/n";send "y\r"
        expect "y/n";send "y\r"
           expect ">"
        send "add host initiator host_id=1 initiator_type=FC wwn=21000024ff2c952b\r"
        expect "y/n";send "y\r"
        expect "y/n";send "y\r"
        expect ">"
        send "add host initiator host_id=1 initiator_type=FC wwn=21000024ff371ea4\r"
        expect "y/n";send "y\r"
        expect "y/n";send "y\r"
           expect ">"
        send "add host initiator host_id=1 initiator_type=FC wwn=21000024ff371ea5\r"
        expect "y/n";send "y\r"
```

```
      expect "y/n";send "y\r"
      expect ">"
      send "add host initiator host_id=1 initiator_type=FC wwn=21000024ff372908\r"
      expect "y/n";send "y\r"
      expect "y/n";send "y\r"
      expect ">"
      send "add host initiator host_id=1 initiator_type=FC wwn=21000024ff372909\r"
      expect "y/n";send "y\r"
      expect "y/n";send "y\r"
         expect ">"
      send "add host initiator host_id=1 initiator_type=FC wwn=21000024ff49ae18\r"
      expect "y/n";send "y\r"
      expect "y/n";send "y\r"
      expect ">"
      send "add host initiator host_id=1 initiator_type=FC wwn=21000024ff49ae19\r"
      expect "y/n";send "y\r"
      expect "y/n";send "y\r"
         expect ">"
      send "add host initiator host_id=1 initiator_type=FC wwn=21000024ff49af6e\r"
      expect "y/n";send "y\r"
      expect "y/n";send "y\r"
      expect ">"
      send "add host initiator host_id=1 initiator_type=FC wwn=21000024ff49af6f\r"
      expect "y/n";send "y\r"
      expect "y/n";send "y\r"
         expect ">"
      send "add host initiator host_id=1 initiator_type=FC wwn=21000024ff49af7a\r"
      expect "y/n";send "y\r"
      expect "y/n";send "y\r"
         expect ">"
      send "add host initiator host_id=1 initiator_type=FC wwn=21000024ff49af7b\r"
      expect "y/n";send "y\r"
      expect "y/n";send "y\r"
      expect ">"
      send "add host initiator host_id=1 initiator_type=FC wwn=21000024ff4a542a\r"
      expect "y/n";send "y\r"
      expect "y/n";send "y\r"
         expect ">"
      send "add host initiator host_id=1 initiator_type=FC wwn=21000024ff4a542b\r"
      expect "y/n";send "y\r"
      expect "y/n";send "y\r"
      expect ">"

      # ------create host_groups--------
      send "create host_group name=HostGroup1 host_group_id=1 host_id_list=1\r"
      expect ">"

      # ------create lun_groups and add all luns to lun_group--------
      send "create lun_group name=LunGroup1 lun_group_id=1
  lun_id_list=0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,2
  7,28,29,30,31,32,33,34,35,36,37,38,39\r"
      expect ">"
      send "add lun_group lun lun_group_id=1
  lun_id_list=40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,
  64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79\r"
      expect ">"
      send "add lun_group lun lun_group_id=1
  lun_id_list=80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102,
  103,104,105,106,107,108,109,110,111,112,113,114,115,116,117,118,119\r"
      expect ">"
      send "add lun_group lun lun_group_id=1
  lun_id_list=120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,
```

```
138,139,140,141,142,143,144,145,146,147,148,149,150,151,152,153,154,155,156,157,158,
159\r"
     expect ">"

     # ------create mapping_views--------
     send "create mapping_view name=MappingView1 host_group_id=1 mapping_view_id=1
lun_group_id=1\r"
     expect ">"

     # ------set the mapping_view command_device disable--------
     send "change mapping_view mapping_view_id=1 command_device=disable\r"
     expect "y/n";send "y\r"
     expect "y/n";send "y\r"
     expect ">"
     send "exit\r"
     expect "(y/n):"
     send "y\r"
     expect EOF
__END_CREATE_LUN
```

mkvolume.sh

```
pvcreate /dev/sdb
pvcreate /dev/sdc
pvcreate /dev/sdd
pvcreate /dev/sde
pvcreate /dev/sdf
pvcreate /dev/sdg
pvcreate /dev/sdh
pvcreate /dev/sdi
pvcreate /dev/sdj
pvcreate /dev/sdk
pvcreate /dev/sdl
pvcreate /dev/sdm
pvcreate /dev/sdn
pvcreate /dev/sdo
pvcreate /dev/sdp
pvcreate /dev/sdq
pvcreate /dev/sdr
pvcreate /dev/sds
pvcreate /dev/sdt
pvcreate /dev/sdu
pvcreate /dev/sdv
pvcreate /dev/sdw
pvcreate /dev/sdx
pvcreate /dev/sdy
pvcreate /dev/sdz
pvcreate /dev/sdaa
pvcreate /dev/sdab
pvcreate /dev/sdac
pvcreate /dev/sdad
pvcreate /dev/sdae
pvcreate /dev/sdaf
pvcreate /dev/sdag
pvcreate /dev/sdah
pvcreate /dev/sdai
pvcreate /dev/sdaj
pvcreate /dev/sdak
pvcreate /dev/sdal
pvcreate /dev/sdam
pvcreate /dev/sdan
pvcreate /dev/sdao
```

```
pvcreate /dev/sdap
pvcreate /dev/sdaq
pvcreate /dev/sdar
pvcreate /dev/sdas
pvcreate /dev/sdat
pvcreate /dev/sdau
pvcreate /dev/sdav
pvcreate /dev/sdaw
pvcreate /dev/sdax
pvcreate /dev/sday
pvcreate /dev/sdaz
pvcreate /dev/sdba
pvcreate /dev/sdbb
pvcreate /dev/sdbc
pvcreate /dev/sdbd
pvcreate /dev/sdbe
pvcreate /dev/sdbf
pvcreate /dev/sdbg
pvcreate /dev/sdbh
pvcreate /dev/sdbi
pvcreate /dev/sdbj
pvcreate /dev/sdbk
pvcreate /dev/sdbl
pvcreate /dev/sdbm
pvcreate /dev/sdbn
pvcreate /dev/sdbo
pvcreate /dev/sdbp
pvcreate /dev/sdbq
pvcreate /dev/sdbr
pvcreate /dev/sdbs
pvcreate /dev/sdbt
pvcreate /dev/sdbu
pvcreate /dev/sdbv
pvcreate /dev/sdbw
pvcreate /dev/sdbx
pvcreate /dev/sdby
pvcreate /dev/sdbz
pvcreate /dev/sdca
pvcreate /dev/sdcb
pvcreate /dev/sdcc
pvcreate /dev/sdcd
pvcreate /dev/sdce
pvcreate /dev/sdcf
pvcreate /dev/sdcg
pvcreate /dev/sdch
pvcreate /dev/sdci
pvcreate /dev/sdcj
pvcreate /dev/sdck
pvcreate /dev/sdcl
pvcreate /dev/sdcm
pvcreate /dev/sdcn
pvcreate /dev/sdco
pvcreate /dev/sdcp
pvcreate /dev/sdcq
pvcreate /dev/sdcr
pvcreate /dev/sdcs
pvcreate /dev/sdct
pvcreate /dev/sdcu
pvcreate /dev/sdcv
pvcreate /dev/sdcw
pvcreate /dev/sdcx
pvcreate /dev/sdcy
pvcreate /dev/sdcz
```

```
pvcreate /dev/sdda
pvcreate /dev/sddb
pvcreate /dev/sddc
pvcreate /dev/sddd
pvcreate /dev/sdde
pvcreate /dev/sddf
pvcreate /dev/sddg
pvcreate /dev/sddh
pvcreate /dev/sddi
pvcreate /dev/sddj
pvcreate /dev/sddk
pvcreate /dev/sddl
pvcreate /dev/sddm
pvcreate /dev/sddn
pvcreate /dev/sddo
pvcreate /dev/sddp
pvcreate /dev/sddq
pvcreate /dev/sddr
pvcreate /dev/sdds
pvcreate /dev/sddt
pvcreate /dev/sddu
pvcreate /dev/sddv
pvcreate /dev/sddw
pvcreate /dev/sddx
pvcreate /dev/sddy
pvcreate /dev/sddz
pvcreate /dev/sdea
pvcreate /dev/sdeb
pvcreate /dev/sdec
pvcreate /dev/sded
pvcreate /dev/sdee
pvcreate /dev/sdef
pvcreate /dev/sdeg
pvcreate /dev/sdeh
pvcreate /dev/sdei
pvcreate /dev/sdej
pvcreate /dev/sdek
pvcreate /dev/sdel
pvcreate /dev/sdem
pvcreate /dev/sden
pvcreate /dev/sdeo
pvcreate /dev/sdep
pvcreate /dev/sdeq
pvcreate /dev/sder
pvcreate /dev/sdes
pvcreate /dev/sdet
pvcreate /dev/sdeu
pvcreate /dev/sdev
pvcreate /dev/sdew
pvcreate /dev/sdex
pvcreate /dev/sdey
pvcreate /dev/sdez
pvcreate /dev/sdfa
pvcreate /dev/sdfb
pvcreate /dev/sdfc
pvcreate /dev/sdfd
pvcreate /dev/sdfe

vgcreate vg1 /dev/sdb /dev/sdc /dev/sdd /dev/sde /dev/sdl /dev/sdm /dev/sdn /dev/sdo
/dev/sdv /dev/sdw /dev/sdx /dev/sdy /dev/sdaf /dev/sdag /dev/sdah /dev/sdai
/dev/sdap /dev/sdaq /dev/sdar /dev/sdas /dev/sdaz /dev/sdba /dev/sdbb /dev/sdbc
/dev/sdbj /dev/sdbk /dev/sdbl /dev/sdbm /dev/sdbt /dev/sdbu /dev/sdbv /dev/sdbw
/dev/sdcd /dev/sdce /dev/sdcf /dev/sdcg /dev/sdcn /dev/sdco /dev/sdcp /dev/sdcq
```

```
/dev/sdcx /dev/sdcy /dev/sdcz /dev/sdda /dev/sddh /dev/sddi /dev/sddj /dev/sddk
/dev/sddr /dev/sdds /dev/sddt /dev/sddu /dev/sdeb /dev/sdec /dev/sded /dev/sdee
/dev/sdel /dev/sdem /dev/sden /dev/sdeo /dev/sdev /dev/sdew /dev/sdex /dev/sdey
vgcreate vg2 /dev/sdf /dev/sdg /dev/sdh /dev/sdi /dev/sdp /dev/sdq /dev/sdr /dev/sds
/dev/sdz /dev/sdaa /dev/sdab /dev/sdac /dev/sdaj /dev/sdak /dev/sdal /dev/sdam
/dev/sdat /dev/sdau /dev/sdav /dev/sdaw /dev/sdbd /dev/sdbe /dev/sdbf /dev/sdbg
/dev/sdbn /dev/sdbo /dev/sdbp /dev/sdbq /dev/sdbx /dev/sdby /dev/sdbz /dev/sdca
/dev/sdch /dev/sdci /dev/sdcj /dev/sdck /dev/sdcr /dev/sdcs /dev/sdct /dev/sdcu
/dev/sddb /dev/sddc /dev/sddd /dev/sdde /dev/sddl /dev/sddm /dev/sddn /dev/sddo
/dev/sddv /dev/sddw /dev/sddx /dev/sddy /dev/sdef /dev/sdeg /dev/sdeh /dev/sdei
/dev/sdep /dev/sdeq /dev/sder /dev/sdes /dev/sdez /dev/sdfa /dev/sdfb /dev/sdfc
vgcreate vg3 /dev/sdj /dev/sdk /dev/sdt /dev/sdu /dev/sdad /dev/sdae /dev/sdan
/dev/sdao /dev/sdax /dev/sday /dev/sdbh /dev/sdbi /dev/sdbr /dev/sdbs /dev/sdcb
/dev/sdcc /dev/sdcl /dev/sdcm /dev/sdcv /dev/sdcw /dev/sddf /dev/sddg /dev/sddp
/dev/sddq /dev/sddz /dev/sdea /dev/sdej /dev/sdek /dev/sdet /dev/sdeu /dev/sdfd
/dev/sdfe

lvcreate -n asu11  -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu12  -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu13  -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu14  -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu15  -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu16  -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu17  -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu18  -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu19  -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu110 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu111 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu112 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu113 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu114 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu115 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu116 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu117 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu118 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu119 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu120 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu121 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu122 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu123 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu124 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu125 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu126 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu127 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu128 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu129 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu130 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu131 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu132 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu133 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu134 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu135 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu136 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu137 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu138 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu139 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu140 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu141 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu142 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu143 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu144 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu145 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu146 -i 64 -I 512 -C y -L 1800g vg1
```

```
lvcreate -n asu147 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu148 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu149 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu150 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu151 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu152 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu153 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu154 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu155 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu156 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu157 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu158 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu159 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu160 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu161 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu162 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu163 -i 64 -I 512 -C y -L 1800g vg1
lvcreate -n asu164 -i 64 -I 512 -C y -L 1800g vg1

lvcreate -n asu21  -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu22  -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu23  -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu24  -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu25  -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu26  -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu27  -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu28  -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu29  -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu210 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu211 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu212 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu213 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu214 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu215 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu216 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu217 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu218 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu219 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu220 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu221 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu222 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu223 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu224 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu225 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu226 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu227 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu228 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu229 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu230 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu231 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu232 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu233 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu234 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu235 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu236 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu237 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu238 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu239 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu240 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu241 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu242 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu243 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu244 -i 64 -I 512 -C y -L 1800g vg2
```

```
lvcreate -n asu245 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu246 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu247 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu248 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu249 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu250 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu251 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu252 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu253 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu254 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu255 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu256 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu257 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu258 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu259 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu260 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu261 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu262 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu263 -i 64 -I 512 -C y -L 1800g vg2
lvcreate -n asu264 -i 64 -I 512 -C y -L 1800g vg2

lvcreate -n asu31  -i 32 -I 512 -C y -L 1600g vg3
lvcreate -n asu32  -i 32 -I 512 -C y -L 1600g vg3
lvcreate -n asu33  -i 32 -I 512 -C y -L 1600g vg3
lvcreate -n asu34  -i 32 -I 512 -C y -L 1600g vg3
lvcreate -n asu35  -i 32 -I 512 -C y -L 1600g vg3
lvcreate -n asu36  -i 32 -I 512 -C y -L 1600g vg3
lvcreate -n asu37  -i 32 -I 512 -C y -L 1600g vg3
lvcreate -n asu38  -i 32 -I 512 -C y -L 1600g vg3
lvcreate -n asu39  -i 32 -I 512 -C y -L 1600g vg3
lvcreate -n asu310 -i 32 -I 512 -C y -L 1600g vg3
lvcreate -n asu311 -i 32 -I 512 -C y -L 1600g vg3
lvcreate -n asu312 -i 32 -I 512 -C y -L 1600g vg3
lvcreate -n asu313 -i 32 -I 512 -C y -L 1600g vg3
lvcreate -n asu314 -i 32 -I 512 -C y -L 1600g vg3
lvcreate -n asu315 -i 32 -I 512 -C y -L 1600g vg3
lvcreate -n asu316 -i 32 -I 512 -C y -L 1600g vg3

exit 0
```

lv_scan.sh

```
pvscan
vgscan
lvscan
lvchange -ay /dev/vg1/asu11
lvchange -ay /dev/vg1/asu12
lvchange -ay /dev/vg1/asu13
lvchange -ay /dev/vg1/asu14
lvchange -ay /dev/vg1/asu15
lvchange -ay /dev/vg1/asu16
lvchange -ay /dev/vg1/asu17
lvchange -ay /dev/vg1/asu18
lvchange -ay /dev/vg1/asu19
lvchange -ay /dev/vg1/asu110
lvchange -ay /dev/vg1/asu111
lvchange -ay /dev/vg1/asu112
lvchange -ay /dev/vg1/asu113
lvchange -ay /dev/vg1/asu114
lvchange -ay /dev/vg1/asu115
lvchange -ay /dev/vg1/asu116
lvchange -ay /dev/vg1/asu117
```

```
lvchange -ay /dev/vg1/asu118
lvchange -ay /dev/vg1/asu119
lvchange -ay /dev/vg1/asu120
lvchange -ay /dev/vg1/asu121
lvchange -ay /dev/vg1/asu122
lvchange -ay /dev/vg1/asu123
lvchange -ay /dev/vg1/asu124
lvchange -ay /dev/vg1/asu125
lvchange -ay /dev/vg1/asu126
lvchange -ay /dev/vg1/asu127
lvchange -ay /dev/vg1/asu128
lvchange -ay /dev/vg1/asu129
lvchange -ay /dev/vg1/asu130
lvchange -ay /dev/vg1/asu131
lvchange -ay /dev/vg1/asu132
lvchange -ay /dev/vg1/asu133
lvchange -ay /dev/vg1/asu134
lvchange -ay /dev/vg1/asu135
lvchange -ay /dev/vg1/asu136
lvchange -ay /dev/vg1/asu137
lvchange -ay /dev/vg1/asu138
lvchange -ay /dev/vg1/asu139
lvchange -ay /dev/vg1/asu140
lvchange -ay /dev/vg1/asu141
lvchange -ay /dev/vg1/asu142
lvchange -ay /dev/vg1/asu143
lvchange -ay /dev/vg1/asu144
lvchange -ay /dev/vg1/asu145
lvchange -ay /dev/vg1/asu146
lvchange -ay /dev/vg1/asu147
lvchange -ay /dev/vg1/asu148
lvchange -ay /dev/vg1/asu149
lvchange -ay /dev/vg1/asu150
lvchange -ay /dev/vg1/asu151
lvchange -ay /dev/vg1/asu152
lvchange -ay /dev/vg1/asu153
lvchange -ay /dev/vg1/asu154
lvchange -ay /dev/vg1/asu155
lvchange -ay /dev/vg1/asu156
lvchange -ay /dev/vg1/asu157
lvchange -ay /dev/vg1/asu158
lvchange -ay /dev/vg1/asu159
lvchange -ay /dev/vg1/asu160
lvchange -ay /dev/vg1/asu161
lvchange -ay /dev/vg1/asu162
lvchange -ay /dev/vg1/asu163
lvchange -ay /dev/vg1/asu164



lvchange -ay /dev/vg2/asu21
lvchange -ay /dev/vg2/asu22
lvchange -ay /dev/vg2/asu23
lvchange -ay /dev/vg2/asu24
lvchange -ay /dev/vg2/asu25
lvchange -ay /dev/vg2/asu26
lvchange -ay /dev/vg2/asu27
lvchange -ay /dev/vg2/asu28
lvchange -ay /dev/vg2/asu29
lvchange -ay /dev/vg2/asu210
lvchange -ay /dev/vg2/asu211
lvchange -ay /dev/vg2/asu212
lvchange -ay /dev/vg2/asu213
```

```
lvchange -ay /dev/vg2/asu214
lvchange -ay /dev/vg2/asu215
lvchange -ay /dev/vg2/asu216
lvchange -ay /dev/vg2/asu217
lvchange -ay /dev/vg2/asu218
lvchange -ay /dev/vg2/asu219
lvchange -ay /dev/vg2/asu220
lvchange -ay /dev/vg2/asu221
lvchange -ay /dev/vg2/asu222
lvchange -ay /dev/vg2/asu223
lvchange -ay /dev/vg2/asu224
lvchange -ay /dev/vg2/asu225
lvchange -ay /dev/vg2/asu226
lvchange -ay /dev/vg2/asu227
lvchange -ay /dev/vg2/asu228
lvchange -ay /dev/vg2/asu229
lvchange -ay /dev/vg2/asu230
lvchange -ay /dev/vg2/asu231
lvchange -ay /dev/vg2/asu232
lvchange -ay /dev/vg2/asu233
lvchange -ay /dev/vg2/asu234
lvchange -ay /dev/vg2/asu235
lvchange -ay /dev/vg2/asu236
lvchange -ay /dev/vg2/asu237
lvchange -ay /dev/vg2/asu238
lvchange -ay /dev/vg2/asu239
lvchange -ay /dev/vg2/asu240
lvchange -ay /dev/vg2/asu241
lvchange -ay /dev/vg2/asu242
lvchange -ay /dev/vg2/asu243
lvchange -ay /dev/vg2/asu244
lvchange -ay /dev/vg2/asu245
lvchange -ay /dev/vg2/asu246
lvchange -ay /dev/vg2/asu247
lvchange -ay /dev/vg2/asu248
lvchange -ay /dev/vg2/asu249
lvchange -ay /dev/vg2/asu250
lvchange -ay /dev/vg2/asu251
lvchange -ay /dev/vg2/asu252
lvchange -ay /dev/vg2/asu253
lvchange -ay /dev/vg2/asu254
lvchange -ay /dev/vg2/asu255
lvchange -ay /dev/vg2/asu256
lvchange -ay /dev/vg2/asu257
lvchange -ay /dev/vg2/asu258
lvchange -ay /dev/vg2/asu259
lvchange -ay /dev/vg2/asu260
lvchange -ay /dev/vg2/asu261
lvchange -ay /dev/vg2/asu262
lvchange -ay /dev/vg2/asu263
lvchange -ay /dev/vg2/asu264


lvchange -ay /dev/vg3/asu31
lvchange -ay /dev/vg3/asu32
lvchange -ay /dev/vg3/asu33
lvchange -ay /dev/vg3/asu34
lvchange -ay /dev/vg3/asu35
lvchange -ay /dev/vg3/asu36
lvchange -ay /dev/vg3/asu37
lvchange -ay /dev/vg3/asu38
lvchange -ay /dev/vg3/asu39
lvchange -ay /dev/vg3/asu310
```

```
lvchange -ay /dev/vg3/asu311
lvchange -ay /dev/vg3/asu312
lvchange -ay /dev/vg3/asu313
lvchange -ay /dev/vg3/asu314
lvchange -ay /dev/vg3/asu315
lvchange -ay /dev/vg3/asu316
```

scheduler.sh

```
echo noop > /sys/block/sdb/queue/scheduler
echo noop > /sys/block/sdc/queue/scheduler
echo noop > /sys/block/sdd/queue/scheduler
echo noop > /sys/block/sde/queue/scheduler
echo noop > /sys/block/sdf/queue/scheduler
echo noop > /sys/block/sdg/queue/scheduler
echo noop > /sys/block/sdh/queue/scheduler
echo noop > /sys/block/sdi/queue/scheduler
echo noop > /sys/block/sdj/queue/scheduler
echo noop > /sys/block/sdk/queue/scheduler
echo noop > /sys/block/sdl/queue/scheduler
echo noop > /sys/block/sdm/queue/scheduler
echo noop > /sys/block/sdn/queue/scheduler
echo noop > /sys/block/sdo/queue/scheduler
echo noop > /sys/block/sdp/queue/scheduler
echo noop > /sys/block/sdq/queue/scheduler
echo noop > /sys/block/sdr/queue/scheduler
echo noop > /sys/block/sds/queue/scheduler
echo noop > /sys/block/sdt/queue/scheduler
echo noop > /sys/block/sdu/queue/scheduler
echo noop > /sys/block/sdv/queue/scheduler
echo noop > /sys/block/sdw/queue/scheduler
echo noop > /sys/block/sdx/queue/scheduler
echo noop > /sys/block/sdy/queue/scheduler
echo noop > /sys/block/sdz/queue/scheduler
echo noop > /sys/block/sdaa/queue/scheduler
echo noop > /sys/block/sdab/queue/scheduler
echo noop > /sys/block/sdac/queue/scheduler
echo noop > /sys/block/sdad/queue/scheduler
echo noop > /sys/block/sdae/queue/scheduler
echo noop > /sys/block/sdaf/queue/scheduler
echo noop > /sys/block/sdag/queue/scheduler
echo noop > /sys/block/sdah/queue/scheduler
echo noop > /sys/block/sdai/queue/scheduler
echo noop > /sys/block/sdaj/queue/scheduler
echo noop > /sys/block/sdak/queue/scheduler
echo noop > /sys/block/sdal/queue/scheduler
echo noop > /sys/block/sdam/queue/scheduler
echo noop > /sys/block/sdan/queue/scheduler
echo noop > /sys/block/sdao/queue/scheduler
echo noop > /sys/block/sdap/queue/scheduler
echo noop > /sys/block/sdaq/queue/scheduler
echo noop > /sys/block/sdar/queue/scheduler
echo noop > /sys/block/sdas/queue/scheduler
echo noop > /sys/block/sdat/queue/scheduler
echo noop > /sys/block/sdau/queue/scheduler
echo noop > /sys/block/sdav/queue/scheduler
echo noop > /sys/block/sdaw/queue/scheduler
echo noop > /sys/block/sdax/queue/scheduler
echo noop > /sys/block/sday/queue/scheduler
echo noop > /sys/block/sdaz/queue/scheduler
echo noop > /sys/block/sdba/queue/scheduler
echo noop > /sys/block/sdbb/queue/scheduler
```

```
echo noop > /sys/block/sdbc/queue/scheduler
echo noop > /sys/block/sdbd/queue/scheduler
echo noop > /sys/block/sdbe/queue/scheduler
echo noop > /sys/block/sdbf/queue/scheduler
echo noop > /sys/block/sdbg/queue/scheduler
echo noop > /sys/block/sdbh/queue/scheduler
echo noop > /sys/block/sdbi/queue/scheduler
echo noop > /sys/block/sdbj/queue/scheduler
echo noop > /sys/block/sdbk/queue/scheduler
echo noop > /sys/block/sdbl/queue/scheduler
echo noop > /sys/block/sdbm/queue/scheduler
echo noop > /sys/block/sdbn/queue/scheduler
echo noop > /sys/block/sdbo/queue/scheduler
echo noop > /sys/block/sdbp/queue/scheduler
echo noop > /sys/block/sdbq/queue/scheduler
echo noop > /sys/block/sdbr/queue/scheduler
echo noop > /sys/block/sdbs/queue/scheduler
echo noop > /sys/block/sdbt/queue/scheduler
echo noop > /sys/block/sdbu/queue/scheduler
echo noop > /sys/block/sdbv/queue/scheduler
echo noop > /sys/block/sdbw/queue/scheduler
echo noop > /sys/block/sdbx/queue/scheduler
echo noop > /sys/block/sdby/queue/scheduler
echo noop > /sys/block/sdbz/queue/scheduler
echo noop > /sys/block/sdca/queue/scheduler
echo noop > /sys/block/sdcb/queue/scheduler
echo noop > /sys/block/sdcc/queue/scheduler
echo noop > /sys/block/sdcd/queue/scheduler
echo noop > /sys/block/sdce/queue/scheduler
echo noop > /sys/block/sdcf/queue/scheduler
echo noop > /sys/block/sdcg/queue/scheduler
echo noop > /sys/block/sdch/queue/scheduler
echo noop > /sys/block/sdci/queue/scheduler
echo noop > /sys/block/sdcj/queue/scheduler
echo noop > /sys/block/sdck/queue/scheduler
echo noop > /sys/block/sdcl/queue/scheduler
echo noop > /sys/block/sdcm/queue/scheduler
echo noop > /sys/block/sdcn/queue/scheduler
echo noop > /sys/block/sdco/queue/scheduler
echo noop > /sys/block/sdcp/queue/scheduler
echo noop > /sys/block/sdcq/queue/scheduler
echo noop > /sys/block/sdcr/queue/scheduler
echo noop > /sys/block/sdcs/queue/scheduler
echo noop > /sys/block/sdct/queue/scheduler
echo noop > /sys/block/sdcu/queue/scheduler
echo noop > /sys/block/sdcv/queue/scheduler
echo noop > /sys/block/sdcw/queue/scheduler
echo noop > /sys/block/sdcx/queue/scheduler
echo noop > /sys/block/sdcy/queue/scheduler
echo noop > /sys/block/sdcz/queue/scheduler
echo noop > /sys/block/sdda/queue/scheduler
echo noop > /sys/block/sddb/queue/scheduler
echo noop > /sys/block/sddc/queue/scheduler
echo noop > /sys/block/sddd/queue/scheduler
echo noop > /sys/block/sdde/queue/scheduler
echo noop > /sys/block/sddf/queue/scheduler
echo noop > /sys/block/sddg/queue/scheduler
echo noop > /sys/block/sddh/queue/scheduler
echo noop > /sys/block/sddi/queue/scheduler
echo noop > /sys/block/sddj/queue/scheduler
echo noop > /sys/block/sddk/queue/scheduler
echo noop > /sys/block/sddl/queue/scheduler
echo noop > /sys/block/sddm/queue/scheduler
```

```
echo noop > /sys/block/sddn/queue/scheduler
echo noop > /sys/block/sddo/queue/scheduler
echo noop > /sys/block/sddp/queue/scheduler
echo noop > /sys/block/sddq/queue/scheduler
echo noop > /sys/block/sddr/queue/scheduler
echo noop > /sys/block/sdds/queue/scheduler
echo noop > /sys/block/sddt/queue/scheduler
echo noop > /sys/block/sddu/queue/scheduler
echo noop > /sys/block/sddv/queue/scheduler
echo noop > /sys/block/sddw/queue/scheduler
echo noop > /sys/block/sddx/queue/scheduler
echo noop > /sys/block/sddy/queue/scheduler
echo noop > /sys/block/sddz/queue/scheduler
echo noop > /sys/block/sdea/queue/scheduler
echo noop > /sys/block/sdeb/queue/scheduler
echo noop > /sys/block/sdec/queue/scheduler
echo noop > /sys/block/sded/queue/scheduler
echo noop > /sys/block/sdee/queue/scheduler
echo noop > /sys/block/sdef/queue/scheduler
echo noop > /sys/block/sdeg/queue/scheduler
echo noop > /sys/block/sdeh/queue/scheduler
echo noop > /sys/block/sdei/queue/scheduler
echo noop > /sys/block/sdej/queue/scheduler
echo noop > /sys/block/sdek/queue/scheduler
echo noop > /sys/block/sdel/queue/scheduler
echo noop > /sys/block/sdem/queue/scheduler
echo noop > /sys/block/sden/queue/scheduler
echo noop > /sys/block/sdeo/queue/scheduler
echo noop > /sys/block/sdep/queue/scheduler
echo noop > /sys/block/sdeq/queue/scheduler
echo noop > /sys/block/sder/queue/scheduler
echo noop > /sys/block/sdes/queue/scheduler
echo noop > /sys/block/sdet/queue/scheduler
echo noop > /sys/block/sdeu/queue/scheduler
echo noop > /sys/block/sdev/queue/scheduler
echo noop > /sys/block/sdew/queue/scheduler
echo noop > /sys/block/sdex/queue/scheduler
echo noop > /sys/block/sdey/queue/scheduler
echo noop > /sys/block/sdez/queue/scheduler
echo noop > /sys/block/sdfa/queue/scheduler
echo noop > /sys/block/sdfb/queue/scheduler
echo noop > /sys/block/sdfc/queue/scheduler
echo noop > /sys/block/sdfd/queue/scheduler
echo noop > /sys/block/sdfe/queue/scheduler
```

chg_cpu.sh

```
#!/bin/bash

echo performance > /sys/devices/system/cpu/cpu0/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu1/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu2/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu3/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu4/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu5/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu6/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu7/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu8/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu9/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu10/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu11/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu12/cpufreq/scaling_governor
```

```
echo performance > /sys/devices/system/cpu/cpu13/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu14/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu15/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu16/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu17/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu18/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu19/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu20/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu21/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu22/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu23/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu24/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu25/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu26/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu27/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu28/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu29/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu30/cpufreq/scaling_governor
echo performance > /sys/devices/system/cpu/cpu31/cpufreq/scaling_governor
```

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

ASU Pre-Fill

The content of command and parameter file, used in this benchmark to execute the required ASU pre-fill, is listed below.

```
compratio=1
hd=default,vdbench=/root/vdbench503rc11,user=root,shell=ssh
hd=hd1,system=host1
hd=hd2,system=host2
hd=hd3,system=host3
hd=hd4,system=host4
hd=hd5,system=host5
hd=hd6,system=host6
hd=hd7,system=host7
hd=hd8,system=host8

sd=default,openflags=o_direct,threads=32
sd=sd11,host=hd1,lun=/dev/vg1/asu11,size=1932735283200
sd=sd12,host=hd1,lun=/dev/vg1/asu12,size=1932735283200
sd=sd13,host=hd1,lun=/dev/vg1/asu13,size=1932735283200
sd=sd14,host=hd1,lun=/dev/vg1/asu14,size=1932735283200
sd=sd15,host=hd1,lun=/dev/vg1/asu15,size=1932735283200
sd=sd16,host=hd1,lun=/dev/vg1/asu16,size=1932735283200
sd=sd17,host=hd1,lun=/dev/vg1/asu17,size=1932735283200
sd=sd18,host=hd1,lun=/dev/vg1/asu18,size=1932735283200
sd=sd19,host=hd2,lun=/dev/vg1/asu19,size=1932735283200
sd=sd110,host=hd2,lun=/dev/vg1/asu110,size=1932735283200
sd=sd111,host=hd2,lun=/dev/vg1/asu111,size=1932735283200
sd=sd112,host=hd2,lun=/dev/vg1/asu112,size=1932735283200
sd=sd113,host=hd2,lun=/dev/vg1/asu113,size=1932735283200
sd=sd114,host=hd2,lun=/dev/vg1/asu114,size=1932735283200
sd=sd115,host=hd2,lun=/dev/vg1/asu115,size=1932735283200
sd=sd116,host=hd2,lun=/dev/vg1/asu116,size=1932735283200
sd=sd117,host=hd3,lun=/dev/vg1/asu117,size=1932735283200
sd=sd118,host=hd3,lun=/dev/vg1/asu118,size=1932735283200
sd=sd119,host=hd3,lun=/dev/vg1/asu119,size=1932735283200
sd=sd120,host=hd3,lun=/dev/vg1/asu120,size=1932735283200
sd=sd121,host=hd3,lun=/dev/vg1/asu121,size=1932735283200
sd=sd122,host=hd3,lun=/dev/vg1/asu122,size=1932735283200
sd=sd123,host=hd3,lun=/dev/vg1/asu123,size=1932735283200
sd=sd124,host=hd3,lun=/dev/vg1/asu124,size=1932735283200
sd=sd125,host=hd4,lun=/dev/vg1/asu125,size=1932735283200
sd=sd126,host=hd4,lun=/dev/vg1/asu126,size=1932735283200
sd=sd127,host=hd4,lun=/dev/vg1/asu127,size=1932735283200
sd=sd128,host=hd4,lun=/dev/vg1/asu128,size=1932735283200
sd=sd129,host=hd4,lun=/dev/vg1/asu129,size=1932735283200
sd=sd130,host=hd4,lun=/dev/vg1/asu130,size=1932735283200
sd=sd131,host=hd4,lun=/dev/vg1/asu131,size=1932735283200
sd=sd132,host=hd4,lun=/dev/vg1/asu132,size=1932735283200
sd=sd133,host=hd5,lun=/dev/vg1/asu133,size=1932735283200
sd=sd134,host=hd5,lun=/dev/vg1/asu134,size=1932735283200
sd=sd135,host=hd5,lun=/dev/vg1/asu135,size=1932735283200
sd=sd136,host=hd5,lun=/dev/vg1/asu136,size=1932735283200
sd=sd137,host=hd5,lun=/dev/vg1/asu137,size=1932735283200
sd=sd138,host=hd5,lun=/dev/vg1/asu138,size=1932735283200
sd=sd139,host=hd5,lun=/dev/vg1/asu139,size=1932735283200
sd=sd140,host=hd5,lun=/dev/vg1/asu140,size=1932735283200
```

```
sd=sd141,host=hd6,lun=/dev/vg1/asu141,size=1932735283200
sd=sd142,host=hd6,lun=/dev/vg1/asu142,size=1932735283200
sd=sd143,host=hd6,lun=/dev/vg1/asu143,size=1932735283200
sd=sd144,host=hd6,lun=/dev/vg1/asu144,size=1932735283200
sd=sd145,host=hd6,lun=/dev/vg1/asu145,size=1932735283200
sd=sd146,host=hd6,lun=/dev/vg1/asu146,size=1932735283200
sd=sd147,host=hd6,lun=/dev/vg1/asu147,size=1932735283200
sd=sd148,host=hd6,lun=/dev/vg1/asu148,size=1932735283200
sd=sd149,host=hd7,lun=/dev/vg1/asu149,size=1932735283200
sd=sd150,host=hd7,lun=/dev/vg1/asu150,size=1932735283200
sd=sd151,host=hd7,lun=/dev/vg1/asu151,size=1932735283200
sd=sd152,host=hd7,lun=/dev/vg1/asu152,size=1932735283200
sd=sd153,host=hd7,lun=/dev/vg1/asu153,size=1932735283200
sd=sd154,host=hd7,lun=/dev/vg1/asu154,size=1932735283200
sd=sd155,host=hd7,lun=/dev/vg1/asu155,size=1932735283200
sd=sd156,host=hd7,lun=/dev/vg1/asu156,size=1932735283200
sd=sd157,host=hd8,lun=/dev/vg1/asu157,size=1932735283200
sd=sd158,host=hd8,lun=/dev/vg1/asu158,size=1932735283200
sd=sd159,host=hd8,lun=/dev/vg1/asu159,size=1932735283200
sd=sd160,host=hd8,lun=/dev/vg1/asu160,size=1932735283200
sd=sd161,host=hd8,lun=/dev/vg1/asu161,size=1932735283200
sd=sd162,host=hd8,lun=/dev/vg1/asu162,size=1932735283200
sd=sd163,host=hd8,lun=/dev/vg1/asu163,size=1932735283200
sd=sd164,host=hd8,lun=/dev/vg1/asu164,size=1932735283200


sd=sd21,host=hd1,lun=/dev/vg2/asu21,size=1932735283200
sd=sd22,host=hd1,lun=/dev/vg2/asu22,size=1932735283200
sd=sd23,host=hd1,lun=/dev/vg2/asu23,size=1932735283200
sd=sd24,host=hd1,lun=/dev/vg2/asu24,size=1932735283200
sd=sd25,host=hd1,lun=/dev/vg2/asu25,size=1932735283200
sd=sd26,host=hd1,lun=/dev/vg2/asu26,size=1932735283200
sd=sd27,host=hd1,lun=/dev/vg2/asu27,size=1932735283200
sd=sd28,host=hd1,lun=/dev/vg2/asu28,size=1932735283200
sd=sd29,host=hd2,lun=/dev/vg2/asu29,size=1932735283200
sd=sd210,host=hd2,lun=/dev/vg2/asu210,size=1932735283200
sd=sd211,host=hd2,lun=/dev/vg2/asu211,size=1932735283200
sd=sd212,host=hd2,lun=/dev/vg2/asu212,size=1932735283200
sd=sd213,host=hd2,lun=/dev/vg2/asu213,size=1932735283200
sd=sd214,host=hd2,lun=/dev/vg2/asu214,size=1932735283200
sd=sd215,host=hd2,lun=/dev/vg2/asu215,size=1932735283200
sd=sd216,host=hd2,lun=/dev/vg2/asu216,size=1932735283200
sd=sd217,host=hd3,lun=/dev/vg2/asu217,size=1932735283200
sd=sd218,host=hd3,lun=/dev/vg2/asu218,size=1932735283200
sd=sd219,host=hd3,lun=/dev/vg2/asu219,size=1932735283200
sd=sd220,host=hd3,lun=/dev/vg2/asu220,size=1932735283200
sd=sd221,host=hd3,lun=/dev/vg2/asu221,size=1932735283200
sd=sd222,host=hd3,lun=/dev/vg2/asu222,size=1932735283200
sd=sd223,host=hd3,lun=/dev/vg2/asu223,size=1932735283200
sd=sd224,host=hd3,lun=/dev/vg2/asu224,size=1932735283200
sd=sd225,host=hd4,lun=/dev/vg2/asu225,size=1932735283200
sd=sd226,host=hd4,lun=/dev/vg2/asu226,size=1932735283200
sd=sd227,host=hd4,lun=/dev/vg2/asu227,size=1932735283200
sd=sd228,host=hd4,lun=/dev/vg2/asu228,size=1932735283200
sd=sd229,host=hd4,lun=/dev/vg2/asu229,size=1932735283200
sd=sd230,host=hd4,lun=/dev/vg2/asu230,size=1932735283200
sd=sd231,host=hd4,lun=/dev/vg2/asu231,size=1932735283200
sd=sd232,host=hd4,lun=/dev/vg2/asu232,size=1932735283200
sd=sd233,host=hd5,lun=/dev/vg2/asu233,size=1932735283200
sd=sd234,host=hd5,lun=/dev/vg2/asu234,size=1932735283200
sd=sd235,host=hd5,lun=/dev/vg2/asu235,size=1932735283200
sd=sd236,host=hd5,lun=/dev/vg2/asu236,size=1932735283200
sd=sd237,host=hd5,lun=/dev/vg2/asu237,size=1932735283200
```

```
sd=sd238,host=hd5,lun=/dev/vg2/asu238,size=1932735283200
sd=sd239,host=hd5,lun=/dev/vg2/asu239,size=1932735283200
sd=sd240,host=hd5,lun=/dev/vg2/asu240,size=1932735283200
sd=sd241,host=hd6,lun=/dev/vg2/asu241,size=1932735283200
sd=sd242,host=hd6,lun=/dev/vg2/asu242,size=1932735283200
sd=sd243,host=hd6,lun=/dev/vg2/asu243,size=1932735283200
sd=sd244,host=hd6,lun=/dev/vg2/asu244,size=1932735283200
sd=sd245,host=hd6,lun=/dev/vg2/asu245,size=1932735283200
sd=sd246,host=hd6,lun=/dev/vg2/asu246,size=1932735283200
sd=sd247,host=hd6,lun=/dev/vg2/asu247,size=1932735283200
sd=sd248,host=hd6,lun=/dev/vg2/asu248,size=1932735283200
sd=sd249,host=hd7,lun=/dev/vg2/asu249,size=1932735283200
sd=sd250,host=hd7,lun=/dev/vg2/asu250,size=1932735283200
sd=sd251,host=hd7,lun=/dev/vg2/asu251,size=1932735283200
sd=sd252,host=hd7,lun=/dev/vg2/asu252,size=1932735283200
sd=sd253,host=hd7,lun=/dev/vg2/asu253,size=1932735283200
sd=sd254,host=hd7,lun=/dev/vg2/asu254,size=1932735283200
sd=sd255,host=hd7,lun=/dev/vg2/asu255,size=1932735283200
sd=sd256,host=hd7,lun=/dev/vg2/asu256,size=1932735283200
sd=sd257,host=hd8,lun=/dev/vg2/asu257,size=1932735283200
sd=sd258,host=hd8,lun=/dev/vg2/asu258,size=1932735283200
sd=sd259,host=hd8,lun=/dev/vg2/asu259,size=1932735283200
sd=sd260,host=hd8,lun=/dev/vg2/asu260,size=1932735283200
sd=sd261,host=hd8,lun=/dev/vg2/asu261,size=1932735283200
sd=sd262,host=hd8,lun=/dev/vg2/asu262,size=1932735283200
sd=sd263,host=hd8,lun=/dev/vg2/asu263,size=1932735283200
sd=sd264,host=hd8,lun=/dev/vg2/asu264,size=1932735283200


sd=sd31,host=hd1,lun=/dev/vg3/asu31,size=1717986918400
sd=sd32,host=hd1,lun=/dev/vg3/asu32,size=1717986918400
sd=sd33,host=hd2,lun=/dev/vg3/asu33,size=1717986918400
sd=sd34,host=hd2,lun=/dev/vg3/asu34,size=1717986918400
sd=sd35,host=hd3,lun=/dev/vg3/asu35,size=1717986918400
sd=sd36,host=hd3,lun=/dev/vg3/asu36,size=1717986918400
sd=sd37,host=hd4,lun=/dev/vg3/asu37,size=1717986918400
sd=sd38,host=hd4,lun=/dev/vg3/asu38,size=1717986918400
sd=sd39,host=hd5,lun=/dev/vg3/asu39,size=1717986918400
sd=sd310,host=hd5,lun=/dev/vg3/asu310,size=1717986918400
sd=sd311,host=hd6,lun=/dev/vg3/asu311,size=1717986918400
sd=sd312,host=hd6,lun=/dev/vg3/asu312,size=1717986918400
sd=sd313,host=hd7,lun=/dev/vg3/asu313,size=1717986918400
sd=sd314,host=hd7,lun=/dev/vg3/asu314,size=1717986918400
sd=sd315,host=hd8,lun=/dev/vg3/asu315,size=1717986918400
sd=sd316,host=hd8,lun=/dev/vg3/asu316,size=1717986918400

wd=wd1,sd=sd*,rdpct=0,seekpct=-1,xfersize=128K
rd=asu_prefill,wd=wd1,iorate=max,elapsed=36000,interval=10
```

Common Command Lines – Primary Metrics and Repeatability Tests

The following command lines appear at the beginning of each command and parameter file for the Primary Metrics and Repeatability Test. The command lines are only listed below to eliminate redundancy.

```
host=master

slaves=(slave1,slave2,slave3,slave4,slave5,slave6,slave7,slave8,slave9,slave10,slave
11,slave12,slave13,slave14,slave15,slave16,slave17,slave18,slave19,slave20,slave21,s
lave22,slave23,slave24,slave25,slave26,slave27,slave28,slave29,slave30,slave31,slave
32,slave33,slave34,slave35,slave36,slave37,slave38,slave39,slave40,slave41,slave42,s
lave43,slave44,slave45,slave46,slave47,slave48,slave49,slave50,slave51,slave52,slave
53,slave54,slave55,slave56,slave57,slave58,slave59,slave60,slave61,slave62,slave63,s
lave64,slave65,slave66,slave67,slave68,slave69,slave70,slave71,slave72,slave73,slave
74,slave75,slave76,slave77,slave78,slave79,slave80,slave81,slave82,slave83,slave84,s
lave85,slave86,slave87,slave88,slave89,slave90,slave91,slave92,slave93,slave94,slave
95,slave96,slave97,slave98,slave99,slave100,slave101,slave102,slave103,slave104,slav
e105,slave106,slave107,slave108,slave109,slave110,slave111,slave112,slave113,slave11
4,slave115,slave116,slave117,slave118,slave119,slave120,slave121,slave122,slave123,s
lave124,slave125,slave126,slave127,slave128,slave129,slave130,slave131,slave132,slav
e133,slave134,slave135,slave136,slave137,slave138,slave139,slave140,slave141,slave14
2,slave143,slave144,slave145,slave146,slave147,slave148,slave149,slave150,slave151,s
lave152,slave153,slave154,slave155,slave156,slave157,slave158,slave159,slave160,slav
e161,slave162,slave163,slave164,slave165,slave166,slave167,slave168,slave169,slave17
0,slave171,slave172,slave173,slave174,slave175,slave176,slave177,slave178,slave179,s
lave180,slave181,slave182,slave183,slave184,slave185,slave186,slave187,slave188,slav
e189,slave190,slave191,slave192,slave193,slave194,slave195,slave196,slave197,slave19
8,slave199,slave200,slave201,slave202,slave203,slave204,slave205,slave206,slave207,s
lave208)

sd=asu1_1,lun=/dev/vg1/asu11,size=1932735283200
sd=asu1_2,lun=/dev/vg1/asu12,size=1932735283200
sd=asu1_3,lun=/dev/vg1/asu13,size=1932735283200
sd=asu1_4,lun=/dev/vg1/asu14,size=1932735283200
sd=asu1_5,lun=/dev/vg1/asu15,size=1932735283200
sd=asu1_6,lun=/dev/vg1/asu16,size=1932735283200
sd=asu1_7,lun=/dev/vg1/asu17,size=1932735283200
sd=asu1_8,lun=/dev/vg1/asu18,size=1932735283200
sd=asu1_9,lun=/dev/vg1/asu19,size=1932735283200
sd=asu1_10,lun=/dev/vg1/asu110,size=1932735283200
sd=asu1_11,lun=/dev/vg1/asu111,size=1932735283200
sd=asu1_12,lun=/dev/vg1/asu112,size=1932735283200
sd=asu1_13,lun=/dev/vg1/asu113,size=1932735283200
sd=asu1_14,lun=/dev/vg1/asu114,size=1932735283200
sd=asu1_15,lun=/dev/vg1/asu115,size=1932735283200
sd=asu1_16,lun=/dev/vg1/asu116,size=1932735283200
sd=asu1_17,lun=/dev/vg1/asu117,size=1932735283200
sd=asu1_18,lun=/dev/vg1/asu118,size=1932735283200
sd=asu1_19,lun=/dev/vg1/asu119,size=1932735283200
sd=asu1_20,lun=/dev/vg1/asu120,size=1932735283200
sd=asu1_21,lun=/dev/vg1/asu121,size=1932735283200
sd=asu1_22,lun=/dev/vg1/asu122,size=1932735283200
sd=asu1_23,lun=/dev/vg1/asu123,size=1932735283200
sd=asu1_24,lun=/dev/vg1/asu124,size=1932735283200
sd=asu1_25,lun=/dev/vg1/asu125,size=1932735283200
sd=asu1_26,lun=/dev/vg1/asu126,size=1932735283200
sd=asu1_27,lun=/dev/vg1/asu127,size=1932735283200
sd=asu1_28,lun=/dev/vg1/asu128,size=1932735283200
sd=asu1_29,lun=/dev/vg1/asu129,size=1932735283200
```

```
sd=asu1_30,lun=/dev/vg1/asu130,size=1932735283200
sd=asu1_31,lun=/dev/vg1/asu131,size=1932735283200
sd=asu1_32,lun=/dev/vg1/asu132,size=1932735283200
sd=asu1_33,lun=/dev/vg1/asu133,size=1932735283200
sd=asu1_34,lun=/dev/vg1/asu134,size=1932735283200
sd=asu1_35,lun=/dev/vg1/asu135,size=1932735283200
sd=asu1_36,lun=/dev/vg1/asu136,size=1932735283200
sd=asu1_37,lun=/dev/vg1/asu137,size=1932735283200
sd=asu1_38,lun=/dev/vg1/asu138,size=1932735283200
sd=asu1_39,lun=/dev/vg1/asu139,size=1932735283200
sd=asu1_40,lun=/dev/vg1/asu140,size=1932735283200
sd=asu1_41,lun=/dev/vg1/asu141,size=1932735283200
sd=asu1_42,lun=/dev/vg1/asu142,size=1932735283200
sd=asu1_43,lun=/dev/vg1/asu143,size=1932735283200
sd=asu1_44,lun=/dev/vg1/asu144,size=1932735283200
sd=asu1_45,lun=/dev/vg1/asu145,size=1932735283200
sd=asu1_46,lun=/dev/vg1/asu146,size=1932735283200
sd=asu1_47,lun=/dev/vg1/asu147,size=1932735283200
sd=asu1_48,lun=/dev/vg1/asu148,size=1932735283200
sd=asu1_49,lun=/dev/vg1/asu149,size=1932735283200
sd=asu1_50,lun=/dev/vg1/asu150,size=1932735283200
sd=asu1_51,lun=/dev/vg1/asu151,size=1932735283200
sd=asu1_52,lun=/dev/vg1/asu152,size=1932735283200
sd=asu1_53,lun=/dev/vg1/asu153,size=1932735283200
sd=asu1_54,lun=/dev/vg1/asu154,size=1932735283200
sd=asu1_55,lun=/dev/vg1/asu155,size=1932735283200
sd=asu1_56,lun=/dev/vg1/asu156,size=1932735283200
sd=asu1_57,lun=/dev/vg1/asu157,size=1932735283200
sd=asu1_58,lun=/dev/vg1/asu158,size=1932735283200
sd=asu1_59,lun=/dev/vg1/asu159,size=1932735283200
sd=asu1_60,lun=/dev/vg1/asu160,size=1932735283200
sd=asu1_61,lun=/dev/vg1/asu161,size=1932735283200
sd=asu1_62,lun=/dev/vg1/asu162,size=1932735283200
sd=asu1_63,lun=/dev/vg1/asu163,size=1932735283200
sd=asu1_64,lun=/dev/vg1/asu164,size=1932735283200


sd=asu2_1,lun=/dev/vg2/asu21,size=1932735283200
sd=asu2_2,lun=/dev/vg2/asu22,size=1932735283200
sd=asu2_3,lun=/dev/vg2/asu23,size=1932735283200
sd=asu2_4,lun=/dev/vg2/asu24,size=1932735283200
sd=asu2_5,lun=/dev/vg2/asu25,size=1932735283200
sd=asu2_6,lun=/dev/vg2/asu26,size=1932735283200
sd=asu2_7,lun=/dev/vg2/asu27,size=1932735283200
sd=asu2_8,lun=/dev/vg2/asu28,size=1932735283200
sd=asu2_9,lun=/dev/vg2/asu29 ,size=1932735283200
sd=asu2_10,lun=/dev/vg2/asu210,size=1932735283200
sd=asu2_11,lun=/dev/vg2/asu211,size=1932735283200
sd=asu2_12,lun=/dev/vg2/asu212,size=1932735283200
sd=asu2_13,lun=/dev/vg2/asu213,size=1932735283200
sd=asu2_14,lun=/dev/vg2/asu214,size=1932735283200
sd=asu2_15,lun=/dev/vg2/asu215,size=1932735283200
sd=asu2_16,lun=/dev/vg2/asu216,size=1932735283200
sd=asu2_17,lun=/dev/vg2/asu217,size=1932735283200
sd=asu2_18,lun=/dev/vg2/asu218,size=1932735283200
sd=asu2_19,lun=/dev/vg2/asu219,size=1932735283200
sd=asu2_20,lun=/dev/vg2/asu220,size=1932735283200
sd=asu2_21,lun=/dev/vg2/asu221,size=1932735283200
sd=asu2_22,lun=/dev/vg2/asu222,size=1932735283200
sd=asu2_23,lun=/dev/vg2/asu223,size=1932735283200
sd=asu2_24,lun=/dev/vg2/asu224,size=1932735283200
sd=asu2_25,lun=/dev/vg2/asu225,size=1932735283200
sd=asu2_26,lun=/dev/vg2/asu226,size=1932735283200
```

```
sd=asu2_27,lun=/dev/vg2/asu227,size=1932735283200
sd=asu2_28,lun=/dev/vg2/asu228,size=1932735283200
sd=asu2_29,lun=/dev/vg2/asu229,size=1932735283200
sd=asu2_30,lun=/dev/vg2/asu230,size=1932735283200
sd=asu2_31,lun=/dev/vg2/asu231,size=1932735283200
sd=asu2_32,lun=/dev/vg2/asu232,size=1932735283200
sd=asu2_33,lun=/dev/vg2/asu233,size=1932735283200
sd=asu2_34,lun=/dev/vg2/asu234,size=1932735283200
sd=asu2_35,lun=/dev/vg2/asu235,size=1932735283200
sd=asu2_36,lun=/dev/vg2/asu236,size=1932735283200
sd=asu2_37,lun=/dev/vg2/asu237,size=1932735283200
sd=asu2_38,lun=/dev/vg2/asu238,size=1932735283200
sd=asu2_39,lun=/dev/vg2/asu239,size=1932735283200
sd=asu2_40,lun=/dev/vg2/asu240,size=1932735283200
sd=asu2_41,lun=/dev/vg2/asu241,size=1932735283200
sd=asu2_42,lun=/dev/vg2/asu242,size=1932735283200
sd=asu2_43,lun=/dev/vg2/asu243,size=1932735283200
sd=asu2_44,lun=/dev/vg2/asu244,size=1932735283200
sd=asu2_45,lun=/dev/vg2/asu245,size=1932735283200
sd=asu2_46,lun=/dev/vg2/asu246,size=1932735283200
sd=asu2_47,lun=/dev/vg2/asu247,size=1932735283200
sd=asu2_48,lun=/dev/vg2/asu248,size=1932735283200
sd=asu2_49,lun=/dev/vg2/asu249,size=1932735283200
sd=asu2_50,lun=/dev/vg2/asu250,size=1932735283200
sd=asu2_51,lun=/dev/vg2/asu251,size=1932735283200
sd=asu2_52,lun=/dev/vg2/asu252,size=1932735283200
sd=asu2_53,lun=/dev/vg2/asu253,size=1932735283200
sd=asu2_54,lun=/dev/vg2/asu254,size=1932735283200
sd=asu2_55,lun=/dev/vg2/asu255,size=1932735283200
sd=asu2_56,lun=/dev/vg2/asu256,size=1932735283200
sd=asu2_57,lun=/dev/vg2/asu257,size=1932735283200
sd=asu2_58,lun=/dev/vg2/asu258,size=1932735283200
sd=asu2_59,lun=/dev/vg2/asu259,size=1932735283200
sd=asu2_60,lun=/dev/vg2/asu260,size=1932735283200
sd=asu2_61,lun=/dev/vg2/asu261,size=1932735283200
sd=asu2_62,lun=/dev/vg2/asu262,size=1932735283200
sd=asu2_63,lun=/dev/vg2/asu263,size=1932735283200
sd=asu2_64,lun=/dev/vg2/asu264,size=1932735283200


sd=asu3_1,lun=/dev/vg3/asu31,size=1717986918400
sd=asu3_2,lun=/dev/vg3/asu32,size=1717986918400
sd=asu3_3,lun=/dev/vg3/asu33,size=1717986918400
sd=asu3_4,lun=/dev/vg3/asu34,size=1717986918400
sd=asu3_5,lun=/dev/vg3/asu35,size=1717986918400
sd=asu3_6,lun=/dev/vg3/asu36,size=1717986918400
sd=asu3_7,lun=/dev/vg3/asu37,size=1717986918400
sd=asu3_8,lun=/dev/vg3/asu38,size=1717986918400
sd=asu3_9,lun=/dev/vg3/asu39,size=1717986918400
sd=asu3_10,lun=/dev/vg3/asu310,size=1717986918400
sd=asu3_11,lun=/dev/vg3/asu311,size=1717986918400
sd=asu3_12,lun=/dev/vg3/asu312,size=1717986918400
sd=asu3_13,lun=/dev/vg3/asu313,size=1717986918400
sd=asu3_14,lun=/dev/vg3/asu314,size=1717986918400
sd=asu3_15,lun=/dev/vg3/asu315,size=1717986918400
sd=asu3_16,lun=/dev/vg3/asu316,size=1717986918400
```

Primary Metrics Test: Sustainability Test Phase/Test Run

common commands 1

```
rd=sustain,bsus=20120,startup=7200,elapsed=28800,interval=60
```

Primary Metrics Test: IOPS Test Phase *(100% Test Run)*

common commands 1

```
rd=ramp_100,bsus=20120,startup=180,elapsed=600,interval=60
```

Primary Metrics Test: Response Time Ramp Test Phase *(95% Test Run)*

common commands 1

```
rd=ramp_95,bsus=19114,startup=180,elapsed=600,interval=60
```

Primary Metrics Test: Response Time Ramp Test Phase *(90% Test Run)*

common commands 1

```
rd=ramp_90,bsus=18108,startup=180,elapsed=600,interval=60
```

Primary Metrics Test: Response Time Ramp Test Phase *(80% Test Run)*

common commands 1

```
rd=ramp_80,bsus=16096,startup=180,elapsed=600,interval=60
```

Primary Metrics Test: Response Time Ramp Test Phase *(50% Test Run)*

common commands 1

```
rd=ramp_50,bsus=10060,startup=180,elapsed=600,interval=60
```

Primary Metrics Test: Response Time Ramp Test Phase *(10% Test Run)*

common commands 1

```
rd=ramp_10,bsus=2012,startup=180,elapsed=600,interval=60
```

Repeatability Test: Repeatability Test Phase 1 (10% and 1005 Test Runs)

common commands 1

```
rd=repeat1_lrt,bsus=2012,startup=180,elapsed=600,interval=60
rd=repeat1_iops,bsus=20120,startup=180,elapsed=600,interval=60
```

Repeatability Test: Repeatability Test Phase 2 *(10% and 100% Test Runs)*

common commands 1

```
rd=repeat2_lrt,bsus=2012,startup=180,elapsed=600,interval=60
rd=repeat2_iops,bsus=20120,startup=180,elapsed=600,interval=60
```

SPC-1 Persistence Test Run 1

The content of SPC-1 Workload Generator command and parameter file, used in this benchmark to execute a reduced level SPC-1 Persistence Test Run 1, is listed below.

```
sd=asu1_1,lun=/dev/vg1/asu11,size=1932735283200
sd=asu1_2,lun=/dev/vg1/asu12,size=1932735283200
sd=asu1_3,lun=/dev/vg1/asu13,size=1932735283200
sd=asu1_4,lun=/dev/vg1/asu14,size=1932735283200
sd=asu1_5,lun=/dev/vg1/asu15,size=1932735283200
sd=asu1_6,lun=/dev/vg1/asu16,size=1932735283200
sd=asu1_7,lun=/dev/vg1/asu17,size=1932735283200
sd=asu1_8,lun=/dev/vg1/asu18,size=1932735283200
sd=asu1_9,lun=/dev/vg1/asu19,size=1932735283200
sd=asu1_10,lun=/dev/vg1/asu110,size=1932735283200
sd=asu1_11,lun=/dev/vg1/asu111,size=1932735283200
sd=asu1_12,lun=/dev/vg1/asu112,size=1932735283200
sd=asu1_13,lun=/dev/vg1/asu113,size=1932735283200
sd=asu1_14,lun=/dev/vg1/asu114,size=1932735283200
sd=asu1_15,lun=/dev/vg1/asu115,size=1932735283200
sd=asu1_16,lun=/dev/vg1/asu116,size=1932735283200
sd=asu1_17,lun=/dev/vg1/asu117,size=1932735283200
sd=asu1_18,lun=/dev/vg1/asu118,size=1932735283200
sd=asu1_19,lun=/dev/vg1/asu119,size=1932735283200
sd=asu1_20,lun=/dev/vg1/asu120,size=1932735283200
sd=asu1_21,lun=/dev/vg1/asu121,size=1932735283200
sd=asu1_22,lun=/dev/vg1/asu122,size=1932735283200
sd=asu1_23,lun=/dev/vg1/asu123,size=1932735283200
sd=asu1_24,lun=/dev/vg1/asu124,size=1932735283200
sd=asu1_25,lun=/dev/vg1/asu125,size=1932735283200
sd=asu1_26,lun=/dev/vg1/asu126,size=1932735283200
sd=asu1_27,lun=/dev/vg1/asu127,size=1932735283200
sd=asu1_28,lun=/dev/vg1/asu128,size=1932735283200
sd=asu1_29,lun=/dev/vg1/asu129,size=1932735283200
sd=asu1_30,lun=/dev/vg1/asu130,size=1932735283200
sd=asu1_31,lun=/dev/vg1/asu131,size=1932735283200
sd=asu1_32,lun=/dev/vg1/asu132,size=1932735283200
sd=asu1_33,lun=/dev/vg1/asu133,size=1932735283200
sd=asu1_34,lun=/dev/vg1/asu134,size=1932735283200
sd=asu1_35,lun=/dev/vg1/asu135,size=1932735283200
sd=asu1_36,lun=/dev/vg1/asu136,size=1932735283200
sd=asu1_37,lun=/dev/vg1/asu137,size=1932735283200
sd=asu1_38,lun=/dev/vg1/asu138,size=1932735283200
sd=asu1_39,lun=/dev/vg1/asu139,size=1932735283200
sd=asu1_40,lun=/dev/vg1/asu140,size=1932735283200
sd=asu1_41,lun=/dev/vg1/asu141,size=1932735283200
sd=asu1_42,lun=/dev/vg1/asu142,size=1932735283200
sd=asu1_43,lun=/dev/vg1/asu143,size=1932735283200
sd=asu1_44,lun=/dev/vg1/asu144,size=1932735283200
sd=asu1_45,lun=/dev/vg1/asu145,size=1932735283200
sd=asu1_46,lun=/dev/vg1/asu146,size=1932735283200
sd=asu1_47,lun=/dev/vg1/asu147,size=1932735283200
sd=asu1_48,lun=/dev/vg1/asu148,size=1932735283200
sd=asu1_49,lun=/dev/vg1/asu149,size=1932735283200
sd=asu1_50,lun=/dev/vg1/asu150,size=1932735283200
sd=asu1_51,lun=/dev/vg1/asu151,size=1932735283200
sd=asu1_52,lun=/dev/vg1/asu152,size=1932735283200
sd=asu1_53,lun=/dev/vg1/asu153,size=1932735283200
sd=asu1_54,lun=/dev/vg1/asu154,size=1932735283200
sd=asu1_55,lun=/dev/vg1/asu155,size=1932735283200
sd=asu1_56,lun=/dev/vg1/asu156,size=1932735283200
sd=asu1_57,lun=/dev/vg1/asu157,size=1932735283200
sd=asu1_58,lun=/dev/vg1/asu158,size=1932735283200
sd=asu1_59,lun=/dev/vg1/asu159,size=1932735283200
sd=asu1_60,lun=/dev/vg1/asu160,size=1932735283200
sd=asu1_61,lun=/dev/vg1/asu161,size=1932735283200
sd=asu1_62,lun=/dev/vg1/asu162,size=1932735283200
```

```
sd=asu1_63,lun=/dev/vg1/asu163,size=1932735283200
sd=asu1_64,lun=/dev/vg1/asu164,size=1932735283200

sd=asu2_1,lun=/dev/vg2/asu21,size=1932735283200
sd=asu2_2,lun=/dev/vg2/asu22,size=1932735283200
sd=asu2_3,lun=/dev/vg2/asu23,size=1932735283200
sd=asu2_4,lun=/dev/vg2/asu24,size=1932735283200
sd=asu2_5,lun=/dev/vg2/asu25,size=1932735283200
sd=asu2_6,lun=/dev/vg2/asu26,size=1932735283200
sd=asu2_7,lun=/dev/vg2/asu27,size=1932735283200
sd=asu2_8,lun=/dev/vg2/asu28,size=1932735283200
sd=asu2_9,lun=/dev/vg2/asu29,size=1932735283200
sd=asu2_10,lun=/dev/vg2/asu210,size=1932735283200
sd=asu2_11,lun=/dev/vg2/asu211,size=1932735283200
sd=asu2_12,lun=/dev/vg2/asu212,size=1932735283200
sd=asu2_13,lun=/dev/vg2/asu213,size=1932735283200
sd=asu2_14,lun=/dev/vg2/asu214,size=1932735283200
sd=asu2_15,lun=/dev/vg2/asu215,size=1932735283200
sd=asu2_16,lun=/dev/vg2/asu216,size=1932735283200
sd=asu2_17,lun=/dev/vg2/asu217,size=1932735283200
sd=asu2_18,lun=/dev/vg2/asu218,size=1932735283200
sd=asu2_19,lun=/dev/vg2/asu219,size=1932735283200
sd=asu2_20,lun=/dev/vg2/asu220,size=1932735283200
sd=asu2_21,lun=/dev/vg2/asu221,size=1932735283200
sd=asu2_22,lun=/dev/vg2/asu222,size=1932735283200
sd=asu2_23,lun=/dev/vg2/asu223,size=1932735283200
sd=asu2_24,lun=/dev/vg2/asu224,size=1932735283200
sd=asu2_25,lun=/dev/vg2/asu225,size=1932735283200
sd=asu2_26,lun=/dev/vg2/asu226,size=1932735283200
sd=asu2_27,lun=/dev/vg2/asu227,size=1932735283200
sd=asu2_28,lun=/dev/vg2/asu228,size=1932735283200
sd=asu2_29,lun=/dev/vg2/asu229,size=1932735283200
sd=asu2_30,lun=/dev/vg2/asu230,size=1932735283200
sd=asu2_31,lun=/dev/vg2/asu231,size=1932735283200
sd=asu2_32,lun=/dev/vg2/asu232,size=1932735283200
sd=asu2_33,lun=/dev/vg2/asu233,size=1932735283200
sd=asu2_34,lun=/dev/vg2/asu234,size=1932735283200
sd=asu2_35,lun=/dev/vg2/asu235,size=1932735283200
sd=asu2_36,lun=/dev/vg2/asu236,size=1932735283200
sd=asu2_37,lun=/dev/vg2/asu237,size=1932735283200
sd=asu2_38,lun=/dev/vg2/asu238,size=1932735283200
sd=asu2_39,lun=/dev/vg2/asu239,size=1932735283200
sd=asu2_40,lun=/dev/vg2/asu240,size=1932735283200
sd=asu2_41,lun=/dev/vg2/asu241,size=1932735283200
sd=asu2_42,lun=/dev/vg2/asu242,size=1932735283200
sd=asu2_43,lun=/dev/vg2/asu243,size=1932735283200
sd=asu2_44,lun=/dev/vg2/asu244,size=1932735283200
sd=asu2_45,lun=/dev/vg2/asu245,size=1932735283200
sd=asu2_46,lun=/dev/vg2/asu246,size=1932735283200
sd=asu2_47,lun=/dev/vg2/asu247,size=1932735283200
sd=asu2_48,lun=/dev/vg2/asu248,size=1932735283200
sd=asu2_49,lun=/dev/vg2/asu249,size=1932735283200
sd=asu2_50,lun=/dev/vg2/asu250,size=1932735283200
sd=asu2_51,lun=/dev/vg2/asu251,size=1932735283200
sd=asu2_52,lun=/dev/vg2/asu252,size=1932735283200
sd=asu2_53,lun=/dev/vg2/asu253,size=1932735283200
sd=asu2_54,lun=/dev/vg2/asu254,size=1932735283200
sd=asu2_55,lun=/dev/vg2/asu255,size=1932735283200
sd=asu2_56,lun=/dev/vg2/asu256,size=1932735283200
sd=asu2_57,lun=/dev/vg2/asu257,size=1932735283200
sd=asu2_58,lun=/dev/vg2/asu258,size=1932735283200
sd=asu2_59,lun=/dev/vg2/asu259,size=1932735283200
sd=asu2_60,lun=/dev/vg2/asu260,size=1932735283200
```

```
sd=asu2_61,lun=/dev/vg2/asu261,size=1932735283200
sd=asu2_62,lun=/dev/vg2/asu262,size=1932735283200
sd=asu2_63,lun=/dev/vg2/asu263,size=1932735283200
sd=asu2_64,lun=/dev/vg2/asu264,size=1932735283200

sd=asu3_1,lun=/dev/vg3/asu31,size=1717986918400
sd=asu3_2,lun=/dev/vg3/asu32,size=1717986918400
sd=asu3_3,lun=/dev/vg3/asu33,size=1717986918400
sd=asu3_4,lun=/dev/vg3/asu34,size=1717986918400
sd=asu3_5,lun=/dev/vg3/asu35,size=1717986918400
sd=asu3_6,lun=/dev/vg3/asu36,size=1717986918400
sd=asu3_7,lun=/dev/vg3/asu37,size=1717986918400
sd=asu3_8,lun=/dev/vg3/asu38,size=1717986918400
sd=asu3_9,lun=/dev/vg3/asu39,size=1717986918400
sd=asu3_10,lun=/dev/vg3/asu310,size=1717986918400
sd=asu3_11,lun=/dev/vg3/asu311,size=1717986918400
sd=asu3_12,lun=/dev/vg3/asu312,size=1717986918400
sd=asu3_13,lun=/dev/vg3/asu313,size=1717986918400
sd=asu3_14,lun=/dev/vg3/asu314,size=1717986918400
sd=asu3_15,lun=/dev/vg3/asu315,size=1717986918400
sd=asu3_16,lun=/dev/vg3/asu316,size=1717986918400
```

SPC-2 Persistence Test

If approved by the SPC Auditor, the SPC-2 Persistence Test may be used to meet the SPC-1 persistence requirements. Both the SPC-1 and SPC-2 Persistence Tests provide the same level of functionality and verification of data integrity.

Common Command Lines – SPC-2 Persistence Test

The following command lines appear at the beginning of each command and parameter file for the two SPC-2 Persistence Test Runs. The command lines are only listed below to eliminate redundancy

```
host=localhost,spc2="/root/spc2",shell=spc2,jvms=10,maxstreams=100
host=(100.124.66.12,coltrane1),spc2="/root/spc2",shell=spc2,jvms=10,maxstreams=100
host=(100.124.66.13,coltrane2),spc2="/root/spc2",shell=spc2,jvms=10,maxstreams=100

sd=default,host=localhost
sd=sd1,lun=/dev/vg1/asu11,size=1932735283200
sd=sd2,lun=/dev/vg1/asu12,size=1932735283200
sd=sd3,lun=/dev/vg1/asu13,size=1932735283200
sd=sd4,lun=/dev/vg1/asu14,size=1932735283200
sd=sd5,lun=/dev/vg1/asu15,size=1932735283200
sd=sd6,lun=/dev/vg1/asu16,size=1932735283200
sd=sd7,lun=/dev/vg1/asu17,size=1932735283200
sd=sd8,lun=/dev/vg1/asu18,size=1932735283200
sd=sd9,lun=/dev/vg1/asu19,size=1932735283200
sd=sd10,lun=/dev/vg1/asu110,size=1932735283200
sd=sd11,lun=/dev/vg1/asu111,size=1932735283200
sd=sd12,lun=/dev/vg1/asu112,size=1932735283200
sd=sd13,lun=/dev/vg1/asu113,size=1932735283200
sd=sd14,lun=/dev/vg1/asu114,size=1932735283200
sd=sd15,lun=/dev/vg1/asu115,size=1932735283200
sd=sd16,lun=/dev/vg1/asu116,size=1932735283200
sd=sd17,lun=/dev/vg1/asu117,size=1932735283200
```

```
sd=sd18,lun=/dev/vg1/asu118,size=1932735283200
sd=sd19,lun=/dev/vg1/asu119,size=1932735283200
sd=sd20,lun=/dev/vg1/asu120,size=1932735283200
sd=sd21,lun=/dev/vg1/asu121,size=1932735283200
sd=sd22,lun=/dev/vg1/asu122,size=1932735283200
sd=sd23,lun=/dev/vg1/asu123,size=1932735283200
sd=sd24,lun=/dev/vg1/asu124,size=1932735283200
sd=sd25,lun=/dev/vg1/asu125,size=1932735283200
sd=sd26,lun=/dev/vg1/asu126,size=1932735283200
sd=sd27,lun=/dev/vg1/asu127,size=1932735283200
sd=sd28,lun=/dev/vg1/asu128,size=1932735283200
sd=sd29,lun=/dev/vg1/asu129,size=1932735283200
sd=sd30,lun=/dev/vg1/asu130,size=1932735283200
sd=sd31,lun=/dev/vg1/asu131,size=1932735283200
sd=sd32,lun=/dev/vg1/asu132,size=1932735283200
sd=sd33,lun=/dev/vg1/asu133,size=1932735283200
sd=sd34,lun=/dev/vg1/asu134,size=1932735283200
sd=sd35,lun=/dev/vg1/asu135,size=1932735283200
sd=sd36,lun=/dev/vg1/asu136,size=1932735283200
sd=sd37,lun=/dev/vg1/asu137,size=1932735283200
sd=sd38,lun=/dev/vg1/asu138,size=1932735283200
sd=sd39,lun=/dev/vg1/asu139,size=1932735283200
sd=sd40,lun=/dev/vg1/asu140,size=1932735283200
sd=sd41,lun=/dev/vg1/asu141,size=1932735283200
sd=sd42,lun=/dev/vg1/asu142,size=1932735283200
sd=sd43,lun=/dev/vg1/asu143,size=1932735283200
sd=sd44,lun=/dev/vg1/asu144,size=1932735283200
sd=sd45,lun=/dev/vg1/asu145,size=1932735283200
sd=sd46,lun=/dev/vg1/asu146,size=1932735283200
sd=sd47,lun=/dev/vg1/asu147,size=1932735283200
sd=sd48,lun=/dev/vg1/asu148,size=1932735283200
sd=sd49,lun=/dev/vg1/asu149,size=1932735283200
sd=sd50,lun=/dev/vg1/asu150,size=1932735283200
sd=sd51,lun=/dev/vg1/asu151,size=1932735283200
sd=sd52,lun=/dev/vg1/asu152,size=1932735283200
sd=sd53,lun=/dev/vg1/asu153,size=1932735283200
sd=sd54,lun=/dev/vg1/asu154,size=1932735283200
sd=sd55,lun=/dev/vg1/asu155,size=1932735283200
sd=sd56,lun=/dev/vg1/asu156,size=1932735283200
sd=sd57,lun=/dev/vg1/asu157,size=1932735283200
sd=sd58,lun=/dev/vg1/asu158,size=1932735283200
sd=sd59,lun=/dev/vg1/asu159,size=1932735283200
sd=sd60,lun=/dev/vg1/asu160,size=1932735283200
sd=sd61,lun=/dev/vg1/asu161,size=1932735283200
sd=sd62,lun=/dev/vg1/asu162,size=1932735283200
sd=sd63,lun=/dev/vg1/asu163,size=1932735283200
sd=sd64,lun=/dev/vg1/asu164,size=1932735283200

sd=sd65,lun=/dev/vg2/asu21,size=1932735283200
sd=sd66,lun=/dev/vg2/asu22,size=1932735283200
sd=sd67,lun=/dev/vg2/asu23,size=1932735283200
sd=sd68,lun=/dev/vg2/asu24,size=1932735283200
sd=sd69,lun=/dev/vg2/asu25,size=1932735283200
sd=sd70,lun=/dev/vg2/asu26,size=1932735283200
sd=sd71,lun=/dev/vg2/asu27,size=1932735283200
sd=sd72,lun=/dev/vg2/asu28,size=1932735283200
sd=sd73,lun=/dev/vg2/asu29,size=1932735283200
sd=sd74,lun=/dev/vg2/asu210,size=1932735283200
sd=sd75,lun=/dev/vg2/asu211,size=1932735283200
sd=sd76,lun=/dev/vg2/asu212,size=1932735283200
sd=sd77,lun=/dev/vg2/asu213,size=1932735283200
sd=sd78,lun=/dev/vg2/asu214,size=1932735283200
sd=sd79,lun=/dev/vg2/asu215,size=1932735283200
```

```
sd=sd80,lun=/dev/vg2/asu216,size=1932735283200
sd=sd81,lun=/dev/vg2/asu217,size=1932735283200
sd=sd82,lun=/dev/vg2/asu218,size=1932735283200
sd=sd83,lun=/dev/vg2/asu219,size=1932735283200
sd=sd84,lun=/dev/vg2/asu220,size=1932735283200
sd=sd85,lun=/dev/vg2/asu221,size=1932735283200
sd=sd86,lun=/dev/vg2/asu222,size=1932735283200
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sd=sd141,lun=/dev/vg3/asu313,size=1717986918400
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sd=sd94,lun=/dev/vg2/asu230,size=1932735283200
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sd=sd96,lun=/dev/vg2/asu232,size=1932735283200
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```
sd=sd97,lun=/dev/vg2/asu233,size=1932735283200
sd=sd98,lun=/dev/vg2/asu234,size=1932735283200
sd=sd99,lun=/dev/vg2/asu235,size=1932735283200
sd=sd100,lun=/dev/vg2/asu236,size=1932735283200
sd=sd101,lun=/dev/vg2/asu237,size=1932735283200
sd=sd102,lun=/dev/vg2/asu238,size=1932735283200
sd=sd103,lun=/dev/vg2/asu239,size=1932735283200
sd=sd104,lun=/dev/vg2/asu240,size=1932735283200
sd=sd105,lun=/dev/vg2/asu241,size=1932735283200
sd=sd106,lun=/dev/vg2/asu242,size=1932735283200
sd=sd107,lun=/dev/vg2/asu243,size=1932735283200
sd=sd108,lun=/dev/vg2/asu244,size=1932735283200
sd=sd109,lun=/dev/vg2/asu245,size=1932735283200
sd=sd110,lun=/dev/vg2/asu246,size=1932735283200
sd=sd111,lun=/dev/vg2/asu247,size=1932735283200
sd=sd112,lun=/dev/vg2/asu248,size=1932735283200
sd=sd113,lun=/dev/vg2/asu249,size=1932735283200
sd=sd114,lun=/dev/vg2/asu250,size=1932735283200
sd=sd115,lun=/dev/vg2/asu251,size=1932735283200
sd=sd116,lun=/dev/vg2/asu252,size=1932735283200
sd=sd117,lun=/dev/vg2/asu253,size=1932735283200
sd=sd118,lun=/dev/vg2/asu254,size=1932735283200
sd=sd119,lun=/dev/vg2/asu255,size=1932735283200
sd=sd120,lun=/dev/vg2/asu256,size=1932735283200
sd=sd121,lun=/dev/vg2/asu257,size=1932735283200
sd=sd122,lun=/dev/vg2/asu258,size=1932735283200
sd=sd123,lun=/dev/vg2/asu259,size=1932735283200
sd=sd124,lun=/dev/vg2/asu260,size=1932735283200
sd=sd125,lun=/dev/vg2/asu261,size=1932735283200
sd=sd126,lun=/dev/vg2/asu262,size=1932735283200
sd=sd127,lun=/dev/vg2/asu263,size=1932735283200
sd=sd128,lun=/dev/vg2/asu264,size=1932735283200

sd=sd129,lun=/dev/vg3/asu31,size=1717986918400
sd=sd130,lun=/dev/vg3/asu32,size=1717986918400
sd=sd131,lun=/dev/vg3/asu33,size=1717986918400
sd=sd132,lun=/dev/vg3/asu34,size=1717986918400
sd=sd133,lun=/dev/vg3/asu35,size=1717986918400
sd=sd134,lun=/dev/vg3/asu36,size=1717986918400
sd=sd135,lun=/dev/vg3/asu37,size=1717986918400
sd=sd136,lun=/dev/vg3/asu38,size=1717986918400
sd=sd137,lun=/dev/vg3/asu39,size=1717986918400
sd=sd138,lun=/dev/vg3/asu310,size=1717986918400
sd=sd139,lun=/dev/vg3/asu311,size=1717986918400
sd=sd140,lun=/dev/vg3/asu312,size=1717986918400
sd=sd141,lun=/dev/vg3/asu313,size=1717986918400
sd=sd142,lun=/dev/vg3/asu314,size=1717986918400
sd=sd143,lun=/dev/vg3/asu315,size=1717986918400
sd=sd144,lun=/dev/vg3/asu316,size=1717986918400
```

SPC-2 Persistence Test Run 1 *(write phase)*

common commands 2

```
maxlatestart=1
reportinginterval=5
segmentlength=512m

rd=default,rampup=360,periods=180,measurement=300,runout=0,rampdown=0,buffers=1

rd=default,rdpct=0,xfersize=1024k
rd=TR1-101s_SPC-2-persist-w,streams=670
```

SPC-2 Persistence Test Run 2 *(read phase)*

common commands 2

```
maxlatestart=1
reportinginterval=5
segmentlength=512m

maxpersistenceerrors=10

rd=default,buffers=1,rdpct=100,xfersize=1024k
rd=TR1-5s_SPC-2-persist-r
```

Slave JVMs

Each Slave JVM was invoked with a command and parameter file similar to the example listed below. The only difference in each file was **host** parameter value, which was unique to each Slave JVM, e.g. **slave1**…**slave208**.

```
master=host1
host=slave1
sd=asu1_1,lun=/dev/vg1/asu11,size=1932735283200
sd=asu1_2,lun=/dev/vg1/asu12,size=1932735283200
sd=asu1_3,lun=/dev/vg1/asu13,size=1932735283200
sd=asu1_4,lun=/dev/vg1/asu14,size=1932735283200
sd=asu1_5,lun=/dev/vg1/asu15,size=1932735283200
sd=asu1_6,lun=/dev/vg1/asu16,size=1932735283200
sd=asu1_7,lun=/dev/vg1/asu17,size=1932735283200
sd=asu1_8,lun=/dev/vg1/asu18,size=1932735283200
sd=asu1_9,lun=/dev/vg1/asu19,size=1932735283200
sd=asu1_10,lun=/dev/vg1/asu110,size=1932735283200
sd=asu1_11,lun=/dev/vg1/asu111,size=1932735283200
sd=asu1_12,lun=/dev/vg1/asu112,size=1932735283200
sd=asu1_13,lun=/dev/vg1/asu113,size=1932735283200
sd=asu1_14,lun=/dev/vg1/asu114,size=1932735283200
sd=asu1_15,lun=/dev/vg1/asu115,size=1932735283200
sd=asu1_16,lun=/dev/vg1/asu116,size=1932735283200
sd=asu1_17,lun=/dev/vg1/asu117,size=1932735283200
sd=asu1_18,lun=/dev/vg1/asu118,size=1932735283200
sd=asu1_19,lun=/dev/vg1/asu119,size=1932735283200
sd=asu1_20,lun=/dev/vg1/asu120,size=1932735283200
sd=asu1_21,lun=/dev/vg1/asu121,size=1932735283200
sd=asu1_22,lun=/dev/vg1/asu122,size=1932735283200
sd=asu1_23,lun=/dev/vg1/asu123,size=1932735283200
sd=asu1_24,lun=/dev/vg1/asu124,size=1932735283200
sd=asu1_25,lun=/dev/vg1/asu125,size=1932735283200
sd=asu1_26,lun=/dev/vg1/asu126,size=1932735283200
sd=asu1_27,lun=/dev/vg1/asu127,size=1932735283200
sd=asu1_28,lun=/dev/vg1/asu128,size=1932735283200
sd=asu1_29,lun=/dev/vg1/asu129,size=1932735283200
sd=asu1_30,lun=/dev/vg1/asu130,size=1932735283200
sd=asu1_31,lun=/dev/vg1/asu131,size=1932735283200
sd=asu1_32,lun=/dev/vg1/asu132,size=1932735283200
sd=asu1_33,lun=/dev/vg1/asu133,size=1932735283200
sd=asu1_34,lun=/dev/vg1/asu134,size=1932735283200
sd=asu1_35,lun=/dev/vg1/asu135,size=1932735283200
sd=asu1_36,lun=/dev/vg1/asu136,size=1932735283200
sd=asu1_37,lun=/dev/vg1/asu137,size=1932735283200
sd=asu1_38,lun=/dev/vg1/asu138,size=1932735283200
```

```
sd=asu1_39,lun=/dev/vg1/asu139,size=1932735283200
sd=asu1_40,lun=/dev/vg1/asu140,size=1932735283200
sd=asu1_41,lun=/dev/vg1/asu141,size=1932735283200
sd=asu1_42,lun=/dev/vg1/asu142,size=1932735283200
sd=asu1_43,lun=/dev/vg1/asu143,size=1932735283200
sd=asu1_44,lun=/dev/vg1/asu144,size=1932735283200
sd=asu1_45,lun=/dev/vg1/asu145,size=1932735283200
sd=asu1_46,lun=/dev/vg1/asu146,size=1932735283200
sd=asu1_47,lun=/dev/vg1/asu147,size=1932735283200
sd=asu1_48,lun=/dev/vg1/asu148,size=1932735283200
sd=asu1_49,lun=/dev/vg1/asu149,size=1932735283200
sd=asu1_50,lun=/dev/vg1/asu150,size=1932735283200
sd=asu1_51,lun=/dev/vg1/asu151,size=1932735283200
sd=asu1_52,lun=/dev/vg1/asu152,size=1932735283200
sd=asu1_53,lun=/dev/vg1/asu153,size=1932735283200
sd=asu1_54,lun=/dev/vg1/asu154,size=1932735283200
sd=asu1_55,lun=/dev/vg1/asu155,size=1932735283200
sd=asu1_56,lun=/dev/vg1/asu156,size=1932735283200
sd=asu1_57,lun=/dev/vg1/asu157,size=1932735283200
sd=asu1_58,lun=/dev/vg1/asu158,size=1932735283200
sd=asu1_59,lun=/dev/vg1/asu159,size=1932735283200
sd=asu1_60,lun=/dev/vg1/asu160,size=1932735283200
sd=asu1_61,lun=/dev/vg1/asu161,size=1932735283200
sd=asu1_62,lun=/dev/vg1/asu162,size=1932735283200
sd=asu1_63,lun=/dev/vg1/asu163,size=1932735283200
sd=asu1_64,lun=/dev/vg1/asu164,size=1932735283200
sd=asu2_1,lun=/dev/vg2/asu21,size=1932735283200
sd=asu2_2,lun=/dev/vg2/asu22,size=1932735283200
sd=asu2_3,lun=/dev/vg2/asu23,size=1932735283200
sd=asu2_4,lun=/dev/vg2/asu24,size=1932735283200
sd=asu2_5,lun=/dev/vg2/asu25,size=1932735283200
sd=asu2_6,lun=/dev/vg2/asu26,size=1932735283200
sd=asu2_7,lun=/dev/vg2/asu27,size=1932735283200
sd=asu2_8,lun=/dev/vg2/asu28,size=1932735283200
sd=asu2_9,lun=/dev/vg2/asu29,size=1932735283200
sd=asu2_10,lun=/dev/vg2/asu210,size=1932735283200
sd=asu2_11,lun=/dev/vg2/asu211,size=1932735283200
sd=asu2_12,lun=/dev/vg2/asu212,size=1932735283200
sd=asu2_13,lun=/dev/vg2/asu213,size=1932735283200
sd=asu2_14,lun=/dev/vg2/asu214,size=1932735283200
sd=asu2_15,lun=/dev/vg2/asu215,size=1932735283200
sd=asu2_16,lun=/dev/vg2/asu216,size=1932735283200
sd=asu2_17,lun=/dev/vg2/asu217,size=1932735283200
sd=asu2_18,lun=/dev/vg2/asu218,size=1932735283200
sd=asu2_19,lun=/dev/vg2/asu219,size=1932735283200
sd=asu2_20,lun=/dev/vg2/asu220,size=1932735283200
sd=asu2_21,lun=/dev/vg2/asu221,size=1932735283200
sd=asu2_22,lun=/dev/vg2/asu222,size=1932735283200
sd=asu2_23,lun=/dev/vg2/asu223,size=1932735283200
sd=asu2_24,lun=/dev/vg2/asu224,size=1932735283200
sd=asu2_25,lun=/dev/vg2/asu225,size=1932735283200
sd=asu2_26,lun=/dev/vg2/asu226,size=1932735283200
sd=asu2_27,lun=/dev/vg2/asu227,size=1932735283200
sd=asu2_28,lun=/dev/vg2/asu228,size=1932735283200
sd=asu2_29,lun=/dev/vg2/asu229,size=1932735283200
sd=asu2_30,lun=/dev/vg2/asu230,size=1932735283200
sd=asu2_31,lun=/dev/vg2/asu231,size=1932735283200
sd=asu2_32,lun=/dev/vg2/asu232,size=1932735283200
sd=asu2_33,lun=/dev/vg2/asu233,size=1932735283200
sd=asu2_34,lun=/dev/vg2/asu234,size=1932735283200
sd=asu2_35,lun=/dev/vg2/asu235,size=1932735283200
sd=asu2_36,lun=/dev/vg2/asu236,size=1932735283200
sd=asu2_37,lun=/dev/vg2/asu237,size=1932735283200
```

```
sd=asu2_38,lun=/dev/vg2/asu238,size=1932735283200
sd=asu2_39,lun=/dev/vg2/asu239,size=1932735283200
sd=asu2_40,lun=/dev/vg2/asu240,size=1932735283200
sd=asu2_41,lun=/dev/vg2/asu241,size=1932735283200
sd=asu2_42,lun=/dev/vg2/asu242,size=1932735283200
sd=asu2_43,lun=/dev/vg2/asu243,size=1932735283200
sd=asu2_44,lun=/dev/vg2/asu244,size=1932735283200
sd=asu2_45,lun=/dev/vg2/asu245,size=1932735283200
sd=asu2_46,lun=/dev/vg2/asu246,size=1932735283200
sd=asu2_47,lun=/dev/vg2/asu247,size=1932735283200
sd=asu2_48,lun=/dev/vg2/asu248,size=1932735283200
sd=asu2_49,lun=/dev/vg2/asu249,size=1932735283200
sd=asu2_50,lun=/dev/vg2/asu250,size=1932735283200
sd=asu2_51,lun=/dev/vg2/asu251,size=1932735283200
sd=asu2_52,lun=/dev/vg2/asu252,size=1932735283200
sd=asu2_53,lun=/dev/vg2/asu253,size=1932735283200
sd=asu2_54,lun=/dev/vg2/asu254,size=1932735283200
sd=asu2_55,lun=/dev/vg2/asu255,size=1932735283200
sd=asu2_56,lun=/dev/vg2/asu256,size=1932735283200
sd=asu2_57,lun=/dev/vg2/asu257,size=1932735283200
sd=asu2_58,lun=/dev/vg2/asu258,size=1932735283200
sd=asu2_59,lun=/dev/vg2/asu259,size=1932735283200
sd=asu2_60,lun=/dev/vg2/asu260,size=1932735283200
sd=asu2_61,lun=/dev/vg2/asu261,size=1932735283200
sd=asu2_62,lun=/dev/vg2/asu262,size=1932735283200
sd=asu2_63,lun=/dev/vg2/asu263,size=1932735283200
sd=asu2_64,lun=/dev/vg2/asu264,size=1932735283200
sd=asu3_1,lun=/dev/vg3/asu31,size=1717986918400
sd=asu3_2,lun=/dev/vg3/asu32,size=1717986918400
sd=asu3_3,lun=/dev/vg3/asu33,size=1717986918400
sd=asu3_4,lun=/dev/vg3/asu34,size=1717986918400
sd=asu3_5,lun=/dev/vg3/asu35,size=1717986918400
sd=asu3_6,lun=/dev/vg3/asu36,size=1717986918400
sd=asu3_7,lun=/dev/vg3/asu37,size=1717986918400
sd=asu3_8,lun=/dev/vg3/asu38,size=1717986918400
sd=asu3_9,lun=/dev/vg3/asu39,size=1717986918400
sd=asu3_10,lun=/dev/vg3/asu310,size=1717986918400
sd=asu3_11,lun=/dev/vg3/asu311,size=1717986918400
sd=asu3_12,lun=/dev/vg3/asu312,size=1717986918400
sd=asu3_13,lun=/dev/vg3/asu313,size=1717986918400
sd=asu3_14,lun=/dev/vg3/asu314,size=1717986918400
sd=asu3_15,lun=/dev/vg3/asu315,size=1717986918400
sd=asu3_16,lun=/dev/vg3/asu316,size=1717986918400
```

APPENDIX E: SPC-1 WORKLOAD GENERATOR INPUT PARAMETERS

The 'master' script, **run.sh**, was invoked to execute the required ASU pre-fill. the 3 "Ramp-Up" Range Test Runs, 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)*, a reduced level SPC-1 Persistence Test Run 1 and SPC-2 Persistence Test Run 1 in an uninterrupted sequence.

The script also calculates the start and duration time for the SmartTier functionality. The **SmartTier_config.sh** script is invoked set the start and duration time for "hot" data migration to the configured SSD storage devices.

After the above test sequence completed, the script pauses until the required TSC power off/power on cycle is completed then executes SPC-2 Persistence Test Run 2.

The **run.sh** script also included the appropriate commands to capture the detailed TSC profile listings required for a Remote Audit.

run.sh

```
#!/bin/sh

JAVA="/usr/java/jre1.7.0_06/bin/java -Xms8192m -Xmx8192m -Xss512k"
EXEDIR=/root/18800

expect shstorage.tcl > profile1_storage.log
date > profile1_volume.log
lvdisplay >> profile1_volume.log
date >> profile1_volume.log

echo "ASU prefill started......"
../vdbench503rc11/vdbench -f /root/18800/prefill.parm -o /root/18800/PreFill
echo "ASU prefill complete....."

time_now=`date +%s`
start_monitor_time=$(($time_now+1500))
start_relocation_time=$(($start_monitor_time+5460))
day_of_week_monitor=$(date +%a -d "1970-01-01 UTC $start_monitor_time seconds")
day_of_week_relocation=$(date +%a -d "1970-01-01 UTC $start_relocation_time
seconds")
start_monitor_time=$(date +%H:%M -d "1970-01-01 UTC $start_monitor_time seconds")
monitor_duration=01:30
start_relocation_time=$(date +%H:%M -d "1970-01-01 UTC $start_relocation_time
seconds")
relocation_duration=10:00

./SmartTier_config.sh $start_monitor_time $monitor_duration $start_relocation_time
$relocation_duration $day_of_week_monitor $day_of_week_relocation

N=1
for host in host1 host2 host3 host4 host5 host6 host7 host8
do

  ssh $host rm -rf $EXEDIR/output
  ssh $host rm -rf $EXEDIR/config
  ssh $host mkdir $EXEDIR/output
  ssh $host mkdir $EXEDIR/config
  for((i=1;i<=26;i++))
  do
```

```
     echo "start slave$N on $host"
     echo "master=host1" > $EXEDIR/config/slave$N.cfg
     echo "host=slave$N" >> $EXEDIR/config/slave$N.cfg


echo "sd=asu1_1,lun=/dev/vg1/asu11,size=1932735283200" >> $EXEDIR/config/slave$N.cfg
echo "sd=asu1_2,lun=/dev/vg1/asu12,size=1932735283200" >> $EXEDIR/config/slave$N.cfg
echo "sd=asu1_3,lun=/dev/vg1/asu13,size=1932735283200" >> $EXEDIR/config/slave$N.cfg
echo "sd=asu1_4,lun=/dev/vg1/asu14,size=1932735283200" >> $EXEDIR/config/slave$N.cfg
echo "sd=asu1_5,lun=/dev/vg1/asu15,size=1932735283200" >> $EXEDIR/config/slave$N.cfg
echo "sd=asu1_6,lun=/dev/vg1/asu16,size=1932735283200" >> $EXEDIR/config/slave$N.cfg
echo "sd=asu1_7,lun=/dev/vg1/asu17,size=1932735283200" >> $EXEDIR/config/slave$N.cfg
echo "sd=asu1_8,lun=/dev/vg1/asu18,size=1932735283200" >> $EXEDIR/config/slave$N.cfg
echo "sd=asu1_9,lun=/dev/vg1/asu19,size=1932735283200" >> $EXEDIR/config/slave$N.cfg
echo "sd=asu1_10,lun=/dev/vg1/asu110,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_11,lun=/dev/vg1/asu111,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_12,lun=/dev/vg1/asu112,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_13,lun=/dev/vg1/asu113,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_14,lun=/dev/vg1/asu114,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_15,lun=/dev/vg1/asu115,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_16,lun=/dev/vg1/asu116,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_17,lun=/dev/vg1/asu117,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_18,lun=/dev/vg1/asu118,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_19,lun=/dev/vg1/asu119,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_20,lun=/dev/vg1/asu120,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_21,lun=/dev/vg1/asu121,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_22,lun=/dev/vg1/asu122,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_23,lun=/dev/vg1/asu123,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_24,lun=/dev/vg1/asu124,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_25,lun=/dev/vg1/asu125,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_26,lun=/dev/vg1/asu126,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_27,lun=/dev/vg1/asu127,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_28,lun=/dev/vg1/asu128,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_29,lun=/dev/vg1/asu129,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_30,lun=/dev/vg1/asu130,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_31,lun=/dev/vg1/asu131,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_32,lun=/dev/vg1/asu132,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_33,lun=/dev/vg1/asu133,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
```

```
echo "sd=asu1_34,lun=/dev/vg1/asu134,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_35,lun=/dev/vg1/asu135,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_36,lun=/dev/vg1/asu136,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_37,lun=/dev/vg1/asu137,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_38,lun=/dev/vg1/asu138,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_39,lun=/dev/vg1/asu139,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_40,lun=/dev/vg1/asu140,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_41,lun=/dev/vg1/asu141,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_42,lun=/dev/vg1/asu142,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_43,lun=/dev/vg1/asu143,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_44,lun=/dev/vg1/asu144,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_45,lun=/dev/vg1/asu145,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_46,lun=/dev/vg1/asu146,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_47,lun=/dev/vg1/asu147,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_48,lun=/dev/vg1/asu148,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_49,lun=/dev/vg1/asu149,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_50,lun=/dev/vg1/asu150,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_51,lun=/dev/vg1/asu151,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_52,lun=/dev/vg1/asu152,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_53,lun=/dev/vg1/asu153,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_54,lun=/dev/vg1/asu154,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_55,lun=/dev/vg1/asu155,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_56,lun=/dev/vg1/asu156,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_57,lun=/dev/vg1/asu157,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_58,lun=/dev/vg1/asu158,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_59,lun=/dev/vg1/asu159,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_60,lun=/dev/vg1/asu160,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_61,lun=/dev/vg1/asu161,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_62,lun=/dev/vg1/asu162,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_63,lun=/dev/vg1/asu163,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu1_64,lun=/dev/vg1/asu164,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
```

```
echo "sd=asu2_1,lun=/dev/vg2/asu21,size=1932735283200" >> $EXEDIR/config/slave$N.cfg
echo "sd=asu2_2,lun=/dev/vg2/asu22,size=1932735283200" >> $EXEDIR/config/slave$N.cfg
echo "sd=asu2_3,lun=/dev/vg2/asu23,size=1932735283200" >> $EXEDIR/config/slave$N.cfg
echo "sd=asu2_4,lun=/dev/vg2/asu24,size=1932735283200" >> $EXEDIR/config/slave$N.cfg
echo "sd=asu2_5,lun=/dev/vg2/asu25,size=1932735283200" >> $EXEDIR/config/slave$N.cfg
echo "sd=asu2_6,lun=/dev/vg2/asu26,size=1932735283200" >> $EXEDIR/config/slave$N.cfg
echo "sd=asu2_7,lun=/dev/vg2/asu27,size=1932735283200" >> $EXEDIR/config/slave$N.cfg
echo "sd=asu2_8,lun=/dev/vg2/asu28,size=1932735283200" >> $EXEDIR/config/slave$N.cfg
echo "sd=asu2_9,lun=/dev/vg2/asu29,size=1932735283200" >> $EXEDIR/config/slave$N.cfg
echo "sd=asu2_10,lun=/dev/vg2/asu210,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_11,lun=/dev/vg2/asu211,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_12,lun=/dev/vg2/asu212,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_13,lun=/dev/vg2/asu213,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_14,lun=/dev/vg2/asu214,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_15,lun=/dev/vg2/asu215,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_16,lun=/dev/vg2/asu216,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_17,lun=/dev/vg2/asu217,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_18,lun=/dev/vg2/asu218,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_19,lun=/dev/vg2/asu219,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_20,lun=/dev/vg2/asu220,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_21,lun=/dev/vg2/asu221,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_22,lun=/dev/vg2/asu222,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_23,lun=/dev/vg2/asu223,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_24,lun=/dev/vg2/asu224,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_25,lun=/dev/vg2/asu225,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_26,lun=/dev/vg2/asu226,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_27,lun=/dev/vg2/asu227,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_28,lun=/dev/vg2/asu228,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_29,lun=/dev/vg2/asu229,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_30,lun=/dev/vg2/asu230,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_31,lun=/dev/vg2/asu231,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_32,lun=/dev/vg2/asu232,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_33,lun=/dev/vg2/asu233,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_34,lun=/dev/vg2/asu234,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_35,lun=/dev/vg2/asu235,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_36,lun=/dev/vg2/asu236,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
```

```
echo "sd=asu2_37,lun=/dev/vg2/asu237,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_38,lun=/dev/vg2/asu238,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_39,lun=/dev/vg2/asu239,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_40,lun=/dev/vg2/asu240,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_41,lun=/dev/vg2/asu241,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_42,lun=/dev/vg2/asu242,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_43,lun=/dev/vg2/asu243,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_44,lun=/dev/vg2/asu244,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_45,lun=/dev/vg2/asu245,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_46,lun=/dev/vg2/asu246,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_47,lun=/dev/vg2/asu247,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_48,lun=/dev/vg2/asu248,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_49,lun=/dev/vg2/asu249,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_50,lun=/dev/vg2/asu250,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_51,lun=/dev/vg2/asu251,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_52,lun=/dev/vg2/asu252,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_53,lun=/dev/vg2/asu253,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_54,lun=/dev/vg2/asu254,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_55,lun=/dev/vg2/asu255,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_56,lun=/dev/vg2/asu256,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_57,lun=/dev/vg2/asu257,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_58,lun=/dev/vg2/asu258,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_59,lun=/dev/vg2/asu259,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_60,lun=/dev/vg2/asu260,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_61,lun=/dev/vg2/asu261,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_62,lun=/dev/vg2/asu262,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_63,lun=/dev/vg2/asu263,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu2_64,lun=/dev/vg2/asu264,size=1932735283200" >>
$EXEDIR/config/slave$N.cfg

echo "sd=asu3_1,lun=/dev/vg3/asu31,size=1717986918400" >> $EXEDIR/config/slave$N.cfg
echo "sd=asu3_2,lun=/dev/vg3/asu32,size=1717986918400" >> $EXEDIR/config/slave$N.cfg
echo "sd=asu3_3,lun=/dev/vg3/asu33,size=1717986918400" >> $EXEDIR/config/slave$N.cfg
echo "sd=asu3_4,lun=/dev/vg3/asu34,size=1717986918400" >> $EXEDIR/config/slave$N.cfg
echo "sd=asu3_5,lun=/dev/vg3/asu35,size=1717986918400" >> $EXEDIR/config/slave$N.cfg
echo "sd=asu3_6,lun=/dev/vg3/asu36,size=1717986918400" >> $EXEDIR/config/slave$N.cfg
```

```
echo "sd=asu3_7,lun=/dev/vg3/asu37,size=1717986918400" >> $EXEDIR/config/slave$N.cfg
echo "sd=asu3_8,lun=/dev/vg3/asu38,size=1717986918400" >> $EXEDIR/config/slave$N.cfg
echo "sd=asu3_9,lun=/dev/vg3/asu39,size=1717986918400" >> $EXEDIR/config/slave$N.cfg
echo "sd=asu3_10,lun=/dev/vg3/asu310,size=1717986918400" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu3_11,lun=/dev/vg3/asu311,size=1717986918400" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu3_12,lun=/dev/vg3/asu312,size=1717986918400" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu3_13,lun=/dev/vg3/asu313,size=1717986918400" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu3_14,lun=/dev/vg3/asu314,size=1717986918400" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu3_15,lun=/dev/vg3/asu315,size=1717986918400" >>
$EXEDIR/config/slave$N.cfg
echo "sd=asu3_16,lun=/dev/vg3/asu316,size=1717986918400" >>
$EXEDIR/config/slave$N.cfg

 scp $EXEDIR/config/slave$N.cfg $host:$EXEDIR/config/slave$N.cfg
    ssh $host "$JAVA -cp $EXEDIR/../spc1 spc1 -f $EXEDIR/config/slave$N.cfg -o
$EXEDIR/output/slave$N" > /dev/null &
    N=$[N+1]
  done
done

rm -rf spc1.cfg
cp range.cfg spc1.cfg

$JAVA -cp ../spc1 range -b 5030 -t 7200
mv rangetest rangetest1
$JAVA -cp ../spc1  range -b 10060 -t 14400
mv rangetest rangetest2
$JAVA -cp ../spc1 range -b 15090 -t 21600
mv rangetest rangetest3

$JAVA -cp ../spc1 spc1 -w SPC1 -f sustain.cfg -o sustain SPCOut
$JAVA -cp ../spc1 spc1 -w SPC1 -f ramp_100.cfg -o ramp_100 SPCOut
$JAVA -cp ../spc1 spc1 -w SPC1 -f ramp_95.cfg -o ramp_95 SPCOut
$JAVA -cp ../spc1 spc1 -w SPC1 -f ramp_90.cfg -o ramp_90 SPCOut
$JAVA -cp ../spc1 spc1 -w SPC1 -f ramp_80.cfg -o ramp_80 SPCOut
$JAVA -cp ../spc1 spc1 -w SPC1 -f ramp_50.cfg -o ramp_50 SPCOut
$JAVA -cp ../spc1 spc1 -w SPC1 -f ramp_10.cfg -o ramp_10 SPCOut
$JAVA -cp ../spc1 spc1 -w SPC1 -f repeat1.cfg -o repeat1 SPCOut
$JAVA -cp ../spc1 spc1 -w SPC1 -f repeat2.cfg -o repeat2 SPCOut

for host in host1 host2 host3 host4 host5 host6 host7 host8
do
  ssh $host killall java
done

rm -rf spc1.cfg
cp persist.cfg spc1.cfg

$JAVA -cp ../spc1 persist1 -b 2012

for host in host2 host3
do
    ssh $host $JAVA -cp $EXEDIR/../spc2 RemoteStart &
done

../spc2/spc2 -f persist1.cfg -o persist1 -init
../spc2/spc2 -f persist1.cfg -o persist1
```

```
echo "Power cycle TSC, then Enter to continue"
read

expect shstorage.tcl > profile2_storage.log
date > profile2_volume.log
lvdisplay >> profile2_volume.log
date >> profile2_volume.log

../spc2/spc2 -f persist2.cfg -o persist2 -init
../spc2/spc2 -f persist2.cfg -o persist2
```

SmartTier_config.sh

```
#!/bin/bash


stor=100.124.66.41
stor_user=admin
stor_pswd=Admin@storage

export LANG=C

echo "configurate SmartTier ..."

expect <<__END_CREATE_LUN
     spawn ssh $stor_user@$stor
     set timeout 60
     expect {
            -re "assword" { send "$stor_pswd\n" }
            -re "yes/no" { send "yes\n"; exp_continue }
     }
     expect ">"

     set start_monitor_time $1
     set monitor_duration $2
     set start_relocation_time $3
     set relocation_duration $4
     set day_of_week_monitor $5
     set day_of_week_relocation $6

     send "change storage_pool relocation_speed relocation_speed=High\r"
     expect ">"

     foreach EngineId {0 1 2 3 4 5 6 7} {
            # ------change relocation policy of lun--------
            send "change lun lun_id=[expr \$EngineId * 20 + 0]
relocation_policy=automatic\r"
            expect ">"
            send "change lun lun_id=[expr \$EngineId * 20 + 1]
relocation_policy=automatic\r"
            expect ">"
            send "change lun lun_id=[expr \$EngineId * 20 + 2]
relocation_policy=automatic\r"
            expect ">"
            send "change lun lun_id=[expr \$EngineId * 20 + 3]
relocation_policy=automatic\r"
            expect ">"
            send "change lun lun_id=[expr \$EngineId * 20 + 10]
relocation_policy=automatic\r"
            expect ">"
            send "change lun lun_id=[expr \$EngineId * 20 + 11]
relocation_policy=automatic\r"
```

```
            expect ">"
            send "change lun lun_id=[expr \$EngineId * 20 + 12]
relocation_policy=automatic\r"
            expect ">"
            send "change lun lun_id=[expr \$EngineId * 20 + 13]
relocation_policy=automatic\r"
            expect ">"

            # -----create monitor and relocation schedule--------
            set pool_id [expr \$EngineId * 8 + 0]
            send "change storage_pool relocation_schedule pool_id=\$pool_id
relocation_type=automatic\r"
            expect ">"
            send "create schedule monitor name=m\${pool_id} pool_id=\$pool_id
period=weekly day_of_week=\$day_of_week_monitor start_time=\$start_monitor_time
duration=\$monitor_duration\r"
            expect ">"
            send "create schedule relocate name=r\${pool_id} pool_id=\$pool_id
period=weekly day_of_week=\$day_of_week_relocation
start_time=\$start_relocation_time duration=\$relocation_duration\r"
            expect ">"

            set pool_id [expr \$EngineId * 8 + 1]
            send "change storage_pool relocation_schedule pool_id=\$pool_id
relocation_type=automatic\r"
            expect ">"
            send "create schedule monitor name=m\${pool_id} pool_id=\$pool_id
period=weekly day_of_week=\$day_of_week_monitor start_time=\$start_monitor_time
duration=\$monitor_duration\r"
            expect ">"
            send "create schedule relocate name=r\${pool_id} pool_id=\$pool_id
period=weekly day_of_week=\$day_of_week_relocation
start_time=\$start_relocation_time duration=\$relocation_duration\r"
            expect ">"
     }

     send "exit\r"
     expect "(y/n):"
     send "y\r"
     expect EOF
__END_CREATE_LUN
```

APPENDIX F: THIRD-PARTY QUOTATION

Priced Storage Configuration

Netfast Technology Solutions, Inc.
989, Avenues of America, Fl 12
New York, NY 10018, USA
Voice: (212) 792-5200 , Fax: (212) 213-1152

12/20/2013, Quote Valid:90 Days

No.	Model	Description	Qty	Unit Price($)	Total Price($)
1	**Phase**				
1.1	**Location**				
1.1.1	**OceanStor 18800 Enterprise System**				
1.1.1.1	**Control Module**				**310,345.60**
	C2E384G-AC	OceanStor 18800 - Engine(Dual Controller,AC, 384GB Cache	8	34912.00	279,296.00
	SYSRACK0-AC	Primary Controller Rack	1	4688.00	4,688.00
	SYSRACK1-AC	Second Controller Rack	1	5088.00	5,088.00
	SYSRACKEXP-AC	Controller Rack Exp	6	3545.60	21,273.60
1.1.1.2	**Disk Enclosure**				**100,556.80**
	DAE-4U-AC	DAE12435U4 Disk Enclosure(4U,3.5",AC)	64	1571.20	100,556.80
1.1.1.3	**Hard Disk Drives**				**1,243,545.60**
	SAS600-15K-3	600GB 15K RPM SAS Drive(3.5")	1344	524.80	705,331.20
	SLC200-3	200GB SLC SSD Drive(3.5")	192	2803.20	538,214.40
1.1.1.4	**IO Interface**				**78,848.00**
	LPU-F4X8G	4*8Gbps Fibre Channel I/O modules(Total 4 ports)	16	2662.40	42,598.40
	LPU-S2X24G-BACK	2*24Gbps SAS-wide I/O modules(Total 2 ports)	32	1132.80	36,249.60
1.1.1.5	**Switch**				**18,095.04**
	SN0Z01FCSP	OceanStor SNS2120 FC Switch,Single-Power Supply,AC,20 Ports Enabled(Includes 20*8Gb SFPs,20 Ports(MAX)),4*10Gb Stacking Ports	4	4072.00	16,288.00
	SN0-TOL-RM	Rack Mount Kit,For SNS2120	1	61.12	61.12
	SN0-CAB-228MM	SNS2120 FC Switch,Stacking Cable,228mm	16	109.12	1,745.92
1.1.1.6	**Accessory**				**1,027.00**
	DLC-3	Patch Cord,DLC/PC-DLC/PC,Multimode,2mm Parallel,3m	72	13.00	936.00
	MODEM-56K	Modem,56K/Data/Fax,External,Split Type(DB25 To DB25,DB9) Cable,English/Chinese Documents,AC To 12VAC Transformer	1	91.00	91.00

Priced Storage Configuration *(continued)*

1.1.1.7	**HBA**				**8,000.00**
	N8GHBA000	QLOGIC QLE2562 HBA Card,PCIE,8Gbps DualPort ,Fiber Channel Multimode LC Optic Interface,English Manual, No Drive CD	8	1000.00	8,000.00
1.1.1.8	**Host Software**				**1,027.20**
	STLUP	UltraPath Software License	1	1027.20	1,027.20
`	**Storage Software**				**790,709.76**
	STLSFLIC88T	XVE Software For OceanStor 18800 Base License	1	5254.40	5,254.40
	STLS14S88T	XVE Software For OceanStor 18800, 1TB (0-14TB) ,SSD & SAS	14	484.48	6,782.72
	STLS25S88T	XVE Software For OceanStor 18800, 1TB (15-25TB) ,SSD & SAS	11	474.56	5,220.16
	STLS40S88T	XVE Software For OceanStor 18800, 1TB (26-40TB) ,SSD & SAS	15	465.28	6,979.20
	STLS60S88T	XVE Software For OceanStor 18800, 1TB (41-60TB) ,SSD & SAS	20	456.00	9,120.00
	STLS100S88T	XVE Software For OceanStor 18800, 1TB (61-100TB) ,SSD & SAS	40	446.72	17,868.80
	STLS150S88T	XVE Software For OceanStor 18800, 1TB (101-150TB) ,SSD & SAS	50	437.76	21,888.00
	STLS250S88T	XVE Software For OceanStor 18800, 1TB (151-250TB) ,SSD & SAS	100	429.12	42,912.00
	STLS400S88T	XVE Software For OceanStor 18800, 1TB (251-400TB) ,SSD & SAS	150	420.48	63,072.00
	STLS4BS88T	XVE Software For OceanStor 18800, 1TB (400+TB) ,SSD & SAS	445	412.16	183,411.20
	STLDMC88T	Management Console For OceanStor 18800 Base License	1	5254.40	5,254.40
	STLD14S88T	Management Console For OceanStor 18800, 1TB (0-14TB) ,SSD & SAS	14	322.88	4,520.32
	STLD25S88T	Management Console For OceanStor 18800, 1TB (15-25TB) ,SSD & SAS	11	316.48	3,481.28
	STLD40S88T	Management Console For OceanStor 18800, 1TB (26-40TB) ,SSD & SAS	15	310.08	4,651.20
	STLD60S88T	Management Console For OceanStor 18800, 1TB (41-60TB) ,SSD & SAS	20	304.00	6,080.00
	STLD100S88T	Management Console For OceanStor 18800, 1TB (61-100TB) ,SSD & SAS	40	297.92	11,916.80
	STLD150S88T	Management Console For OceanStor 18800, 1TB (101-150TB) ,SSD & SAS	50	291.84	14,592.00
	STLD250S88T	Management Console For OceanStor 18800, 1TB (151-250TB) ,SSD	100	286.08	28,608.00
	STLD400S88T	Management Console For OceanStor 18800, 1TB (251-400TB) ,SSD & SAS	150	280.32	42,048.00

Priced Storage Configuration *(continued)*

	STLD4BS88T	Management Console For OceanStor 18800, 1TB (400+TB) ,SSD & SAS	445	274.88	122,321.60
	STLSCT88T	SmartTier Software OceanStor 18800 Base License	1	14011.52	14,011.52
	STLT14S88T	SmartTier Software OceanStor 18800, 1TB (0-14TB) ,SSD & SAS	14	403.84	5,653.76
	STLT25S88T	SmartTier Software OceanStor 18800, 1TB (15-25TB) ,SSD & SAS	11	363.20	3,995.20
	STLT40S88T	SmartTier Software OceanStor 18800, 1TB (26-40TB) ,SSD & SAS	15	327.04	4,905.60
	STLT60S88T	SmartTier Software OceanStor 18800, 1TB (41-60TB) ,SSD & SAS	20	294.40	5,888.00
	STLT100S88T	SmartTier Software OceanStor 18800, 1TB (61-100TB) ,SSD & SAS	40	264.96	10,598.40
	STLT150S88T	SmartTier Software OceanStor 18800, 1TB (101-150TB) ,SSD & SAS	50	238.40	11,920.00
	STLT250S88T	SmartTier Software OceanStor 18800, 1TB (151-250TB) ,SSD & SAS	100	214.40	21,440.00
	STLT400S88T	SmartTier Software OceanStor 18800, 1TB (251-400TB) ,SSD & SAS	150	193.28	28,992.00
	STLT4BS88T	SmartTier Software OceanStor 18800, 1TB (400+TB) ,SSD & SAS	445	173.76	77,323.20
Total of Product					**2,552,155.00**
1.1.1.10	**Maintenance Support Service**				**242,816.80**
		OceanStor 18800 Engineering Service System Rack,Installtion Base Service,per Set	8	6393.31	51,146.48
		Engineering Service System Warranty Upgrade To Hi-Care Onsite Premier 24x7x4H Engineer Onsite Service (Per Set*3Year)	8	8491.00	67,928.00
		Disk Enclosure Warranty Upgrade To Hi-Care Onsite Premier 24x7x4H Engineer Onsite Service(Per Set*3Year)	64	1933.47	123,742.32
Total of Service (3 years)					**242,816.80**
Total Price					**2,794,971.80**

Notes:Hi-Care Premier On-Site Service include: 7*24 Technical Assistance Center Access. Access to all new software updates and Online Support. 24*7*4 Hours Onsite Hardware Replacement.