SPC BENCHMARK 1™

FULL DISCLOSURE REPORT

HUAWEI TECHNOLOGIES CO., LTD
HUAWEI OCEANSTOR™ 6800 V3

SPC-1 V3.2

SUBMISSION IDENTIFIER: A31004

SUBMITTED FOR REVIEW: JANUARY 25, 2017

Second Edition – February 2018

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Benchmark Specification and Glossary

The official SPC Benchmark 1™ (SPC-1™) specification is available on the website of the Storage Performance Council (SPC) at www.storageperformance.org.

The SPC-1™ specification contains a glossary of the SPC-1™ terms used in this publication.

Table of Contents

AUDIT CERTIFICATION

InfoSizing
The Right Metric For Sizing IT

Storage Performance Council
Certified Auditor

Zhong Xu
Huawei Technologies Co., Ltd.
Huawei Industrial Base, Bantian,
Longgang, Shenzhen city,
Guangdong province, China

January 25, 2017

I verified the SPC Benchmark 1™ (SPC-1™ Revision3.2) test execution and performance results of the following Tested Storage Product:

HUAWEI OCEANSTOR™ 6800 V3

The results were:

SPC-1 IOPS™	**800,022**
SPC-1 Price-Performance™	**$0.34/SPC-1 IOPS™**
SPC-1 IOPS™ Response Time	0.713 ms
SPC-1 Overall Response Time	0.514 ms
SPC-1 ASU Capacity	25,428 GB
SPC-1 ASU Price	$10.42/GB
SPC-1 Total System Price	$264,741.42

In my opinion, these performance results were produced in compliance with the SPC requirements for the benchmark.

The testing was executed using the SPC-1 Toolkit Version 3.0 Build d34fb3c. The audit process was conducted in accordance with the SPC Policies and met the requirements for the benchmark.

A Letter of Good Faith was issued by the Test Sponsor, stating the accuracy and completeness of the documentation and testing data provided in support of the audit of this result.

A Full Disclosure Report for this result was prepared by InfoSizing, reviewed and approved by the Test Sponsor, and can be found at **www.storageperformance.org** under the Submission Identifier **A31004**.

20 Kreg Lane • Manitou Springs, CO 80829 • 719-473-7555 • www.sizing.com

The independent audit process conducted by InfoSizing included the verifications of the following items:

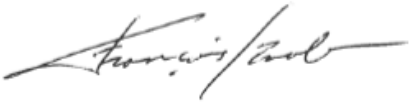
- The physical capacity of the data repository;
- The total capacity of the Application Storage Unit (ASU);
- The accuracy of the Benchmark Configuration diagram;
- The tuning parameters used to configure the Benchmark Configuration;
- The Workload Generator commands used to execute the testing;
- The validity and integrity of the test result files;
- The compliance of the results from each performance test;
- The compliance of the results from the persistence test;
- The compliance of the submitted pricing model; and
- The differences between the tested and the priced configuration, if any.

The Full Disclosure Report for this result was prepared in accordance with the disclosure requirements set forth in the specification for the benchmark.

The following benchmark requirements, if any, were waived according to the SPC Policies:

- None.

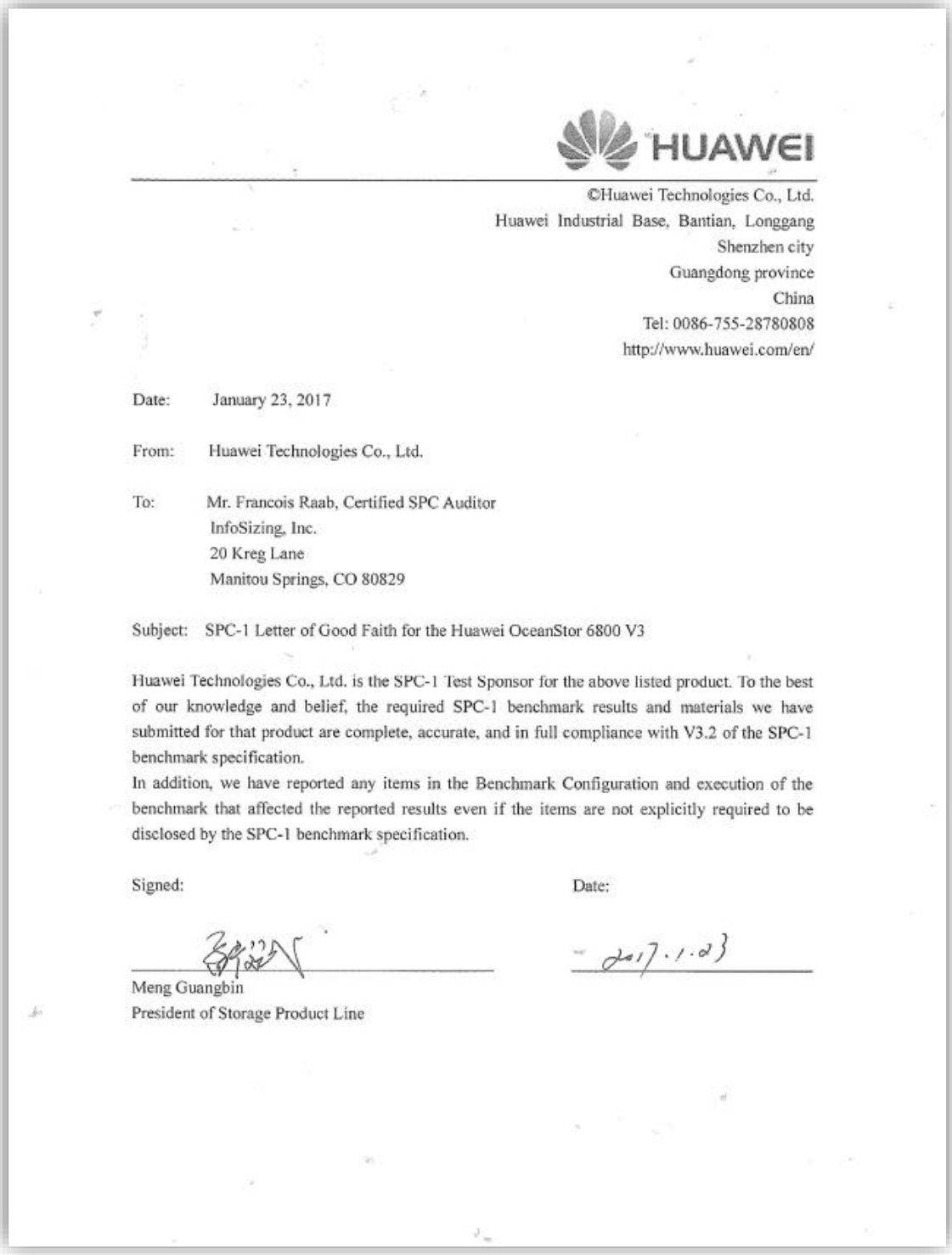
Respectfully Yours,



François Raab, Certified SPC Auditor

20 Kreg Lane • Manitou Springs, CO 80829 • 719-473-7555 • www.sizing.com

LETTER OF GOOD FAITH



HUAWEI

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Huawei Industrial Base, Bantian, Longgang
Shenzhen city
Guangdong province
China
Tel: 0086-755-28780808
http://www.huawei.com/en/

Date: January 23, 2017

From: Huawei Technologies Co., Ltd.

To: Mr. Francois Raab, Certified SPC Auditor
InfoSizing, Inc.
20 Kreg Lane
Manitou Springs, CO 80829

Subject: SPC-1 Letter of Good Faith for the Huawei OceanStor 6800 V3

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 V3.2 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:

2017.1.23

Meng Guangbin
President of Storage Product Line

SPC BENCHMARK 1™

EXECUTIVE SUMMARY

HUAWEI TECHNOLOGIES CO., LTD
HUAWEI OCEANSTOR™ 6800 V3

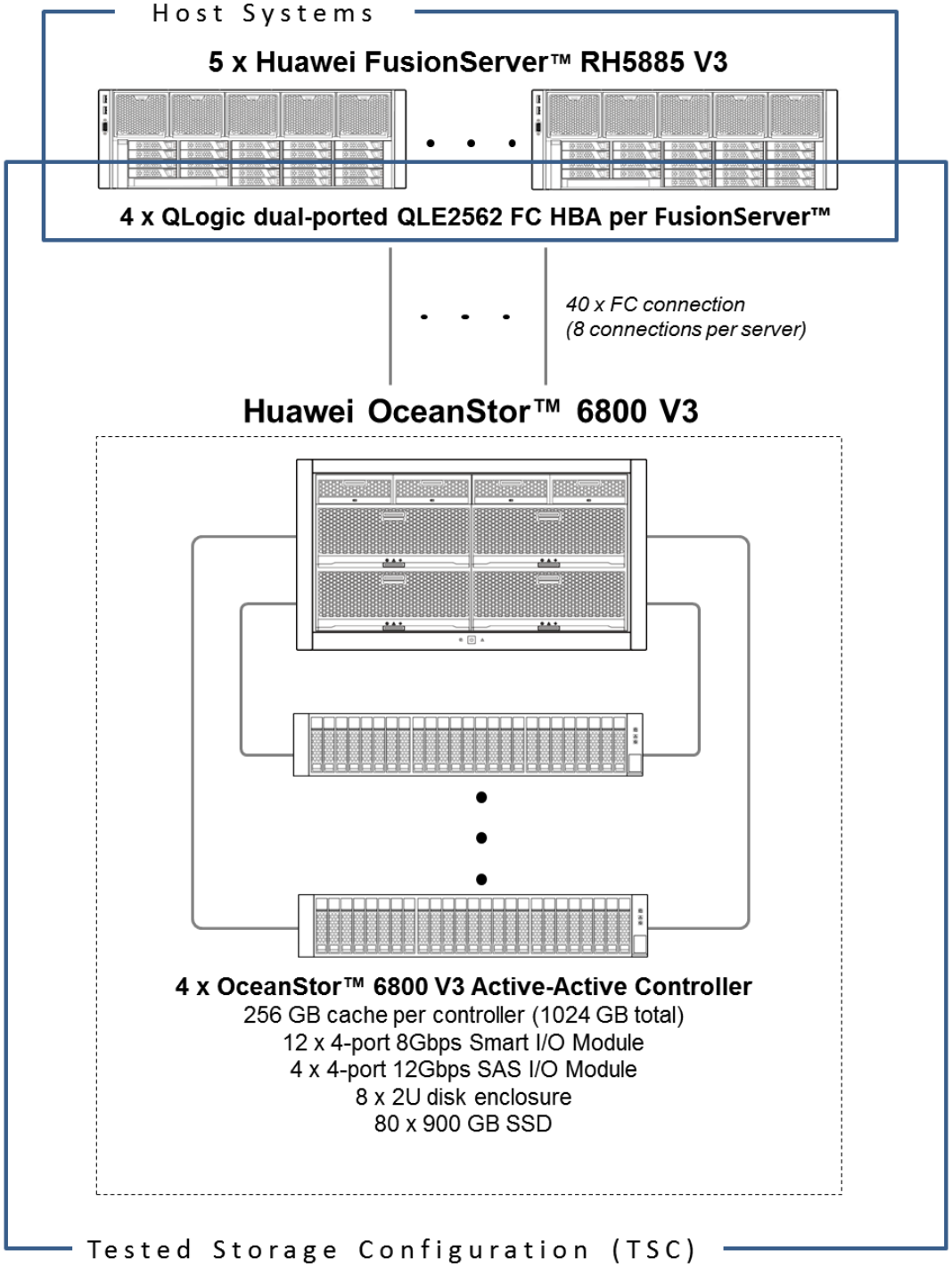
SPC-1 IOPS™	**800,022**
SPC-1 Price-Performance™	**$330.92/SPC-1 KIOPS™**
SPC-1 IOPS™ Response Time	0.713 ms
SPC-1 Overall Response Time	0.514 ms
SPC-1 ASU Capacity	25,428 GB
SPC-1 ASU Price	$10.42/GB
SPC-1 Total System Price	$264,741.42
Data Protection Level	Protected 2 (RAID-10)
Physical Storage Capacity	71,600 GB
Pricing Currency / Target Country	U.S. Dollars / USA

SPC-1 V3.2

SUBMISSION IDENTIFIER: A31004

SUBMITTED FOR REVIEW: JANUARY 25, 2017

Benchmark Configuration Diagram



Tested Storage Product Description

The OceanStor™ 6800 V3 Storage System offers a cloud architecture-oriented operating system, high-performance hardware platform, and a complete suite of smart management software.

The OceanStor™ 6800 V3 Storage System achieves high performance at a latency lower than 1 ms when configured with all SSDs.

Scalable to eight controllers, 4 TB cache, 25.6 PB storage capacity, with many interfaces, including 16 Gbit/s FC, 56 Gbit/s IB, PCIe 3.0, 12 Gbit/s SAS, and smart I/O cards.

A secure solution for large OLTP/OLAP databases, file sharing, or cloud computing in government, finance, telecom, energy, and media industries.

For more details, visit:

http://e.huawei.com/en/products/cloud-computing-dc/storage/unified-storage/high-end

Priced Storage Configuration Components

20 x QLogic dual-ported QLE2562 FC HBA
4 x OceanStor™ 6800 V3 Active-Active Controller, each with: **256 GB cache (1024 GB total)** **3 x 4-port 8Gbps Smart I/O Module (40 ports active total)** **4 x 4-port 12Gbps SAS I/O Module** **8 x 2U disk enclosure, each with:** **10 x 900 GB SSD (80 total)**

Storage Configuration Pricing

	Description	Qty	Unit Price	Ext. Price	Disc.	Disc. Price
Hardware & Software						
6800V3-512E-AC	6800 V3 (Four Controller, AC, 1TB Cache, 12*4-port SmartIO I/O module, 4*4-port 4 12Gb SAS Entire Sharing I/O module, SPE72C0600), Enhanced Version	1	341,695.00	341,695.00	74%	88,840.70
SSDM-900G2S-02	900GB SSD SAS Disk Unit(2.5")	80	4,832.00	386,560.00	75%	96,640.00
DAE22525U2-1-AC	Disk Enclosure (2U, AC, 2.5", Expanding Module, 25 Disk Slots,without Disk Unit, DAE22525U2)	8	8,820.00	70,560.00	75%	17,640.00
N8GHBA000	QLOGIC QLE2562 HBA Card, PCIE ,8Gbps DualPort, Fiber Channel Multimode LC Optic Interface, English Manual, No Drive CD	20	1,000.00	20,000.00	0%	20,000.00
HS-SAS-3-01	High Speed Cable, Mini SAS HD Cable, 3m, (SFF 8644 Plug), (28AWG*4P*2B(S)), (SFF 8644 Plug), Indoor use	16	96.00	1,536.00	0%	1,536.00
SN2F01FCPC	Patch Cord, DLC/PC, DLC/PC, Multi-mode, 3m, A1a.2, 42mm DLC ,OM3 bending insensitive	48	11.00	528.00	0%	528.00
LIC-6800V3-BS	Basic Software License for Block (Device Management, SmartThin, SmartMulti-tenant, SmartMigration, SmartErase, SmartMotion, UltraPath, Cloud Service, SystemReporter)	1	29,552.00	29,552.00	73%	7,979.04
				Hardware & Software Subtotal		**233,163.74**
Support & Maintenance						
88125ESH	OceanStor 6800 V3 Installation Service - Engineering	1	5,557.59	5,557.59	30%	3,890.31
02350XCS-88134ULF-36	6800 V3 (6U,Dual Ctrl, AC, 512GB, SPE72C0600), Enhanced Version-Hi-Care Onsite Premier 24x7x4H Engineer Onsite Service-36Month(s)	1	9,009.54	9,009.54	30%	6,306.68
02359806-88134ULF-36	Disk Enclosure (2U, AC, 2.5", Expanding Module, 25 Disk Slots, without Disk Unit, DAE22525U2) - Hi-Care Onsite Premier 24x7x4H Engineer Onsite Service-36Month(s)	8	3,485.73	27,885.84	30%	19,520.09
88032NMR-88134UHK-36	Basic Software License for Block (Device Management, SmartThin, SmartMulti-tenant, SmartMigration, SmartErase, SmartMotion, UltraPath, Cloud Service, SystemReporter) - Hi-Care Application Software Upgrade Support Service - 36-Month	1	2,658.00	2,658.00	30%	1,860.60
				Support & Maintenance Subtotal		**31,577.68**
SPC-1 Total System Price						**264,741.42**
SPC-1 IOPS™						800,022
SPC-1 Price-Performance™ ($/SPC-1 KIOPS™)						**330.92**
SPC-1 ASU Capacity (GB)						25,428
SPC-1 ASU Price ($/GB)						**10.42**

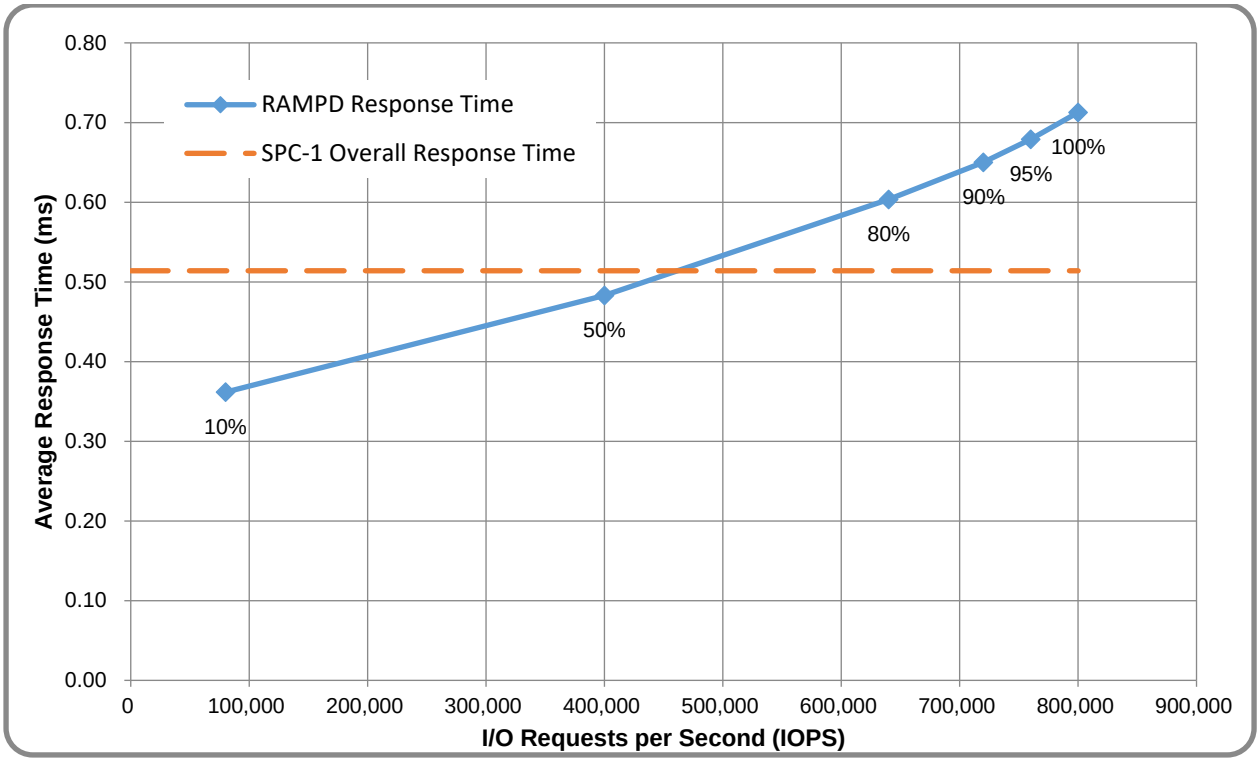
Third-Party Reseller: Huawei Technologies Co., Ltd. only sells its products to third-party resellers who, in turn, sell those products to U.S. customers. The above reflects the pricing quoted by one of those third-party resellers. See Appendix B of the Full Disclosure Report for a copy of the third-party reseller's quotation.

Discount Details: The discounts shown are based on the storage capacity purchased and are generally available.

Warranty: Hi-Care Premier On-Site Service include: 7x24 Technical Assistance Center Access. Access to all new software updates and Online Support. 24x7 with 4-hour On-site Hardware Replacement.

Availability Date: Currently available.

Response Time and Throughput Graph



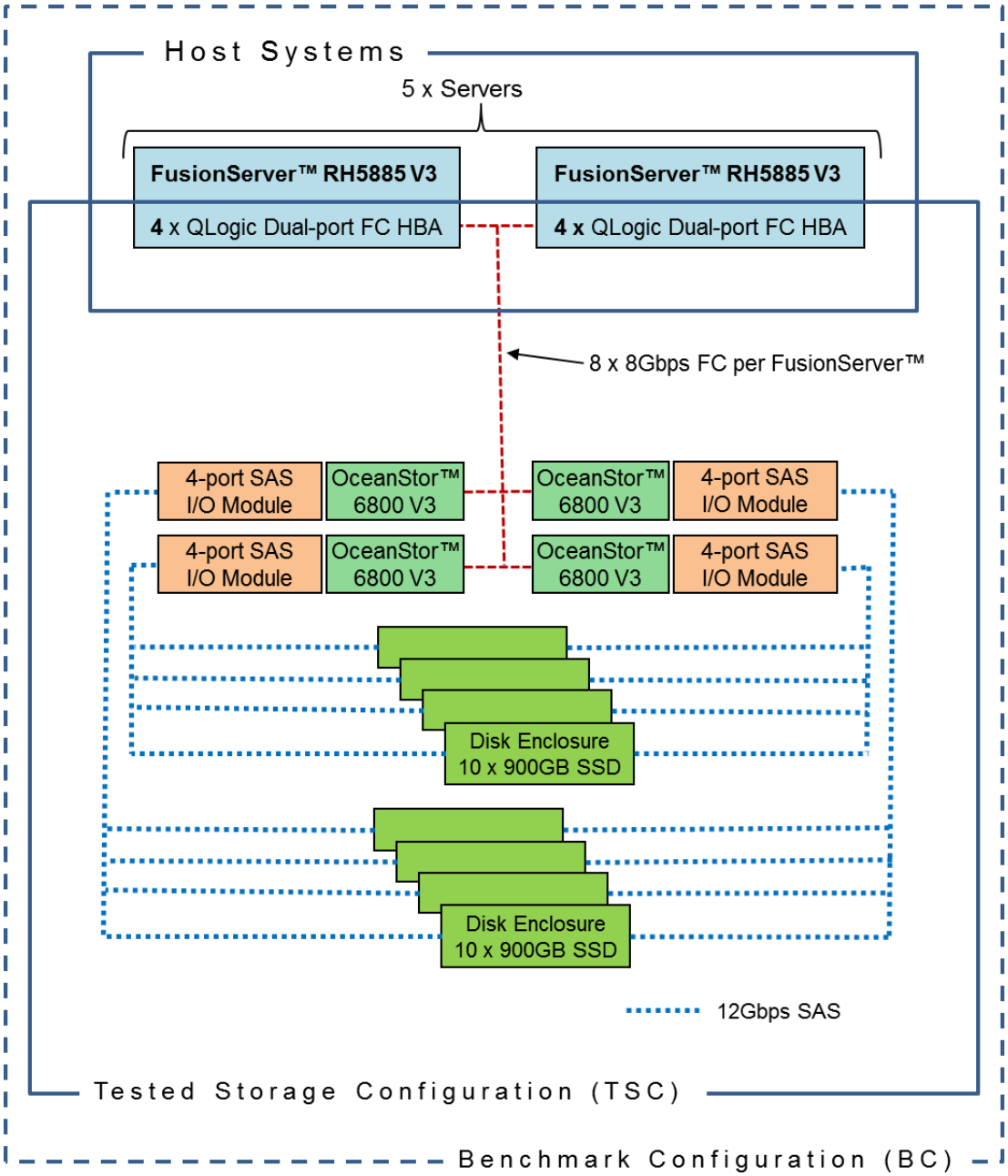
Contact Information	
Test Sponsor Primary Contact	Huawei Technologies Co., Ltd.– www.huawei.com Zhong Xu– xuzhong@huawei.com
SPC Auditor	InfoSizing – www.sizing.com Francois Raab – francois@sizing.com

Revision Information	
SPC Benchmark 1™ Revision	V3.2.0
SPC-1 Workload Generator Revision	V3.0 build d34fb3c
Publication Revision History	• First Edition: January 25, 2017 • Second Edition: February 15, 2018 - Updated SPC-1 Price-Performance™ metric based on SPC-1 v3.6.0 definition.

CONFIGURATION INFORMATION

Benchmark Configuration and Tested Storage Configuration

The following diagram illustrates the Benchmark Configuration (BC), including the Tested Storage Configuration (TSC) and the Host System(s).



Storage Network Configuration

The Tested Storage Configuration (TSC) involved an external storage subsystem made of four Huawei OceanStor™ 6800, driven by five host systems (Huawei FusionServer™ RH5885 V3). Each FusionServer™ had a dual connection with each OceanStor™. That connection was established via two ports from one of the four dual-port Fibre Chanel HBAs on the FusionServer™; and two port from one of the three 4-port Smart I/O Modules on the OceanStor™, leaving two of these ports inactive. These Fibre Chanel paths operated at 8Gbps.

Host System and Tested Storage Configuration Components

The following table lists the components of the Host System(s) and the Tested Storage Configuration (TSC).

Host Systems
5 x Huawei FusionServer™ RH5885 V3 4 x Intel Xeon E7-4820 V2 (2.0 GHz 8-Core 16 MB L3) 256 GB Main Memory Red Hat Enterprise Linux 7.1
Priced Storage Configuration
20 x QLogic dual-ported QLE2562 FC HBA
4 x OceanStor™ 6800 V3 Active-Active Controller, each with: 256 GB cache (1024 GB total) 3 x 4-port 8Gbps Smart I/O Module (40 ports active total) 4 x 4-port 12Gbps SAS I/O Module 8 x 2U disk enclosure, each with: 10 x 900 GB SSD (80 total)

Differences Between Tested and Priced Storage Configurations

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

Component Changes in Revised Full Disclosure Report

The following table outlines component changes that were made in revisions to this Full Disclosure Report.

Original Component	Revised Component	Description of Change
n/a	n/a	Initial submission

Benchmark Configuration Creation Process

Customer Tuning Parameters and Options

All the customer tuning parameters and options that have been altered from their default values for this benchmark are included in Appendix C and in the Supporting Files (see Appendix A).

Tested Storage Configuration Creation

A detailed description of how the logical representation of the TSC was created is included in Appendix D and in the Supporting Files (see Appendix A).

Tested Storage Configuration Inventory

An inventory of the components in the TSC, as seen by the Benchmark Configuration, is included in Appendix E and in the Supporting Files (see Appendix A).

Workload Generator Storage Configuration

The SPC-1 Workload Generator storage configuration commands and parameters used to invoke the execution of the tests are included in Appendix F and in the Supporting Files (see Appendix A).

Logical Volume Capacity and ASU Mapping

The following table details the capacity of each ASU and how they are mapped to logical volumes (LV).

	LV per ASU	LV Capacity	Used per LV	Total per ASU	% ASU Capacity
ASU-1	18	635.7	635.7	11,442.6	45.00%
ASU-2	18	635.7	635.7	11,442.6	45.00%
ASU-3	2	1,271.4	1,271.4	2,542.8	10.00%
			SPC-1 ASU Capacity	**25,428.0**	

Physical Storage Capacity and Utilization

The following table details the Physical Capacity of the storage devices and the Physical Capacity Utilization (percentage of Total Physical Capacity used) in support of hosting the ASUs.

Devices	Count	Physical Capacity	Total Capacity
900GB SSD	80	895.0	71,600.0
		Total Physical Capacity	**71,600.0**
		Physical Capacity Utilization	**35.51%**

Data Protection

The data protection level used for all logical volumes was **Protected 2**, which was accomplished by configuring 8 pools of 10 drives into 8 RAID-10 arrays.

BENCHMARK EXECUTION RESULTS

This portion of the Full Disclosure Report documents the results of the various SPC-1 Tests, Test Phases, and Test Runs.

Benchmark Execution Overview

Workload Generator Input Parameters

The SPC-1 Workload Generator commands and input parameters for the Test Phases are presented in the Supporting Files (see Appendix A).

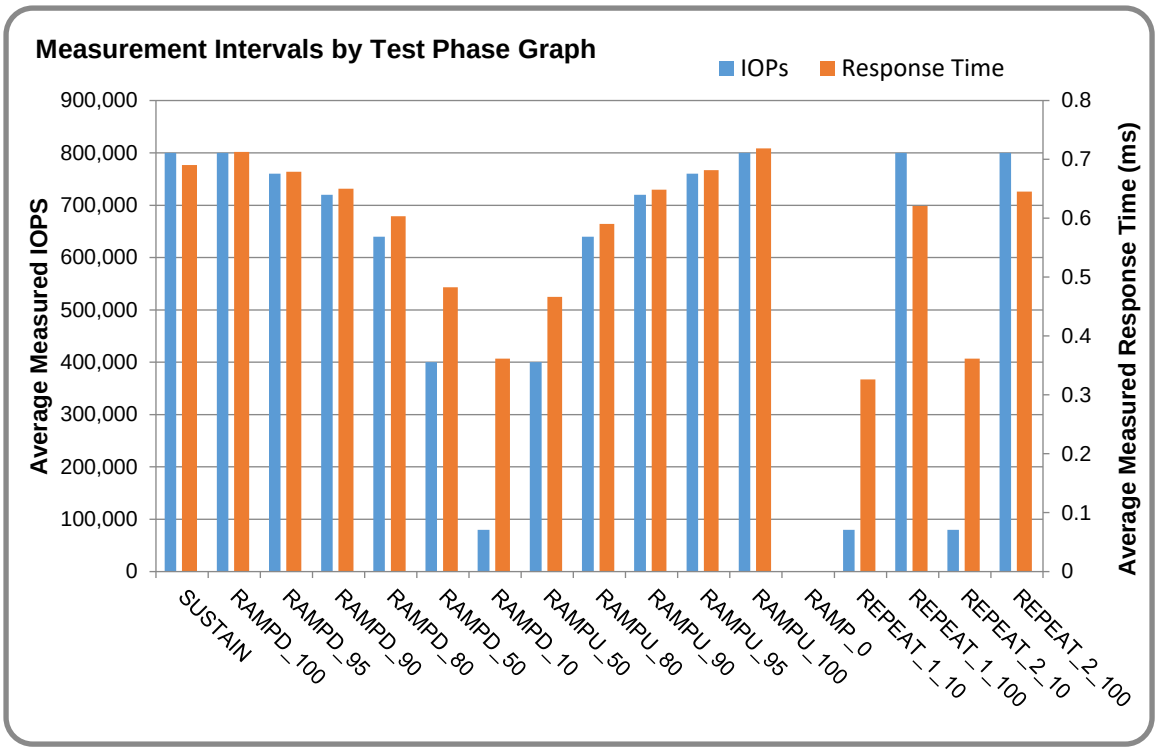
Primary Metrics Test Phases

The benchmark execution consists of the Primary Metrics Test Phases, including the Test Phases SUSTAIN, RAMPD_100 to RAMPD_10, RAMPU_50 to RAMPU_100, RAMP_0, REPEAT_1 and REPEAT_2.

Each Test Phase starts with a transition period followed by a Measurement Interval.

Measurement Intervals by Test Phase Graph

The following graph presents the average IOPS and the average Response Times measured over the Measurement Interval (MI) of each Test Phase.



Exception and Waiver

None.

SUSTAIN Test Phase

SUSTAIN – Results File

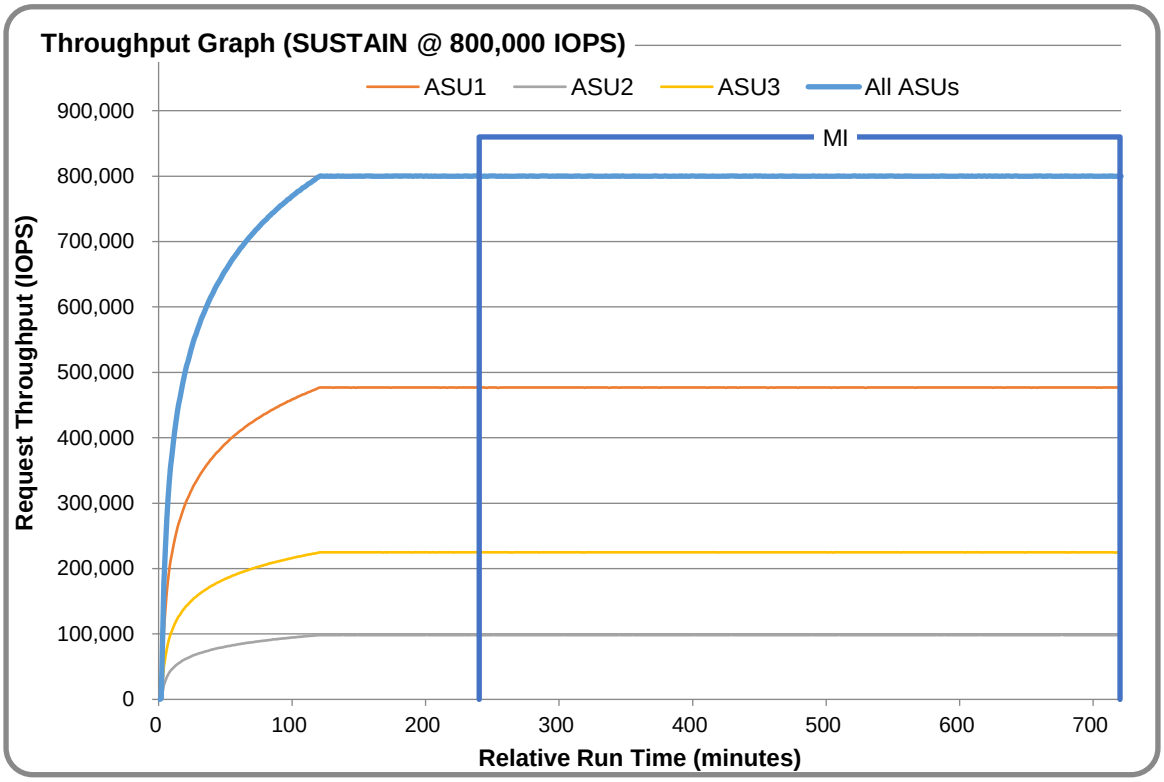
The results file generated during the execution of the SUSTAIN Test Phase is included in the Supporting Files (see Appendix A) as follows:

- **SPC1_METRICS_0_Raw_Results.xlsx**

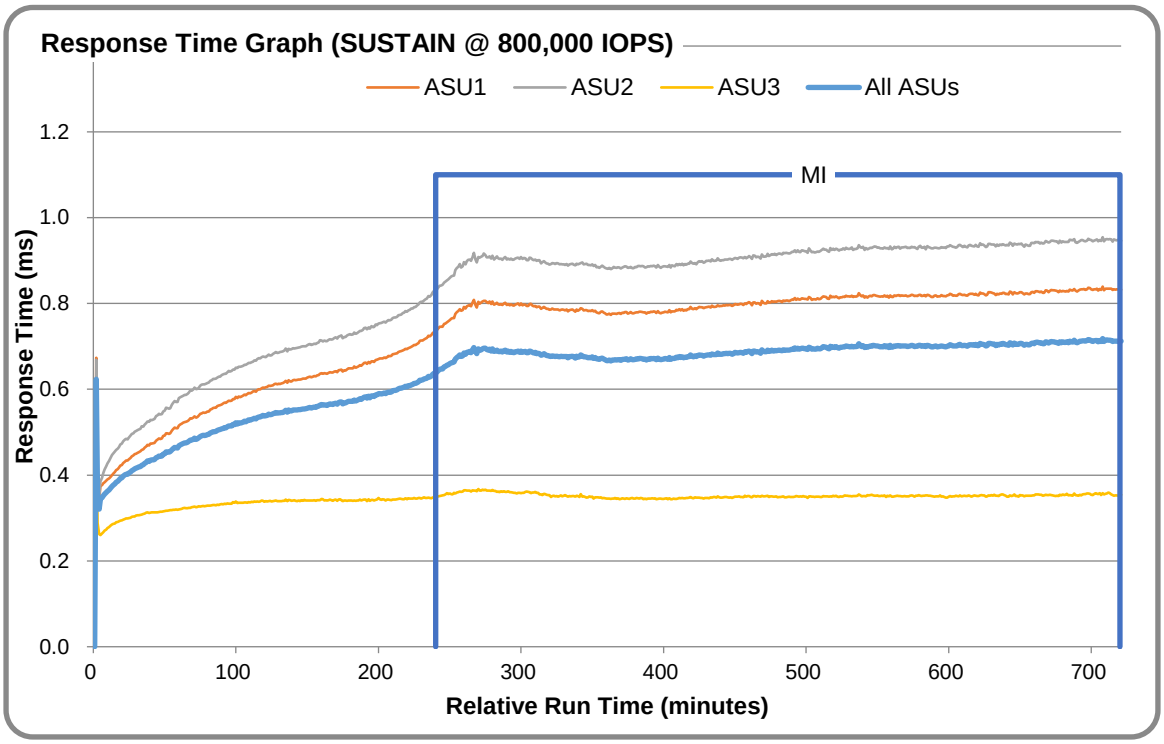
SUSTAIN – Execution Times

Interval	Start Date	Start Time	End Time	Duration
Transition Period	17-Jan-17	12:20:41.532	16:20:37.857	3:59:56.325
Measurement Interval	17-Jan-17	16:20:37.857	0:20:38.857	8:00:01.000

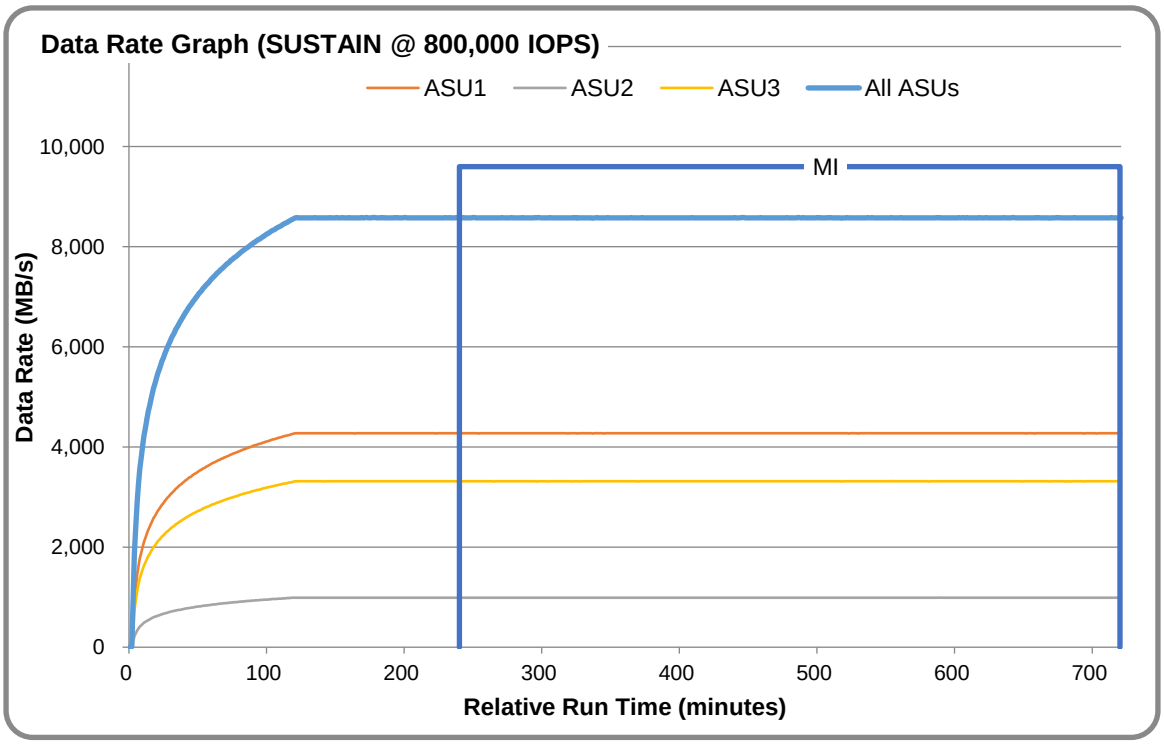
SUSTAIN – Throughput Graph



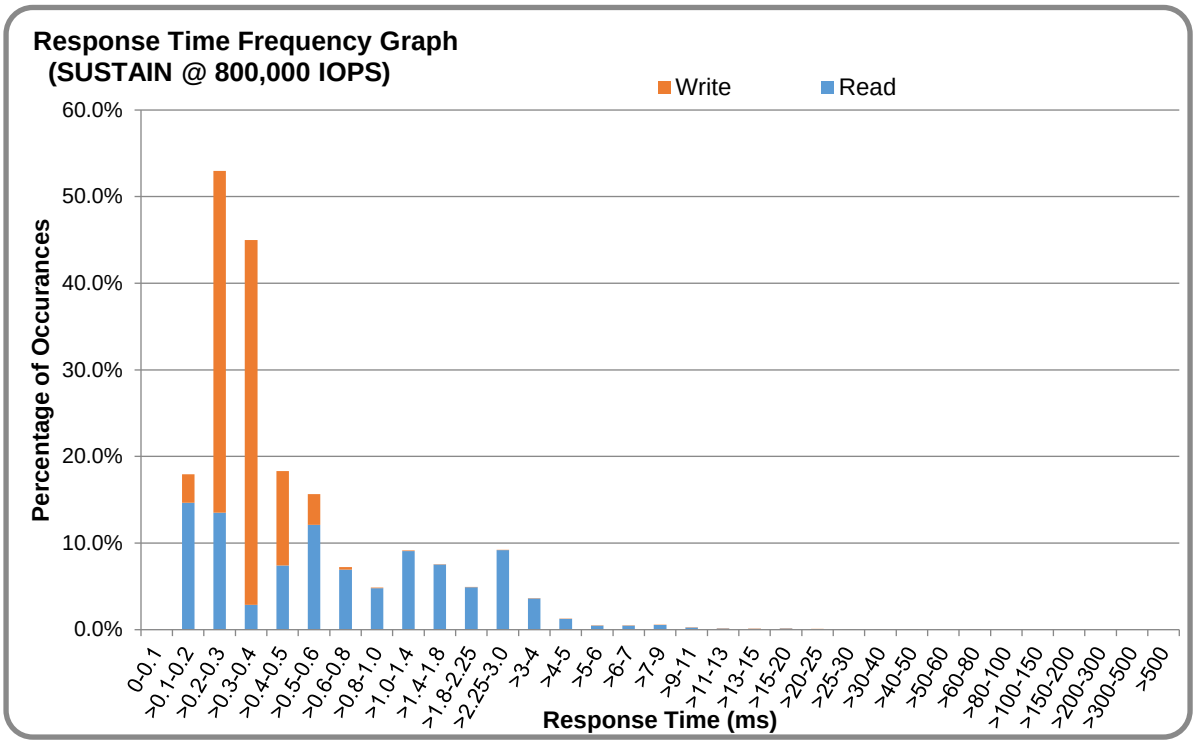
SUSTAIN – Response Time Graph



SUSTAIN – Data Rate Graph



SUSTAIN – Response Time Frequency Graph



SUSTAIN – Intensity Multiplier

The following table lists the targeted intensity multiplier (Defined), the measured intensity multiplier (Measured) for each I/O STREAM, its coefficient of variation (Variation) and the percentage of difference (Difference) between Target and Measured.

	ASU1-1	ASU1-2	ASU1-3	ASU1-4	ASU2-1	ASU2-2	ASU2-3	ASU3-1
Defined	0.0350	0.2810	0.0700	0.2100	0.0180	0.0700	0.0350	0.2810
Measured	0.0350	0.2810	0.0700	0.2100	0.0180	0.0700	0.0350	0.2810
Variation	0.0007	0.0002	0.0005	0.0003	0.0011	0.0005	0.0007	0.0002
Difference	0.000%	0.003%	0.002%	0.002%	0.008%	0.002%	0.002%	0.001%

RAMPD_100 Test Phase

RAMPD_100 – Results File

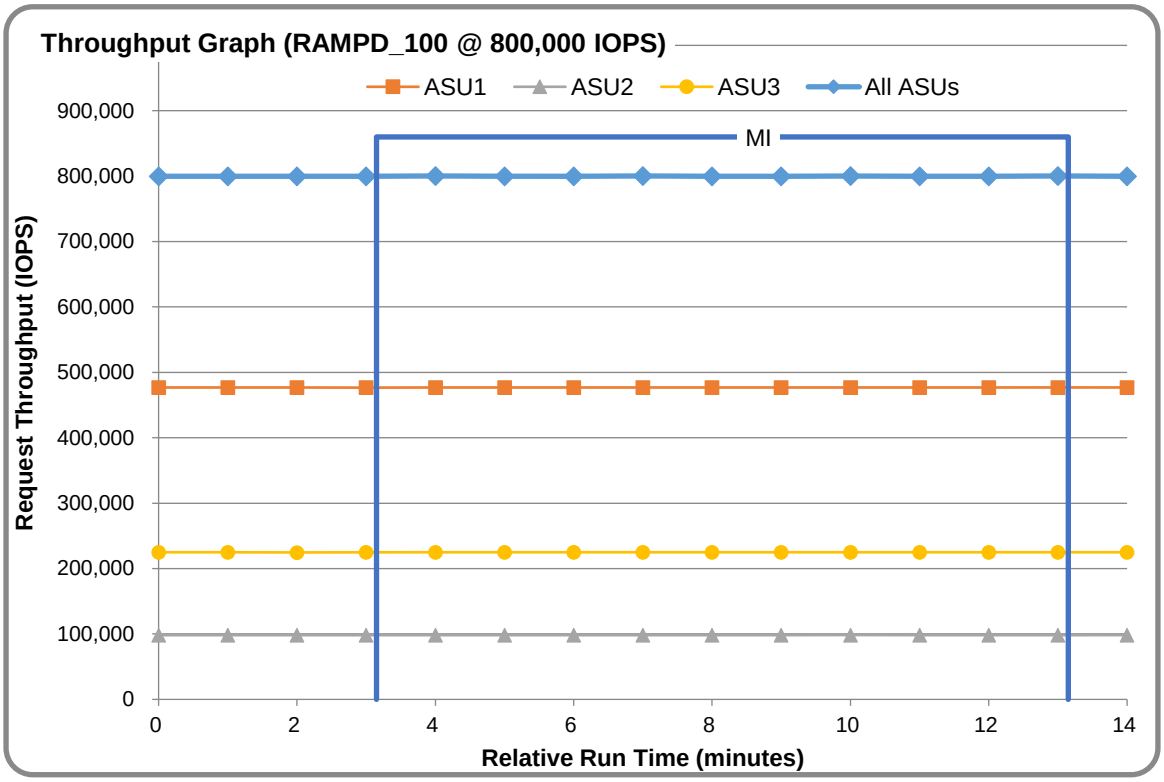
The results file generated during the execution of the RAMPD_100 Test Phase is included in the Supporting Files (see Appendix A) as follows:

- **SPC1_METRICS_0_Raw_Results.xlsx**

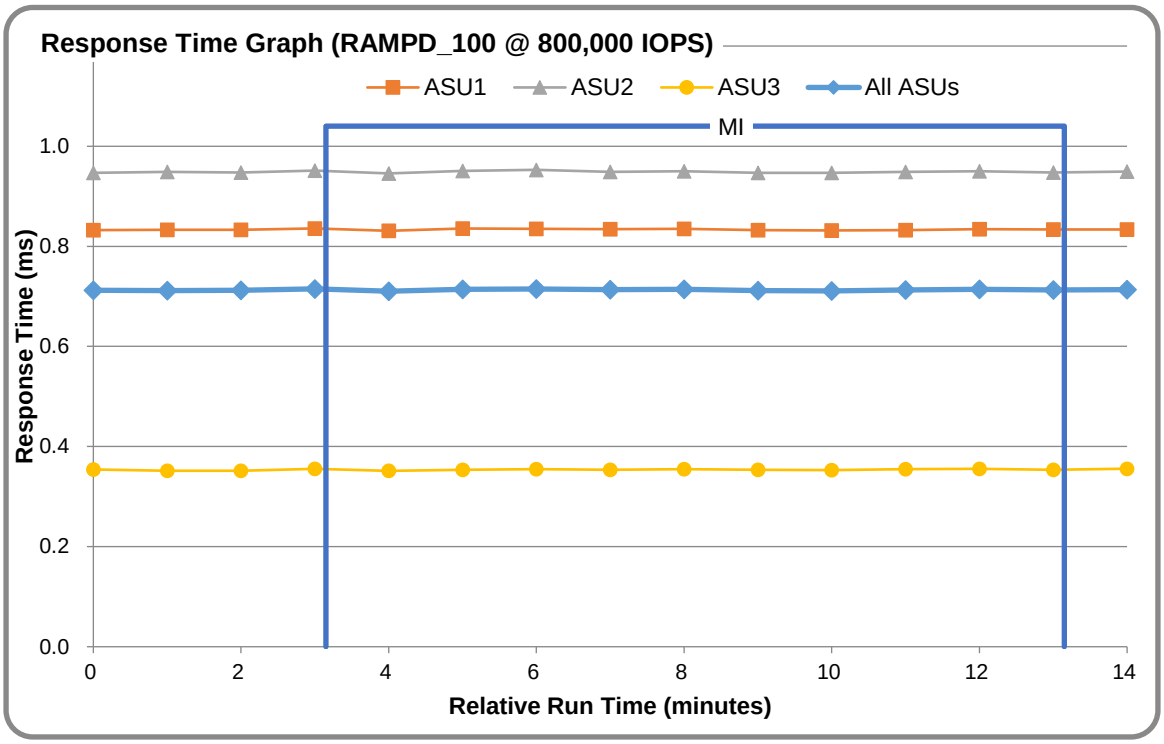
RAMPD_100 – Execution Times

Interval	Start Date	Start Time	End Time	Duration
Transition Period	18-Jan-17	0:21:37.957	0:24:37.957	0:03:00.000
Measurement Interval	18-Jan-17	0:24:37.957	0:34:38.957	0:10:01.000

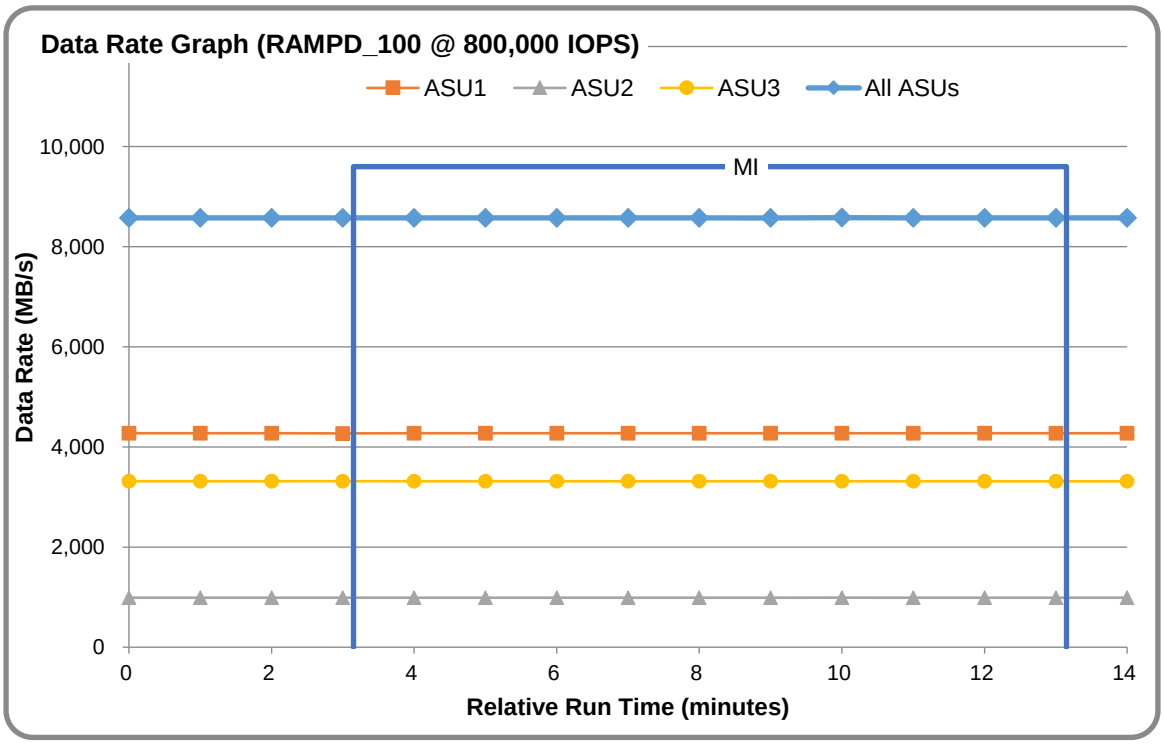
RAMPD_100 – Throughput Graph



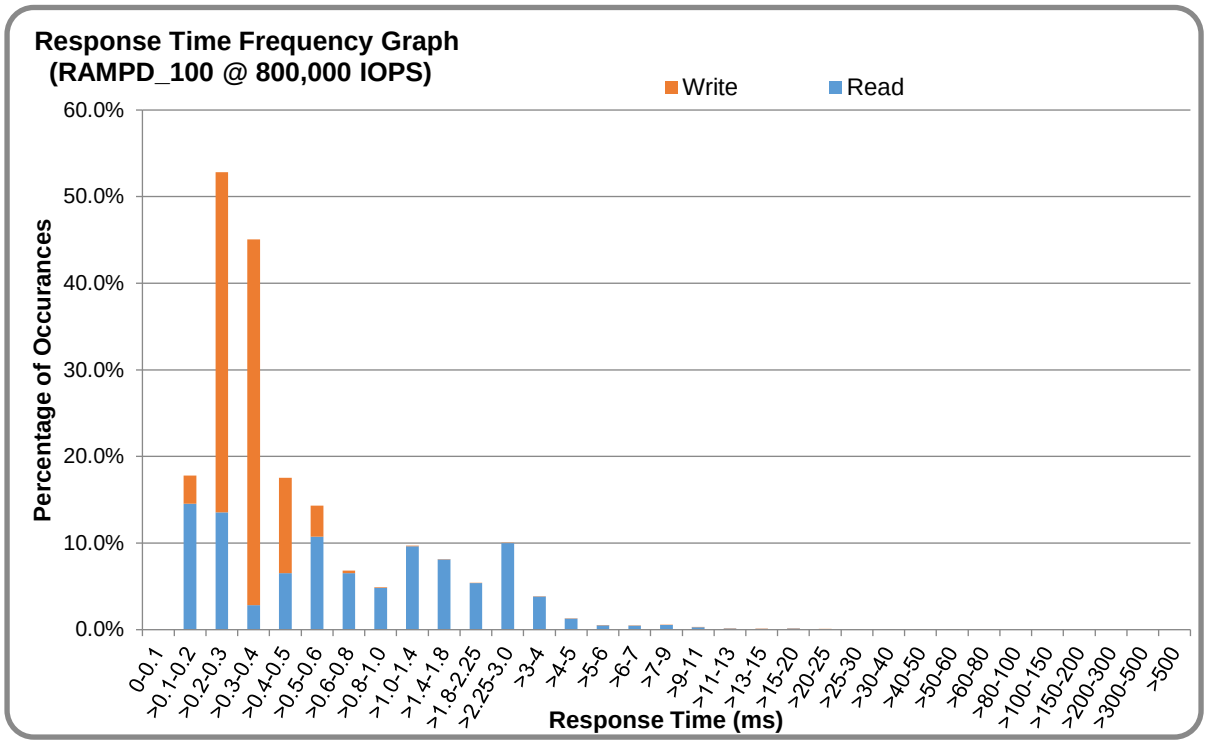
RAMPD_100 – Response Time Graph



RAMPD_100 – Data Rate Graph



RAMPD_100 – Response Time Frequency Graph



RAMPD_100 – Intensity Multiplier

The following table lists the targeted intensity multiplier (Defined), the measured intensity multiplier (Measured) for each I/O STREAM, its coefficient of variation (Variation) and the percentage of difference (Difference) between Target and Measured.

	ASU1-1	ASU1-2	ASU1-3	ASU1-4	ASU2-1	ASU2-2	ASU2-3	ASU3-1
Defined	0.0350	0.2810	0.0700	0.2100	0.0180	0.0700	0.0350	0.2810
Measured	0.0350	0.2810	0.0700	0.2100	0.0180	0.0700	0.0350	0.2810
Variation	0.0007	0.0002	0.0004	0.0002	0.0012	0.0007	0.0007	0.0002
Difference	0.023%	0.011%	0.002%	0.005%	0.038%	0.002%	0.006%	0.002%

RAMPD_100 – I/O Request Summary

I/O Requests Completed in the Measurement Interval	480,003,805
I/O Requests Completed with Response Time <= 30 ms	479,973,332
I/O Requests Completed with Response Time > 30 ms	30,473

Response Time Ramp Test

Response Time Ramp Test – Results File

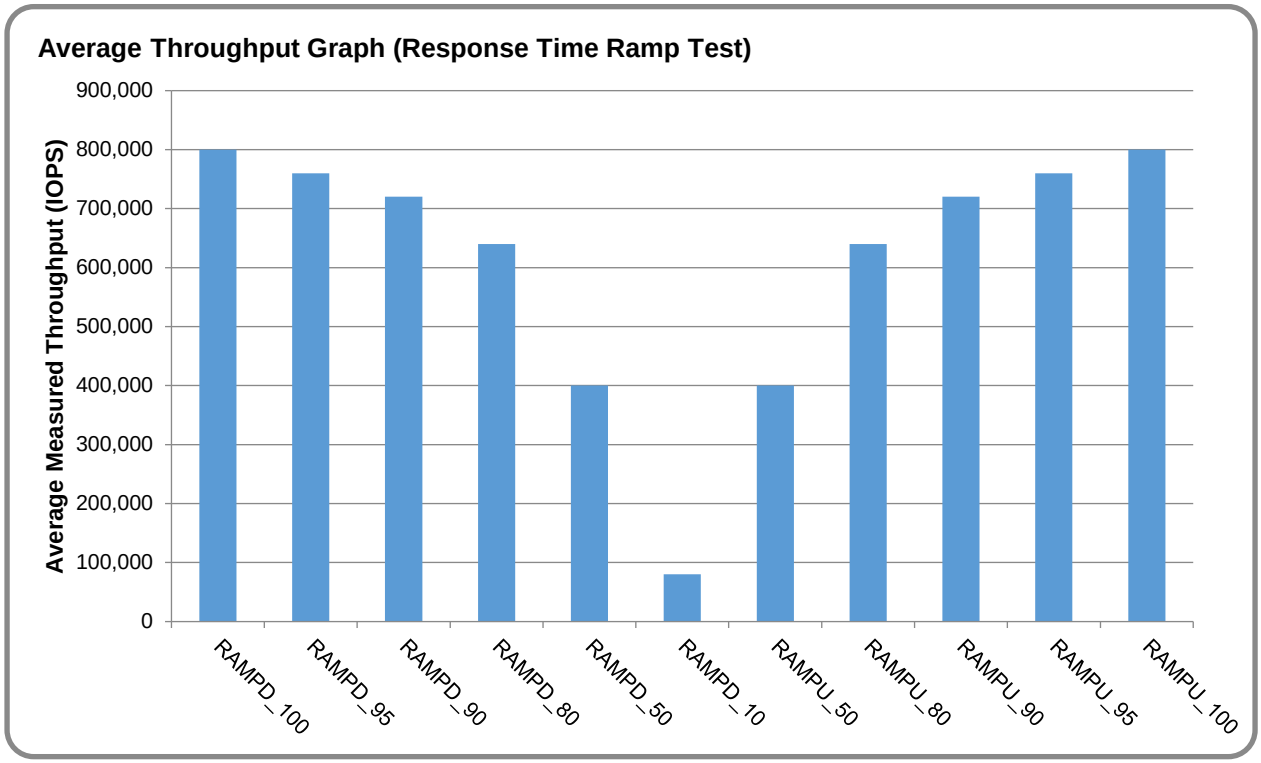
The results file generated during the execution of the Response Time Ramp Test is included in the Supporting Files (see Appendix A) as follows:

- **SPC1_METRICS_0_Raw_Results.xlsx**

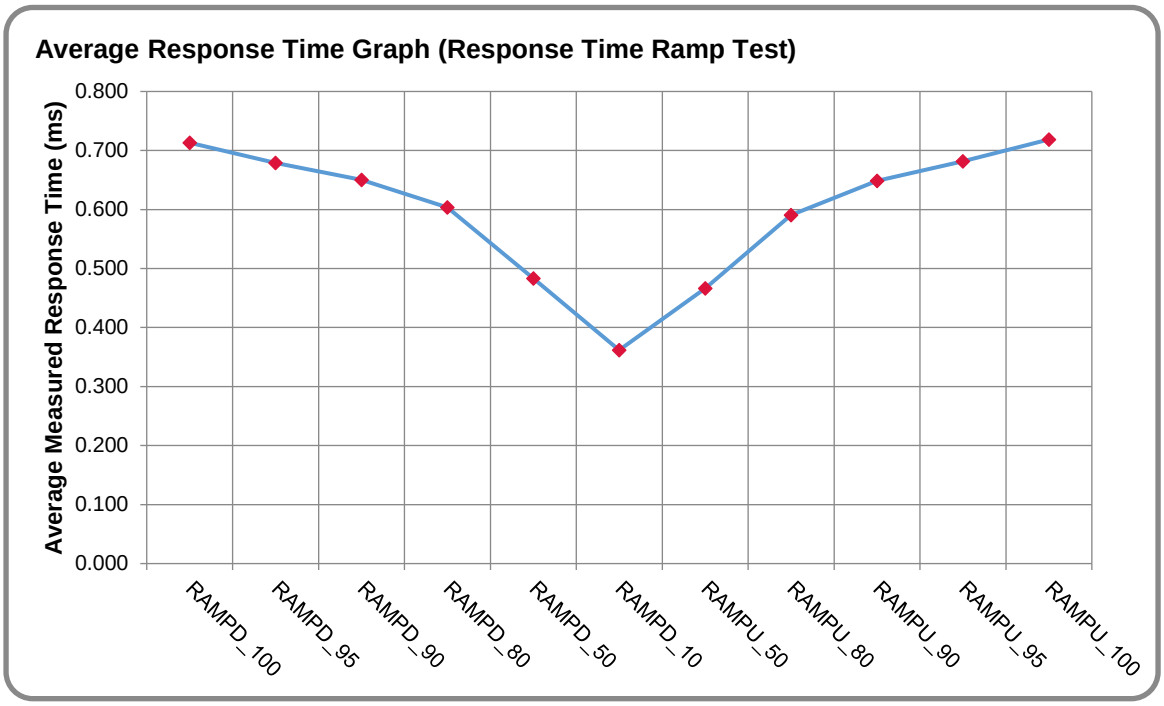
Response Time Ramp Test – Phases

The Response Time Ramp Test is comprised of 11 Test Phases, including six Ramp-Down Phases (executed at 100%, 95%, 90%, 80%, 50%, and 10% of the Business Scaling Unit) and five Ramp-Up Phases (executed at 50%, 80%, 90%, 95%, and 100% of the Business Scaling Unit).

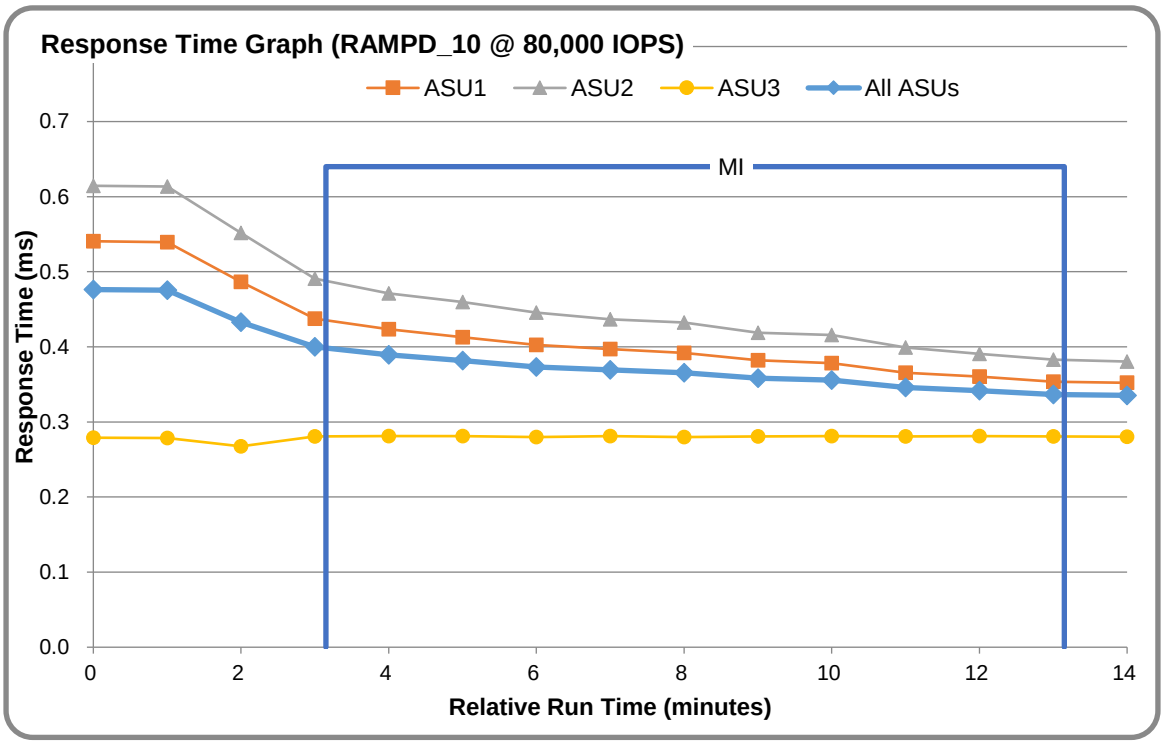
Response Time Ramp Test – Average Throughput Graph



Response Time Ramp Test – Average Response Time Graph



Response Time Ramp Test – RAMPD_10 Response Time Graph



Repeatability Test

Repeatability Test Results File

The results file generated during the execution of the Repeatability Test is included in the Supporting Files (see Appendix A) as follows:

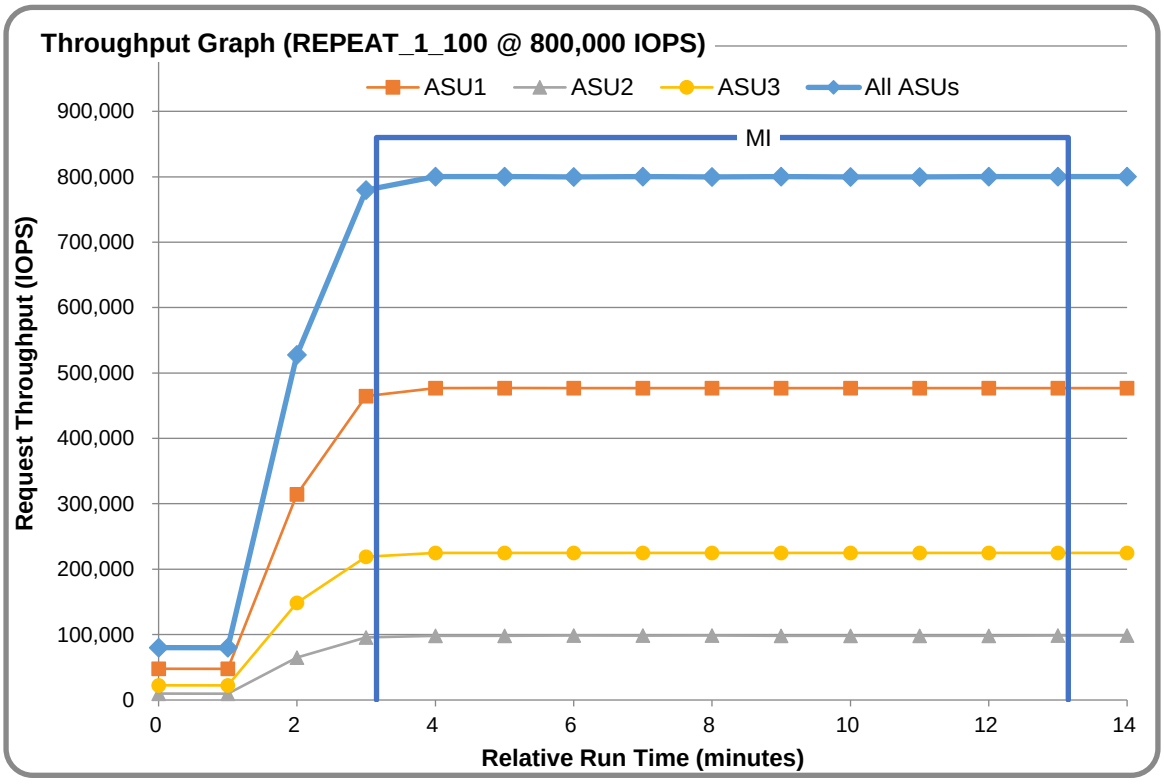
- **SPC1_METRICS_0_Raw_Results.xlsx**

Repeatability Test Results

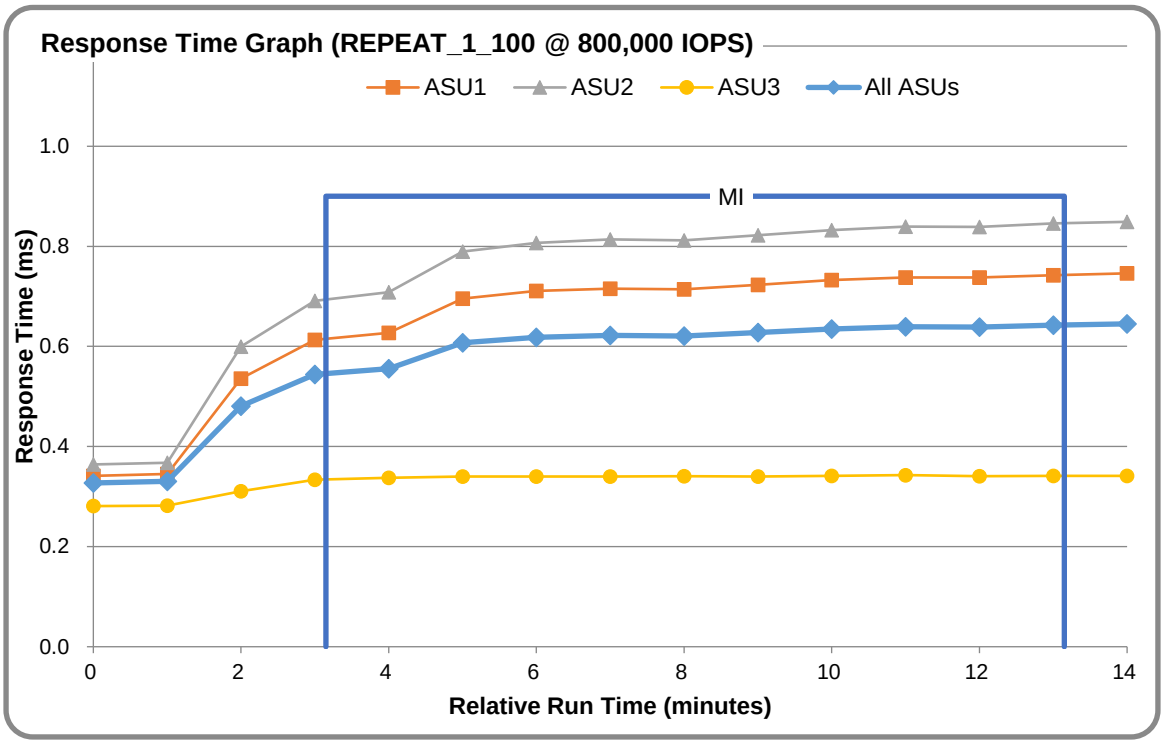
The throughput measurements for the Response Time Ramp Test (RAMPD) and the Repeatability Test Phases (REPEAT_1 and REPEAT_2) are listed in the tables below.

Test Phase	100% IOPS	10% IOPS
RAMPD	800,023.0	80,011.0
REPEAT_1	800,054.5	80,009.6
REPEAT_2	800,092.4	79,994.0

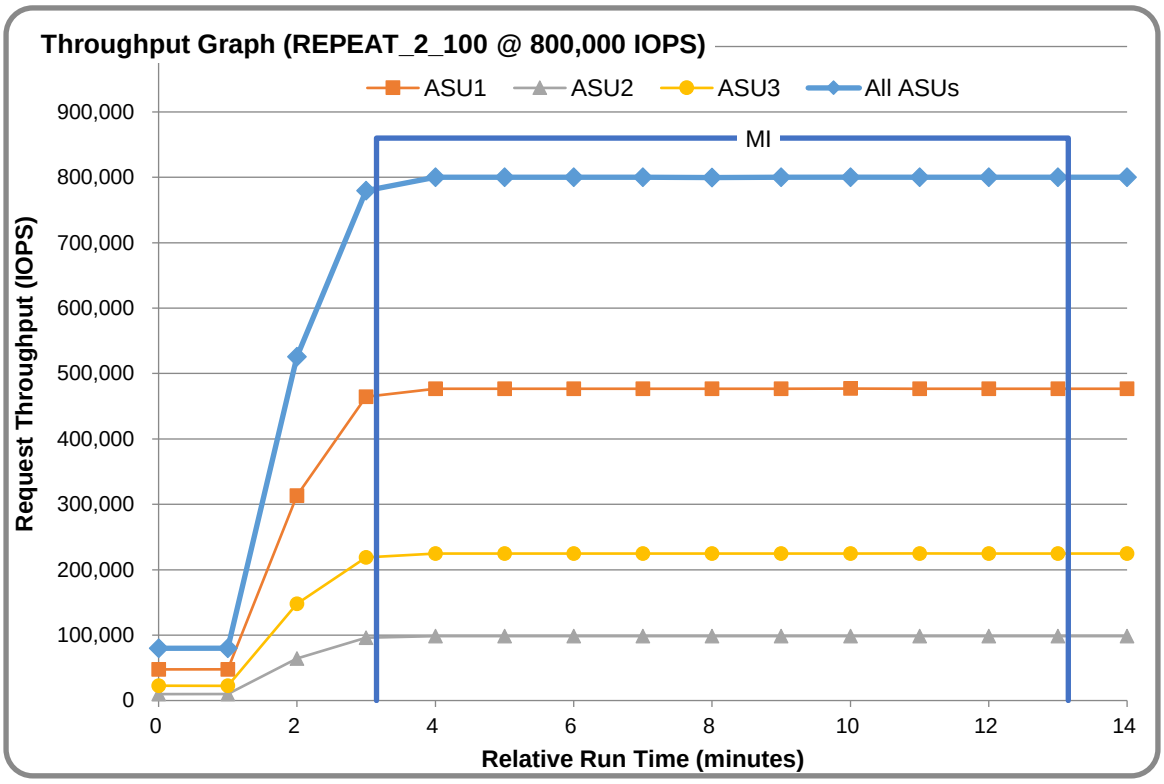
REPEAT_1_100 – Throughput Graph



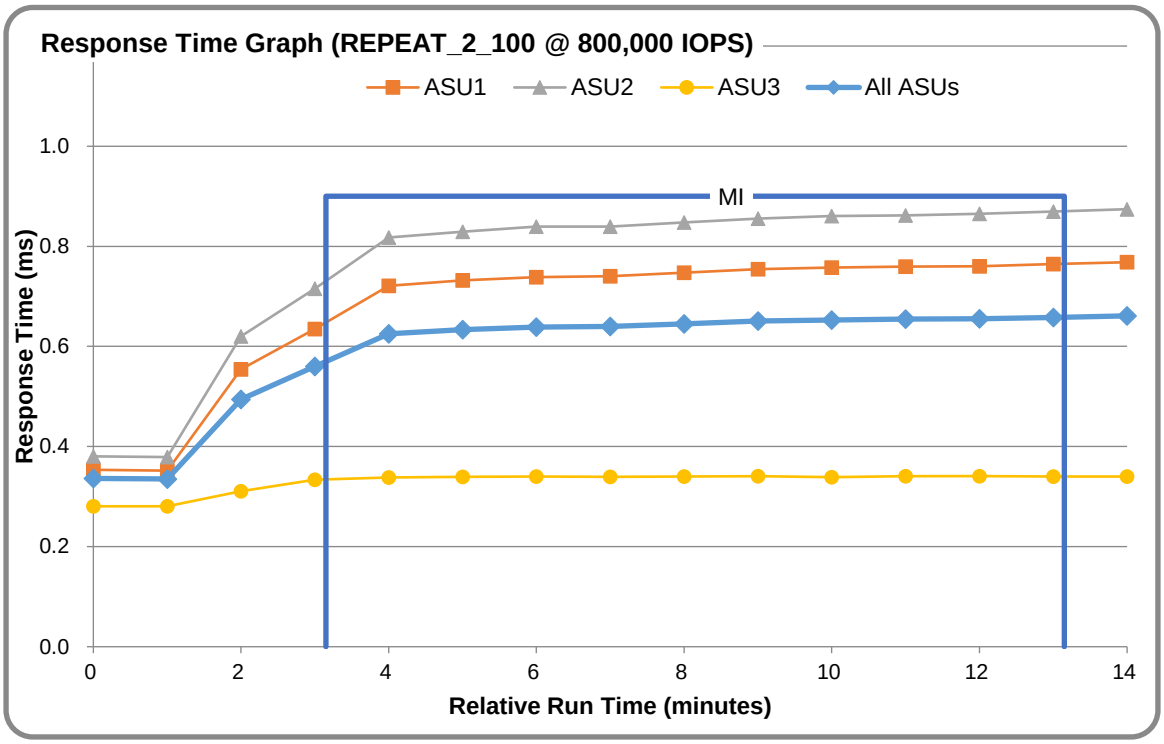
REPEAT_1_100 – Response Time Graph



REPEAT_2_100 – Throughput Graph



REPEAT_2_100 – Response Time Graph



Repeatability Test – Intensity Multiplier

The following tables lists the targeted intensity multiplier (Defined), the measured intensity multiplier (Measured) for each I/O STREAM, its coefficient of variation (Variation) and the percent of difference (Difference) between Target and Measured.

REPEAT_1_100 Test Phase

	ASU1-1	ASU1-2	ASU1-3	ASU1-4	ASU2-1	ASU2-2	ASU2-3	ASU3-1
Defined	0.0350	0.2810	0.0700	0.2100	0.0180	0.0700	0.0350	0.2810
Measured	0.0350	0.2810	0.0700	0.2100	0.0180	0.0700	0.0350	0.2810
Variation	0.0008	0.0002	0.0004	0.0002	0.0011	0.0005	0.0009	0.0003
Difference	0.031%	0.001%	0.006%	0.011%	0.004%	0.013%	0.003%	0.001%

REPEAT_2_100 Test Phase

	ASU1-1	ASU1-2	ASU1-3	ASU1-4	ASU2-1	ASU2-2	ASU2-3	ASU3-1
Defined	0.0350	0.2810	0.0700	0.2100	0.0180	0.0700	0.0350	0.2810
Measured	0.0350	0.2810	0.0700	0.2100	0.0180	0.0700	0.0350	0.2810
Variation	0.0009	0.0002	0.0005	0.0003	0.0011	0.0005	0.0005	0.0002
Difference	0.007%	0.010%	0.006%	0.009%	0.037%	0.024%	0.050%	0.004%

Data Persistence Test

Data Persistence Test Results file

The results files generated during the execution of the Data Persistence Test is included in the Supporting Files (see Appendix A) as follows:

- **SPC1_PERSIST_1_0_Raw_Results.xlsx**
- **SPC1_PERSIST_2_0_Raw_Results.xlsx**

Data Persistence Test Execution

The Data Persistence Test was executed using the following sequence of steps:

- The PERSIST_1_0 Test Phase was executed to completion.
- The Benchmark Configuration was taken through an orderly shutdown process and powered off.
- The Benchmark Configuration was powered on and taken through an orderly startup process.
- The PERSIST_2_0 Test Phase was executed to completion.

Data Persistence Test Results

Data Persistence Test Phase: Persist1	
Total Number of Logical Blocks Written	98,969,916
Total Number of Logical Blocks Verified	52,940,101
Total Number of Logical Blocks that Failed Verification	0
Time Duration for Writing Test Logical Blocks (sec.)	301
Size in bytes of each Logical Block	8,192
Number of Failed I/O Requests in the process of the Test	0

APPENDIX A: SUPPORTING FILES

The following table details the content of the Supporting Files provided as part of this Full Disclosure Report.

File Name	Description	Location
/SPC1_RESULTS	**Data reduction worksheets**	**root**
SPC1_INIT_0_Raw_Results.xlsx	Raw results for INIT Test Phase	/SPC1_RESULTS
SPC1_METRICS_0_Quick_Look.xlsx	Quick Look Test Run Overview	/SPC1_RESULTS
SPC1_METRICS_0_Raw_Results.xlsx	Raw results for Primary Metrics Test	/SPC1_RESULTS
SPC1_METRICS_0_Summary_Results.xlsx	Primary Metrics Summary	/SPC1_RESULTS
SPC1_PERSIST_1_0_Raw_Results.xlsx	Raw results for PERSIST1 Test Phase	/SPC1_RESULTS
SPC1_PERSIST_2_0_Raw_Results.xlsx	Raw results for PERSIST2 Test Phase	/SPC1_RESULTS
SPC1_Run_Set_Overview.xlsx	Run Set Overview Worksheet	/SPC1_RESULTS
SPC1_VERIFY_0_Raw_Results.xlsx	Raw results for first VERIFY Test Phase	/SPC1_RESULTS
SPC1_VERIFY_1_Raw_Results.xlsx	Raw results for second VERIFY Test Phase	/SPC1_RESULTS
/C_Tuning	**Tuning parameters and options**	**root**
aio-max-nr.sh	Set maximum asynchronous I/O	/C_Tuning
requests.sh	Increase disk queue depth	/C_Tuning
scheduler.sh	Change the I/O scheduler	/C_Tuning
/D_Creation	**Storage configuration creation**	**root**
mklun.txt	Create the storage environment	/D_Creation
mkvolume.sh	Create the Logical Volumes	/D_Creation
/E_Inventory	**Configuration inventory**	**root**
shstorage.tcl	Captures profile of storage environment	/E_Inventory
profile1_volume.log	List of logical volumes before INIT	/E_Inventory
profile1_storage.log	List of storage devices before INIT	/E_Inventory
profile2_volume.log	List of logical volumes after restart	/E_Inventory
profile2_storage.log	List of storage devices after restart	/E_Inventory
/F_Generator	**Workload generator**	**root**
slave_asu.asu	Defining LUNs hosting the ASUs	/F_generator
5host.HST	Host configuration file	/F_generator
full_run.sh	Executing all test phases	/F_generator

APPENDIX B: THIRD PARTY QUOTATION

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Address: 32 Bro
New Y
Tel. 212-60
Email: sales@

1/19/2017, Quote Valid:90 Days

No.	Model	Description	Qty.	Unit Price (USD)	Ext.Price (USD)	Disc. (off)
1	Phase					
1.1	Location					
1.1.1	OceanStor 6800 V3 Storage System					
1.1.1	Engine					
	6800V3-512E-AC	6800 V3(Four Controller,AC,1TB Cache,12*4 port SmartIO I/O module,4*4 port 4*12Gb SAS Entire Sharing I/O module,SPE72C0600),Enhanced Version	1	341,695.00	341695	74%
1.1.2	Disk Components					
	SSDM-900G2S-02	900GB SSD SAS Disk Unit(2.5")	80	4,832.00	386560	75%
1.1.3	Disk Enclosure					
	DAE22525U2-1-AC	Disk Enclosure(2U,AC,2.5",Expanding Module,25 Disk Slots,without Disk Unit,DAE22525U2)	8	8,820.00	70560	75%
1.1.4	HBA					
	N8GHBA000	QLOGIC QLE2562 HBA Card,PCIE,8Gbps DualPort ,Fiber Channel Multimode LC Optic Interface,English Manual, No Drive CD	20	1000.00	20000	0%

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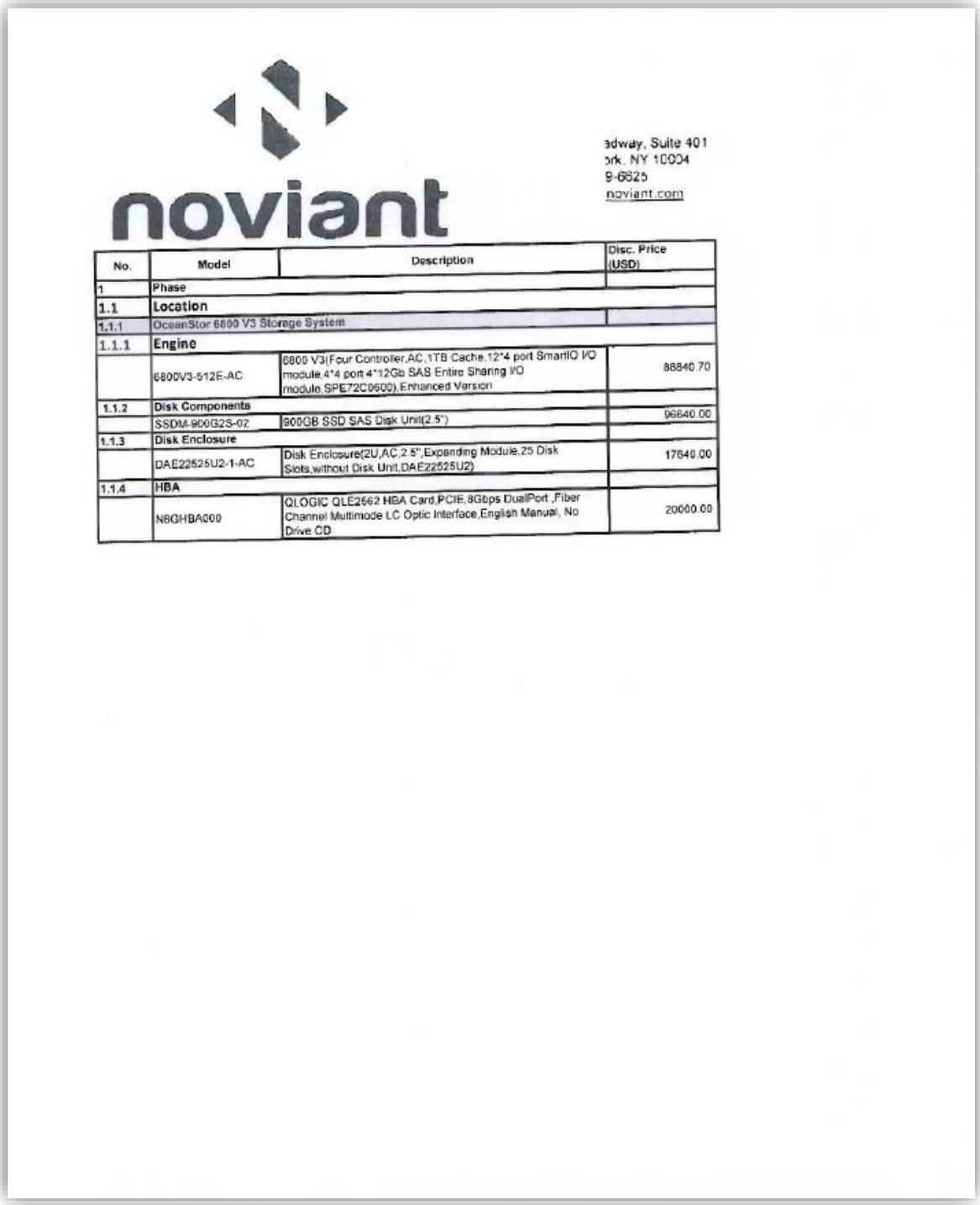
New Y
Tel. 212-60
Email sales@

1/19/2017, Quote Valid:90 Days

No.	Model	Description	Qty.	Unit Price (USD)	Ext.Price (USD)	Disc. (off)
1.1.5	Accessory					
	HS-SAS-3-01	High Speed Cable,Mini SAS HD Cable,3m (SFF 8644 Plug),(28AWG*4P*28(S)),(SFF 8644 Plug),Indoor use	16	96	1536	0%
	SN2F01FCPC	Patch Cord,DLC/PC,DLC/PC,Multi-mode,3m,A1a.2,2mm,42mm DLC,OM3 bending insensitive	48	11.00	528	0%
1.1.6	Storage Software					
	LIC-6800V3-BS	Basic Software License for Block(Include Device Management,SmartThin,SmartMulti-tenant,SmartMigration,SmartErase,SmartMotion,UltraPath,Cloud Service,SystemReporter)	1	29,552.00	29552	73%
Total of Product						
1.1.7	Maintenance Support Service					
	88125ESH	OceanStor 6800 V3 Installation Service - Engineering	1	5,557.59	5558	30%
	02350XCS-88134ULF-36	6800 V3(6U,Dual Ctrl,AC,512GB,SPE72C0600),Enhanced Version-Hi-Care Onsite Premier 24x7x4H Engineer Onsite Service-36Month(s)	1	9,009.54	9010	30%
	02358606-88134ULF-36	Disk Enclosure(2U,AC,2.5",Expanding Module,25 Disk Slots,without Disk Unit,DAE22525U2)-Hi-Care Onsite Premier 24x7x4H Engineer Onsite Service-36Month(s)	8	3,485.73	27886	30%
	88032NMR-88134UHK-36	Basic Software License for Block(Include Device Management,SmartThin,SmartMulti-tenant,SmartMigration,SmartErase,SmartMotion,UltraPath,Cloud Service,SystemReporter)-Hi-Care Application Software Upgrade Support Service-36Month(s)	1	2658	2658	30%
Total of Service (3 years)						
Total Price						

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.



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ork, NY 10004
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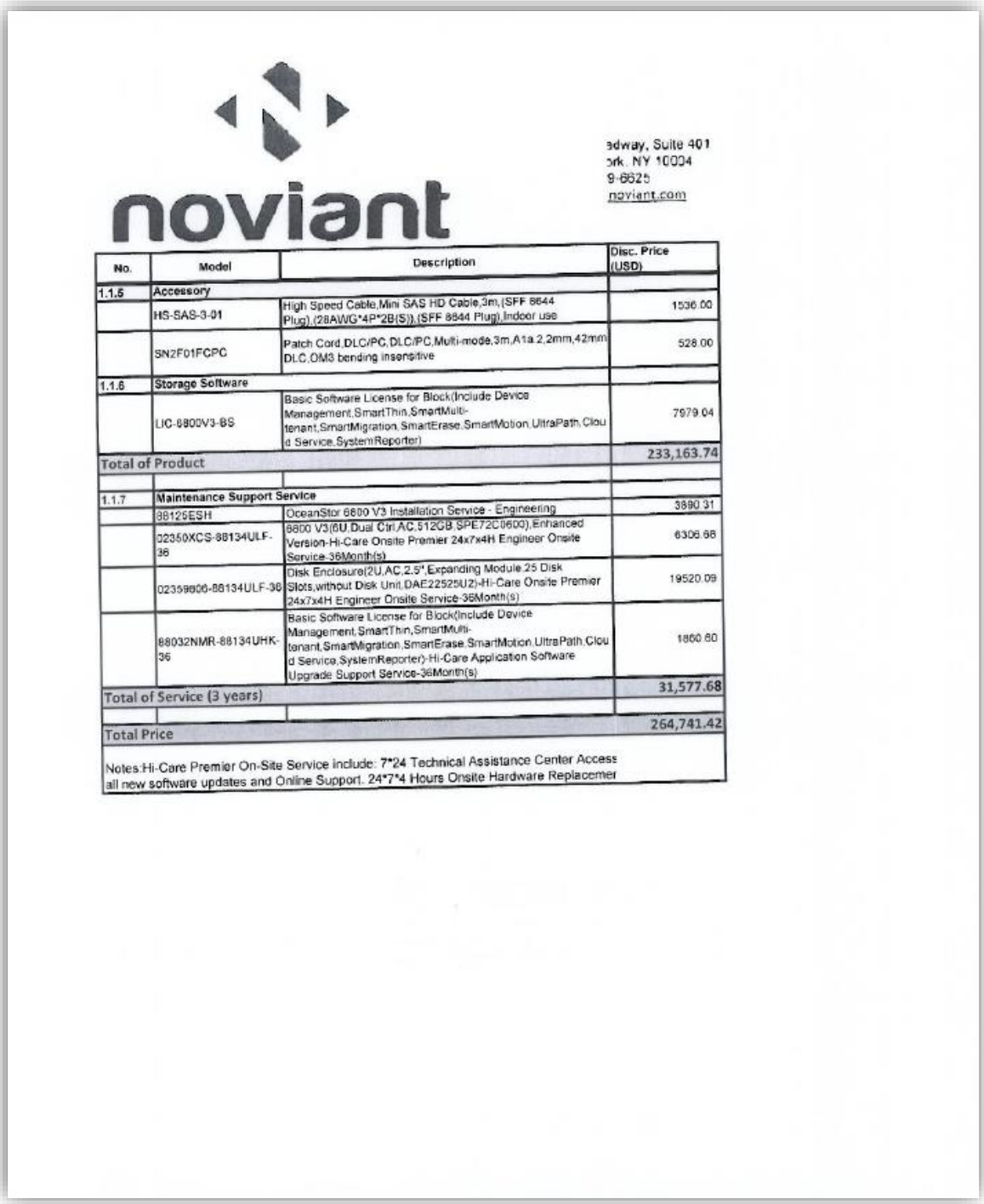
No.	Model	Description	Disc. Price (USD)
1	Phase		
1.1	Location		
1.1.1	OceanStor 6800 V3 Storage System		
1.1.1	Engine		
	6800V3-512E-AC	6800 V3(Four Controller,AC,1TB Cache,12*4 port SmartIO I/O module,4*4 port 4*12Gb SAS Entire Sharing I/O module,SPE72C0600),Enhanced Version	88840.70
1.1.2	Disk Components		
	SSDM-900G2S-02	900GB SSD SAS Disk Unit(2.5")	96840.00
1.1.3	Disk Enclosure		
	DAE22525U2-1-AC	Disk Enclosure(2U,AC,2.5",Expanding Module,25 Disk Slots,without Disk Unit,DAE22525U2)	17640.00
1.1.4	HBA		
	N8GHBA000	QLOGIC QLE2562 HBA Card,PCIE,8Gbps DualPort ,Fiber Channel Multimode LC Optic Interface,English Manual, No Drive CD	20000.00



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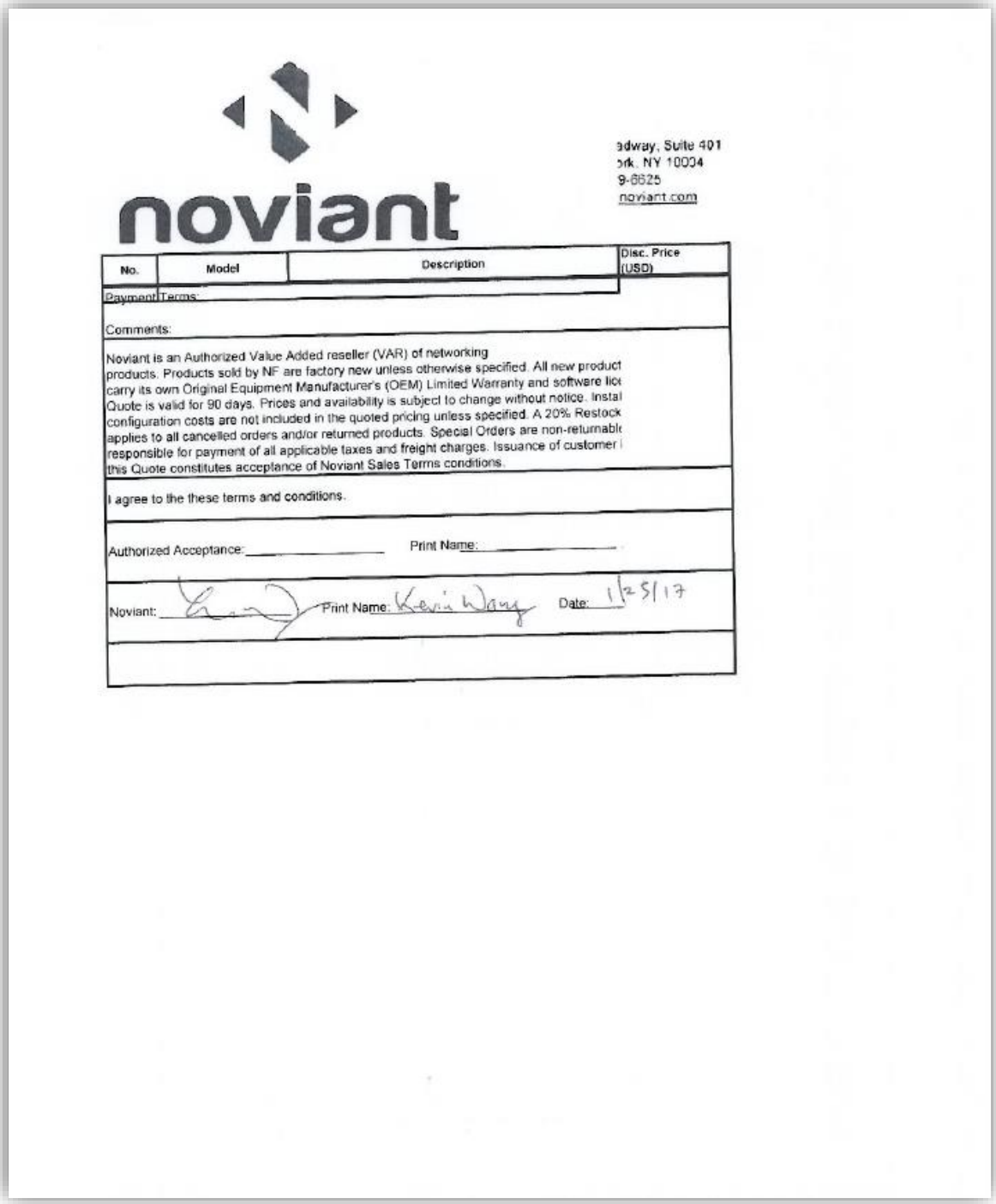
No.	Model	Description	Disc. Price (USD)
1.1.5	Accessory		
	HS-SAS-3-01	High Speed Cable,Mini SAS HD Cable,3m,(SFF 8644 Plug),(28AWG*4P*2B(S)),(SFF 8644 Plug),Indoor use	1536.00
	SN2F01FCPC	Patch Cord,DLC/PC,DLC/PC,Multi-mode,3m,A1a.2,2mm,42mm DLC,OM3 bending insensitive	528.00
1.1.6	Storage Software		
	LIC-6800V3-BS	Basic Software License for Block(Include Device Management,SmartThin,SmartMulti-tenant,SmartMigration,SmartErase,SmartMotion,UltraPath,Cloud Service,SystemReporter)	7979.04
Total of Product			233,163.74
1.1.7	Maintenance Support Service		
	88125ESH	OceanStor 6800 V3 Installation Service - Engineering	3890.31
	02350XCS-88134ULF-36	6800 V3(6U,Dual Ctrl,AC,512GB,SPE72C0600),Enhanced Version-Hi-Care Onsite Premier 24x7x4H Engineer Onsite Service-36Month(s)	6306.66
	02359806-88134ULF-36	Disk Enclosure(2U,AC,2.5",Expanding Module,25 Disk Slots,without Disk Unit,DAE22525U2)-Hi-Care Onsite Premier 24x7x4H Engineer Onsite Service-36Month(s)	19520.09
	88032NMR-88134UHK-36	Basic Software License for Block(Include Device Management,SmartThin,SmartMulti-tenant,SmartMigration,SmartErase,SmartMotion,UltraPath,Cloud Service,SystemReporter)-Hi-Care Application Software Upgrade Support Service-36Month(s)	1860.60
Total of Service (3 years)			31,577.68
Total Price			264,741.42

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



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No.	Model	Description	Disc. Price (USD)

Payment Terms:

Comments:

Noviant is an Authorized Value Added reseller (VAR) of networking products. Products sold by NF are factory new unless otherwise specified. All new product carry its own Original Equipment Manufacturer's (OEM) Limited Warranty and software lic Quote is valid for 90 days. Prices and availability is subject to change without notice. Instal configuration costs are not included in the quoted pricing unless specified. A 20% Restock applies to all cancelled orders and/or returned products. Special Orders are non-returnabl responsible for payment of all applicable taxes and freight charges. Issuance of customer this Quote constitutes acceptance of Noviant Sales Terms conditions.

I agree to the these terms and conditions.

Authorized Acceptance:_____ Print Name:_____

Noviant: _____ Print Name: Kevin Wang Date: 1/25/17

APPENDIX C: TUNING PARAMETERS AND OPTIONS

The following scripts, listed below, were used to set tuning parameters and options:

- ***aio-max-nr.sh*** to set the maximum asynchronous I/O
- ***requests.sh*** to change the I/O scheduler
- ***scheduler.sh*** to increase the disk queue depth

The scripts described above are included in the Supporting Files (see Appendix A) and listed below.

aio-max-nr.sh

```
echo 1048576 > /proc/sys/fs/aio-max-nr
```

requests.sh

```
echo 1024 > /sys/block/sdb/queue/nr_requests
echo 1024 > /sys/block/sdc/queue/nr_requests
echo 1024 > /sys/block/sdd/queue/nr_requests
echo 1024 > /sys/block/sde/queue/nr_requests
echo 1024 > /sys/block/sdf/queue/nr_requests
echo 1024 > /sys/block/sdg/queue/nr_requests
echo 1024 > /sys/block/sdh/queue/nr_requests
echo 1024 > /sys/block/sdi/queue/nr_requests
echo 1024 > /sys/block/sdj/queue/nr_requests
echo 1024 > /sys/block/sdk/queue/nr_requests
echo 1024 > /sys/block/sdl/queue/nr_requests
echo 1024 > /sys/block/sdm/queue/nr_requests
echo 1024 > /sys/block/sdn/queue/nr_requests
echo 1024 > /sys/block/sdo/queue/nr_requests
echo 1024 > /sys/block/sdp/queue/nr_requests
echo 1024 > /sys/block/sdq/queue/nr_requests
```

aio-max-nr.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
```

APPENDIX D: STORAGE CONFIGURATION CREATION

Environment

First, the CLI commands from the following command file are copied from the file and pasted into the OceanStor 6800 V3 CLI window. These commands are executed on one of the Host Systems.

- ***mklun.txt***

Next, the following shell script is executed on one of the Host Systems.

- ***mkvolume.sh***

Step 1 - Create Disk Domains, Storage Pools, LUNs

The ***mklun.txt*** command file, listed below, includes all the CLI commands to perform the following actions:

- Create 8 disk domains
- Create 8 storage pools
- Create 16 LUNs
- Create one LUN group
- Add the 16 LUNs to the LUN group

The command file described above is included in the Supporting Files (see Appendix A) and listed below.

mklun.txt

```
create disk_domain name=1 disk_list=DAE000.0-9 disk_domain_id=1
create disk_domain name=2 disk_list=DAE010.0-9 disk_domain_id=2
create disk_domain name=3 disk_list=DAE020.0-9 disk_domain_id=3
create disk_domain name=4 disk_list=DAE030.0-9 disk_domain_id=4
create disk_domain name=5 disk_list=DAE080.0-9 disk_domain_id=5
create disk_domain name=6 disk_list=DAE090.0-9 disk_domain_id=6
create disk_domain name=7 disk_list=DAE0A0.0-9 disk_domain_id=7
create disk_domain name=8 disk_list=DAE0B0.0-9 disk_domain_id=8

----------------------------------------

create storage_pool name=pool1 disk_type=SSD capacity=3370GB disk_domain_id=1
   stripe_depth=32KB raid_level=RAID10 pool_id=1
create storage_pool name=pool2 disk_type=SSD capacity=3370GB disk_domain_id=2
   stripe_depth=32KB raid_level=RAID10 pool_id=2
create storage_pool name=pool3 disk_type=SSD capacity=3370GB disk_domain_id=3
   stripe_depth=32KB raid_level=RAID10 pool_id=3
create storage_pool name=pool4 disk_type=SSD capacity=3370GB disk_domain_id=4
   stripe_depth=32KB raid_level=RAID10 pool_id=4
create storage_pool name=pool5 disk_type=SSD capacity=3370GB disk_domain_id=5
   stripe_depth=32KB raid_level=RAID10 pool_id=5
create storage_pool name=pool6 disk_type=SSD capacity=3370GB disk_domain_id=6
   stripe_depth=32KB raid_level=RAID10 pool_id=6
create storage_pool name=pool7 disk_type=SSD capacity=3370GB disk_domain_id=7
   stripe_depth=32KB raid_level=RAID10 pool_id=7
```

```
create storage_pool name=pool8 disk_type=SSD capacity=3370GB disk_domain_id=8
   stripe_depth=32KB raid_level=RAID10 pool_id=8

----------------------------------------

create lun name=lun1 pool_id=1 capacity=1684GB owner_controller=0A lun_id=1
create lun name=lun2 pool_id=1 capacity=1684GB owner_controller=0B lun_id=2
create lun name=lun3 pool_id=2 capacity=1684GB owner_controller=0A lun_id=3
create lun name=lun4 pool_id=2 capacity=1684GB owner_controller=0B lun_id=4
create lun name=lun5 pool_id=3 capacity=1684GB owner_controller=0A lun_id=5
create lun name=lun6 pool_id=3 capacity=1684GB owner_controller=0B lun_id=6
create lun name=lun7 pool_id=4 capacity=1684GB owner_controller=0A lun_id=7
create lun name=lun8 pool_id=4 capacity=1684GB owner_controller=0B lun_id=8

create lun name=lun9 pool_id=5 capacity=1684GB owner_controller=0C lun_id=9
create lun name=lun10 pool_id=5 capacity=1684GB owner_controller=0D lun_id=10
create lun name=lun11 pool_id=6 capacity=1684GB owner_controller=0C lun_id=11
create lun name=lun12 pool_id=6 capacity=1684GB owner_controller=0D lun_id=12
create lun name=lun13 pool_id=7 capacity=1684GB owner_controller=0C lun_id=13
create lun name=lun14 pool_id=7 capacity=1684GB owner_controller=0D lun_id=14
create lun name=lun15 pool_id=8 capacity=1684GB owner_controller=0C lun_id=15
create lun name=lun16 pool_id=8 capacity=1684GB owner_controller=0D lun_id=16

----------------------------------------

create lun_group name=lg lun_group_id=1

----------------------------------------

add lun_group lun lun_group_id=1
   lun_id_list=1,2,9,10,3,4,11,12,5,6,13,14,7,8,15,16
```

Step 2 - Create Mapping View, Host Group and Host

The portion of the ***mklun.txt*** command file, listed below, includes all the CLI commands to perform the following actions:

- Create a mapping view
- Create a host group
- Create 5 hosts
- Add the 5 hosts to the host group
- Add the host group to the mapping view
- Add the FC port's WWN to the 5 hosts
- Add the LUN group to the mapping view

The command file described above is included in the Supporting Files (see Appendix A) and listed below.

mklun.txt

```
create mapping_view name=mv mapping_view_id=1

----------------------------------------

create host_group name=hg host_group_id=1
```

```
----------------------------------------

create host name=h1 operating_system=Linux host_id=1
create host name=h2 operating_system=Linux host_id=2
create host name=h3 operating_system=Linux host_id=3
create host name=h4 operating_system=Linux host_id=4
create host name=h5 operating_system=Linux host_id=5

----------------------------------------

add host_group host host_group_id=1 host_id_list=1,2,3,4,5

----------------------------------------

add mapping_view host_group mapping_view_id=1 host_group_id=1

----------------------------------------

add host initiator host_id=1 initiator_type=FC wwn=21000024ff3cc528
add host initiator host_id=1 initiator_type=FC wwn=21000024ff3cc529
add host initiator host_id=1 initiator_type=FC wwn=21000024ff3e093a
add host initiator host_id=1 initiator_type=FC wwn=21000024ff3e093b
add host initiator host_id=1 initiator_type=FC wwn=21000024ff4380b6
add host initiator host_id=1 initiator_type=FC wwn=21000024ff4380b7
add host initiator host_id=1 initiator_type=FC wwn=21000024ff5470a4
add host initiator host_id=1 initiator_type=FC wwn=21000024ff5470a5

add host initiator host_id=2 initiator_type=FC wwn=21000024ff403916
add host initiator host_id=2 initiator_type=FC wwn=21000024ff403917
add host initiator host_id=2 initiator_type=FC wwn=21000024ff55c634
add host initiator host_id=2 initiator_type=FC wwn=21000024ff55c635
add host initiator host_id=2 initiator_type=FC wwn=21000024ff5f894e
add host initiator host_id=2 initiator_type=FC wwn=21000024ff5f894f
add host initiator host_id=2 initiator_type=FC wwn=21000024ff8af430
add host initiator host_id=2 initiator_type=FC wwn=21000024ff8af431

add host initiator host_id=3 initiator_type=FC wwn=21000024ff4bc458
add host initiator host_id=3 initiator_type=FC wwn=21000024ff4bc459
add host initiator host_id=3 initiator_type=FC wwn=21000024ff5f8c1e
add host initiator host_id=3 initiator_type=FC wwn=21000024ff5f8c1f
add host initiator host_id=3 initiator_type=FC wwn=21000024ff5f8ca6
add host initiator host_id=3 initiator_type=FC wwn=21000024ff5f8ca7
add host initiator host_id=3 initiator_type=FC wwn=21000024ff8e8dde
add host initiator host_id=3 initiator_type=FC wwn=21000024ff8e8ddf

add host initiator host_id=4 initiator_type=FC wwn=21000024ff4a108a
add host initiator host_id=4 initiator_type=FC wwn=21000024ff4a108b
add host initiator host_id=4 initiator_type=FC wwn=21000024ff4b81a0
add host initiator host_id=4 initiator_type=FC wwn=21000024ff4b81a1
add host initiator host_id=4 initiator_type=FC wwn=21000024ff53330c
add host initiator host_id=4 initiator_type=FC wwn=21000024ff53330d
add host initiator host_id=4 initiator_type=FC wwn=21000024ff756e88
add host initiator host_id=4 initiator_type=FC wwn=21000024ff756e89

add host initiator host_id=5 initiator_type=FC wwn=21000024ff455ed2
add host initiator host_id=5 initiator_type=FC wwn=21000024ff455ed3
add host initiator host_id=5 initiator_type=FC wwn=21000024ff533338
add host initiator host_id=5 initiator_type=FC wwn=21000024ff533339
add host initiator host_id=5 initiator_type=FC wwn=21000024ff4bc2d6
add host initiator host_id=5 initiator_type=FC wwn=21000024ff4bc2d7
add host initiator host_id=5 initiator_type=FC wwn=21000024ff4a4f8c
```

```
add host initiator host_id=5 initiator_type=FC wwn=21000024ff4a4f8d

----------------------------------------

add mapping_view lun_group mapping_view_id=1 lun_group_id=1
```

Step 3 - Create Volumes on the Host Systems

The ***mkvolume.sh*** shell script, listed below, is invoked on one of the Host Systems to perform the following actions:

- Create 16 physical volumes
- Create a volume group for the 16 physical volumes
- Create 18 Logical Volumes for ASU-1
- Create 18 Logical Volumes for ASU-2
- Create 2 Logical Volumes for ASU-3

The shell script described above is included in the Supporting Files (see Appendix A) and listed below.

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

----------------------------------------

vgcreate vg1 /dev/sdb /dev/sdc /dev/sdd /dev/sde /dev/sdf /dev/sdg /dev/sdh
   /dev/sdi /dev/sdj /dev/sdk /dev/sdl /dev/sdm /dev/sdn /dev/sdo /dev/sdp
   /dev/sdq

----------------------------------------

lvcreate -n asu101 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu102 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu103 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu104 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu105 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu106 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu107 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu108 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu109 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu110 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu111 -i 16 -I 512 -C y -L 592g vg1
```

```
lvcreate -n asu112 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu113 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu114 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu115 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu116 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu117 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu118 -i 16 -I 512 -C y -L 592g vg1

lvcreate -n asu201 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu202 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu203 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu204 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu205 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu206 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu207 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu208 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu209 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu210 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu211 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu212 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu213 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu214 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu215 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu216 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu217 -i 16 -I 512 -C y -L 592g vg1
lvcreate -n asu218 -i 16 -I 512 -C y -L 592g vg1

lvcreate -n asu301 -i 16 -I 512 -C y -L 1184g vg1
lvcreate -n asu302 -i 16 -I 512 -C y -L 1184g vg1
```

APPENDIX E: CONFIGURATION INVENTORY

An inventory of the Tested Storage Configuration was collected during the execution the script *full_run.sh.* It generated the following log file:

- ***profile1_volume.log*** List of configured volumes before the INIT Phase.
- ***profile1_storage.log*** List of configured storage before the INIT Phase.
- ***Profile2_volume.log*** List of configured volumes after TSC restart.
- ***Profile2_storage.log*** List of configured storage after TSC restart.

The above log files are included in the Supporting Files (see Appendix A).

APPENDIX F: WORKLOAD GENERATOR

The ASUs accessed by the SPC-1 workload generator, are defined using the script ***slave_asu.asu***.

The phases of the benchmark are executed using the script ***full_run.sh***. The script pauses at the end of the PERSIST_1 test phase. Once the TSC has been restarted, the PERSIST_2 test phase is executed by pressing ENTER from the console where the script has been invoked.

The above scripts are included in the Supporting Files (see Appendix A) and listed below.

slave_asu.asu

```
ASU=1
OFFSET=0
SIZE=0
DEVICE=/dev/vg1/asu101
DEVICE=/dev/vg1/asu102
DEVICE=/dev/vg1/asu103
DEVICE=/dev/vg1/asu104
DEVICE=/dev/vg1/asu105
DEVICE=/dev/vg1/asu106
DEVICE=/dev/vg1/asu107
DEVICE=/dev/vg1/asu108
DEVICE=/dev/vg1/asu109
DEVICE=/dev/vg1/asu110
DEVICE=/dev/vg1/asu111
DEVICE=/dev/vg1/asu112
DEVICE=/dev/vg1/asu113
DEVICE=/dev/vg1/asu114
DEVICE=/dev/vg1/asu115
DEVICE=/dev/vg1/asu116
DEVICE=/dev/vg1/asu117
DEVICE=/dev/vg1/asu118


--
ASU=2
OFFSET=0
SIZE=0
DEVICE=/dev/vg1/asu201
DEVICE=/dev/vg1/asu202
DEVICE=/dev/vg1/asu203
DEVICE=/dev/vg1/asu204
DEVICE=/dev/vg1/asu205
DEVICE=/dev/vg1/asu206
DEVICE=/dev/vg1/asu207
DEVICE=/dev/vg1/asu208
DEVICE=/dev/vg1/asu209
DEVICE=/dev/vg1/asu210
DEVICE=/dev/vg1/asu211
DEVICE=/dev/vg1/asu212
DEVICE=/dev/vg1/asu213
DEVICE=/dev/vg1/asu214
DEVICE=/dev/vg1/asu215
DEVICE=/dev/vg1/asu216
```

```
DEVICE=/dev/vg1/asu217
DEVICE=/dev/vg1/asu218
--
ASU=3
OFFSET=0
SIZE=0
DEVICE=/dev/vg1/asu301
DEVICE=/dev/vg1/asu302
```

full_run.sh

```
#!/bin/sh
expect shstorage.tcl > profile1_storage.log
date > profile1_volume.log
lvdisplay >> profile1_volume.log
date >> profile1_volume.log

spc1 -run SPC1_INIT -iops 45000 -storage slave_asu.asu -output
   ~/newtool/spc1_INIT_45k_iops -master 5host.HST
spc1 -run SPC1_VERIFY -iops 100 -storage slave_asu.asu -output
   ~/newtool/spc1_VERIFY1_100_iops
spc1 -run SPC1_METRICS -iops 800000 -storage slave_asu.asu -output
   ~/newtool/spc1_METRICS_800k_iops -master 5host.HST
spc1 -run SPC1_VERIFY -iops 100 -storage slave_asu.asu -output
   ~/newtool/spc1_VERIFY2_100_iops
spc1 -run SPC1_PERSIST_1 -iops 200000 -storage slave_asu.asu -output
   ~/newtool/spc1_PERSIST_200k_iops -master 5host.HST
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
spc1 -run SPC1_PERSIST_2 -iops 200000 -storage slave_asu.asu -output
   ~/newtool/spc1_PERSIST_200k_iops -master 5host.HST
```