SPC BENCHMARK 1™

FULL DISCLOSURE REPORT

HUAWEI TECHNOLOGIES CO., LTD
HUAWEI OCEANSTOR 18800F V5

SPC-1 V3.6

SUBMISSION IDENTIFIER: A31012

SUBMITTED FOR REVIEW: MARCH 7, 2018
First Edition – March 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.
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AUDIT CERTIFICATION

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

March 5, 2018

I verified the SPC Benchmark 1™ (SPC-1™ Revision 3.6) test execution and performance results of the following Tested Storage Product:

HUAWEI OCEANSTOR 18800F V5

The results were:

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPC-1 IOPS™</td>
<td>5,000,572</td>
</tr>
<tr>
<td>SPC-1 Price-Performance™</td>
<td>$465.79/SPC-1 KIOPS™</td>
</tr>
<tr>
<td>SPC-1 IOPS™ Response Time</td>
<td>0.941 ms</td>
</tr>
<tr>
<td>SPC-1 Overall Response Time</td>
<td>0.533 ms</td>
</tr>
<tr>
<td>SPC-1 ASU Capacity</td>
<td>148,176 GB</td>
</tr>
<tr>
<td>SPC-1 ASU Price</td>
<td>$18.87/GB</td>
</tr>
<tr>
<td>SPC-1 Total System Price</td>
<td>$2,794,955.10</td>
</tr>
</tbody>
</table>

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 A31012.

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

20 KREG LANE • MANITOU SPRINGS, CO 80829 • 719-473-7555 • WWW.SIZING.COM
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
Letter of Good Faith

Date: March 5, 2018

From: Huawei Technologies Co., Ltd.

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

Subject: SPC-1 Letter of Good Faith for the Huawei OceanStor 18800F V5

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 V3.6 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: ____________________________

Xiang Fei
Vice President of Storage Product Line

Date: 2018/3/15
# EXECUTIVE SUMMARY

## HUAWEI TECHNOLOGIES CO., LTD

### HUAWEI OCEANSTOR 18800F V5

<table>
<thead>
<tr>
<th>SPC-1 IOPS™</th>
<th>6,000,572</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPC-1 Price-Performance™</td>
<td>$465.79/SPC-1 KIOPS™</td>
</tr>
<tr>
<td>SPC-1 IOPS™ Response Time</td>
<td>0.941 ms</td>
</tr>
<tr>
<td>SPC-1 Overall Response Time</td>
<td>0.533 ms</td>
</tr>
<tr>
<td>SPC-1 ASU Capacity</td>
<td>148,176 GB</td>
</tr>
<tr>
<td>SPC-1 ASU Price</td>
<td>$18.87/GB</td>
</tr>
<tr>
<td>SPC-1 Total System Price</td>
<td>$2,794,955.10</td>
</tr>
</tbody>
</table>

- **Data Protection Level**: Protected 2 (RAID-10)
- **Physical Storage Capacity**: 343,680 GB
- **Pricing Currency / Target Country**: U.S. Dollars / USA

### SPC-1 V3.6

**SUBMISSION IDENTIFIER: A31012**

**SUBMITTED FOR REVIEW: MARCH 7, 2018**
Benchmark Configuration Diagram

Host Systems

28 x Huawei FusionServer™ RH2288H V3

2 x QLogic dual-ported QLE2562 FC HBA per FusionServer™

- - -
112 x FC connections
(4 connections per server)

Huawei OceanStor 18800F V5

16 x OceanStor 18800F V5 Active-Active Controllers
512 GB cache per controller (8192 GB total)
32 x 4-port 8Gbps Smart I/O Modules
16 x 12-port 12Gbps SAS I/O Modules
16 x 2-port PCIe Modules
2 x PCIe 16-port switches
16 x SSD disk enclosures
384 x 900 GB SSDs

Tested Storage Configuration (TSC)
**Tested Storage Product Description**

Huawei’s OceanStor 18500F/18800F V5 mission-critical all-flash storage systems are dedicated to providing the highest level of data services for enterprises’ mission-critical businesses.

Innovative SmartMatrix™ 2.0 architecture, industry-leading scalability, flash-enabled performance, and hybrid-cloud-ready solution provide the optimal data services for enterprises.

The OceanStor 18500F/18800F V5 systems satisfy the storage requirements of large-database OLTP/OLAP and cloud computing, making it a perfect choice for the government, finance, telecommunications, and manufacturing sectors.

For more details, visit:


**Priced Storage Configuration Components**

<table>
<thead>
<tr>
<th>56 x QLogic dual-ported QLE2562 FC HBA</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 x OceanStor 18800F V5 Active-Active Controllers, each with:</td>
</tr>
<tr>
<td>512 GB cache (8192 GB total)</td>
</tr>
<tr>
<td>2 x 4-port 8Gbps Smart I/O Modules</td>
</tr>
<tr>
<td>16 x 12-port 12Gbps SAS I/O Modules</td>
</tr>
<tr>
<td>16 x 2U disk enclosures, each with:</td>
</tr>
<tr>
<td>24 x 900 GB SSDs (384 total)</td>
</tr>
<tr>
<td>2 x PCIe 16-port switches</td>
</tr>
<tr>
<td>1 x Service Processor</td>
</tr>
<tr>
<td>1 x 8-port KVM</td>
</tr>
</tbody>
</table>
### Storage Configuration Pricing

<table>
<thead>
<tr>
<th>Description</th>
<th>Qty</th>
<th>Unit Price</th>
<th>Ext. Price</th>
<th>Disc.</th>
<th>Disc. Price</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>88FV5-4C2T-AC</strong> OceanStor 18800F V5 Engine(6U,Four Controller,AC240HVDC, 4<em>512GB Cache, 32</em>8Gb FC,48*port SAS,SPE73C0600)</td>
<td>4</td>
<td>930,857.00</td>
<td>3,723,428.00</td>
<td>72%</td>
<td>1,042,559.84</td>
</tr>
<tr>
<td><strong>DV5-LPU5P2PCIE</strong> 2 port PCIe I/O module(with hw o NT Ports)</td>
<td>16</td>
<td>811.00</td>
<td>12,976.00</td>
<td>75%</td>
<td>3,244.00</td>
</tr>
<tr>
<td><strong>HSSD-900G2S-A6</strong> 900GB SSD SAS Disk Unit(2.5&quot;)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DAE22525U2-HF-AC</strong> Disk Enclosure(2U, AC240HVDC. 2.5&quot;, Expanding Module, 25 Disk Slots, w ithout Disk Unit, DAE52525U2)</td>
<td>16</td>
<td>8,366.00</td>
<td>133,856.00</td>
<td>75%</td>
<td>33,464.00</td>
</tr>
<tr>
<td><strong>PRACK-SYS-H-AC</strong> OceanStor 18000 Series System Primary Cabinet (w ith Service Processor, KVM, External MiniSAS HD Cable, Power Cable)</td>
<td>1</td>
<td>54,609.00</td>
<td>54,609.00</td>
<td>75%</td>
<td>13,652.25</td>
</tr>
<tr>
<td><strong>SRACK-SYS-H-AC</strong> OceanStor 18000 Series System Second Cabinet (w ith External MiniSAS HD Cable, Power Cable)</td>
<td>1</td>
<td>34,021.00</td>
<td>34,021.00</td>
<td>75%</td>
<td>8,505.25</td>
</tr>
<tr>
<td><strong>N8GHBA000</strong> QLOGIC QLE2562 HBA Card,PCIe,8Gbps DualPort, Fiber Channel Multimode LC Optic Interface, English Manual, No Drive CD</td>
<td>56</td>
<td>1,698.00</td>
<td>95,088.00</td>
<td>0%</td>
<td>95,088.00</td>
</tr>
<tr>
<td><strong>SWITCH-V5H2</strong> PCIe 3.0 Switch(AC240HVDC.8GB Cache,16 Port,w ith 16&quot;Quadw ire 40 Gb/s Parallel AOC for PCIe 3.0, SWE1600P08)</td>
<td>2</td>
<td>11,478.00</td>
<td>22,956.00</td>
<td>0%</td>
<td>22,956.00</td>
</tr>
<tr>
<td><strong>SN2F01FCPC</strong> Patch Cord, DLC/PC, DLC/PC, Multi-mode, 3m, A1a.2, 2mm, 42mm DLC, OM3 bending insensitive</td>
<td>112</td>
<td>11.00</td>
<td>1,232.00</td>
<td>0%</td>
<td>1,232.00</td>
</tr>
<tr>
<td><strong>88FV5-LBASIC</strong> Basic Software Suite License (Including OceanStor OS, DeviceManager, SmartThin, SmartMulti-tenant, SmartPartition, SmartErase, SmartMigration, SmartMotion and SmartQoS and SystemReporter, UltraPath)</td>
<td>1</td>
<td>149,417.00</td>
<td>149,417.00</td>
<td>72%</td>
<td>41,836.76</td>
</tr>
</tbody>
</table>

**Hardware & Software Subtotal** 2,282,154.10
### Support & Maintenance

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Quantity</th>
<th>Price/GB</th>
<th>Total Price</th>
<th>Discount</th>
<th>Final Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>02351TLK-88134ULF-36</td>
<td>OceanStor 18800F V5 Engine (6U, Four Controller, AC240HVDC, 4<em>512GB Cache, 32</em>8Gb FC, 48*port SAS, SPE73C0600) - Hi-Care Onsite Premier 24x7x4H Engineer Onsite Service - 36Month(s)</td>
<td>4</td>
<td>45,984.00</td>
<td>183,936.00</td>
<td>0%</td>
<td>183,936.00</td>
</tr>
<tr>
<td>02351RYF-88134ULF-36</td>
<td>900GB SSD SAS Disk Unit (2.5&quot;) - Hi-Care Onsite Premier 24x7x4H Engineer Onsite Service - 36Month(s)</td>
<td>384</td>
<td>246.00</td>
<td>94,464.00</td>
<td>0%</td>
<td>94,464.00</td>
</tr>
<tr>
<td>88034KUY-88134UHK-36</td>
<td>Basic Software Suite License (Including OceanStor OS, DeviceManager, SmartThin, SmartMulti-tenant, SmartPartition, SmartErase, SmartMigration, SmartMotion and SmartQoS and SystemReporter, UltraPath) - Hi-Care Application Software Upgrade Support Service - 36Month(s)</td>
<td>1</td>
<td>62,061.00</td>
<td>62,061.00</td>
<td>0%</td>
<td>62,061.00</td>
</tr>
<tr>
<td>88125ESH</td>
<td>OceanStor 18800F V5 Installation Service - Engineering</td>
<td>1</td>
<td>172,340.00</td>
<td>172,340.00</td>
<td>0%</td>
<td>172,340.00</td>
</tr>
</tbody>
</table>

**SPC-1 Total System Price**: $2,794,955.10

**SPC-1 ASU Price ($/GB)**: $18.87

**SPC-1 IOPS™**

**SPC-1 Price-Performance™ ($/SPC-1 KIOPS™)**: $465.79

**Support & Maintenance Subtotal**: $512,801.00

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**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 V3.6.0
SPC-1 Workload Generator Revision V3.0 build d34fb3c
Publication Revision History First Edition
**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).

![Benchmark and Storage Configuration Diagram]

**Storage Network Configuration**

The Tested Storage Configuration (TSC) involved an external storage subsystem made of 16 Huawei OceanStor 18800F V5, driven by 28 host systems (Huawei...
FusionServer RH2288H V3). The OceanStor controllers were grouped in sets of four, forming four OceanStor Engines. Each FusionServer host system connected one-to-one to each OceanStor Engine. That connection was established via a port from one of the two dual-port Fibre Chanel HBAs on the FusionServer; and a port from one of the eight 4-port Smart I/O Modules on the OceanStor Engine, leaving 4 of these ports inactive in each Engine. 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).

<table>
<thead>
<tr>
<th>Host Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>28 x Huawei FusionServer™ RH2288H V3</td>
</tr>
<tr>
<td>2 x Intel® Xeon® E5-2667 v4 (3.2 GHz, 8 Cores, 25 MB L3)</td>
</tr>
<tr>
<td>128 GB Main Memory</td>
</tr>
<tr>
<td>Red Hat Enterprise Linux 7.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Priced Storage Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>56 x QLogic dual-ported QLE2562 FC HBA</td>
</tr>
<tr>
<td>16 x OceanStor 18800F V5 Active-Active Controllers, each with:</td>
</tr>
<tr>
<td>512 GB cache (8192 GB total)</td>
</tr>
<tr>
<td>2 x 4-port 8Gbps Smart I/O Modules</td>
</tr>
<tr>
<td>16 x 12-port 12Gbps SAS I/O Modules</td>
</tr>
<tr>
<td>16 x 2U disk enclosures, each with:</td>
</tr>
<tr>
<td>24 x 900 GB SSDs (384 total)</td>
</tr>
<tr>
<td>2 x PCIe 16-port switches</td>
</tr>
<tr>
<td>1 x Service Processor</td>
</tr>
<tr>
<td>1 x 8-port KVM</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Original Component</th>
<th>Revised Component</th>
<th>Description of Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>n/a</td>
<td>n/a</td>
<td>Initial submission</td>
</tr>
</tbody>
</table>
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).

<table>
<thead>
<tr>
<th>LV per ASU</th>
<th>LV Capacity</th>
<th>Used per LV</th>
<th>Total per ASU</th>
<th>% ASU Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASU-1</td>
<td>18</td>
<td>3,704.5</td>
<td>3,704.4</td>
<td>66,679.4</td>
</tr>
<tr>
<td>ASU-2</td>
<td>18</td>
<td>3,704.5</td>
<td>3,704.4</td>
<td>66,679.4</td>
</tr>
<tr>
<td>ASU-3</td>
<td>2</td>
<td>7,408.9</td>
<td>7,408.8</td>
<td>14,817.6</td>
</tr>
</tbody>
</table>

SPC-1 ASU Capacity | 148,176.4

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.

<table>
<thead>
<tr>
<th>Devices</th>
<th>Count</th>
<th>Physical Capacity</th>
<th>Total Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>900GB SSD</td>
<td>384</td>
<td>895.0</td>
<td>343,680.0</td>
</tr>
<tr>
<td><strong>Total Physical Capacity</strong></td>
<td></td>
<td></td>
<td>343,680.0</td>
</tr>
<tr>
<td><strong>Physical Capacity Utilization</strong></td>
<td></td>
<td></td>
<td>43.11%</td>
</tr>
</tbody>
</table>

Data Protection

The data protection level used for all logical volumes was Protected 2, which was accomplished by configuring 16 pools of 24 drives into 16 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.

![Measurement Intervals by Test Phase Graph](image)

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

<table>
<thead>
<tr>
<th>Interval</th>
<th>Start Time</th>
<th>End Time</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transition Period</td>
<td>26-Feb-18 17:34:33</td>
<td>27-Feb-18 01:34:33</td>
<td>8:00:00</td>
</tr>
<tr>
<td>Measurement Interval</td>
<td>27-Feb-18 01:34:33</td>
<td>27-Feb-18 09:34:34</td>
<td>8:00:01</td>
</tr>
</tbody>
</table>

SUSTAIN – Throughput Graph

![Throughput Graph (SUSTAIN @ 6,000,200 IOPS)](image)
SUSTAIN – Response Time Graph

![Response Time Graph (SUSTAIN @ 6,000,200 IOPS)](image)

SUSTAIN – Data Rate Graph

![Data Rate Graph (SUSTAIN @ 6,000,200 IOPS)](image)
**SUSTAIN – Response Time Frequency Graph**

![Response Time Frequency Graph](image)

**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.

<table>
<thead>
<tr>
<th></th>
<th>ASU-1</th>
<th>ASU-2</th>
<th>ASU-3</th>
<th>ASU-4</th>
<th>ASU-1</th>
<th>ASU-2</th>
<th>ASU-3</th>
<th>ASU-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defined</td>
<td>0.0350</td>
<td>0.2810</td>
<td>0.0700</td>
<td>0.2100</td>
<td>0.0180</td>
<td>0.0700</td>
<td>0.0350</td>
<td>0.2810</td>
</tr>
<tr>
<td>Measured</td>
<td>0.0350</td>
<td>0.2810</td>
<td>0.0700</td>
<td>0.2100</td>
<td>0.0180</td>
<td>0.0700</td>
<td>0.0350</td>
<td>0.2810</td>
</tr>
<tr>
<td>Variation</td>
<td>0.0003</td>
<td>0.0001</td>
<td>0.0002</td>
<td>0.0001</td>
<td>0.0004</td>
<td>0.0002</td>
<td>0.0003</td>
<td>0.0001</td>
</tr>
<tr>
<td>Difference</td>
<td>0.006%</td>
<td>0.002%</td>
<td>0.004%</td>
<td>0.000%</td>
<td>0.005%</td>
<td>0.005%</td>
<td>0.004%</td>
<td>0.002%</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Interval</th>
<th>Start Time</th>
<th>End Time</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transition Period</td>
<td>27-Feb-18 09:35:33</td>
<td>27-Feb-18 09:40:33</td>
<td>0:05:00</td>
</tr>
<tr>
<td>Measurement Interval</td>
<td>27-Feb-18 09:40:33</td>
<td>27-Feb-18 09:50:34</td>
<td>0:10:01</td>
</tr>
</tbody>
</table>

RAMPD_100 – Throughput Graph

Throughput Graph (RAMPD_100 @ 6,000,200 IOPS)
RAMPD_100 – Response Time Graph

![Response Time Graph (RAMPD_100 @ 6,000,200 IOPS)](image)

RAMPD_100 – Data Rate Graph

![Data Rate Graph (RAMPD_100 @ 6,000,200 IOPS)](image)
RAMPD_100 – Response Time Frequency Graph

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.

<table>
<thead>
<tr>
<th></th>
<th>ASU1-1</th>
<th>ASU1-2</th>
<th>ASU1-3</th>
<th>ASU1-4</th>
<th>ASU2-1</th>
<th>ASU2-2</th>
<th>ASU2-3</th>
<th>ASU3-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defined</td>
<td>0.0350</td>
<td>0.2810</td>
<td>0.0700</td>
<td>0.2100</td>
<td>0.0180</td>
<td>0.0700</td>
<td>0.0350</td>
<td>0.2810</td>
</tr>
<tr>
<td>Measured</td>
<td>0.0350</td>
<td>0.2810</td>
<td>0.0700</td>
<td>0.2100</td>
<td>0.0180</td>
<td>0.0700</td>
<td>0.0350</td>
<td>0.2810</td>
</tr>
<tr>
<td>Variation</td>
<td>0.0003</td>
<td>0.0001</td>
<td>0.0003</td>
<td>0.0001</td>
<td>0.0004</td>
<td>0.0002</td>
<td>0.0003</td>
<td>0.0001</td>
</tr>
<tr>
<td>Difference</td>
<td>0.009%</td>
<td>0.001%</td>
<td>0.003%</td>
<td>0.002%</td>
<td>0.007%</td>
<td>0.016%</td>
<td>0.008%</td>
<td>0.007%</td>
</tr>
</tbody>
</table>

RAMPD_100 – I/O Request Summary

- **I/O Requests Completed in the Measurement Interval**: 3,600,368,029
- **I/O Requests Completed with Response Time <= 30 ms**: 3,599,573,947
- **I/O Requests Completed with Response Time > 30 ms**: 794,082
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

![Average Throughput Graph (Response Time Ramp Test)](chart.png)
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.

<table>
<thead>
<tr>
<th>Test Phase</th>
<th>100% IOPS</th>
<th>10% IOPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAMPD</td>
<td>6,000,572.9</td>
<td>600,132.7</td>
</tr>
<tr>
<td>REPEAT_1</td>
<td>6,000,619.1</td>
<td>600,036.1</td>
</tr>
<tr>
<td>REPEAT_2</td>
<td>6,000,446.4</td>
<td>600,025.5</td>
</tr>
</tbody>
</table>

REPEAT_1_100 – Throughput Graph

![Throughput Graph (REPEAT_1_100 @ 6,000,200 IOPS)](attachment:image.png)
REPEAT_1_100 – Response Time Graph

REPEAT_2_100 – Throughput Graph
**REPEAT 2_100 – Response Time Graph**

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**

<table>
<thead>
<tr>
<th></th>
<th>ASU1-1</th>
<th>ASU1-2</th>
<th>ASU1-3</th>
<th>ASU1-4</th>
<th>ASU2-1</th>
<th>ASU2-2</th>
<th>ASU2-3</th>
<th>ASU3-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defined</td>
<td>0.0350</td>
<td>0.2810</td>
<td>0.0700</td>
<td>0.2100</td>
<td>0.0180</td>
<td>0.0700</td>
<td>0.0350</td>
<td>0.2810</td>
</tr>
<tr>
<td>Measured</td>
<td>0.0350</td>
<td>0.2810</td>
<td>0.0700</td>
<td>0.2100</td>
<td>0.0180</td>
<td>0.0700</td>
<td>0.0350</td>
<td>0.2810</td>
</tr>
<tr>
<td>Variation</td>
<td>0.0004</td>
<td>0.0001</td>
<td>0.0002</td>
<td>0.0002</td>
<td>0.0005</td>
<td>0.0002</td>
<td>0.0004</td>
<td>0.0001</td>
</tr>
<tr>
<td>Difference</td>
<td>0.015%</td>
<td>0.003%</td>
<td>0.001%</td>
<td>0.004%</td>
<td>0.001%</td>
<td>0.002%</td>
<td>0.007%</td>
<td>0.007%</td>
</tr>
</tbody>
</table>

**REPEAT 2_100 Test Phase**

<table>
<thead>
<tr>
<th></th>
<th>ASU1-1</th>
<th>ASU1-2</th>
<th>ASU1-3</th>
<th>ASU1-4</th>
<th>ASU2-1</th>
<th>ASU2-2</th>
<th>ASU2-3</th>
<th>ASU3-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defined</td>
<td>0.0350</td>
<td>0.2810</td>
<td>0.0700</td>
<td>0.2100</td>
<td>0.0180</td>
<td>0.0700</td>
<td>0.0350</td>
<td>0.2810</td>
</tr>
<tr>
<td>Measured</td>
<td>0.0350</td>
<td>0.2810</td>
<td>0.0700</td>
<td>0.2100</td>
<td>0.0180</td>
<td>0.0700</td>
<td>0.0350</td>
<td>0.2810</td>
</tr>
<tr>
<td>Variation</td>
<td>0.0002</td>
<td>0.0001</td>
<td>0.0003</td>
<td>0.0001</td>
<td>0.0002</td>
<td>0.0002</td>
<td>0.0003</td>
<td>0.0001</td>
</tr>
<tr>
<td>Difference</td>
<td>0.003%</td>
<td>0.001%</td>
<td>0.006%</td>
<td>0.002%</td>
<td>0.001%</td>
<td>0.001%</td>
<td>0.003%</td>
<td>0.002%</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Data Persistence Test Phase: Persist1</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Number of Logical Blocks Written</td>
<td>296,876,356</td>
</tr>
<tr>
<td>Total Number of Logical Blocks Verified</td>
<td>148,264,153</td>
</tr>
<tr>
<td>Total Number of Logical Blocks that Failed Verification</td>
<td>148,612,203</td>
</tr>
<tr>
<td>Time Duration for Writing Test Logical Blocks (sec.)</td>
<td>0</td>
</tr>
<tr>
<td>Size in bytes of each Logical Block</td>
<td>300</td>
</tr>
<tr>
<td>Number of Failed I/O Requests in the process of the Test</td>
<td>8,192</td>
</tr>
</tbody>
</table>

Committed Data Persistence Implementation

The persistency of committed data is implemented at two levels. At the disk level, data loss is prevented through the use of RAID 10 arrays. At the controller level, all caches are mirrored across controllers, where write requests are only completed once the local cache has been successfully mirrored in another controller’s cache. In addition, cache content is protected from a loss of power by flushing the cache content to permanent flash memory, as soon as a power loss is detected. The flushing action is powered by a battery backup located in each controller.
## APPENDIX A: SUPPORTING FILES

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

<table>
<thead>
<tr>
<th>File Name</th>
<th>Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>/SPC1_RESULTS</code></td>
<td>Data reduction worksheets</td>
<td>root</td>
</tr>
<tr>
<td>SPC1_INIT_0_Raw_Results.xlsx</td>
<td>Raw results for INIT Test Phase</td>
<td>/SPC1_RESULTS</td>
</tr>
<tr>
<td>SPC1_METRICS_0_Quick_Look.xlsx</td>
<td>Quick Look Test Run Overview</td>
<td>/SPC1_RESULTS</td>
</tr>
<tr>
<td>SPC1_METRICS_0_Raw_Results.xlsx</td>
<td>Raw results for Primary Metrics Test</td>
<td>/SPC1_RESULTS</td>
</tr>
<tr>
<td>SPC1_METRICS_0_Summary_Results.xlsx</td>
<td>Primary Metrics Summary</td>
<td>/SPC1_RESULTS</td>
</tr>
<tr>
<td>SPC1_PERSIST_1_0_Raw_Results.xlsx</td>
<td>Raw results for PERSIST1 Test Phase</td>
<td>/SPC1_RESULTS</td>
</tr>
<tr>
<td>SPC1_PERSIST_2_0_Raw_Results.xlsx</td>
<td>Raw results for PERSIST2 Test Phase</td>
<td>/SPC1_RESULTS</td>
</tr>
<tr>
<td>SPC1_Run_Set_Overview.xlsx</td>
<td>Run Set Overview Worksheet</td>
<td>/SPC1_RESULTS</td>
</tr>
<tr>
<td>SPC1_VERIFY_0_Raw_Results.xlsx</td>
<td>Raw results for first VERIFY Test Phase</td>
<td>/SPC1_RESULTS</td>
</tr>
<tr>
<td>SPC1_VERIFY_1_Raw_Results.xlsx</td>
<td>Raw results for second VERIFY Test Phase</td>
<td>/SPC1_RESULTS</td>
</tr>
<tr>
<td><code>/C_Tuning</code></td>
<td>Tuning parameters and options</td>
<td>root</td>
</tr>
<tr>
<td>aio-max-nr.sh</td>
<td>Set maximum asynchronous I/O</td>
<td>/C_Tuning</td>
</tr>
<tr>
<td>nr_requests.sh</td>
<td>Increase disk queue depth</td>
<td>/C_Tuning</td>
</tr>
<tr>
<td>scheduler.sh</td>
<td>Change the I/O scheduler</td>
<td>/C_Tuning</td>
</tr>
<tr>
<td><code>/D_Creation</code></td>
<td>Storage configuration creation</td>
<td>root</td>
</tr>
<tr>
<td>mklun.txt</td>
<td>Create the storage environment</td>
<td>/D_Creation</td>
</tr>
<tr>
<td>mkvolume.sh</td>
<td>Create the Logical Volumes</td>
<td>/D_Creation</td>
</tr>
<tr>
<td><code>/E_Inventory</code></td>
<td>Configuration inventory</td>
<td>root</td>
</tr>
<tr>
<td>shstorage.tcl</td>
<td>Captures profile of storage environment</td>
<td>/E_Inventory</td>
</tr>
<tr>
<td>profile1_volume.log</td>
<td>List of logical volumes before INIT</td>
<td>/E_Inventory</td>
</tr>
<tr>
<td>profile1_storage.log</td>
<td>List of storage devices before INIT</td>
<td>/E_Inventory</td>
</tr>
<tr>
<td>profile2_volume.log</td>
<td>List of logical volumes after restart</td>
<td>/E_Inventory</td>
</tr>
<tr>
<td>profile2_storage.log</td>
<td>List of storage devices after restart</td>
<td>/E_Inventory</td>
</tr>
<tr>
<td><code>/F_Generator</code></td>
<td>Workload generator</td>
<td>root</td>
</tr>
<tr>
<td>slave_asu.asu</td>
<td>Defining LUNs hosting the ASUs</td>
<td>/F_generator</td>
</tr>
<tr>
<td>28host.HST</td>
<td>Host configuration file</td>
<td>/F_generator</td>
</tr>
<tr>
<td>full_run.sh</td>
<td>Executing all test phases</td>
<td>/F_generator</td>
</tr>
</tbody>
</table>
# APPENDIX B: THIRD PARTY QUOTATION

![Third Party Quotation Image]

## Huawei OceanStor 18800F V5

### Huawei Technologies Co., Ltd

**Address:** 32 Broadway, Suite 401  
**New York, NY 10004**  
**Tel:** 212-809-6625  
**Email:** sales@noviant.com

02/27/2018, Quote Valid 90 Days

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>Phase</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Location</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1.1</td>
<td>OceanStor 18800F V5 Main Equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1.1.1</td>
<td>Controller Enclosure</td>
<td>OceanStor 18800F V5 Engine/6U Four Controller, AC/240V/3C, 4<em>5120B Cache, 32</em>16GB EC/4C<em>Port SAS, SPE/F0</em>Port SAS</td>
<td>4</td>
<td>930,857.00</td>
<td>3,730,428.00</td>
<td>72.00%</td>
<td>1,042,558.00</td>
</tr>
<tr>
<td>1.1.2</td>
<td>Expanding Interface Module</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1.3</td>
<td>Disk Components</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1.4</td>
<td>Disk Enclosure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1.5</td>
<td>HBA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Model</td>
<td>Description</td>
<td>Qty.</td>
<td>Unit Price (USD)</td>
<td>Ext. Price (USD)</td>
<td>Disc. (%)</td>
<td>Disc. Price (USD)</td>
</tr>
<tr>
<td>-----</td>
<td>-------</td>
<td>-------------</td>
<td>------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>----------</td>
<td>------------------</td>
</tr>
<tr>
<td>1.1.6</td>
<td>Accessory</td>
<td>PCle 3.0 Switch/ACU2408/8Gbl,8GB Cache,16 Port w/ 16*Quadrate 40 Gbps Parallel AOC for PCle 3.0 SWE (100P08)</td>
<td>2</td>
<td>11,478.00</td>
<td>22,956.00</td>
<td>0.00%</td>
<td>22,956.00</td>
</tr>
<tr>
<td>1.1.7</td>
<td>Storage Software</td>
<td>OceanStor OS,DeviceManager,SmartThin,SmartMulti-tenant,SmartPartition,SmartErase,SmartMigrate</td>
<td>1</td>
<td>149,417.00</td>
<td>149,417.00</td>
<td>72.00%</td>
<td>41,386.70</td>
</tr>
<tr>
<td>1.1.8</td>
<td>Maintenance Support Service</td>
<td>OceanStor 18800F V5 Engine(6U,Four Controller,ACU24/84VDC, 4<em>512GB Cache, 12</em>96Gb FC, 48-port SAS, SRET/SCS0606) Hi Care Onsite Premier 24x7x4H Engineer Onsite Service-3M Month(s)</td>
<td>4</td>
<td>45,084.00</td>
<td>183,336.00</td>
<td>0.00%</td>
<td>183,336.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OceanStor 800G SSD SAS Disk Unit(2.5&quot;) Hi Care Onsite Premier 24x7x4H Engineer Onsite Service-3M Month(s)</td>
<td>384</td>
<td>246.00</td>
<td>94,464.00</td>
<td>0.00%</td>
<td>94,464.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OceanStor Storage (including OceanStor CSE,DeviceManager,SmartThin,SmartMulti-tenant,SmartPartition,SmartErase,SmartMigrate,SmartMotion and SmartOsS and SystemReporter,UltraPath) Hi Care Application</td>
<td>1</td>
<td>62,061.00</td>
<td>62,061.00</td>
<td>0.00%</td>
<td>62,061.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OceanStor 18800F V5 Installation Service - Engineering</td>
<td>1</td>
<td>172,340.00</td>
<td>172,340.00</td>
<td>0.00%</td>
<td>172,340.00</td>
</tr>
<tr>
<td>Total of Product</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>2,282,154.10</strong></td>
</tr>
<tr>
<td>Total of Service (3 years)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>512,801.00</strong></td>
</tr>
<tr>
<td>Total Price</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>2,794,955.10</strong></td>
</tr>
</tbody>
</table>

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.
# Huawei OceanStor 18800F V5

## Huawei Technologies Co., Ltd

Submitted for Review: March 7, 2018

---

### Noviant

**Address:** 32 Broadway, Suite 401

**New York, NY 10004**

**Tel.:** 212-509-8825

**Email:** sales@noviant.com

02/27/2018, Quote Valid 90 Days

---

**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 products sold by NF carry its own Original Equipment Manufacturer's (OEM) Limited Warranty and software licenses. This Quote is valid for 90 days. Prices and availability are subject to change without notice. All installation and configuration costs are not included in the quoted pricing unless specified. A 20% Restocking Fee applies to all cancelled orders and/or returned products. Special Orders are non-refundable. Buyer is responsible for payment of all applicable taxes and freight charges. Issuance of customer PO against this Quote constitutes acceptance of Noviant Sales Terms & Conditions.

I agree to the these terms and conditions.

---

**Authorized Acceptance:**

Print Name: __________________ Date: __________

---

Noviant: __________________ Print Name: __________________ Date: __________
APPENDIX C: TUNING PARAMETERS AND OPTIONS

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

- **aio-max-nr.sh** to change the maximum number of AIO operations to 1048576
- **nr_requests.sh** to change nr_requests from 128 to 1024 on each Host System for each device
- **scheduler.sh** to 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

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

### aio-max-nr.sh

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

### nr_requests.sh

```bash
echo 2048 >/sys/block/sdb/queue/nr_requests
echo 2048 >/sys/block/sdc/queue/nr_requests
echo 2048 >/sys/block/sdd/queue/nr_requests
echo 2048 >/sys/block/sde/queue/nr_requests
echo 2048 >/sys/block/sdf/queue/nr_requests
echo 2048 >/sys/block/sdg/queue/nr_requests
echo 2048 >/sys/block/sdh/queue/nr_requests
echo 2048 >/sys/block/sdj/queue/nr_requests
echo 2048 >/sys/block/sdk/queue/nr_requests
echo 2048 >/sys/block/sdl/queue/nr_requests
echo 2048 >/sys/block/sdm/queue/nr_requests
echo 2048 >/sys/block/sdn/queue/nr_requests
echo 2048 >/sys/block/sdo/queue/nr_requests
echo 2048 >/sys/block/sdp/queue/nr_requests
echo 2048 >/sys/block/sdq/queue/nr_requests
echo 2048 >/sys/block/sdr/queue/nr_requests
echo 2048 >/sys/block/sds/queue/nr_requests
echo 2048 >/sys/block/sdt/queue/nr_requests
echo 2048 >/sys/block/sdu/queue/nr_requests
echo 2048 >/sys/block/sdv/queue/nr_requests
echo 2048 >/sys/block/sdw/queue/nr_requests
echo 2048 >/sys/block/sdx/queue/nr_requests
echo 2048 >/sys/block/sdy/queue/nr_requests
echo 2048 >/sys/block/sdz/queue/nr_requests
```

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- **scheduler.sh**

  ```
echo 2048 >/sys/block/sdaj/queue/nr_requests  
echo 2048 >/sys/block/sdak/queue/nr_requests  
echo 2048 >/sys/block/sdal/queue/nr_requests  
echo 2048 >/sys/block/sdam/queue/nr_requests  
echo 2048 >/sys/block/sdan/queue/nr_requests  
echo 2048 >/sys/block/sdao/queue/nr_requests  
echo 2048 >/sys/block/sdap/queue/nr_requests  
echo 2048 >/sys/block/sdaq/queue/nr_requests  
echo 2048 >/sys/block/sdar/queue/nr_requests  
echo 2048 >/sys/block/sdas/queue/nr_requests  
echo 2048 >/sys/block/sdat/queue/nr_requests  
echo 2048 >/sys/block/sdav/queue/nr_requests  
echo 2048 >/sys/block/sdw/queue/nr_requests  
echo 2048 >/sys/block/sdx/queue/nr_requests  
echo 2048 >/sys/block/sdy/queue/nr_requests  
echo 2048 >/sys/block/sdz/queue/nr_requests  
echo 2048 >/sys/block/sdaa/queue/nr_requests  
echo 2048 >/sys/block/sdab/queue/nr_requests  
echo 2048 >/sys/block/sdac/queue/nr_requests

  • 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  
```

- Full Disclosure Report
- Submission Identifier: A31012
- Submitted for Review: March 7, 2018
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/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
APPENDIX D: STORAGE CONFIGURATION CREATION

Environment

First, the CLI commands from the following command file are copied and pasted into the OceanStor 18800F V5 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 16 disk domains
- Create 16 storage pools
- Create 64 LUNs
- Create one LUN group
- Add the 64 LUNs to the LUN group

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

**mklun.txt**

```bash
create disk_domain name=dd00 disk_list=DAE000.0-23 tier0_hotspare_strategy=low
disk_domain_id=0
create disk_domain name=dd01 disk_list=DAE010.0-23 tier0_hotspare_strategy=low
disk_domain_id=1
create disk_domain name=dd02 disk_list=DAE004.0-23 tier0_hotspare_strategy=low
disk_domain_id=2
create disk_domain name=dd03 disk_list=DAE014.0-23 tier0_hotspare_strategy=low
disk_domain_id=3
create disk_domain name=dd04 disk_list=DAE100.0-23 tier0_hotspare_strategy=low
disk_domain_id=4
create disk_domain name=dd05 disk_list=DAE110.0-23 tier0_hotspare_strategy=low
disk_domain_id=5
create disk_domain name=dd06 disk_list=DAE104.0-23 tier0_hotspare_strategy=low
disk_domain_id=6
create disk_domain name=dd07 disk_list=DAE114.0-23 tier0_hotspare_strategy=low
disk_domain_id=7
create disk_domain name=dd08 disk_list=DAE200.0-23 tier0_hotspare_strategy=low
disk_domain_id=8
create disk_domain name=dd09 disk_list=DAE210.0-23 tier0_hotspare_strategy=low
disk_domain_id=9
create disk_domain name=dd10 disk_list=DAE204.0-23 tier0_hotspare_strategy=low
disk_domain_id=10
create disk_domain name=dd11 disk_list=DAE214.0-23 tier0_hotspare_strategy=low
disk_domain_id=11
create disk_domain name=dd12 disk_list=DAE300.0-23 tier0_hotspare_strategy=low
disk_domain_id=12
```
create disk_domain name=dd13 disk_list=DAE310.0-23 tier0_hotspare_strategy=low
disk_domain_id=13
create disk_domain name=dd14 disk_list=DAE304.0-23 tier0_hotspare_strategy=low
disk_domain_id=14
create disk_domain name=dd15 disk_list=DAE314.0-23 tier0_hotspare_strategy=low
disk_domain_id=15
create storage_pool name=sp00 disk_type=SSD capacity=9070GB raid_level=RAID10 pool_id=0 disk_domain_id=0
create storage_pool name=sp01 disk_type=SSD capacity=9070GB raid_level=RAID10 pool_id=1 disk_domain_id=1
create storage_pool name=sp02 disk_type=SSD capacity=9070GB raid_level=RAID10 pool_id=2 disk_domain_id=2
create storage_pool name=sp03 disk_type=SSD capacity=9070GB raid_level=RAID10 pool_id=3 disk_domain_id=3
create storage_pool name=sp04 disk_type=SSD capacity=9070GB raid_level=RAID10 pool_id=4 disk_domain_id=4
create storage_pool name=sp05 disk_type=SSD capacity=9070GB raid_level=RAID10 pool_id=5 disk_domain_id=5
create storage_pool name=sp06 disk_type=SSD capacity=9070GB raid_level=RAID10 pool_id=6 disk_domain_id=6
create storage_pool name=sp07 disk_type=SSD capacity=9070GB raid_level=RAID10 pool_id=7 disk_domain_id=7
create storage_pool name=sp08 disk_type=SSD capacity=9070GB raid_level=RAID10 pool_id=8 disk_domain_id=8
create storage_pool name=sp09 disk_type=SSD capacity=9070GB raid_level=RAID10 pool_id=9 disk_domain_id=9
create storage_pool name=sp10 disk_type=SSD capacity=9070GB raid_level=RAID10 pool_id=10 disk_domain_id=10
create storage_pool name=sp11 disk_type=SSD capacity=9070GB raid_level=RAID10 pool_id=11 disk_domain_id=11
create storage_pool name=sp12 disk_type=SSD capacity=9070GB raid_level=RAID10 pool_id=12 disk_domain_id=12
create storage_pool name=sp13 disk_type=SSD capacity=9070GB raid_level=RAID10 pool_id=13 disk_domain_id=13
create storage_pool name=sp14 disk_type=SSD capacity=9070GB raid_level=RAID10 pool_id=14 disk_domain_id=14
create storage_pool name=sp15 disk_type=SSD capacity=9070GB raid_level=RAID10 pool_id=15 disk_domain_id=15
create lun name=lun_sp00 lun_id_list=0-3 pool_id=0 capacity=2260GB
create lun name=lun_sp01 lun_id_list=4-7 pool_id=1 capacity=2260GB
create lun name=lun_sp02 lun_id_list=8-11 pool_id=2 capacity=2260GB
create lun name=lun_sp03 lun_id_list=12-15 pool_id=3 capacity=2260GB
create lun name=lun_sp04 lun_id_list=16-19 pool_id=4 capacity=2260GB
create lun name=lun_sp05 lun_id_list=20-23 pool_id=5 capacity=2260GB
create lun name=lun_sp06 lun_id_list=24-27 pool_id=6 capacity=2260GB
create lun name=lun_sp07 lun_id_list=28-31 pool_id=7 capacity=2260GB
create lun name=lun_sp08 lun_id_list=32-35 pool_id=8 capacity=2260GB
create lun name=lun_sp09 lun_id_list=36-39 pool_id=9 capacity=2260GB
create lun name=lun_sp10 lun_id_list=40-43 pool_id=10 capacity=2260GB
create lun name=lun_sp11 lun_id_list=44-47 pool_id=11 capacity=2260GB
create lun name=lun_sp12 lun_id_list=48-51 pool_id=12 capacity=2260GB
create lun name=lun_sp13 lun_id_list=52-55 pool_id=13 capacity=2260GB
create lun name=lun_sp14 lun_id_list=56-59 pool_id=14 capacity=2260GB
create lun name=lun_sp15 lun_id_list=60-63 pool_id=15 capacity=2260GB
create lun_group name=lg0 lun_group_id=0
add lun_group lun lun_group_id=0 lun_id_list=0-63
**Step 2 - Create Mapping View, Host Group and Host**

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

- Create 4 hosts
- Create a host group
- Create a mapping view
- Add the 4 hosts to the host group
- Add the host group and the LUN group to the mapping view
- Add the FC port’s WWN to the 4 hosts

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

**mklun.txt**

```plaintext
create host name=host0 operating_system=Linux host_id=0
create host name=host1 operating_system=Linux host_id=1
create host name=host2 operating_system=Linux host_id=2
create host name=host3 operating_system=Linux host_id=3
create host_group name=hg0 host_group_id=0 host_id_list=0-3
create mapping_view name=mv1 mapping_view_id=1 lun_group_id=0 host_group_id=0

add host initiator host_id=0 initiator_type=FC wwn=2100000e1e1807b0
add host initiator host_id=0 initiator_type=FC wwn=2100000e1e1807b1
add host initiator host_id=0 initiator_type=FC wwn=2100000e1e1aa1e0
add host initiator host_id=0 initiator_type=FC wwn=2100000e1e1aa1e1
add host initiator host_id=0 initiator_type=FC wwn=2100000e1e1c2450
add host initiator host_id=0 initiator_type=FC wwn=2100000e1e1c2451
add host initiator host_id=0 initiator_type=FC wwn=2100000e1e1c2800
add host initiator host_id=0 initiator_type=FC wwn=2100000e1e1c2801
add host initiator host_id=0 initiator_type=FC wwn=2100000e1e1c7430
add host initiator host_id=0 initiator_type=FC wwn=2100000e1e1c7431
add host initiator host_id=0 initiator_type=FC wwn=2100000e1e231560
add host initiator host_id=0 initiator_type=FC wwn=2100000e1e231561
add host initiator host_id=0 initiator_type=FC wwn=2100000e1e23acd0
add host initiator host_id=0 initiator_type=FC wwn=2100000e1e23acd1
add host initiator host_id=0 initiator_type=FC wwn=2100000e1e28a9b0
add host initiator host_id=0 initiator_type=FC wwn=2100000e1e28a9b1
add host initiator host_id=0 initiator_type=FC wwn=2100000e1e2a1c10
add host initiator host_id=0 initiator_type=FC wwn=2100000e1e2a1c11
add host initiator host_id=0 initiator_type=FC wwn=2100000e24ff17df38
add host initiator host_id=0 initiator_type=FC wwn=2100000e24ff17df39
add host initiator host_id=0 initiator_type=FC wwn=2100000e24ff17df44
add host initiator host_id=0 initiator_type=FC wwn=2100000e24ff17df5
add host initiator host_id=0 initiator_type=FC wwn=2100000e24ff17e0ba
add host initiator host_id=0 initiator_type=FC wwn=2100000e24ff17e0bb
add host initiator host_id=0 initiator_type=FC wwn=2100000e24ff17e0bc
add host initiator host_id=0 initiator_type=FC wwn=2100000e24ff17e0bd
add host initiator host_id=0 initiator_type=FC wwn=2100000e24ff208834
add host initiator host_id=0 initiator_type=FC wwn=2100000e24ff208835
add host initiator host_id=0 initiator_type=FC wwn=2100000e24ff208835
add host initiator host_id=0 initiator_type=FC wwn=2100000e24ff295a
add host initiator host_id=0 initiator_type=FC wwn=2100000e24ff295b
add host initiator host_id=0 initiator_type=FC wwn=2100000e24ff295c
add host initiator host_id=0 initiator_type=FC wwn=2100000e24ff295dd
```

add host initiator host_id=1 initiator_type=FC wwn=21000024ff369d90
add host initiator host_id=1 initiator_type=FC wwn=21000024ff369d91
add host initiator host_id=1 initiator_type=FC wwn=21000024ff37203c
add host initiator host_id=1 initiator_type=FC wwn=21000024ff37203d
add host initiator host_id=1 initiator_type=FC wwn=21000024ff3a3d5c
add host initiator host_id=1 initiator_type=FC wwn=21000024ff3a3d5d
add host initiator host_id=1 initiator_type=FC wwn=21000024ff3cc4ca
add host initiator host_id=1 initiator_type=FC wwn=21000024ff3cc4cb
add host initiator host_id=1 initiator_type=FC wwn=21000024ff40508e
add host initiator host_id=1 initiator_type=FC wwn=21000024ff40508f
add host initiator host_id=1 initiator_type=FC wwn=21000024ff4b81fc
add host initiator host_id=1 initiator_type=FC wwn=21000024ff4b81fd
add host initiator host_id=1 initiator_type=FC wwn=21000024ff4b82ea
add host initiator host_id=1 initiator_type=FC wwn=21000024ff4b82eb
add host initiator host_id=1 initiator_type=FC wwn=21000024ff4b82ed
add host initiator host_id=1 initiator_type=FC wwn=21000024ff5439d6
add host initiator host_id=1 initiator_type=FC wwn=21000024ff5439d7
add host initiator host_id=1 initiator_type=FC wwn=21000024ff53be2
add host initiator host_id=1 initiator_type=FC wwn=21000024ff53be3
add host initiator host_id=1 initiator_type=FC wwn=21000024ff55c716
add host initiator host_id=1 initiator_type=FC wwn=21000024ff55c717
add host initiator host_id=1 initiator_type=FC wwn=21000024ff55c364e
add host initiator host_id=1 initiator_type=FC wwn=21000024ff55c364f
add host initiator host_id=1 initiator_type=FC wwn=21000024ff752140
add host initiator host_id=1 initiator_type=FC wwn=21000024ff752141
add host initiator host_id=1 initiator_type=FC wwn=21000024ff756d78
add host initiator host_id=1 initiator_type=FC wwn=21000024ff756d79
add host initiator host_id=2 initiator_type=FC wwn=21000024ff756e14
add host initiator host_id=2 initiator_type=FC wwn=21000024ff756e15
add host initiator host_id=2 initiator_type=FC wwn=21000024ff76cb42
add host initiator host_id=2 initiator_type=FC wwn=21000024ff76cb43
add host initiator host_id=2 initiator_type=FC wwn=21000024ff77a9f0
add host initiator host_id=2 initiator_type=FC wwn=21000024ff77a9f1
add host initiator host_id=2 initiator_type=FC wwn=21000024ff77a9f2
add host initiator host_id=2 initiator_type=FC wwn=21000024ff77a9f3
add host initiator host_id=2 initiator_type=FC wwn=21000024ff77a9f4
add host initiator host_id=2 initiator_type=FC wwn=21000024ff77a9f5
add host initiator host_id=2 initiator_type=FC wwn=21000024ff77a9f6
add host initiator host_id=2 initiator_type=FC wwn=21000024ff77a9f7
add host initiator host_id=2 initiator_type=FC wwn=21000024ff77a9f8
add host initiator host_id=2 initiator_type=FC wwn=21000024ff77a9f9
add host initiator host_id=2 initiator_type=FC wwn=21000024ff77a9fa
add host initiator host_id=2 initiator_type=FC wwn=21000024ff77a9fb
add host initiator host_id=2 initiator_type=FC wwn=21000024ff77a9fc
add host initiator host_id=2 initiator_type=FC wwn=21000024ff77a9fd
add host initiator host_id=2 initiator_type=FC wwn=21000024ff77a9fe
add host initiator host_id=2 initiator_type=FC wwn=21000024ff77a9ff
add host initiator host_id=2 initiator_type=FC wwn=21000024ff77f889a
add host initiator host_id=2 initiator_type=FC wwn=21000024ff77f889b
add host initiator host_id=2 initiator_type=FC wwn=21000024ff77f88ca
add host initiator host_id=2 initiator_type=FC wwn=21000024ff77f88cb
Add host initiator host_id=2 initiator_type=FC wwn=21000024ff7f8a02
add host initiator host_id=2 initiator_type=FC wwn=21000024ff7f8a03
add host initiator host_id=2 initiator_type=FC wwn=21000024ff7f8aba
add host initiator host_id=2 initiator_type=FC wwn=21000024ff7f8abb
add host initiator host_id=3 initiator_type=FC wwn=21000024ff7f8b716
add host initiator host_id=3 initiator_type=FC wwn=21000024ff7f8b717
add host initiator host_id=3 initiator_type=FC wwn=21000024ff7f8b902
add host initiator host_id=3 initiator_type=FC wwn=21000024ff7f8b903
add host initiator host_id=3 initiator_type=FC wwn=21000024ff899b12
add host initiator host_id=3 initiator_type=FC wwn=21000024ff899b13
add host initiator host_id=3 initiator_type=FC wwn=21000024ff89be00
add host initiator host_id=3 initiator_type=FC wwn=21000024ff89be01
add host initiator host_id=3 initiator_type=FC wwn=21000024ff89ee0c
add host initiator host_id=3 initiator_type=FC wwn=21000024ff89ee0d
add host initiator host_id=3 initiator_type=FC wwn=2100000e1e1c2600
add host initiator host_id=3 initiator_type=FC wwn=2100000e1e1c2601
add host initiator host_id=3 initiator_type=FC wwn=21000024ff899b12
add host initiator host_id=3 initiator_type=FC wwn=21000024ff89be00
add host initiator host_id=3 initiator_type=FC wwn=21000024ff89be01
add host initiator host_id=3 initiator_type=FC wwn=21000024ff89be00
add host initiator host_id=3 initiator_type=FC wwn=21000024ff89be01

Step 3 - Create Volumes on the Host Systems

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

- Create 64 physical volumes
- Create a volume group for the 64 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/sdi
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/sdza
pvcreate /dev/sdab
pvcreate /dev/sdac
pvcreate /dev/sdad
pvcreate /dev/sdae
pvcreate /dev/sdaf
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/sday
pvcreate /dev/sdaa
pvcreate /dev/sdb
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

lvcreate -n asu101 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu102 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu103 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu104 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu105 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu106 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu107 -i 64 -I 512 -C y -L 3450g vg1
APPENDIX D
Storage Configuration Creation

```bash
lvcreate -n asu108 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu109 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu110 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu111 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu112 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu113 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu114 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu115 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu116 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu117 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu118 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu201 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu202 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu203 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu204 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu205 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu206 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu207 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu208 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu209 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu210 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu211 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu212 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu213 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu214 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu215 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu216 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu217 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu218 -i 64 -I 512 -C y -L 3450g vg1
lvcreate -n asu301 -i 64 -I 512 -C y -L 6900g vg1
lvcreate -n asu302 -i 64 -I 512 -C y -L 6900g 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 36000 -storage slave_asu.asu -output
~/newtool/spc1_INIT_36k_iops -master 28host.HST
spc1 -run SPC1_VERIFY -iops 1000 -storage slave_asu.asu -output
~/newtool/spc1_VERIFY1_1000_iops
spc1 -run SPC1_METRICS -iops 6000200 -storage slave_asu.asu -output
~/newtool/spc1_METRICS_6000k_iops -master 28host.HST
spc1 -run SPC1_VERIFY -iops 1000 -storage slave_asu.asu -output
~/newtool/spc1_VERIFY2_1000_iops
spc1 -run SPC1_PERSIST_1 -iops 600000 -storage slave_asu.asu -output
~/newtool/spc1_PERSIST_600k_iops -master 28host.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 600000 -storage slave_asu.asu -output
~/newtool/spc1_PERSIST_600k_iops -master 28host.HST