SPC BENCHMARK 1™
EXECUTIVE SUMMARY

HUAWEI TECHNOLOGIES CO., LTD.
HUAWEI OCEANSTOR™ 2600 V3

SPC-1 V1.14

Submitted for Review: December 20, 2016
Submission Identifier: A00182

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

Test Sponsor and Contact Information	
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Auditor	Storage Performance Council – http://www.storageperformance.org Walter E. Baker – AuditService@StoragePerformance.org Gradient Systems, Inc. 643 Bair Island Road, Suite 211 Redwood City, CA 94063 Phone: (650) 556-9384 FAX: (650) 257-7511

Revision Information and Key Dates

Revision Information and Key Dates	
SPC-1 Specification revision number	V1.14
SPC-1 Workload Generator revision number	V2.3.0
Date Results were first used publicly	December 20, 2016
Date the FDR was submitted to the SPC	December 20, 2016
Date the Priced Storage Configuration is available for shipment to customers	currently available
Date the TSC completed audit certification	December 16, 2016

Tested Storage Product (TSP) Description

Huawei OceanStor 2600 V3 storage systems are storage products specifically designed for enterprise-class applications. Employing a storage operating system built on a cloud-oriented architecture, a powerful new hardware platform, and a suite of intelligent management software, the V3 storage systems deliver industry-leading functionality, performance, efficiency, reliability, and ease-of-use.

The V3 storage systems are ideal for applications such as midrange/large database Online Transaction Processing (OLTP)/Online Analytical Processing (OLAP), file sharing, and cloud computing. Further, these systems offer a wide range of efficient backup and disaster recovery solutions.

With a versatile set of capabilities, the V3 storage systems can be widely applied in industries ranging from government, finance, telecommunications, to energy.

Summary of Results

SPC-1 Reported Data	
Tested Storage Product (TSP) Name: Huawei OceanStor™ 2600 V3	
Metric	**Reported Result**
SPC-1 IOPS™	100,493.48
SPC-1 Price-Performance™	$0.26/SPC-1 IOPS™
Total ASU Capacity	2,093.797 GB
Data Protection Level	Protected 2 *(Mirroring)*
Total Price	$26,534.48
Currency Used	U.S. Dollars
Target Country for availability, sales and support	USA

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

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

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

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

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

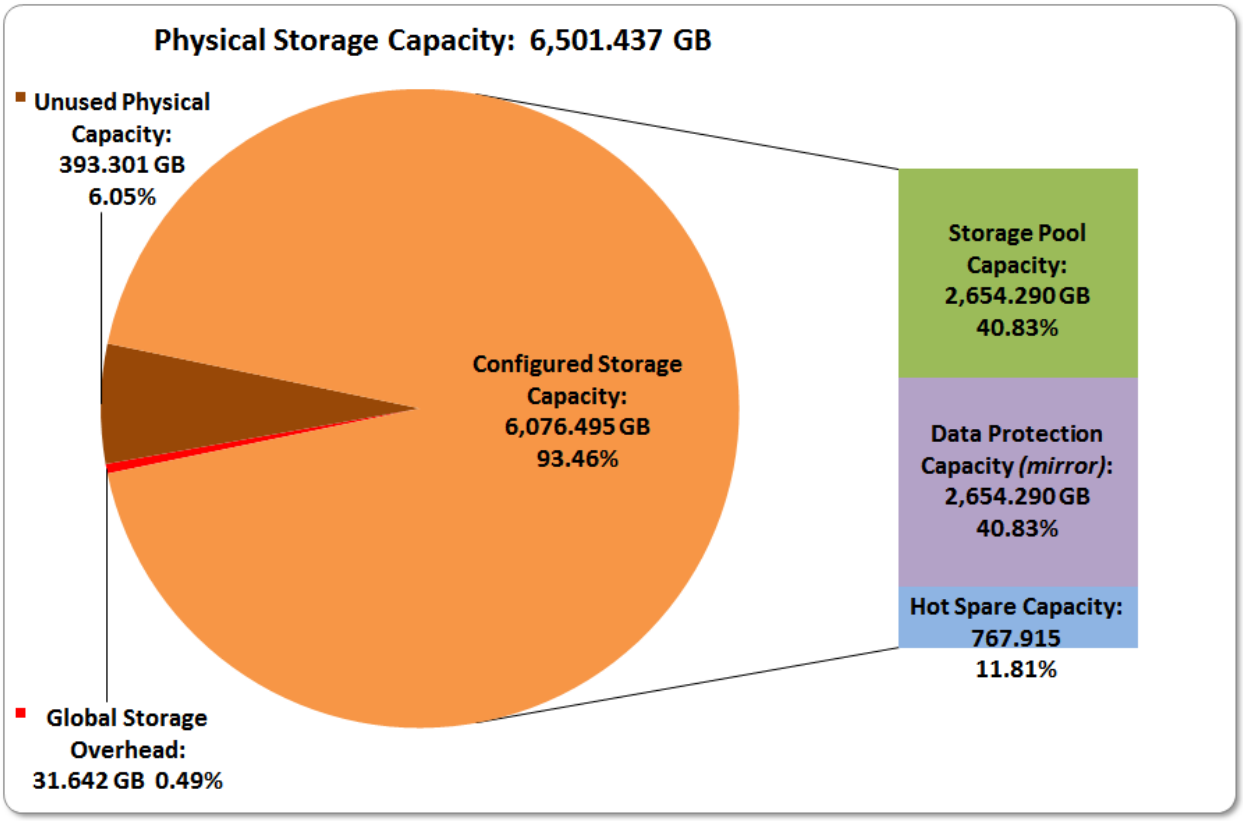
Total Price includes the cost of the Priced Storage Configuration plus three years of hardware maintenance and software support as detailed on page 9.

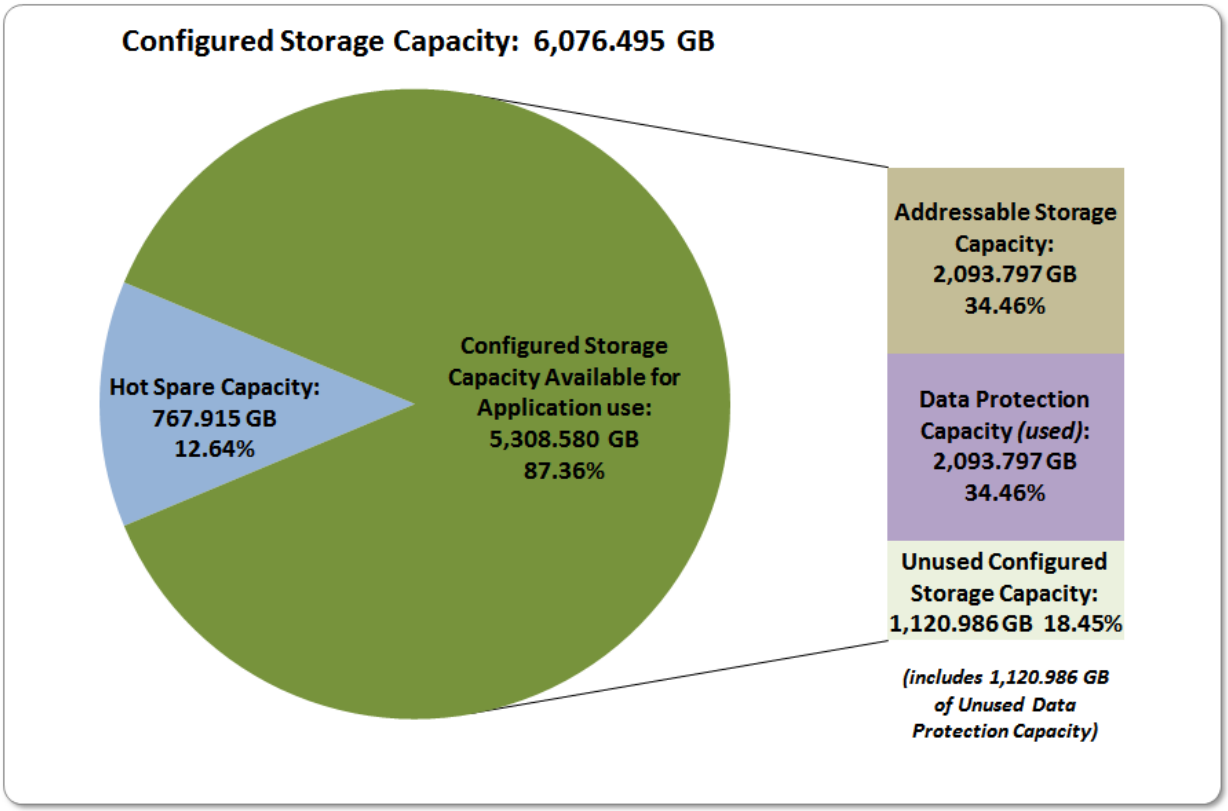
Currency Used is formal name for the currency used in calculating the **Total Price** and **SPC-1 Price-Performance™**. That currency may be the local currency of the **Target Country** or the currency of a difference country *(non-local currency)*.

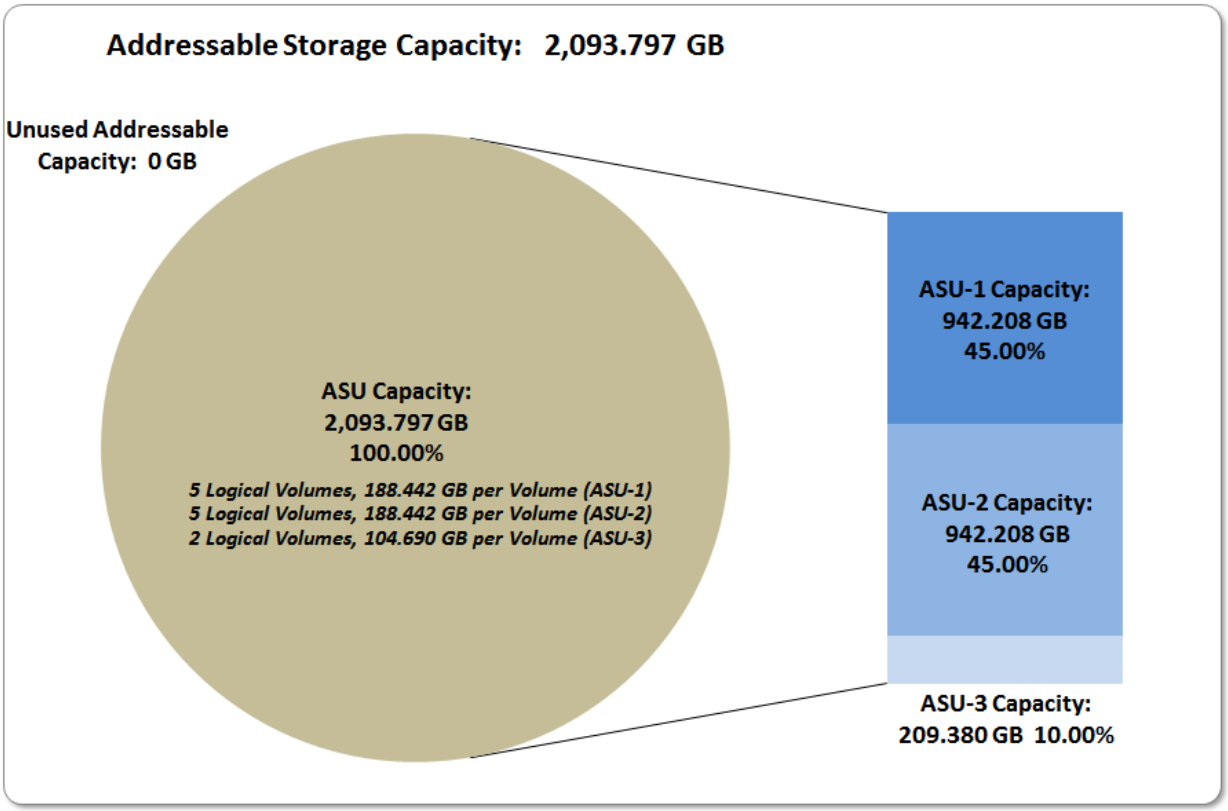
The **Target Country** is the country in which the Priced Storage Configuration is available for sale and in which the required hardware maintenance and software support is provided either directly from the Test Sponsor or indirectly via a third-party supplier.

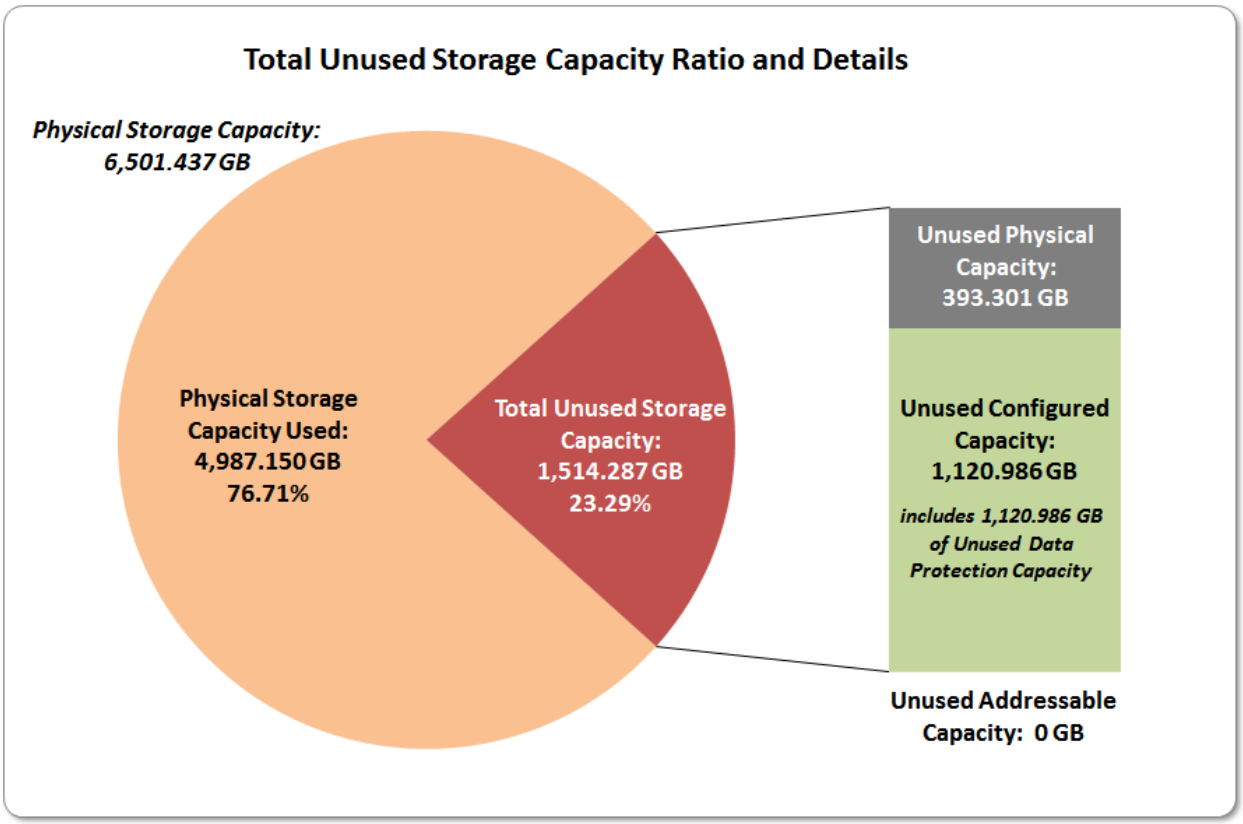
Storage Capacities, Relationships, and Utilization

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




Configured Storage Capacity: 6,076.495 GB
Hot Spare Capacity:
767.915 GB
12.64%
Configured Storage Capacity Available for Application use:
5,308.580 GB
87.36%
Addressable Storage Capacity:
2,093.797 GB
34.46%
Data Protection Capacity (used):
2,093.797 GB
34.46%
Unused Configured Storage Capacity:
1,120.986 GB 18.45%
(includes 1,120.986 GB of Unused Data Protection Capacity)


Addressable Storage Capacity: 2,093.797 GB
Unused Addressable Capacity: 0 GB
ASU Capacity:
2,093.797 GB
100.00%
5 Logical Volumes, 188.442 GB per Volume (ASU-1)
5 Logical Volumes, 188.442 GB per Volume (ASU-2)
2 Logical Volumes, 104.690 GB per Volume (ASU-3)
ASU-1 Capacity:
942.208 GB
45.00%
ASU-2 Capacity:
942.208 GB
45.00%
ASU-3 Capacity:
209.380 GB 10.00%



SPC-1 Storage Capacity Utilization	
Application Utilization	32.21%
Protected Application Utilization	64.41%
Unused Storage Ratio	23.29%

Application Utilization: Total ASU Capacity *(2,093.797 GB)* divided by Physical Storage Capacity *(6,501,437 GB)*.

Protected Application Utilization: (Total ASU Capacity *(2,093.797 GB)* plus total Data Protection Capacity *(2,654,290GB)* minus unused Data Protection Capacity *(560.493 GB)*) divided by Physical Storage Capacity *(6,501,437 GB)*.

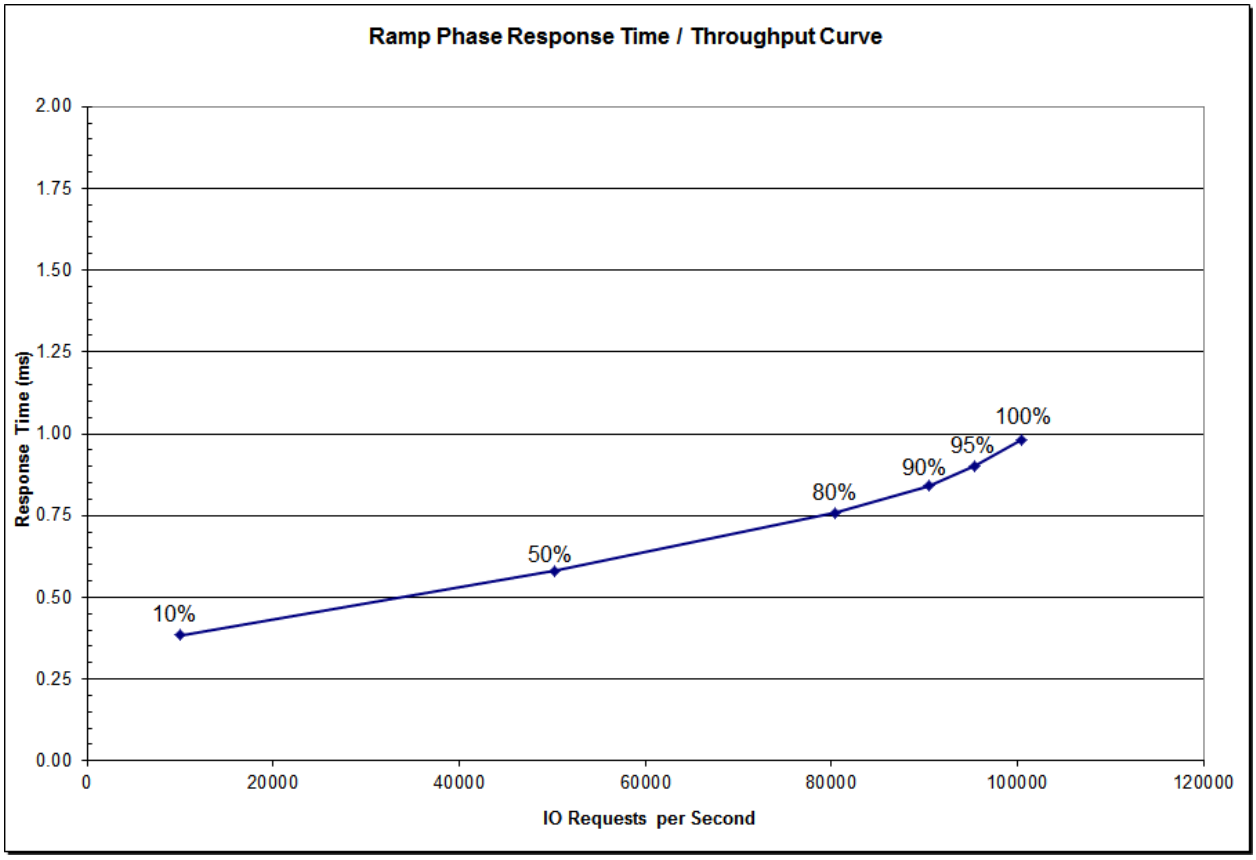
Unused Storage Ratio: Total Unused Capacity *(1,514.287 GB)* divided by Physical Storage Capacity *(6,501,437 GB)* and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 29-30 in the associated Full Disclosure Report.

Response Time – Throughput Curve

The Response Time-Throughput Curve illustrates the Average Response Time (milliseconds) and I/O Request Throughput at 100%, 95%, 90%, 80%, 50%, and 10% of the workload level used to generate the SPC-1 IOPS™ metric.

The Average Response Time measured at the any of the above load points cannot exceed 30 milliseconds or the benchmark measurement is invalid.



Response Time – Throughput Data

	10% Load	50% Load	80% Load	90% Load	95% Load	100% Load
I/O Request Throughput	10,047.44	50,257.02	80,420.32	90,443.44	95,439.71	100,493.48
Average Response Time (ms):						
All ASUs	0.38	0.58	0.76	0.84	0.90	0.98
ASU-1	0.39	0.61	0.80	0.88	0.94	1.01
ASU-2	0.40	0.63	0.82	0.90	0.96	1.03
ASU-3	0.37	0.50	0.65	0.73	0.80	0.89
Reads	0.42	0.73	0.97	1.05	1.10	1.16
Writes	0.36	0.48	0.62	0.71	0.77	0.87

Priced Storage Configuration Pricing

No.	Model	Description	Qty	Unit Price($)	Total Price($)
1	Phase				
1.1	Location				
1.1.1	2600 V3 Storage System				
1.1.1.1	Control Module				
	26V3I-S-64G-AC	2600 V3(2U,Dual Ctrl,AC,64GB,2*6*GE,25*2.5",SPE23C0225)	1	7213.44	7,213.44
1.1.1.2	Hard Disk Drives				
	26V3-S-SSD400	400GB SSD Disk Unit(2.5")	16	639.36	10,229.76
1.1.1.3	IO Interface				
	SMARTIO8FC	4 port SmartIO I/O module(SFP+,8Gb FC)	2	665.04	1,330.08
1.1.1.4	Accessory				
	SN2F01FCPC	Patch Cord,DLC/PC,DLC/PC,Multi-mode,3m,A1a.2,2mm,42mm	4	11.00	44.00
1.1.1.5	HBA				
	N8GHBA000	QLOGIC QLE2562 HBA Card,PCIE,8Gbps DualPort ,Fiber Channel Multimode LC Optic Interface,English Manual, No Drive CD	2	1000.00	2,000.00
1.1.1.6	Storage Software				
	LIC-26V3I-BS	Basic Software License for Block(Include Device Management,SmartThin,SmartMultiTenant,SmartMigration,SmartErase,SmartMotion,SmartConfig,Ultrapath,CloudService)	1	624.00	624.00
Total of Product					21,441.28
1.1.1.8	Maintenance Support Service				
	88125ESH	OceanStor 2600 V3 Installation Service - Engineering	1	1424.50	1,424.50
	02350SJE-88134ULF-3	2600 V3(2U,Dual Ctrl,AC,64GB,2*6*GE,25*2.5",SPE23C0225)-Hi-Care Onsite Premier 24x7x4H Engineer Onsite Service-3Year(s)	1	3259.20	3,259.20
	88033NKH-88134UHK-3	Basic Software License for Block-Hi-Care Application Software Upgrade Support Service-3Year(s)	1	409.50	409.50
Total of Service (3 years)					5,093.20
Total Price					26,534.48

Huawei Technologies Co., Ltd. only sells its products to third-party resellers, who in turn, sell those products to U.S. customers. The above pricing, which also includes the required three-year maintenance and support, was obtained from one of those third-party resellers. See page 77 *(Appendix F: Third-Party Quotation)* of the associated Full Disclosure Report for a copy of the third-party reseller quotation.

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

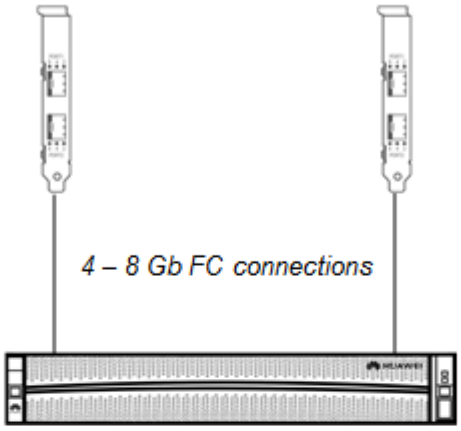
- Acknowledgement of new and existing problems within four (4) hours.
- Onsite presence of a qualified maintenance engineer or provision of a customer replaceable part within four (4) hours of the above acknowledgement for any hardware failure that results in an inoperative Price Storage Configuration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

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

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

Priced Storage Configuration Diagram

2 – QLogic dual-ported QLE2562 FC HBAs



Huawei OceanStor™ 2600 V3

1 – 2U System Enclosure

1 – Engine with

2 – Active-Active Controllers

64 GB cache *(32 GB per controller)*

2 – 4-port 8Gb Smart I/O modules *(FC)*
(1 module per controller)

4 – "built-in" 12 Gb SAS ports
(2 ports per controller)

16– 400GB 2.5" SSD drives

Priced Storage Configuration Components

Priced Storage Configuration
OceanStor UltraPath
2 – QLogic QLE2562 dual-port, 8 Gbps, FC HBAs
Huawei OceanStor™ 2600 V3 1 – 2U System Enclosure 2 – Active-Active Controllers each controller includes: 32 GB cache *(64 GB total)* 1 – 4-port 8Gb Smart I/O module *(FC)* *(2 modules total, 4 ports per controller* *(8 ports total and 4 ports used)* 2 – "built-in" 12Gbps SAS ports (4 ports total) 16 – 400 GB, 2.5" SSD drives

The major components used in the Benchmark Configuration/Tested Storage Configuration are documented in further detail on page 24 of the Full Disclosure Report.

The Engine, Controller and FC Module relationships are documented on page 25 of the Full Disclosure Report.

The FC HBA/Controller Host Port FC connections are documented on page 26 of the Full Disclosure Report.

page 26 of the Full Disclosure Report.