SPC Benchmark 2™
Executive Summary

Huawei Technologies Co., Ltd.
Huawei OceanStor™ 6800 V3

SPC-2™ V1.5

Submitted for Review: January 25, 2016
Submission Identifier: B00076

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

Test Sponsor and Contact Information	
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Test Sponsor Alternate Contact	Huawei Technologies Co., Ltd. – http://www.huawei.com/en/ Li Huan – tomas.l@huawei.com Huawei Chengdu Base No. 1899, Xiyuan Avenue Chengdu, 611731 P.R. China Phone: 86 28 65281927 FAX: 86 28 62282516
Auditor	Storage Performance Council – http://www.storageperformance.org Walter E. Baker – AuditService@StoragePerformance.org 643 Bair Island Road, Suite 103 Redwood City, CA 94063 Phone: (650) 556-9384 FAX: (650) 556-9385

Revision Information and Key Dates

Revision Information and Key Dates	
SPC-2 Specification revision number	V1.5
SPC-2 Workload Generator revision number	V1.2
Date Results were first used publicly	January 25, 2016
Date FDR was submitted to the SPC	January 25, 2016
Date the TSC will be available for shipment to customers	currently available
Date the TSC completed audit certification	January 24, 2016

Tested Storage Product (TSP) Description

Huawei OceanStor™ 6800 V3 high-end storage system is the next-generation unified storage product specifically designed for enterprise-class applications. Leveraging a storage operating system, OceanStor OS, built on a cloud-oriented architecture, a powerful new hardware platform, and a suite of intelligent management software, the V3 high-end storage system delivers industry-leading functionality, performance, efficiency, reliability, and ease-of-use. It provides data storage for applications such as large-database Online Transaction Processing (OLTP)/Online Analytical Processing (OLAP), file sharing, and cloud computing, which can be widely applied to industries ranging from government, finance, telecommunications, energy, media and entertainment (M&E). Meanwhile, the V3 high-end storage system can provide a wide range of efficient and flexible backup and disaster recovery solutions to ensure business continuity and data security, delivering excellent storage services.

OceanStor OS, the Huawei OceanStor storage operating system, enables Huawei storage products evolve to the future cloud architecture and deliver the core business platform. It supports all OceanStor Storage arrays, specifically, for managing the underlying infrastructure, the physical space and logical space. OceanStor OS delivers intelligent and convergent services and multiple SLAs to the application scenarios, including SAN and NAS convergence, all-level storage convergence, performance and capacity convergence, primary and backup storage convergence, and heterogeneous storage convergence. OceanStor OS helps customers evolve their traditional storage to cloud services in the future.

SPC-2 Reported Data

SPC-2 Reported Data consists of three groups of information:

- The following SPC-2 Primary Metrics, which characterize the overall benchmark result:
    - SPC-2 MBPS™
    - SPC-2 Price Performance
    - Application Storage Unit (ASU) Capacity

- Supplemental data to the SPC-2 Primary Metrics.
    - Total Price
    - Data Protection Level

- Reported Data for each SPC Test: Large File Processing (LFP), Large Database Query (LDQ), and Video on Demand Delivery (VOD) Test.

SPC-2 MBPS™ represents the aggregate data rate, in megabytes per second, of all three SPC-2 workloads: Large File Processing (LFP), Large Database Query (LDQ), and Video on Demand (VOD).

SPC-2 Price-Performance™ is the ratio of **Total Price** to **SPC-2 MBPS™**.

ASU *(Application Storage Unit)* **Capacity** represents the total storage capacity available to be read and written in the course of executing the SPC-2 benchmark.

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

Data Protection Level of **Protected 2** using *RAID-5* by distributing check data corresponding to user data across multiple disks in the form of bit-by-bit parity.

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

Currency Used is formal name for the currency used in calculating the **Total Price** and **SPC-2 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.
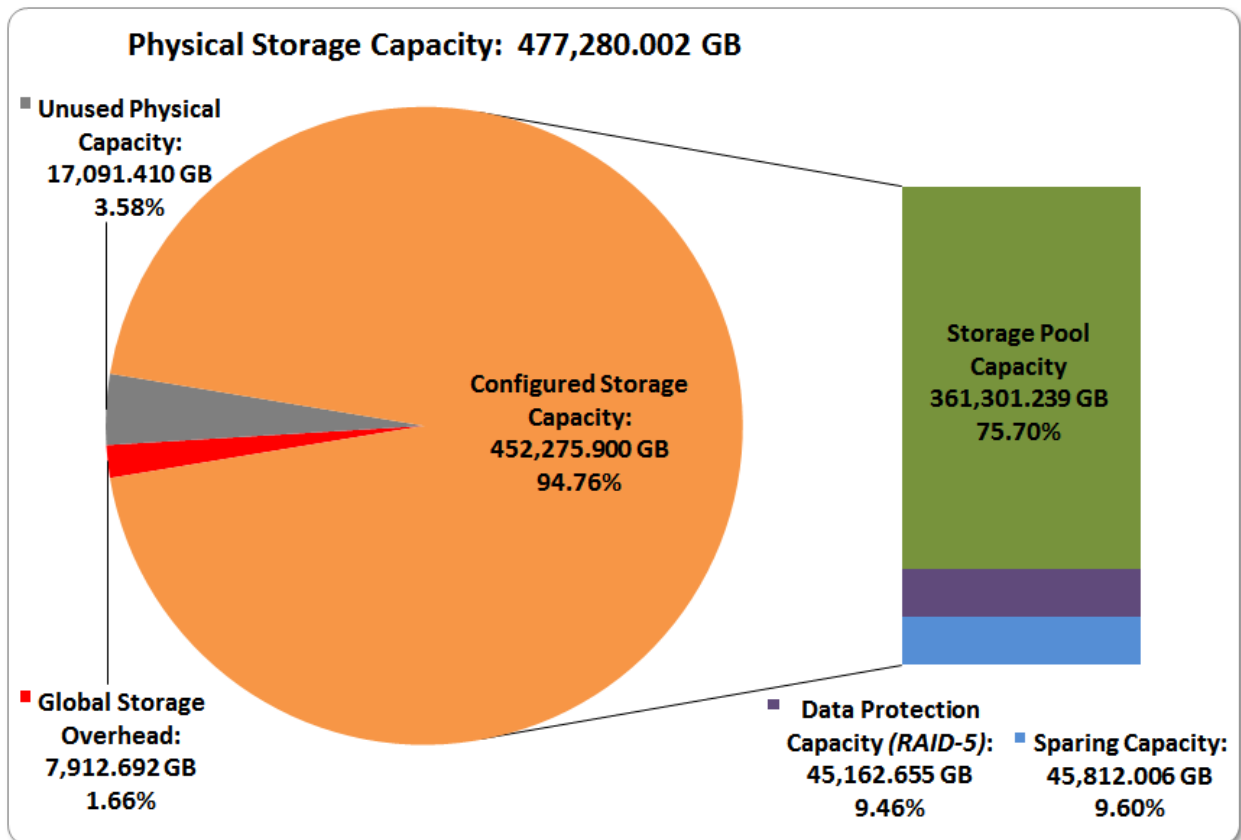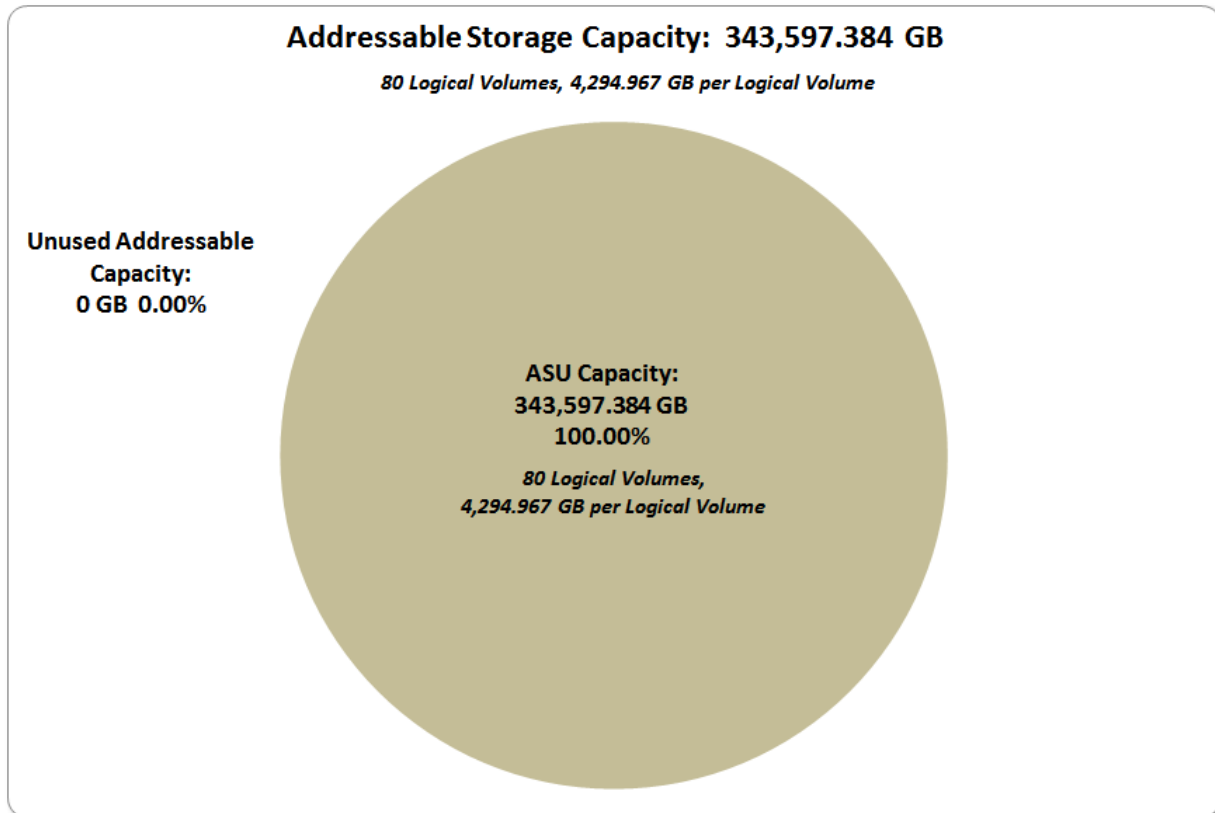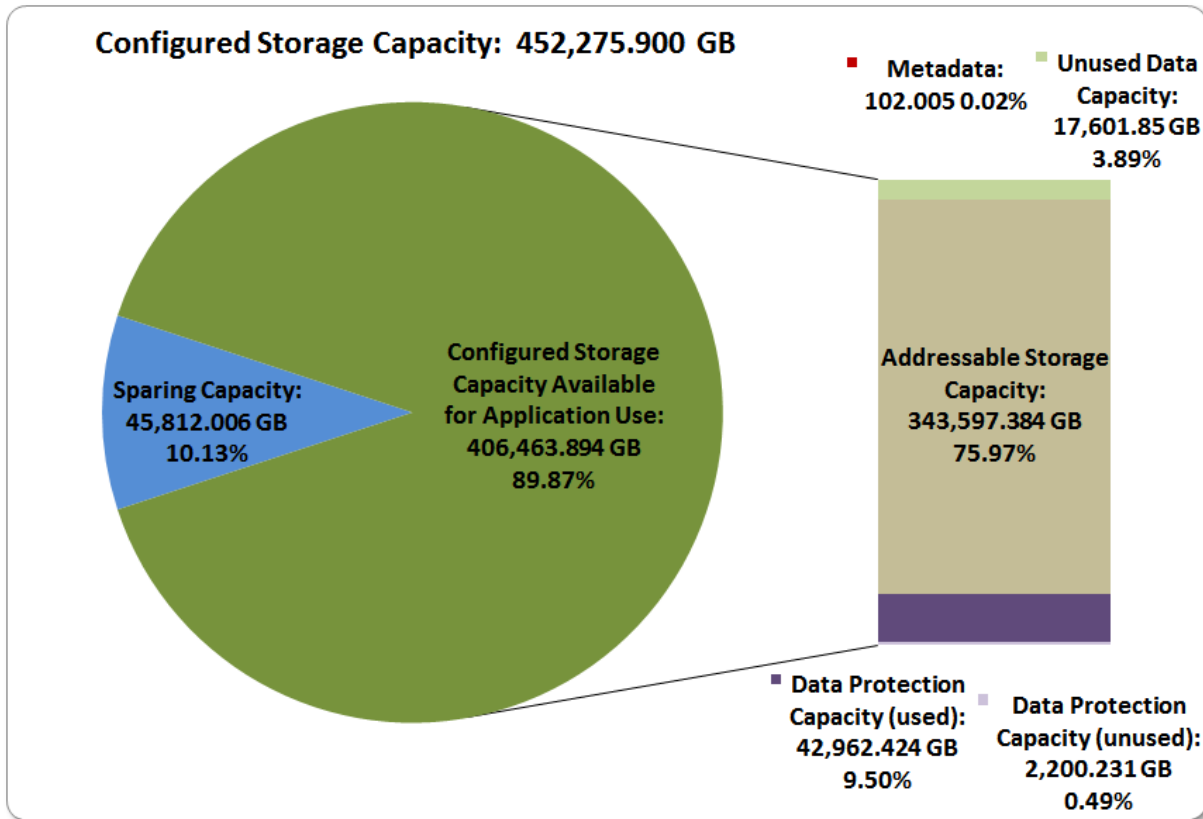
SPC-2 Reported Data *(continued)*

SPC-2 Reported Data				
Huawei OceanStor™ 6800 V3				
SPC-2 MBPS™	**SPC-2 Price-Performance**	**ASU Capacity (GB)**	**Total Price**	**Data Protection Level**
42,801.98	$16.89	343,597.384	$722,775.69	Protected 2 *(RAID-5)*
The above SPC-2 MBPS™ value represents the aggregate data rate of all three SPC-2 workloads: Large File Processing (LFP), Large Database Query (LDQ), and Video On Demand (VOD)				
Currency Used:		**"Target Country":**		
U.S. dollars		USA		
SPC-2 Large File Processing (LFP) Reported Data				
	Data Rate *(MB/second)*	**Number of Streams**	**Data Rate per Stream**	**Price-Performance**
LFP Composite	46,219.13			$15.64
Write Only:				
1024 KiB Transfer	34,271.86	2,000	17.14	
256 KiB Transfer	32,794.37	2,000	16.40	
Read-Write:				
1024 KiB Transfer	49,405.38	2,000	24.70	
256 KiB Transfer	50,818.13	2,000	25.41	
Read Only:				
1024 KiB Transfer	55,480.75	2,000	27.74	
256 KiB Transfer	54,544.28	2,000	27.27	
The above SPC-2 Data Rate value for LFP Composite represents the aggregate performance of all three LFP Test Phases: (Write Only, Read-Write, and Read Only).				
SPC-2 Large Database Query (LDQ) Reported Data				
	Data Rate *(MB/second)*	**Number of Streams**	**Data Rate per Stream**	**Price-Performance**
LDQ Composite	54,661.72			$13.22
1024 KiB Transfer Size				
4 I/Os Outstanding	56,828.51	2,000	28.41	
1 I/O Outstanding	55,369.30	2,000	27.68	
64 KiB Transfer Size				
4 I/Os Outstanding	53,424.77	2,000	26.71	
1 I/O Outstanding	53,024.29	2,000	26.51	
The above SPC-2 Data Rate value for LDQ Composite represents the aggregate performance of the two LDQ Test Phases: (1024 KiB and 64 KiB Transfer Sizes).				
SPC-2 Video On Demand (VOD) Reported Data				
	Data Rate *(MB/second)*	**Number of Streams**	**Data Rate per Stream**	**Price-Performance**
	27,525.10	35,000	0.79	$26.26

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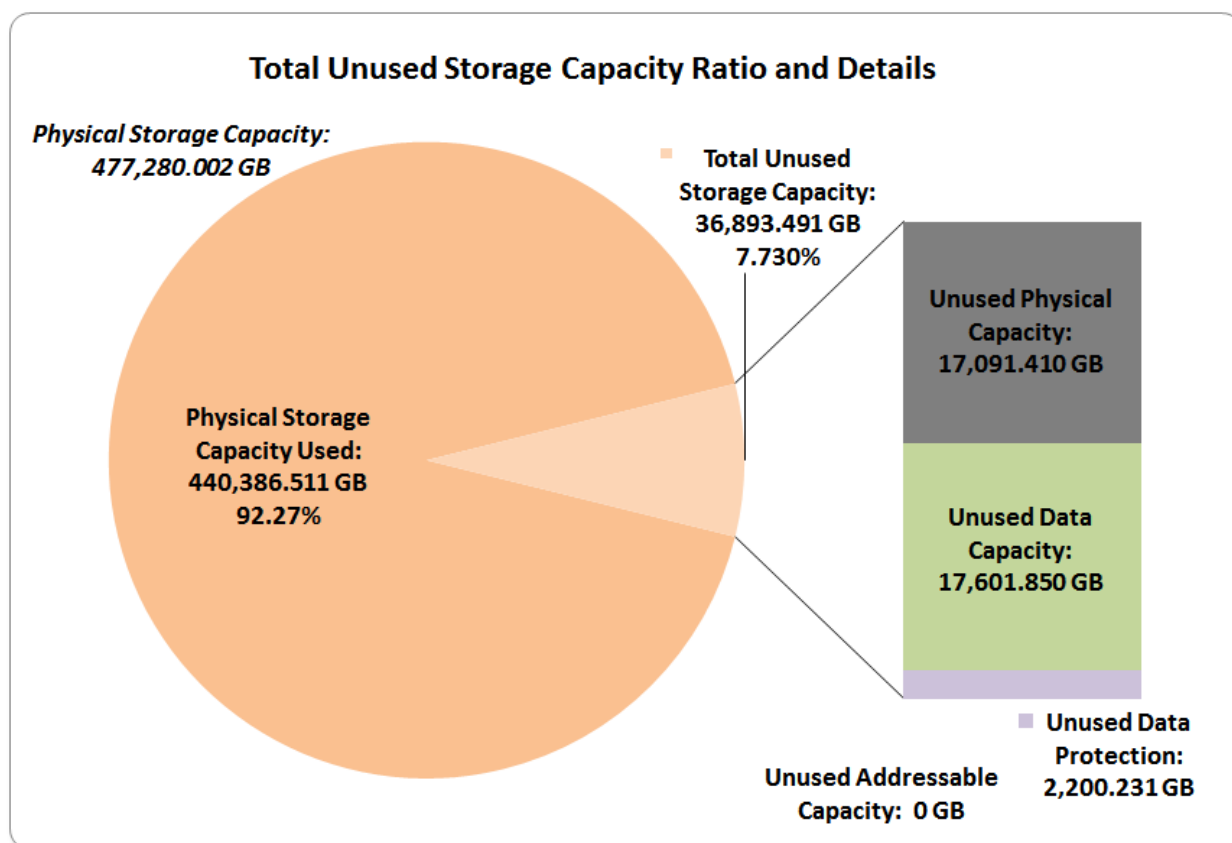## Storage Capacities and Relationships

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

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

Configured Storage Capacity: 452,275.900 GB

■ **Metadata:** 102.005 0.02%   ■ **Unused Data Capacity:** 17,601.85 GB 3.89%

Sparing Capacity: 45,812.006 GB 10.13%

Configured Storage Capacity Available for Application Use: 406,463.894 GB 89.87%

Addressable Storage Capacity: 343,597.384 GB 75.97%

■ **Data Protection Capacity (used):** 42,962.424 GB 9.50%   ■ **Data Protection Capacity (unused):** 2,200.231 GB 0.49%

Addressable Storage Capacity: 343,597.384 GB

80 Logical Volumes, 4,294.967 GB per Logical Volume

Unused Addressable Capacity: 0 GB 0.00%

ASU Capacity: 343,597.384 GB 100.00%

80 Logical Volumes, 4,294.967 GB per Logical Volume

Total Unused Storage Capacity Ratio and Details

Physical Storage Capacity: 477,280.002 GB

Physical Storage Capacity Used: 440,386.511 GB 92.27%

Total Unused Storage Capacity: 36,893.491 GB 7.730%

Unused Physical Capacity: 17,091.410 GB

Unused Data Capacity: 17,601.850 GB

Unused Data Protection: 2,200.231 GB

Unused Addressable Capacity: 0 GB

SPC-2 Storage Capacity Utilization	
Application Utilization	71.99%
Protected Application Utilization	80.99%
Unused Storage Ratio	7.73%

Application Utilization:

Total ASU Capacity *(343,597.384 GB)* divided by Physical Storage Capacity *(477,280.002 GB)*.

Protected Application Utilization: (Total ASU Capacity *(343,597.384 GB)* plus total Data Protection Capacity *(45,162.655 GB)* minus unused Data Protection Capacity (2,200.231 *GB)*) divided by Physical Storage Capacity *(477,280.002 GB)*.

Unused Storage Ratio: Total Unused Capacity *(36,893.491 GB)* divided by Physical Storage Capacity *(477,280.002 GB)* and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 26-27 in the Full Disclosure Report

Priced Storage Configuration Pricing

No.	Model	Description	Qty.	Unit Price (USD)	Total Price (USD)
1	**Phase**				
1.1	**Location**				
1.1.1	**OceanStor 6800 V3 Storage System**				
1.1.1	**Engine**				
	6800V3-512G-AC	6800 V3(6U,Dual Ctrl,AC,512GB,SPE72C0600)	2	44,791.92	89,583.84
	6800V3-256G-CTL	Controller Module(2*Intel 6 Cores,256GB Cache)	4	12,631.92	50,527.68
1.1.2	**Expand Interface Module**				
	SMARTIO8FC	4 port SmartIO I/O module(SFP+,8Gb FC)	24	665.04	15,960.96
	SMARTIO10ETH	4 port SmartIO I/O module(SFP+,10Gb Eth/FCoE(VN2VF)/Scale-out)	8	1,310.16	10,481.28
	LPU4S12V3	4 port 4*12Gb SAS I/O module(MiniSAS HD)	16	992.64	15,882.24
1.1.3	**Disk Components**				
	SAS600-10K-2-V3	600GB 10K RPM SAS Disk Unit(2.5")	800	439.44	351,552.00
1.1.4	**Disk Enclosure**				
	DAE22525U2-1-AC	Disk Enclosure(2U,AC,2.5",Expanding Module,25 Disk Slots,without Disk Unit, DAE22525U2)	32	2,116.80	67,737.60
1.1.5	**Cabinet**				
	RACK-42U-1	T or V3 Series Universal 42U Storage AC Cabinet	2	1,200.00	2,400.00
	PDU2000-32-1PH-20/4-B2	AC Power Distribution Unit	4	180.00	360.00
1.1.6	**Installation Material**				
	CE6850-EI-B00	CE6850-48S4Q-EI Switch(2*350W AC Power Module,2*FAN Box,Port side exhaust)	2	5,000.00	10,000.00
	SN2F01FCPC	Patch Cord,DLC/PC,DLC/PC,Multi-mode,3m,A1a.2,2mm,OM3 bending insensitive	88	11.00	968.00
	HS-SAS-1-01	High Speed Cable,External MiniSAS HD Cable,1m,(SFF 8644 Plug),(28AWG*4P*2B(S)),(SFF 8644 Plug),Indoor use	48	55.00	2,640.00
	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
	C3018BK00	Power Cable,300V/500V,60227 IEC 10(BVV),3x6mm^2,Black(3Cores:Brown,Blue,Yellow/Green),46A,Outdoor Cable,CCC,CE (Unit:meter)	74	5.70	421.80
1.1.7	**HBA**				
	N8GHBA000	QLOGIC QLE2562 HBA Card,PCIE,8Gbps DualPort ,Fiber Channel Multimode LC Optic Interface,English Manual, No Drive CD	36	1,000.00	36,000.00
1.1.8	**Storage Software**				
	LIC-6800V3-BS	Basic Software License for Block(Include Device Management,SmartThin,SmartMulti-tenant,SmartMigration,SmartErase,SmartMotion,Cloud Service)	1	6,146.88	6,146.88
	LIC-6800V3-PATH	OceanStor HW UltraPath Software License	1	945.60	945.60
Total of Product					**663,143.88**

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Priced Storage Configuration Pricing *(continued)*

1.1.9	Maintenance Support Service				
	02350BRY-88134ULJ-3	6800 V3(6U,Dual Ctrl,AC,512GB,SPE72C0600)-Warranty Upgrade To Hi-Care Onsite Premier 24x7x4H Engineer Onsite Service-3Year(s)	2	4,054.29	8,108.57
	02359806-88134ULJ-3	Disk Enclosure(2U,AC,2.5",Expanding Module,25 Disk Slots,without Disk Unit,DAE22525U2)-Warranty Upgrade To Hi-Care Onsite Premier 24x7x4H Engineer Onsite Service-3Year(s)	32	1,568.57	50,194.24
	88032KMV-88134UHK-3	OceanStor HW UltraPath Software License-Hi-Care Application Software Upgrade Support Service-3Year(s)	1	177.00	177.00
	88032NMR-88134UHK-3	Basic Software License for Block(Include Device Management,SmartThin,SmartMulti-tenant,SmartMigration,SmartErase,SmartMotion,Cloud Service)-Hi-Care Application Software Upgrade Support Service-3Year(s)	1	1,152.00	1,152.00
Total of Service (3 years)					59,631.81
Total Price					722,775.69

The following pricing includes the following:

- Acknowledgement of new and existing hardware and/or software problems within four hours.

- Onsite presence of a qualified maintenance engineer or provision of a customer replaceable part within four hours of the above acknowledgement for any hardware failure that results in an inoperative Priced Storage Configuration component.
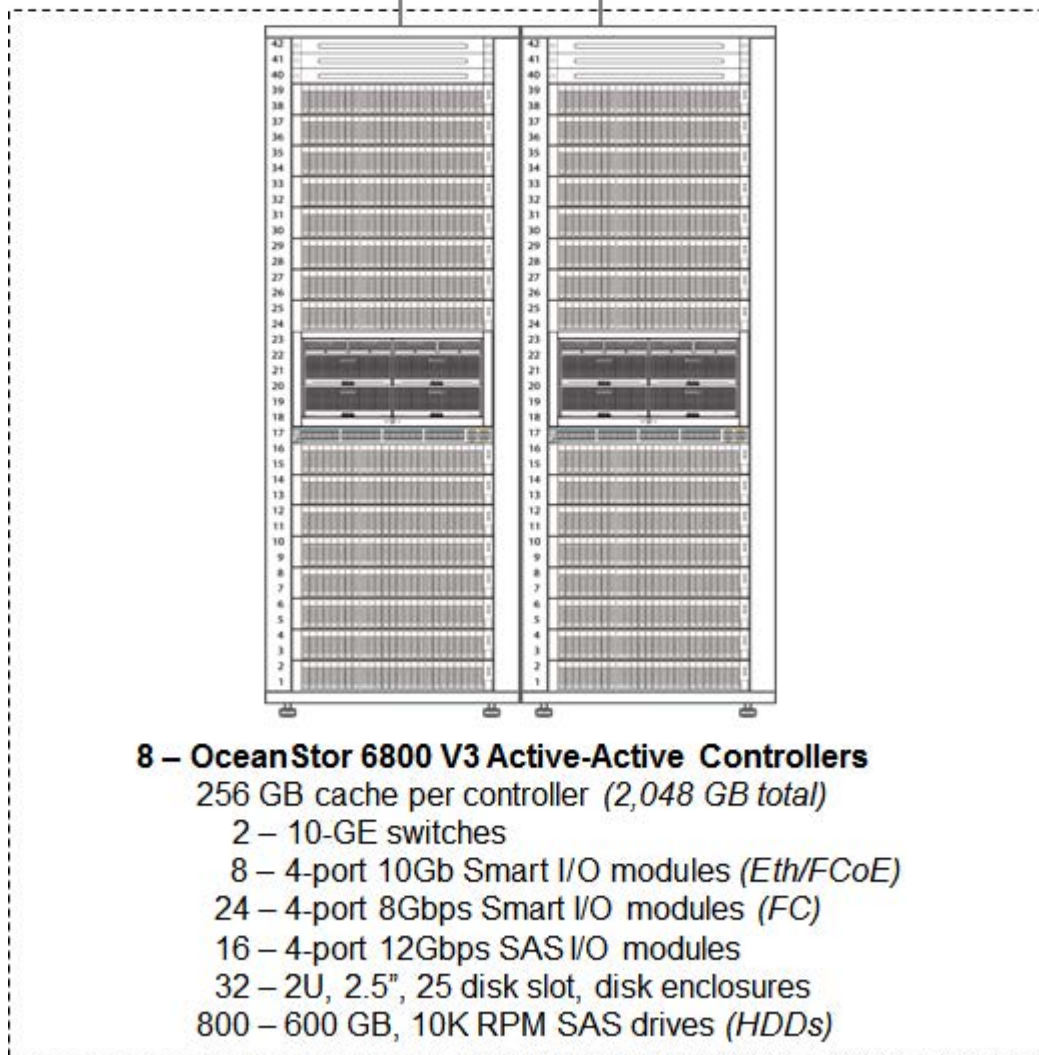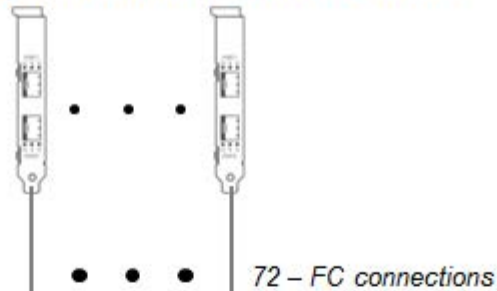
Huawei Technologies Co., Ltd. only sells its products to third-party resellers, who in turn, sell those products to U.S. customers. The above pricing, which also includes the required three-year maintenance and support, was obtained from one of those third-party resellers. See page 102 *(Appendix F: Third-Party Quotation)* of the Full Disclosure Report for a copy of the third-party reseller quotation.

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

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

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Priced Storage Configuration Diagram

36 – QLogic dual-ported QLE2562 FC HBAs

72 – FC connections

8 – OceanStor 6800 V3 Active-Active Controllers
256 GB cache per controller *(2,048 GB total)*
2 – 10-GE switches
8 – 4-port 10Gb Smart I/O modules *(Eth/FCoE)*
24 – 4-port 8Gbps Smart I/O modules *(FC)*
16 – 4-port 12Gbps SAS I/O modules
32 – 2U, 2.5", 25 disk slot, disk enclosures
800 – 600 GB, 10K RPM SAS drives *(HDDs)*

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Priced Storage Configuration Components

Priced Storage Configuration
Huawei OceanStor UltraPath
36 – QLogic QLE2562 dual-port, 8 Gbps, FC HBAs

Huawei OceanStor™ 6800 V3
 	
8 – Active-Active Controllers
    each controller includes:
    256 GB cache *(2,048 GB total)*
    3 – 4-port 8Gbps Smart I/O modules *(FC)*
        (24 modules total, 12 ports per controller, 96 ports total)
        (9 ports used per controller, 72 ports total used)
    2 – 4-port 12 Gbps SAS I/O modules
        (16 modules total, 64 ports total)
        (4 ports used per controller, 32 ports total used)

8 – 4-port 10Gb Smart I/O modules *(for inter-controller connectivity)*
2 – 10-GE switches *(for inter-controller connectivity)*
32 – Disk Enclosures *(2U, 2.5")*
800 – 600 GB 10K RPM SAS HDDs *(25 HDDs per disk enclosure)*
2 –V3 Series System Cabinet
4 – AC Power Distribution Units