



**SPC BENCHMARK 1™
EXECUTIVE SUMMARY**

**HUAWEI TECHNOLOGIES CO., LTD.
HUAWEI OCEANSTOR™ 18800 V3**

SPC-1 V1.14

**Submitted for Review: November 14, 2015
Submission Identifier: A00163**

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

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

Revision Information and Key Dates

Revision Information and Key Dates	
SPC-1 Specification revision number	V1.14
SPC-1 Workload Generator revision number	V2.3.0
Date Results were first used publicly	November 14, 2015
Date the FDR was submitted to the SPC	November 14, 2015
Date the Priced Storage Configuration is available for shipment to customers	currently available
Date the TSC completed audit certification	November 13, 2015

Tested Storage Product (TSP) Description

The OceanStor 18000 V3 series storage systems are the new benchmark for high-end storage, providing the best data services for enterprises' mission-critical businesses.

Scalable to 16 controllers, 16 TB of cache, and 27.6 PB total capacity, the 18000 V3 system handles large-scale OLTP and OLAP database applications with ease. The system's 3 million IOPS and extremely low latency give life to cloud computing applications.

Available in 2 models for large-scale, data-intensive applications in government, finance, telecommunications, power utilities, transportation, and manufacturing industries.

Summary of Results

SPC-1 Reported Data	
Tested Storage Product (TSP) Name: Huawei OceanStor™ 18800 V3	
Metric	Reported Result
SPC-1 IOPS™	3,010,007.37
SPC-1 Price-Performance™	\$0.79/SPC-1 IOPS™
Total ASU Capacity	68,934.225 GB
Data Protection Level	Protected 1 (<i>Mirroring</i>)
Total Price	\$2,370,763.89
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 1** using **Mirroring** configures two or more identical copies of user data.

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

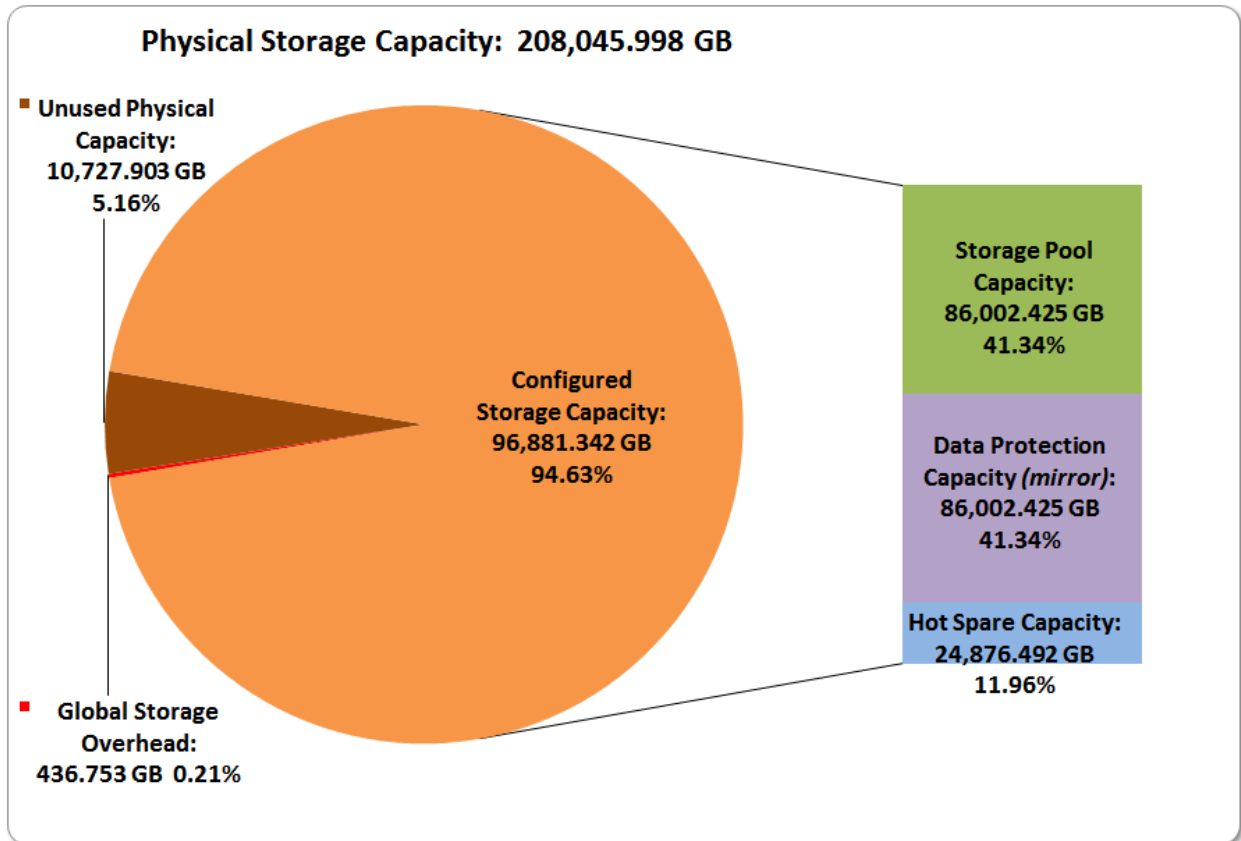
Total Price includes the cost of the Priced Storage Configuration plus three years of hardware maintenance and software support as detailed on page 8.

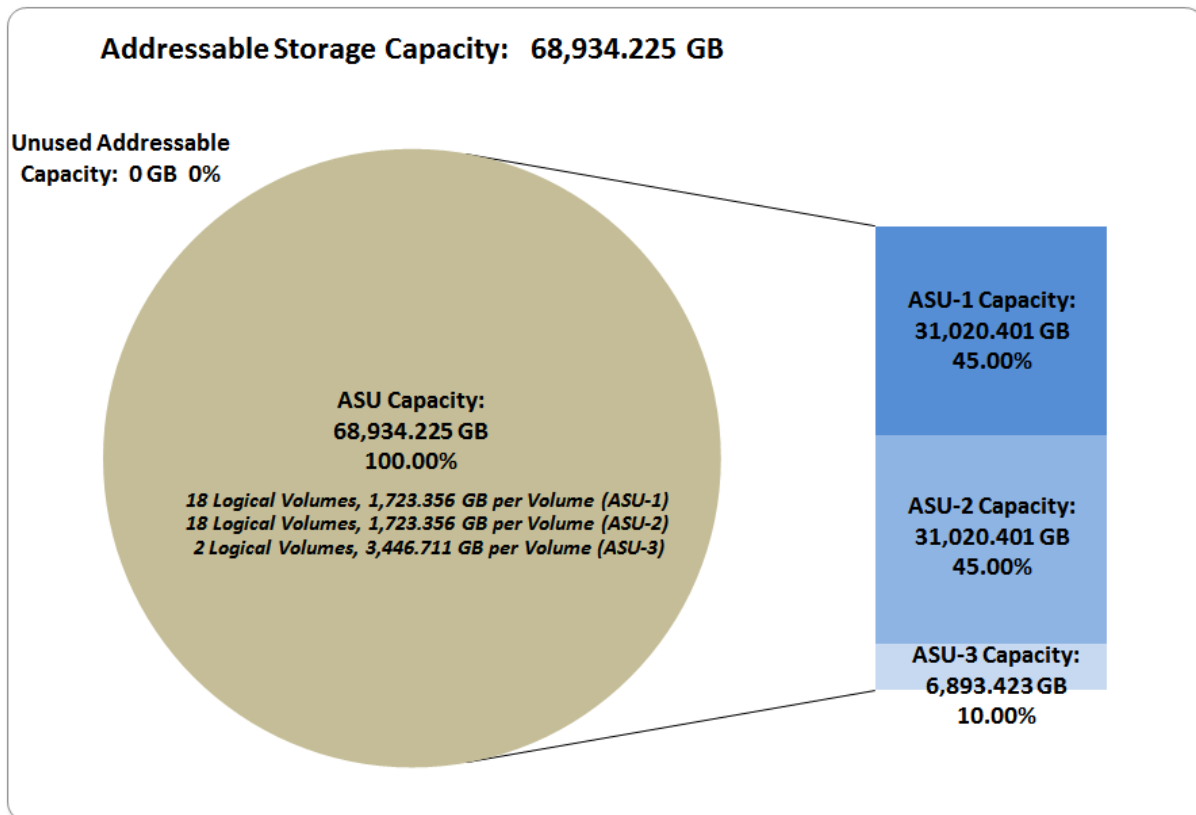
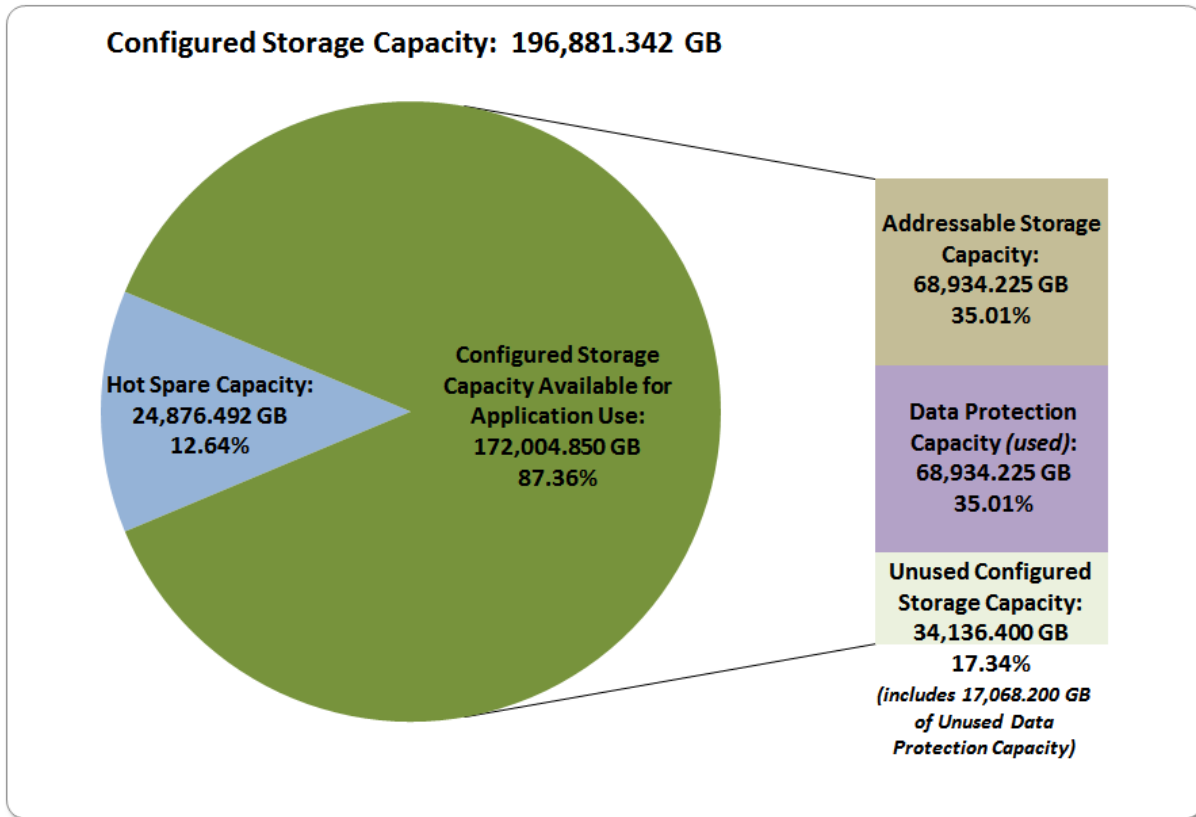
Currency Used is formal name for the currency used in calculating the **Total Price** and **SPC-1 Price-Performance™**. That currency may be the local currency of the **Target Country** or the currency of a difference country (*non-local currency*).

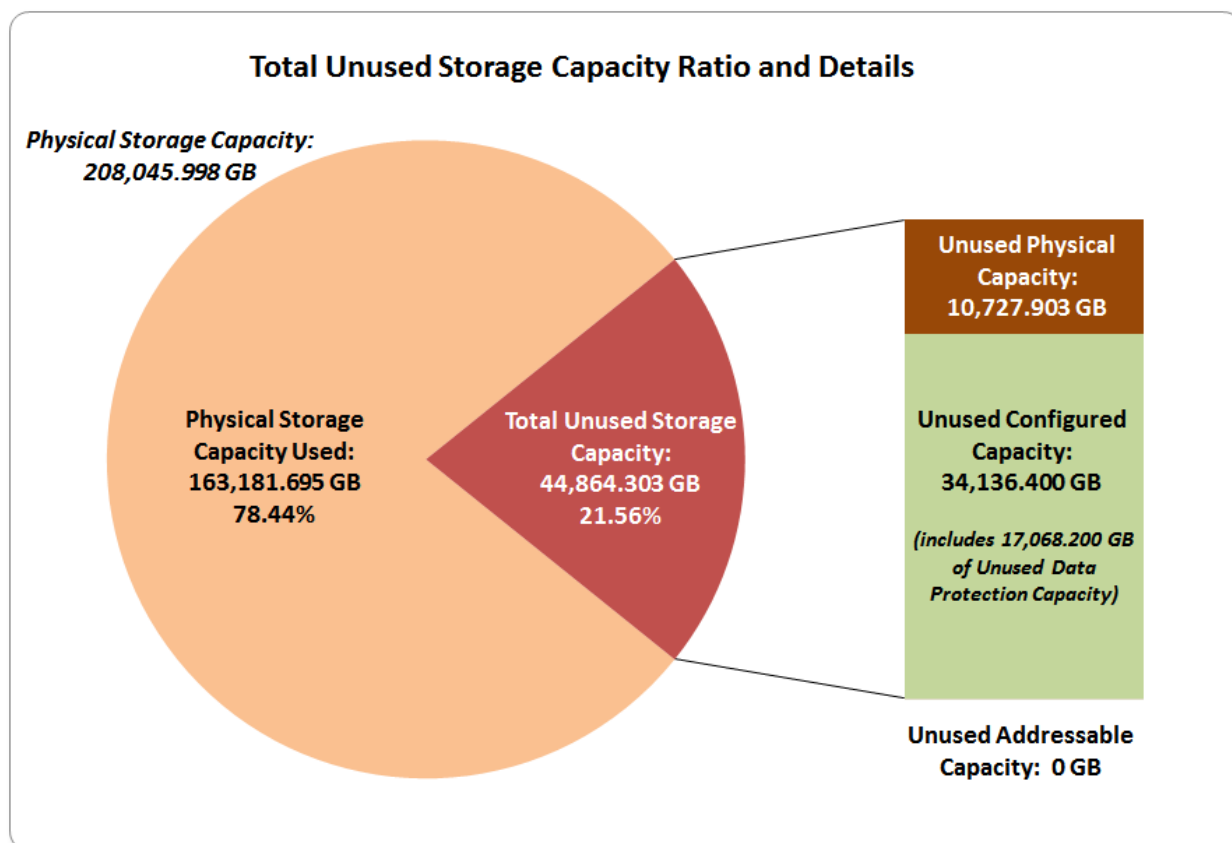
The **Target Country** is the country in which the Priced Storage Configuration is available for sale and in which the required hardware maintenance and software support is provided either directly from the Test Sponsor or indirectly via a third-party supplier.

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.







SPC-1 Storage Capacity Utilization	
Application Utilization	33.13%
Protected Application Utilization	66.27%
Unused Storage Ratio	21.56%

Application Utilization: Total ASU Capacity (68,934.225 GB) divided by Physical Storage Capacity (208,045.998 GB).

Protected Application Utilization: (Total ASU Capacity (68,934.225 GB) plus total Data Protection Capacity (86,002.425 GB) minus unused Data Protection Capacity (17,068.200 GB)) divided by Physical Storage Capacity (208,045.998 GB).

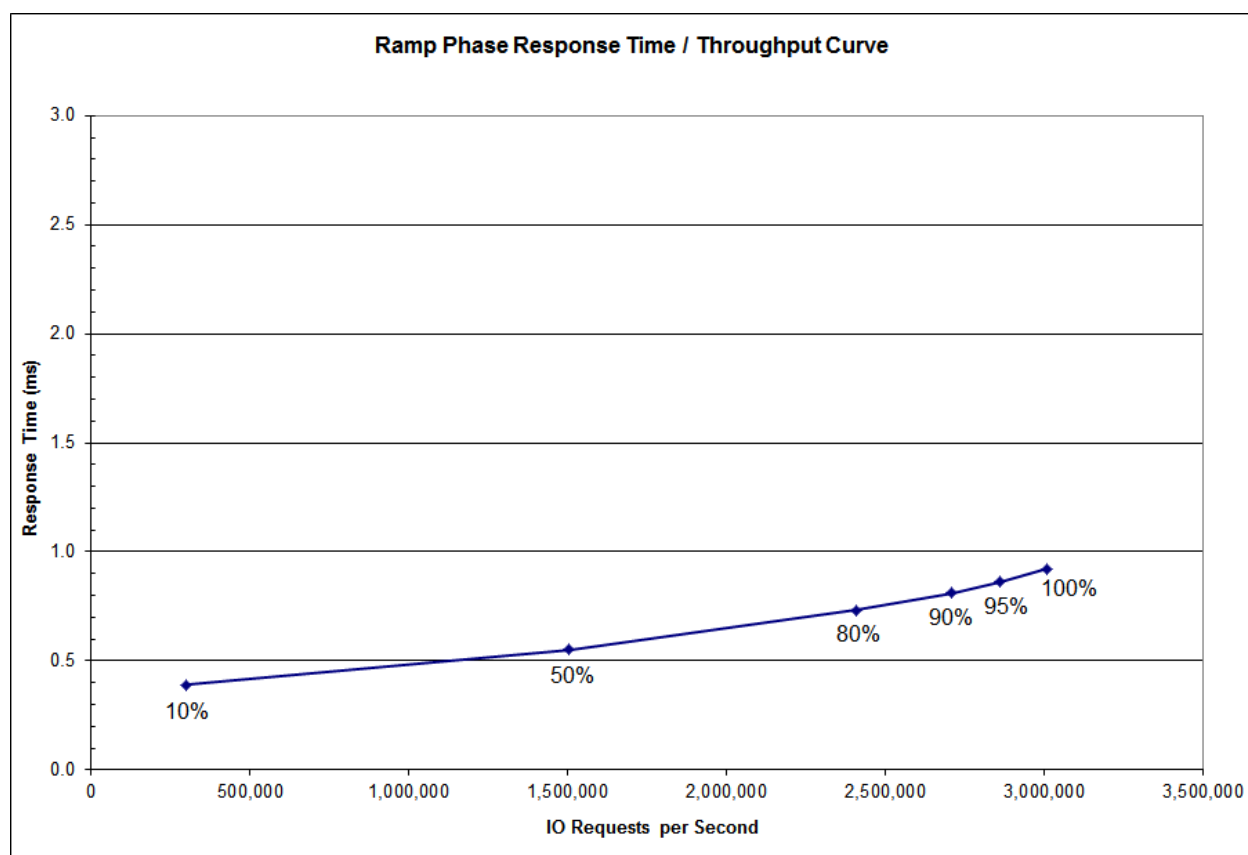
Unused Storage Ratio: Total Unused Capacity (44,864.303 GB) divided by Physical Storage Capacity (208,045.998 GB) and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 25-26 in the 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	300,985.93	1,505,067.60	2,407,867.14	2,708,970.22	2,859,478.87	3,010,007.37
Average Response Time (ms):						
All ASUs	0.39	0.55	0.73	0.81	0.86	0.92
ASU-1	0.38	0.58	0.77	0.86	0.91	0.97
ASU-2	0.42	0.63	0.85	0.95	1.01	1.07
ASU-3	0.39	0.46	0.59	0.65	0.70	0.75
Reads	0.39	0.71	0.97	1.08	1.15	1.22
Writes	0.39	0.45	0.58	0.64	0.68	0.73

Priced Storage Configuration Pricing

No.	Model	Description	Qty.	Unit Price (USD)	Total Price (USD)
1	Phase				
1.1	Location				
1.1.1	OceanStor 18800 V3 Storage System				
1.1.1.1	Engine				
	88V3-4C1T-AC	OceanStor 18800 V3 Engine(Four Controller,AC\240HVDC,1TB Cache,SPE72C0600)	4	67,081.80	268,327.20
1.1.1.2	Expand Interface Module				
	LPU5PCIEV3H	2 port PCIe I/O module	16	811.06	12,976.96
	SMARTIO8FCV3H	4 port SmartIO I/O module(SFP+,8Gb FC)	48	972.17	46,664.16
	LPU12S12V3H	12 port 12Gb SAS Entire Sharing I/O module(MiniSAS HD)	16	3,962.48	63,399.68
1.1.1.3	Disk Components				
	SSD400-2-H	400GB SSD eMLC SAS Disk Unit(2.5")	512	3,174.65	1,625,420.80
1.1.1.4	Disk Enclosure				
	DAE22525U2-H-AC	Disk Enclosure(2U,2.5",AC\240HVDC,DAE22525U2)	24	1,757.80	42,187.20
1.1.1.5	Cabinet				
	RACK-SYS-H-AC	OceanStor 18000 V3 Series System Cabinet	2	6,422.33	12,844.66
1.1.1.6	Option Class Item				
	SVP4-V3H	Service Processor (1U, AC\240HDVC,8GB Cache,Including Windows OS Software and Security software)	1	3,760.39	3,760.39
	WM1P0CIKVM02	KVM,KVM 4 in 1 Control Module,1U, 17" LED, 8 KVM ports, With Power Cable,8 USB Straight signal cables/With mounting Accessories,English doc,110V/240V AC,Black,Compliant	1	585.00	585.00
	SWITCH-V3H	PCIe Switch(AC\240HVDC,2GB Cache,16 Port,SWE1603P05)	2	1,587.47	3,174.94
	OQSFPOM00	Quadwire 40 Gb/s Parallel AOC	32	1,494.00	47,808.00
	PDU2000-V3-H	AC Power Distribution Unit	8	127.00	1,016.00
	HS-SAS-1-01	High Speed Cable,External MiniSAS HD Cable,1m,(SFF 8644 Plug),(28AWG*4P*2B(S)),(SFF 8644 Plug),Indoor use	32	55.00	1,760.00
	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
1.1.1.7	HBA				
	N8GHBA000	QLOGIC QLE2562 HBA Card,PCIe,8Gbps DualPort ,Fiber Channel Multimode LC Optic Interface,English Manual, No Drive CD	80	1,000.00	80,000.00
1.1.1.8	Accessory				
	VADMSMR02	Software Service,Trend Micro,05280169,Original Manufacturer Service, 1 Year,7*24 Standard Service,10 users	2	314.00	628.00
	SN2F01FCPC	Patch Cord,DLC/PC,DLC/PC,Multi-mode,3m,A1a.2,2mm,OM3 bending insensitive	160	11.00	1,760.00
	P-16mm^2-Olivine-LSZH	Power Cable,450V/750V,H07Z-K UL3386,16mm^2,Yellow/Green,107A,LSZH Cable,VDE,UL (Unit:meter)	10	3.80	38.00
	C3006BK01	Power Cable,600V/1000V,ZA-RVV,3x6mm^2,Black(3Cores:Brown,Blue,Yellow/Green),46A,Outdoor Cable,CE (Unit:meter)	80	6.90	552.00

Priced Storage Configuration Pricing (continued)

1.1.9 Storage Software					
	88V3-LBASIC-N	Basic Software Suite License(OceanStor OS,DeviceManager,SmartThin,SmartMotion,SmartQos,SmartPartition,SmartCache,SmartMigration,SmartErase,SmartMulti-tenant,SystemReporter,Cloud Service)	1	2,815.25	2,815.25
	88V3-LBASIC200	Basic Software Suite Capacity License(101-200TB)	200	160.87	32,174.00
	88V3-LBASICU	Basic Software Suite Unlimited Capacity License	1	0.01	0.01
	88V3-LULTRAPATH	OceanStor UltraPath Software License	1	596.37	596.37
Total of Product					2,250,024.62
1.1.10 Maintenance Support Service					
	88125ESH	OceanStor 18800 V3 Installation Service - Engineering	1	107,346.67	107,346.67
	88032XVE-88134UHK-3	Basic Software Suite Capacity License(101-200TB)-Hi-Care Application Software Upgrade Support Service-3Year(s)	200	62.74	12,548.00
	88032XVG-88134UHK-3	Basic Software Suite Unlimited Capacity License-Hi-Care Application Software Upgrade Support Service-3Year(s)	1	0.01	0.01
	88032YCT-88134UHK-3	OceanStor UltraPath Software License-Hi-Care Application Software Upgrade Support Service-3Year(s)	1	0.01	0.01
	88033JKR-88134UHK-3	Basic Software Suite License(OceanStor OS,DeviceManager,SmartThin,SmartMotion,SmartQos,SmartPartition,SmartCache,SmartMigration,SmartErase,SmartMulti-tenant,SystemReporter,Cloud Service)-Hi-Care Application Software Upgrade Support Service-3Year(s)	1	844.58	844.58
Total of Service (3 years)					120,739.27
Total Price					2,370,763.89

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 Priced Storage Configuration that can be remedied by the repair or replacement of a Priced Storage Configuration component.

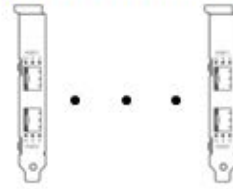
Huawei Technologies Co., Ltd. only sells its products to third-party resellers, who in turn, sell those products to U.S. customers. The above pricing, which also includes the required three-year maintenance and support, was obtained from one of those third-party resellers. See page 99 (*Appendix F: Third-Party Quotation*) in the corresponding SPC-1 Full Disclosure Report for a copy of the third-party reseller quotation.

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

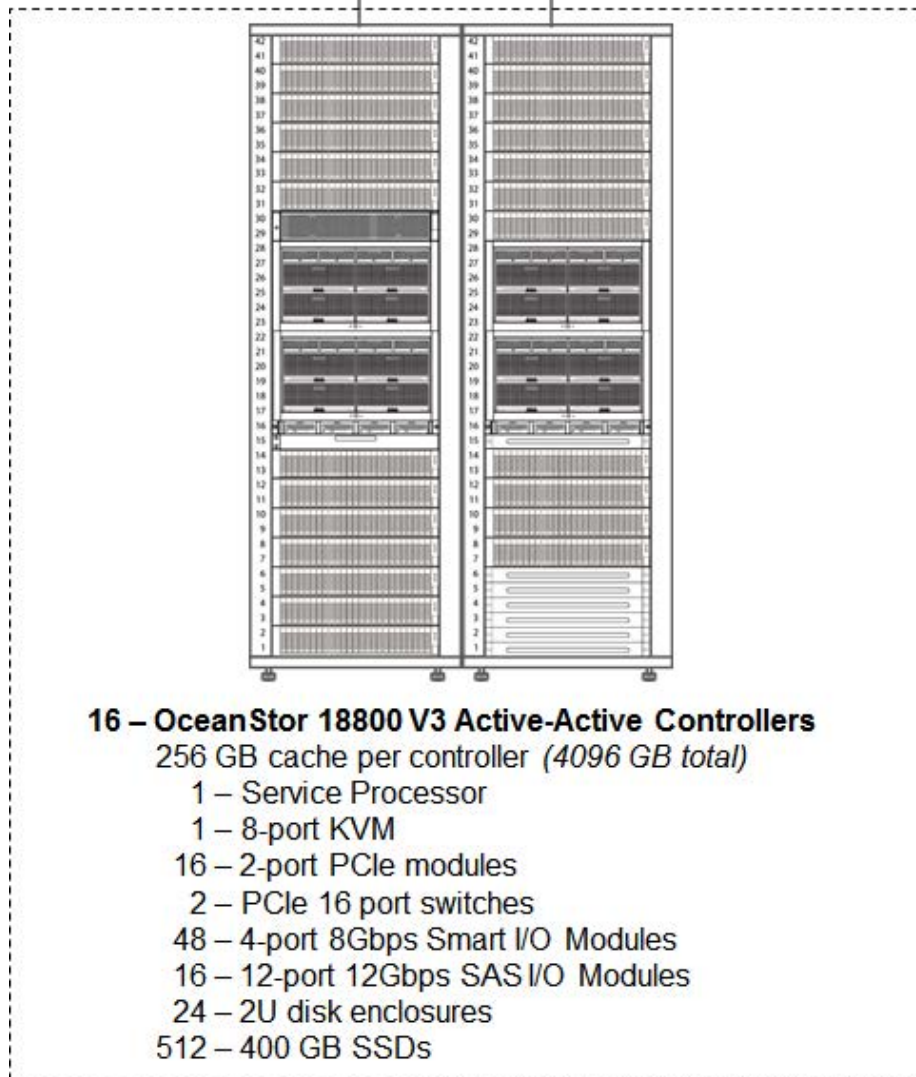
There were no differences between the Tested Storage Configuration and the Priced Storage Configuration.

Priced Storage Configuration Diagram

80 – QLogic dual-ported QLE2562 FC HBAs



160 – 8 Gbps FC connections



16 – OceanStor 18800 V3 Active-Active Controllers

256 GB cache per controller (4096 GB total)

1 – Service Processor

1 – 8-port KVM

16 – 2-port PCIe modules

2 – PCIe 16 port switches

48 – 4-port 8Gbps Smart I/O Modules

16 – 12-port 12Gbps SAS I/O Modules

24 – 2U disk enclosures

512 – 400 GB SSDs

Huawei OceanStor™ 18800 V3

Priced Storage Configuration Components

Priced Storage Configuration
OceanStor UltraPath
80 – QLogic QLE2562 dual-port, 8 Gbps, FC HBAs
Huawei OceanStor™ 18800 V3
16 – Active-Active Controllers each controller includes: 256 GB cache (<i>4,096 GB total</i>) 3 – 4-port 8Gbps Smart I/O modules <i>(48 modules total, 12 ports per controller, 192 ports total)</i> <i>(10 ports used per controller, 160 ports total used)</i> 1 – 12-port 12 Gbps SAS I/O module <i>(16 modules total, 192 ports total)</i> <i>(3 ports used per controller, 48 ports total used)</i>
1 – Service Processor
1 – 8-port KVM
16 – 2-port PCIe modules (<i>for inter-controller connectivity</i>)
2 – PCIe 16 port switches (<i>for inter-controller connectivity</i>)
24 – Disk Enclosures (<i>2U, 2.5"</i>)
512 – 400 GB SSDs <i>24 SSDs in 16 enclosures</i> <i>16 SSDs in 8 enclosures</i>
2 – OceanStor 18000 V3 Series System Cabinet
8 – AC Power Distribution Units