



**SPC BENCHMARK 1™  
EXECUTIVE SUMMARY**

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

**SPC-1 V1.14**

**Submitted for Review: January 24, 2014**

**Submission Identifier: A00140**

**Revised: January 28, 2014**

**EXECUTIVE SUMMARY****Test Sponsor and Contact Information**

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**Revision Information and Key Dates**

<b>Revision Information and Key Dates</b>	
<b>SPC-1 Specification revision number</b>	V1.14
<b>SPC-1 Workload Generator revision number</b>	V2.3.0
<b>Date Results were first used publicly</b>	January 24, 2014
<b>Date the FDR was submitted to the SPC</b>	January 24, 2014
<b>Date revised FDR was submitted to the SPC</b> Corrected Audit Certification letter date Minor typographical corrections	January 28, 2014
<b>Date the Priced Storage Configuration is available for shipment to customers</b>	currently available
<b>Date the TSC completed audit certification</b>	January 24, 2014

## **Tested Storage Product (TSP) Description**

Huawei OceanStor™ 18000 Series Enterprise Storage System is an optimum storage platform for next generation data centers that features virtualization, hybrid and simplified IT. Flexible and efficient, OceanStor™ 18000 Series meets the demanding requirements of mission-critical applications in industries including finance, government sector, energy, manufacturing, transportation, education and telecommunications.

The SmartTier feature of OceanStor™ 18000 Series automatically analyzes data access frequency in a finer-grained manner and migrates data to proper disk tiers of SSD, SAS and NL-SAS accordingly. Customers can specify the statistical period (by hour or day), migration data size (from 256 KB to 64 MB), migration mode (automatic or manual), migration period and speed per needs. The SmartTier improves the storage performance of hot data, reduces storage cost of cold data and thus increases the system overall price performance ratio.

## Summary of Results

SPC-1 Reported Data	
Tested Storage Product (TSP) Name: Huawei OceanStor™ 18800	
Metric	Reported Result
SPC-1 IOPS™	1,005,893.43
SPC-1 Price-Performance™	\$2.78/SPC-1 IOPS™
Total ASU Capacity	274,877.907 GB
Data Protection Level	Protected 2 ( <i>Mirroring</i> )
Total Price	\$2,794,971.80
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 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-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 10.

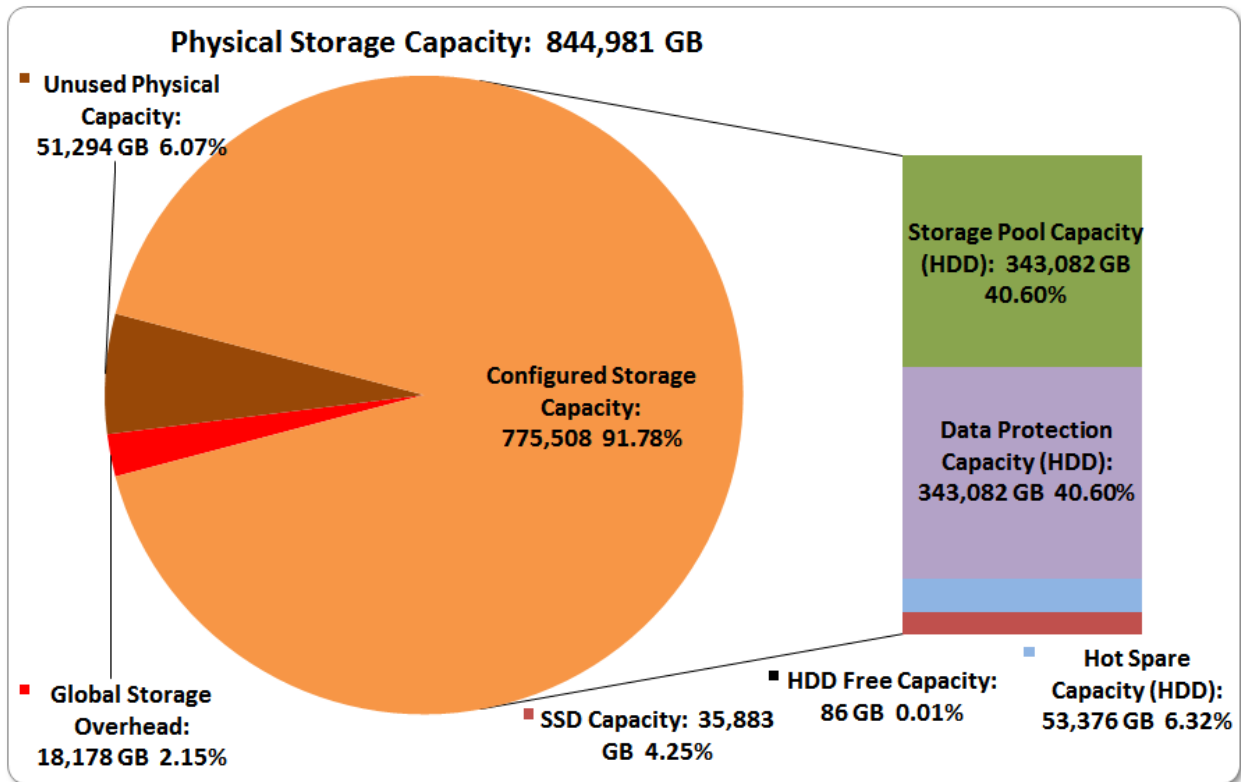
**Currency Used** is formal name for the currency used in calculating the **Total Price** and **SPC-1 Price-Performance™**. That currency may be the local currency of the **Target Country** or the currency of a difference country (*non-local currency*).

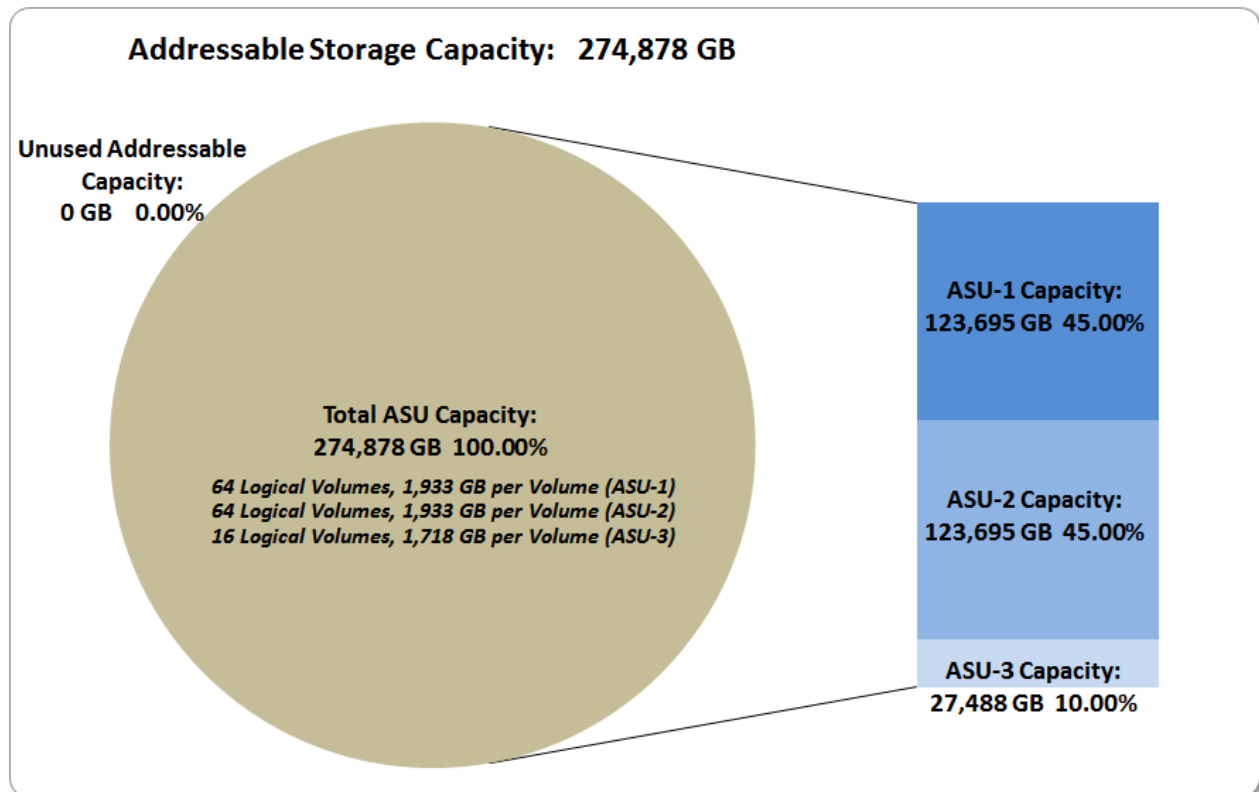
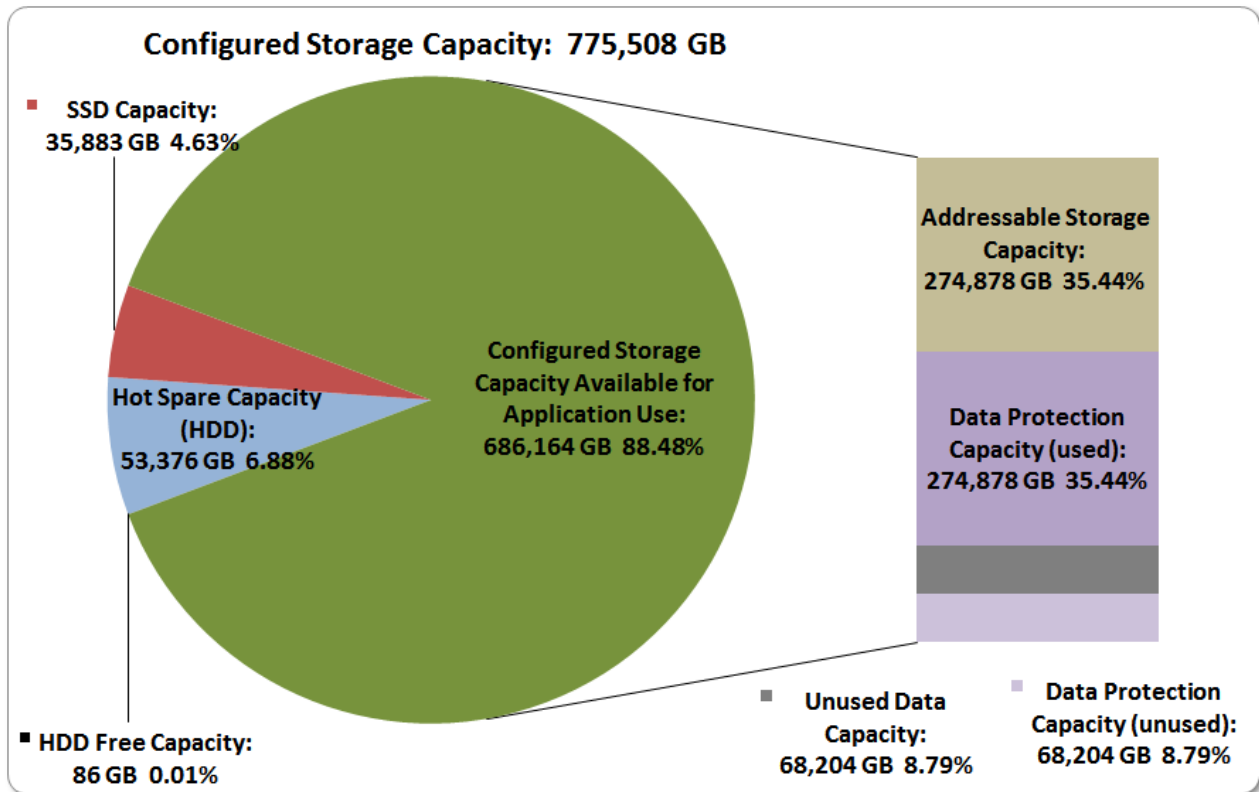
The **Target Country** is the country in which the Priced Storage Configuration is available for sale and in which the required hardware maintenance and software support is provided either directly from the Test Sponsor or indirectly via a third-party supplier.

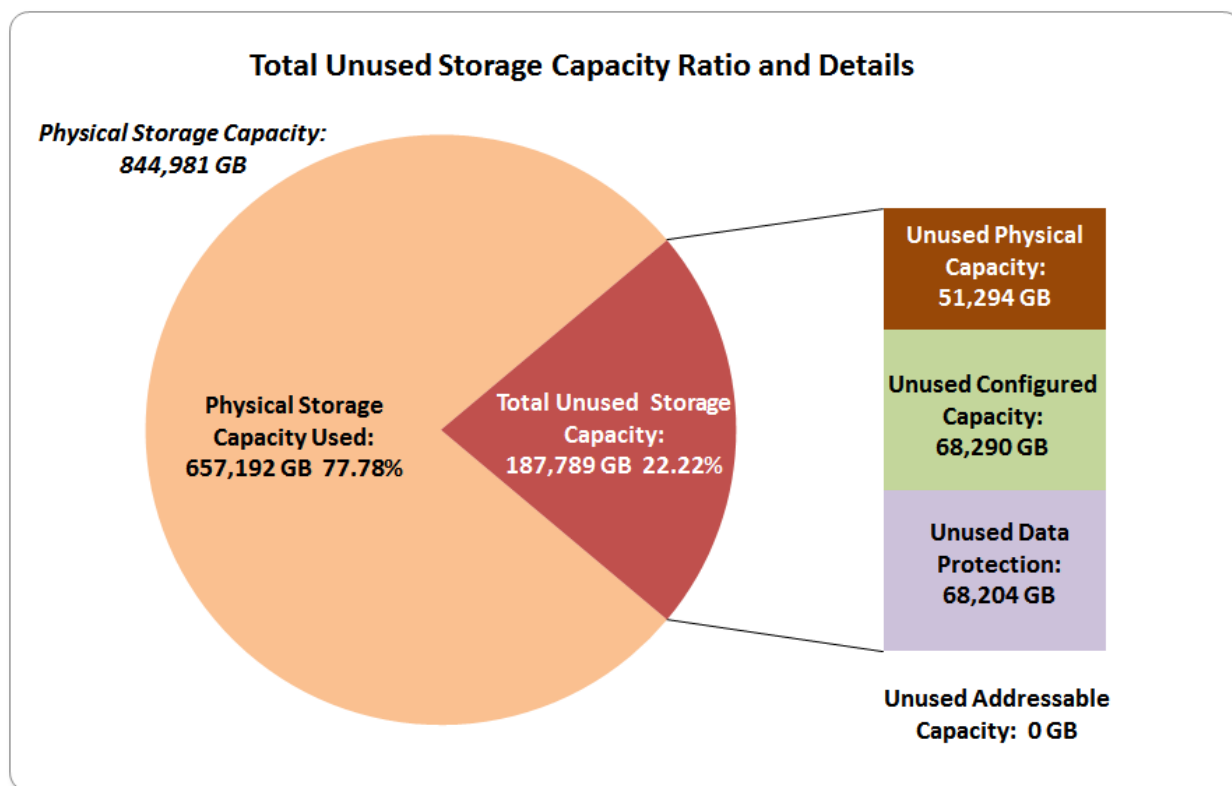
### Storage Capacities, Relationships, and Utilization

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.

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.







SPC-1 Storage Capacity Utilization	
Application Utilization	32.53%
Protected Application Utilization	65.06%
Unused Storage Ratio	22.22%

**Application Utilization:** Total ASU Capacity (274,877.907 GB) divided by Physical Storage Capacity (844,980.579 GB).

**Protected Application Utilization:** Total ASU Capacity (274,877.907 GB) plus total Data Protection Capacity (343,081.988 GB) minus unused Data Protection Capacity (68,204.081 GB) divided by Physical Storage Capacity (844,980.579 GB).

**Unused Storage Ratio:** Total Unused Capacity (187,788.661 GB) divided by Physical Storage Capacity (844,980.579 GB) and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 32-33 in the Full Disclosure Report.

## SmartTier Overview

SmartTier analyzes the activity levels of data and matches it with proper storage media accordingly. Active data will be promoted to higher performance storage media such as SSD, and data that is less active will be demoted to cost effective ones.

The SmartTier data migration process consists of performance statistics collection, data analysis and data migration.

- Performance statistics are collected by an I/O monitoring module, which identifies I/O activities and sizes. User-defined monitoring periods are allowed.
- The data placement analysis module identifies “hot” and “cold” data based on the performance statistics collected during the I/O monitoring.
- The data migration module allocates data to different storage tiers according to data placement analysis. Data migration can be either manual or automatic. Manual migration occurs immediately when necessary, while automatic migration will occur based on the preset migration start time and duration, which is user-definable.

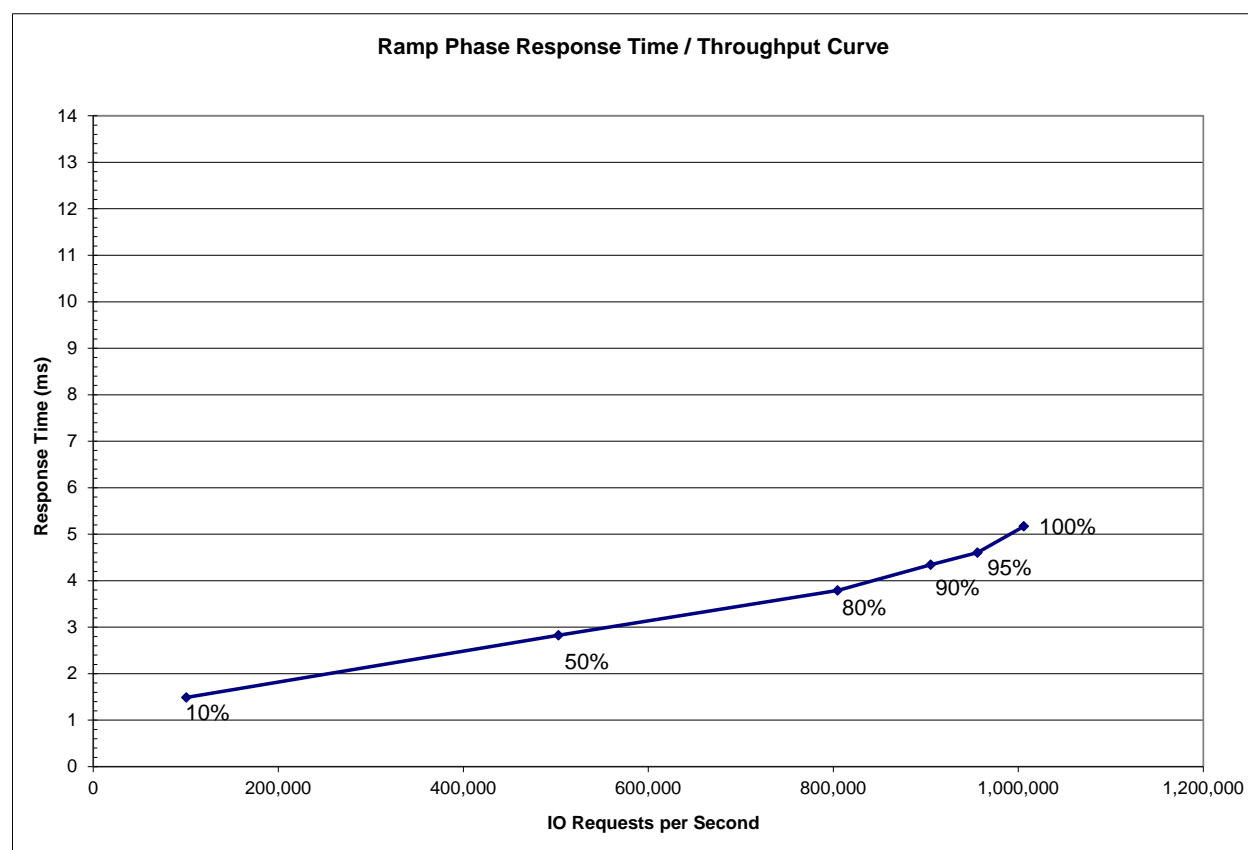
The SPC-1 Application Storage Units (*ASU-1, ASU-2 and ASU-3*) were defined to only utilize the available HDD storage capacity. The SSD storage capacity was utilized by SmartTier for relocation of “hot” data.



## 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
<b>I/O Request Throughput</b>	100,595.53	502,965.70	804,787.27	905,380.23	955,814.41	1,005,893.43
<b>Average Response Time (ms):</b>						
<b>All ASUs</b>	1.49	2.83	3.79	4.34	4.60	5.17
<b>ASU-1</b>	1.33	2.48	3.30	3.78	4.02	4.56
<b>ASU-2</b>	2.70	5.61	8.14	9.26	9.81	10.64
<b>ASU-3</b>	1.28	2.33	2.92	3.38	3.55	4.07
<b>Reads</b>	1.84	3.61	5.15	5.85	6.24	6.88
<b>Writes</b>	1.26	2.31	2.91	3.36	3.54	4.06

## Priced Storage Configuration Pricing

No.	Model	Description	Qty	Unit Price(\$)	Total Price(\$)
<b>1</b>	<b>Phase</b>				
<b>1.1</b>	<b>Location</b>				
<b>1.1.1</b>	<b>OceanStor 18800 Enterprise System</b>				
<b>1.1.1.1</b>	<b>Control Module</b>				<b>310,345.60</b>
	C2E384G-AC	OceanStor 18800 - Engine(Dual Controller,AC, 384GB Cache	8	34912.00	279,296.00
	SYSRACK0-AC	Primary Controller Rack	1	4688.00	4,688.00
	SYSRACK1-AC	Second Controller Rack	1	5088.00	5,088.00
	SYSRACKEXP-AC	Controller Rack Exp	6	3545.60	21,273.60
<b>1.1.1.2</b>	<b>Disk Enclosure</b>				<b>100,556.80</b>
	DAE-4U-AC	DAE12435U4 Disk Enclosure(4U,3.5",AC)	64	1571.20	100,556.80
<b>1.1.1.3</b>	<b>Hard Disk Drives</b>				<b>1,243,545.60</b>
	SAS600-15K-3	600GB 15K RPM SAS Drive(3.5")	1344	524.80	705,331.20
	SLC200-3	200GB SLC SSD Drive(3.5")	192	2803.20	538,214.40
<b>1.1.1.4</b>	<b>IO Interface</b>				<b>78,848.00</b>
	LPU-F4X8G	4*8Gbps Fibre Channel I/O modules(Total 4 ports)	16	2662.40	42,598.40
	LPU-S2X24G-BACK	2*24Gbps SAS-wide I/O modules(Total 2 ports)	32	1132.80	36,249.60
<b>1.1.1.5</b>	<b>Switch</b>				<b>18,095.04</b>
	SN0Z01FCSP	OceanStor SNS2120 FC Switch,Single-Power Supply,AC,20 Ports Enabled(Includes 20*8Gb SFPs,20 Ports(MAX)),4*10Gb Stacking Ports	4	4072.00	16,288.00
	SN0-TOL-RM	Rack Mount Kit,For SNS2120	1	61.12	61.12
	SN0-CAB-228MM	SNS2120 FC Switch,Stacking Cable,228mm	16	109.12	1,745.92
<b>1.1.1.6</b>	<b>Accessory</b>				<b>1,027.00</b>
	DLC-3	Patch Cord,DLC/PC-DLC/PC,Multimode,2mm Parallel,3m	72	13.00	936.00
	MODEM-56K	Modem,56K/Data/Fax,External,Split Type(DB25 To DB25,DB9) Cable,English/Chinese Documents,AC To 12VAC Transformer	1	91.00	91.00
<b>1.1.1.7</b>	<b>HBA</b>				<b>8,000.00</b>
	N8GHBA000	QLOGIC QLE2562 HBA Card,PCIE,8Gbps DualPort ,Fiber Channel Multimode LC Optic Interface,English Manual, No Drive CD	8	1000.00	8,000.00
<b>1.1.1.8</b>	<b>Host Software</b>				<b>1,027.20</b>
	STLUP	UltraPath Software License	1	1027.20	1,027.20

**Priced Storage Configuration Pricing (continued)**

<b>1.1.1.9</b>	<b>Storage Software</b>				<b>790,709.76</b>
	STLSFLIC88T	XVE Software For OceanStor 18800 Base License	1	5254.40	5,254.40
	STLS14S88T	XVE Software For OceanStor 18800, 1TB (0-14TB) ,SSD & SAS	14	484.48	6,782.72
	STLS25S88T	XVE Software For OceanStor 18800, 1TB (15-25TB) ,SSD & SAS	11	474.56	5,220.16
	STLS40S88T	XVE Software For OceanStor 18800, 1TB (26-40TB) ,SSD & SAS	15	465.28	6,979.20
	STLS60S88T	XVE Software For OceanStor 18800, 1TB (41-60TB) ,SSD & SAS	20	456.00	9,120.00
	STLS100S88T	XVE Software For OceanStor 18800, 1TB (61-100TB) ,SSD & SAS	40	446.72	17,868.80
	STLS150S88T	XVE Software For OceanStor 18800, 1TB (101-150TB) ,SSD & SAS	50	437.76	21,888.00
	STLS250S88T	XVE Software For OceanStor 18800, 1TB (151-250TB) ,SSD & SAS	100	429.12	42,912.00
	STLS400S88T	XVE Software For OceanStor 18800, 1TB (251-400TB) ,SSD & SAS	150	420.48	63,072.00
	STLS4BS88T	XVE Software For OceanStor 18800, 1TB (400+TB) ,SSD & SAS	445	412.16	183,411.20
	STLDMC88T	Management Console For OceanStor 18800 Base License	1	5254.40	5,254.40
	STLD14S88T	Management Console For OceanStor 18800, 1TB (0-14TB) ,SSD & SAS	14	322.88	4,520.32
	STLD25S88T	Management Console For OceanStor 18800, 1TB (15-25TB) ,SSD & SAS	11	316.48	3,481.28
	STLD40S88T	Management Console For OceanStor 18800, 1TB (26-40TB) ,SSD & SAS	15	310.08	4,651.20
	STLD60S88T	Management Console For OceanStor 18800, 1TB (41-60TB) ,SSD & SAS	20	304.00	6,080.00
	STLD100S88T	Management Console For OceanStor 18800, 1TB (61-100TB) ,SSD & SAS	40	297.92	11,916.80
	STLD150S88T	Management Console For OceanStor 18800, 1TB (101-150TB) ,SSD & SAS	50	291.84	14,592.00
	STLD250S88T	Management Console For OceanStor 18800, 1TB (151-250TB) ,SSD	100	286.08	28,608.00
	STLD400S88T	Management Console For OceanStor 18800, 1TB (251-400TB) ,SSD & SAS	150	280.32	42,048.00
	STLD4BS88T	Management Console For OceanStor 18800, 1TB (400+TB) ,SSD & SAS	445	274.88	122,321.60

**Priced Storage Configuration Pricing (continued)**

	STLSCT88T	SmartTier Software OceanStor 18800 Base License	1	14011.52	14,011.52
	STLT14S88T	SmartTier Software OceanStor 18800, 1TB (0-14TB) ,SSD & SAS	14	403.84	5,653.76
	STLT25S88T	SmartTier Software OceanStor 18800, 1TB (15-25TB) ,SSD & SAS	11	363.20	3,995.20
	STLT40S88T	SmartTier Software OceanStor 18800, 1TB (26-40TB) ,SSD & SAS	15	327.04	4,905.60
	STLT60S88T	SmartTier Software OceanStor 18800, 1TB (41-60TB) ,SSD & SAS	20	294.40	5,888.00
	STLT100S88T	SmartTier Software OceanStor 18800, 1TB (61-100TB) ,SSD & SAS	40	264.96	10,598.40
	STLT150S88T	SmartTier Software OceanStor 18800, 1TB (101-150TB) ,SSD & SAS	50	238.40	11,920.00
	STLT250S88T	SmartTier Software OceanStor 18800, 1TB (151-250TB) ,SSD & SAS	100	214.40	21,440.00
	STLT400S88T	SmartTier Software OceanStor 18800, 1TB (251-400TB) ,SSD & SAS	150	193.28	28,992.00
	STLT4BS88T	SmartTier Software OceanStor 18800, 1TB (400+TB) ,SSD & SAS	445	173.76	77,323.20
<b>Total of Product</b>					<b>2,552,155.00</b>
<b>1.1.1.10 Maintenance Support Service</b>					<b>242,816.80</b>
		OceanStor 18800 Engineering Service System Rack,Installation Base Service,per Set	8	6393.31	51,146.48
		Engineering Service System Warranty Upgrade To Hi-Care Onsite Premier 24x7x4H Engineer Onsite Service (Per Set*3Year)	8	8491.00	67,928.00
		Disk Enclosure Warranty Upgrade To Hi-Care Onsite Premier 24x7x4H Engineer Onsite Service(Per Set*3Year)	64	1933.47	123,742.32
<b>Total of Service (3 years)</b>					<b>242,816.80</b>
<b>Total Price</b>					<b>2,794,971.80</b>

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:

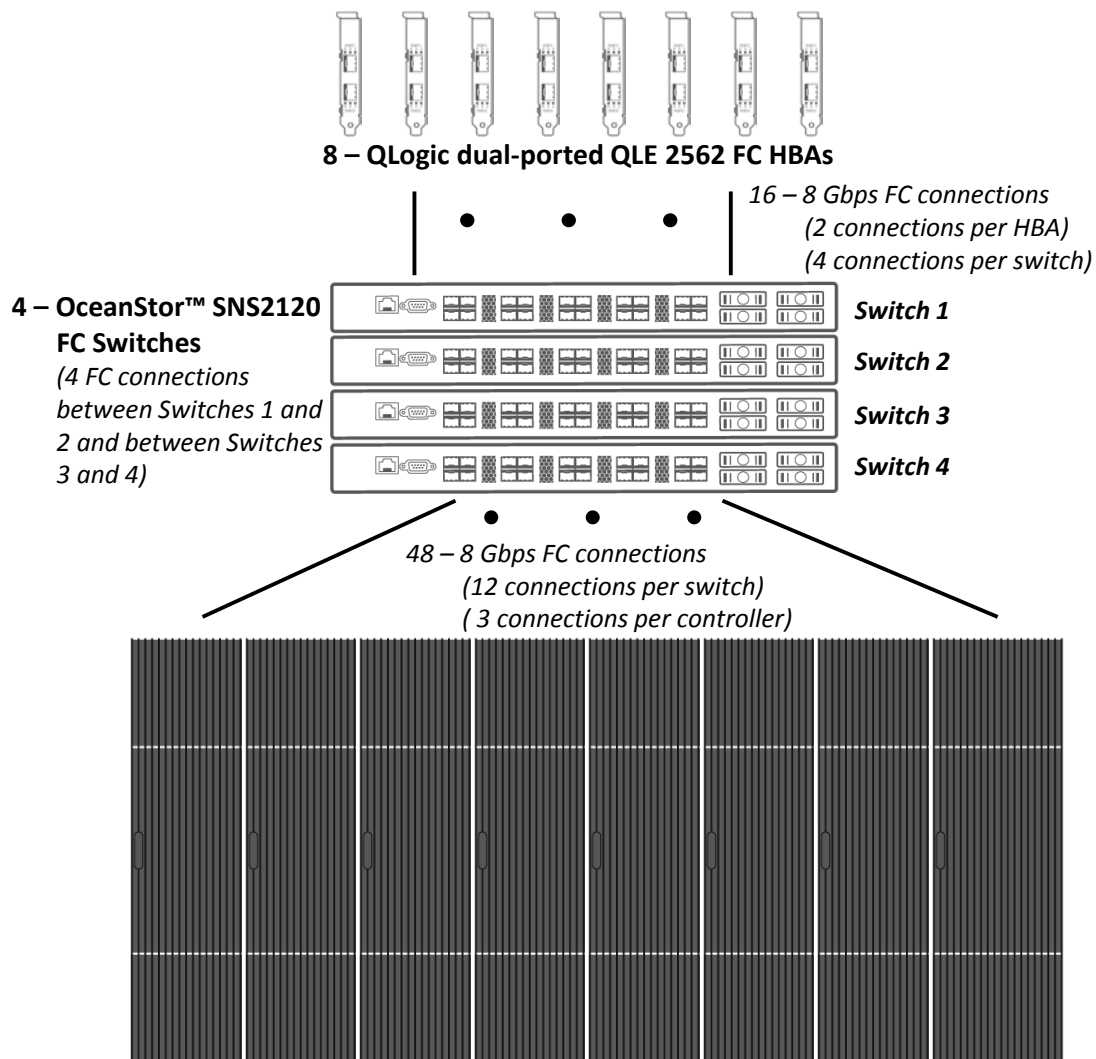
- Acknowledgement of new and existing problems with four (4) hours.
- Onsite presence of a qualified maintenance engineer or provision of a customer replaceable part within four (4) hours of the above acknowledgement for any hardware failure that results in an inoperative Priced Storage Configuration 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 122 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.

## Priced Storage Configuration Diagram



### Huawei OceanStor™ 1880

**8 – Dual Controllers (OceanStor™ 1880 Engine)**  
(16 controllers total)

each dual controller includes:

**384 GB cache (3,072 GB total)**

**2 – 4-port Fibre Channel I/O modules**

(16 modules total, 64 ports total, 48 ports used)

**4 – 2-port 24 Gbps SAS-wide I/O modules**

(32 modules total, 64 ports total and used)

**64 – Disk Enclosures**

**1,344 – 600 GB, 15K RPM SAS drives (HDDs)**

**192 – 200 GB SLC SSD drives**

**1 – Primary Controller Rack**

**1 – Second Controller Rack**

**6 – Controller Rack Exp.**

## Priced Storage Configuration Components

<b>Priced Storage Configuration</b>
8 – QLogic QLE2562 dual-port, 8 Gbps, FC HBAs
4 – OceanStor™ SNS2120 FC Switches, each switch includes 20 ports enabled, 20 8Gbps SFPs
<b>Huawei OceanStor™ 18800</b>
8 – Dual Controllers ( <i>OceanStor™ 18800 Engine</i> ), (16 controllers total), each dual controller includes: 384 GB cache ( <i>192 GB per controller, 3,072 GB total</i> ) 2 – 4 port Fibre Channel I/O modules ( <i>16 modules total, 64 ports total, 48 ports used</i> ) 4 – 2 port 24 Gbps SAS-wide I/O modules ( <i>32 modules total, 64 ports total, 64 ports used</i> )
1,344 – 600 GB, 15K RPM SAS drives ( <i>HDDs</i> )
192 – 200 GB SLC SSD drives
64 – Disk Enclosures ( <i>4U, 3.5"</i> ) ( <i>56 disk enclosures, each with 24 HDDs</i> ) ( <i>8 disk enclosures, eah with 24 SSDs</i> )
1 – Primary Controller Rack with 2 PDUs
1 – Second Controller Rack with 2 PDUs
6 – Controller Rack Exp. each 2 PDUs