



**SPC BENCHMARK 1™  
EXECUTIVE SUMMARY**

**HITACHI DATA SYSTEMS CORPORATION  
HITACHI UNIFIED STORAGE 150 (*WITH SSDS*)**

**SPC-1 V1.13**

**Submitted for Review: March 26, 2013**

**Submission Identifier: A00129**

**Revised: March 20, 2014**

## EXECUTIVE SUMMARY

### Test Sponsor and Contact Information

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### Revision Information and Key Dates

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<b>SPC-1 Specification revision number</b>	V1.13
<b>SPC-1 Workload Generator revision number</b>	V2.3.0
<b>Date Results were first used publicly</b>	March 26, 2013
<b>Date the FDR was submitted to the SPC</b>	March 26, 2013
<b>Date revised FDR was submitted to the SPC</b> Revised pricing ( <a href="#">page 6</a> ) Revised price-related SPC-1 Reported Data ( <a href="#">page 3</a> ) New third-party quote ( <a href="#">page 79 of the Full Disclosure Report</a> )	March 20, 2014
<b>Date the Priced Storage Configuration is available for shipment to customers</b>	April 24, 2012
<b>Date the TSC completed audit certification</b>	March 19, 2013

### Tested Storage Product (TSP) Description

Hitachi redefines unified storage with Hitachi Unified Storage. With trusted Hitachi reliability, it helps you meet application availability requirements and application latency requirements with lower investment. You will be able to deploy storage for all data types and easily grow to meet expanding requirements with software features like HDT and meet service level objectives for critical business applications. It simplifies operations with easy to use management and is part of a robust portfolio of storage solutions that can be managed from a single interface for optimal management efficiency. Combine all of this with the solution portfolio for the HUS portfolio and customers will find that the HUS platform will address all of their data center needs.

## Summary of Results

SPC-1 Reported Data	
Tested Storage Product (TSP) Name: Hitachi Unified Storage 150 (with SSDs)	
Metric	Reported Result
SPC-1 IOPS™	125,018.87
SPC-1 Price-Performance™	\$1.63/SPC-1 IOPS™
Total ASU Capacity	1,717.987 GB
Data Protection Level	Protected 2 (Mirroring)
Total Price	\$203,301.34
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.*

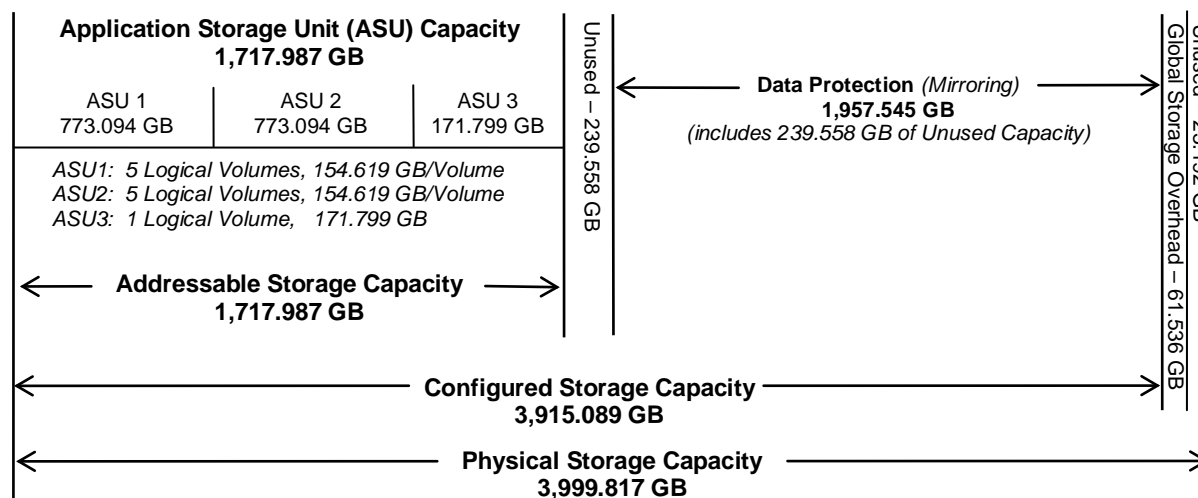
**Total Price** includes the cost of the Priced Storage Configuration plus three years of hardware maintenance and software support as detailed on page 6.

**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 diagram 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	42.95%
Protected Application Utilization	85.90%
Unused Storage Ratio	12.56%

**Application Utilization:** Total ASU Capacity (1,717.987 GB) divided by Physical Storage Capacity (3,999.817 GB).

**Protected Application Utilization:** Total ASU Capacity (1,717.987 GB) plus total Data Protection Capacity (1,957.545 GB) minus unused Data Protection Capacity (239.558 GB) divided by Physical Storage Capacity (3,999.817 GB).

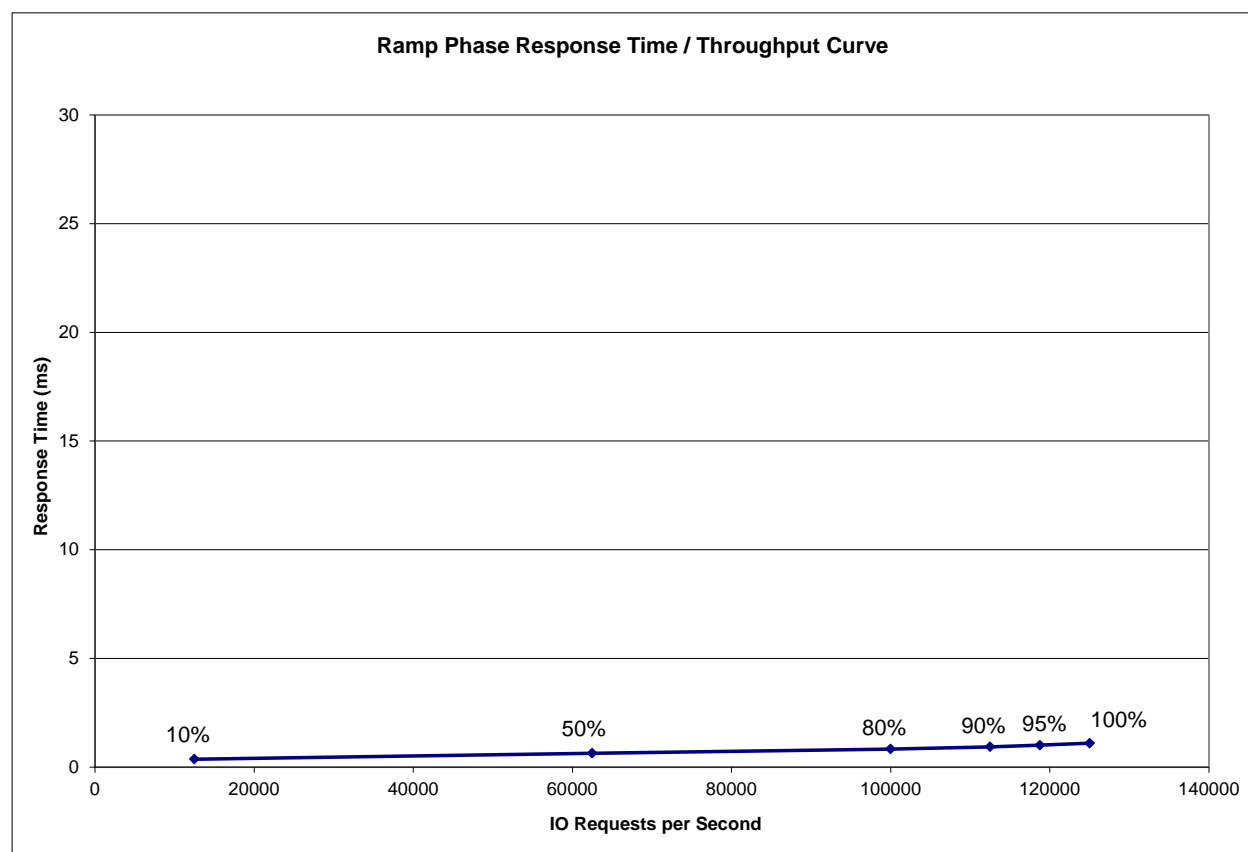
**Unused Storage Ratio:** Total Unused Capacity (502.307 GB) divided by Physical Storage Capacity (3,999.817 GB) and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 22-23 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
<b>I/O Request Throughput</b>	12,499.48	62,490.02	100,000.28	112,493.93	118,750.40	125,018.87
<b>Average Response Time (ms):</b>						
<b>All ASUs</b>	0.36	0.63	0.83	0.93	1.00	1.09
<b>ASU-1</b>	0.40	0.65	0.85	0.95	1.02	1.12
<b>ASU-2</b>	0.39	0.62	0.78	0.87	0.93	1.01
<b>ASU-3</b>	0.28	0.60	0.80	0.91	0.99	1.09
<b>Reads</b>	0.49	0.72	0.92	1.02	1.08	1.17
<b>Writes</b>	0.28	0.58	0.77	0.87	0.95	1.05

## Priced Storage Configuration Pricing

Product Description	Qty	Unit List Price	Product List Price
AMS 19 in rack Americas MIN	1	\$5,427.00	\$5,427.00
HUS 200GB SSDs for CBSS/DBS-Base	20	\$6,340.00	\$126,800.00
HUS 150 8GB Cache Module	4	\$1,930.00	\$7,720.00
HUS 150 Controller, including (2) SAS IOC processors	2	\$15,200.00	\$30,400.00
HUS Drive Box - SFF 2U x 24	4	\$5,890.00	\$23,560.00
HUS 150 4x8Gbps FC Interface Adapter	4	\$2,850.00	\$11,400.00
Hitachi Unified Storage SAS Cable 5m	8	\$760.00	\$6,080.00
HUS 150 Base Controller Box	1	\$7,600.00	\$7,600.00
50/125 LC/LC PLN 5M 2f round SB 10gig OM3	16	\$81.00	\$1,296.00
12 outlet, single phase 208V/30AMP, NEMA, 10 ft cord	4	\$735.00	\$2,940.00
<b>Hardware Components:</b>		---	<b>\$223,223.00</b>
HUS 150 Base Operating System Security Extension License	1	\$400.00	\$400.00
HUS 150 Base Operating System E Lic	1	\$9,600.00	\$9,600.00
<b>Software Components:</b>		---	<b>\$10,000.00</b>
HUS 150 Installation Support	1	\$2,750.00	\$2,750.00
HUS 150 Hardware Maintenance Support - Includes 3 years of Standard Support (24 x 7 x 4 hour response)	1	\$75,425.76	\$75,425.76
HUS 150 Storage Software Support - Includes 3 years of Standard Support	1	\$2,745.00	\$2,745.00
<b>Installation and Support:</b>		---	<b>\$80,920.76</b>
Brocade 360 switch w/ 24 active ports, Full Fabric, 24 SWL 8Gb BR SFPs, Fixed Rack Mount	2	\$4,827.00	\$9,654.00
3 Year Support	1	\$320.00	\$320.00
13 mos support	1	\$107.00	\$107.00
Fibre Channel Cables	4	\$21.25	\$85.00
EMC LightPulse Dual Port Fibre Channel Host Bus Adapter LPE12002-E	2	\$1,295.00	\$2,590.00
Symantec VRTS STORAGE FOUNDATION 6.0 WIN FOR OS TIER STANDARD EDITION PER SERVER STD LIC EXPRESS BAND S	1	\$440.00	\$440.00
VRTS STORAGE FOUNDATION 6.0 WIN FOR OS TIER STANDARD EDITION PER SERVER INITIAL ESSENTIAL 3 YEARS EXPRESS BAND S	1	\$402.00	\$402.00
<b>Third Party Components:</b>		---	<b>\$13,598.00</b>

	List Price	Std Discount	Std Buy Price
Hardware Components	\$223,223.00	54%	\$102,682.58
Software Components	\$10,000.00	39%	\$6,100.00
Installation & Support	\$80,920.76	0%	\$80,920.76
Third Party Components	\$13,598.00	0%	\$13,598.00
<b>Total:</b>			<b>\$203,301.34</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:

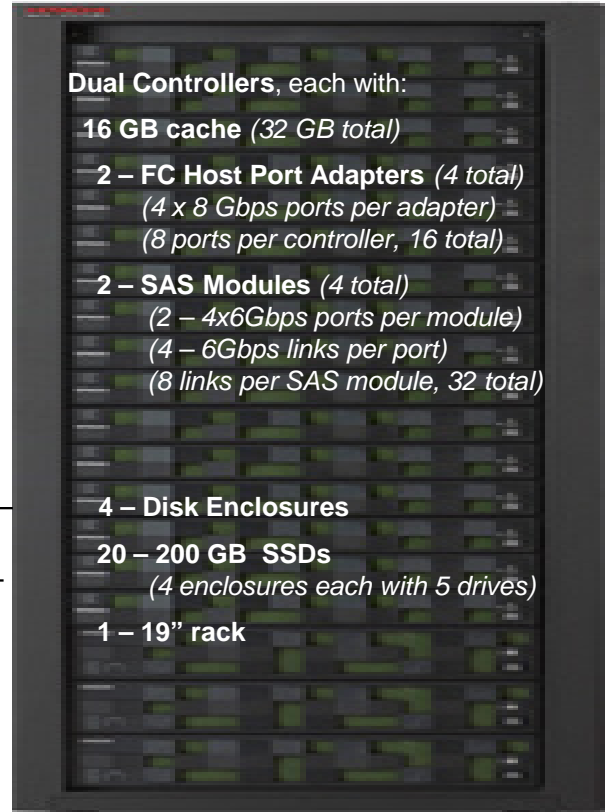
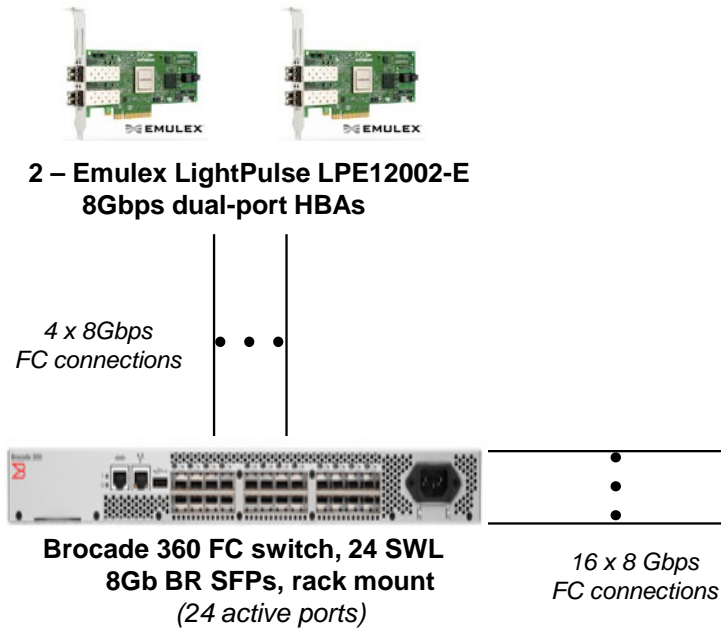
- Acknowledgement of new and existing problems with four (4) hours.
- Onsite presence of a qualified maintenance engineer or provision of a customer replaceable part within four (4) hours of the above acknowledgement for any hardware failure that results in an inoperative Priced Storage Configuration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

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

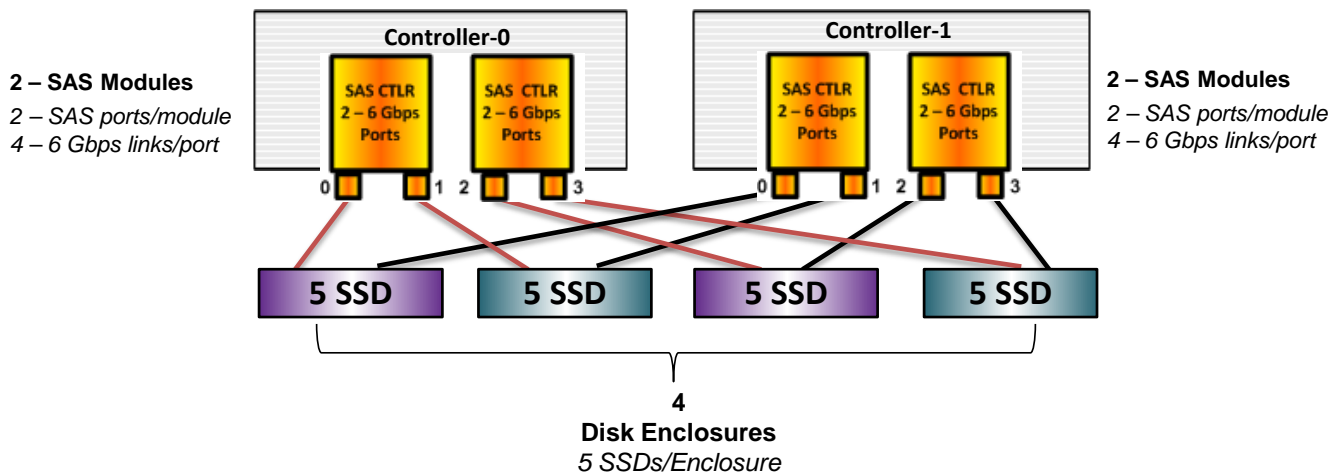
A second 24-port FC switch was included in the Priced Storage Configuration as a spare to fulfill one of the requirements for a data protection level of **Protected 2**.

## Priced Storage Configuration Diagram

### Hitachi Unified Storage 150



### Controllers, SAS Modules, Disk Enclosure and Disk Drive Details





## Priced Storage Configuration Components

<b>Priced Storage Configuration:</b>
VERITAS Storage Foundation for Windows Standard Edition v6.0
2 – Emulex LightPulse LPe12002-E 8Gbps dual port FC HBAs
2 – Brocade 360 FC switch, 24 active ports, 24 8Gb SFPs <i>(second switch included as a spare)</i>
<b>Hitachi Unified Storage 150</b>
Dual Active-Active Controllers, each with 16 GB cache <i>(32 GB total)</i>
2 – FC Host Port Adapters <i>(4 total)</i> <i>(4 – 8 Gbps ports adapter)</i> <i>(8 ports per controller, 16 total, 16 used)</i>
2 – SAS Modules <i>(4 total)</i> <i>(2 – 8x6Gbps ports per module)</i> <i>(4 ports per module, 8 total, 8 used)</i> <i>(4 – 8x6Gbps links per port)</i> <i>(8 links per module, 32 total, 32 used)</i>
4 – Disk Enclosures
20 – 200 GB Solid State Drives (SSDs) <i>5 SSDs per Disk Enclosure</i>
1 – 19" rack with 4 PDUs