



**SPC BENCHMARK 1™  
EXECUTIVE SUMMARY**

**HITACHI DATA SYSTEMS CORPORATION  
HITACHI UNIVERSAL STORAGE PLATFORM™ V**

**SPC-1 V1.10.1**

**Submitted for Review: October 1, 2007**

**Submission Identifier: A00054**

## **EXECUTIVE SUMMARY**

### **Test Sponsor and Contact Information**

<b>Test Sponsor and Contact Information</b>	
<b>Test Sponsor Primary Contact</b>	Hitachi Data Systems Corporation – <a href="http://www.hds.com">http://www.hds.com</a> Roberto Basilio – <a href="mailto:Roberto.Basilio@hds.com">Roberto.Basilio@hds.com</a> 750 Central Expressway M/S 3488 Santa Clara, CA 95050 Phone (408) 970-5990 FAX: (408) 562-5477
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### **Revision Information and Key Dates**

<b>Revision Information and Key Dates</b>	
<b>SPC-1 Specification revision number</b>	V1.10.1
<b>SPC-1 Workload Generator revision number</b>	V2.00.04a
<b>Date Results were first used publicly</b>	October 1, 2007
<b>Date the FDR was submitted to the SPC</b>	October 1, 2007
<b>Date the TSC is available for shipment to customers</b>	currently available
<b>Date the TSC completed audit certification</b>	October 1, 2007

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

The Hitachi Universal Storage Platform™ V, the world's most advanced storage services platform, provides the foundation for Hitachi Services Oriented Storage Solutions, a new architecture that enables IT departments to tailor and offer a wide range of storage services based on the value to the business. With its powerful controller-based platform, Hitachi Data Systems is in a unique position to package and deliver storage services across heterogeneous storage assets, whether file, object or block-based. Powered by an enhanced Hitachi Universal Star Network™ V crossbar switch architecture with faster internal processors, 4Gb/sec host ports, 4Gb/sec disks, and 4Gb/sec switched-loop back-end directors, it provides 40% more system performance and further extends the scalability and enterprise-class functionality introduced with its predecessor, the Hitachi Universal Storage Platform. This massive-capacity, mega-scalable system assists storage managers in their mission to simplify storage administration, improve performance, and reduce overall costs.

### Summary of Results

SPC-1 Results	
Tested Storage Configuration (TSC) Name: Hitachi Universal Storage Platform™ V	
Metric	Reported Result
SPC-1 IOPS™	200,245.73
SPC-1 Price-Performance	\$17.61/SPC-1 IOPS™
Total ASU Capacity	26,000.000 GB
Data Protection Level	Mirroring
Total TSC Price (including three-year maintenance)	\$3,525,389

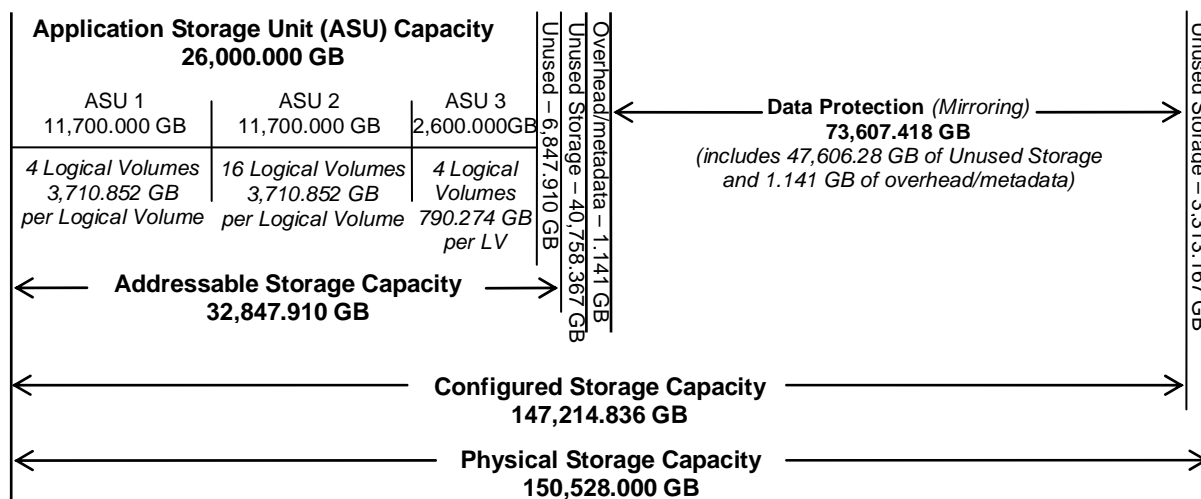
**SPC-1 IOPS™** represents the maximum I/O Request Throughput at the 100% load point.

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

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

### Storage Capacities and Relationships

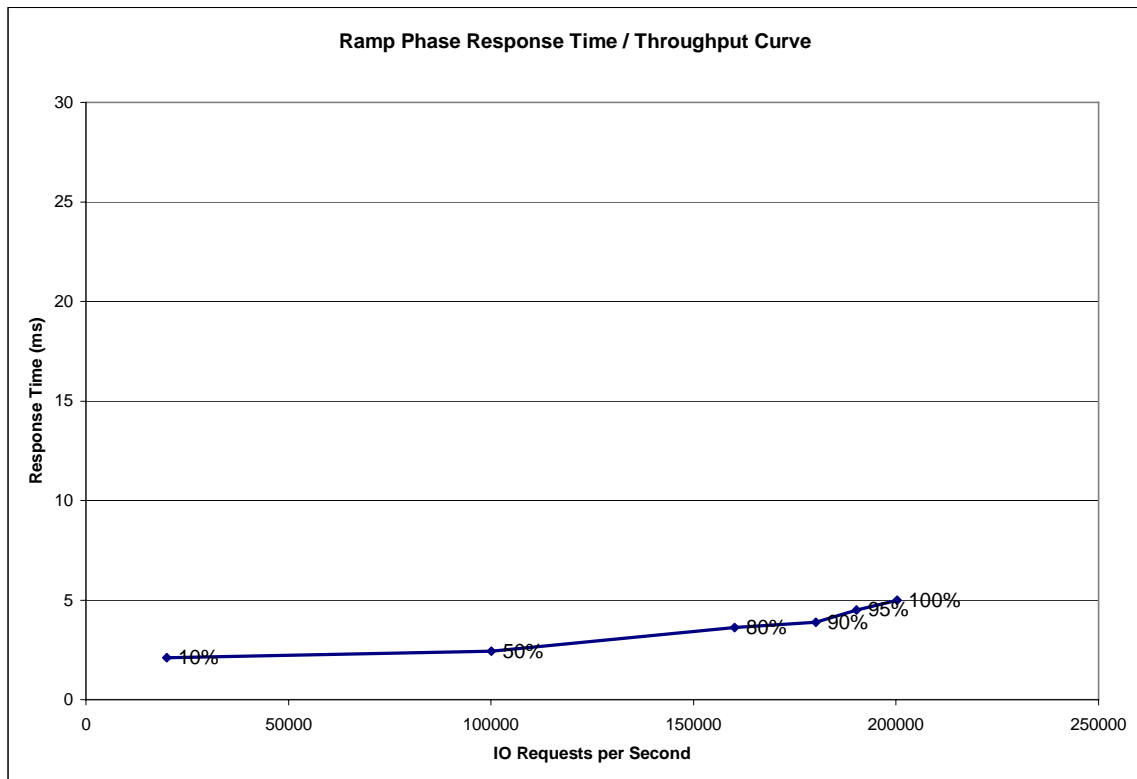
The following diagram documents the various storage capacities, used in this benchmark, and their relationships.



### 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>	19,994.33	100,105.69	160,170.55	180,202.31	190,196.63	200,245.73
<b>Average Response Time (ms):</b>						
All ASUs	2.10	2.43	3.62	3.89	4.50	4.99
ASU-1	2.92	3.20	4.68	4.92	5.54	6.10
ASU-2	2.11	2.63	3.75	4.23	4.82	5.37
ASU-3	0.34	0.70	1.31	1.58	2.15	2.47
Reads	4.82	5.10	6.99	7.46	8.12	8.89
Writes	0.33	0.69	1.43	1.57	2.14	2.45

**Tested Storage Configuration Pricing (Priced Storage Configuration)**

Product Code	Description	Qty	List	List EXT	List MMC	List MMC Ext
041-100056-01.P	USP V Product Documentation Library-HDS	1	0	0	0	0
041-100057-01.P	USP V Microcode Kit	1	0	0	0	0
DKC-F6051-18.P	Disk Array Frame	4	33,800.00	135,200.00	0	0
DKC-F6051-AKT.P	DKU Expansion Kit	4	14,200.00	56,800.00	0	0
DKC-F6051-DH.P	DKU Door Kit for HDS	4	0	0	0	0
DKC-F6051-EXC.P	DEV Interface Cable (DKU-DKU)	4	500.00	2,000.00	0	0
DKC-F6101-16FS.P	Fibre 16-Port Adapter(4Gbps)	8	30,300.00	242,400.00	0	0
DKC-F6101-3PS.P	AC Box Kit (3 Phase 30A)	5	600.00	3,000.00	0	0
DKC-F6101-3UC.P	Power Cable Kit (3Phase 30A for USA)	5	600.00	3,000.00	0	0
DKC-F6101-AB.P	Additional Battery-1	3	2,600.00	7,800.00	0	0
DKC-F6101-APC.P	Additional Power Supply	2	2,100.00	4,200.00	0	0
DKC-F6101-C8G.P	Cache Memory Module (8GB)	32	32,600.00	1,043,200.00	0	0
DKC-F6101-CSW.P	Data Path Expansion Kit	3	26,900.00	80,700.00	0	0
DKC-F6101-CX.P	Cache Memory Adapter	4	2,000.00	8,000.00	0	0
DKC-F6101-DH.P	DKC Door Kit for HDS	1	0	0	0	0
DKC-F6101-DKA.P	Disk Adapter	8	24,100.00	192,800.00	0	0
DKC-F6101-L1DC.P	Device Interface Cable (DKC to DKU-L1)	1	500.00	500.00	0	0
DKC-F6101-L1UC.P	Device Interface Cable (DKC to DKU-L1)	1	500.00	500.00	0	0
DKC-F6101-MDM.P	Modem Card Kit	1	500.00	500.00	0	0
DKC-F6101-R1DC.P	Device Interface Cable (DKC to DKU-R1)	1	500.00	500.00	0	0
DKC-F6101-R1UC.P	Device Interface Cable (DKC to DKU-R1)	1	500.00	500.00	0	0
DKC-F6101-S4GQ.P	Shared Memory Module (4GB)	5	21,200.00	106,000.00	0	0
DKC-F6101-SX.P	Shared Memory Adapter	2	2,300.00	4,600.00	0	0
DKC6101-5.P	Disk Control Frame	1	55,000.00	55,000.00	0	0
DTI512.P	512MB USB memory stick	1	0	0	0	0
IP0662-14.P	LAN Cable 14ft	1	0	0	0	0
IP0664-12.P	Phone Cable 12ft	1	0	0	0	0
IP0665-11.P	RJ-11 Modular In-Line Coupler 4 Conductor	1	0	0	0	0
IP0665-45.P	RJ-45 Modular In-Line Coupler 6 Conductor	1	0	0	0	0
DKC-F6051-146KS.P	1 HDD Canister (DKR2F-K146FC)	1024	3,260.00	3,338,240.00	0	0

<b>Hardware Components</b>	<b>\$5,285,440.00</b>
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Product Code	Description	Qty	List	List EXT	List MMC	List MMC Ext
044-220001-01.P	USP V Basic Operating System Bundle Media Kit	1	0	0	0	0
044-220001-03.P	USP V Basic Operating System Bundle License Base	1	7,200.00	7,200.00	0	0
044-220001-03F.P	USP V Basic Optg Sys Bndl 1TB (Above 100TB) Lic	146	1,750.00	255,500.00	0	0
304-220001-03.P	SVC Mo USP V Basic Operating System Bundle License Base	36	0	0	2,579.00	92,844.00

<b>Software Components</b>	<b>\$262,700.00</b>	<b>\$92,844.00</b>
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	List	Discount	Total
USP V Hardware	\$5,285,440.00	40.00%	\$3,171,264.00
USP V Hardware Maintenance -- Includes 3-years of Premium Service (24x7x2 hour response) and installation	\$0.00	0.00%	\$0.00
USP V Software	\$262,700.00	35.00%	\$170,755.00
USP V Software Maintenance -- Includes 3-years of Service (24x7x2 hour response)	\$92,844.00	35.00%	\$60,348.60
64 IBM 5758 4 Gb Single-Port Fibre Channel PCI-X 2.0 DDR Adapter	\$121,539.20	0.00%	\$121,539.20
64 LC-LC FC Cable (*)	\$1,482.24	0.00%	\$1,482.24

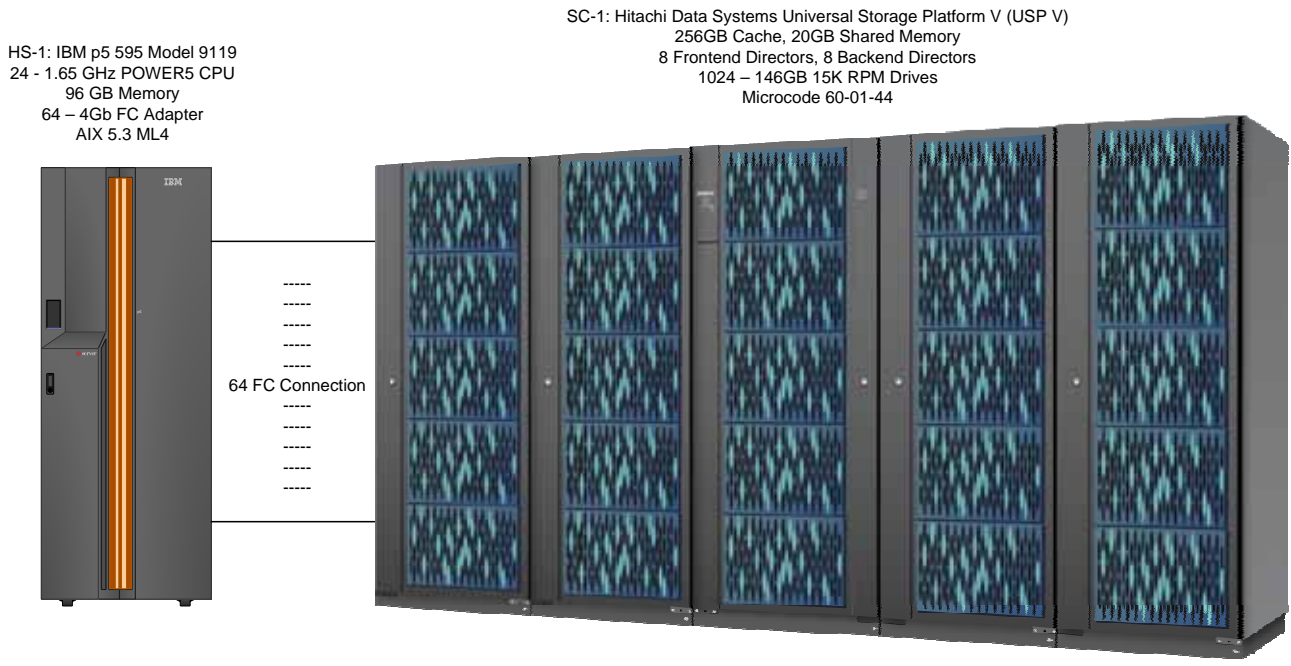
\*(Purchased by HDS for test. Not resold by HDS.)

<b>Total</b>	<b>\$3,525,389.04</b>
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**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.

### Benchmark Configuration/Tested Storage Configuration Diagram



### Benchmark Configuration/Tested Storage Configuration Components

Host System:	Tested Storage Configuration (TSC):
<b>UID=HS-1</b> IBM P5 595 Model 9119	64 – 4 Gb P5 595 FC PCI-X 2.0 DDR Adapters
24 - 1.65 GHz CPUs – 2 CPUs/POWER5 chip 32 KB L1 cache, 960 KB L2 cache, and 18 MB L3 cache per CPU	<b>UID=SC-1:</b> Hitachi Data Systems Universal Storage Platform V
96 GB main memory	256 GB cache ( <i>data</i> ), 22 GB shared memory ( <i>metadata</i> )
AIX 5.3 ML4	8 pair (16 ports/pair) 4 Gb FC Front-End Directors (128 ports total, 64 ports used)
PCI-X/RIO	9 pair 4 Gb Backend Directors supporting 64 FC disk loops
WG	1024 – 146 GB 15K RPM disk drives