



**SPC BENCHMARK 1™
EXECUTIVE SUMMARY**

**HITACHI DATA SYSTEMS CORPORATION
HITACHI ADAPTABLE MODULAR STORAGE 2100**

SPC-1 V1.10.1

Submitted for Review: March 24, 2009

Submission Identifier: A00076

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

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Test Sponsor Alternate Contact	Hitachi Data Systems Corporation – http://www.hds.com Mel Boksenbaum – mel.boksenbaum@hds.com 750 Central Expressway M/S 3275 Santa Clara, CA 95050 Phone (408) 970-7922 FAX: (408) 327-3066
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

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SPC-1 Specification revision number	V1.10.1
SPC-1 Workload Generator revision number	V2.00.04a
Date Results were first used publicly	March 24, 2009
Date the FDR was submitted to the SPC	March 24, 2009
Date the TSC is available for shipment to customers	currently available
Date the TSC completed audit certification	March 24, 2009

Tested Storage Product (TSP) Description

The cost effective option with a rich set of features in a model that scales to 120 disk drives. Ideal for medium and large businesses, Hitachi Adaptable Modular Storage 2100 is an easy-to-use, scalable, storage system for Microsoft® Exchange Server, VMware, databases and other business applications.

Summary of Results

SPC-1 Results	
Tested Storage Configuration (TSC) Name: Hitachi Adaptable Modular Storage 2100	
Metric	Reported Result
SPC-1 IOPS™	31,498.58
SPC-1 Price-Performance	\$5.85/SPC-1 IOPS™
Total ASU Capacity	3,967.500 GB
Data Protection Level	Mirroring
Total TSC Price (including three-year maintenance)	\$187,321

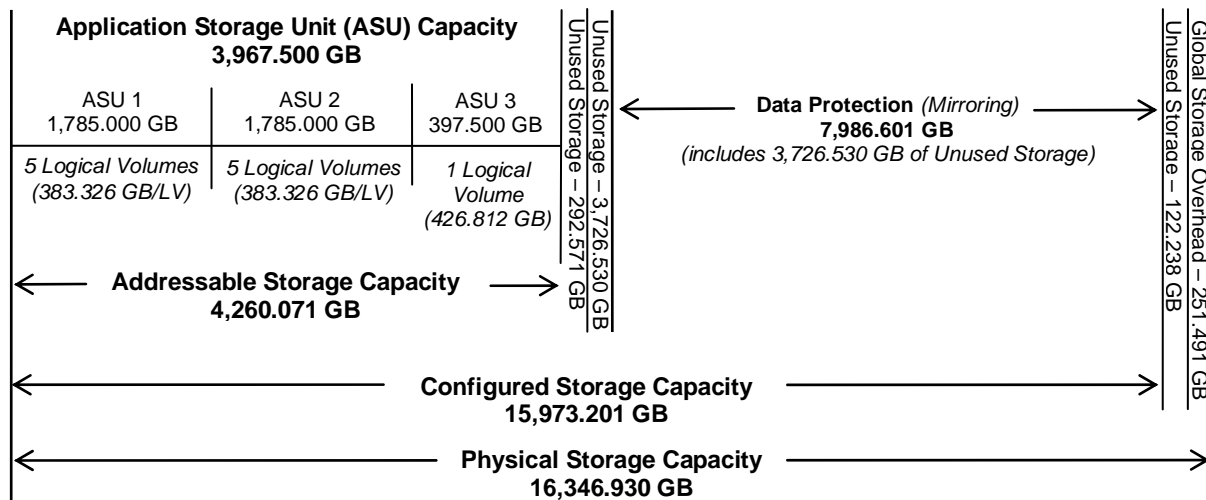
SPC-1 IOPS™ represents the maximum I/O Request Throughput at the 100% load point.

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

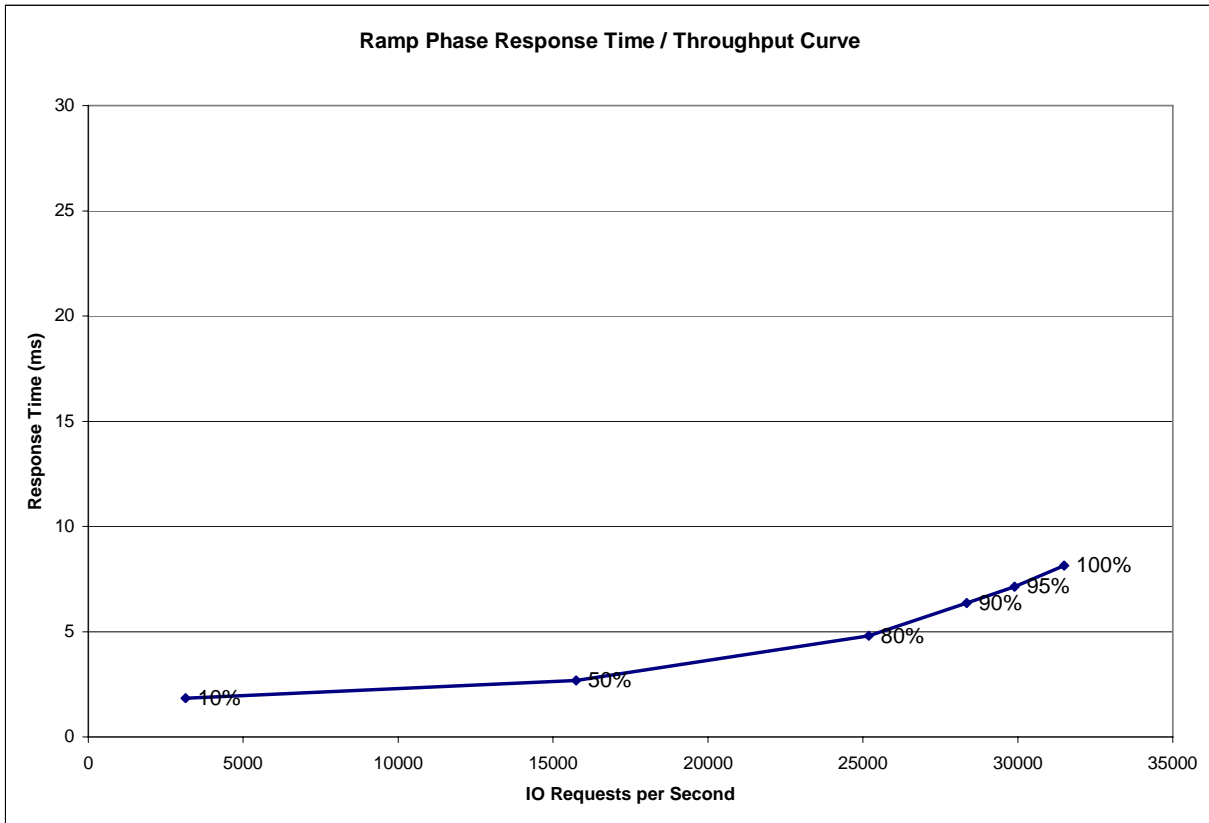
The following diagram documents the various storage capacities, used in this benchmark, and their relationships.



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
I/O Request Throughput	3,147.80	15,752.82	25,197.99	28,356.17	29,900.01	31,498.58
Average Response Time (ms):						
All ASUs	1.83	2.67	4.80	6.37	7.14	8.15
ASU-1	2.51	3.52	5.92	7.60	8.42	9.49
ASU-2	2.12	3.36	7.47	11.37	13.38	16.00
ASU-3	0.27	0.57	1.26	1.56	1.71	1.86
Reads	4.27	5.93	10.22	13.68	15.41	17.67
Writes	0.24	0.55	1.27	1.61	1.76	1.95

Tested Storage Configuration Pricing (*Priced Storage Configuration*)

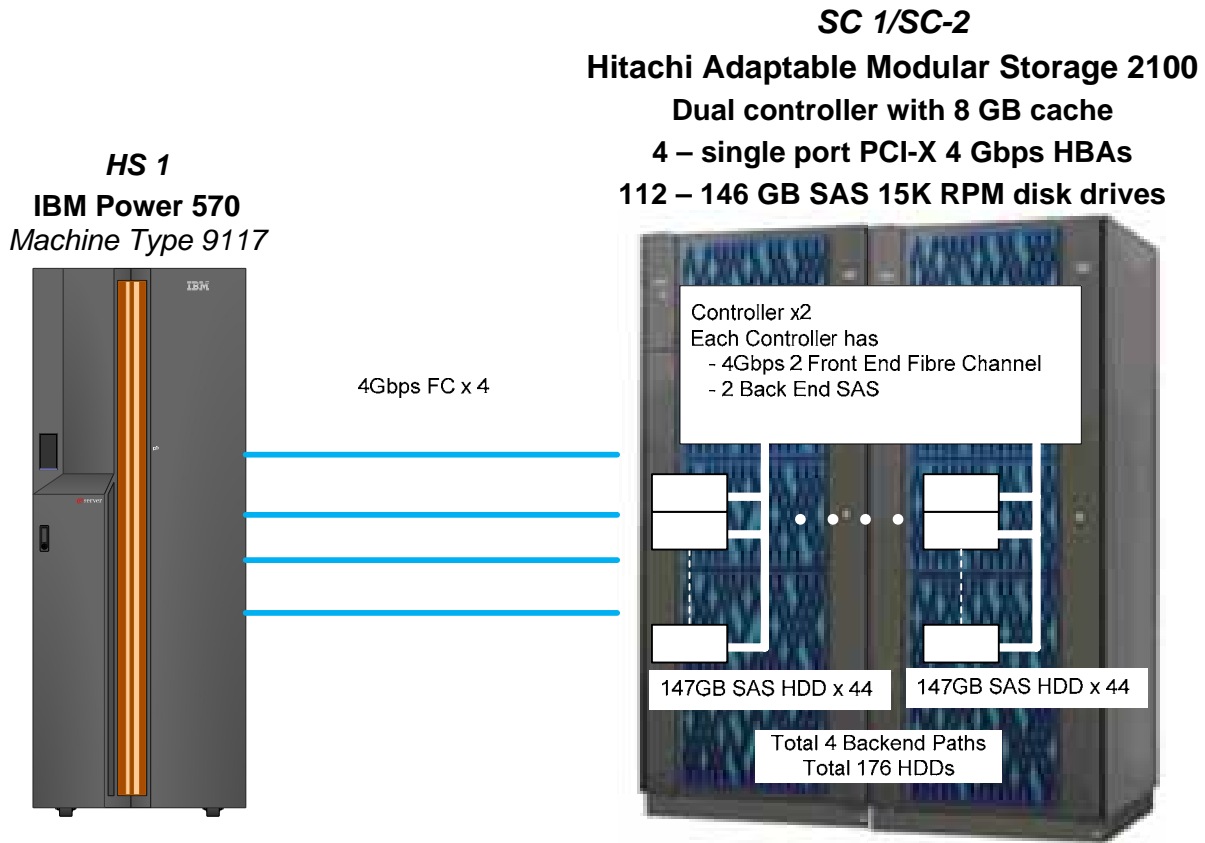
Product Code	Description	Qty	List	List EXT	List MMC	List MMC Ext
AMS2100-A0001.S	AMS2100 Rack Mount System	1				
043-100422-01.P	AMS 2100 Family Basic Operating System-Modular	1	\$ -	\$ -	\$ -	\$ -
043-991150-01.P	AMS2100 Svc Warranty 1 Mo Yr 1-3	36	\$ -	\$ -	\$ -	\$ -
043-991154-01.P	AMS2100 Svc Uplift to Standard 1Mo	36	\$ -	\$ -	\$ 77	\$ 2,772
043-991174-01.P	AMS2000 Svc RKAK Warranty 1 Mo Yr 1-3	252	\$ -	\$ -	\$ -	\$ -
043-991178-01.P	AMS2000 Svc RKAK Uplift to Standard 1Mo	252	\$ -	\$ -	\$ 45	\$ 11,340
043-991206-01.P	AMS2100 Service Installation	1	\$ 1,250	\$ 1,250	\$ -	\$ -
1508441-001.P	Dummy drive for DF600/DF700/DF800/RAID 600	8	\$ -	\$ -	\$ -	\$ -
7846630.P	42U AMS2000 Rack 1050mm Deep w/30amp Nema PDU (4)	1	\$ 5,295	\$ 5,295	\$ -	\$ -
DF-F800-AKH146.P	AMS2000 146GB SAS 15K RPM HDD	112	\$ 610	\$ 68,320	\$ -	\$ -
DF-F800-RKAK.P	AMS2000 SAS/SATA Storage Expansion Tray	7	\$ 8,840	\$ 61,880	\$ -	\$ -
HDF-F800-SFC4.P	AMS2100 Dual Controller, 8GB Cache, 4x4Gbps FC Intf	1	\$ 23,220	\$ 23,220	\$ -	\$ -
HDF800-BASE.P	AMS2100/AMS2300 Chassis	1	\$ 6,810	\$ 6,810	\$ -	\$ -
AMS2100-SOFTWARE.S	AMS2100 Storage Software Sales	1				
043-100409-01.P	AMS 2000 Family Storage Navigator Modular 2	1	\$ 1,500	\$ 1,500	\$ -	\$ -
304-100409-01.P	SVC Mo Storage Navigator Modular 2, AMS 2100 Family	12	\$ -	\$ -	\$ 19	\$ 225
JD-X50BB010PXF	ezLINET™ LC/LC Uniboot® Jumper, OFNP, 10-ft (50/125) Aqua	4	\$ 18	\$ 74		
91117-5758	IBM 4 Gb Single-Port Fibre Channel PCI-X 2.0 DDR Adapter	4	\$ 1,159	\$ 4,636		
	Total			\$ 172,984		\$ 14,337
	Grand Total					\$ 187,321

The above hardware maintenance and software support pricing components provides acknowledgement of new and existing problems within four (4) hours. In addition, the priced components provide onsite presence of a qualified maintenance engineer or provision of a customer replaceable part within four (4) of the above acknowledgement for any hardware failure that results in an inoperative Priced Storage Configuration that can be remedied by repair or replacement of a Priced Storage Configuration component.

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):
UID=HS-1 IBM Power 570 Server	4 – 9117-5758 IBM DS4000 1-pt PCI-X 4 Gbps HBA
8 - 1.9 GHz CPUs – 2 CPUs/POWER5 chip 32 KB L1 cache, 960 KB L2 cache, and 18 MB L3 cache per CPU	UID=SC-1/SC-2: Hitachi Adaptable Modular Storage 2100 Dual controller with 8 GB cache 2 – FC front-end ports per controller (<i>4 total ports</i>) 2 – backend SAS interfaces per controller 28 drives per interface (<i>4 total interfaces</i>)
64 GB main memory	Cache Partition Manager
AIX 5.3 ML6 SP4	7 – AMS2000 SAS/SATA Storage Expansion Trays
PCI-X/RIO	1 – 42U AMS2000 Racks w/30amp Nema PDU (<i>4</i>)
AIX Logical Volume Manager	112 – 146 GB SAS 15K RPM disk drives
WG	