SPC BENCHMARK 1™

EXECUTIVE SUMMARY

HITACHI DATA SYSTEMS CORPORATION

HITACHI ADAPTABLE MODULAR STORAGE 2300

SPC-1 V1.10.1

Submitted for Review: March 24, 2009
Submission Identifier: A00077

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 best combination of price and performance in a model that scales to 240 disk drives. Ideal for large businesses and enterprises, Hitachi Adaptable Modular Storage 2300 is a highly reliable, flexible and 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 2300	
Metric	**Reported Result**
SPC-1 IOPS™	42,502.61
SPC-1 Price-Performance	$6.96/SPC-1 IOPS™
Total ASU Capacity	7,955.000 GB
Data Protection Level	Mirroring
Total TSC Price (including three-year maintenance)	$295,740

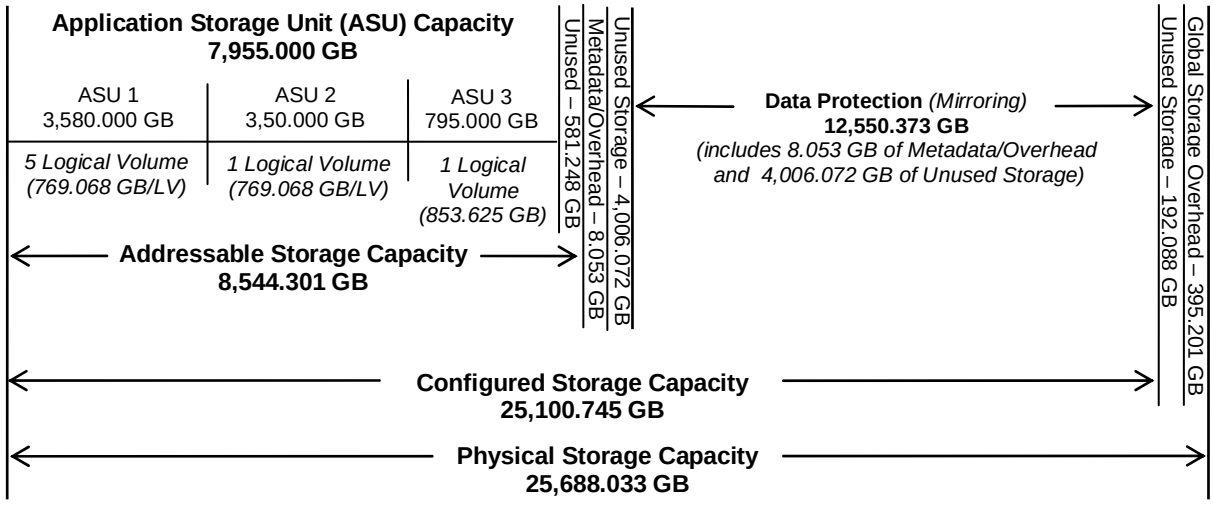
SPC-1 IOPS™ represents the maximum I/O Request Throughput at the 100% load point.

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

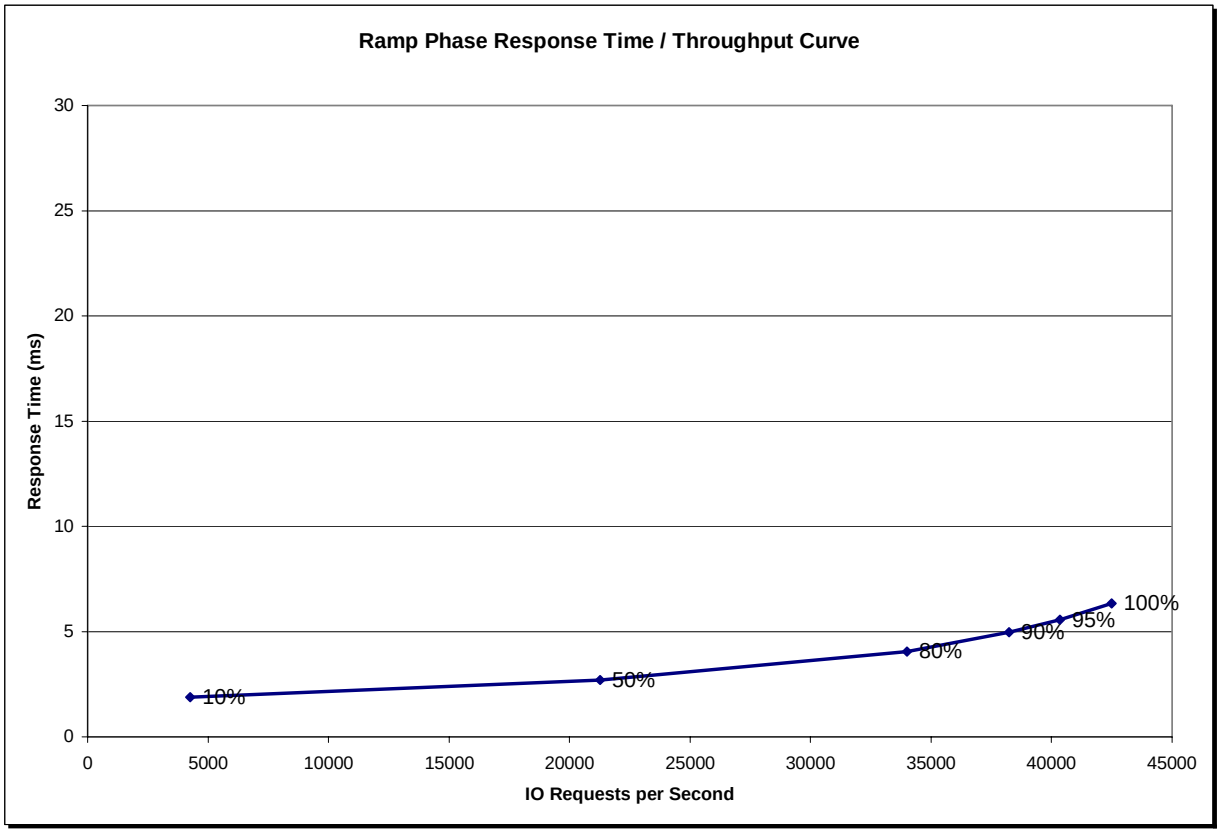
The following diagram documents the various storage capacities, used in this benchmark, and their relationships.



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	4,250.60	21,258.89	34,000.14	38,247.63	40,354.67	42,502.61
Average Response Time (ms):						
All ASUs	1.88	2.70	4.05	4.97	5.57	6.33
ASU-1	2.58	3.48	4.98	6.05	6.70	7.55
ASU-2	2.09	3.32	5.00	6.84	8.23	9.87
ASU-3	0.30	0.79	1.64	1.88	2.00	2.19
Reads	4.34	5.69	7.77	9.72	11.04	12.67
Writes	0.28	0.76	1.62	1.88	2.01	2.21

Tested Storage Configuration Pricing *(Priced Storage Configuration)*

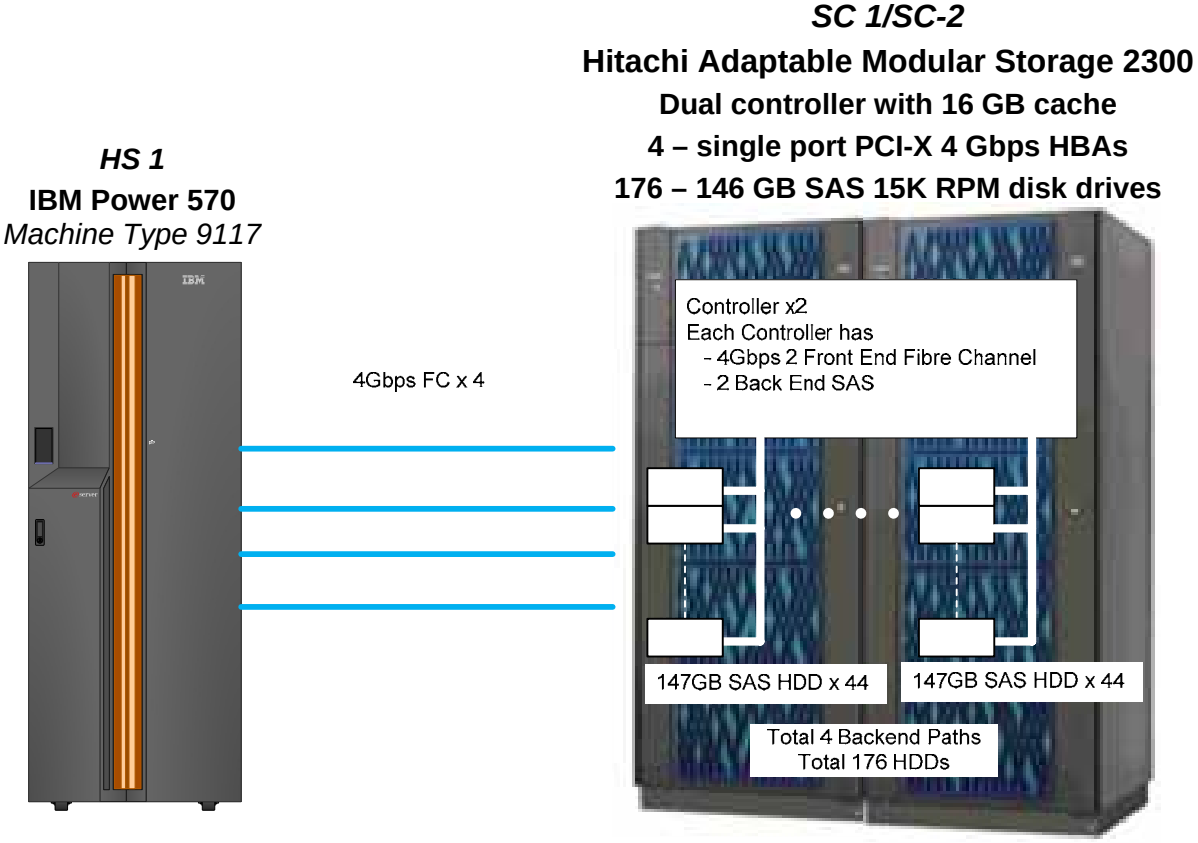
Description	Qty	List	List EXT	List MMC	List MMC Ext
AMS2300 Rack Mount System	1				
AMS 2300 Family Basic Operating System-Modular	1	0	0	0	0
AMS2300 Svc Warranty 1 Mo Yr 1-3	36	0	0	0	0
AMS2300 Svc Uplift to Standard 1Mo	36	0	0	136	4,896.00
AMS2000 Svc RKAK Warranty 1 Mo Yr 1-3	396	0	0	0	0
AMS2000 Svc RKAK Uplift to Standard 1Mo	396	0	0	45	17,820.00
AMS2300 Service Installation	1	0	2,000.00	0	0
Dummy drive for DF600/DF700/DF800/RAID 600	4	0	0	0	0
42U AMS2000 Rack 1050mm Deep w/30amp Nema PDU (4)	1	5,295.00	5,295.00	0	0
AMS2000 146GB SAS 15K RPM HDD	176	610	107,360.00	0	0
AMS2000 SAS/SATA Storage Expansion Tray	11	8,840.00	97,240.00	0	0
AMS2300 Dual Controller, 16GB Cache, 8x4Gbps FC Intf	1	45,240.00	45,240.00	0	0
AMS2100/AMS2300 Chassis	1	6,810.00	6,810.00	0	0
AMS2300 Storage Software Sales	1				
Storage Navigator Modular 2, AMS 2300 Family	1	3,800.00	3,800.00	0	0
SVC Mo Storage Navigator Modular 2, AMS 2300 Family	12	0	0	47.5	570
ezLINE™ LC/LC Uniboot® Jumper, OFNP, 10-ft (50/125) Aqua	4	18.45	73.8		
IBM 4 Gb Single-Port Fibre Channel PCI-X 2.0 DDR Adapter	4	1,158.88	4635.52		
Total			**$ 272,454**	**$**	**23,286**
Grand Total				**$**	**295,740**

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 2300 Dual controller with 8 GB cache per controller 2 – FC front-end ports per controller *(4 total ports)* 2 – backend SAS interfaces per controller 44 drives per interface *(4 total interfaces)*
64 GB main memory	
AIX 5.3 ML6 SP4	Cache Partition Manager
PCI-X/RIO	11 – AMS2000 SAS/SATA Storage Expansion Trays
AIX Logical Volume Manager	1 – 42U AMS2000 Racks w/30amp Nema PDU *(4)*
WG	176 – 146 GB SAS 15K RPM disk drives