SPC BENCHMARK 1™

EXECUTIVE SUMMARY

IBM CORPORATIONS

IBM SYSTEM STORAGE DS4700 EXPRESS MODEL

SPC-1 V1.10

Submitted for Review: August 21, 2006
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EXECUTIVE SUMMARY

Test Sponsor and Contact Information

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Revision Information and Key Dates

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SPC-1 Specification revision number	V1.10
SPC-1 Workload Generator revision number	V2.00.04a
Date Results were first used publicly	August 21, 2006
Date the FDR was submitted to the SPC	August 21, 2006
Date the TSC is available for shipment to customers	currently available
Date the TSC completed audit certification	August 21, 2006

Summary of Results

SPC-1 Results	
Tested Storage Configuration (TSC) Name: IBM System Storage DS4700 Express Model	
Metric	**Reported Result**
SPC-1 IOPS™	17,195.84
SPC-1 Price-Performance	$13.23/SPC-1 IOPS™
Total ASU Capacity	1,963.270 GB
Data Protection Level	Mirroring
Total TSC Price (including three-year maintenance)	$227,546.00

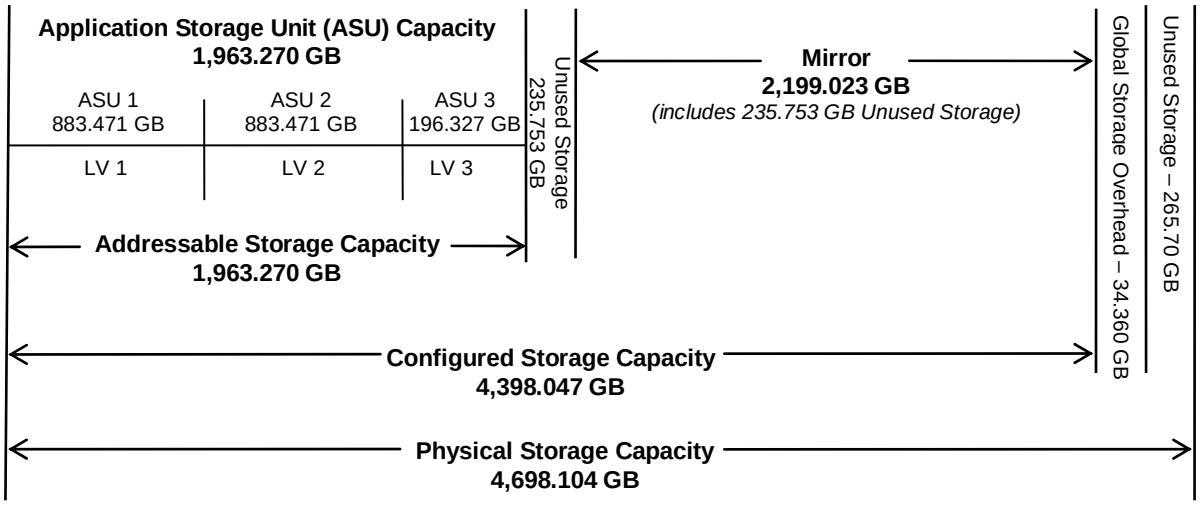
SPC-1 IOPS™ represents the maximum I/O Request Throughput at the 100% load point.

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

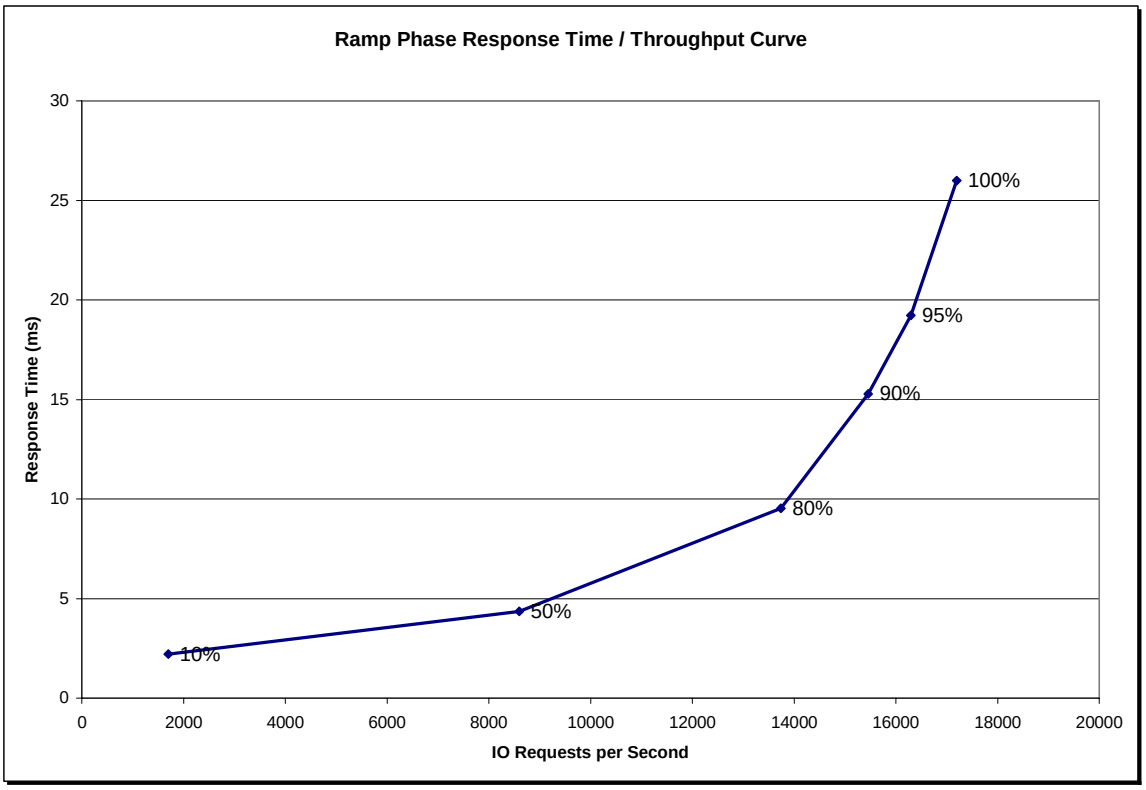
The following diagram documents the various storage capacities, used in this benchmark, and their relationships.



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	1,699.56	8,598.17	13,742.20	15,457.48	16,293.51	17,195.84
Average Response Time (ms):						
All ASUs	2.20	4.35	9.54	15.27	19.22	26.00
ASU-1	2.71	5.30	10.43	15.59	19.07	25.30
ASU-2	3.31	6.57	14.93	22.72	27.89	36.34
ASU-3	0.62	1.34	5.29	11.34	15.74	22.95
Reads	4.70	9.06	16.34	21.95	25.50	32.26
Writes	0.57	1.27	5.11	10.93	15.13	21.92

Tested Storage Configuration Pricing *(Priced Storage Configuration)*

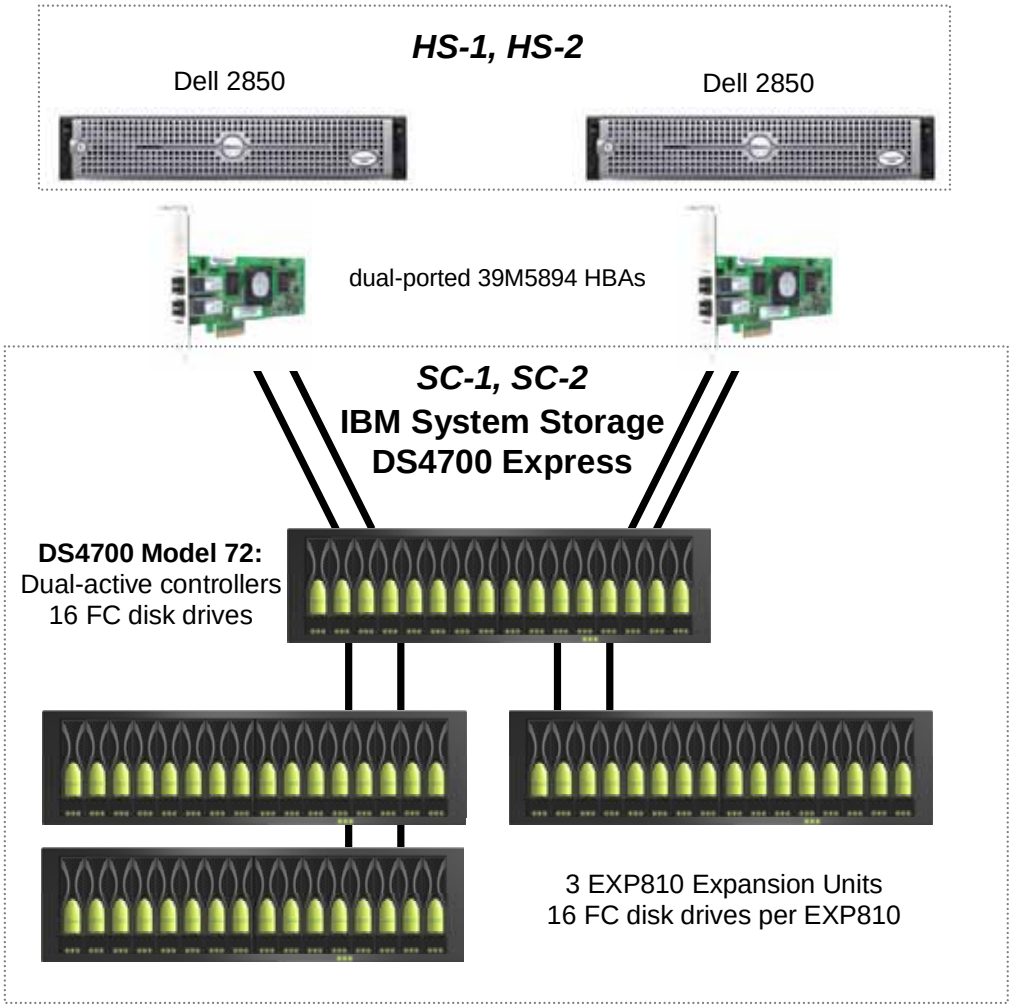
Product	Quantity	List Price each	extended list price
DS4700 Model 72 with: 8 storage partitions Windows Host Kit	1	$44,250	$44,250
DS4000 EXP810 Expansion Unit	3	$6,000	$18,000
Dual ported 39M5894 HBAs	2	$2,485	$4,970
73 GB x15K RPM disk drives	64	$2,099	$134,336
1m Fiber Optic Cable LC-LC	10	$79	$790
annual 24x7x4hr upgrade	3	$8,400	$25,200
TOTAL			**$227,546**

Maintenance/support is provided 24 hours per day, 7 days per week for three years with four hour acknowledgement and four hour subsequent response (support engineer onsite or customer replaceable part available).

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

Each disk drive in the Priced Storage Configuration is mounted in an IBM drive carrier and configured to self-identify as a DS4000 brand.

Benchmark Configuration/Tested Storage Configuration Diagram



Host System:	Tested Storage Configuration (TSC):
UID=HS-1, HS-2	2 – 39M5894 HBAs *(1 per Host System)*
2 – Dell 2850 Servers each server configured with:	***UID=SC-1, SC-2:*** **IBM System Storage DS4700 Express Model**
2 – 3.6 GHz Pentium 4 Xeon CPUs 2 MB L2 cache per CPU	Dual active RAID Controller 2 GB RAM per controller
3 GB main memory	8 – 4Gb Fibre Channel host connections *(4 used)*
Windows 2003 Enterprise Edition SP1	4 – 4Gb Fibre Channel drive connections
PCI-X	3 – DS4000 EXP810 Expansion Units
WG	64 – 73 GB 15K RPM disk drives