



**SPC BENCHMARK 1™
EXECUTIVE SUMMARY**

**IBM CORPORATION
IBM SYSTEM STORAGE DS5300 (FDE)**

SPC-1 V1.10.1

Submitted for Review: July 14, 2009

Submission Identifier: A00080

Revised: March 8, 2010

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

Test Sponsor and Contact Information	
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Revision Information and Key Dates

Revision Information and Key Dates	
SPC-1 Specification revision number	V1.10.1
SPC-1 Workload Generator revision number	V2.00.04a
Date Results were first used publicly	July 14, 2009
Date the FDR was submitted to the SPC	July 14, 2009
Date the revised FDR was submitted to the SPC Revised Total Price and SPC-1 Price-Performance (<i>highlighted in red, page 3</i>) Corrected TSC and Priced Storage Configuration differences (page 5) Revised pricing (<i>highlighted in red, page 4</i>)	March 8, 2010
Date the TSC is available for shipment to customers	August 21, 2009
Date the TSC completed audit certification	July 13, 2009

Tested Storage Product (TSP) Description

The System Storage DS5000 series disk system is IBM's midrange disk offering, specifically designed to meet the needs of midrange/departmental storage requirements, delivering high performance, advanced function, high availability, modular and scalable storage capacity, with SAN-attached 4 Gbps Fibre Channel (FC) connectivity, and support for RAID 0, 1, 3, 5, 6, and 10, with up to 256 TB physical storage capacity.

The DS5000 series represents the seventh-generation architecture within the midrange disk family. This SPC-1 submission is the first to demonstrate the active use of HDD-based encryption (FDE).

Summary of Results

SPC-1 Results	
Tested Storage Configuration (TSC) Name: IBM System Storage DS5300 (FDE)	
Metric	Reported Result
SPC-1 IOPS™	62,243.63
SPC-1 Price-Performance	\$14.16/SPC-1 IOPS™
Total ASU Capacity	13,742.218 GB
Data Protection Level	Mirroring
Total TSC Price (including three-year maintenance)	\$881,130

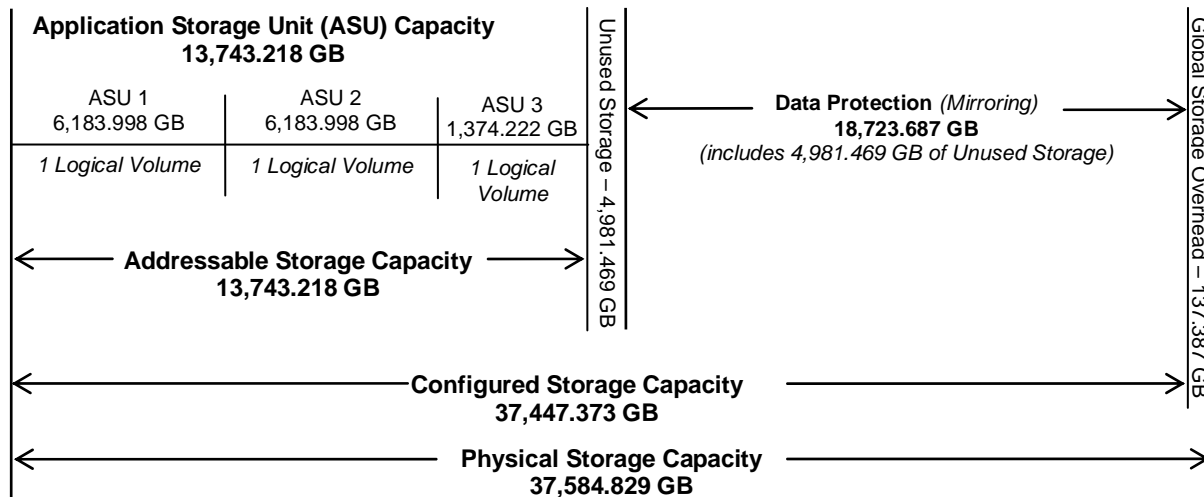
SPC-1 IOPS™ represents the maximum I/O Request Throughput at the 100% load point.

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

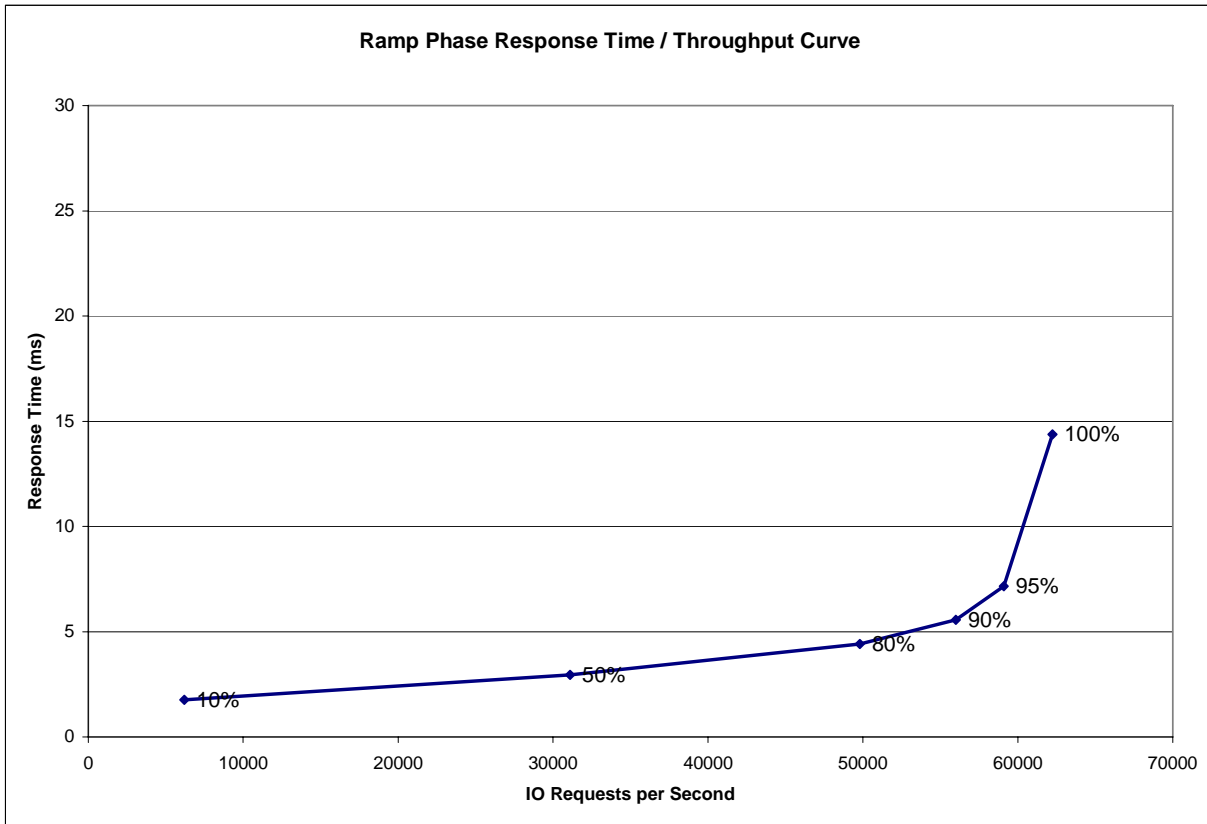
The following diagram documents the various storage capacities, used in this benchmark, and their relationships.



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	6,198.64	31,103.40	49,808.03	56,016.13	59,107.26	62,243.63
Average Response Time (ms):						
All ASUs	1.75	2.95	4.41	5.56	7.15	14.37
ASU-1	2.41	4.02	5.70	6.85	8.35	15.01
ASU-2	2.17	3.79	6.34	8.14	10.04	17.50
ASU-3	0.18	0.32	0.84	1.71	3.34	11.63
Reads	4.21	7.03	9.95	11.54	13.13	19.09
Writes	0.16	0.30	0.81	1.67	3.25	11.29

Tested Storage Configuration Pricing (*Priced Storage Configuration*)

Model Type / Feature	Description	List Price	QTY	Extended Price
1818-53A	DS5300 Dual Controller Disk System	\$80,000	1	\$80,000
1818-D1A	EXP5000 16 slot Expansion unit (incl 2 x 4 Gb SFPs)	\$6,000	16	\$96,000
2031	8GB Cache Memory	\$16,000	1	\$16,000
2052	Two Quad 8 Gbps FC Host Port Cards (each port includes SFP)	\$15,000	2	\$30,000
2412	Short Wave 4Gbps SFP Transceiver Pair	\$998	16	\$15,968
5605	5M LC-LC FIBER OPTIC CABLE	\$129	48	\$6,192
7720	DS5000 WINDOWS HOST KIT	\$1,250	1	\$1,250
8900	DS5000 8 STG PARTITION-IP0	\$10,000	1	\$10,000
7358	Disk Encryption Activation	\$25,000	1	\$25,000
5540	16-Pak 146.8 GB/15K DDM, FDE	\$31,200	16	\$499,200
39R6525	single port Qlogic PCIe - 8GbFC	\$1,299	16	\$20,784
			Total List	\$800,394
	Std warranty 1 year 24x7x4hr response			
	addtl 2 years 24x7x4		incl	\$80,736
			Grand Total	\$881,130

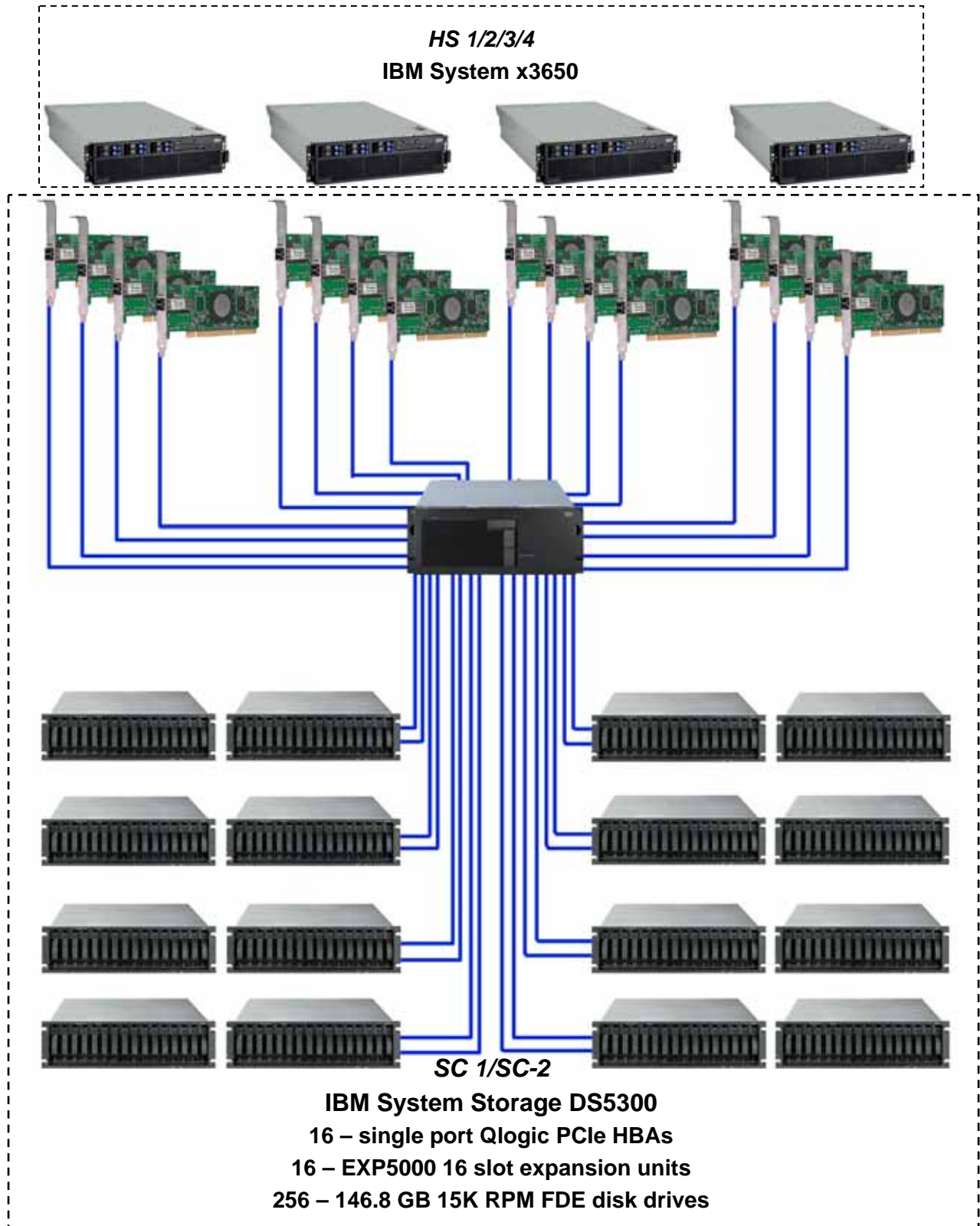
Differences between the Tested Storage Configuration (TSC) and Priced Storage Configuration

The differences between the TSC and Priced Storage Configuration consisted of the following:

- The priced disk drives are mounted in an IBM drive carrier and each disk drive is configured to self-identify as a DS5000 brand.
- The TSC was configured with 77 4Gbps SFPs, of which 64 were used. The Priced Storage Configuration included only the required 64 SFPs.

The above differences, if applied to the TSC, would not have a negative impact on the reported SPC-1 performance.

Benchmark Configuration/Tested Storage Configuration Diagram



Benchmark Configuration/Tested Storage Configuration Components

Host System:	Tested Storage Configuration (TSC):
HS-1/2/3/4: IBM System x3650	16 – single port Qlogic PCIe HBAs (<i>39R6525</i>)
Each Host System with:	SC-1/SC-2: IBM System Storage DS5300
2 – 3.00 GHz Dual Xeon Processors with 4 MB L2 cache	2 – dual-active controllers with:
5 GB main memory	8 GB cache total, 4 GB per controller
Windows Server 2003 Enterprise Edition 32-bit with SP2	4 –Quad 8 Gbps FC Host Port Cards (<i>2 pair, includes 16 SFPs (8 Gbps)</i>)
PCIe:	16 – 8 Gb Fibre Channel front-end connections
WG	16 – 4 Gb Fibre Channel backend connection
	16 – 4 Gbps SFPs
	16 – EXP5000 16 slot expansion units (<i>each with 2 SFPs (4 Gbps)</i>)
	256 – 146.8 GB 15K RPM FDE disk drives (<i>16 disk drives per expansion unit</i>)