SPC Benchmark 1™
Executive Summary

IBM Corporation
IBM System Storage DS3400

SPC-1 V1.10.1

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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	February 27, 2008
Date the FDR was submitted to the SPC	February 27, 2008

Date the revised FDR was submitted to the SPC
    Revised SPC-1 Price-Performance *(page 4)*
    Revised pricing *(page 6)*
	March 4, 2008

Date the TSC is available for shipment to customers	currently available
Date the TSC completed audit certification	February 26, 2008

Tested Storage Product (TSP) Description

The DS3400 is a 4 Gb external Fibre Channel storage solution that is easy to deploy and manage. Available in single and dual controller models, the DS3400 scales in capacity to support a total of 48 hard disk drives by using the EXP3000 expansion unit. The DS3400 is a direct-attach and SAN solution for System x, and BladeCenter servers, and enables small and medium businesses to manage their fast-growing data capacity requirements on an affordable budget. Features include:

- 2U rack mount enclosure with 12 easily accessible drive bays
- Support for dual-ported, and hot-swappable SAS disks at 10,000 and 15,000 rpm speeds
- Scalability of up to 3.6 TB of storage capacity with 300 GB hot-swappable SAS disks
- Expandable by attaching up to three EXP3000s, or a total of 48 hard disk drives
- Built-in reliability features with dual-redundant power-supplies standard
- Three-year limited warranty(1) on parts and labor

Summary of Results

| SPC-1 Results	
Tested Storage Configuration (TSC) Name: IBM System Storage DS3400	
Metric	**Reported Result**
SPC-1 IOPS™	9,000.88
SPC-1 Price-Performance	$3.79/SPC-1 IOPS™
Total ASU Capacity	981.132 GB
Data Protection Level	Mirroring
Total TSC Price (including three-year maintenance)	$34,127

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.
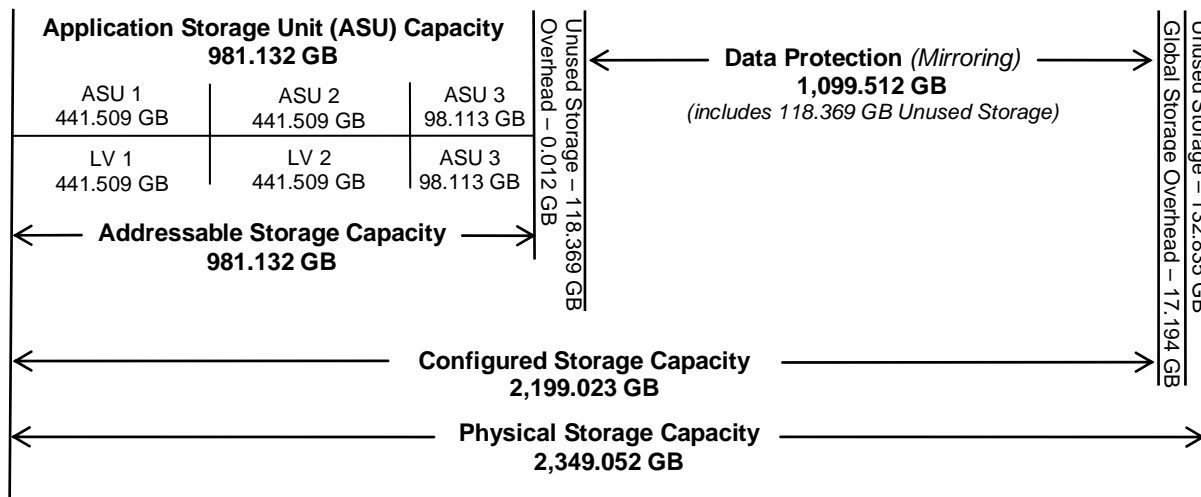
Response Time – Throughput Curve

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.

Ramp Phase Response Time / Throughput Curve
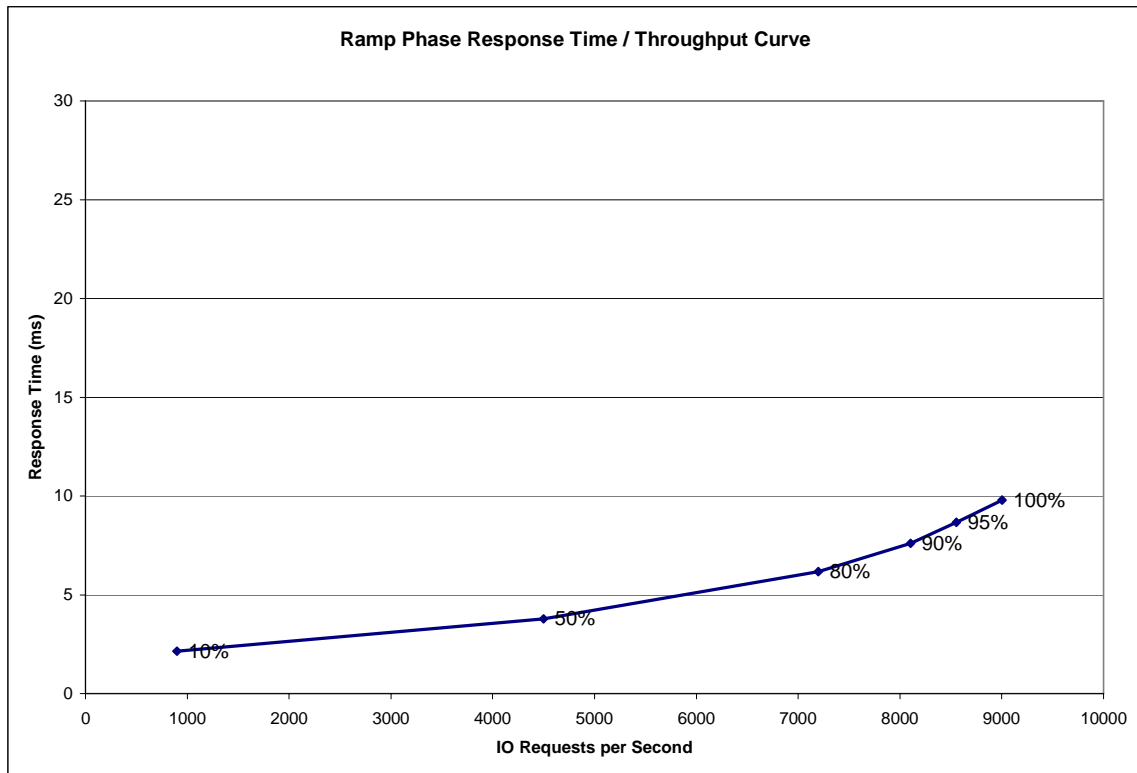
Response Time – Throughput Data

	10% Load	50% Load	80% Load	90% Load	95% Load	100% Load
I/O Request Throughput	899.38	4,498.43	7,199.33	8,105.39	8,553.28	9,000.88
Average Response Time (ms):						
All ASUs	2.15	3.79	6.18	7.61	8.66	9.81
ASU-1	2.73	4.78	7.27	8.67	9.66	10.73
ASU-2	2.60	4.91	9.96	13.78	16.47	19.57
ASU-3	0.72	1.20	2.22	2.65	3.13	3.55
Reads	4.43	7.89	12.47	15.54	17.60	19.95
Writes	0.67	1.12	2.08	2.44	2.83	3.20

Tested Storage Configuration Pricing *(Priced Storage Configuration)*

Description	Part Numbers	Qty	Price	Extended Price
DS3400 Dual Controller	172642E	1	$8,749	$8,749
(incl 4 SFP's and 4 -5M Cables)				
SAS Cables	39R6529	4	$119	$476
73 GB SAS 3.5" HDDs	40K1043	32	$309	$9,888
HBA's (QLA2462)	39R6527	2	$1,899	$3,798
EXP3000	172701X	2	$3,199	$6,398
ESM for EXP3000	39R6515	2	$999	$1,998
3yr. 24.7.4hr Upgrade				$2,820
			Total	**$34,127**

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

The difference between the Tested Storage Configuration and Priced Storage Configuration is that the priced disk drives are mounted in an IBM drive carrier and each disk drive is configured to self-identify as a DS3000 brand. That difference, if applied to the TSC, would not have a negative impact on the reported SPC-1 performance.

Benchmark Configuration/Tested Storage Configuration Diagram

HS-1

IBM xSeries 346 Server

dual-ported

Qlogic 2462 HBAs

SC-1/SC-2

IBM System Storage DS3400
(dual-active controllers, 12 SAS disk drives)

EXP3000 with 12 SAS disk drives

EXP3000 with 8 SAS disk drives
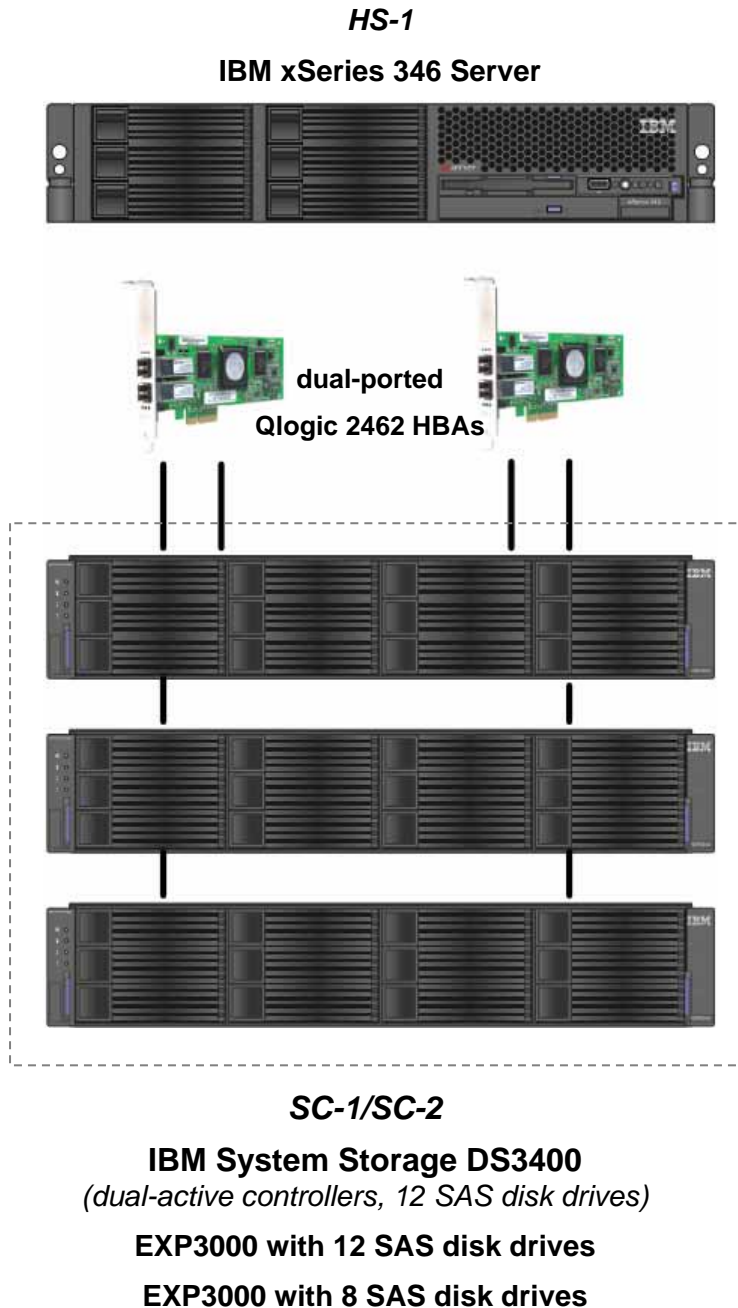
Benchmark Configuration/Tested Storage Configuration Components

Host System:	Tested Storage Configuration (TSC):
HS-1: IBM xSeries 346 Server	2 – dual-ported Qlogic 2462 HBAs

2 – 3.4 GHz Xeon CPUs with 1 MB L2 cache per CPU	**SC-1/SC-2: IBM System Storage DS3400**
	2 – dual-active controllers each with:
	  512 MB cache
	  2 – 4 Gb Fibre Channel host connections
	    (4 total, 4 used)
	  1 – 4x 3 Gb SAS drive connection
	    (2 total, 2 used)

4 GB main memory	
Windows Server 2003 Enterprise Edition with SP1	
PCI-X	
WG:	
	2 – EXP3000 expansion units
	32 – 73 GB 15K RPM disk drives