SPC BENCHMARK 2™

EXECUTIVE SUMMARY

IBM CORPORATION
IBM SYSTEM STORAGE DS3400

SPC-2™ V1.2.1

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EXECUTIVE SUMMARY

Test Sponsor and Contact Information

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Revision Information and Key Dates

Revision Information and Key Dates	
SPC-2 Specification revision number	V1.2.1
SPC-2 Workload Generator revision number	spc2rc9g
Date Results were first used publicly	February 27, 2008
Date FDR was submitted to the SPC	February 27, 2008
Date the revised FDR was submitted to the SPC Revised SPC-2 Price-Performance *(page 4)* Revised pricing *(page 6)* Corrected BC/TSC diagram and table *(pages7,8)*	March 4, 2008
Date the TSC will be 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
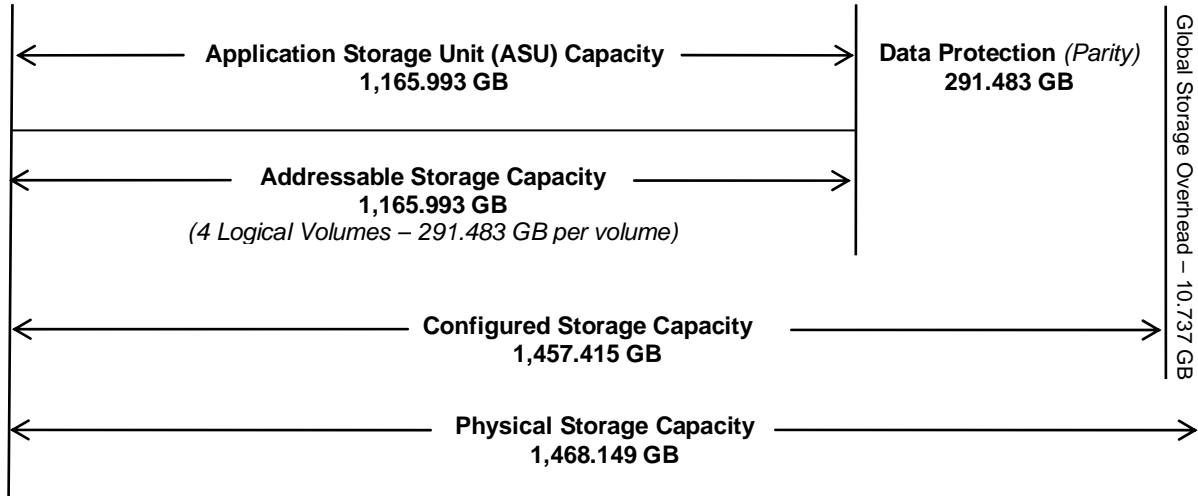
SPC-2 Reported Data

SPC-2 Reported Data consists of three groups of information:

- The following SPC-2 Primary Metrics, which characterize the overall benchmark result:
  - ➢ SPC-2 MBPS™
  - ➢ SPC-2 Price Performance
  - ➢ Application Storage Unit (ASU) Capacity

- Supplemental data to the SPC-2 Primary Metrics.
  - ➢ Total Price
  - ➢ Data Protection Level

- Reported Data for each SPC Test: Large File Processing (LFP), Large Database Query (LDQ), and Video on Demand Delivery (VOD) Test.

SPC-2 Reported Data				
IBM System Storage DS3400				
SPC-2 MBPS™	**SPC-2 Price-Performance**	**ASU Capacity (GB)**	**Total Price**	**Data Protection Level**
731.25	$34.36	1,165.933	$25,123	RAID-5
The above SPC-2 MBPS™ value represents the aggregate data rate of all three SPC-2 workloads: Large File Processing (LFP), Large Database Query (LDQ), and Video On Demand (VOD)				
SPC-2 Large File Processing (LFP) Reported Data				
	Data Rate (MB/second)	**Number of Streams**	**Data Rate per Stream**	**Price-Performance**
LFP Composite	559.66			$44.89
Write Only:				
1024 KiB Transfer	414.74	8	51.84	
256 KiB Transfer	279.88	8	34.98	
Read-Write:				
1024 KiB Transfer	486.07	8	60.76	
256 KiB Transfer	426.72	8	53.34	
Read Only:				
1024 KiB Transfer	873.50	8	109.19	
256 KiB Transfer	877.05	8	109.63	
The above SPC-2 Data Rate value for LFP Composite represents the aggregate performance of all three LFP Test Phases: (Write Only, Read-Write, and Read Only).				
SPC-2 Large Database Query (LDQ) Reported Data				
	Data Rate (MB/second)	**Number of Streams**	**Data Rate per Stream**	**Price-Performance**
LDQ Composite	769.01			$32.67
1024 KiB Transfer Size				
4 I/Os Outstanding	882.70	8	110.34	
1 I/O Outstanding	872.44	8	109.06	
64 KiB Transfer Size				
4 I/Os Outstanding	573.76	8	71.72	
1 I/O Outstanding	747.13	8	93.39	
The above SPC-2 Data Rate value for LDQ Composite represents the aggregate performance of the two LDQ Test Phases: (1024 KiB and 64 KiB Transfer Sizes).				
SPC-2 Video On Demand (VOD) Reported Data				
	Data Rate (MB/second)	**Number of Streams**	**Data Rate per Stream**	**Price-Performance**
	865.08	1,100	0.79	$29.04

Storage Capacities and Relationships

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

```
|<───────── Application Storage Unit (ASU) Capacity ──────────>|  Data Protection (Parity)      | Global Storage Overhead – 10.737 GB
|                          1,165.993 GB                        |       291.483 GB              |
|                                                              |                               |
|<──────────── Addressable Storage Capacity ─────────────>|                                     |
|                          1,165.993 GB                        |                               |
|              (4 Logical Volumes – 291.483 GB per volume)     |                               |
|                                                              |                               |
|<──────────────── Configured Storage Capacity ──────────────────────────>|                     |
|                          1,457.415 GB                                    |                     |
|<──────────────────── Physical Storage Capacity ───────────────────────────────>|             |
|                          1,468.149 GB                                           |             |
```

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	2	$119	$238
73 GB SAS 3.5" HDDs	40K1043	20	$309	$6,180
HBA's (QLA2462)	39R6527	2	$1,899	$3,798
EXP3000	172001X	1	$3,199	$3,199
ESM for EXP3000	39R6515	1	$999	$999
3yr. 24.7.4hr Upgrade				$1,960
			Total	**$25,123**

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, 10 SAS disk drives)

EXP3000 with 10 SAS disk drives

Host System(s) and 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
4 GB main memory	2 – 4 Gb Fibre Channel host connections *(4 total, 4 used)*
Windows Server 2003 Enterprise Edition with SP1	1 – 4x 3 Gb SAS drive connection *(2 total, 2 used)*
PCI-X	
WG:	1 – EXP3000 expansion unit
	20 – 73 GB 15K RPM disk drives