



**SPC BENCHMARK 2™
EXECUTIVE SUMMARY**

**IBM CORPORATION
IBM SYSTEM STORAGE
DS4700 EXPRESS MODEL 70**

SPC-2™ V1.2.1

**Submitted for Review: October 27, 2006
Submission Identifier: B00012**

EXECUTIVE SUMMARY**Test Sponsor and Contact Information**

Test Sponsor and Contact Information	
Test Sponsor Primary Contact	IBM Corporation – http://www.ibm.com Peter Leung – leungp@us.ibm.com 65S/9062-2 9000 South Rita Road Tucson, AZ 85744 Phone: (520) 799-2853 FAX: (520) 799-5530
Test Sponsor Alternate Contact	IBM Corporation – http://www.ibm.com Bruce McNutt – bmcnutt@us.ibm.com KBV/9062-2 9000 South Rita Road Tucson, AZ 85744 Phone: (520) 799-2460 FAX: (520) 799-5530
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

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	October 27, 2006
Date FDR was submitted to the SPC	October 27, 2006
Date the TSC will be available for shipment to customers	currently available
Date the TSC completed audit certification	October 27, 2006

Tested Storage Product (TSP) Description

The IBM System Storage DS4700 Express Model 70 is a part of the DS4000 series storage product family that address the needs of midrange and departmental storage requirements. It is designed to deliver high performance with advanced function and high availability, employing sixth-generation architecture that delivers 4 Gbps FC connectivity directly to host servers, SAN fabric, and disk drive expansion enclosures.

The IBM System Storage DS4700 Express Model 70 comes in a compact, 3U rack-mountable enclosure that contains dual intelligent, high-performance RAID controllers with support for RAID 0, 1, 3, 5, and 10. It can accommodate up to 16 E-DDS for up to 4.8 TB internal physical storage capacity. Storage capacity may be expanded by attaching DS4000 storage expansion units for configurations up to 33 TB of physical storage capacity.

The IBM System Storage DS4700 Express Model 70 has advanced storage management and capacity allocation options. It comes with two storage partitions enabled, which may be field upgraded to 4, 8, 16, and 64 storage partitions.

For attachment to host servers, the IBM System Storage DS4700 Express Model 70 is shipped with Windows Host Kit option. The host kit contains DS4700 Storage Manager and IBM Machine Code to support attachment to host servers running Windows.

SPC-2 Reported Data

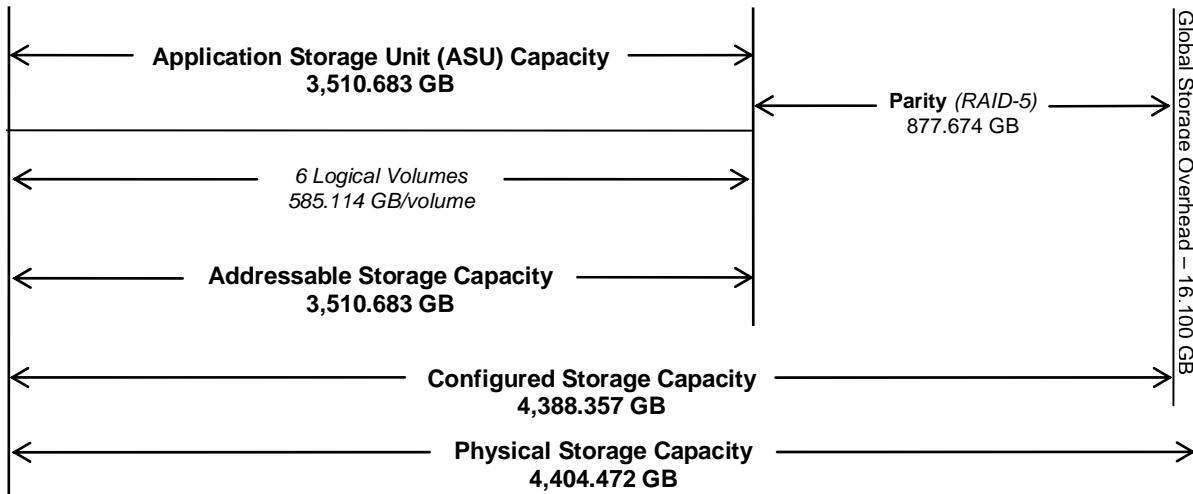
SPC-2 Reported Data consists of three groups of information:

- 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 DS4700 Express Model 70				
SPC-2 MBPS™	SPC-2 Price-Performance	ASU Capacity (GB)	Total Price	Data Protection Level
804.29	\$169.47	3,510.683	\$136,305	RAID-5
<i>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)</i>				
SPC-2 Large File Processing (LFP) Reported Data				
	Data Rate (MB/second)	Number of Streams	Data Rate per Stream	Price-Performance
LFP Composite	687.05			\$198.39
Write Only:				
1024 KiB Transfer	669.70	32	20.93	
256 KiB Transfer	286.44	32	8.95	
Read-Write:				
1024 KiB Transfer	792.05	32	24.75	
256 KiB Transfer	426.20	32	13.32	
Read Only:				
1024 KiB Transfer	965.67	32	30.18	
256 KiB Transfer	982.23	32	30.69	
<i>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).</i>				
SPC-2 Large Database Query (LDQ) Reported Data				
	Data Rate (MB/second)	Number of Streams	Data Rate per Stream	Price-Performance
LDQ Composite	852.88			\$159.82
1024 KiB Transfer Size				
4 I/Os Outstanding	972.80	32	30.40	
1 I/O Outstanding	942.50	32	29.45	
64 KiB Transfer Size				
4 I/Os Outstanding	759.12	32	23.72	
1 I/O Outstanding	737.09	32	23.03	
<i>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).</i>				
SPC-2 Video On Demand (VOD) Reported Data				
	Data Rate (MB/second)	Number of Streams	Data Rate per Stream	Price-Performance
	872.94	1,110	0.79	\$156.14

Storage Capacities and Relationships

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



Tested Storage Configuration Pricing (*Priced Storage Configuration*)

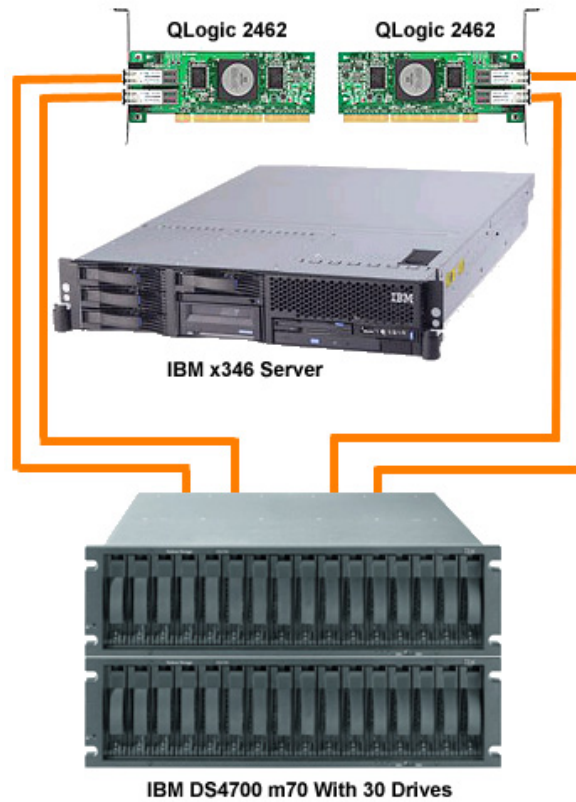
Product	Quantity	List Price each	extended list price
IBM DS4700 Express Model 70 dual controller tray 1 GB cache/controller (2 GB total) 2 storage partitions Windows Host Kit	1	\$19,449	\$19,449
EXP810	1	\$6,000	\$6,000
39M5894 HBAs (QLA 2462)	2	\$2,485	\$4,970
146.8 GB x15K RPM disk drives	30	\$3,099	\$92,970
1m Fiber Optic Cable LC-LC	4	\$79	\$316
annual 24x7x4hr upgrade	3	\$4,200	\$12,600
Total			\$136,305

The above pricing provides maintenance/support for 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(s) and Tested Storage Configuration Components

Host System:	Tested Storage Configuration (TSC):
UID=HS-1	2 – QLogic 2462 HBAs
IBM xSeries 346 2 – Intel Xeon 3.4 GHz CPUs 2 MB L2 cache per CPU	UID=SC-1, SC-2: IBM System Storage DS4700 Express Model 70
2 GB main memory	Dual active RAID Controller 2 GB RAM per controller
Windows 2003 Enterprise Edition SP1	4 – 4Gb Fibre Channel host connections
PCI-X	4 – 4Gb Fibre Channel drive connections
WG	1 – DS4000 EXP810 Expansion Units
	30 – 146 GB 15K RPM disk drives