



**SPC BENCHMARK 2™
EXECUTIVE SUMMARY**

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

SPC-2™ V1.2.1

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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

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SPC-2 Specification revision number	V1.2.1
SPC-2 Workload Generator revision number	spc2rc9g
Date Results were first used publicly	March 6, 2007
Date FDR was submitted to the SPC	March 6, 2007
Date revised FDR was submitted to the SPC Revised pricing and SPC-1 Price-Performance	June 27, 2007
Date the TSC will be available for shipment to customers	currently available
Date the TSC completed audit certification	February 28, 2007

Tested Storage Product (TSP) Description

The IBM System Storage DS4700 Express Model 70 is a part of the DS4000 series storage product family that addresses 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-DDMs 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

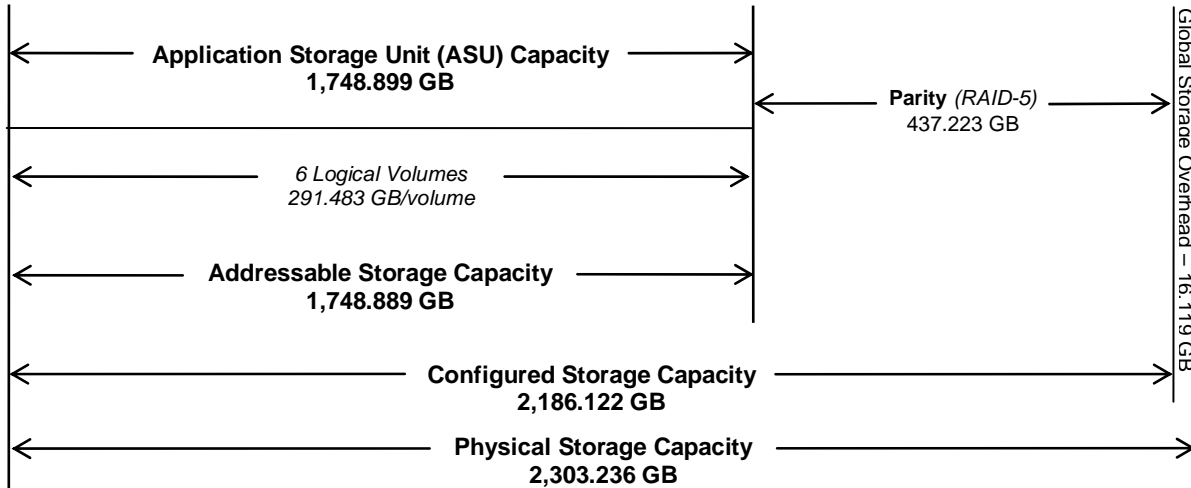
SPC-2 Reported Data consists of three groups of information:

- 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 Model 70 Array				
SPC-2 MBPS™	SPC-2 Price-Performance	ASU Capacity (GB)	Total Price	Data Protection Level
798.53	\$117.35	1,748.899	\$93,705	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	695.11			\$134.81
Write Only:				
1024 KiB Transfer	694.03	32	21.69	
256 KiB Transfer	287.21	32	8.98	
Read-Write:				
1024 KiB Transfer	807.25	32	25.23	
256 KiB Transfer	425.81	32	13.31	
Read Only:				
1024 KiB Transfer	973.76	32	30.43	
256 KiB Transfer	982.59	32	30.71	
<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	827.54			\$113.23
1024 KiB Transfer Size				
4 I/Os Outstanding	940.49	32	29.39	
1 I/O Outstanding	842.82	32	26.34	
64 KiB Transfer Size				
4 I/Os Outstanding	781.32	32	24.42	
1 I/O Outstanding	745.52	32	23.30	
<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	\$107.34

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*)

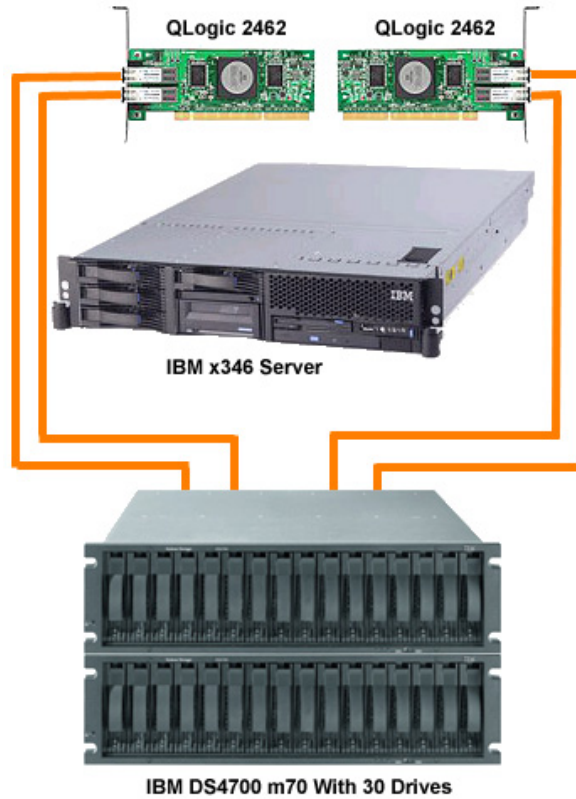
Product	Quantity	List Price each	extended list price
IBM DS4700 Express Model 70 2 GB total cache/1 GB per controller Windows Host Kit and 2 Storage Partitions	1	\$19,449	\$19,449
EXP810	1	\$6,000	\$6,000
39M5894 HBAs	2	\$2,485	\$4,970
73.4 GB x15K RPM disk drives	30	\$1,679	\$50,370
1m Fiber Optic Cable LC-LC	4	\$79	\$316
annual 24x7x4hr upgrade	3	\$4,200	\$12,600
total			\$93,705

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 – FC4600 Expansion Unit
	30 – 73.4 GB 15K RPM disk drives