



**SPC BENCHMARK 2™
EXECUTIVE SUMMARY**

**IBM CORPORATION
IBM SYSTEM STORAGE DS8870**

SPC-2™ V1.3

**Submitted for Review: October 3, 2012
Submission Identifier: B00062**

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

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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

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SPC-2 Specification revision number	V1.3
SPC-2 Workload Generator revision number	V1.0
Date Results were first used publicly	October 3, 2012
Date FDR was submitted to the SPC	October 3, 2012
Date the TSC will be available for shipment to customers	October 19, 2012
Date the TSC completed audit certification	October 1, 2012

Tested Storage Product (TSP) Description

The DS8870 represents the latest in this series of enterprise disk storage systems designed for high-performance, high-capacity and resiliency. New with the 8870 are a major upgrade of the processing complex and system bandwidth.

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 DS8870				
SPC-2 MBPS™	SPC-2 Price-Performance	ASU Capacity (GB)	Total Price	Data Protection Level
15,423.66	\$131.21	30,923.765	\$2,023,742.10	Protected (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	14,508.33			\$139.49
Write Only:				
1024 KiB Transfer	11,212.14	192	58.40	
256 KiB Transfer	11,270.31	192	58.70	
Read-Write:				
1024 KiB Transfer	13,983.66	192	72.83	
256 KiB Transfer	13,909.56	192	72.45	
Read Only:				
1024 KiB Transfer	18,435.57	192	96.02	
256 KiB Transfer	18,238.73	192	94.99	
<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	17,607.02			\$114.94
1024 KiB Transfer Size				
4 I/Os Outstanding	17,966.58	192	93.58	
1 I/O Outstanding	18,309.61	192	95.36	
64 KiB Transfer Size				
4 I/Os Outstanding	17,206.58	192	89.62	
1 I/O Outstanding	16,945.32	192	88.26	
<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
	14,155.62	18,000	0.79	\$142.96

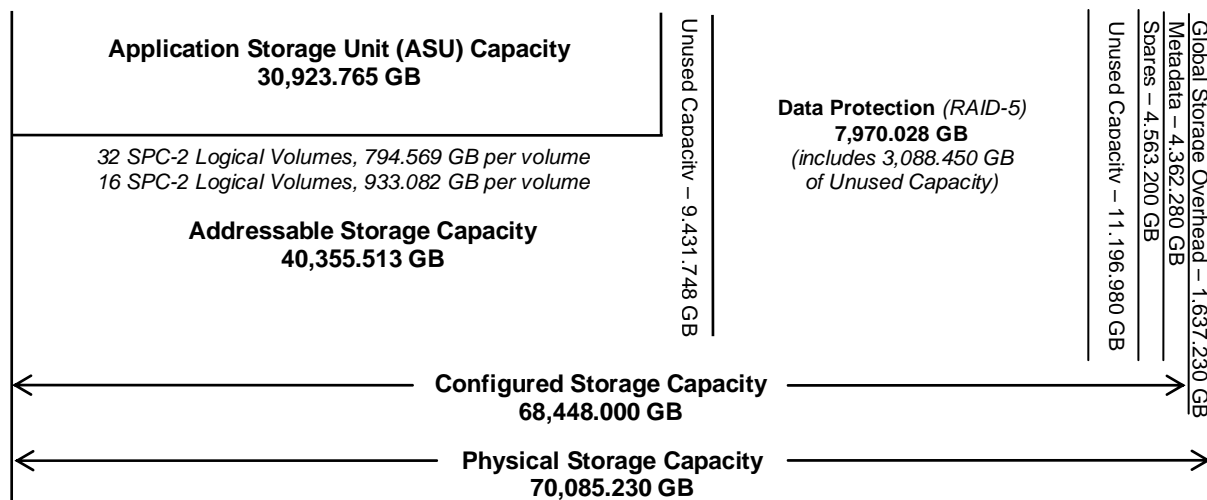
SPC-2 MBPS™ represents the aggregate data rate, in megabytes per second, of all three SPC-2 workloads: Large File Processing (LFP), Large Database Query (LDQ), and Video on Demand (VOD).

ASU (Application Storage Unit) Capacity represents the total storage capacity read and written in the course of executing the SPC-2 benchmark.

A **Data Protection Level of Protected** using **RAID-5** provides data protection by distributing check data corresponding to user data across multiple disks in the form of bit-by-bit parity.

Storage Capacities and Relationships

The following diagram (*not to scale*) and table document the various storage capacities, used in this benchmark, and their relationships, as well as the storage utilization values required to be reported.



SPC-1 Storage Capacity Utilization	
Application Utilization	44.12%
Protected Application Utilization	51.09%
Unused Storage Ratio	33.84%

Application Utilization: Total ASU Capacity (*30,923.765 GB*) divided by Physical Storage Capacity (*70,085.230 GB*)

Protected Application Utilization: Total ASU Capacity (*30,923.765 GB*) plus total Data Protection Capacity (*7,970.028 GB*) minus unused Data Protection Capacity (*3,088.450 GB*) divided by Physical Storage Capacity (*70,085.230 GB*).

Unused Storage Ratio: Total Unused Capacity (*23,717.178 GB*) divided by Physical Storage Capacity (*70,085.230 GB*) and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 24-25 in the Full Disclosure Report.

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

There were no differences between the Tested Storage Configuration and the Priced Storage Configuration.

Priced Storage Configuration Pricing

Product	Description	Serial	Qty	Unit Price	List Price	% disc't	Ext. Price
2423-961	IBM System Storage DS8870		1	\$ 72,419.00	\$ 72,419.00	50%	\$ 36,209.50
1	9xE factory merge		1	\$ -	\$ -	50%	\$ -
100	Eligible for EU Shipment		1	\$ -	\$ -	50%	\$ -
201	Storage Enclosure Infrastructure		1	\$ -	\$ -	50%	\$ -
351	961 - 96E Position 1		1	\$ -	\$ -	50%	\$ -
700	OEL Indicator		1	\$ -	\$ -	50%	\$ -
713	IBM System Storage Easy Tier Indicator		1	\$ -	\$ -	50%	\$ -
820	50.1 to 75.0 TB capacity		1	\$ -	\$ -	50%	\$ -
900	Non-Standby CoD		1	\$ -	\$ -	50%	\$ -
1051	Battery Assembly		2	\$ 16,200.00	\$ 32,400.00	50%	\$ 16,200.00
1082	Line Cord (US/LA/AP/Canada)		1	\$ 7,000.00	\$ 7,000.00	50%	\$ 3,500.00
1120	Management Console - English Laptop Internal		1	\$ 9,160.00	\$ 9,160.00	50%	\$ 4,580.00
1241	Disk Enclosure Pair		5	\$ 20,000.00	\$ 100,000.00	50%	\$ 50,000.00
1242	HD STD Enclosure Indicator		5	\$ -	\$ -	50%	\$ -
1246	HD Disk Drive Cable Group 1		1	\$ 7,000.00	\$ 7,000.00	50%	\$ 3,500.00
1301	I/O Enclosure Pair PCIE		2	\$ 11,780.00	\$ 23,560.00	50%	\$ 11,780.00
1321	PCI-E Cable Group 2		1	\$ 4,100.00	\$ 4,100.00	50%	\$ 2,050.00
1731	DS8000 LMC R7.0		1	\$ 40,000.00	\$ 40,000.00	50%	\$ 20,000.00
5108	146 GB 15K Drive Set FDE		15	\$ 53,909.00	\$ 808,635.00	50%	\$ 404,317.50
3053	Device Adapter Pair I		4	\$ 15,000.00	\$ 60,000.00	50%	\$ 30,000.00
3153	8 Gb 4 port SW FCP/FICON Adapter PCIE		8	\$ 37,312.00	\$ 298,496.00	50%	\$ 149,248.00
4315	256 GB Processor Memory (8-core)		1	\$ 339,960.00	\$ 339,960.00	50%	\$ 169,980.00
4403	8-core Processor Card		1	\$ 170,210.00	\$ 170,210.00	50%	\$ 85,105.00
7031	OEL - 1 TB		1	\$ -	\$ -	50%	\$ -
7033	OEL - 10 TB		2	\$ -	\$ -	50%	\$ -
7035	OEL - 50 TB		1	\$ -	\$ -	50%	\$ -
7051	OEL - 1 Value Unit		4	\$ -	\$ -	50%	\$ -
7052	OEL - 5 Value Unit		1	\$ -	\$ -	50%	\$ -
7053	OEL - 10 Value Unit		1	\$ -	\$ -	50%	\$ -
7054	OEL - 25 Value Unit		1	\$ -	\$ -	50%	\$ -
7060	OEL - 100 Value Unit		1	\$ -	\$ -	50%	\$ -
7083	IBM System Storage Easy Tier indicator		1	\$ -	\$ -	50%	\$ -
2398-LFA	DS8000 Function Authorization		1	\$ -	\$ -	40%	\$ -
7031	OEL - 1 TB		1	\$ -	\$ -	40%	\$ -
7033	OEL - 10 TB		2	\$ -	\$ -	40%	\$ -
7035	OEL - 50 TB		1	\$ -	\$ -	40%	\$ -
7051	OEL - 1 Value Unit		4	\$ 6,666.00	\$ 26,664.00	40%	\$ 15,998.40
7052	OEL - 5 Value Unit		1	\$ 26,829.00	\$ 26,829.00	40%	\$ 16,097.40
7053	OEL - 10 Value Unit		1	\$ 53,659.00	\$ 53,659.00	40%	\$ 32,195.40
7054	OEL - 25 Value Unit		1	\$ 85,397.00	\$ 85,397.00	40%	\$ 51,238.20
7060	OEL - 100 Value Unit		1	\$ 226,588.00	\$ 226,588.00	40%	\$ 135,952.80
7083	IBM System Storage Easy Tier		1	\$ -	\$ -	40%	\$ -

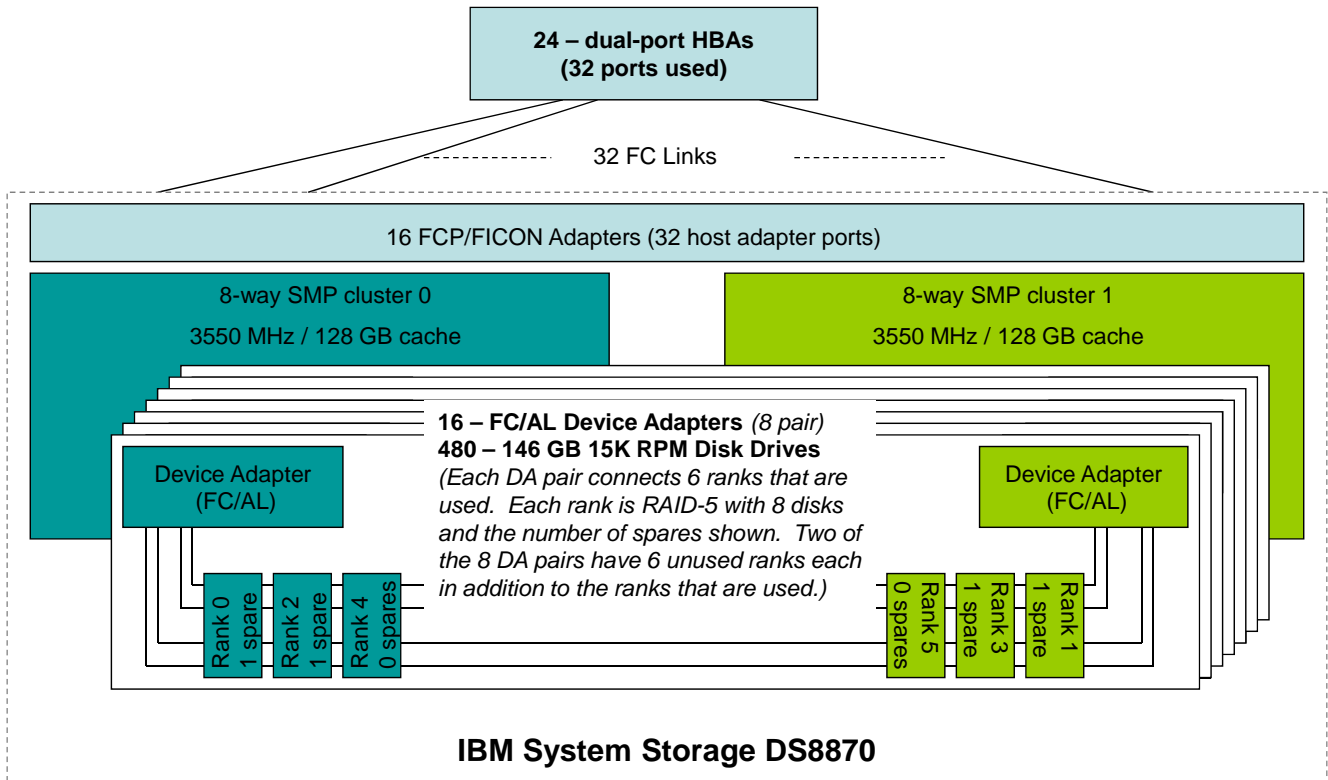
Priced Storage Configuration Pricing (continued)

Product	Description	Serial	Qty	Unit Price	List Price	% disc't	Ext. Price
2423-96E	IBM System Storage DS8800 Expansion Unit		1	\$ 73,500.00	\$ 73,500.00	50%	\$ 36,750.00
1	9xE factory merge		1	\$ -	\$ -	50%	\$ -
100	Eligible for EU Shipment		1	\$ -	\$ -	50%	\$ -
201	Storage Enclosure Infrastructure		1	\$ -	\$ -	50%	\$ -
351	961 - 96E Position 1		1	\$ -	\$ -	50%	\$ -
820	50.1 to 75.0 TB capacity		1	\$ -	\$ -	50%	\$ -
1051	Battery Assembly		2	\$ 16,200.00	\$ 32,400.00	50%	\$ 16,200.00
1082	Line Cord (US/LA/AP/Canada)		1	\$ 7,000.00	\$ 7,000.00	50%	\$ 3,500.00
1241	Disk Enclosure Pair		5	\$ 20,000.00	\$ 100,000.00	50%	\$ 50,000.00
1242	HD STD Enclosure Indicator		5	\$ -	\$ -	50%	\$ -
1247	HD Disk Drive Cable Group 2		1	\$ 9,000.00	\$ 9,000.00	50%	\$ 4,500.00
1301	I/O Enclosure Pair PCIE		2	\$ 11,780.00	\$ 23,560.00	50%	\$ 11,780.00
1322	PCIE Cable Group 3		1	\$ 5,000.00	\$ 5,000.00	50%	\$ 2,500.00
1831	DS8000 LMC R7.0 indicator		1	\$ -	\$ -	50%	\$ -
5108	146 GB 15K Drive Set		15	\$ 53,909.00	\$ 808,635.00	50%	\$ 404,317.50
3053	Device Adapter Pair I		4	\$ 15,000.00	\$ 60,000.00	50%	\$ 30,000.00
3153	8 Gb 4 port SW FCP/FICON Adapter PCIE		8	\$ 37,312.00	\$ 298,496.00	50%	\$ 149,248.00
9117-5735	8 Gbps dual port FC adapter		24	\$ 4,583.00	\$ 109,992.00	30%	\$ 76,994.40
	TOTAL						\$2,023,742.10

The following pricing includes the following:

- Acknowledgement of new and existing hardware and/or software problems within four hours.
- Onsite presence of a qualified maintenance engineer or provision of a customer replaceable part within four hours of the above acknowledgement for any hardware failure that results in an inoperative Priced Storage Configuration component.

Priced Storage Configuration Diagram



Priced Configuration Components

Priced Storage Configuration:
24 – 8 Gbps dual port FC HBAs
IBM System Storage DS8870
2 –SMP processing clusters
Each cluster contains:
8 – processor cores
128 GB – processor memory (256 GB total)
16 – 8 Gb, 4 port SW FCP/FICON adapter pairs <i>(128 host port front-end connections, 32 used)</i>
8 – 4 port, 8 Gb FC-AL device adapter pairs (4 adapter pair/cluster) <i>(64 backend connections, 64 used)</i>
1 – Management Console (internal laptop)
1 – DS8870 Expansion Unit
10 – Disk Enclosure pairs (48 disk drives per enclosure pair)
480 – 146 GB, 15K RPM, 2.5” disk drives