



**SPC BENCHMARK 2™  
EXECUTIVE SUMMARY**

**IBM CORPORATION  
IBM SYSTEM STORAGE  
SAN VOLUME CONTROLLER 4.1**

**SPC-2™ V1.2**

**Submitted for Review: September 12, 2006  
Submission Identifier: B00011**

**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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<b>SPC-2 Specification revision number</b>	V1.2
<b>SPC-2 Workload Generator revision number</b>	spc2rc9g
<b>Date Results were first used publicly</b>	September 12, 2006
<b>Date FDR was submitted to the SPC</b>	September 12, 2006
<b>Date the TSC will be available for shipment to customers</b>	currently available
<b>Date the TSC completed audit certification</b>	September 11, 2006

## SPC-2 Reported Data

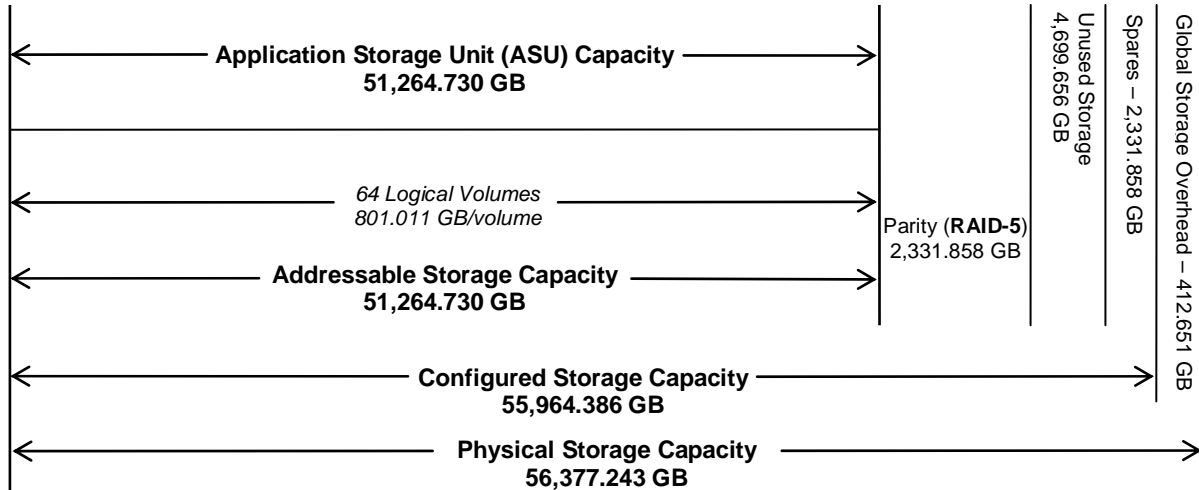
SPC-2 Reported Data consists of three groups of information:

- 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.

IBM System Storage SAN Volume Controller 4.1				
SPC-2 MBPS™	SPC-2 Price-Performance	ASU Capacity (GB)	Total Price	Data Protection Level
4,544.35	\$400.78	51,264.730	\$1,821,301	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	3,237.93			\$562.49
Write Only:				
1024 KiB Transfer	1,325.72	16	82.86	
256 KiB Transfer	1,326.92	16	82.93	
Read-Write:				
1024 KiB Transfer	2,056.60	32	64.27	
256 KiB Transfer	2,116.72	32	66.15	
Read Only:				
1024 KiB Transfer	6,294.03	64	98.34	
256 KiB Transfer	6,307.57	64	98.56	
<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	5,990.98			\$304.01
1024 KiB Transfer Size				
4 I/Os Outstanding	5,898.18	32	184.32	
1 I/O Outstanding	6,116.82	128	47.79	
64 KiB Transfer Size				
4 I/Os Outstanding	6,023.02	128	47.05	
1 I/O Outstanding	5,925.89	128	46.30	
<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
	4,404.14	5,600	0.79	\$413.54

### 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*)

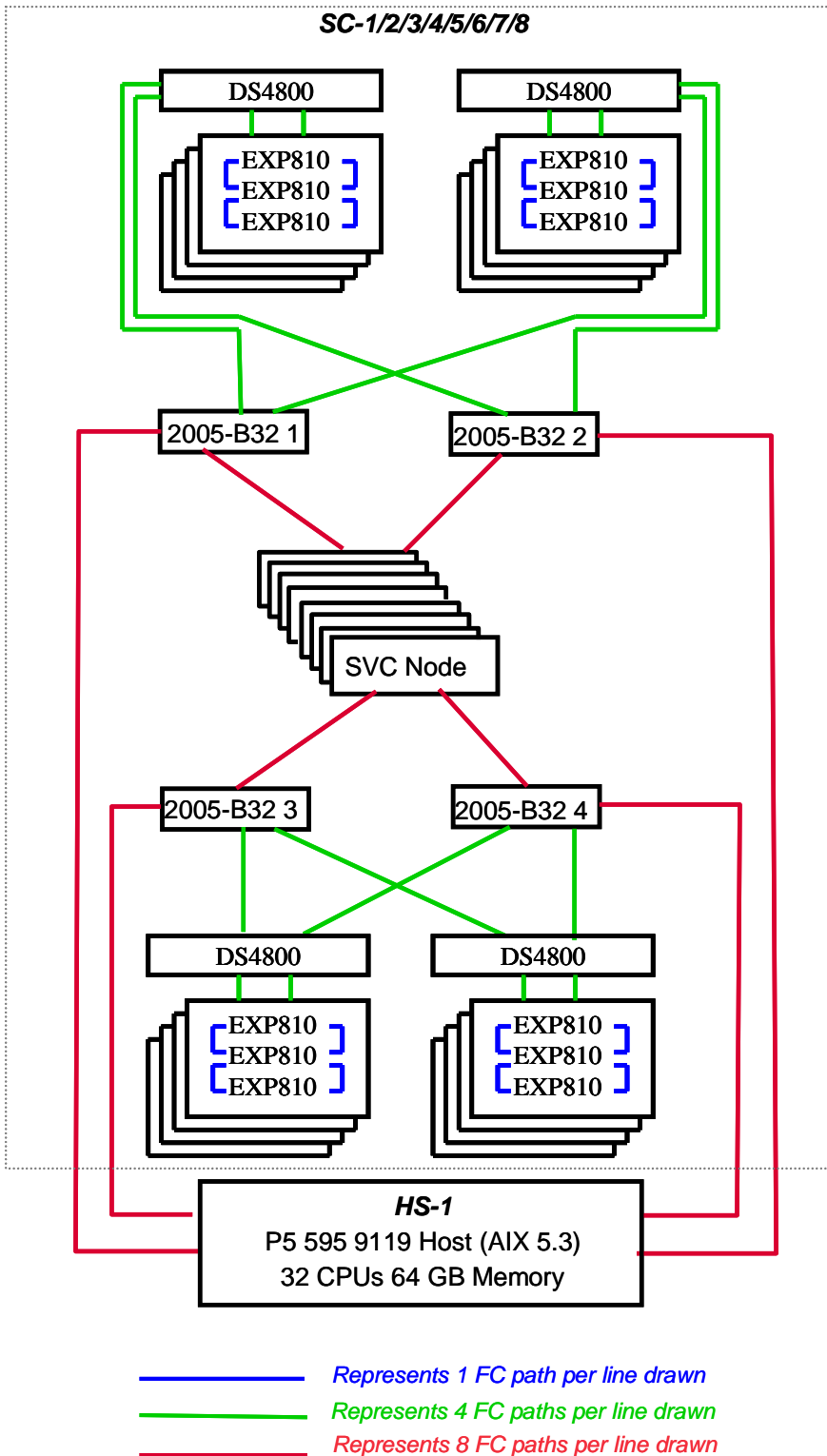
Component	Comments	Quantity	Unit Price	Unit Maint	List w/ Maint	% discount	Total Price
SVC Storage Engine		8	16,500.00	3,564.00	160,512.00	30	112,358.40
UPS		8	1,250.00	2,268.00	28,144.00	30	19,700.80
Master Console		1	7,499.00	3,312.00	10,811.00	30	7,567.70
SVC Software license	up to 52 virtualized TB	1	224,000.00	89,600.00	313,600.00	30	219,520.00
19 inch rack (7014-T42)		5	3,970.00	1,512.00	27,410.00	50	13,705.00
32 port fibre channel switch (2005-B32)	32 ports enabled	4	32,675.00	2,240.00	139,660.00	20	111,728.00
Ethernet switch (73P-2413)		1	489.99	35.00	524.99	42	304.49
DS4800	w/ 16 SFP, 8 - 5m cables	4	59,019	3,200	248,876.00	37	156,791.88
EXP810 with 16 15K RPM drives (73 GB)	w/ 4 SFP, 2 - 1m cables	48	34,740	960	1,713,600.00	37	1,079,568.00
SFP (4 pack, 4Gbit)		16	550		8,800.00	20	7,040.00
Short wave fibre channel cable (5 m)		32	129		4,128.00	20	3,302.40
Short wave fibre channel cable (25 m)		32	189		6,048.00	20	4,838.40
Ethernet cable (7 feet)		12	6.99		83.88	0	83.88
Ethernet cable (25 feet)		8	14.99		119.92	0	119.92
4 Gbit P5 595 adapter (5758)		32	2,646.00		84,672.00	0	84,672.00
<b>Total Price</b>							1,821,301

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

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

**Benchmark Configuration/Tested Storage Configuration Diagram**



**Notes:**

All storage is managed by each node (single image).

Each EXP810 has 16 disks (total of 768). Disks are 73 GB, 15K RPM.

Each switch has one zone for node-to-storage traffic, two zones for node-to-host traffic (even nodes to even fcs's, odd nodes to odd fcs's).

## Host System(s) and Tested Storage Configuration Components

Host Systems:	Tested Storage Configuration (TSC):
<b>UID=HS-1</b>	32 – 4 Gbit P5 595 HBAs
IBM P5 595 Model 9119	<b>UID=SC-1/2/3/4/5/6/7/8:</b>
32 – 1.9 GHz CPUs – 2 CPUs/POWER5 chip 32 KB L1 cache, 960 KB L2 cache, and 18 MB L3 cache per CPU	8 – TotalStorage® SAN Volume Controllers
64 GB main memory	Per controller:
AIX 5.3	xSeries 336 processor which contains:
PCI-X/RIO	2 – 3.0 GHz Intel P4 CPUs
WG	8 GB memory/cache
	4 – 4 Gbit FC ports
	4 – 32 port FC switches
	1 – Ethernet switch
	4 – DS4800 enclosures
	48 – EXP810 enclosures
	16 – 73 GB, 15K RPM disk drives per EXP810
	5 – 19 inch racks
	8 – UPS