



**SPC BENCHMARK 1™  
EXECUTIVE SUMMARY**

**IBM CORPORATION  
IBM TOTALSTORAGE® DS4800**

**SPC-1 V1.9**

**Submitted for Review: May 9, 2005**

**Submission Identifier: A00042**

**Accepted: July 8, 2005**



## **EXECUTIVE SUMMARY**

### **Test Sponsor and Contact Information**

<b>Test Sponsor and Contact Information</b>	
<b>Test Sponsor Primary Contact</b>	IBM Corporation – <a href="http://www.ibm.com">http://www.ibm.com</a> Peter Leung – <a href="mailto:leungp@us.ibm.com">leungp@us.ibm.com</a> 65S/9062-2 9000 South Rita Road Tucson, AZ 85744 Phone: (520) 799-2853 FAX: (520) 799-5530
<b>Test Sponsor Alternate Contact</b>	IBM Corporation – <a href="http://www.ibm.com">http://www.ibm.com</a> Bruce McNutt – <a href="mailto:bmcnutt@us.ibm.com">bmcnutt@us.ibm.com</a> KBV/9062-2 9000 South Rita Road Tucson, AZ 85744 Phone: (520) 799-2460 FAX: (520) 799-5530
<b>Auditor</b>	Storage Performance Council – <a href="http://www.StoragePerformance.org">http://www.StoragePerformance.org</a> Walter E. Baker – <a href="mailto:AuditService@StoragePerformance.org">AuditService@StoragePerformance.org</a> 643 Bair Island Road, Suite 103 Redwood City, CA 94063 Phone: (650) 556-9384 FAX: (650) 556-9385

### **Revision Information and Key Dates**

<b>Revision Information and Key Dates</b>	
<b>SPC-1 Specification revision number</b>	V1.9
<b>SPC-1 Workload Generator revision number</b>	V2.00.04a
<b>Date Results were first used publicly</b>	May 9, 2005
<b>Date FDR was submitted to the SPC</b>	May 9, 2005
<b>Date the TSC is/was available for shipment to customers</b>	June 17, 2005
<b>Date the TSC completed audit certification</b>	May 5, 2005

### Summary of Results

SPC-1 Results	
Tested Storage Configuration (TSC) Name: IBM TotalStorage® DS4800	
Metric	Reported Result
SPC-1 IOPS™	42,254.07
SPC-1 Price-Performance	\$17.55/SPC-1 IOPS™
Total ASU Capacity	6,871.109GB
Data Protection Level	Mirroring
Total TSC Price (including three-year maintenance)	\$741,670

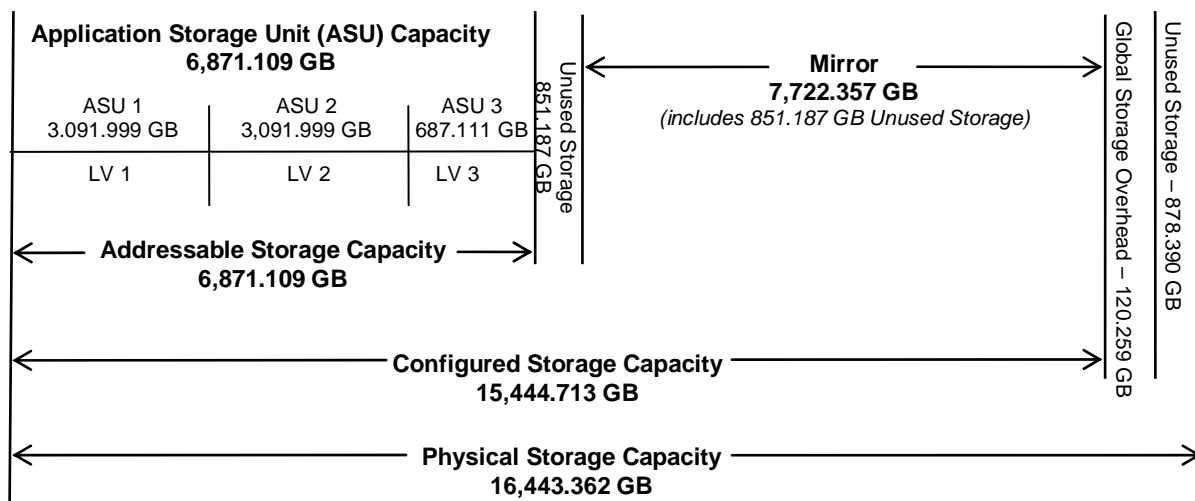
**SPC-1 IOPS™** represents the maximum I/O Request Throughput at the 100% load point.

**Total ASU (Application Storage Unit) Capacity** represents the total storage capacity read and written in the course of executing the SPC-1 benchmark.

A **Data Protection Level** of Mirroring configures two or more identical copies of user data.

### Storage Capacities and Relationships

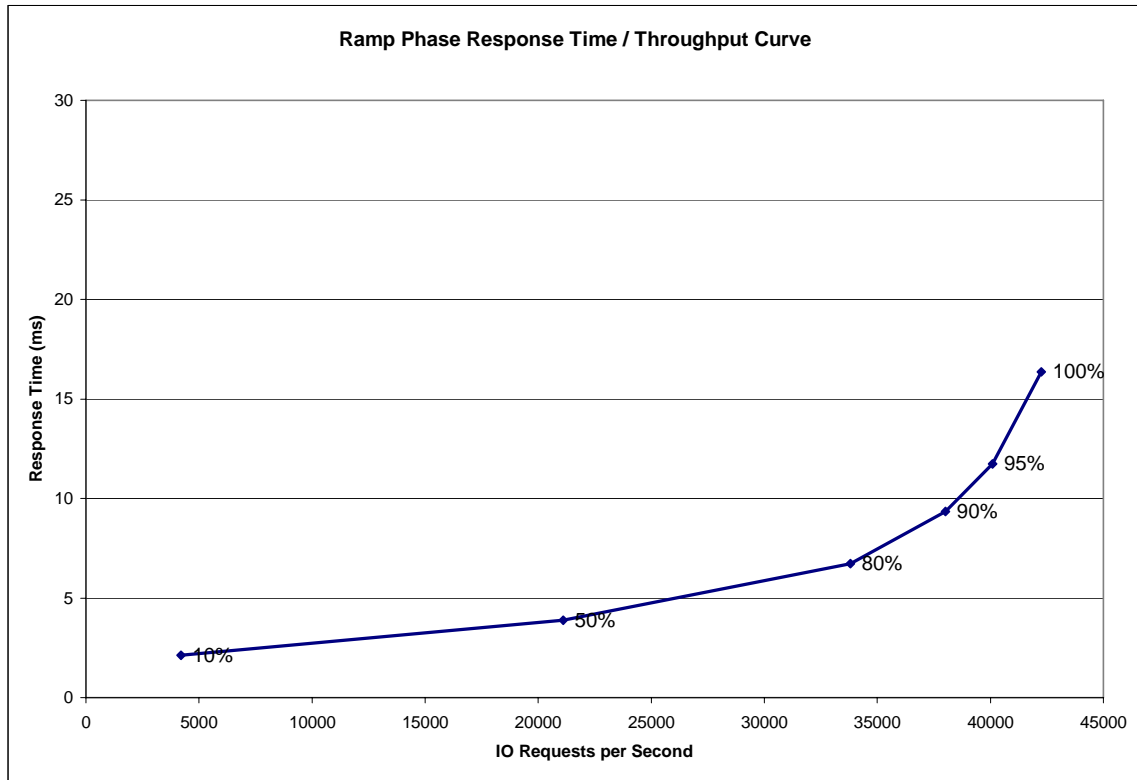
The following diagram documents the various storage capacities, used in this benchmark, and their relationships.



### Response Time – Throughput Curve

The Response Time-Throughput Curve illustrates the Average Response Time (milliseconds) and I/O Request Throughput at 100%, 95%, 90%, 80%, 50%, and 10% of the workload level used to generate the SPC-1 IOPS™ metric.

The Average Response Time measured at the any of the above load points cannot exceed 30 milliseconds or the benchmark measurement is invalid.



### Response Time – Throughput Data

	10% Load	50% Load	80% Load	90% Load	95% Load	100% Load
<b>I/O Request Throughput</b>	4,199.77	21,102.43	33,802.92	38,003.23	40,091.69	42,254.07
<b>Average Response Time (ms):</b>						
All ASUs	2.12	3.88	6.74	9.34	11.75	16.36
ASU-1	2.76	4.89	7.86	10.31	12.50	16.69
ASU-2	2.75	5.45	9.83	13.34	16.29	21.94
ASU-3	0.50	1.05	2.99	5.53	8.16	13.23
Reads	4.70	8.34	12.63	15.36	17.47	21.46
Writes	0.45	0.97	2.90	5.42	8.02	13.05

**Tested Storage Configuration Pricing (Priced Storage Configuration)**

	<u>QTY</u>	<u>list price</u>	<u>extended</u>	<u>total</u>
1815-82A DS4800 Model 82	1	\$53,995	\$53,995	
2104 DS4000 Host Bus Adapter	16	\$1,485	\$23,760	
2410 SW 4Gbps SFP pairs	4	\$998	\$3,992	
5605 5m Fiber Optic cable	8	\$129	\$1,032	
7700 Windows Host Kit	1	\$1,250	\$1,250	
8870 Eight Storage Partitions	1	\$10,000	\$10,000	
9202 Field Integrate	1	n/c	n/c	
9800 Group 1 Power Cords	1	n/c	n/c	
warranty upgrade to 24x7x4	1	\$3,200	\$3,200	
1740-710 DS4000 EXP710 Expansion Unit	16	\$6,000	\$96,000	
2210 SW 2Gbps SFP	72	\$499	\$35,928	
5601 1m Fiber Optic cable	28	\$79	\$2,212	
5605 5m Fiber Optic cable	4	\$129	\$516	
5213 73GB/15K FC Disk Module	224	\$2,099	\$470,176	
9018 Attach to DS4800	16	n/c	n/c	
9800 Group 1 Power Cords	16	n/c	n/c	
warranty upgrade to 24x7x4	1	\$760	\$760	
IBM TotalStorage SAN32B-2 4Gbps fabric				
2005-B32 switch with 16 ports and dual power supply	1	\$17,750	\$17,750	
2410 4 Gbps SW SFP Transceiver	32	\$150	\$4,800	
5605 Fibre Cabe LC/LC 5M Multi	16	\$105	\$1,680	
7510 B32 Ports 16-23 Activation	1	\$9,000	\$9,000	
Warranty upgrade for 3 years	1	\$5,619	\$5,619	

**\$741,670**

Maintenance/support is provided 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**

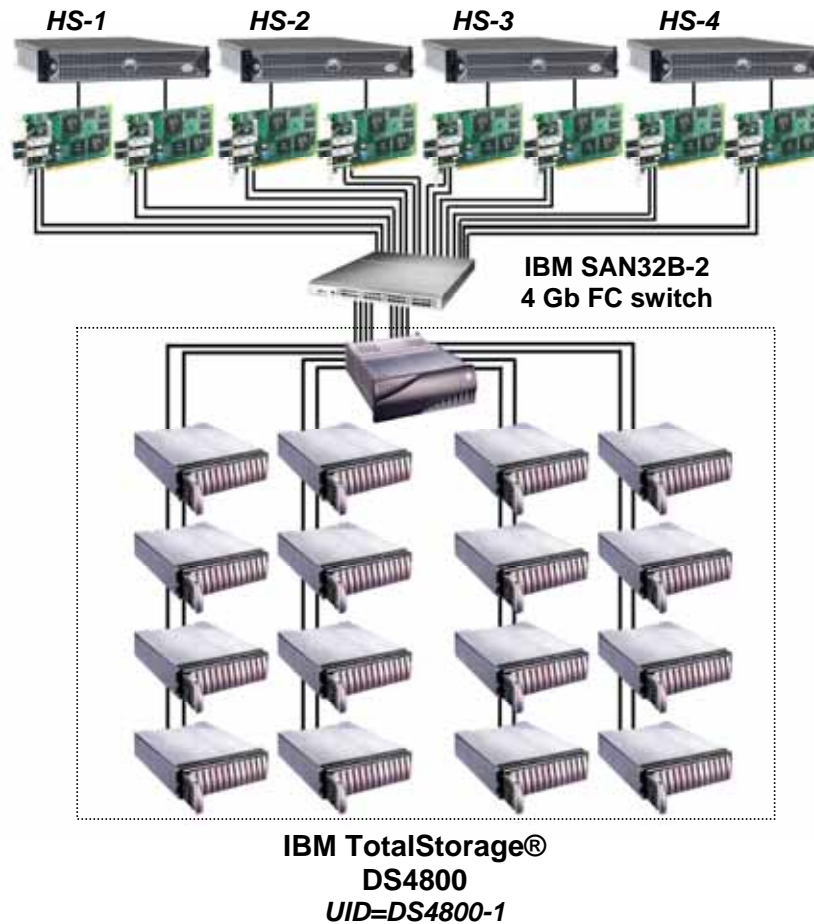
The differences between the Tested Storage Configuration (TSC) and Priced Storage Configuration are listed below:

- The Priced Storage Configuration included sixteen (16) IBM DS4000 Single Port HBAs rather than the eight (8) QLogic 2342 Dual Port HBAs used in the TSC.
- The IBM TotalStorage® SAN Switch 2005-B32 is an IBM relabeled version of the Brocade SilkWorm 4100 Switch, identical to the component used in the TSC.
- Five meter fibre optic cables were priced rather than the thirty meter cables used in the TSC.
- Each disk drive in the Priced Storage Configuration is mounted in an IBM drive carrier and configured to self-identify as a FASTT brand.

- The “data scrubbing” option has a default setting of ‘off’ in the TSC, but would need to be explicitly set to ‘off’ in the Priced Storage Configuration.

If the TSC had been configured and measured with any combination of the above, there would not have been any negative impact on the reported performance.

**Benchmark Configuration/Tested Storage Configuration Diagram**



Host Systems:	Tested Storage Configuration (TSC)
<b>UID=HS-1, HS-2, HS-3, HS-4:</b>	SANtricity Storage Manager v9.
4 – Dell 2650 Servers, each configured with: 2 – 3.2 GHz Pentium 4 Xeon CPUs 512 KB L2 and 2 MB L3 caches/CPU 3 GB main memory Windows 2003 Enterprise Edition	8 – Qlogic 2342 HBAs (2 per Host System)
WG	1 – IBM TotalStorage SAN32B-2 switch
	<b>UID=DS4800-1:</b>
	IBM TotalStorage® DS4800 which includes: 2 – disk array controllers with 2 GB RAM per controller
	8 – 4 Gb Fibre Channel host connections
	8 – 2 Gb Fibre Channel host connections
	16 – DS4000 EXP710 Expansion Units
	224 – 73 GB 15K RPM Disk Drives