



**SPC BENCHMARK 2™  
EXECUTIVE SUMMARY**

**IBM CORPORATION  
IBM SYSTEM STORAGE® DS3524 EXPRESS TURBO**

**SPC-2™ V1.3**

**Submitted for Review: December 31, 2010  
Submission Identifier: B00053**

## **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> Bruce McNutt – <a href="mailto:bmcnutt@us.ibm.com">bmcnutt@us.ibm.com</a> 650 Harry Road San Jose, CA 95120 Phone: (408) 927-2717 FAX: (408) 927-2050
<b>Test Sponsor Alternate Contact</b>	IBM Corporation – <a href="http://www.ibm.com">http://www.ibm.com</a> Vernon Miller – <a href="mailto:millerv@us.ibm.com">millerv@us.ibm.com</a> KBV/9062-2 9000 South Rita Road Tucson, AZ 85744 Phone: (520) 799-4849 FAX: (520) 799-5550
<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-2 Specification revision number</b>	V1.3
<b>SPC-2 Workload Generator revision number</b>	V1.0
<b>Date Results were first used publicly</b>	December 31, 2010
<b>Date FDR was submitted to the SPC</b>	December 31, 2010
<b>Date the TSC will be available for shipment to customers</b>	currently available
<b>Date the TSC completed audit certification</b>	December 30, 2010

### **Tested Storage Product (TSP) Description**

The IBM System Storage DS3500 Express Storage Systems and EXP3500 Express Expansion Units are the newest addition to the IBM System Storage DS3000 series family of entry disk storage systems. The DS3500 delivers affordable, entry-level configurations for small and medium businesses in compact 2U, 19-inch rack mount enclosures, with the flexibility to scale in capacity, performance, host interfaces, and functions as your business grows or requirements change.

## 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® DS3524 Express Turbo				
SPC-2 MBPS™	SPC-2 Price-Performance	ASU Capacity (GB)	Total Price	Data Protection Level
2,510.56	\$26.76	14,374.215	\$ 67,185.00	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	2,248.13			\$29.88
Write Only:				
1024 KiB Transfer	1,323.79	20	66.19	
256 KiB Transfer	1,288.81	20	64.44	
Read-Write:				
1024 KiB Transfer	1,843.00	20	92.15	
256 KiB Transfer	1,898.16	20	94.91	
Read Only:				
1024 KiB Transfer	3,630.54	20	181.53	
256 KiB Transfer	3,504.49	20	175.22	
<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	3,160.15			\$21.26
1024 KiB Transfer Size				
4 I/Os Outstanding	3,455.38	20	172.77	
1 I/O Outstanding	3,493.38	20	174.67	
64 KiB Transfer Size				
4 I/Os Outstanding	2,771.20	20	138.56	
1 I/O Outstanding	2,920.65	20	146.03	
<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
	2,123.38	2,700	0.79	\$31.64

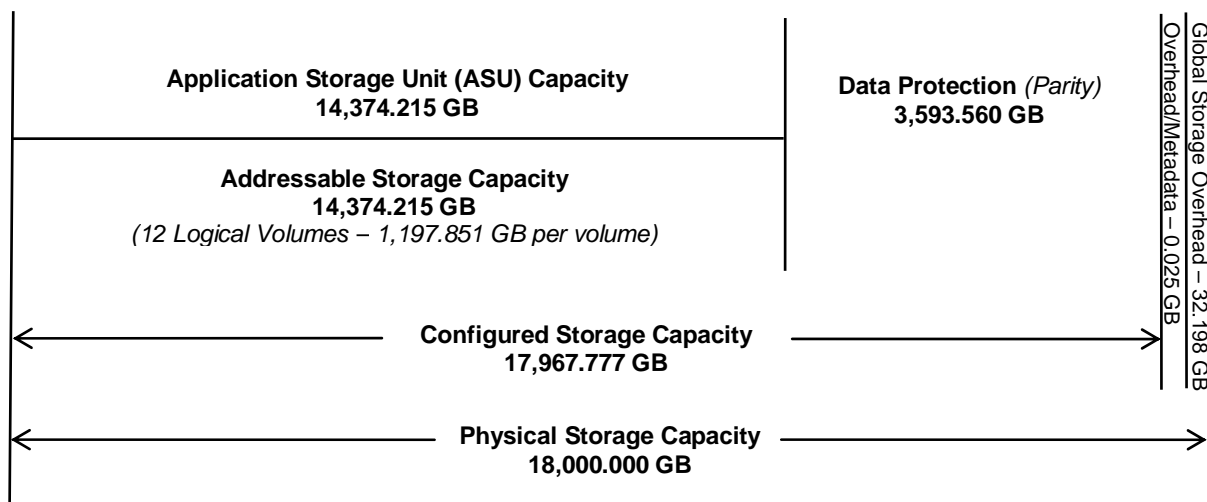
**SPC-2 MBPS™** represents the aggregate data rate, in megabytes per second, of all three SPC-2 workloads: Large File Processing (LFP), Large Database Query (LDQ), and Video on Demand (VOD).

**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.



<b>SPC-1 Storage Capacity Utilization</b>	
Application Utilization	79.86%
Protected Application Utilization	99.82%
Unused Storage Ratio	0.00%

**Application Utilization:** Total ASU Capacity (14,374.215 GB) divided by Physical Storage Capacity (18,000.000 GB)

**Protected Application Utilization:** (Total ASU Capacity (14,374.215 GB) plus total Data Protection Capacity (3,593.560 GB) minus unused Data Protection Capacity (GB) divided by Physical Storage Capacity (18,000.000 GB).

**Unused Storage Ratio:** Total Unused Capacity (0.000 GB) divided by Physical Storage Capacity (18,000.000 GB) and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 23-24 in the Full Disclosure Report.

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

The difference between the Tested Storage Configuration and Priced Storage Configuration is that the priced disk drives are mounted in an IBM drive carrier and each disk drive is configured to self-identify as a DS3000 brand. That difference, if applied to the TSC, would not have a negative impact on the reported SPC-1 performance.

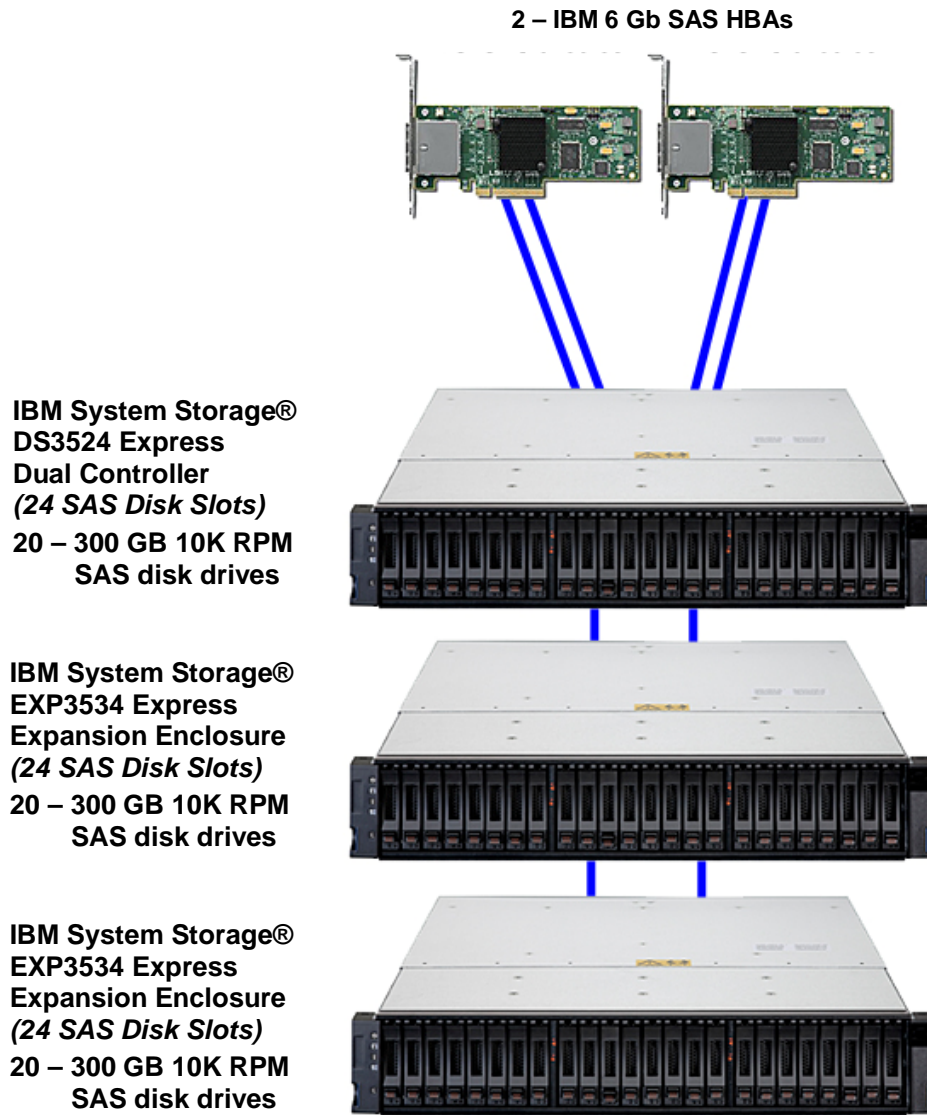
## Priced Storage Configuration Pricing

Item	IBM Description	Feature Code (4 digits) or Part Number (7 digits)	Qty	Unit Price (usd)	Total (usd)
HBA	IBM 6Gb SAS HBA	46M0907	2	\$ 199.00	\$ 398.00
Storage System	IBM System Storage DS3524 Express Dual Controller	2812	1	\$ 9,299.00	\$ 9,299.00
Advanced Functions	Turbo Performance	4400	1	\$ 6,850.00	\$ 6,850.00
Memory	2 GB cache upgrade	3630	2	\$ 2,499.00	\$ 4,998.00
Expansion Unit	IBM System Storage EXP3524 Express	2822	2	\$ 3,999.00	\$ 7,998.00
Drives	300GB 10,000 rpm 6Gb SAS 2.5" HDD	5210	60	\$ 549.00	\$ 32,940.00
Cables	1m SAS Cable	3708	8	\$ 119.00	\$ 952.00
Maintenance and Warranty	DS3524 3 Year Onsite Repair 24x7 4 Hour Response	67567DT	1	\$ 1,350.00	\$ 1,350.00
Maintenance and Warranty	EXP3524 3 Year Onsite Repair 24x7 4 Hour Response	67567F3	2	\$ 1,200.00	\$ 2,400.00
				<b>Total Price List (usd)</b>	<b>\$ 67,185.00</b>

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
2 – IBM 6 Gb dual-ported SAS HBAs
<b>IBM System Storage® DS3524 Express Turbo</b> <b>IBM System Storage® DS3524 Express dual controller with:</b> 2 GB cache per controller ( <i>4 GB total</i> ) Turbo Performance 2 – 6 Gb SAS host connections per controller ( <i>4 total, 4 used</i> ) 1 – 6 Gb SAS drive connections per controller ( <i>2 total, 2 used</i> )
8 – 1m SAS cables
2 – IBM System Storage® EXP3524 Express expansion units
60 – 300 GB 10K RPM SAS disk drives 20 disk drives in the base unit 20 disk drives in each expansion unit