



**SPC BENCHMARK 1C™  
EXECUTIVE SUMMARY**

**SEAGATE TECHNOLOGY LLC  
IBM 600GB 10K 6GBPS SAS 2.5" G2HS HYBRID**

**SPC-1C™ V1.5**

**Submitted for Review: June 14, 2013**

**Submission Identifier: C00016**

## EXECUTIVE SUMMARY

### Test Sponsor and Contact Information

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### Revision Information and Key Dates

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<b>SPC-1C Specification revision number</b>	V1.5
<b>SPC-1C Workload Generator revision number</b>	V1.0
<b>Date Results were first used publicly</b>	June 14, 2013
<b>Date the FDR was submitted to the SPC</b>	June 14, 2013
<b>Date the TSC is available for shipment to customers</b>	currently available
<b>Date the TSC completed audit certification</b>	June 14, 2013

## Tested Storage Product (TSP) Description

The amount of information that is gathered and stored by businesses continues to grow exponentially. In addition to the demand for increased storage, there are increasing requirements to quickly and effectively store and access data. Today, conventional hard disk drives and solid-state storage technology are utilized to achieve specific objectives within the data center. Conventional hard disk drives continue to be the most common storage media offering high density and basic performance in a cost-effective solution. Solid-state storage solutions enable businesses to achieve optimal input/output (IO) through variable read/write capabilities for performance intensive applications and workloads.

IBM is now offering a new technology: hybrid drives. These drives combine a cache of NAND flash and conventional media to accelerate hard disk drive performance - enabling higher IO performance while leveraging the capacity and cost of spinning media for primary storage. IBM is introducing 6 Gbps SAS 2.5-inch G2HS and G2SS hybrid drives - the first generation of hybrid drives from IBM.

Ideal for small and medium businesses or the distributed large enterprise, IBM 600 GB 10K 6 Gbps SAS 2.5-inch G2HS Hybrid (00AD102) and IBM 600 GB 10K 6 Gbps SAS 2.5-inch G2SS Hybrid (00AD107) provide cost-effective performance and density in a small form factor hard disk drive. In addition to the solid-state-based cache, these new drive offerings provide optimal 6 Gbps hot-swap SAS capability for your high-performance and high-availability System x environment. Hard drive functionality and 6 Gbps SAS performance of these new drives are enabled when used with IBM 6 Gbps System x servers and internal ServeRAID controllers.

## Summary of Results

SPC-1C Reported Data	
Tested Storage Product (TSP) Name: IBM 600GB 10K 6Gbps SAS 2.5" G2HS Hybrid	
Metric	Reported Result
SPC-1C Submission Identifier	C00016
SPC-1C IOPS™	1,027.76
Total ASU Capacity	1,500.318 GB
Data Protection Level	Protected 1 (RAID-5)
Total Price	\$11,133.00
Pricing Currency	U.S. Dollars
Target Country for availability, sales and support	USA

**SPC-1C Submission Identifier** is the unique identifier assigned to this specific SPC-1C Result.

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

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

A **Data Protection Level** of **Protected 1** using **RAID-5** by distributing check data corresponding to user data across multiple disk in the form of bit-by-bite parity.

***Protected 1:** The single point of failure of any **storage device** in the configuration will not result in permanent loss of access to or integrity of the SPC-1C Data Repository.*

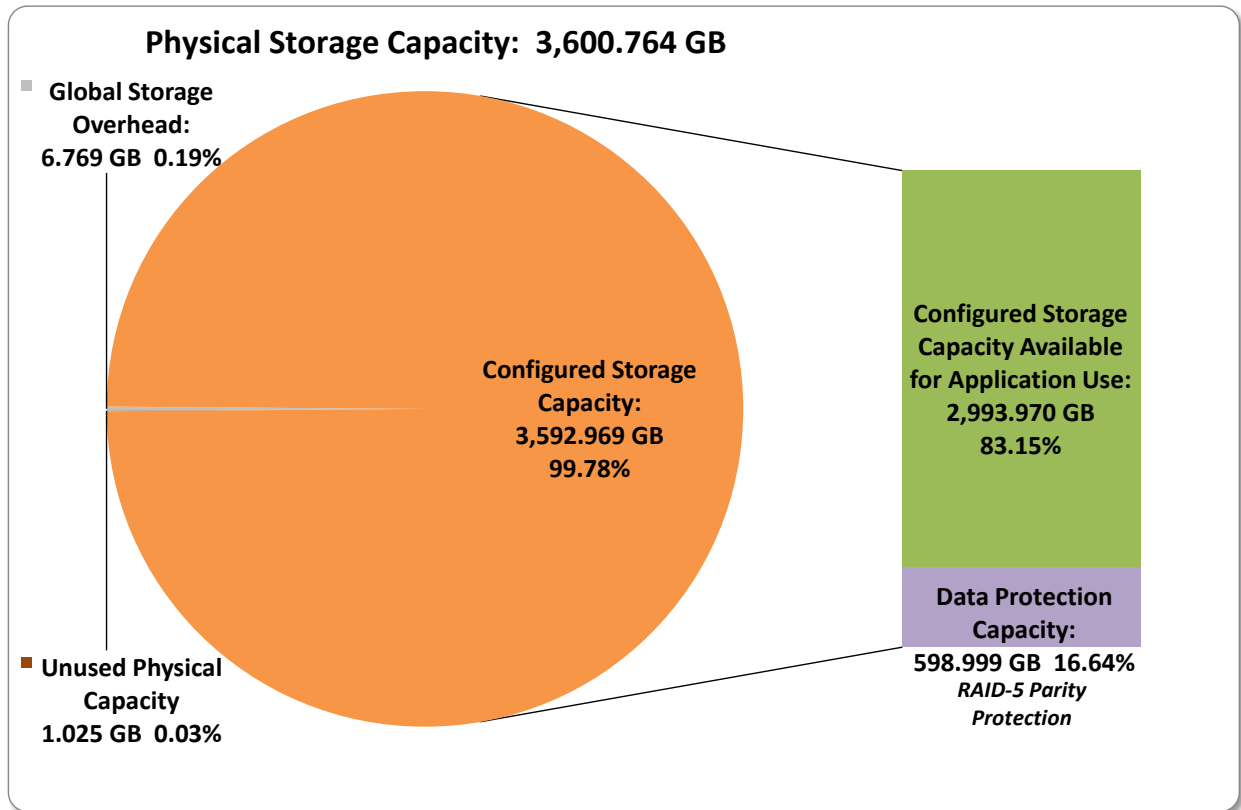
**Total Price** includes the cost of the Priced Storage Configuration plus three years of hardware maintenance and software support as detailed on page [8](#).

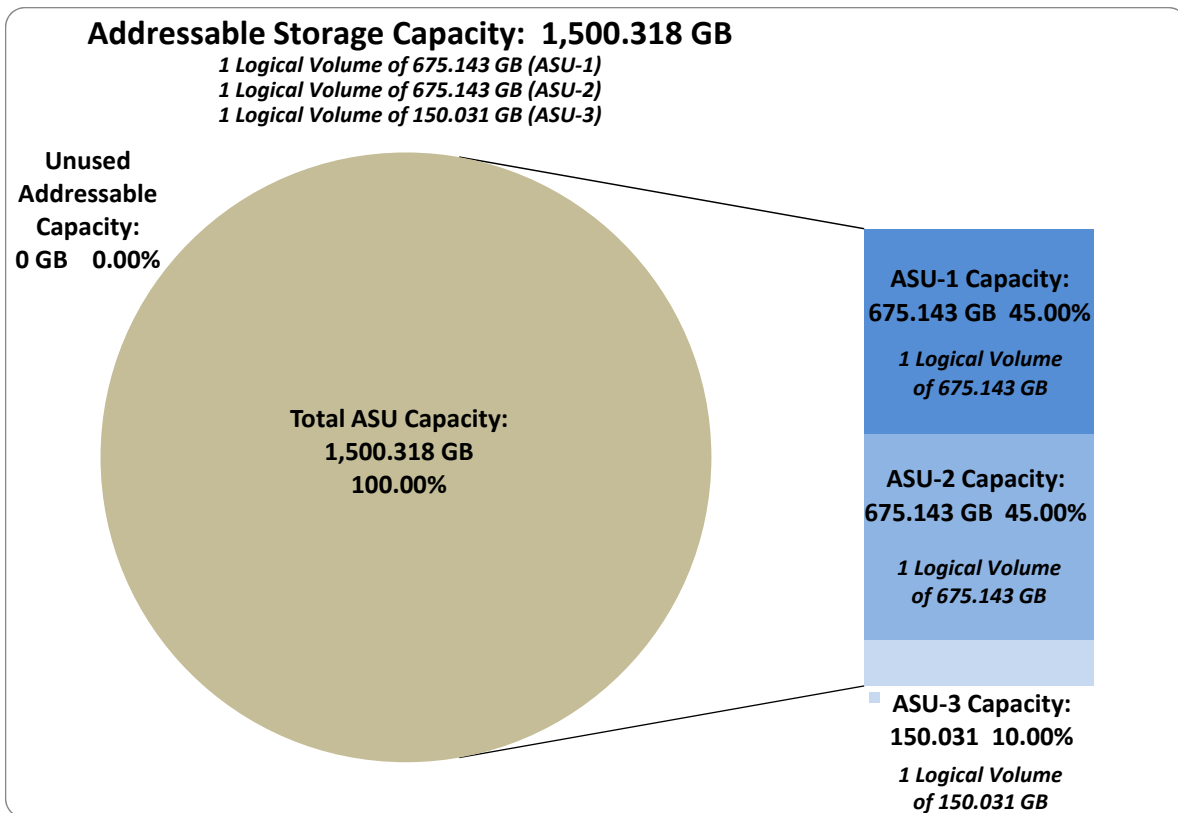
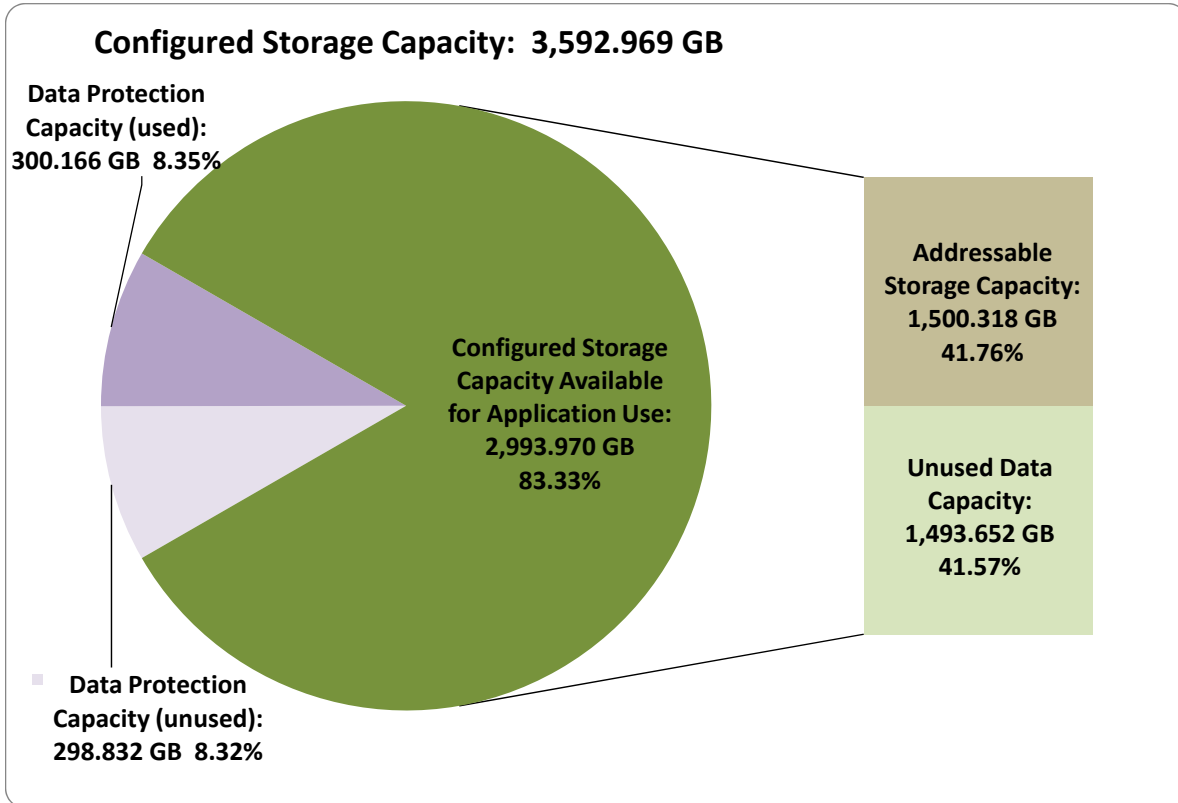
**Pricing Currency** is formal name for the currency used in calculating the **Total Price**. That currency may be the local currency of the **Target Country** or the currency of a difference country (*non-local currency*).

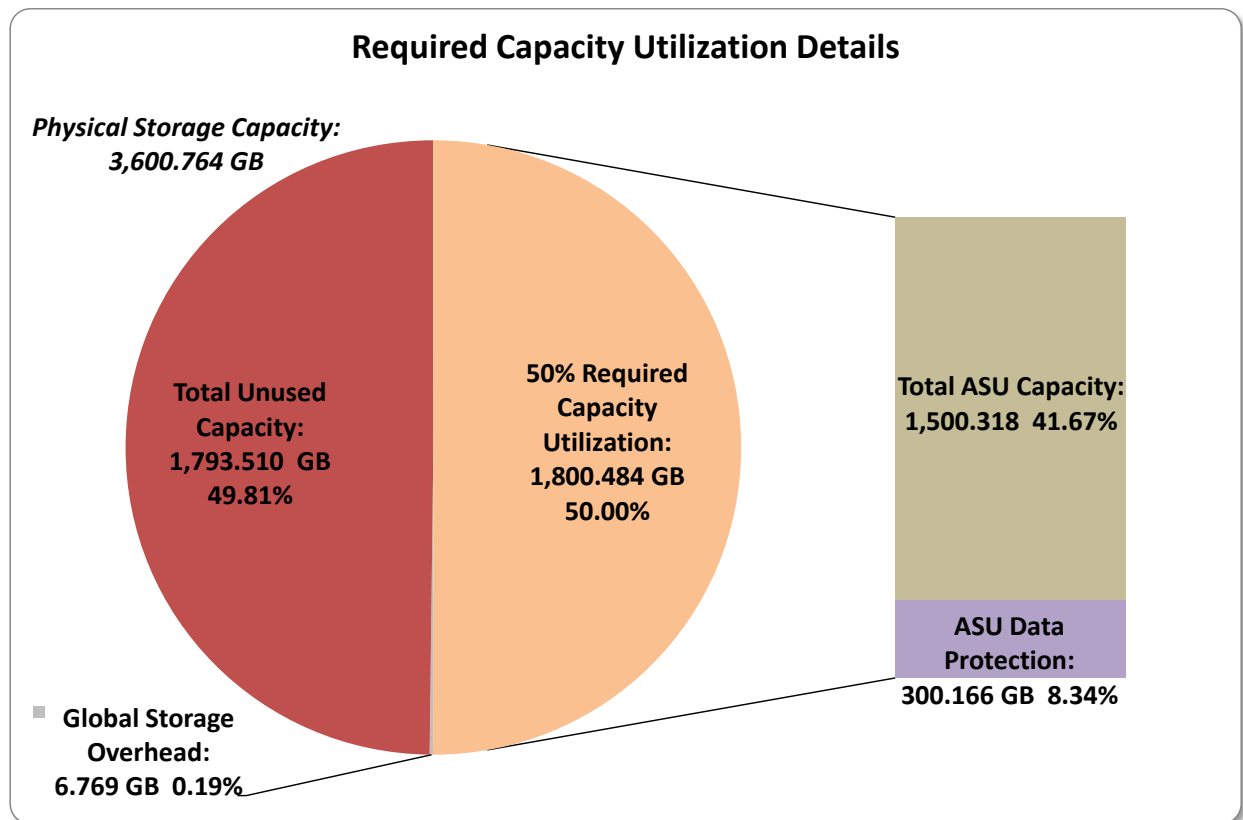
The **Target Country** is the country in which the Priced Storage Configuration is available for sale and in which the required hardware maintenance and software support is provided either directly from the Test Sponsor or indirectly via a third-party supplier.

## Storage Capacities, Relationships, and Utilization

The following four charts 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.







The Tested Storage Configuration (TSC) must be configured so that there is either no Unused Storage or that the sum of Total ASU Capacity and storage required for data protection equals 50% (+-1 GiB) of the Physical Storage Capacity.

The TSC meets the “50%” requirement as documented below:

**3,600.764 GB** (Physical Storage Capacity)

**1,800.382 GB** (50% capacity requirement)

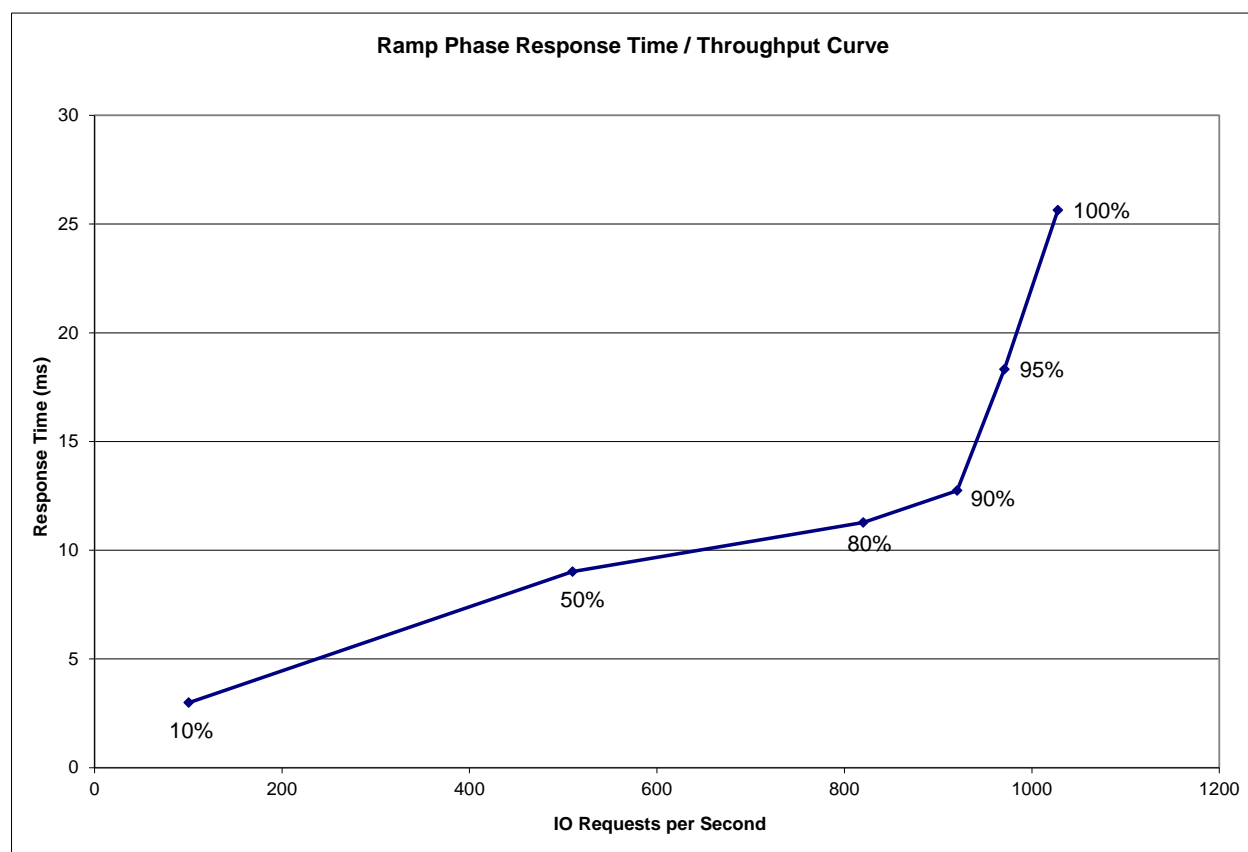
**1,500.318 GB** (Total ASU Capacity) + **300.166 GB** (Data Protection) = **1,800.484 GB**

Detailed information for the various storage capacities and utilizations is available on pages 21-22 of the corresponding SPC-1C Full Disclosure Report (FDR).

## 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>	100.43	509.98	820.21	920.28	970.72	1,027.76
<b>Average Response Time (ms):</b>						
<b>All ASUs</b>	2.99	9.02	11.28	12.74	18.32	25.63
<b>ASU-1</b>	3.34	9.17	10.85	12.06	17.10	23.71
<b>ASU-2</b>	4.45	10.79	14.28	16.62	24.47	35.75
<b>ASU-3</b>	1.61	7.90	10.87	12.48	18.25	25.24
<b>Reads</b>	1.94	5.20	6.37	7.06	9.59	13.19
<b>Writes</b>	3.68	11.49	14.46	16.44	23.99	33.72



## Priced Storage Configuration Pricing

Description		Part Numbers	Qty	Price	Extended Price
<b>IBM 600GB 10K 6Gbps SAS 2.5" G2HS Hybrid</b>	Warranty period 1 year CRU & On-site 9x5 Next Business Day	00AD102	6	\$ 899.00	\$ 5,394.00
<b>IBM system x3650 M4</b>	Base System w/1 Xeon Processor	7915B2U	1	\$ 2,565.00	\$ 2,565.00
	Primary drive	90Y8872	1	\$ 579.00	\$ 579.00
	Xeon Processor	69Y5325	1	\$ 485.00	\$ 485.00
	Power Supply	94Y6668	1	\$ 299.00	\$ 299.00
	4GB DDR3	49Y1559	1	\$ 115.00	\$ 115.00
	8GB DDR3	90Y3109	2	\$ 189.00	\$ 378.00
	RAID M5120 Controller	81Y4478	1	\$ 299.00	\$ 299.00
	RAID M5100 512MB RAID Cache	81Y4484	1	\$ 199.00	\$ 199.00
	Power cables	39Y7931	2	\$ 15.00	\$ 30.00
	3yr onsite repair 24x7 4hr response	00A4405	1	\$ 790.00	\$ 790.00
<b>Total</b>					<b>\$11,133.00</b>

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

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

## Benchmark Configuration/Tested Storage Configuration Diagram

### IBM System x3650 M4



**6 – IBM 600GB 10K 6Gbps SAS 2.5" G2HS Hybrid**  
*(Seagate 600GB Solid State Hybrid Drives)*

## Host System and Tested Storage Configuration Components

### Tested Storage Configuration (TSC):

#### IBM System x3650 M4 rack server

- 2 – Intel® Xeon® E5-2609 quad core processors  
2.4 Ghz, 10 MB L3 cache
- 20 GB – main memory
- 1 – system disk drive
- IBM ServRAID M5110e SAS/SATA built-in controller
- 512 MB RAID cache
- Single embedded PCIe front-end (*PCIe x8*) connection
- Single SAS 6 Gb (*4 lanes*) backend connection

**6 – IBM 600GB 10K 6Gbps SAS 2.5" G2HS Hybrid disk drives**  
*(Seagate 600GB Solid State Hybrid Drives)*