SPC BENCHMARK 1C™

EXECUTIVE SUMMARY

SEAGATE TECHNOLOGY LLC

SEAGATE ST600MP0034
600GB 15K 6GBPS SAS 2.5"

SPC-1C™ V1.5

Submitted for Review: October 29, 2013
Submission Identifier: C00017

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

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Test Sponsor Alternate Contact	Seagate Technology LLC – http://www.seagate.com Barbara Craig– barbara.j.craig@seagate.com 1280 Disc Drive Shakopee, MN 55379 Phone: (952) 402-2804
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-1C Specification revision number	V1.5
SPC-1C Workload Generator revision number	V1.2.0
Date Results were first used publicly	October 29, 2013
Date the FDR was submitted to the SPC	October 29, 2013
Date the TSC is available for shipment to customers	January 15, 2014
Date the TSC completed audit certification	October 23, 2013

Tested Storage Product (TSP) Description

The amount of information that is gathered and stored by businesses continues to grow exponentially. Today, conventional mission critical hard disk drives are utilized to achieve specific objectives within the data center. These conventional hard disk drives continue to be the most common storage media offering high density and basic performance in a cost-effective solution.

Seagate is now offering a high performing 15K-RPM hard drive in capacities up to 600GB. Ideal for medium businesses or the distributed large enterprise, the Enterprise Performance 15K HDD provides cost-effective performance and density in a small form factor hard disk drive.

Hard drive functionality and 6 Gbps SAS performance are enabled when used with traditional Enterprise servers and internal RAID controllers in mission critical Tier 1 environments.

Seagate's Enterprise Performance 15K HDD stores twice the amount of Tier 1 data over previous generation without increasing drive count and enables Tier 1 applications to process transactions more quickly to help increase revenue generation and improve customer satisfaction.

Summary of Results

SPC-1C Reported Data	
Tested Storage Product (TSP) Name: Seagate ST600MP0034 600GB 15K 6Gbps SAS 2.5"	
Metric	**Reported Result**
SPC-1C Submission Identifier	C00017
SPC-1C IOPS™	4,799.79
Total ASU Capacity	10,792.364 GB
Data Protection Level	Protected 1 *(RAID-5)*
Total Price	$19,034.00
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.*

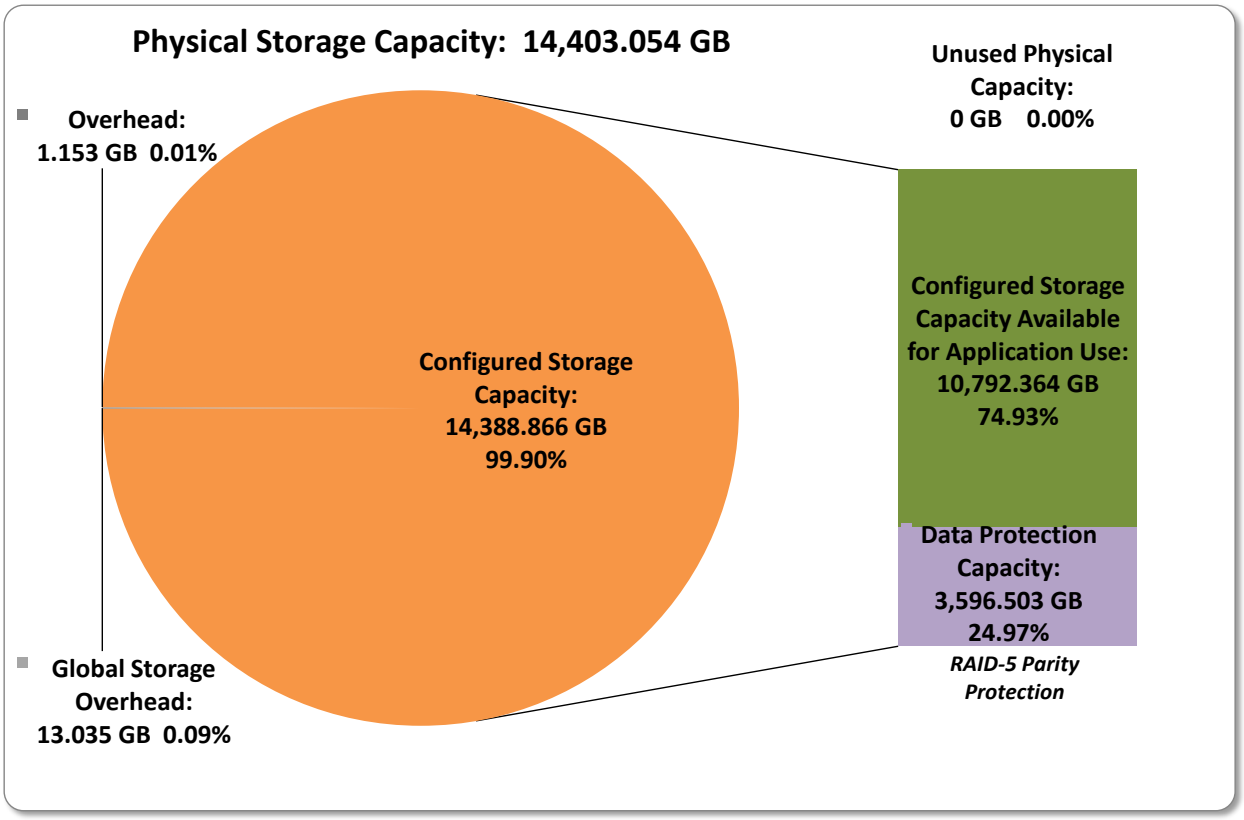
Total Price includes the cost of the Priced Storage Configuration plus three years of hardware maintenance and software support as detailed on page 8.

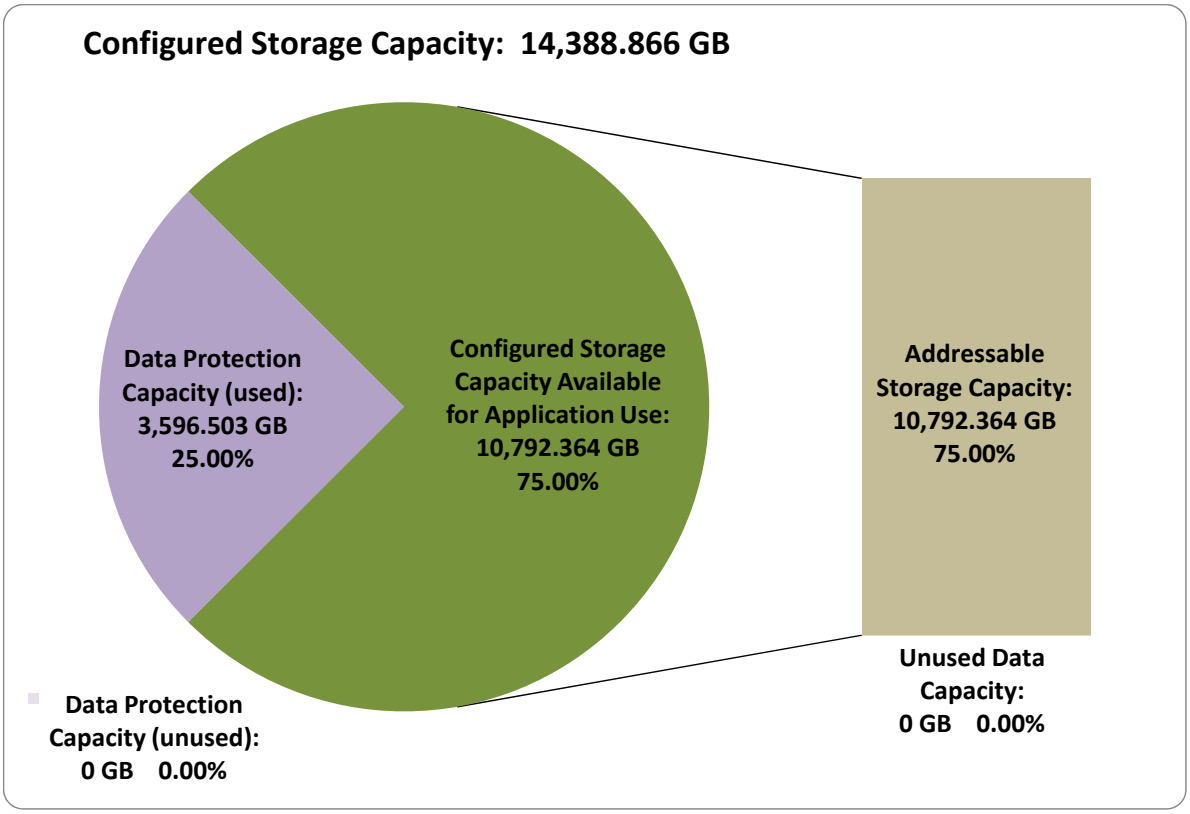
Pricing Currency is formal name for the currency used in calculating the **Total Price**. That currency may be the local currency of the **Target Country** or the currency of a difference country *(non-local currency).*

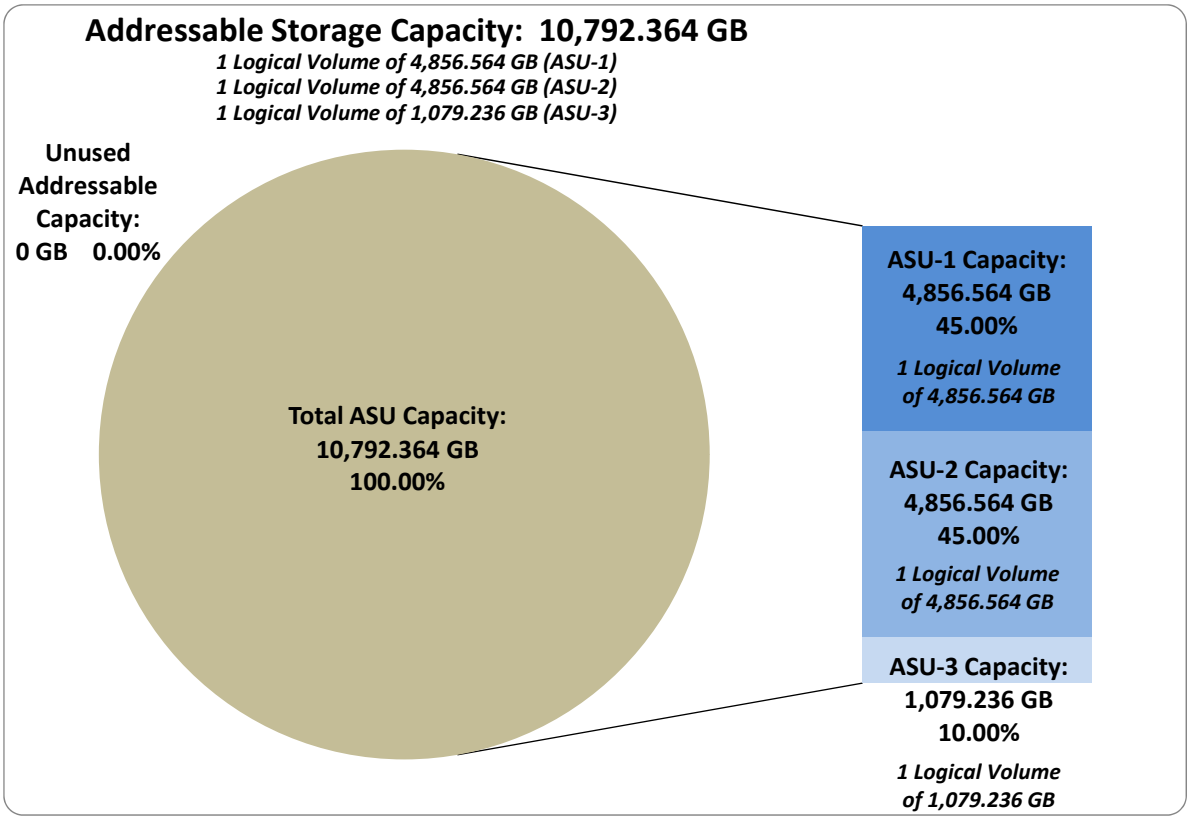
The **Target Country** is the country in which the Priced Storage Configuration is available for sale and in which the required hardware maintenance and software support is provided either directly from the Test Sponsor or indirectly via a third-party supplier.

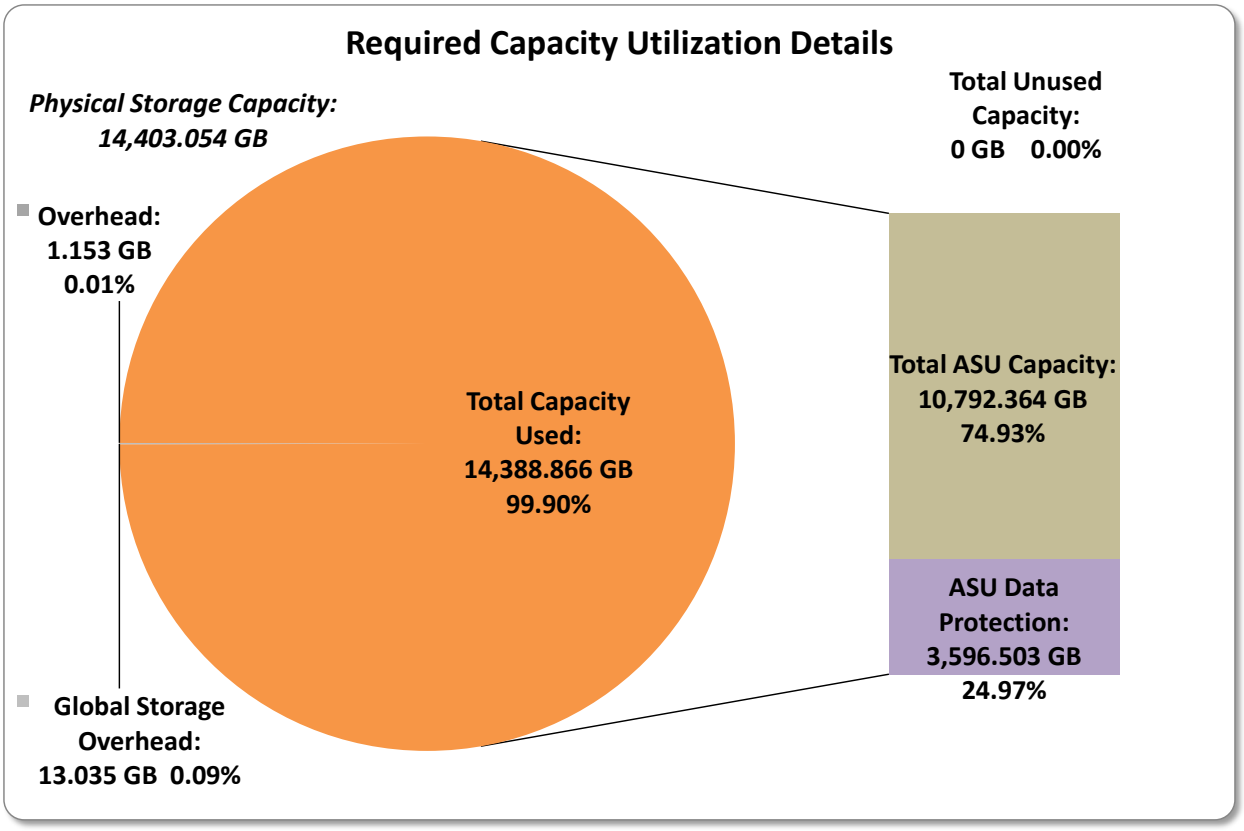
Storage Capacities, Relationships, and Utilization

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.




Configured Storage Capacity: 14,388.866 GB
Data Protection Capacity (used): 3,596.503 GB 25.00%
Configured Storage Capacity Available for Application Use: 10,792.364 GB 75.00%
Addressable Storage Capacity: 10,792.364 GB 75.00%
Unused Data Capacity: 0 GB 0.00%
Data Protection Capacity (unused): 0 GB 0.00%


Addressable Storage Capacity: 10,792.364 GB
1 Logical Volume of 4,856.564 GB (ASU-1)
1 Logical Volume of 4,856.564 GB (ASU-2)
1 Logical Volume of 1,079.236 GB (ASU-3)
Unused Addressable Capacity: 0 GB 0.00%
Total ASU Capacity: 10,792.364 GB 100.00%
ASU-1 Capacity: 4,856.564 GB 45.00%
1 Logical Volume of 4,856.564 GB
ASU-2 Capacity: 4,856.564 GB 45.00%
1 Logical Volume of 4,856.564 GB
ASU-3 Capacity: 1,079.236 GB 10.00%
1 Logical Volume of 1,079.236 GB



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.

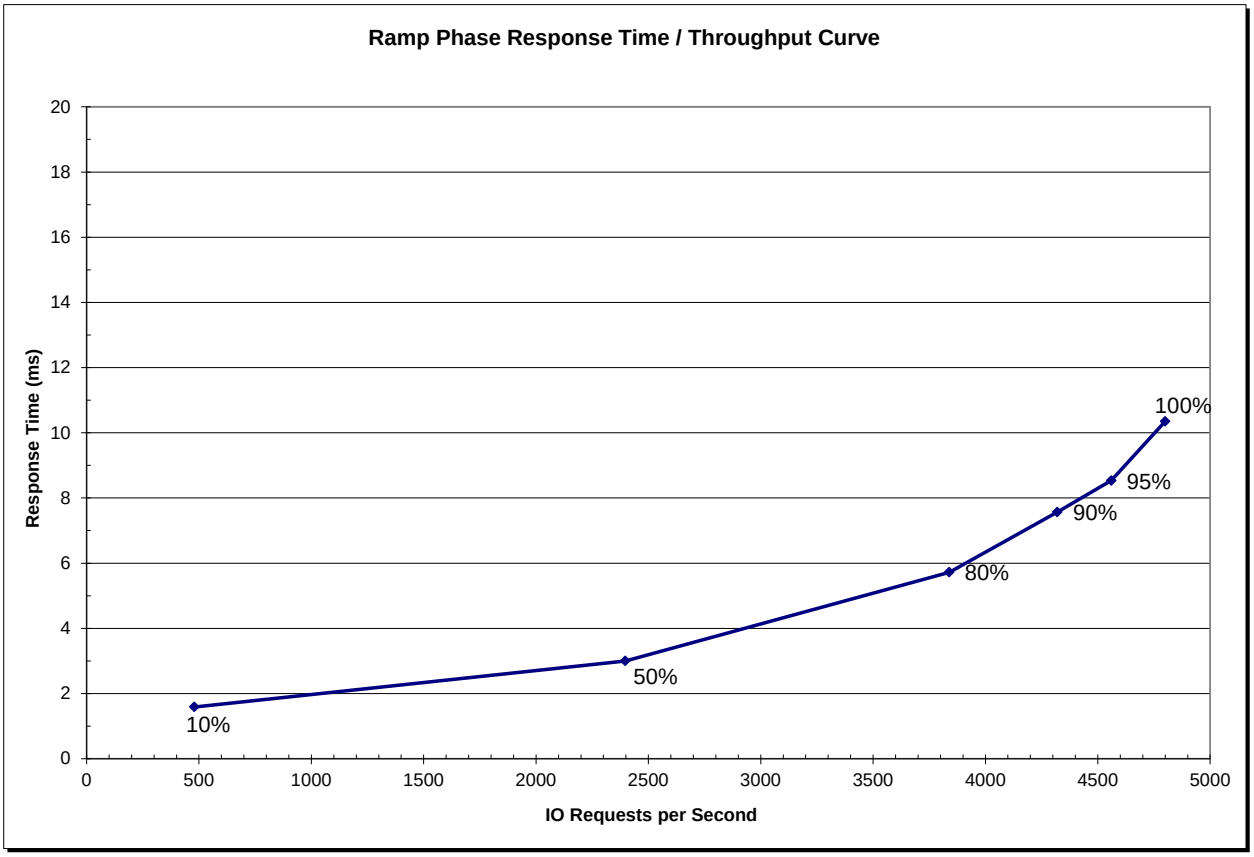
The TSC met the "100% utilization" requirement since it did not include any Unused Storage.

Detailed information for the various storage capacities and utilizations is available on pages 20-21 of the corresponding SPC-1C Full Disclosure Report.

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
I/O Request Throughput	479.48	2,397.47	3,839.24	4,320.34	4,560.34	4,799.79
Average Response Time (ms):						
All ASUs	1.59	3.00	5.72	7.57	8.53	10.35
ASU-1	2.25	4.11	7.77	10.18	11.37	13.66
ASU-2	1.94	4.18	8.25	11.34	13.12	16.23
ASU-3	0.05	0.13	0.26	0.39	0.50	0.77
Reads	3.96	7.45	14.23	18.82	21.15	25.56
Writes	0.05	0.10	0.18	0.25	0.31	0.44

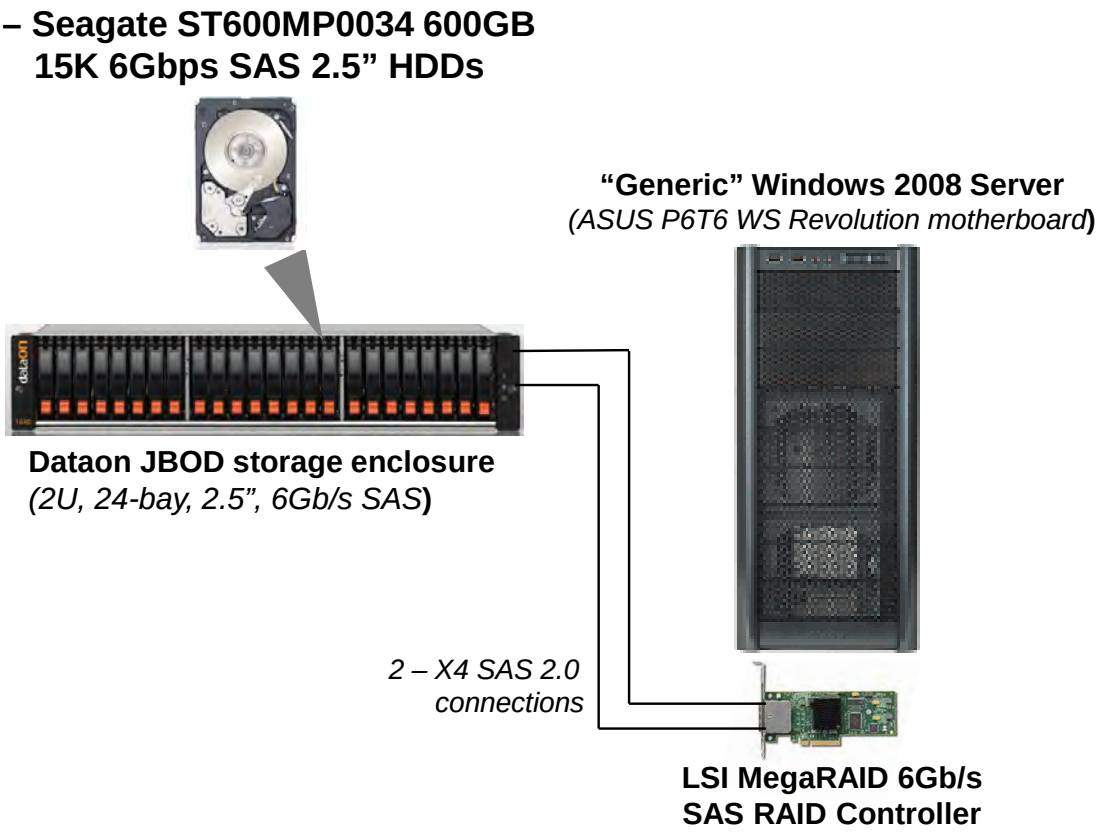
Priced Storage Configuration Pricing

Description	Part Numbers	Qty	Price	Extended Price
600GB SAS 2.5" HDD	ST600MP0034	24	$580.00	$13,920.00
6Gb SAS RAID Controller	LSI SAS 9265-8i	1	$700.00	$700.00
Storage Enclosure JBOD	DNS-1640D	1	$4,295.00	$4,295.00
SAS 2.0 1M Cable	MiniSAS	2	$59.50	$119.00
			Total	**$19,034.00**

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



Host System and Tested Storage Configuration Components

Host System	Tested Storage Configuration (TSC)
"Generic" Windows 2008 Server ASUS P6T6 WS Revolution motherboard 1 – Intel® Xeon® Processor X5570 4 Cores, 2.93 GHz, 8 MB Intel® Smart Cache	1 – LSI MegaRAID 6Gb/s SAS 9265-8i RAID controller with 1 GB cache
	1 – PCIe 2.0 x8 front-end connection
12 GB main memory	2 – 6Gb SAS backend connections *(failover mode) (4 lanes/connection,2 connections used)*
Windows Server 2008 R2	**24 – Seagate ST600MP0034 600GB 15K 6Gbps SAS 2.5" HDDs**
PCIe 2.0	
	1 – Dataon DNS-1640 (JBOD) storage enclosure *(2U 24-bay 2.5" 6Gb/s SAS)*
	2 –SAS 2.0 1m cables