SPC BENCHMARK 2™
EXECUTIVE SUMMARY

SUN MICROSYSTEMS, INC.
SUN STORAGETEK® 6140 ARRAY *(RAID-5)*

SPC-2™ V1.2.1

Submitted for Review: February 13, 2007
Submission Identifier: B00017

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

Test Sponsor and Contact Information	
Test Sponsor Primary Contact	Sun Microsystems, Inc. – http://www.sun.com Leah Schoeb – leah.schoeb@sun.com 5300 Riata Park Court AUS08 Austin, TX 78721 Phone: (877) 319-0457 FAX: (512) 266-2523
Test Sponsor Alternate Contact	Sun Microsystems, Inc. – http://www.sun.com Jason Schaffer – jason.schaffer@sun.com 500 Eldorado Blvd. Broomfield, CO 80021 Phone: (303) 272-4743 FAX: (512) 266-2523
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

Revision Information and Key Dates	
SPC-2 Specification revision number	V1.2.1
SPC-2 Workload Generator revision number	spc2rc9g
Date Results were first used publicly	February 13, 2007
Date FDR was submitted to the SPC	February 13, 2007
Date the TSC will be available for shipment to customers	August 8, 2006
Date the TSC completed audit certification	February 13, 2007

Tested Storage Product (TSP) Description

The Sun StorageTek® 6140 Array (RAID-5) is one of the first products in the Sun StorageTek modular storage family. The StorageTek modular storage family is designed for customers seeking to support business-critical applications and for Service Providers looking for a cost-effective, easy-to-use enterprise-lass platform with the ability to confidently handle large data sets. Through common storage modules, common array management, and common data services, Sun's new modular storage helps customers preserve the investments they've made in people, processes and infrastructure.

The Sun StorageTek® 6140 Array (RAID-5) is a ROHS-compliant, 4 gigabits-per-second (Gb/sec) Fibre Channel (FC) array designed for both direct attached and SAN attached storage. The system features a fully redundant architecture with drive intermixing (FC or SATA-2 disk drives), 8 x 4 Gb FC ports, 4 GB cache, application-oriented management, switched drive connectivity and a maximum capacity of 112 disk drives.
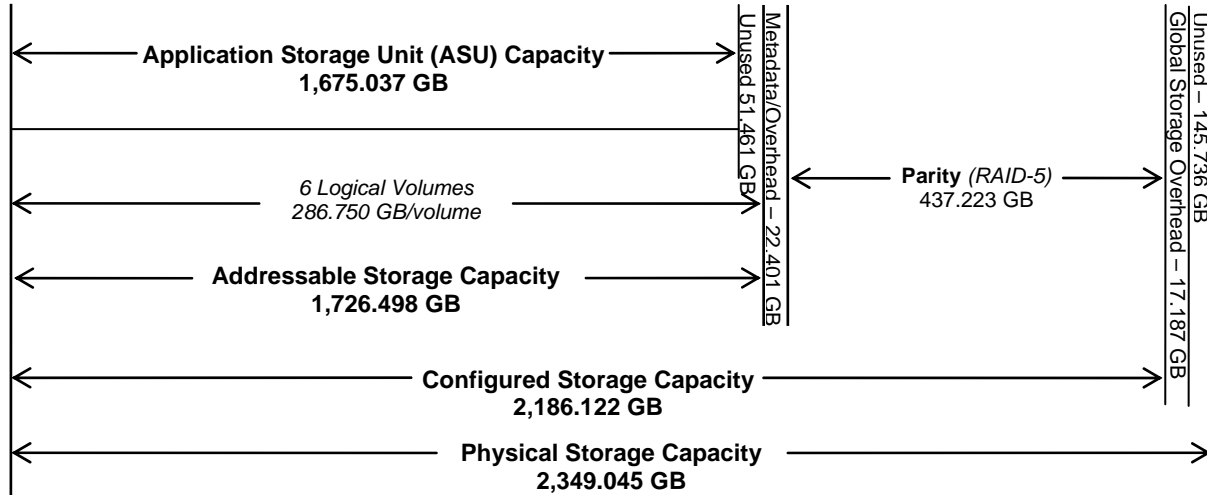
SPC-2 Reported Data

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				
Sun StorageTek® 6140 Array *(RAID-5)*				
SPC-2 MBPS™	SPC-2 Price-Performance	ASU Capacity (GB)	Total Price	Data Protection Level
790.67	$67.82	1,675.037	$53,622	RAID-5
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)				
SPC-2 Large File Processing (LFP) Reported Data				
	Data Rate *(MB/second)*	Number of Streams	Data Rate per Stream	Price-Performance
LFP Composite	698.60			$76.76
Write Only:				
1024 KiB Transfer	693.44	32	21.67	
256 KiB Transfer	288.98	36	8.03	
Read-Write:				
1024 KiB Transfer	830.37	38	21.85	
256 KiB Transfer	433.99	36	12.06	
Read Only:				
1024 KiB Transfer	974.39	32	30.45	
256 KiB Transfer	970.44	36	26.96	
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).				
SPC-2 Large Database Query (LDQ) Reported Data				
	Data Rate *(MB/second)*	Number of Streams	Data Rate per Stream	Price-Performance
LDQ Composite	800.48			$66.99
1024 KiB Transfer Size				
4 I/Os Outstanding	968.44	34	28.48	
1 I/O Outstanding	971.59	34	28.58	
64 KiB Transfer Size				
4 I/Os Outstanding	633.72	42	15.09	
1 I/O Outstanding	628.19	40	15.70	
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).				
SPC-2 Video On Demand (VOD) Reported Data				
	Data Rate *(MB/second)*	Number of Streams	Data Rate per Stream	Price-Performance
	872.94	1,110	0.79	$61.43

Storage Capacities and Relationships

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

Application Storage Unit (ASU) Capacity
1,675.037 GB

Metadata/Overhead – 22.401 GB
Unused 51.461 GB

6 Logical Volumes
286.750 GB/volume

Parity (RAID-5)
437.223 GB

Unused – 145.736 GB
Global Storage Overhead – 17.187 GB

Addressable Storage Capacity
1,726.498 GB

Configured Storage Capacity
2,186.122 GB

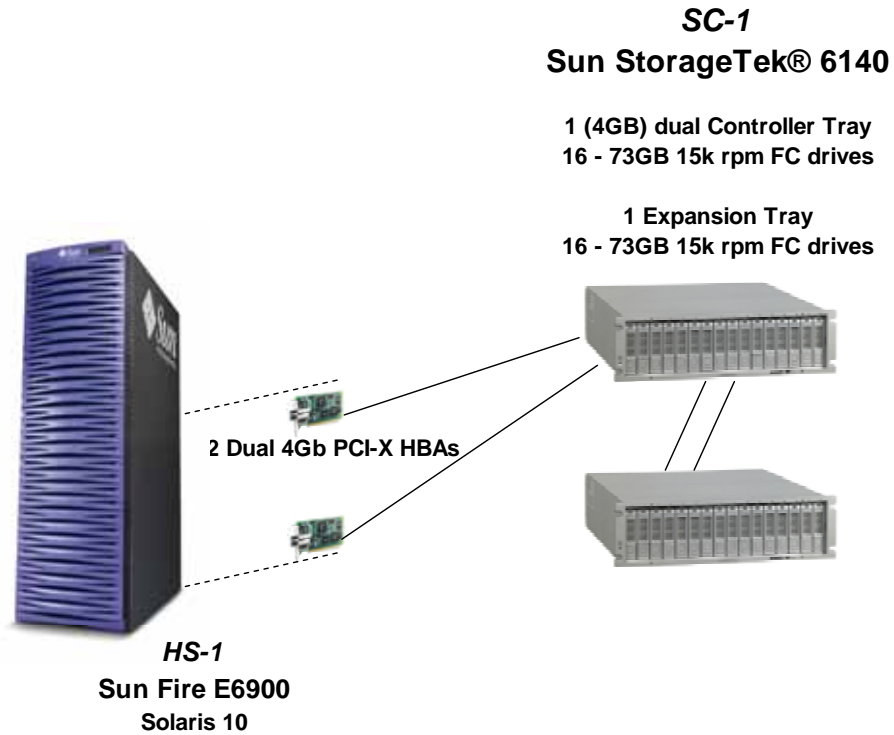Physical Storage Capacity
2,349.045 GB

Tested Storage Configuration Pricing *(Priced Storage Configuration)*

Part Number	Description	Quantity	US List	Total	discount	Ave. Price
XTC6140R11A2B1168	Dual Controller with 1x1x16x73G15K	1	$48,895	$48,895	39%	$29,826
	- 2 Controllers w/ 2GB cache each					
	- 16 73GB 15k rpm drives					
	- All required cables included					
XTCCSM2R01A0B1168	FC Expansion tray 0x1x16x73G15K	1	$26,395	$26,395	39%	$16,101
	- 16 73GB 15k rpm drives					
	- All required cables included					
SG-XPCI2FC-QF4	4Gb PCI-X Dual FC Host Based Adapter	2	$2,530	$5,060	39%	$3,087
W9D-ST6140-4-3G	Controller unit upgrade 3 year Gold Service Maintenance	1	$2,988	$2,988		$2,988
	- 7/24 coverage					
	- 4 hr response time					
	- 4 hour resolution					
W9D-ST6140-4-3G	Expansion unit upgrade 3 year Gold Service Maintenance	1	$1,620	$1,620		$1,620
	- 7/24 coverage					
	- 4 hr response time					
	- 4 hour resolution					
Total			**$82,428**	**$84,958**		**$53,622**

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

SC-1
Sun StorageTek® 6140

1 (4GB) dual Controller Tray
16 - 73GB 15k rpm FC drives

1 Expansion Tray
16 - 73GB 15k rpm FC drives

2 Dual 4Gb PCI-X HBAs

HS-1
Sun Fire E6900
Solaris 10

Host System(s) and Tested Storage Configuration Components

Host System:	Tested Storage Configuration (TSC):
UID=HS-1 **Sun Fire E6900**	2 – 4 Gb dual port FC PCI-X HBAs
	UID=SC-1: **Sun StorageTek® 6140 Array**

24 – 1.2 GHz dual core UltraSPARC-IV processors
    64 KB L1 cache per core,
    2 MB L2/32 MB L3 shared cache per core
	1 Dual Controller
	    2 GB cache per controller *(4 GB total)*

96 GB main memory	4 host connections *(front end)*
Solaris 10 FCS	2 drive connections *(backend)*
PCI-X	1 – FC Expansion Trays
WG	32 – 73 GB 15K RPM disk drives