SPC Benchmark 1™
Executive Summary

Sun Microsystems, Inc.
Sun StorageTek® D280 Disk System
(Mirrored Write Cache)

SPC-1 V1.8

Submitted for Review: February 17, 2004
Submission Identifier: A00025
Accepted: April 17, 2004
Revised: September 5, 2006

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: (512) 401-1227 FAX: (512) 266-2523
Test Sponsor Alternate Contact	Sun Microsystems, Inc. – http://www.sun.com Jason Scaffer – Jason.schaffer@sun.com 500 Eldorado Blvd., UBRM05-211 Broomfield, CO 80021 Phone: (303) 272-4743 FAX: (303) 272-3136
Auditor	Storage Performance Council www.storageperformance.org Walter E. Baker AuditService@storageperformance.org 643 Bair Island Road, Suite 103 Redwood City, CA 94063-2755 Phone: (650) 556-9384 FAX: (650) 556-9385

Revision Information and Key Dates

Revision Information and Key Dates	
SPC-1 Specification revision number	V1.8
SPC-1 Workload Generator revision number	V2.00.03
Date Results were first used publicly	February 17, 2004
Date FDR was submitted to the SPC	February 17, 2004

Date revised FDR was submitted to the SPC
    Revised Test Sponsor Name, product name, and
    primary/alternate contact information to reflect
    Sun/StorageTek merger.
	September 5, 2006

Date the TSC is/was available for shipment to customers	September 27, 2002
Date the TSC completed audit certification	February 13, 2004

Summary of Results

SPC-1 Results	
Tested Storage Configuration (TSC) Name: Sun StorageTek® D280 Disk System *(mirrored write cache)*	
Metric	**Reported Result**
SPC-1 IOPS™	18,447.55
SPC-1 Price-Performance	$16.69/SPC-1 IOPS™
Total ASU Capacity	1,196.092 GB
Data Protection Level	Mirroring
Total TSC Price (including three-year maintenance)	$307,904

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, maintained on separate disks.

Storage Capacities and Relationships

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

Physical Capacity 3,933.36 GB					
Configured Capacity 2,392.18GB			Unused Storage 1,483.19GB	Global Overhead 57.98GB	
Addressable Capacity 1,196.09GB		Addressable Mirror 1,196.09GB			
ASU Capacity 1,196.09GB					
ASU 1 538.24GB	ASU 2 538.24GB	ASU 3 119.60GB			

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 100% load point cannot exceed 30 milliseconds or the benchmark measurement is invalid.

Ramp Phase Response Time / Throughput Curve
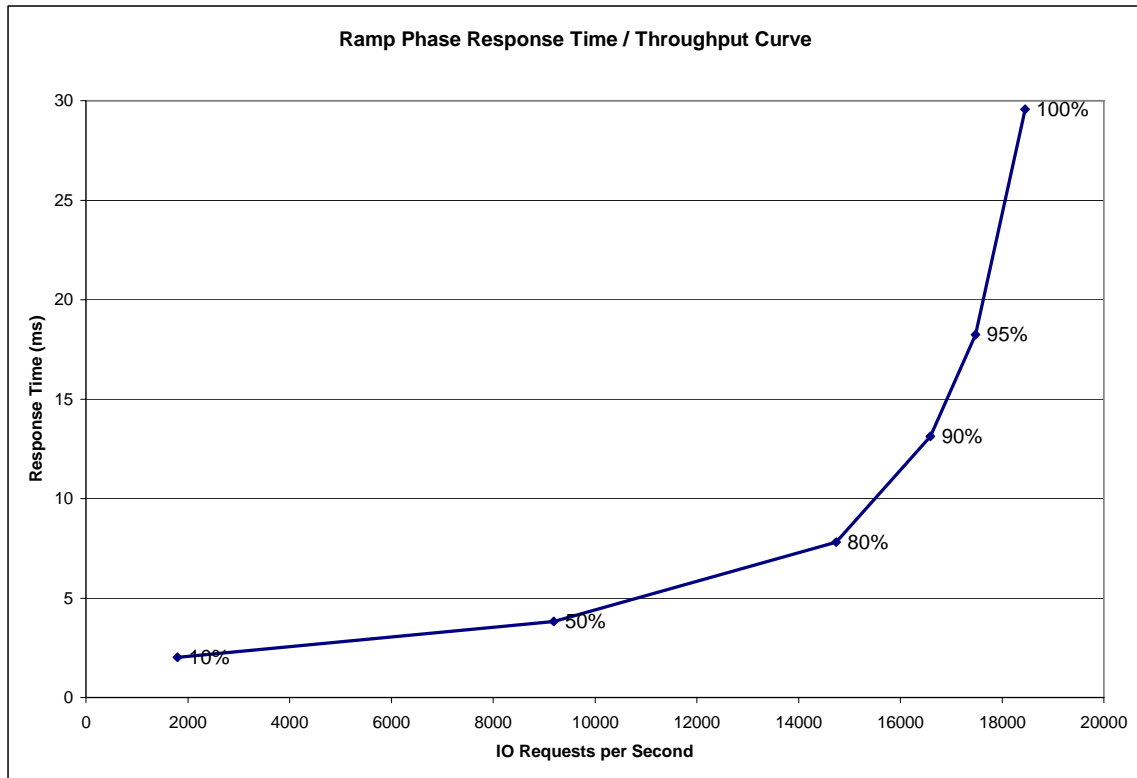
Response Time – Throughput Data

| `	10% Load	50% Load	80% Load	90% Load	95% Load	100% Load
I/O Request Throughput	1,799.52	9,187.16	14,741.60	16,592.22	17,480.36	18,447.55
Average Response Time (ms):						
All ASUs	2.03	3.82	7.81	13.13	18.25	29.57
ASU-1	2.69	4.99	9.49	14.71	19.45	32.31
ASU-2	1.96	3.52	6.33	10.28	14.41	21.00
ASU-3	0.66	1.45	4.87	11.03	17.38	27.53
Reads	4.23	7.46	12.00	15.83	19.13	28.20
Writes	0.60	1.44	5.07	11.37	17.67	30.47

Tested Storage Configuration Pricing *(Priced Storage Configuration)*

StorageTek Item No.	Description	Unit Price	Qty	Aggregate Price
D280002	D280 Command Module, Rack Mount, Dual Controller	$ 62,000	1	$ 62,000
D200014	D200 2Gbit Expansion Drive Module, 14 Slot, Rack Mount, Dual FC ESM	$ 9,000	8	$ 72,000
SMGR-001	SANtricity 8.40 for Windows 2000 Software Feature	$ 10,000	1	$ 10,000
G36	36 GB FC 15K Drive Canister, 2Gb, 1.0" FF	$ 1,050	108	$ 113,400
10800281	FC Optical Cable - 2Gb/2Gb, 3.0m	$ 121	8	$ 968
SNFCS64	Fibre Channel 2Gb Switch, (16 port w/ SFP)	$ 29,400	1	$ 29,400
HBAQ003	QLogic 2342 Host Bus Adapter, dualport, 133 MHZ PCI-X	$ 3,729	4	$ 14,916
126544-01	25-meter fibre channel cables, optical, switch to Command Module	$ 225	4	$ 900
Select	Switch warranty upgrade to 3 yrs	$ 180	24	$ 4,320
				$ 307,904

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
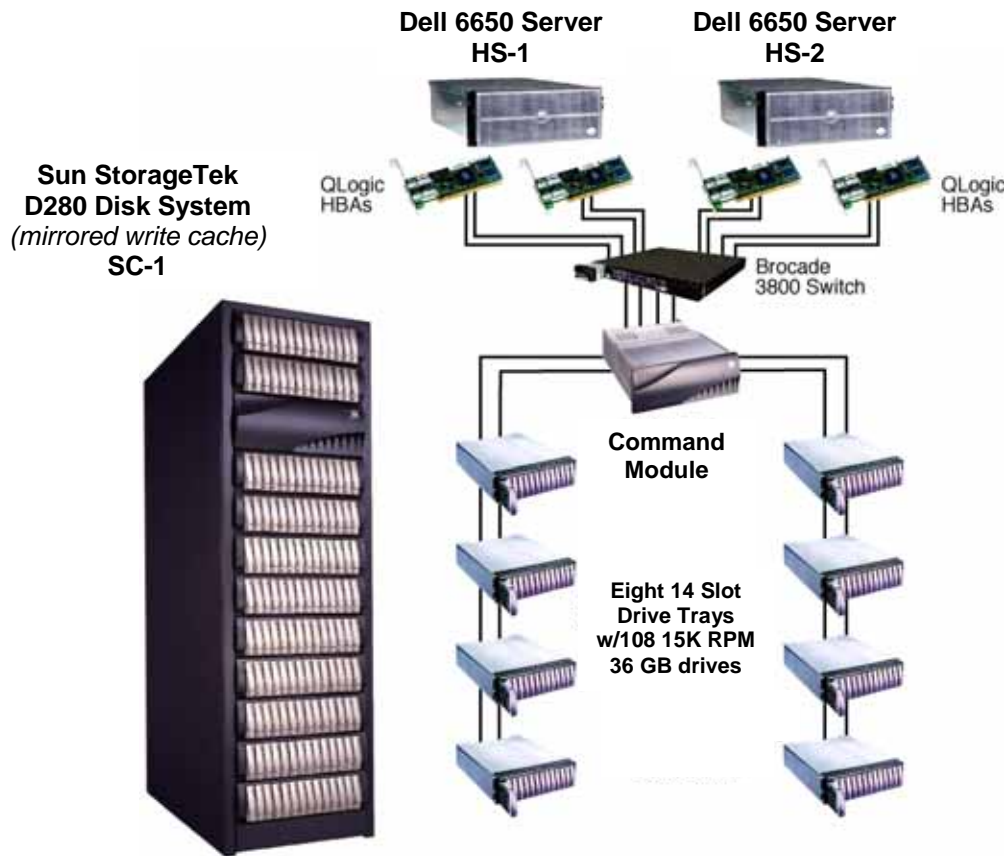
Host Systems:	Tested Storage Configuration (TSC):
UID=HS1, HS2	UID=SC-1
2 – Dell 6650 Servers	2 – QLogic 2342 HBAs per Host System
4 – 2 GHz Pentium 4 Xeon CPUs per Host System	Brocade 3800 Switch
3 GB main memory per Host System	Command Module *(includes 4 miniHubs)*
Windows 2000, SP3	2 –Disk Array Controllers 1 GB RAM per controller
WG	4 – 2gb Fibre Channel host connections
	4 – 2gb Fibre Channel drive connections
	8 –Drive Modules
	108 – 36GB 15K RPM Disk Drives

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Sun StorageTek® D280 Disk System   Accepted: APRIL 17, 2004
(mirrored write cache)