SPC Benchmark 1™

Executive Summary

Sun Microsystems, Inc.

Sun StorEdge™ 3510

SPC-1 V1.8

Submitted for Review: February 1, 2005
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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 Tom Sheffield – tom.sheffield@sun.com 500 Eldorado Blvd. UBRM05 Broomfield, CO 80021 Phone: (303) 272-8804 FAX: (303) 272-7491
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-1 Specification revision number	V1.8
SPC-1 Workload Generator revision number	V2.00.04a
Date Results were first used publicly	February 1, 2005
Date FDR was submitted to the SPC	February 1, 2005
Date revised FDR was submitted to the SPC Revised pricing	February 7, 2006
Date the TSC is/was available for shipment to customers	March 22, 2004
Date the TSC completed audit certification	February 1, 2005

Summary of Results

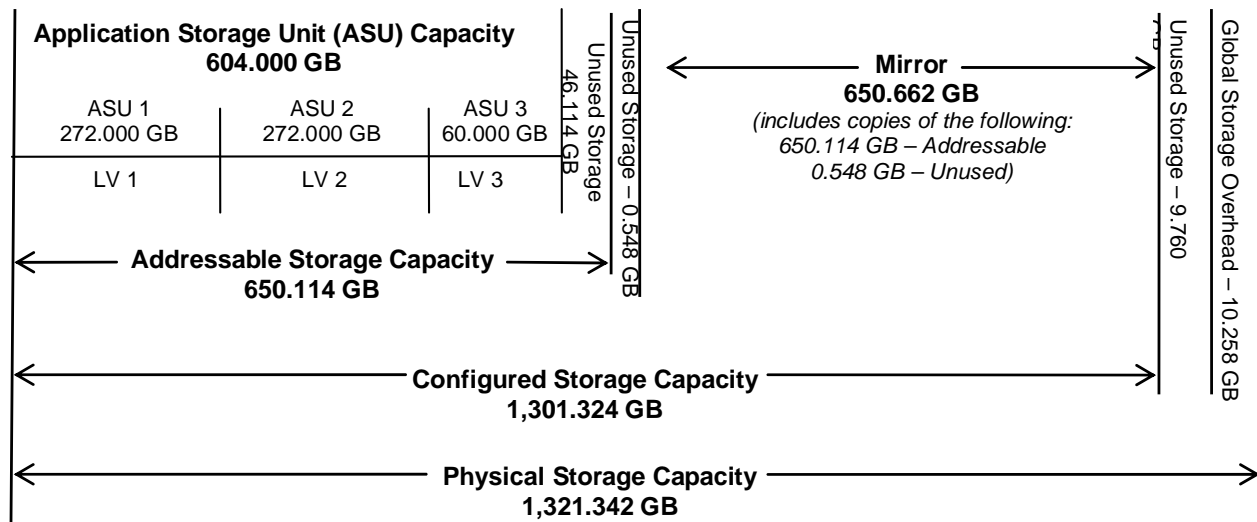| SPC-1 Results	
Tested Storage Configuration (TSC) Name: Sun StorEdge™ 3510	
Metric	**Reported Result**
SPC-1 IOPS™	11,647.63
SPC-1 Price-Performance	$3.72/SPC-1 IOPS™
Total ASU Capacity	604.000 GB
Data Protection Level	Mirroring
Total TSC Price (including three-year maintenance)	$43,327.00

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.

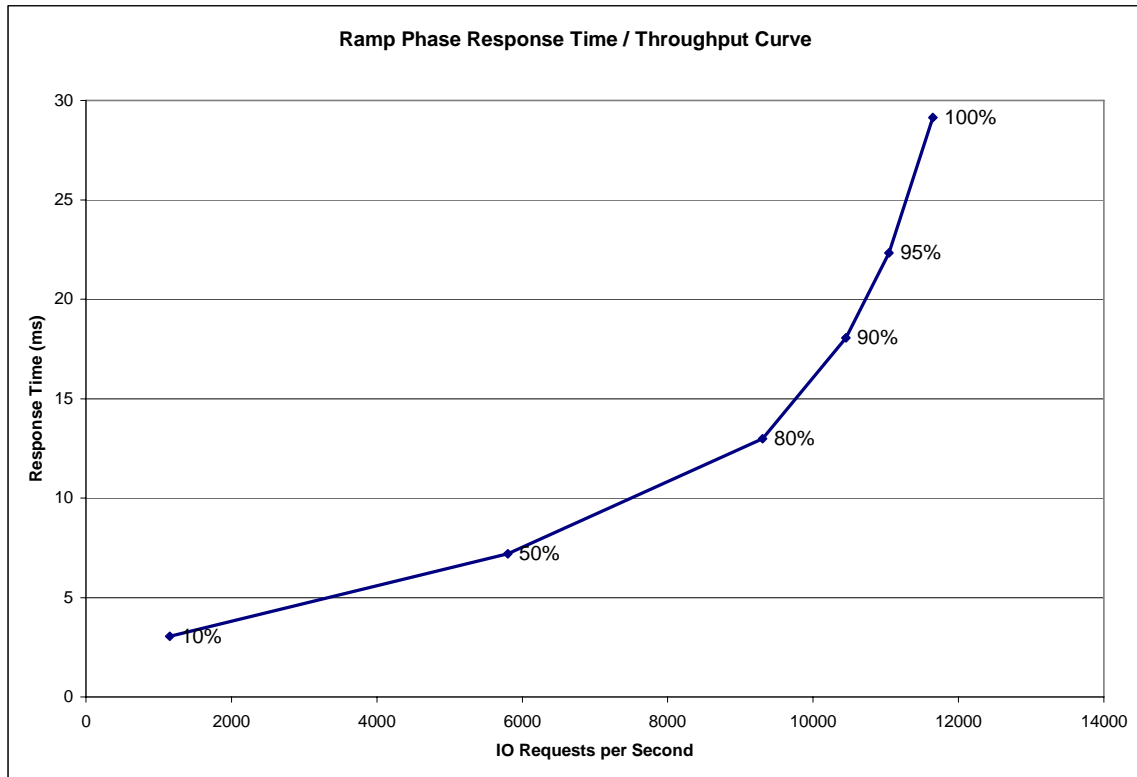## Storage Capacities and Relationships

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

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	1,151.09	5,799.73	9,307.48	10,449.45	11,044.82	11,647.63
Average Response Time (ms):						
All ASUs	3.04	7.19	12.98	18.06	22.34	29.15
ASU-1	3.41	7.73	14.15	19.54	23.80	30.29
ASU-2	2.86	7.02	14.92	23.90	31.81	44.11
ASU-3	2.32	6.14	9.65	12.35	15.08	20.18
Reads	4.24	8.79	18.19	26.94	33.61	43.08
Writes	2.26	6.15	9.59	12.27	15.00	20.08

Tested Storage Configuration Pricing *(Priced Storage Configuration)*

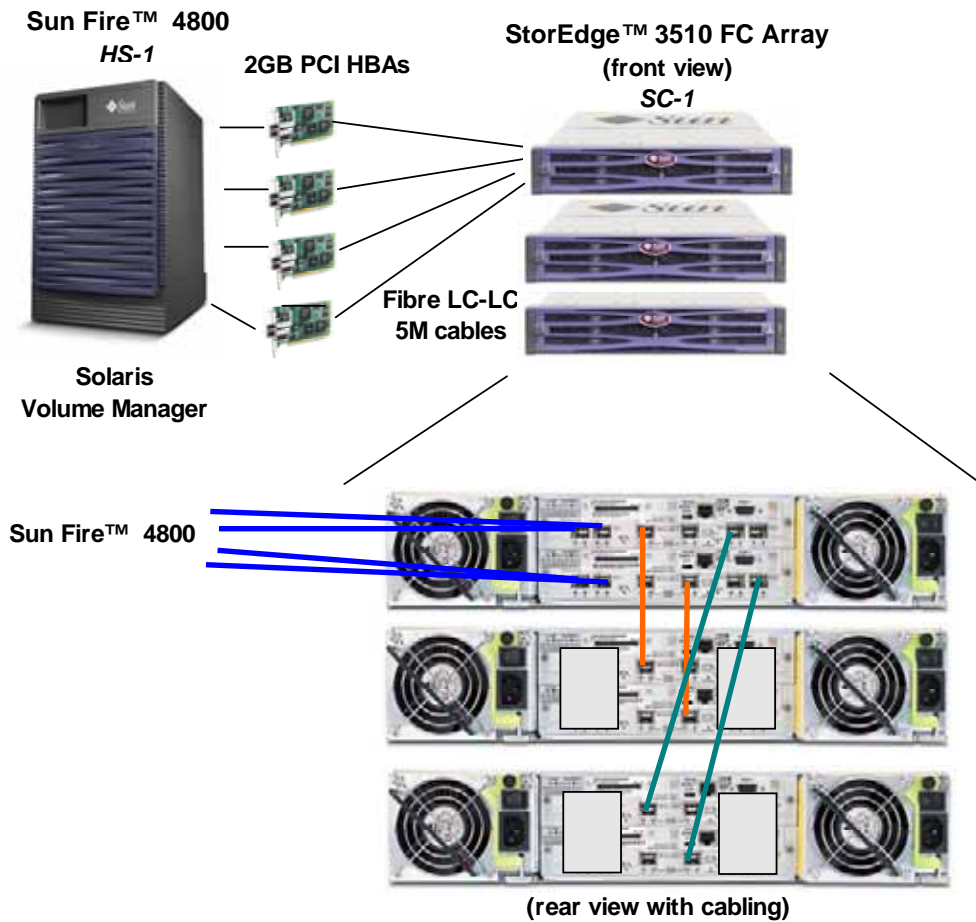| Part Number	Description	Quantity	US List	Extended	Disc.	Ave. Price
XTA3510R01A2S436	Sun StorEdge 3510 Fibre Channel Array	1	$26,995	$26,995	38%	$16,737
	2 FC-AL HW RAID Controllers					
	1GB Std cache per Controller					
	2 AC power supplies					
	Sun StorEdge Configuration Service					
	Rack Ready					
	12 36GB/15K Drives					
XTA3510R01A0S436	Sun StorEdge 3510 Fibre Channel Array JBOD	2	$12,995	$25,990	38%	$16,114
	Rack Ready					
	2 AC power supplies					
	12 36GB/15K Drives					
W9D-6120-2-2403G	3-Year Maintenance Agreement	1	$13,464	$13,464	50%	$6,732
X6767A	2Gb PCI Single FC Host Based Adapter	4	$1,560	$6,240	40%	$3,744
Total			**$55,014**	**$72,689**		**$43,327**

Three year "Gold Service" System Maintenance is included, which provides the following:

- **7 days per week, 24 hours per day coverage.**

- **Acknowledgement of new and existing 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. In either of the two cases, the remedy will result in resumption of operation.**

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

The Tested Storage Configuration was configured with four (4) dual-port HBAs and used a single port in each HBA. The Priced Storage Configuration substituted four (4) single port HBAs for the four (4) dual-port HBAs. If the single port HBAs had been used in the Tested Storage Configuration, they would not have contributed to any measurable performance difference.

Benchmark Configuration/Tested Storage Configuration Diagram

Sun Fire™ 4800
HS-1

2GB PCI HBAs

StorEdge™ 3510 FC Array
(front view)
SC-1

Fibre LC-LC
5M cables

Solaris
Volume Manager

Sun Fire™ 4800

(rear view with cabling)

Host Systems:	Tested Storage Configuration (TSC):
UID=HS-1	4 – 2 GB FC Single PCI HBAs
Sun Fire™ 4800:	*UID=SC-1:*

12 – UltraSPARC™ 1.2 GHz CPUs
      8 MB EEC external cache per CPU
	Sun StorEdge™ 3510 FC Array:
	    2 – controllers
	    1 GB cache per controller
	    8 – Fibre Channel ports
	      (4 ports per controller)

8 GB – main memory	
Solaris 9 update 7	
Solaris Volume Manager	2 – JBOD expansion units
WG	36 – 36 GB 15k rpm disk drives