SPC BENCHMARK 1™
EXECUTIVE SUMMARY

SUN MICROSYSTEMS, INC.
SUN STORAGETEK® 9990V SYSTEM

SPC-1 V1.10.1

Submitted for Review: October 1, 2007
Submission Identifier: A00055

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: (303) 272-9704
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	V1.10.1
SPC-1 Workload Generator revision number	V2.00.04a
Date Results were first used publicly	October 1, 2007
Date the FDR was submitted to the SPC	October 1, 2007
Date the TSC is available for shipment to customers	July 10, 2007
Date the TSC completed audit certification	October 1, 2007

Tested Storage Product (TSP) Description

The Sun StorageTek™ 9990V with its market proven crossbar switch architecture shows enterprise-class functionality and performance. This massive-capacity system further assists storage managers in their mission to simplify storage administration, improve performance, and reduce overall costs. Virtualization of external storage, Thin Provisioning, logical partitioning, and universal replication are available features

Simplifying management saves time and money and improves utilization and flexibility of legacy systems by aggregating internal storage and externally attached Sun and third-party storage system into a single, flexible virtual pool. Increase efficiency (improved use of personnel and technology) through massive consolidation or aggregation of heterogeneous storage platforms.

Summary of Results

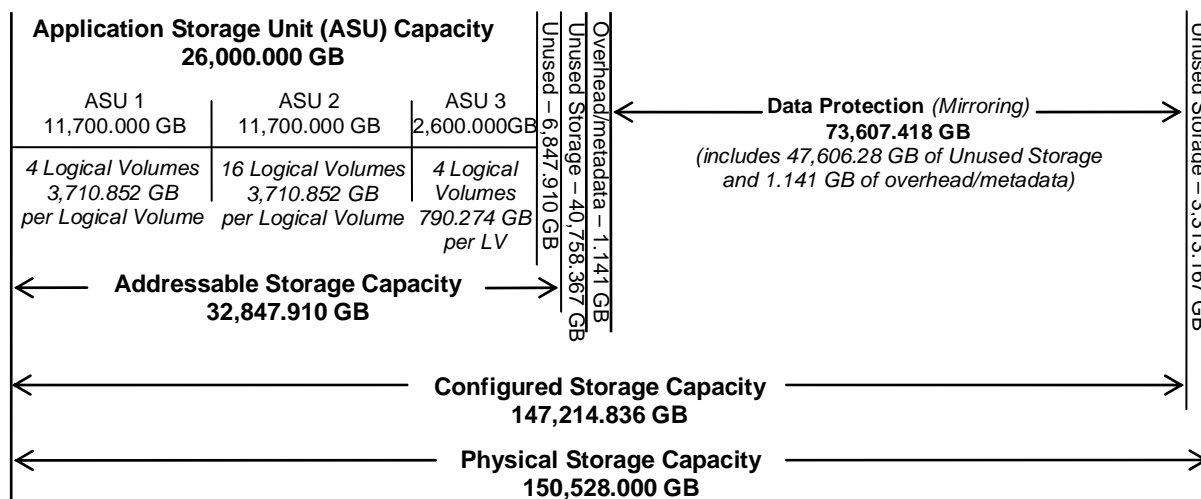| SPC-1 Results	
Tested Storage Configuration (TSC) Name: Sun StorageTek® 9990V System	
Metric	**Reported Result**
SPC-1 IOPS™	200,245.73
SPC-1 Price-Performance	$17.31/SPC-1 IOPS™
Total ASU Capacity	26,000 GB
Data Protection Level	Mirroring
Total TSC Price (including three-year maintenance)	$3,466,309

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.
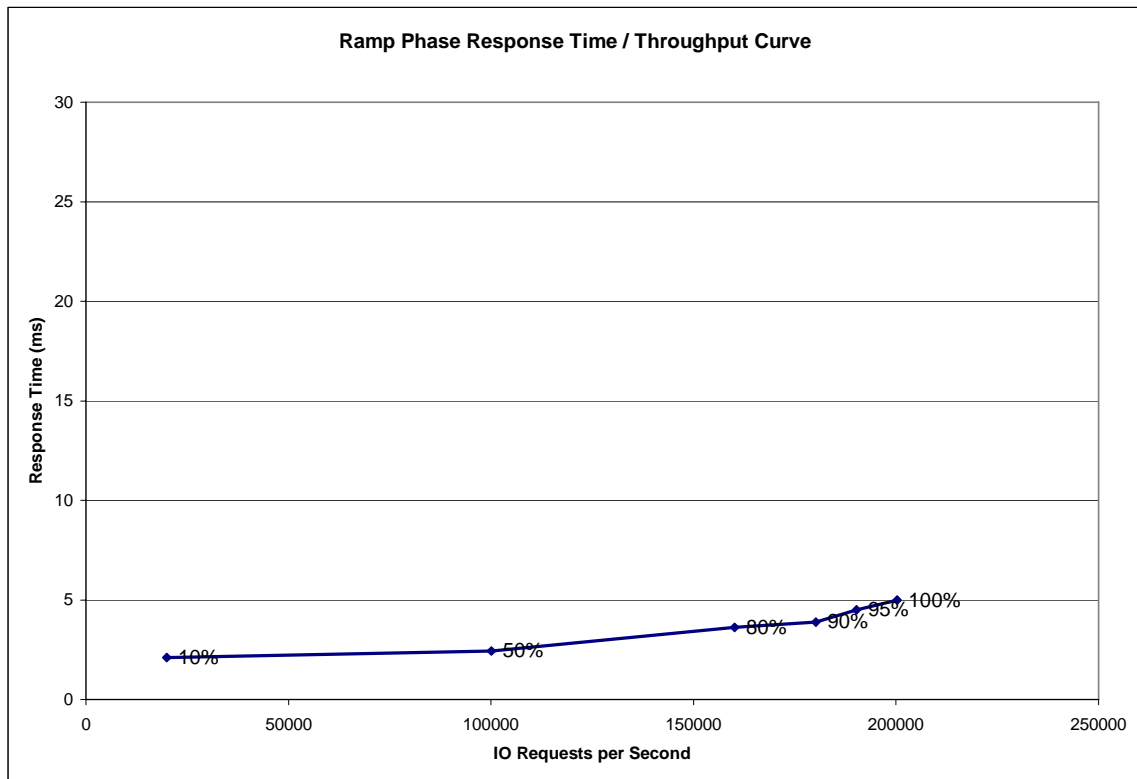
Storage Capacities and Relationships

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

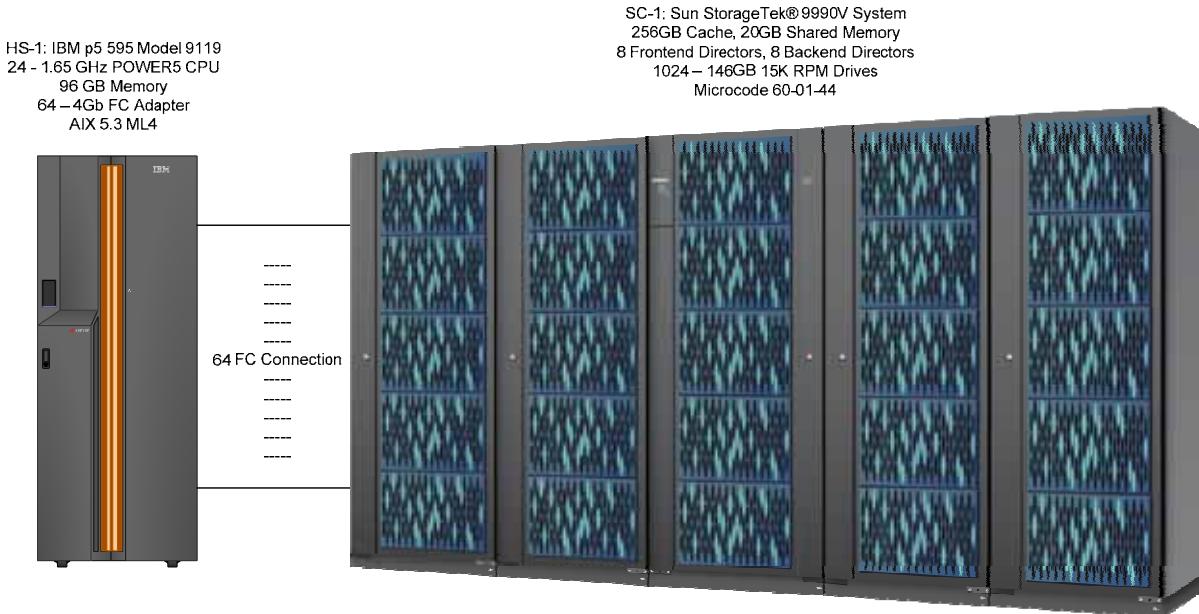|	10% Load	50% Load	80% Load	90% Load	95% Load	100% Load
I/O Request Throughput	19,994.33	100,105.69	160,170.55	180,202.31	190,196.63	200,245.73
Average Response Time (ms):						
All ASUs	2.10	2.43	3.62	3.89	4.50	4.99
ASU-1	2.92	3.20	4.68	4.92	5.54	6.10
ASU-2	2.11	2.63	3.75	4.23	4.82	5.37
ASU-3	0.34	0.70	1.31	1.58	2.15	2.47
Reads	4.82	5.10	6.99	7.46	8.12	8.89
Writes	0.33	0.69	1.43	1.57	2.14	2.45

Tested Storage Configuration Pricing *(Priced Storage Configuration)*

Bill of Materials
Product: Sun StorageTek 9990V System

Product Code	Product Description	Quantity	US List Unit List Price	US List Extended Price	Discount	Net Price
TV9DKC-F605I-146KS	1 HDD Canister (DKS2F-K146FC)	1016	$ 3,245.00	$ 3,296,920.00	44%	$ 1,846,275.20
TV9DKC-F605I-18	Disk Array Frame	4	$ 33,795.00	$ 135,180.00	44%	$ 75,700.80
TV9DKC-F605I-AKT	DKU Expansion Kit	4	$ 17,295.00	$ 69,180.00	44%	$ 38,740.80
TV9DKC-F605I-EXC	DEV Interface Cable (DKU-DKU)	4	$ 635.00	$ 2,540.00	44%	$ 1,422.40
TV9DKC-F610I-16FS	Fibre 16-Port Adapter(4Gbps)	8	$ 33,595.00	$ 268,760.00	44%	$ 150,505.60
TV9DKC-F610I-3PS	AC Box Kit (3 Phase 30A)	5	$ 1,565.00	$ 7,825.00	44%	$ 4,382.00
TV9DKC-F610I-3UC	Power Cable Kit (3Phase 30A for USA)	5	$ 1,005.00	$ 5,025.00	44%	$ 2,814.00
TV9DKC-F610I-AB	Additional Battery-1	3	$ 4,095.00	$ 12,285.00	44%	$ 6,879.60
TV9DKC-F610I-APC	Additional Power Supply	2	$ 5,025.00	$ 10,050.00	44%	$ 5,628.00
TV9DKC-F610I-C8G	Cache Memory Module (8GB)	32	$ 32,600.00	$ 1,043,200.00	44%	$ 584,192.00
TV9DKC-F610I-CSW	Data Path Expansion Kit	3	$ 26,795.00	$ 80,385.00	44%	$ 45,015.60
TV9DKC-F610I-CX	Cache Memory Adapter	4	$ 2,795.00	$ 11,180.00	44%	$ 6,260.80
TV9DKC-F610I-DKA	Disk Adapter	8	$ 43,995.00	$ 351,960.00	44%	$ 197,097.60
TV9DKC-F610I-L1DC	Device Interface Cable (DKC to DKU-L1	1	$ 715.00	$ 715.00	44%	$ 400.40
TV9DKC-F610I-L1UC	Device Interface Cable (DKC to DKU-L1	1	$ 715.00	$ 715.00	44%	$ 400.40
TV9DKC-F610I-R1DC	Device Interface Cable (DKC to DKU-R1	1	$ 715.00	$ 715.00	44%	$ 400.40
TV9DKC-F610I-R1UC	Device Interface Cable (DKC to DKU-R1	1	$ 715.00	$ 715.00	44%	$ 400.40
TV9DKC-F610I-S4GQ	Shared Memory Module (4GB)	5	$ 25,495.00	$ 127,475.00	44%	$ 71,386.00
TV9DKC-F610I-SX	Shared Memory Adapter	2	$ 2,995.00	$ 5,990.00	44%	$ 3,354.00
TV9DKC610I-5	Disk Control Frame	1	$ 55,000.00	$ 55,000.00	44%	$ 30,800.00
ST9990V-STRGFAMILY	ST9990V Product - Order Structuring Reference Or	1	$ -	$ -	44%	$ -
TV9DKC-F605I-146K1	1 HDD Canister (DKS2F-K146FC)	8	$ 3,245.00	$ 25,960.00	44%	$ 14,537.60
TV9044-220001-01	ST9900 BOS Ste Media Kit	1	$ -	$ -	44%	$ -
TV9044-220001-03	ST9900 BOS Ste Base Lic	1	$ 7,595.00	$ 7,595.00	44%	$ 4,253.20
TV9044-220001-03F	ST9900 BOS Ste Above 100TB Lic	146	$ 1,845.00	$ 269,370.00	44%	$ 150,847.20
ST9990V-STRGFAMILY	ST9990V Product - Order Structuring Reference Or	1	$ -	$ -	44%	$ -
TV9-220001-03-3ST	Support-Standard 3 Year ST9900 BOS Ste Base Lic	1	$ 3,228.00	$ 3,228.00	30%	$ 2,259.60
TV9-220001-03F-3ST	Support-Standard 3 Year ST9900 BOS Ste Above 1	146	$ 864.00	$ 126,144.00	30%	$ 88,300.80
TV9-220001-3MED	Support-Base 3 Years ST9900 BOS Ste Media Kit-M	1	$ 180.00	$ 180.00	30%	$ 126.00
Included with Rack BOM	Modem Card Kit	1	$0.00	$0.00		$0.00
Included with Rack BOM	LAN Cable 14ft	1	$0.00	$0.00		$0.00
Included with Rack BOM	Phone Cable 12ft	1	$0.00	$0.00		$0.00
Included with Rack BOM	RJ-11 Modular In-Line Coupler 4 Conductor	1	$0.00	$0.00		$0.00
Included with Rack BOM	RJ-45 Modular In-Line Coupler 6 Conductor	1	$0.00	$0.00		$0.00
TJ9FICSMLCLC025MR	LC/LC Fibre Sngl Mode 9UM Cbl 25M	64	$345.00	$ 22,080.00	44%	$ 12,364.80
TOTAL				$ 5,940,372.00		**$ 3,344,745.60**

ST9990V Hardware			$5,533,855.00	44%	$ 3,098,958.80
ST9985V Hardware Maintenance			$0.00		
-- Includes 3-years (24x7) warranty support and installation			$0.00		
ST9990V Software			$ 276,965.00	44%	$ 155,100.40
ST9990V Software Maintenance			$ 129,552.00	30%	$ 90,686.40
-- Includes 3-years of Service (24x7)					**$ 3,344,745.60**

3rd Party Components (sed for this test)

	Unit List Price	Extended Price	Discount	Net Price
64 IBM 5758 4 Gb Single-Port Fibre Channel PCI-X 2.0 DDR Adapter	$121,539.20	$121,539.20	0%	$ 121,539.20
512MB USB memory stick	$ 25.00	$ 25.00	0%	$ 25.00
				$ 3,466,309.80

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

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

Benchmark Configuration/Tested Storage Configuration Diagram

HS-1: IBM p5 595 Model 9119
24 - 1.65 GHz POWER5 CPU
96 GB Memory
64 – 4Gb FC Adapter
AIX 5.3 ML4

SC-1: Sun StorageTek® 9990V System
256GB Cache, 20GB Shared Memory
8 Frontend Directors, 8 Backend Directors
1024 – 146GB 15K RPM Drives
Microcode 60-01-44

64 FC Connection

Benchmark Configuration/Tested Storage Configuration Components

Host System:	Tested Storage Configuration (TSC):
UID=HS-1 IBM P5 595 Model 9119	64 – 4 Gb P5 595 FC PCI-X 2.0 DDR Adapters

24 - 1.65 GHz CPUs – 2 CPUs/POWER5 chip
     32 KB L1 cache, 960 KB L2 cache,
     and 18 MB L3 cache per CPU
	UID=SC-1:
	Sun StorageTek® 9990 System

96 GB main memory	256 GB cache *(data)*, 22 GB shared memory *(metadata)*
AIX 5.3 ML4	
PCI-X/RIO	8 pair *(16 ports/pair)* 4 Gb FC Front-End Directors *(128 ports total, 64 ports used)* 9 pair 4 Gb Backend Directors supporting 64 FC disk loops
WG	
	1024 – 146 GB 15K RPM disk drives