SPC BENCHMARK 1™
EXECUTIVE SUMMARY

FUJITSU LIMITED
FUJITSU STORAGE SYSTEMS
ETERNUS2000 MODEL 200

SPC-1 V1.10.1

Submitted for Review: October 13, 2008
Submission Identifier: A00071

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

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Test Sponsor Primary Contact	Fujitsu Limited – http://www.fujitsu.com/services/computing/storage/ Fujitsu Computer Systems Corp. C.A. (Sandy) Wilson Sandy_Wilson@us.fujitsu.com 1250 East Arques Ave PO Box 3470 Sunnyvale, CA 94088-3470 Phone: (916) 434-8593
Test Sponsor Alternate Contact	Fujitsu Limited – http://www.fujitsu.com/services/computing/storage/ Fujitsu Computer Systems Corp. Kun Katsumata Kun_Katsumata@us.fujitsu.com 1250 East Arques Ave. PO Box 3470 Sunnyvale, CA 94088-3470 Phone (408) 746-6415
Test Sponsor Alternate Contact	Fujitsu Limited – http://www.fujitsu.com/services/computing/storage/ Tetsuro Kudo – kudo@jp.fujitsu.com Kanagawa-ken, Kawasaki-shi, Nakahara-ku, Kamikodanaka 4-1-1 Japan 211-8588 Phone: 044- 754-3240 FAX: 044-754-3719
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 13, 2008
Date the FDR was submitted to the SPC	October 13, 2008
Date the TSC is available for shipment to customers	currently available
Date the TSC completed audit certification	October 10, 2008

Tested Storage Product (TSP) Description

The Fujitsu ETERNUS2000 Model 200 is a flexible, highly reliable storage array, equipped with redundant components to provide uncompromised availability to the small and mid market requirements. A mixture of 146GB and 300GB 15krpm SAS drives, as well as 500GB, 750GB, and 1TB Nearline SAS drives may be used, up to a maximum of 72 drives. The drives may be arranged in a variety of RAID groups, including RAID1, RAID1+0(10), RAID5, and RAID6. The product is offered with Fibre Channel (as tested), iSCSI, and SAS host connection versions, with 4 channels offered (2 channels per controller) in each version. In addition, a number of different snapshot and replication facilities, native disk data encryption, and MAID capabilities are available.

Summary of Results

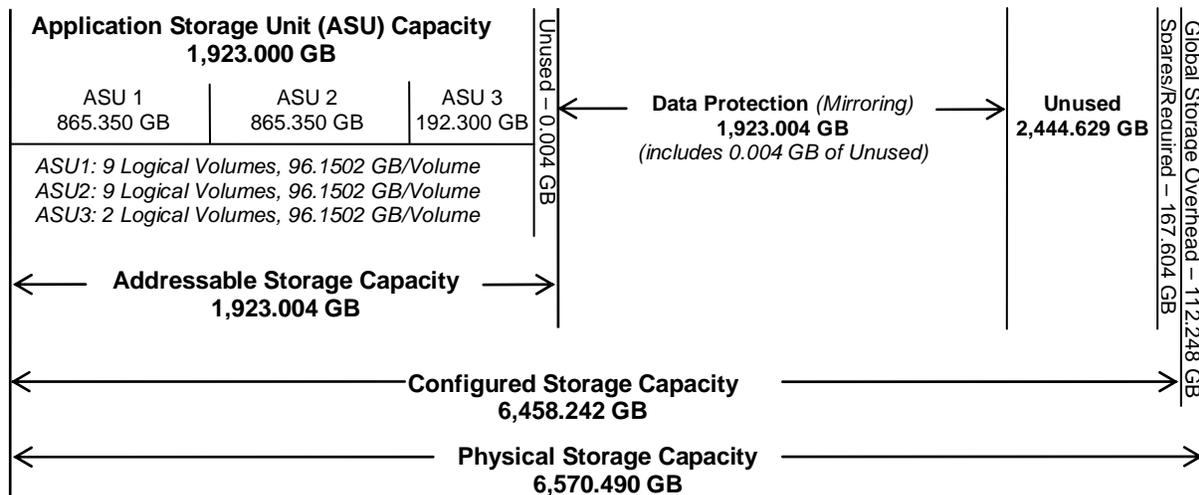| SPC-1 Results	
Tested Storage Configuration (TSC) Name: Fujitsu Storage Systems ETERNUS2000 Model 200	
Metric	**Reported Result**
SPC-1 IOPS™	13,250.44
SPC-1 Price-Performance	$3.40/SPC-1 IOPS™
Total ASU Capacity	1,923.000 GB
Data Protection Level	Mirroring
Total TSC Price (including three-year maintenance)	$45,049

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.
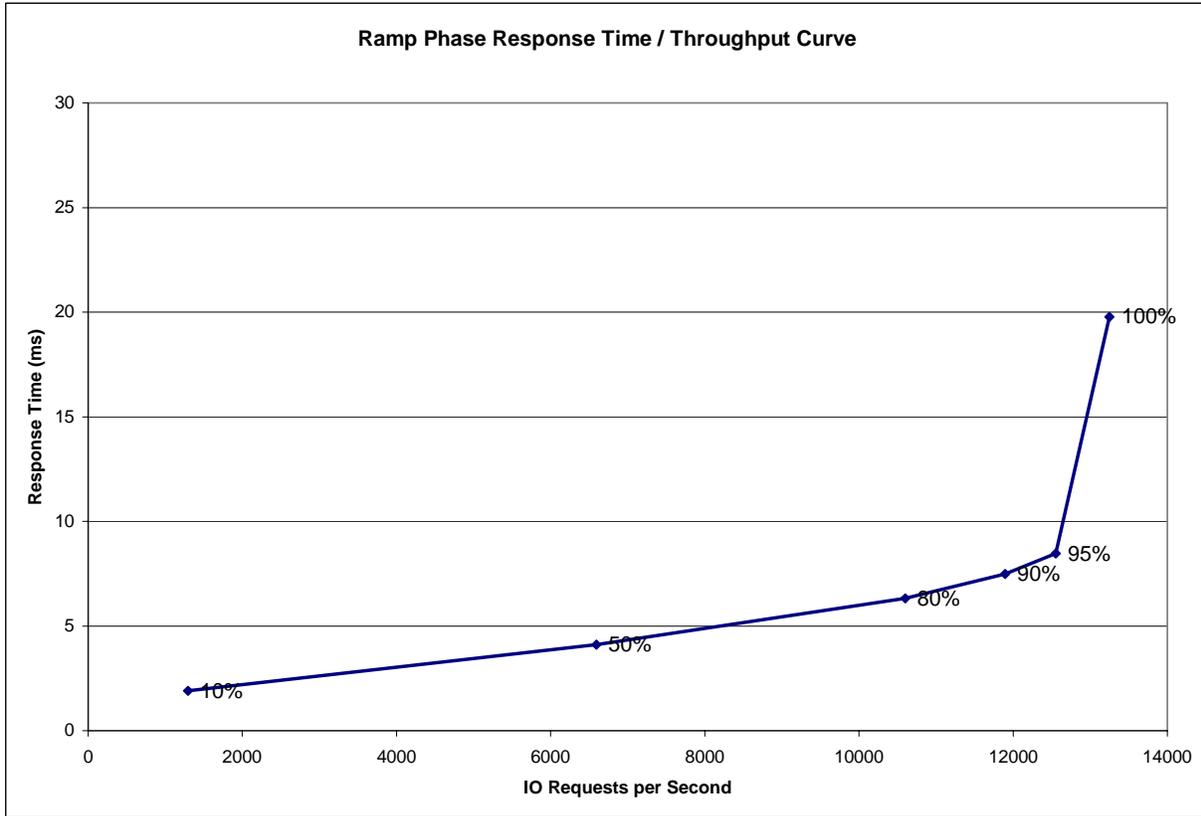
Storage Capacities and Relationships

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.

Ramp Phase Response Time / Throughput Curve

Response Time – Throughput Data

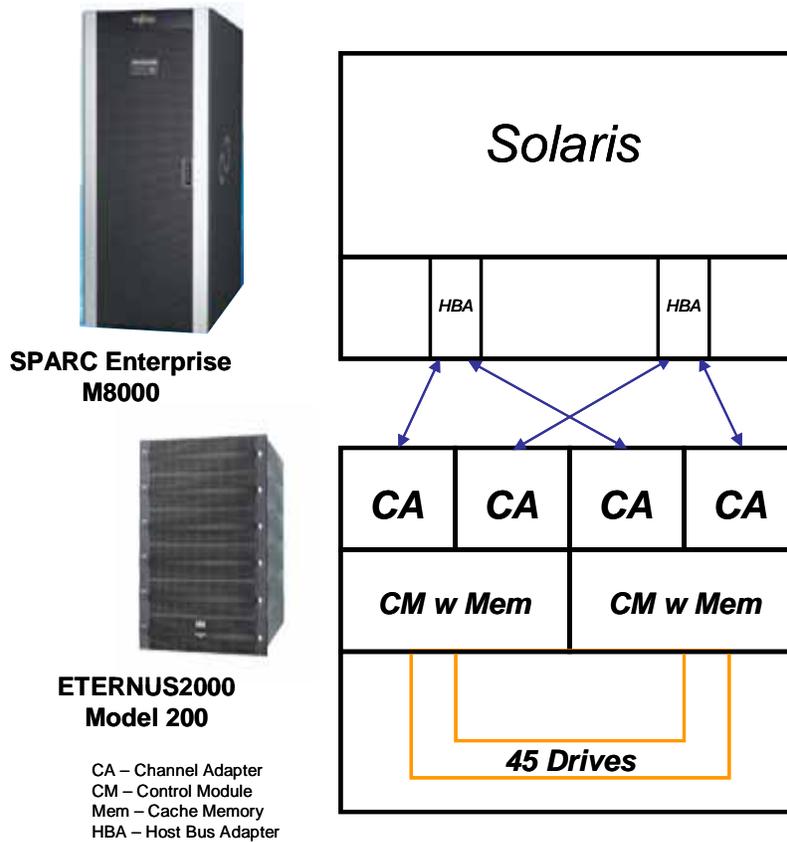|	10% Load	50% Load	80% Load	90% Load	95% Load	100% Load
I/O Request Throughput	1,298.87	6,593.38	10,601.46	11,896.17	12,553.85	13,250.44
Average Response Time (ms):						
All ASUs	1.91	4.10	6.31	7.49	8.46	19.77
ASU-1	2.46	4.87	7.26	8.53	9.56	20.19
ASU-2	1.76	4.11	6.90	8.65	10.08	21.49
ASU-3	0.82	2.48	4.05	4.76	5.43	18.10
Reads	3.64	6.69	10.01	12.03	13.67	24.27
Writes	0.78	2.42	3.91	4.52	5.08	16.83

Tested Storage Configuration Pricing *(Priced Storage Configuration)*

Product name	Qty	Unit LP	Extended LP	Discount %	Discounted Price
ETERNUS2000 model 200 Base unit (FC 4 ports)	1	$13,000.00	$13,000.00	30%	$9,100.00
146GB/15Krpm (SAS) disk drive (set of 2) RAID1 E2K	22	$1,200.00	$26,400.00	30%	$18,480.00
146GB/15Krpm (SAS) disk drive (single) E2K	1	$600.00	$600.00	30%	$420.00
Additional drive enclosure (1xDE) E2K M200	3	$3,000.00	$9,000.00	30%	$6,300.00
Power distribution unit (1U) for E2K	2	$532.00	$1,064.00	30%	$744.80
Emulex 4Gb PCIe 2.5GGhz Dual Channel Fibre Channel HBA	2	$2,565.00	$5,130.00	40%	$3,078.00
24 x 7 Phone Support; 24 x 7, 4-hour On-Site Resp.(Sev-1), 36 Months, Prepaid billing			$10,656.00	35%	$6,926.40
			Total		**$45,049.20**

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

SPARC Enterprise M8000

Solaris

HBA   HBA

ETERNUS2000 Model 200

CA   CA   CA   CA

CM w Mem   CM w Mem

45 Drives

CA – Channel Adapter
CM – Control Module
Mem – Cache Memory
HBA – Host Bus Adapter

Benchmark Configuration/Tested Storage Configuration Components

Host Systems:	Tested Storage Configuration (TSC):
UID=HS-1	2 – Emulex LPe11002 Fibre Channel HBAs

Fujitsu SPARC Enterprise M8000	**UID=SC-1:**
	Fujitsu ETERNUS2000 Model 2000
	   2 – Controller Modules, each with:
	      2 GB cache
	      2 – Channel Adapter Modules
	         4 Fibre Channel ports each
	      2 – SAS Expander Drive Interfaces

16 – SPCAR64 VI chips, each with:
      128 KB L1 data cache,
      6 MB L2 cach3	

512 GB main memory	
Solaris 10	
PCIe	4 – Front side Fibre Channels *(set to 4 Gbit each)*
WG	2 – Back side SAS Channels

	4 – Drive Enclosure Modules, each with:
	      dual SAS interfaces
	      12 – Hot Swap drive slots

	45 – 146 GB, 15K RPM disk drives *(44 drives in 22 RAID Groups plus 1 Hot Spare)*