SPC BENCHMARK 1™

EXECUTIVE SUMMARY

FUJITSU LIMITED

FUJITSU STORAGE SYSTEMS ETERNUS4000 MODEL 500

SPC-1 V1.10

Submitted for Review: August 25, 2006
Submission Identifier: A00047

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

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Revision Information and Key Dates

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SPC-1 Specification revision number	V1.10
SPC-1 Workload Generator revision number	V2.00.04a
Date Results were first used publicly	August 25, 2006
Date the FDR was submitted to the SPC	August 25, 2006
Date the TSC is available for shipment to customers	November 15, 2006
Date the TSC completed audit certification	August 24, 2006

Summary of Results

SPC-1 Results	
Tested Storage Configuration (TSC) Name: Fujitsu Storage Systems ETERNUS4000 Model 500	
Metric	**Reported Result**
SPC-1 IOPS™	60,003.51
SPC-1 Price-Performance	$6.54/SPC-1 IOPS™
Total ASU Capacity	6,820.178 GB
Data Protection Level	Mirroring
Total TSC Price (including three-year maintenance)	$392,174

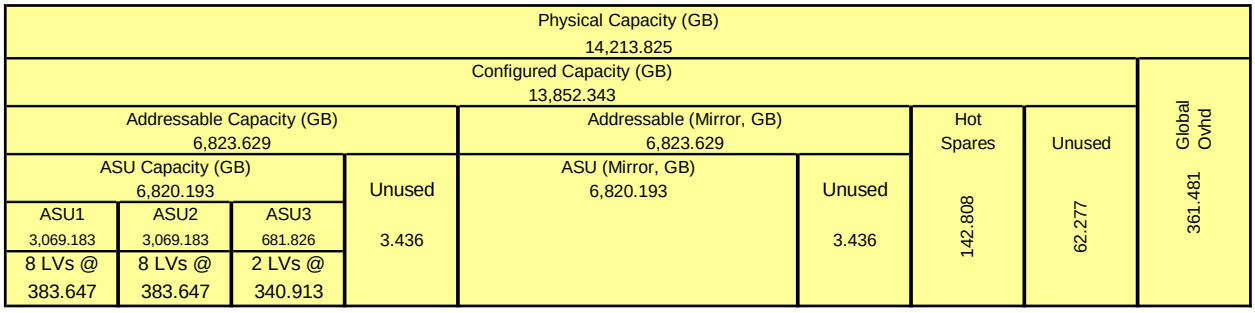
SPC-1 IOPS™ represents the maximum I/O Request Throughput at the 100% load point.

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

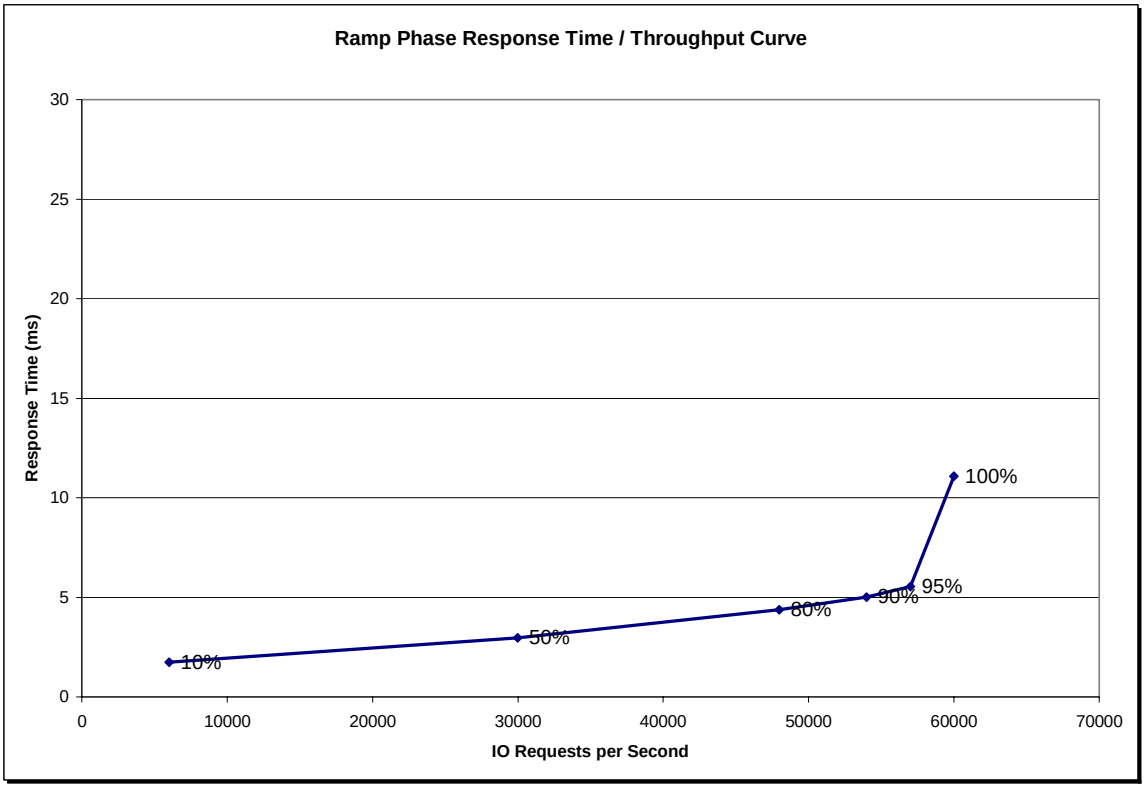
The following diagram documents the various storage capacities, used in this benchmark, and their relationships.



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	6,001.26	29,989.45	47,989.91	53,998.89	56,998.01	60,003.51
Average Response Time (ms):						
All ASUs	1.74	2.96	4.37	5.02	5.54	11.08
ASU-1	2.32	3.66	5.16	5.85	6.39	10.46
ASU-2	1.58	2.87	4.33	5.02	5.56	8.93
ASU-3	0.58	1.52	2.71	3.24	3.72	13.33
Reads	3.58	5.24	7.02	7.85	8.46	11.79
Writes	0.54	1.48	2.65	3.17	3.64	10.62

Tested Storage Configuration Pricing *(Priced Storage Configuration)*

Item	Product Id	Description	Qty	Unit $	Extd $
1	E450S20AU	ETERNUS4000 M500 Base Unit (floor stand) Includes: - 1x controller enclosure - 2x controller - 2x power supply unit - 3x battery unit - 2x drive enclosure - no cache memory - no host interface - no disk drive - 1x 1800mm rack - 1x Power Supply Enclosure (AC200V) - 1x Power distribution unit (AC200V) - 4x AC 200V power cord (NEMA:L6-30P 4m) - 1x ETERNUSmgr and drivers Note: Min. eight disk drives are required. At least one host interface option and one cache memory option are required.	1	$61,075	$61,075
2	E400CR1U	Expansion Rack for E4KM500 - 1x 1, 800 mm expansion rack - 2x Power distribution unit (AC200V) - 4x AC 200V power cord (NEMA:L6-30P 4m) Note: Max. 2 racks can be added to the Base Unit of model 500.	2	$4,450	$8,900
3	E400CE31U	Additional drive enclosure pair (2xDE) FC (Op) E4KM500 - 2x drive enclosure - 8x optical FC cable - 16x SFP module First two sets can be added to an Expansion Rack.. Up to 15 disk drives can be mounted in each drive enclosure. [6EIA unit (6U)]	2	$7,358	$14,716
4	E400CE22U	Additional drive enclosure pair (2xDE) E4KM500 - 2x drive enclosure Up to three sets can be installed to the Base Unit and two sets to the Expansion Rack. Up to 15 disk drives can be mounted in each drive enclosure [6EIA unit (6U)]	11	$7,358	$80,938
5	E400CM24U	16GB Cache Memory (2x 4GB x 2CM) E4KM500 - 4x 4GB DIMM Total 16GB (2x 4GB DIMM x2CM) One set must be mounted. Up to two set can be mounted.	2	$36,384	$72,768
6	E400CH24U	FC (4Gbps) host interface (4-port x 2CA) E4KM300/500 - 2x 4-port FC (4Gbps) CA	2	$6,558	$13,116
7	E400CB2U	36GB/15Krpm (4Gbps) disk drive(set of 2) RAID1E4KM300/M500 - Pre-formatted as RAID1(1D+1M) Only available when ordered with a base unit	2	$1,098	$2,196
8	E400CC2U	36GB/15Krpm (4Gbps) disk drive(set of 8) RAID0+1E4KM300/M500 - Pre-formatted as RAID0+1(4D+4M) Only available when ordered with a base unit	48	$4,393	$210,864
9	E400CA2U	36GB/15Krpm (4Gbps) disk drive (single) E4KM300/M500 - Defined as a hot-spare Only available when ordered with a base unit	4	$549	$2,196
10	61-350563-915	Fibre Channel Cable - LC-LC, 15 m	32	$125	$4,000
11	BR-240E-R0001-A	Brocade Silkworm 200E Fabric Switch 16 ports, 16 SFP, AWT, ADZ, Full Fabric	2	$7,967	$15,934
12	LP11000-M4	Emulex 4Gb PCI-X Single HBA (per quote from InfoX dated 8/23/2006)	16	$779	$12,464
13	ETE4M5-W004240-G000999	Enhanced Plus ETERNUS4000 Model 500 (2 year Warranty included) Phone 24x7, On-site 24x7, maintenance service with 4 hour response	1	$0	$0
14	ETE4M5-P004121-G000999	Enhanced Plus ETERNUS4000 Model 500 (3rd year) Phone 24x7, On-site 24x7, maintenance service with 4 hour response - 1 year Extended Service	1	$48,624	$48,624
15	BR200E-P004241-000	Brocade 200E, Enhanced Plus Maintenance, 2 years Phone 24x7, On-site 24x7, maintenance service with 4 hour response	2	$2,372	$4,744
16	BR200E-P004121-000	Brocade 200E, Enhanced Plus Maintenance (3rd year) Phone 24x7, On-site 24x7, maintenance service with 4 hour response - 1 year Extended Service	2	$1,186	$2,372
		Total Fujitsu Product List Price			$486,703
		Product Discount		30%	
		Net Product Price			$340,692
		Total Service List Price			$55,740
		Service Discount		30%	
		Net Service Price			$39,018
		Outside Quoted Product Price			$12,464
		Total Sell Price, including 3 years Service			$392,174

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

The Tested Storage Configuration used a large 64 port Fibre Channel Switch (Brocade Silkworm 4900), with only 32 ports utilized, based on what was available in the test environment. The Priced Storage Configuration includes two smaller 16 port switches, which provide functional equivalence and do not impact the performance of the system.

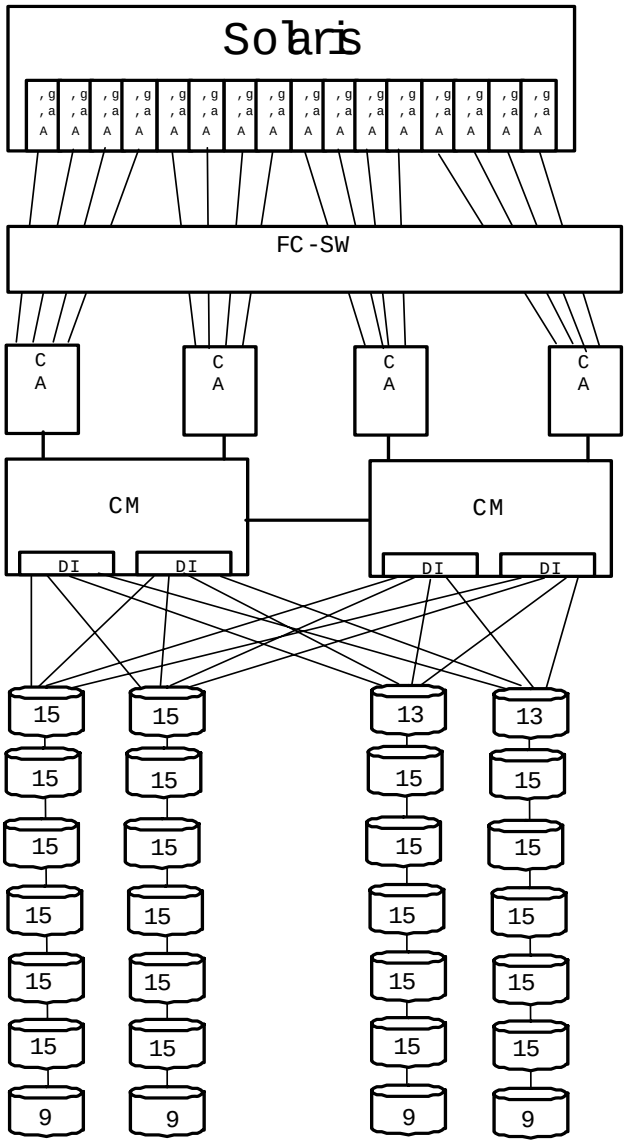
Benchmark Configuration/Tested Storage Configuration Diagram

PRIMEPOWER
HPC2500

SN200-M490

ETERNUS4000
MODEL500

CA-Channel Adapter
CM-Control Module
DI-Drive Interface



Benchmark Configuration/Tested Storage Configuration Components

Host System:	Tested Storage Configuration (TSC):
UID=HS-1 Fujitsu PRIMEPOWER 2500	16 – Emulex LP11000 Fibre Channel HBAs (4 Gbps) Fujitsu SN200 M90 Fibre Channel Switch *(rebranded Brocade Silkworm 4900)*
128 - SPARC64 V (1.3 GHz) CPUs, each with: 128 KB L1 instruction cache, 128 KB L1 data cache, and 2 MB L2 cache	***UID=SC-1:*** Fujitsu ETERNUS4000 Model 500
512 GB main memory	2 – Controller Modules (CM) each with 16 GB cache 4 – Channel Adapter (CA) Modules 4 – Drive Interfaces (DI) 16 – Front side fibre channels (4 Gbps each) 16 – Drive side fibre channel switched FC-AL loops (4 Gbps each)
Solaris 9	
PCI	
WG	
	28 – Drive enclosure modules, each with dual switched FC-AL interfaces 15 hot swap drive slots
	392 – 36 GB 15K RPM disk drives