SPC BENCHMARK 1™
EXECUTIVE SUMMARY

FUJITSU LIMITED
FUJITSU STORAGE SYSTEMS
ETERNUS8000 MODEL 1100

SPC-1 V1.10.1

Submitted for Review: August 20, 2007
Submission Identifier: A00053

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

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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	August 20, 2007
Date the FDR was submitted to the SPC	August 20, 2007
Date the TSC is available for shipment to customers	September 30, 2007
Date the TSC completed audit certification	August 20, 2007

Tested Storage Product (TSP) Description

The Fujitsu ETERNUS8000 Model 1100 is a flexible, highly reliable storage array, equipped with redundant components to provide uncompromised availability. Any mixture of disk drives ranging from 73GB/15krpm to 300GB/15krpm Fibre Channel drives as well as 500GB/7.2krpm Nearline FC drives are supported in the form of RAID1, 0+1 (10), 5 and 6. Up to 64 FC Host Interface channels can be configured, with options for iSCSI Interface channels as well. On top of these, it supports a variety of snapshot and replication capabilities, both local and remote; native disk data encryption; and MAID capability, where drives can be spun down when not needed to save power.

Summary of Results

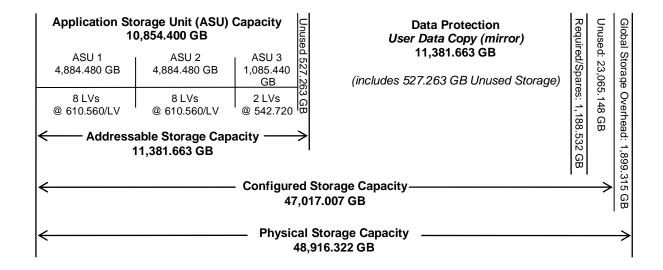| SPC-1 Results	
Tested Storage Configuration (TSC) Name: Fujitsu Storage Systems ETERNUS8000 Model 1100	
Metric	**Reported Result**
SPC-1 IOPS™	115,090.06
SPC-1 Price-Performance	$16.12/SPC-1 IOPS™
Total ASU Capacity	10,854.400 GB
Data Protection Level	Mirroring
Total TSC Price (including three-year maintenance)	$1,855,100

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.
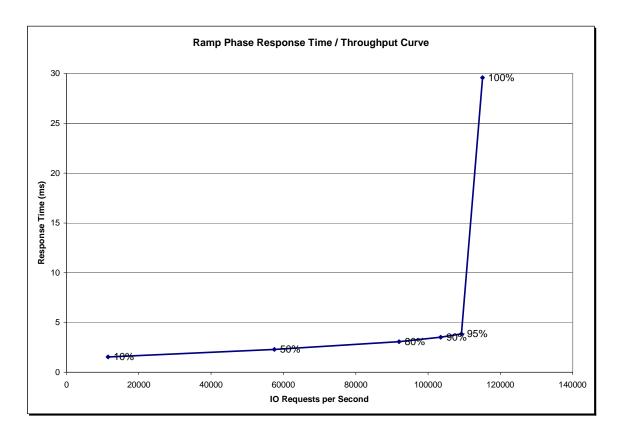
Response Time – Throughput Curve

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	11,498.20	57,491.32	91,973.06	103,476.94	109,246.30	115,090.06
Average Response Time (ms):						
All ASUs	1.53	2.29	3.08	3.51	3.84	29.60
ASU-1	2.00	2.91	3.79	4.28	4.64	39.10
ASU-2	1.38	2.08	2.90	3.35	3.69	6.64
ASU-3	0.59	1.08	1.65	1.97	2.22	19.50
Reads	3.05	4.24	5.37	5.99	6.45	33.59
Writes	0.53	1.02	1.59	1.90	2.15	26.99

Tested Storage Configuration Pricing *(Priced Storage Configuration)*

		Fujitsu ETERNUS8000 Model 1100			
Item	Product Id	Description	Qty	Unit $	Extd $
1	E8B0S20AU	ETERNUS8000 M1100 Base Unit (floor stand) Includes: - 1x 1800mm rack - 2x 1800mm expansion rack - 1x controller enclosure - 4x controller module (CM) - 6x power supply unit (PSU) - 2x service controller (SVC) - 2x frontside router (FRT) - 4x backside router (BRT) - 6x battery unit - 24x drive enclosure (DE) - no cache memory - no host interface - 16x system disk drive - 14x Power distribution unit (AC200V) - 4x AC 200V power cord (NEMA:L6-30P 4m) - 1x ETERNUSmgr and drivers Note: Min. 112 disk drives (not including system disk drives) are required.	1		
2	E800CE21U	Additional drive enclosure for Expansion Rack - 4x drive enclosure (DE) Note: Up to three sets can be mounted in each Expansion Rack.	11		
3	E800CR1U	ETERNUS8000 Expansion Rack provides 1800mm (36U) rack holds up to 12 DEs 2x power distribution (200 VAC)	3		
4	E800CM44U	32GB Cache Memory (2x 4GB x 4CM) E8kM900/M1100/M2100 - 8x 4GB DIMM Total 32GB (2x 4GB DIMM x4CM)	4		
5	E800CH28U	FC (4Gbps) host interface (4-port x 2CA) E8K - 2x 4-port FC (4Gbps) CA	8		
6	E800CC3U	73GB/15Krpm (4Gbps) disk drive(set of 8) RAID1+0 E8K - Pre-formatted as RAID10(4D+4M) Only available when ordered with a base unit	80		
7	E800CA3U	73GB/15Krpm (4Gbps) disk drive (single) E8K - Defined as a hot-spare Only available when ordered with a base unit	16		
8	Item #1 through #7 total	E8000 M1100 storage system	1	$2,232,588	$2,232,588
9	61-343827-015	Fibre Channel Cable - LC-LC, 15 m	64	$125	$7,993
10	LP10000-M2	Emulex 2Gb PCI-X Single HBA	16	$1,036	$16,576
11	LP11000-M4	Emulex 4Gb PCI-X Single HBA	48	$1,236	$59,328
12	ETE811-W004240-K003104	ETE8000 M1100 Standard Warranty, 24 Months (24 x 7 Phone Support; 24 x 7 4-hour On-Site Resp)	1	$0	
13	ETE811-P004122-K003104	ETE8000 M1100 Enhanced +, 24 x 7 Phone Support; 24 x 7, 4-hour On-Site Resp.(Sev-1), Post-Warranty Maintenance, 12 Months	1	$247,332	$247,332
14	ETE811-N067005-K003104	ETE8000 M1100 Eternus Installation, during normal business hours, One Time billing	1	$3,500	$3,500
15	FTSPS-ET-QS81100	Professional Services-ETERNUS 8000 Model1100 QuickStart	1	$12,075	$12,075
16	FTSPS-ET-TE	ETERNUS Consulting Services Travel and Expenses	1	$2,000	$2,000
		Total Fujitsu Product List Price			$2,232,588
		Product Discount		30%	
		Total Non Fujitsu Product List Price			$83,897
		Product Discount		20%	
		Net Product Price			$1,629,929
		Total Service List Price			$264,907
		Service Discount		15%	
		Net Service Price			$225,171
		Total Sell Price, including 3 years Service			$1,855,100

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.
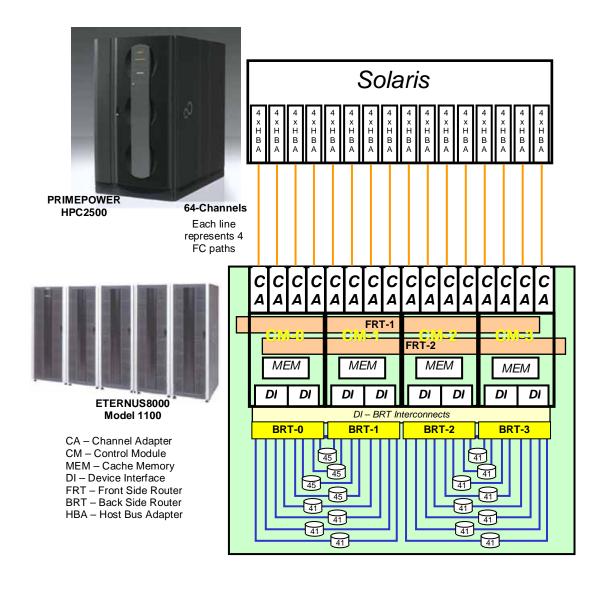
Benchmark Configuration/Tested Storage Configuration Diagram

**PRIMEPOWER
HPC2500**

64-Channels

Each line
represents 4
FC paths

**ETERNUS8000
Model 1100**

CA – Channel Adapter
CM – Control Module
MEM – Cache Memory
DI – Device Interface
FRT – Front Side Router
BRT – Back Side Router
HBA – Host Bus Adapter

Solaris

4 x HBA (×16)

CA (×16)

FRT-1
CM-0   CM-1   CM-2   CM-3
FRT-2

MEM   MEM   MEM   MEM

DI DI   DI DI   DI DI   DI DI

DI – BRT Interconnects

BRT-0   BRT-1   BRT-2   BRT-3

45, 45, 45, 45, 41, 41, 41, 41, 41
41, 41, 41, 41, 41, 41, 41, 41

Benchmark Configuration/Tested Storage Configuration Components

Host System:	Tested Storage Configuration (TSC):
UID=HS-1, HS-2 Fujitsu PRIMEPOWER 2500	48 – Emulex LP11000 Fibre Channel HBAs (4 Gbit) 16 – Emulex LP11000 Fibre Channel HBAs (2 Gbit)

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 ETERNUS8000 Model 1100

Partitioned into two logical Host Systems, each with 64 CPUs and a full view of all of the storage	4 – Controller Modules (CM) each with:
	     32 GB cache
	     4 – Channel Adapter Modules (CA)
	         4 Fiber Channel ports per CA
	     2 – Drive Interfaces (DI)
	         4 Fiber Channel Ports per DI

512 GB main memory	
Solaris 9	
PCI	
WG	64 – Front side Fibre Channels *(4 Gbps capable, set to 2 Gbit each)*
	32 – Back side Fibre Channels *(switched FC-AL set to 4 Gbit each)*

	68 – Drive Enclosure Modules, each with
	     dual switched FC-AL interfaces
	     15 Hot Swap drive slots

	672 – 73 GB 15K RPM disk drives
	     (640 drives in RAID Groups,
	         plus 16 reserved for system use
	         and 16 Hot Spares)