



THE POSSIBILITIES ARE INFINITE

**SPC BENCHMARK 2™
EXECUTIVE SUMMARY**

**FUJITSU LIMITED
FUJITSU STORAGE SYSTEMS
ETERNUS4000 MODEL 500**

SPC-2™ V1.2.1

**Submitted for Review: November 2, 2006
Submission Identifier: B00013**

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

Test Sponsor and Contact Information	
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/ Kouichi Ueda ueda@jp.fujitsu.com Kanagawa-ken, Kawasaki-shi, Nakahara-ku, Kamikodanaka 4-1-1 Japan 211-8588 Phone: 044- 754-3651
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-2 Specification revision number	V1.2.1
SPC-2 Workload Generator revision number	spc2rc9g
Date Results were first used publicly	November 2, 2006
Date FDR was submitted to the SPC	November 2, 2006
Date the TSC will be available for shipment to customers	December 31, 2006
Date the TSC completed audit certification	November 1, 2006

Tested Storage Product (TSP) Description

The Fujitsu ETERNUS4000 Model 500 is a flexible, highly reliable storage array, equipped with redundant components to provide uncompromised availability. Any mixture of disk drives ranging from 36GB/15krpm to 300GB/10krpm Fibre Channel drives as well as 500GB/7.2krpm Nearline FC drive is supported in the form of RAID1, 1+0, 5 and 6. Up to 16 FC Host Interface channels can be configured, with options for iSCSI Host Interface channels. On top of these, it supports variety of snapshots and mirroring capability, MAID and native disk data encryption.

SPC-2 Reported Data

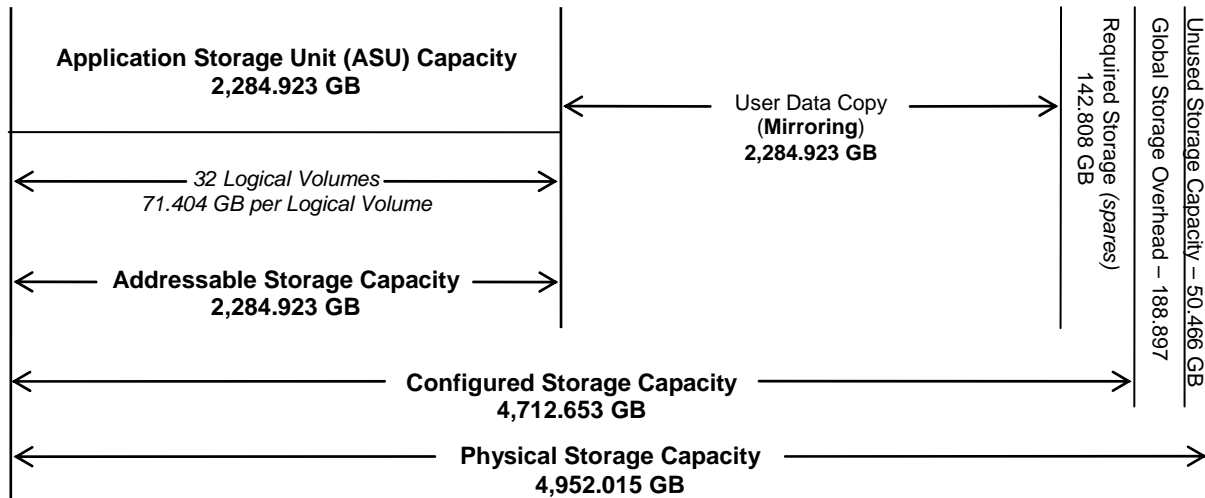
SPC-2 Reported Data consists of three groups of information:

- The following SPC-2 Primary Metrics, which characterize the overall benchmark result:
 - SPC-2 MBPS™
 - SPC-2 Price Performance
 - Application Storage Unit (ASU) Capacity
- Supplemental data to the SPC-2 Primary Metrics.
 - Total Price
 - Data Protection Level
- Reported Data for each SPC Test: Large File Processing (LFP), Large Database Query (LDQ), and Video on Demand Delivery (VOD) Test.

SPC-2 Reported Data				
Fujitsu Storage Systems ETERNUS4000 Model 500				
SPC-2 MBPS™	SPC-2 Price-Performance	ASU Capacity (GB)	Total Price	Data Protection Level
1,985.63	\$114.72	2,284.923	\$227,783	Mirroring
<i>The above SPC-2 MBPS™ value represents the aggregate data rate of all three SPC-2 workloads: Large File Processing (LFP), Large Database Query (LDQ), and Video On Demand (VOD)</i>				
SPC-2 Large File Processing (LFP) Reported Data				
	Data Rate (MB/second)	Number of Streams	Data Rate per Stream	Price-Performance
LFP Composite	1,701.51			\$133.87
Write Only:				
1024 KiB Transfer	1,114.80	32	34.84	
256 KiB Transfer	1,083.75	32	33.87	
Read-Write:				
1024 KiB Transfer	1,630.33	32	50.95	
256 KiB Transfer	1,623.97	32	50.75	
Read Only:				
1024 KiB Transfer	2,377.25	32	74.29	
256 KiB Transfer	2,378.97	32	74.34	
<i>The above SPC-2 Data Rate value for LFP Composite represents the aggregate performance of all three LFP Test Phases: (Write Only, Read-Write, and Read Only).</i>				
SPC-2 Large Database Query (LDQ) Reported Data				
	Data Rate (MB/second)	Number of Streams	Data Rate per Stream	Price-Performance
LDQ Composite	2,305.02			\$98.82
1024 KiB Transfer Size				
4 I/Os Outstanding	2,361.89	32	73.81	
1 I/O Outstanding	2,362.93	32	73.84	
64 KiB Transfer Size				
4 I/Os Outstanding	2,289.38	32	71.54	
1 I/O Outstanding	2,205.87	32	68.93	
<i>The above SPC-2 Data Rate value for LDQ Composite represents the aggregate performance of the two LDQ Test Phases: (1024 KiB and 64 KiB Transfer Sizes).</i>				
SPC-2 Video On Demand (VOD) Reported Data				
	Data Rate (MB/second)	Number of Streams	Data Rate per Stream	Price-Performance
	1,950.37	2,480	0.79	\$116.79

Storage Capacities and Relationships

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



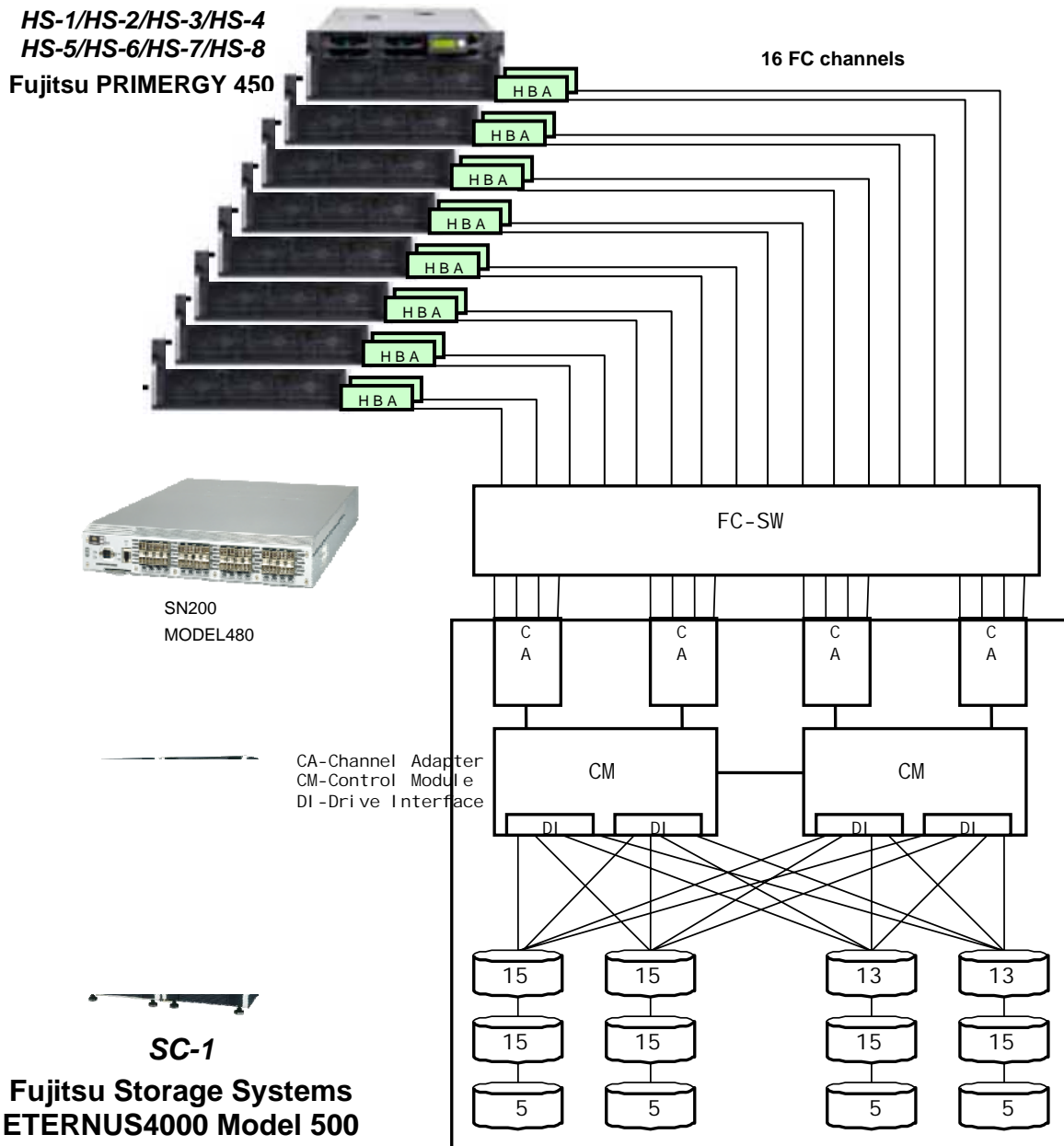
Tested Storage Configuration Pricing (Priced Storage Configuration)

Fujitsu ETERNUS4000 Model 500					
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	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)	1	\$4,450	\$4,450
3	E400CE31U	Additional drive enclosure pair (2xDE) FC (Op) E4KM500 - 2x drive enclosure - 8x optical FC cable - 16x SFP module	2	\$7,358	\$14,716
4	E400CE22U	Additional drive enclosure pair (2xDE) E4KM500 - 2x drive enclosure	3	\$7,358	\$22,074
5	E400CM24U	16GB Cache Memory (2x 4GB x 2CM) E4KM500 - 4x 4GB DIMM Total 16GB (2x 4GB DIMM x2CM)	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)	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)	16	\$4,392	\$70,272
9	E400CA2U	36GB/15Krpm (4Gbps) disk drive (single) E4KM300/M500 - Defined as a hot-spare	4	\$549	\$2,196
10	61-343827-015	Fibre Channel Cable - LC-LC, 15 m	32	\$125	\$3,996
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 10/26/2006)	16	\$778	\$12,448
13	ETE4M5-W001360-K001110	ETE4000 M500 Standard Warranty, 36 Months	1	\$0	\$0
14	ETE4M5-U004362-K001110	ETE4000 M500 Enhanced + 24 x 7 Phone Support; 24 x 7 4-hour On-Site Resp. (Sev-1), Warranty Uplift Maintenance, 36 Months	1	\$13,331	\$13,331
15	BR200E-P004121-000	Brocade 200E, Enhanced Plus Maintenance, Post Warranty, 1 Year Prepaid Phone 24x7, On-site 24x7, maintenance service with 4 hour response	2	\$1,186	\$2,372
16	BR200E-P004241-000	Brocade 200E, Enhanced Plus Maintenance, Post Warranty, 2 Year Prepaid Phone 24x7, On-site 24x7, maintenance service with 4 hour response - 1 year Extended Service	2	\$2,372	\$4,744
Total Fujitsu Product List Price					\$282,793
				Product Discount	30%
Net Product Price					\$197,955
Total Service List Price					\$20,447
				Service Discount	15%
Net Service Price					\$17,380
Outside Quoted Product Price					\$12,448
Total Sell Price, including 3 years Service					\$227,783

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

The Tested Storage Configuration (TSC) used a single 32 port Fibre Channel Switch, 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



Host System(s) and Tested Storage Configuration Components

Host Systems:	Tested Storage Configuration (TSC):
8 – Fujitsu PRIMERGY 450	16 – Emulex LP11000-M4 FC HBAs (4 Gbit)
<p>HS-1/HS-2/HS-3/HS-4 each with: 4 – Intel Xeon™ 2.0 GHz CPUs 1 MB iL3 cache per CPU</p> <p>HS-5/HS-6 each with 4 – Intel Xeon™ 1.9 GHz CPUs 1 MB iL3 cache per CPU</p> <p>HS-5/HS-6 each with 4 – Intel Xeon™ 1.6 GHz CPUs 1 MB iL3 cache per CPU</p>	Fujitsu SN200-M480 FC Switch
	<p>UID=SC-1: Fujitsu ETERNUS4000 Model 500</p> <p>2 – Controller Modules (CM) each with 16 GB cache</p> <p>4 – Channel Adapter (CA) Modules</p> <p>4 – Drive Interfaces (DI)</p> <p>16 – Front side fibre channels (4 Gbps each)</p> <p>16 – Drive side fibre channel switched FC-AL loops (4 Gbps each)</p>
	12 – Drive enclosure modules, each with dual switched FC-AL interfaces and 15 hot swap drive slots
4 GB main memory per Host System	136 – 36 GB 15K RPM disks including 4 reserved for system use and 4 'hot' spares
Windows 2003 Server v5.2 w/SP1	
PCI-X	
WG	