



**SPC BENCHMARK 2™
EXECUTIVE SUMMARY**

**FUJITSU LIMITED
FUJITSU STORAGE SYSTEMS
ETERNUS8000 MODEL 1100**

SPC-2™ V1.2.1

**Submitted for Review: March 8, 2007
Submission Identifier: B00019**

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
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Revision Information and Key Dates

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SPC-2 Specification revision number	V1.2.1
SPC-2 Workload Generator revision number	spc2rc9g
Date Results were first used publicly	March 8, 2007
Date FDR was submitted to the SPC	March 8, 2007
Date the TSC will be available for shipment to customers	currently available
Date the TSC completed audit certification	March 7, 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 36GB/15krpm to 300GB/10krpm Fibre Channel drives as well as 500GB/7.2krpm Nearline FC drive is 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 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

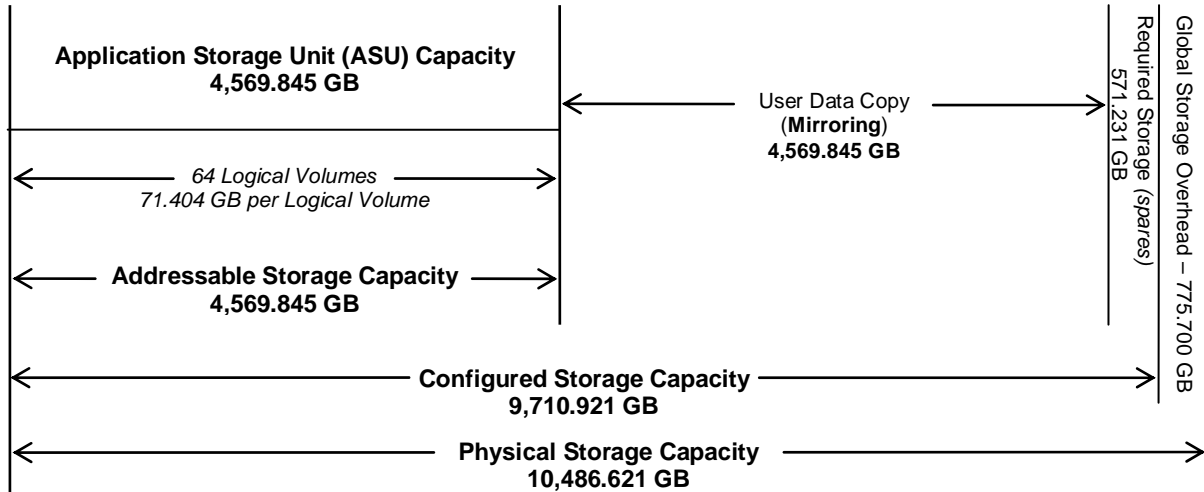
SPC-2 Reported Data consists of three groups of information:

- 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 ETERNUS8000 Model 1100				
SPC-2 MBPS™	SPC-2 Price-Performance	ASU Capacity (GB)	Total Price	Data Protection Level
3,480.68	\$238.93	4,569.845	\$831,649	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	2,803.26			\$296.67
Write Only:				
1024 KiB Transfer	1,803.84	36	50.11	
256 KiB Transfer	1,790.91	36	49.75	
Read-Write:				
1024 KiB Transfer	2,555.25	48	53.23	
256 KiB Transfer	2,522.25	48	52.55	
Read Only:				
1024 KiB Transfer	4,081.63	64	63.78	
256 KiB Transfer	4,065.65	64	63.53	
<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	3,903.22			\$213.07
1024 KiB Transfer Size				
4 I/Os Outstanding	3,680.78	24	153.37	
1 I/O Outstanding	4,064.16	48	84.67	
64 KiB Transfer Size				
4 I/Os Outstanding	3,944.98	48	82.19	
1 I/O Outstanding	3,922.97	96	40.86	
<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
	3,735.56	4,750	0.79	\$222.63

Storage Capacities and Relationships

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



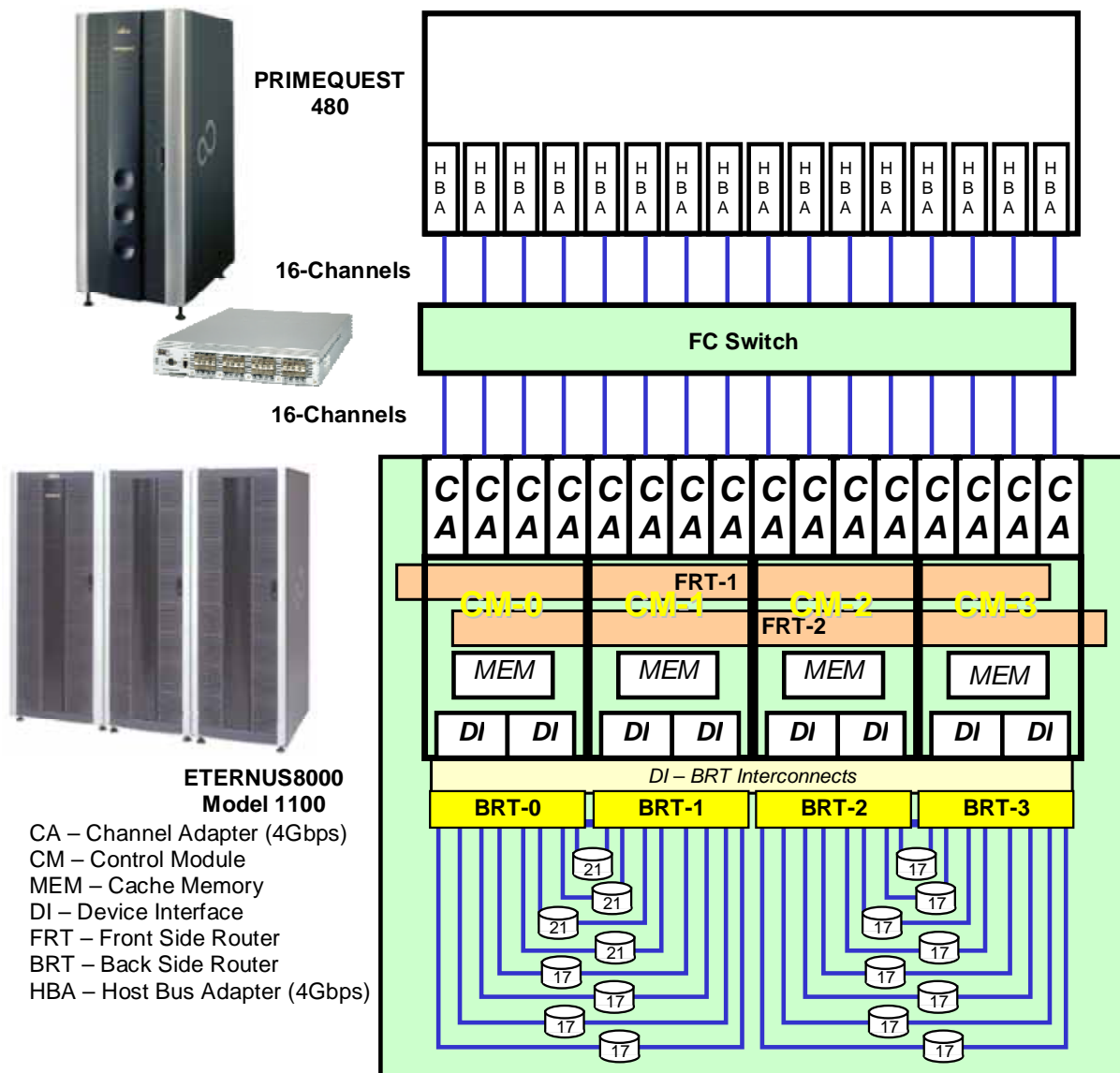
Tested Storage Configuration Pricing (Priced Storage Configuration)

Fujitsu 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. At least one host interface option and two cache memory options are required.	1		\$0
2	E800CE21U	Additional drive enclosure for Expansion Rack - 4x drive enclosure (DE) Note: Up to three sets can be mounted in each Expansion Rack.	2		\$0
3	E800CM42U	16GB Cache Memory (2x 2GB x 4CM) E8kM900/M1100/M2100 - 8x 2GB DIMM Total 16GB (2x 2GB DIMM x4CM)	4		\$0
4	E800CH14U	FC (4Gbps) host interface (2-port x 2CA) E8K - 2x 2-port FC (4Gbps) CA	8		\$0
5	E800CB2U	36GB/15Krpm (4Gbps) disk drive(set of 2) RAID1 E8K - Pre-formatted as RAID1(1D+1M) Only available when ordered with a base unit	128		\$0
6	E800CA2U	36GB/15Krpm (4Gbps) disk drive (single) E8K - Defined as a hot-spare Only available when ordered with a base unit	4		\$0
7	Item #1 through #6 total	E8000 m1100 storage system	1	\$988,656	\$988,656
8	61-343827-015	Fibre Channel Cable - LC-LC, 15 m	32	\$125	\$3,996
9	BR-240E-R0001-A	Brocade SilkWorm 200E Fabric Switch 16 ports, 16 SFP, AWT, ADZ, Full Fabric	2	\$7,967	\$15,934
10	LP11000-M4	Emulex 4Gb PCI-X Single HBA	16	\$1,236	\$19,776
11	ETE811-W004240-K001654	ETE8000 M1100 Standard Warranty, 24 Months	1	\$0	\$0
12	ETE811-P004122-K001661	ETE8000 M1100 Enhanced +, 24 x 7 Phone Support; 24 x 7, 4-hour On-Site Resp.(Sev-1), Post-Warranty Maintenance, 12 Months	1	\$104,736	\$104,736
13	ETE811-N067005-K001654	ETE8000 M1100 Eternus Installation, during normal business hours, One Time billing	1	\$3,500	\$3,500
14	FTSPS-ET-QS81100	Professional Services-ETERNUS 8000 Model1100 QuickStart	1	\$11,500	\$11,500
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	\$988,656
				Product Discount	30%
				Total Non Fujitsu Product List Price	\$39,706
				Product Discount	20%
				Net Product Price	\$723,824
				Total Service List Price	\$126,852
				Service Discount	15%
				Net Service Price	\$107,824
				Total Sell Price, including 3 years Service	\$831,649

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):
UID = HS-1: Fujitsu PRIMEQUEST 480	16 – Emulex LP11000-M4 FC HBAs (4 Gbit)
	Fujitsu SN200-M480 FC Switch (32 ports)
16 – 1.5 GHz Intel® Itanium® 2 Processors with 4 MB L3 cache per processor	UID = SC-1: Fujitsu ETERNUS8000 Model 1100
64 GB main memory	4 – Controller Modules (CM) each with 16 GB cache
Windows 2003 Server Datacenter Edition w/SP1	4 – Channel Adapter (CA) Modules
BEA JRockit Java 1.5.0_08	4 – Drive Interfaces (DI)
PCI-X	16 – Front side fibre channels (4 Gbps each)
WG	16 – Drive side fibre channel switched FC-AL loops (4 Gbps each)
	32 – Drive enclosure modules, each with dual switched FC-AL interfaces and 15 hot swap drive slots
	288 – 36 GB 15K RPM disks including 16 reserved for system use and 16 'hot' spares