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SPC BENCHMARK 2™

EXECUTIVE SUMMARY

FUJITSU LIMITED

FUJITSU STORAGE SYSTEMS
ETERNUS DX8700 S2

SPC-2™ V1.4

Submitted for Review: December 3, 2012
Submission Identifier: B00063

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

Test Sponsor and Contact Information	
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Revision Information and Key Dates

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SPC-2 Specification revision number	V1.4
SPC-2 Workload Generator revision number	V1.2
Date Results were first used publicly	December 3, 2012
Date FDR was submitted to the SPC	December 3, 2012
Date the TSC will be available for shipment to customers	currently available
Date the TSC completed audit certification	December 2, 2012

Tested Storage Product (TSP) Description

The Fujitsu ETERNUS DX8700 S2 is a flexible, highly reliable storage array, equipped with redundant components to provide uncompromised availability to the enterprise market requirements. A mixture of 300GB, 450GB, 600GB, & 900GB/10krpm, 300GB/15krpm, & 1TB/7.2krpm 2.5" SAS drives, plus 100GB, 200GB, 400GB 2.5" SSD drives are supported. In addition 300GB, 450GB, & 600GB/15krpm 3.5" SAS drives, as well as 1TB, 2TB, & 3TB 7.2krpm 3.5" Nearline SAS drives may be installed. Up to 3072 x 2.5" drives may be included, or up to 1546 x 3.5" drives. Both sized drives can be included in the same storage array. The drives may be arranged in a variety of RAID groups, including RAID1, RAID1+0(10), RAID5, RAID6, and RAID5+0(50). The product is offered with Fibre Channel (4 port as tested or 2 port 2/4/8Gbps versions), iSCSI (1Gbps & 10Gbps 2 port), and FCoE (10Gbps 2 port) host connection Channel Adapters. Up to four Channel Adapters can be attached to each of up to eight Controllers, with multiple types available. In addition, a number of different snapshot and replication facilities, native disk data encryption, and MAID capabilities are available.

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 MBPS™ represents the aggregate data rate, in megabytes per second, of all three SPC-2 workloads: Large File Processing (LFP), Large Database Query (LDQ), and Video on Demand (VOD).

SPC-2 Price-Performance™ is the ratio of **Total Price** to **SPC-2 MBPS™**.

ASU *(Application Storage Unit)* **Capacity** represents the total storage capacity available to be read and written in the course of executing the SPC-2 benchmark.

Total Price includes the cost of the Priced Storage Configuration plus three years of hardware maintenance and software support as detailed on page 17 of the Full Disclosure Report.

Data Protection Level of **Protected 2** using ***mirroring***, which configures two or more identical copies of user data.

> ***Protected 2:*** *The single point of failure of any* ***component*** *in the configuration will not result in permanent loss of access to or integrity of the SPC-2 Data Repository.*

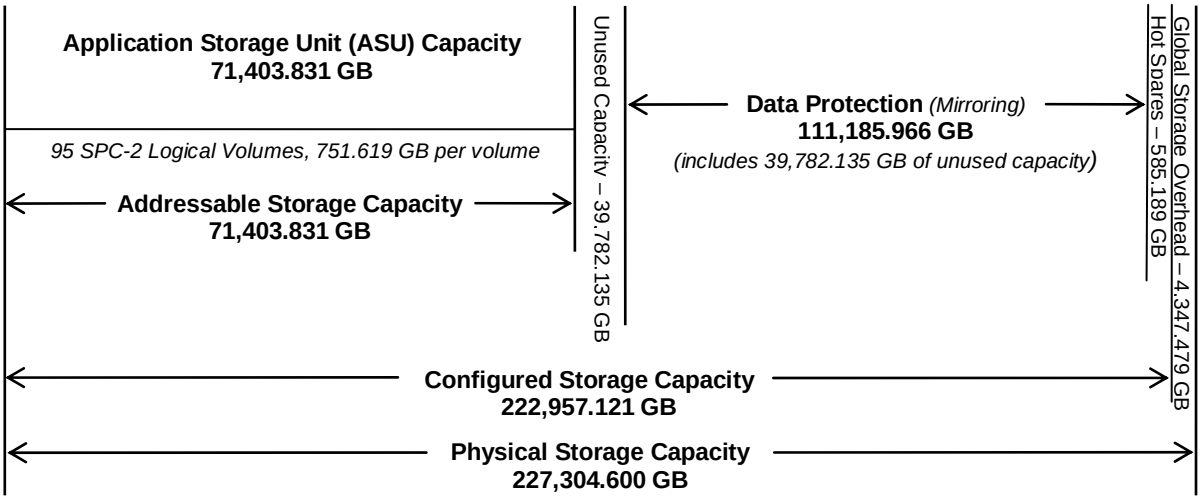
Currency Used is formal name for the currency used in calculating the **Total Price** and **SPC-2 Price-Performance™**. That currency may be the local currency of the **Target Country** or the currency of a difference country *(non-local currency)*.

The **Target Country** is the country in which the Priced Storage Configuration is available for sale and in which the required hardware maintenance and software support is provided either directly from the Test Sponsor or indirectly via a third-party supplier.

SPC-2 Reported Data				
Fujitsu Storage Systems ETERNUS DX8700 S2				
SPC-2 MBPS™	**SPC-2 Price-Performance**	**ASU Capacity (GB)**	**Total Price**	**Data Protection Level**
16,038.74	$79.51	71,403.831	$1,275,162.74	Protected 2 *(Mirroring)*
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)				
SPC-2 Large File Processing (LFP) Reported Data				
	Data Rate *(MB/second)*	**Number of Streams**	**Data Rate per Stream**	**Price-Performance**
LFP Composite	13,516.37			$94.34
Write Only:				
1024 KiB Transfer	7,030.52	95	74.01	
256 KiB Transfer	6,577.27	95	69.23	
Read-Write:				
1024 KiB Transfer	11,903.88	190	62.65	
256 KiB Transfer	11,638.74	190	61.26	
Read Only:				
1024 KiB Transfer	21,385.81	380	56.28	
256 KiB Transfer	22,562.03	475	47.50	
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).				
SPC-2 Large Database Query (LDQ) Reported Data				
	Data Rate *(MB/second)*	**Number of Streams**	**Data Rate per Stream**	**Price-Performance**
LDQ Composite	22,017.04			$57.92
1024 KiB Transfer Size				
4 I/Os Outstanding	21,609.03	380	56.87	
1 I/O Outstanding	21,585.18	380	56.80	
64 KiB Transfer Size				
4 I/Os Outstanding	22,808.31	475	48.02	
1 I/O Outstanding	22,065.63	475	46.45	
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).				
SPC-2 Video On Demand (VOD) Reported Data				
	Data Rate *(MB/second)*	**Number of Streams**	**Data Rate per Stream**	**Price-Performance**
	12,582.81	16,000	0.79	$101.34

Storage Capacities and Relationships

The following diagram *(not to scale)* and table document the various storage capacities, used in this benchmark, and their relationships, as well as the storage utilization values required to be reported.



SPC-1 Storage Capacity Utilization	
Application Utilization	31.41%
Protected Application Utilization	62.83%
Unused Storage Ratio	35.00%

Application Utilization: Total ASU Capacity *(71,403.831 GB)* divided by Physical Storage Capacity *(227,304.600 GB)*

Protected Application Utilization: Total ASU Capacity *(71,403.831 GB)* plus total Data Protection Capacity *(111,185.966 GB)* minus unused Data Protection Capacity *(39,782.135 GB)* divided by Physical Storage Capacity *(227,304.600 GB)*.

Unused Storage Ratio: Total Unused Capacity *(79,564.269 GB)* divided by Physical Storage Capacity *(227,304.600 GB)* and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 25-26 in the Full Disclosure Report.

Priced Storage Configuration Pricing

Product ID	Description	Qty	Unit List Price	Extended LP	Discount %	Discounted Price
ETERD87S_ET872SAU_151990	DX8700 S2 Base System (ET872SAU) Rackmount (AC200V, 19RU) Includes 2xCM & PDU	1				
	Expansion Controller w/ Battery & PS (ETGECB) Includes 2xCM	1				
	Expansion Controller (ETGECA) Includes 2xCM	1				
	FC Host Interface, pair - 8 ports (ETGHF88), with 8 SFP+ modules (2/4/8Gbps, Host/Remote Connect)	6				
	12GB Cache Memory for DX8700 S2 (ETGM26) (2GB two sets of 3)	3				
	Drive Enclosure x4 (2.5" HDD) w/ Backend Router (ETGAB4CU) Rackmount (AC200V, 2RU)	4				
	Drive Enclosure x4 (2.5" HDD) (ETGAD4CU) Rackmount (AC200V, 2RU)	4				
	300GB/10krpm 2.5" Drive x8 (ETGD3SC) (RAID1+0 4+4)	95				
	300GB/10krpm 2.5" Drive x1 (ETGD3HC)	2				
	Base Rack (42RU, 1000x2000mm) (ETGRKA2U) with Front & Rear Doors, side panels without Stabilizers	1				
	Expansion Rack (42RU, 1000x2000mm) (ETGRKB2U) with Front & Rear Doors, NO side panels without Stabilizers	2				
	Power Distribution Unit for DX (ETGP16U) (AC240V, 30A - 8 enclosures, 2RU)	4				
Total for above items	ETERNUS DX8700 S2 Storage Array	1	$1,396,430.00	$1,396,430.00	30%	$977,501.00
BR05340-0008	Brocade 5300 SAN Switch 80 ports licensed 68 ports used, with 80 SFP+ modules	1	$126,600.00	$126,600.00	10%	$113,940.00
QLE2562	QLogic Dual port 8Gbps Fibre Channel Host Bus Adapter	16	$2,597.85	$41,565.60	10%	$37,409.04
61-343827-003	Fibre Channel Cable LC-LC 3 m	68	$132.00	$8,976.00	20%	$7,180.80
(Provide 24 hour per day / 7days per week 4 hour response maintenance for 36 months)						
ETD87S-W004240-AHP	24 months, Warranty DX8700 S2	1	$0.00	$0.00		$0.00
ETD87S_P004121-AHP	12 months, Enhanced Plus DX8700 S2	1	$146,952.00	$146,952.00	20%	$117,561.60
FTSPS-ET-QSHIGH	ETERNUS - High End Storage QuickStart Service	1	$11,160.00	$11,160.00	20%	$8,928.00
5300-SVS-4OS3	36 months, Brocade 5300 Switch	1	$14,047.00	$14,047.00	10%	$12,642.30
				Total:		**$1,275,162.74**

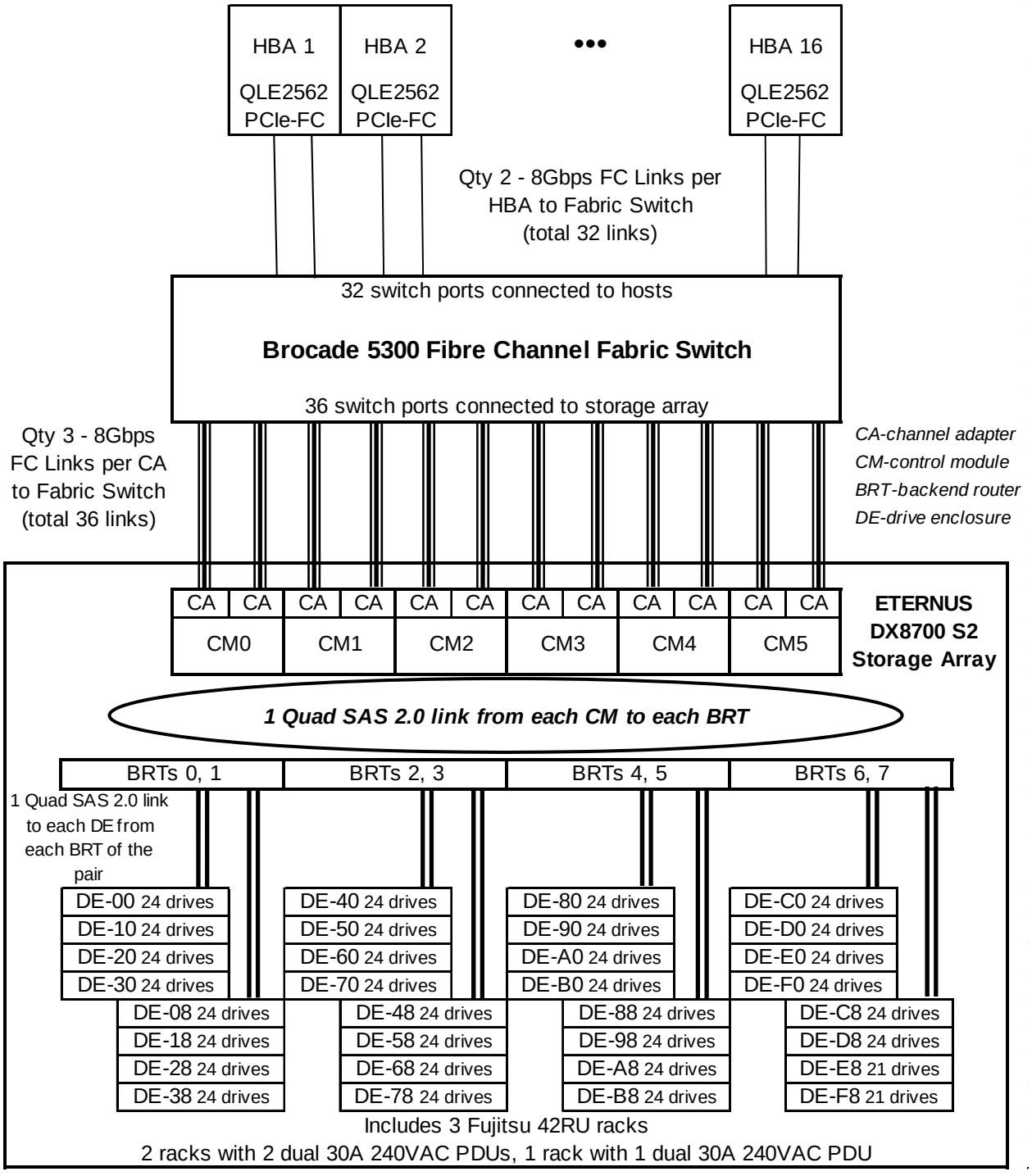
The above pricing includes the following:

- Acknowledgement of new and existing hardware and/or software problems within four hours.
- Onsite presence of a qualified maintenance engineer or provision of a customer replaceable part within four hours of the above acknowledgement for any hardware failure that results in an inoperative Priced Storage Configuration component.

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.

Priced Storage Configuration Diagram



Priced Configuration Components

Priced Storage Configuration
16 – Qlogic QLE2562 FC dual port FC HBAs *(8 Gbps)*
Fujitsu Storage Systems ETERNUS DX8700 S2 6 – Controller Modules, each with: 6 GB cache *(36 GB total)* Flash Memory power fail protection 2 – Channel Adapter Modules *(12 total)*, each with 4 – 8 Gbps Fibre Channel ports *(8 total and 3 used per adapter module)* 48 – front-end connections available and 36 used 8 – Backend routers *(16 Quad SAS 2.0 ports per router, 128 total ports available, 82 used)* *(3 ports/router used for each CM, 18 total ports used)* *(1 port/router used for each of 8 DEs, 64 total ports used)* Dual power supplies and fan modules
1 – Brocade 5300 Fabric Switch *(80 ports available, 68 ports active)*
32 –ETERNUS DX8700 S2 Drive Enclosures, each with 2 – I/O Modules, each with Quad SAS 2.0 Expander Drive interface *(2 total, 2 used)* dual power supplies and fan modules 2 – Quad SAS 2.0 connections *(64 total connections available and used)*
762 – 300 GB 10K RPM 2.5" SAS Disk Drives: *24 disk drives in each of 30 ETERNUS DX8700 S2 Drive Enclosures* *21 disk drives in the remaining 2 drive enclosures*
3 – Fujitsu 42RU racks *2 racks with 2 dual 30A 240 VAC PDUs* *1 rack with 1 dual 30A 240 VAC PDU*