SPC Benchmark 1™
Executive Summary

Fujitsu Limited
Fujitsu Storage Systems ETERNUS DX80 S2

SPC-1 V1.12

Submitted for Review: December 27, 2011
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EXECUTIVE SUMMARY

Test Sponsor and Contact Information

Test Sponsor and Contact Information	
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Revision Information and Key Dates

Revision Information and Key Dates	
SPC-1 Specification revision number	V1.12
SPC-1 Workload Generator revision number	V2.1.0
Date Results were first used publicly	December 27, 2011
Date the FDR was submitted to the SPC	December 27, 2011
Date the Priced Storage Configuration is available for shipment to customers	currently available
Date the TSC completed audit certification	December 27, 2011

Tested Storage Product (TSP) Description

The Fujitsu ETERNUS DX80 S2 is a flexible, highly reliable storage array, equipped with redundant components to provide uncompromised availability to the SMB Market requirements. A mixture of 300GB, 450GB, and 600GB disk drives in either 2.5″ 10krpm or 3.5″ 15krpm SAS are available. There are also 1TB and 2TB 7200rpm Nearline SAS drives and 100GB or 200GB SSD drives available. The product is offered with a choice of host interface connections, including Fibre Channel (as tested), iSCSI (1Gbps & 10Gbps), SAS (6Gbps), and FCoE (10Gbps). Up to 8 host ports can be provided, 4 on each of the two Control Modules. A number of different snapshot and replication facilities are available along with native disk data encryption, and MAID capabilities.

Summary of Results

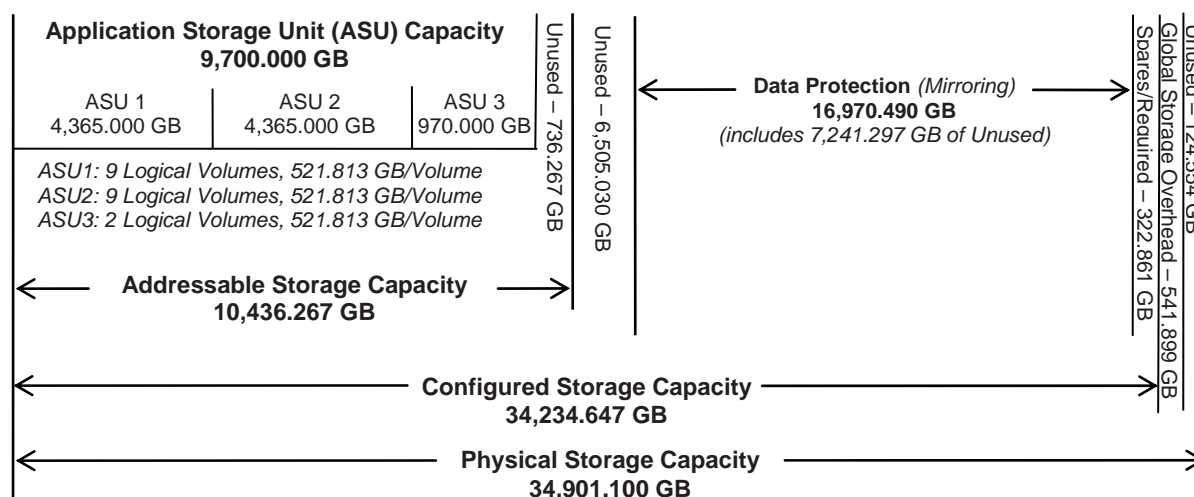| SPC-1 Reported Data	
Tested Storage Product (TSP) Name: Fujitsu Storage Systems ETERNUS DX80 S2	
Metric	**Reported Result**
SPC-1 IOPS™	34,995.02
SPC-1 Price-Performance	$2.25/SPC-1 IOPS™
Total ASU Capacity	9,700.000GB
Data Protection Level	Protected *(Mirroring)*
Total TSC Price (including three-year maintenance)	$78.757.00

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 **Protected** *(Mirroring)* configures two or more identical copies of user data.

Storage Capacities, Relationships, and Utilization

The following diagram 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	27.79%
Protected Application Utilization	55.67%
Unused Storage Ratio	41.85%

Application Utilization: . Capacity *(34,901.100 GB)*

Protected Application Utilization: (Total ASU Capacity *(9,700.000 GB)* plus total Data Protection Capacity *(16,970.490 GB)* minus unused Data Protection Capacity *(7,241.297 GB)* divided by Physical Storage Capacity *(34,901.100 GB)*
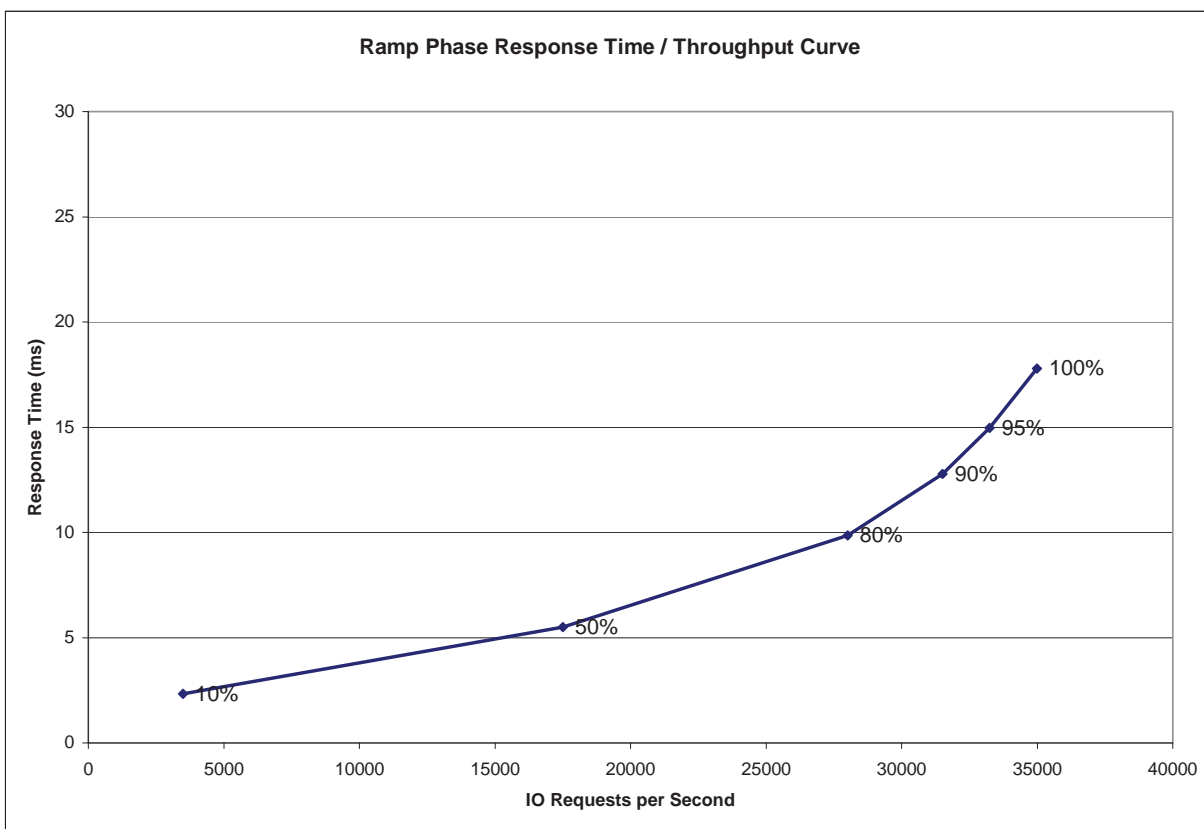
Unused Storage Ratio: Total Unused Capacity *(14,607.148 GB)* divided by Physical Storage Capacity *(34,901.100 GB)* and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 20-21 in the Full Disclosure Report.

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	3,496.86	17,507.97	28,005.44	31,502.57	33,244.01	34,995.02
Average Response Time (ms):						
All ASUs	2.33	5.50	9.85	12.78	14.97	17.79
ASU-1	3.17	6.75	11.12	13.62	15.34	17.68
ASU-2	2.27	6.27	12.93	17.81	21.25	25.26
ASU-3	0.55	2.52	5.80	8.80	11.44	14.77
Reads	5.06	10.15	17.19	21.71	24.85	28.99
Writes	0.55	2.47	5.06	6.97	8.53	10.50

Priced Storage Configuration Pricing

Product ID	Product Name	Qty	Unit List Price	Extended LP	Discount %	Discounted Price
ET082DCU	DX80 S2 Base System Rackmount (AC200V, 2RU) (2.5" HDD, Dual CM type)	1	$8,250.00	$8,250.00	30%	$5,775.00
ETEAD2CU	Drive Enclosure Rackmount (AC200V, 2RU) (2.5" HDD, Dual CM type)	4	$3,900.00	$15,600.00	30%	$10,920.00
ETEHF12	FC Host Interface, 2 ports (2/4/8Gbps, Host/Remote Connect)	4	$850.00	$3,400.00	30%	$2,380.00
ETED3HC	300GB/10krpm 2.5" Disk Drives	117	$460.00	$53,820.00	30%	$37,674.00
QLE2562 (third-party)	QLogic 8Gbps Dual Port Fibre Channel Host Bus Adapter	4	$2,598.00	$10,392.00	10%	$9,352.80
61-343827-003	Fibre Channel Cable LC-LC 3 m	8	$132.00	$1,056.00	30%	$739.20
	(Provide 24 hour per day / 7days per week 4 hour response maintenance for 36 months)					
ET082DCU	Base (36 mos, Enhanced Plus)	1	$3,276.00	$3,276.00		$3,276.00
ETEAD2CU	DE (36 mos, Enhanced Plus) ea.	4	$2,160.00	$8,640.00		$8,640.00

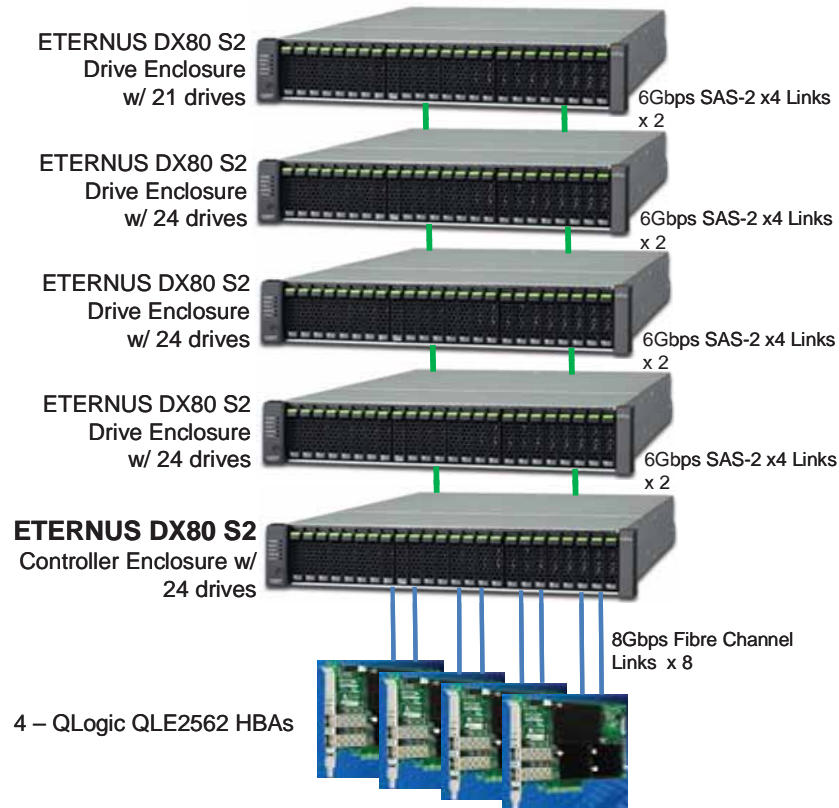SFPs are included.   **Total:**   **$78,757.00**

The above pricing includes hardware maintenance and software support for three years, 7 days per week, 24 hours per day. The hardware maintenance and software support provides the following:

- Acknowledgement of new and existing problems with four (4) hours.

- Onsite presence of a qualified maintenance engineer or provision of a customer replaceable part within four (4) hours of the above acknowledgement for any hardware failure that results in an inoperative Priced Storage Configuration that can be remedied by the repair or replacement of a Priced Storage Configuration component.

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

The TSC was configured with eight (8) dual-port HBAs, of which four (4) were used in the benchmark measurements. The Priced Storage Configuration included only the four (4) HBAs that were used. This difference, if applied to the TSC, would not have had any impact on the benchmark measurements.

Priced Storage Configuration Diagram

ETERNUS DX80 S2
Drive Enclosure
w/ 21 drives

6Gbps SAS-2 x4 Links
x 2

ETERNUS DX80 S2
Drive Enclosure
w/ 24 drives

6Gbps SAS-2 x4 Links
x 2

ETERNUS DX80 S2
Drive Enclosure
w/ 24 drives

6Gbps SAS-2 x4 Links
x 2

ETERNUS DX80 S2
Drive Enclosure
w/ 24 drives

6Gbps SAS-2 x4 Links
x 2

ETERNUS DX80 S2
Controller Enclosure w/
24 drives

8Gbps Fibre Channel
Links x 8

4 – QLogic QLE2562 HBAs

Priced Storage Configuration Components

Priced Storage Configuration
4 – QLogic QLE2562 dual-port 8 Gbps FC HBAs

Fujitsu Storage Systems ETERNUS DX80 S2
  2 – Controller Modules, each with:
      4 GB cache *(8 GB total)*
      Flash Memory power fail protection
      1 - SAS QSFP SAS Drive Enclosure interface
          (backend connections to first drive enclosure; 2 total, 2 used)
      2 – Channel Adapter modules, each with
          2 –8 Gbps Fibre Channel ports
          (front-end Host connections, 8 total, 8 used)

4 –ETERNUS DX80 S2 Drive Enclosures, each with
      2 – I/O Modules, each with
          SAS QSFP SAS Drive Enclosure interface *(2 total, 2 used)*

117 – 300 GB 10K RPM 2.5" SAS Disk Drives
          24 – ETERNUS DX80 S2 Controller Enclosure
          24 – ETERNUS DX80 S2 Drive Enclosure x 3
          21 – ETERNUS DX80 S2 Drive Enclosure x 1