



SPC BENCHMARK 1™
EXECUTIVE SUMMARY

FUJITSU LIMITED
FUJITSU STORAGE SYSTEMS ETERNUS DX80

SPC-1 V1.11

Submitted for Review: September 14, 2009
Submission Identifier: A00082

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 P.O. 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 P.O. Box 3470 Sunnyvale, CA 94088 3470 Phone: (408) 746-6415 FAX: (408) 746-8016 |
| Test Sponsor Alternate Contact | Fujitsu Limited – http://www.fujitsu.com/services/computing/storage/ Yasuhita Arikawa y.arikawa@jp.fumitsu.com 1-1 Kamikodanaka 4-chrome, Nakahara-ku, Kawasaki-shi, Kanagawa-ken 211-8588, Japan Phone: (044) 754-3632 FAX: (044) 754-3719 |
| 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 | V1.11 |
| SPC-1 Workload Generator revision number | V2.1.0 |
| Date Results were first used publicly | September 14, 2009 |
| Date the FDR was submitted to the SPC | September 14, 2009 |
| Date the priced storage configuration is available for shipment to customers | currently available |
| Date the TSC completed audit certification | September 11, 2009 |

Tested Storage Product (TSP) Description

The Fujitsu ETERNUS DX80 is a flexible, highly reliable storage array, equipped with redundant components to provide uncompromised availability to the SMB market requirements. A mixture of 300GB and 450GB 15krpm SAS drives, as well as 750GB and 1TB Nearline SAS drives may be used, up to a maximum of 120 drives. The drives may be arranged in a variety of RAID groups, including RAID1, RAID1+0(10), RAID5, RAID5+0(50), and RAID6. The product is offered with Fibre Channel host connection, with 4 channels (2 channels per controller). SMI-S Version 1.2 is supported by the DX80 array. In addition, a number of different snapshot and replication facilities, disk data encryption, MAID capabilities, and power consumption monitoring features are available

Summary of Results

| SPC-1 Results | |
|---|--------------------------------|
| Tested Storage Configuration (TSC) Name: Fujitsu Storage Systems ETERNUS DX80 <i>Error!</i> <i>Unknown document property name.</i> | |
| Metric | Reported Result |
| SPC-1 IOPS™ | 19,492.86 |
| SPC-1 Price-Performance | \$3.45/SPC-1 IOPS™ |
| Total ASU Capacity | 5,355.400 GB |
| Data Protection Level | Protected (<i>Mirroring</i>) |
| Total TSC Price (including three-year maintenance) | \$67,296.40 |

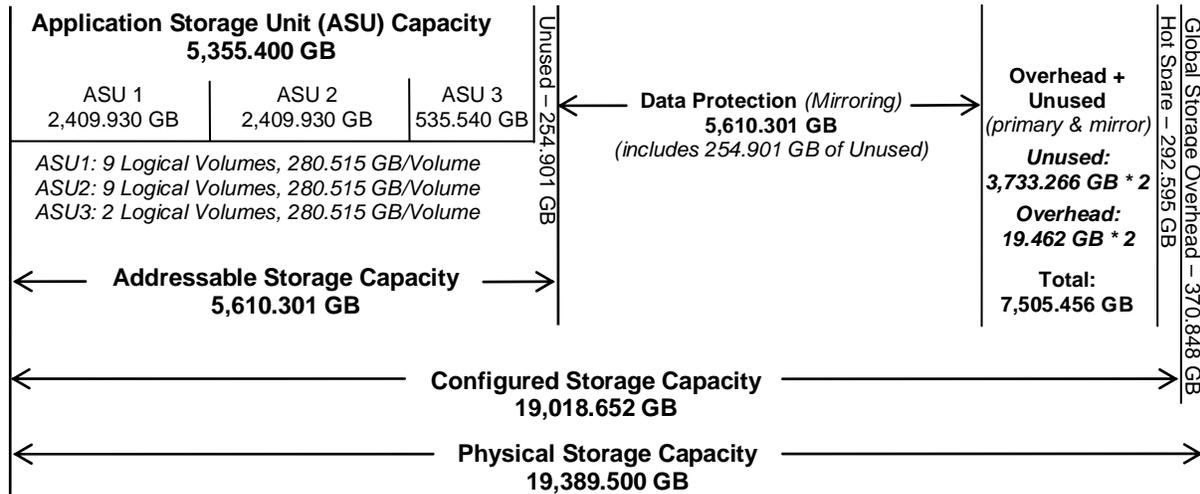
SPC-1 IOPS™ represents the maximum I/O Request Throughput at the 100% load point.

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** using *Mirroring* configures two or more identical copies of user data.

Storage Capacities and Relationships

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 | 27.62% |
| Protected Application Utilization | 55.24% |
| Unused Storage Ratio | 41.14% |

Application Utilization: Total ASU Capacity (5,355.400 GB) divided by Physical Storage Capacity (19,389.500 GB)

Protected Application Utilization: (Total ASU Capacity (5,355.400 GB) plus total Data Protection Capacity (5,610.301GB) minus unused Data Protection Capacity (254.901 GB)) divided by Physical Storage Capacity (19,389.500 GB)

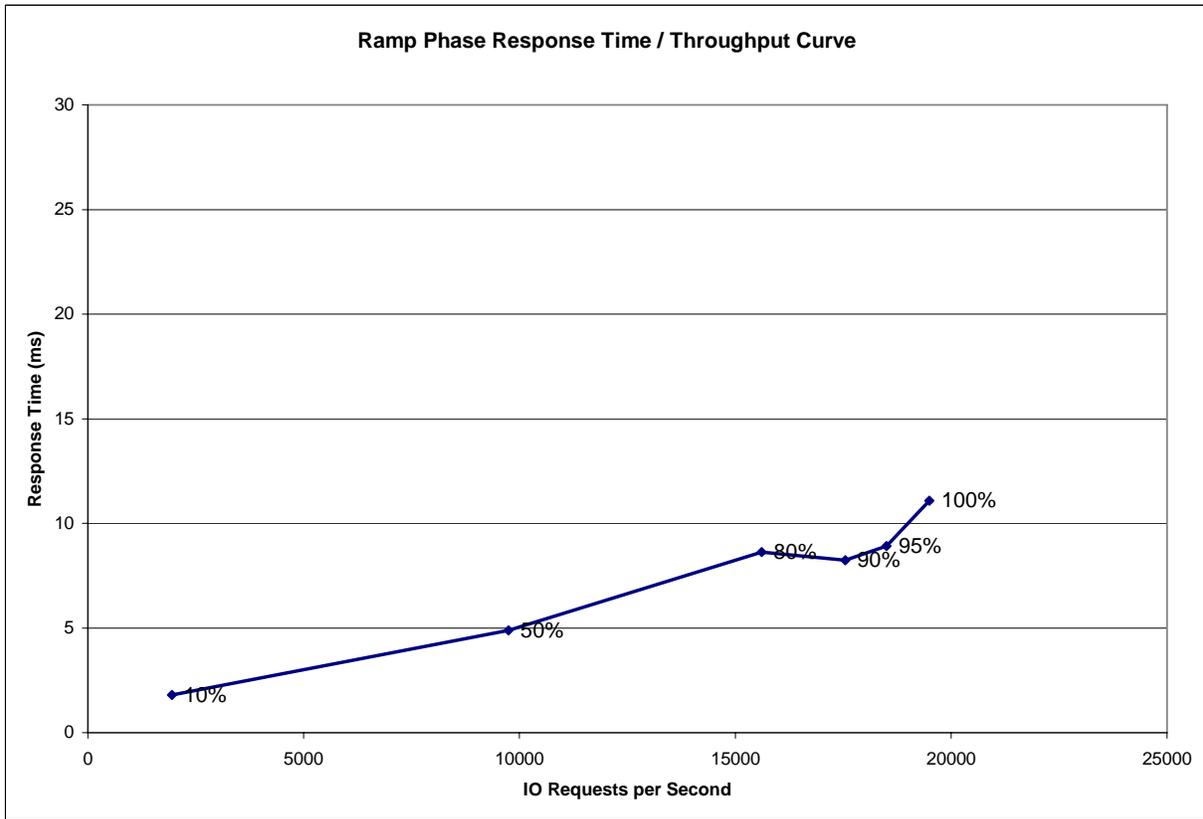
Unused Storage Ratio: Total Unused Capacity (7,976.334 GB) divided by Physical Storage Capacity (19,389.500 GB) and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 19-20 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 | 1,946.07 | 9,748.06 | 15,605.72 | 17,549.20 | 18,501.14 | 19,492.86 |
| Average Response Time (ms): | | | | | | |
| All ASUs | 1.79 | 4.90 | 8.64 | 8.25 | 8.91 | 11.07 |
| ASU-1 | 2.34 | 5.72 | 9.57 | 9.22 | 9.90 | 12.08 |
| ASU-2 | 1.71 | 4.95 | 9.24 | 9.18 | 10.06 | 12.54 |
| ASU-3 | 0.68 | 3.12 | 6.40 | 5.77 | 6.30 | 8.30 |
| Reads | 3.52 | 7.68 | 12.36 | 12.40 | 13.37 | 15.95 |
| Writes | 0.67 | 3.08 | 6.22 | 5.54 | 6.01 | 7.90 |

Tested Storage Configuration Pricing (*Priced Storage Configuration*)

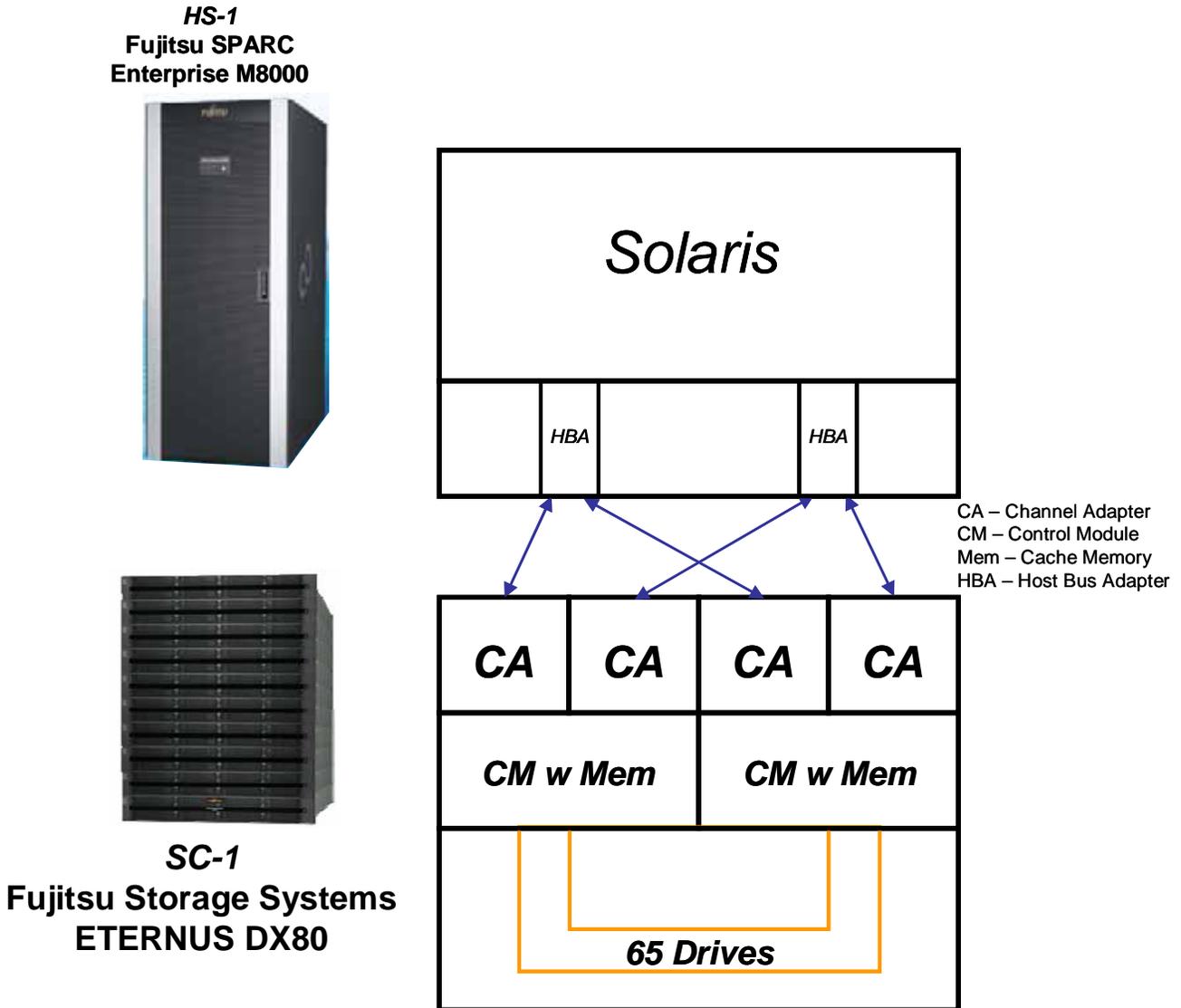
| Product ID | Product name | Qty | Unit LP | Extended LP | Discount % | Discounted Price |
|-------------------|---|-----|-------------|-------------|------------|--------------------|
| ET08E22AU | ETERNUS DX80 Base unit (FC 8Gbps 4 ports) | 1 | \$12,750.00 | \$12,750.00 | 30% | \$8,925.00 |
| ETLDE2AU | Additional drive enclosure for 20M DX80 | 5 | \$3,000.00 | \$15,000.00 | 30% | \$10,500.00 |
| ETLSA3HAU | 300GB/15Krpm (SAS) disk drive (single) | 65 | \$740.00 | \$48,100.00 | 30% | \$33,670.00 |
| ETLAC2U2U | Power distribution unit (2U) | 2 | \$1,410.00 | \$2,820.00 | 30% | \$1,974.00 |
| LPEI1002-M4 | Emulex 4Gb PCIe 2.5Ghz Dual Channel Fibre Channel HBA | 2 | \$2,565.00 | \$5,130.00 | 40% | \$3,078.00 |
| ETDX-EPLUPLT-BASE | ETDX2000, 1 Mnth; 24 x 7, 4-hour On-Site Resp. (Sev-1), Uplift Maintenance for Base Unit | 36 | \$91.00 | \$3,276.00 | 35% | \$2,129.40 |
| ETDX-EPLUPLT-DE | ETDX2000, 1 Mnth; 24 x 7, 4-hour On-Site Resp. (Sev-1), Uplift Maintenance for DE | 180 | \$60.00 | \$10,800.00 | 35% | \$7,020.00 |
| Total | | | | | | \$67,296.40 |

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

There were no differences between the TSC and the Priced Storage Configuration.

Benchmark Configuration (BC)/Tested Storage Configuration (TSC) Priced Storage Configuration Diagram

The TSC/Priced Storage Configuration consists of the Fujitsu Storage Systems ETERNUS DX80 plus the HBAs and excludes the Fujitsu SPARC Enterprise M8000 Host System.



Benchmark Configuration/Tested Storage Configuration Priced Storage Configuration Components

| Host System: | Tested Storage Configuration (TSC) / Priced Storage Configuration: |
|--|---|
| HS-1: Fujitsu SPARC Enterprise M8000 16 – 2.4 GHz SPARC64 VI chips each with: 128 KB L1 instruction cache, 128 KB L1 data cache, 6 MB L2 cache | 2 –LPE11002-M4 FC HBAs (2 – 4 Gbit ports/ HBA) <i>(rebranded Emulex LP12000)</i> |
| 512 GB main memory | SC-1: Fujitsu Storage Systems ETERNUS DX80 2 – Controller Modules, each with: 2 GB cache (4 GB total) 2 – Channel Adapter modules, each with 1 – Fibre Channel port <i>(4 ports total, 4 ports used)</i> 2 – SAS Expander Drive interfaces |
| Solaris 10 | 4 – Front side Fibre Channels (set to 4 Gbit each) 2 – Back side SAS channels |
| Solaris Volume Manager | 6 – Drive Enclosure Modules, each with: dual SAS interfaces, 12 – Hot Swap drive slots |
| PCIe | 65 – 300 GB 15K RPM disk drives <i>(64 drives in 32 RAID Groups and 1 Hot Spare)</i> |
| WG | ETERNUS Administrator |