



**SPC BENCHMARK 2™  
EXECUTIVE SUMMARY**

**FUJITSU LIMITED  
FUJITSU STORAGE SYSTEMS  
ETERNUS DX8900 S3**

**SPC-2™ V1.5**

**Submitted for Review: May 5, 2016  
Submission Identifier: B00079**

## EXECUTIVE SUMMARY

### Test Sponsor and Contact Information

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<b>Test Sponsor Primary Contact</b>	Fujitsu Limited – <a href="http://www.fujitsu.com/services/computing/storage/">http://www.fujitsu.com/services/computing/storage/</a> Fujitsu America, Inc. Kun Katsumata <a href="mailto:kkatsumata@us.fujitsu.com">kkatsumata@us.fujitsu.com</a> 1250 East Arques Ave PO Box 3470 Sunnyvale, CA 94088-3470 Phone: (408) 746-6415
<b>Test Sponsor Alternate Contact</b>	Fujitsu Limited – <a href="http://www.fujitsu.com/services/computing/storage/">http://www.fujitsu.com/services/computing/storage/</a> Fujitsu America, Inc. Eugene Owens <a href="mailto:eownes@us.fujitsu.com">eownes@us.fujitsu.com</a> 1250 East Arques Ave PO Box 3470 Sunnyvale, CA 94088-3470 Phone: (408) 746-6415
<b>Test Sponsor Alternate Contact</b>	Fujitsu Limited – <a href="http://www.fujitsu.com/services/computing/storage/">http://www.fujitsu.com/services/computing/storage/</a> Yoshinori Terao <a href="mailto:terao.yoshinori@jp.fujitsu.com">terao.yoshinori@jp.fujitsu.com</a> 1-1 Kamikodanaka 4-chome, Nakahara-ku, Kawasaki-shi, Kanagawa-ken 211-8588, Japan Phone: (044) 754-3424 FAX: (044) 754-3719
<b>Auditor</b>	Storage Performance Council – <a href="http://www.storageperformance.org">http://www.storageperformance.org</a> Walter E. Baker – <a href="mailto:AuditService@StoragePerformance.org">AuditService@StoragePerformance.org</a> 643 Bair Island Road, Suite 103 Redwood City, CA 94063 Phone: (650) 556-9384 FAX: (650) 556-9385

### Revision Information and Key Dates

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<b>SPC-2 Specification revision number</b>	V1.5
<b>SPC-2 Workload Generator revision number</b>	V1.2
<b>Date Results were first used publicly</b>	May 5, 2016
<b>Date FDR was submitted to the SPC</b>	May 5, 2016
<b>Date the TSC will be available for shipment to customers</b>	currently available
<b>Date the TSC completed audit certification</b>	May 4, 2016

### Tested Storage Product (TSP) Description

The Fujitsu Storage ETERNUS DX8900 S3 systems are purpose-built for large enterprises and ideal for the data management of business-critical core applications and the consolidation of biggest data centers. The Quad Star Architecture with 2 to 24 controllers provides storage capacity with up to 4608 disk drives.

## 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
  - Currency Used
  - Target Country
- 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 on page 8.

**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.

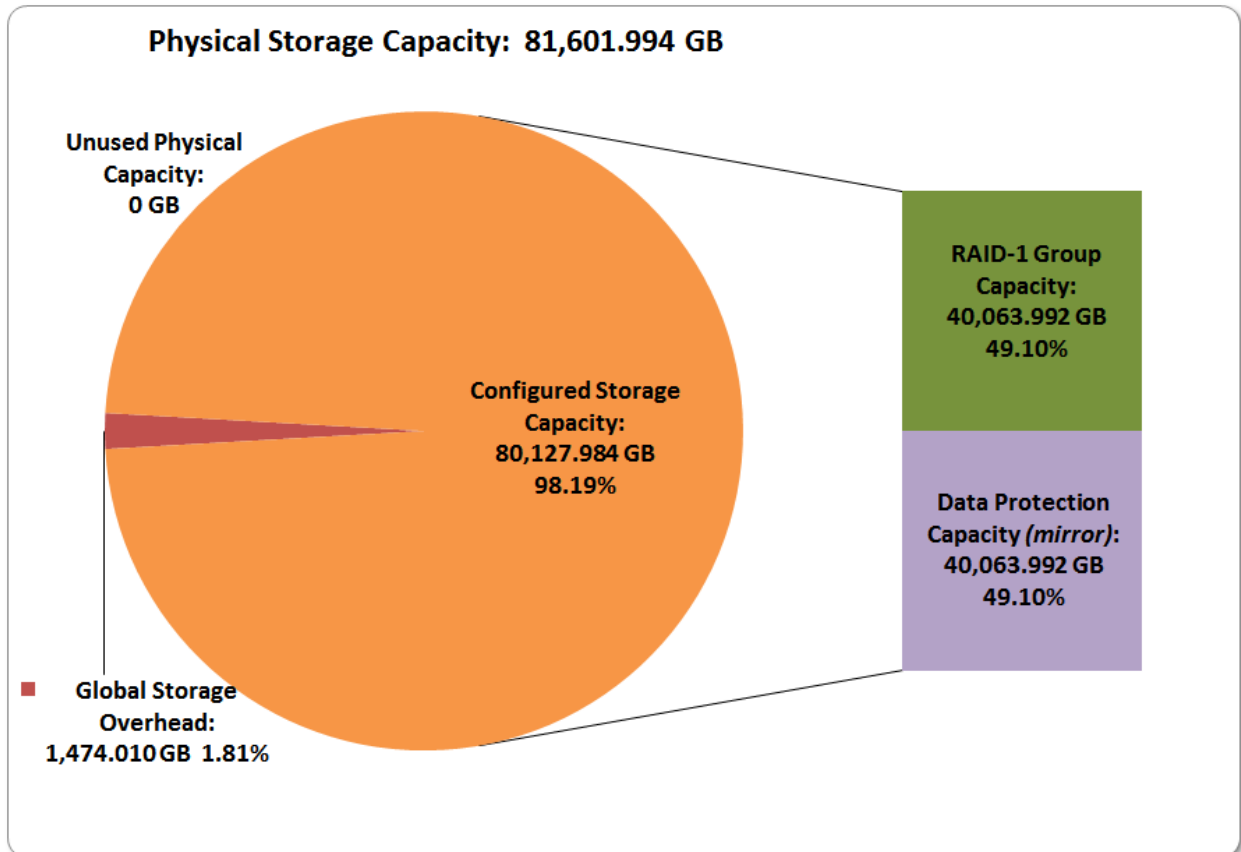
## SPC-2 Reported Data (continued)

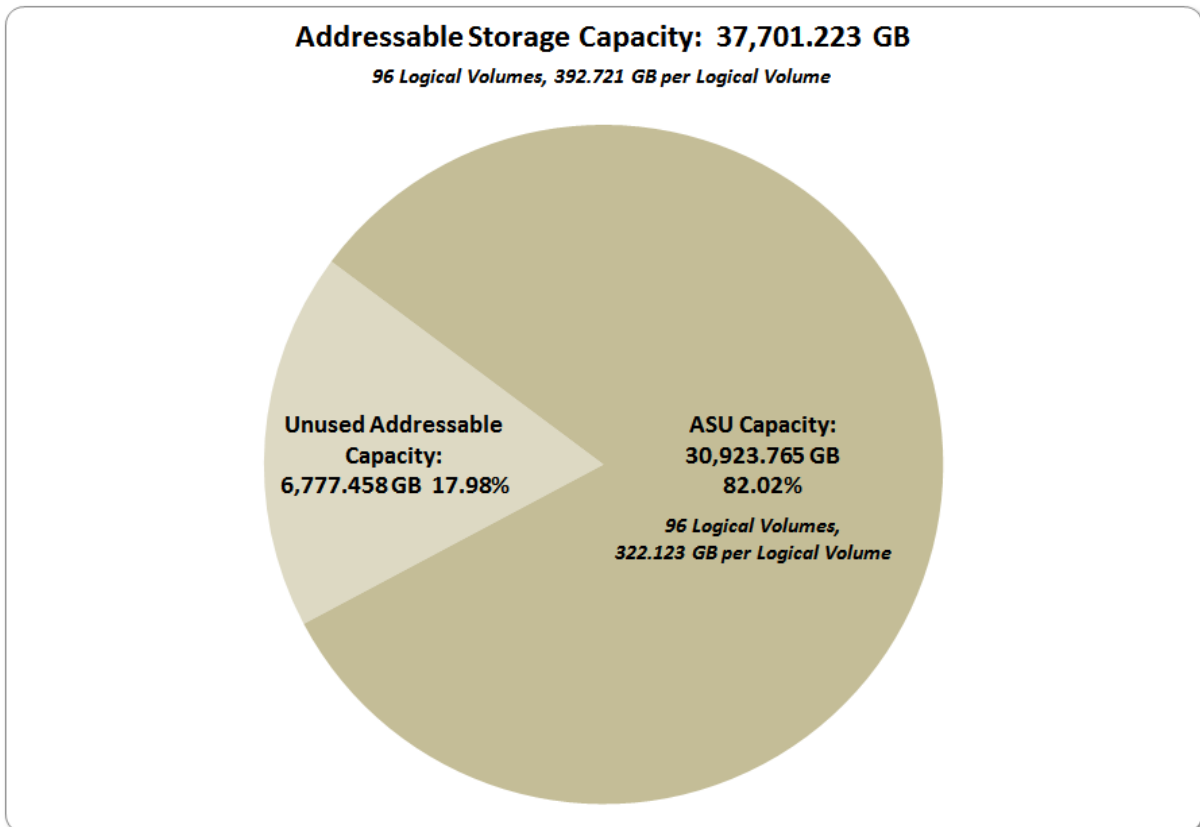
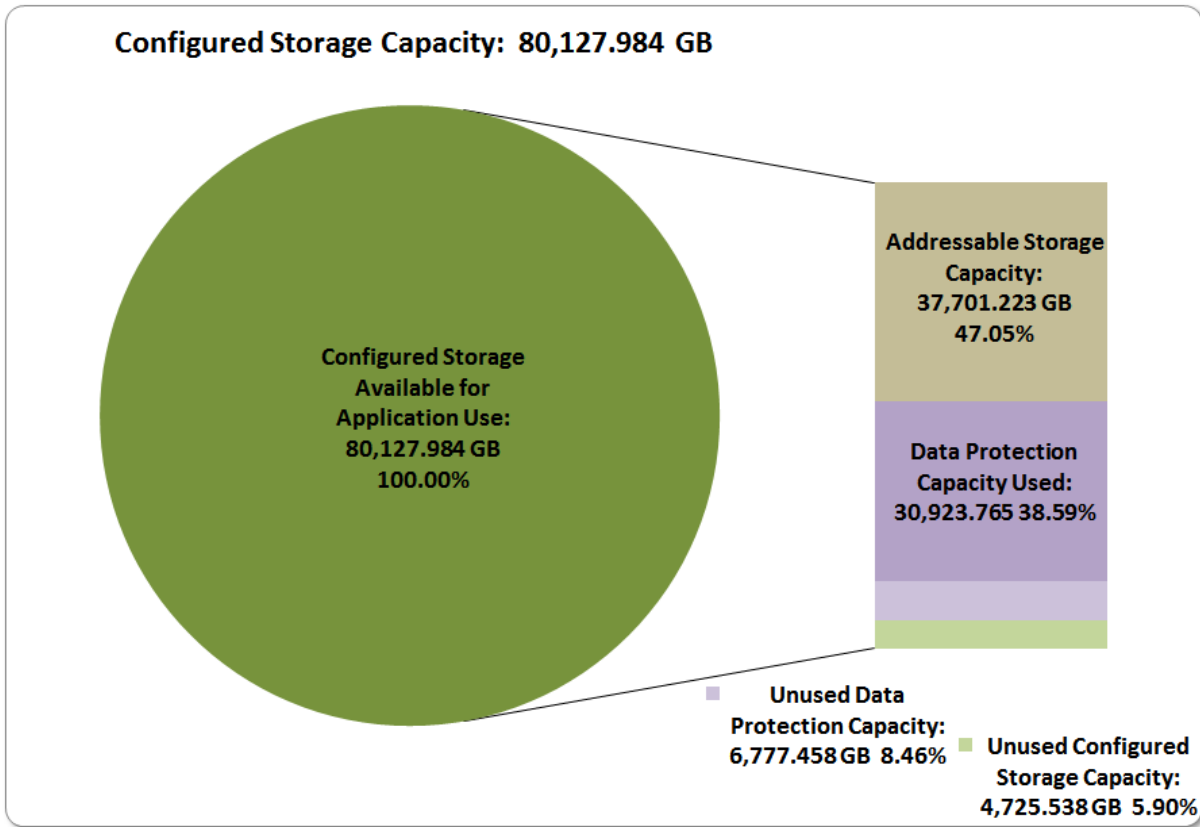
SPC-2 Reported Data				
Fujitsu ETERNUS DX8900 S3				
SPC-2 MBPS™	SPC-2 Price-Performance	ASU Capacity (GB)	Total Price	Data Protection Level
70,120.92	\$24.37	30,923.765	\$1,708,835.40	Protected 2 (mirroring)
The above SPC-2 MBPS™ value represents the aggregate data rate of all three SPC-2 workloads: Large File Processing (LFP), Large Database Query (LDQ), and Video On Demand (VOD)				
Currency Used:		"Target Country":		
U.S. dollars		USA		
SPC-2 Large File Processing (LFP) Reported Data				
	Data Rate (MB/second)	Number of Streams	Data Rate per Stream	Price-Performance
LFP Composite	52,589.36			\$32.49
Write Only:				
1024 KiB Transfer	26,749.00	192	139.32	
256 KiB Transfer	28,959.04	192	150.83	
Read-Write:				
1024 KiB Transfer	50,403.05	192	262.52	
256 KiB Transfer	50,207.67	192	261.50	
Read Only:				
1024 KiB Transfer	77,074.27	2,308	33.39	
256 KiB Transfer	82,143.15	3,840	21.39	
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	84,083.42			\$20.32
1024 KiB Transfer Size				
4 I/Os Outstanding	79,428.97	1,264	62.84	
1 I/O Outstanding	79,277.92	3,264	24.29	
64 KiB Transfer Size				
4 I/Os Outstanding	84,513.51	614	137.64	
1 I/O Outstanding	93,113.27	615	151.40	
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
	73,689.99	93,700	0.79	\$23.19

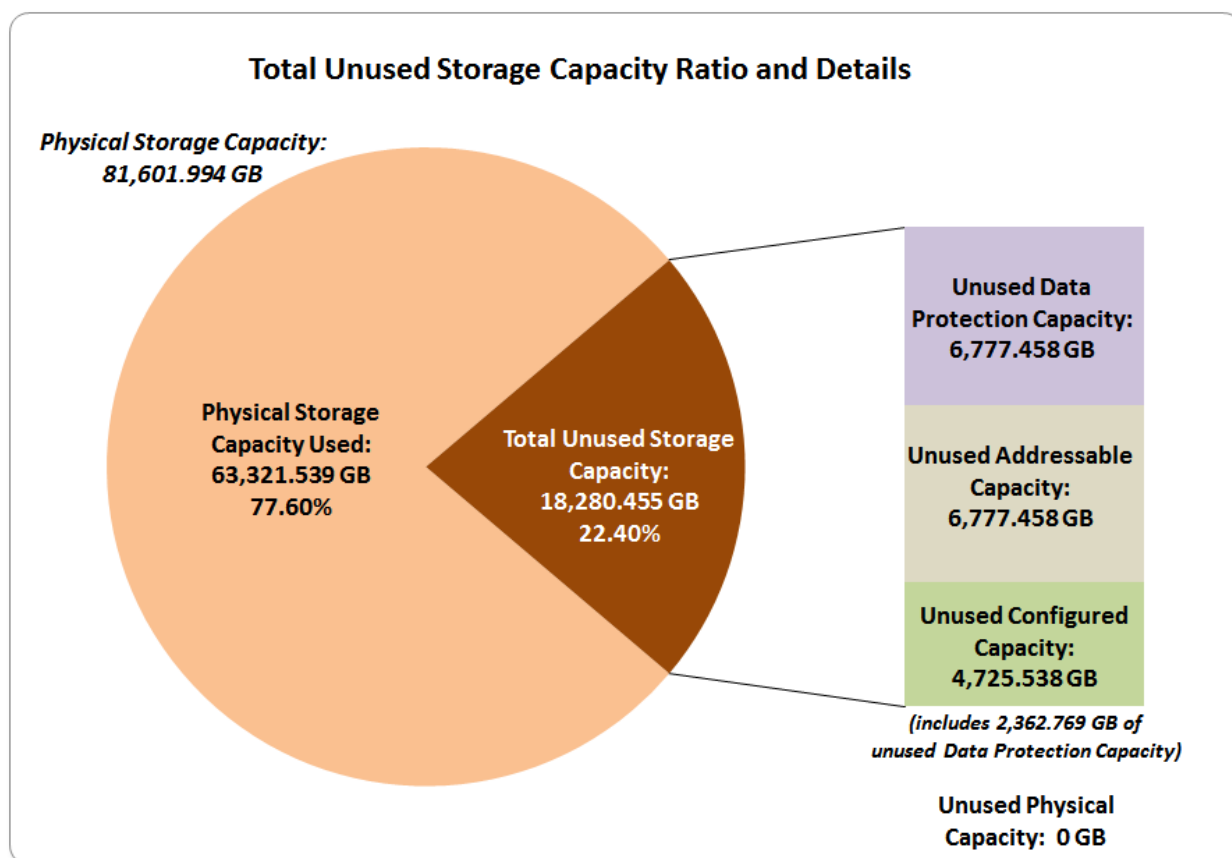
### Storage Capacities and Relationships

The following four charts 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.

The capacity values in each of the following four charts are listed as integer values, for readability, rather than the decimal values listed elsewhere in this document.







SPC-2 Storage Capacity Utilization	
Application Utilization	37.90%
Protected Application Utilization	75.79%
Unused Storage Ratio	22.40%

**Application Utilization:** ASU Capacity (30,923.765 GB) divided by Physical Storage Capacity (81,601.994 GB).

**Protected Application Utilization:** ASU Capacity (30,923.765 GB) plus total Data Protection Capacity (40,063.992 GB) minus unused Data Protection Capacity (6,777.458 GB) divided by Physical Storage Capacity (81,601.994 GB).

**Unused Storage Ratio:** Total Unused Capacity (18,280.455 GB) divided by Physical Storage Capacity (81,601.994 GB) and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 33-34 in the associated Full Disclosure Report.

## Priced Storage Configuration Pricing

Quantity	Part Number	Description	Unit List Price	Extended List Price
1	ET893SAU	ET DX8900 S3 BASE RM CONTR. X2	\$990,000.00	\$990,000.00
4	ETSMC12	DX87/8900S3 128G MEM.SET F.2CONTR.8X8DIM	\$50,000.00	\$200,000.00
1	ETSKA30	DX87/8900S3 EXT. CABLES F.FE 8X3M 4X3M	\$3,187.50	\$3,187.50
2	ETSKA50	DX87/8900S3 EXT. CABLES F.FE 8X3M 4X5M	\$3,437.50	\$6,875.00
16	ETSHFC4U	DX8X00 S3 INTERFCARD FC 4PORT 16G X1	\$16,600.00	\$265,600.00
1	ETEXP7S42UD-S3	DX8X00S3 EXP RACK SYM 700MM 42U ET-DOOR	\$99,999.99	\$99,999.99
1	ETBAS7S42UD-S3	DX8X00S3 BAS RACK SYM 700MM 42U ET-DOOR	\$99,999.99	\$99,999.99
13	S26361-F4530-E131	Dummy panel kit 1U plast.	\$17.00	\$221.00
17	S26361-F4530-E132	Dummy panel kit 2U plast.	\$23.00	\$391.00
4	S26361-F2262-E31	Socket strip 3phase 3x 8 sockets	\$210.00	\$840.00
3	ETSCAU	ET DX8900S3 CONTROLLERENCL. CONTR. X2	\$119,178.57	\$357,535.71
16	ETSEADU	ET DX8X00S3 DRIVEENCL. 2.5 X1	\$8,705.55	\$139,288.80
180	ETSSA4N	DX8X00S3 MLC SSD SAS 400GB 2.5 X1	\$9,638.89	\$1,735,000.20
12	ETSSA8N	DX8X00S3 MLC SSD SAS 800GB 2.5 X1	\$17,111.11	\$205,333.32
1	ET8900-W004360-AAF	Warranty, 36 Months, Enhanced Plus Level, 24x7 4hr Onsite	\$0.00	\$0.00
<b>Hardware &amp; Software Subtotal with 36 Manths Support</b>				<b>\$4,104,272.51</b>
1	ET8900-N067005-AAF	during normal business hours,Eternus Installation, One Time billing	\$6,300.00	\$6,300.00
20	FCDX-INPSR	RACK INSTALLATION ETERNUS DX/JX PRODUCTS	\$50.00	\$1,000.00
<b>Installation Subtotal</b>				<b>\$7,300.00</b>
64	61-343827-005	LC-LC 10 GIGABIT MULTIMODE OM3 LASER OPTIMIZED DUPLEX 50/125 FIBER PATCH CABLE RISER RATED AQUA - 5M	\$140.00	\$8,960.00
32	S26361-F4994-L502	PFC EP LPe16002	\$2,114.00	\$67,648.00
<b>Additional Hardware Subtotal</b>				<b>\$76,608.00</b>

Product Category	List Price	Discount	Discounted Price
Hardware & Software Subtotal	\$4,104,272.51	60%	\$1,641,709.00
Service Subtotal	\$7,300.00	20%	\$5,840.00
Additional Hardware Subtotal	\$76,608.00	20%	\$61,286.40
<b>Grand Total</b>	<b>\$4,188,180.51</b>		<b>\$1,708,835.40</b>

The following pricing includes the following:

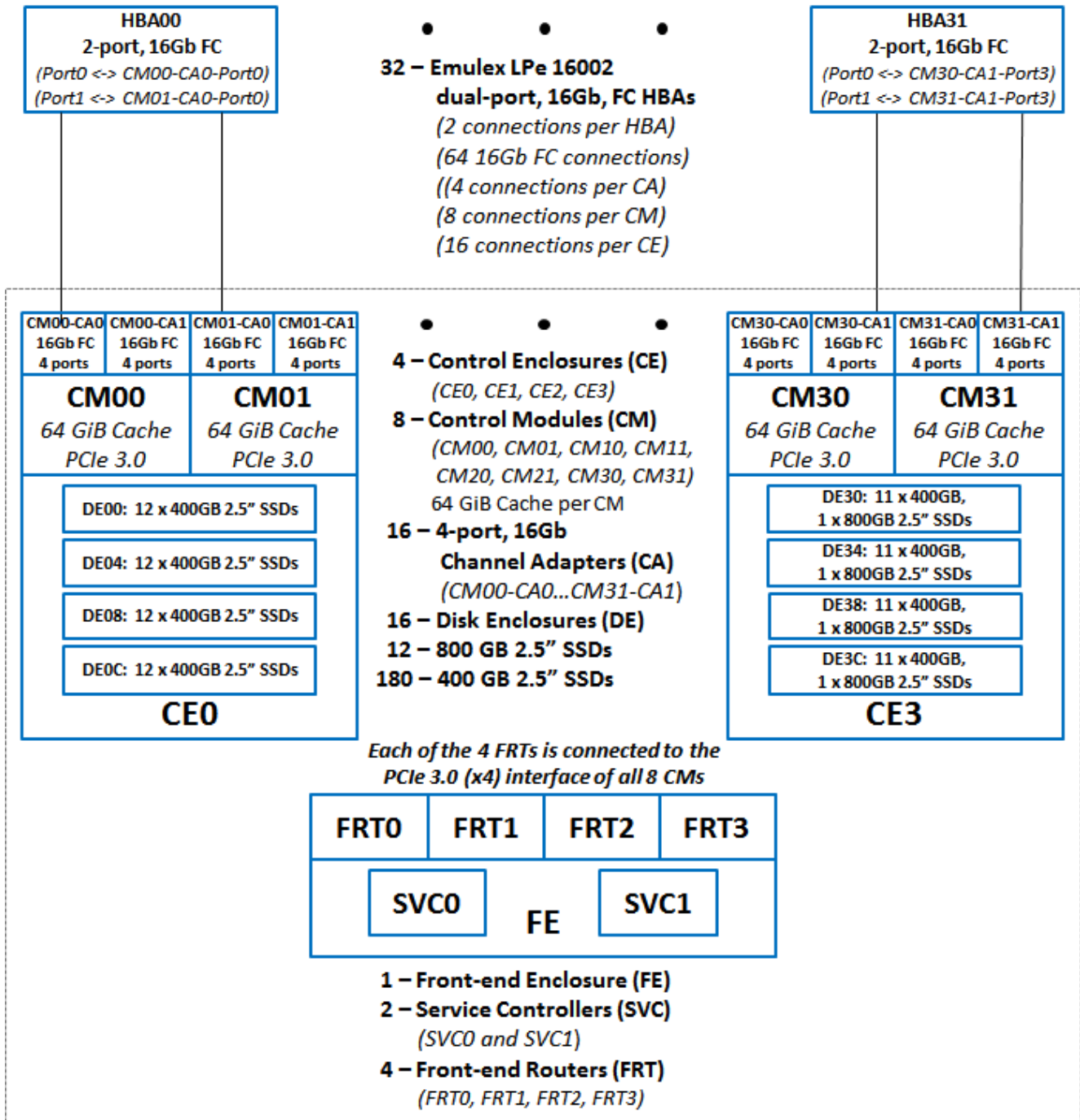
- Acknowledgement of new and existing hardware and/or software problems within four hours.
- Onsite presence of a qualified maintenance engineer or provision of a customer replaceable part within four hours of the above acknowledgement for any hardware failure that results in an inoperative Priced Storage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



### Fujitsu Storage Systems ETERNUS DX8900 S3 Storage Array

## Priced Storage Configuration Components

Priced Storage Configuration
32 – Emulex LPe 16002 dual-port 16 Gbps FC HBAs
<b>Fujitsu Storage Systems ETERNUS DX8900 S3</b> 1 – Front-end Enclosure (FE) which includes: 2 – Service Controllers (SVC) 4 – Front-end Routers (FRT) 4 – DX8900 S3 Control Enclosures each with 2 – Control Modules (CM), 8 CMs total each with 64 GiB cache (128 GiB total per CM, 1,024 GiB total) 2 – Channel Adapters (CA), 16 CAs total each with 4 – 16Gbps FC Host Ports (8 ports per CM total and used, 64 ports total and used) 4 – SAS Expander Drive Interfaces with QSFP 12 Gbps SAS-3 (1 – SAS-3 x4 link per interface) (4 links total and used per CM, 32 links total and used) 4 – DX 8X00 S3 Drive Enclosures (DE), 16 DEs total
192 – 2.5" SSDs (12 – 800 GB SSDs and 180 – 400 GB SSDs) (distribution of SSDs to DEs listed on page 26 of the associated Full Disclosure Report)
1 – 42U DX 8X00 S3 Base Rack
1 – 42U DX 8X00 S3 Expansion Rack
4 – 3 phase PDU/socket strip (3 x 8 sockets)

*The Front-end Enclosure (FE), Service Controller(SVC), Front-end Router FRT), Control Enclosure (CE), Control Modules and Channel Adapter (CA) relationships used in the Tested Storage Configuration are documented on page 27 of the Full Disclosure Report.*

*The HBA Port to Channel Adapter (CA) port connections are documented on page 28 of the Full Disclosure Report.*

*The Control Enclosure (CE) and Disk Enclosure (DE) relationships as well as the distribution of SSDs to Disk Enclosures are documented on page 26 of the Full Disclosure Report.*