SPC BENCHMARK 2™
EXECUTIVE SUMMARY

FUJITSU LIMITED
FUJITSU STORAGE SYSTEMS
ETERNUS DX200 S3 STORAGE ARRAY

SPC-2™ V1.5

Submitted for Review: February 26, 2015
Submission Identifier: B00071

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-2 Specification revision number	V1.5
SPC-2 Workload Generator revision number	V1.2
Date Results were first used publicly	February 26, 2015
Date FDR was submitted to the SPC	February 26, 2015
Date the TSC will be available for shipment to customers	currently available
Date the TSC completed audit certification	February 25, 2015

Tested Storage Product (TSP) Description

The scalable and unified Fujitsu Storage ETERNUS DX200 S3 delivers enterprise-class functionality to small and medium-sized companies and subsidiaries with an excellent price/performance ratio. It is the perfect solution when consolidating data for server virtualization, e-mail, databases and business applications as well as centralized file services. Simple, intuitive system management, highly flexible network connectivity and the option of field upgrades to higher system classes significantly reduce operational and migration costs. The ETERNUS DX family architecture lets customers benefit from software options, such as thin provisioning, automatic storage tiering and quality of service management even as early as the entry-level class. This all contributes to better business support.

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 on page 8.

Data Protection Level of **Protected 2** using ***RAID-5*** by distributing check data corresponding to user data across multiple disks in the form of bit-by-bit parity.

> ***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.

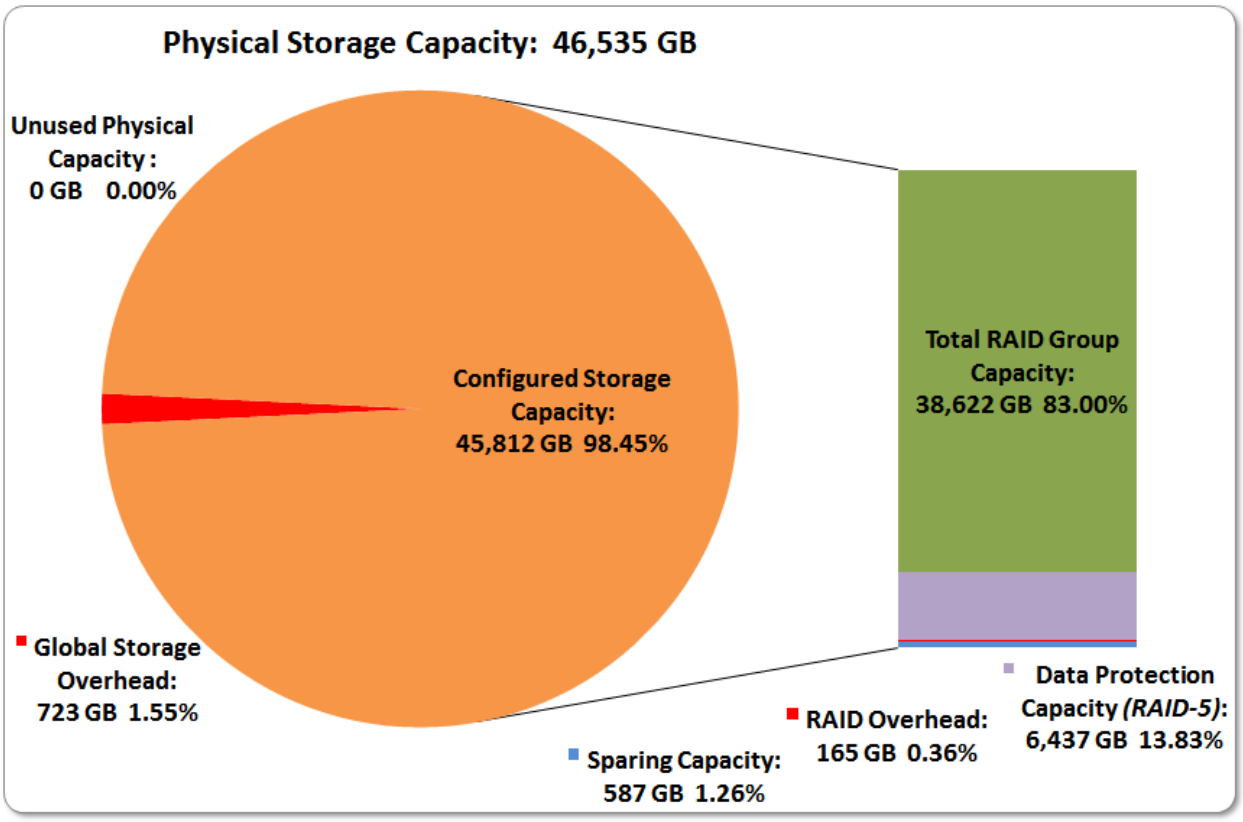
SPC-2 Reported Data *(continued)*

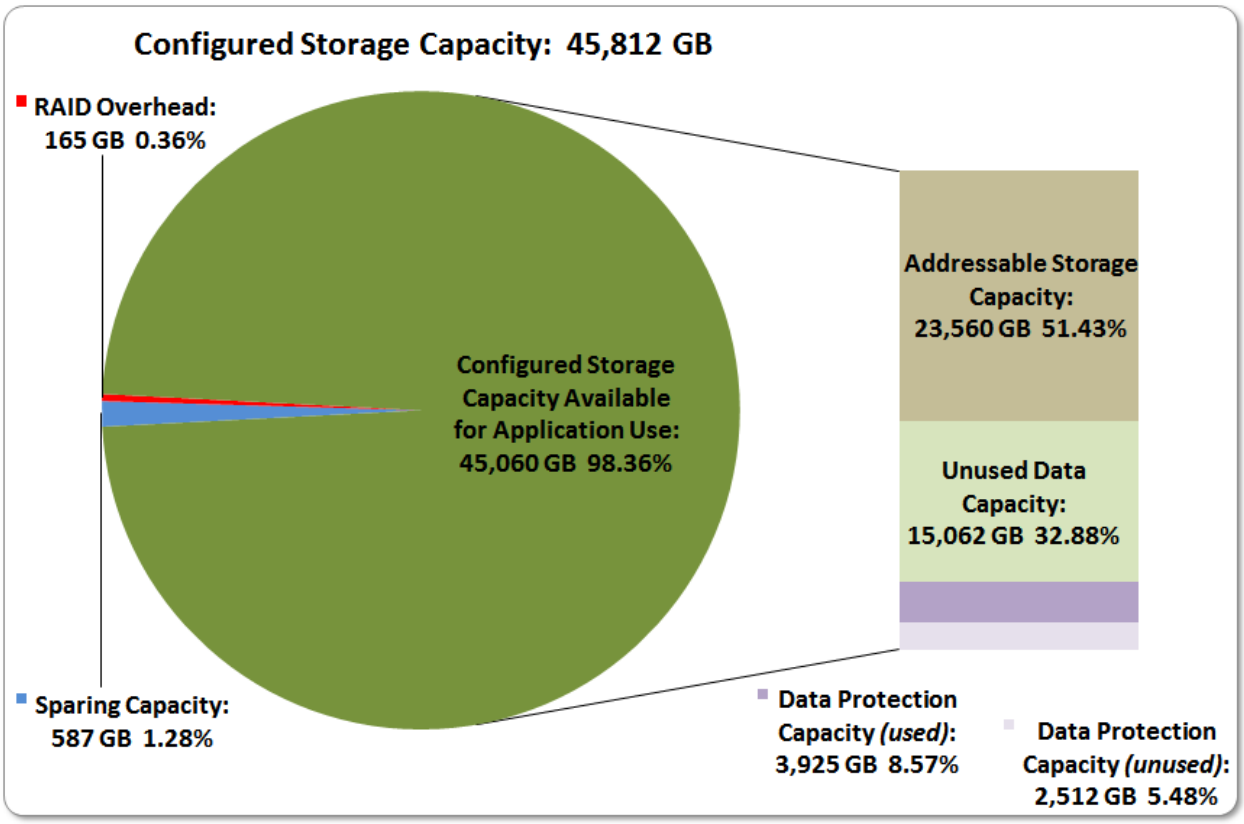
SPC-2 Reported Data				
Fujitsu Storage Systems ETERNUS DX200 S3				
SPC-2 MBPS™	**SPC-2 Price-Performance**	**ASU Capacity (GB)**	**Total Price**	**Data Protection Level**
6,266.50	$15.42	23,551.453	$96,644.30	Protected 2 *(RAID-5)*
The above SPC-2 MBPS™ value represents the aggregate data rate of all 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	5,435.82			$17.78
Write Only:				
1024 KiB Transfer	4,152.50	32	129.77	
256 KiB Transfer	4,209.63	128	32.89	
Read-Write:				
1024 KiB Transfer	5,261.03	64	82.20	
256 KiB Transfer	5,114.87	144	35.52	
Read Only:				
1024 KiB Transfer	6,951.44	32	217.23	
256 KiB Transfer	6,925.44	128	54.10	
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	6,757.68			$14.30
1024 KiB Transfer Size				
4 I/Os Outstanding	6,831.12	32	213.47	
1 I/O Outstanding	6,798.97	32	212.47	
64 KiB Transfer Size				
4 I/Os Outstanding	6,698.83	128	52.33	
1 I/O Outstanding	6,701.79	128	52.36	
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**
	6,606.00	8,400	0.79	$14.63

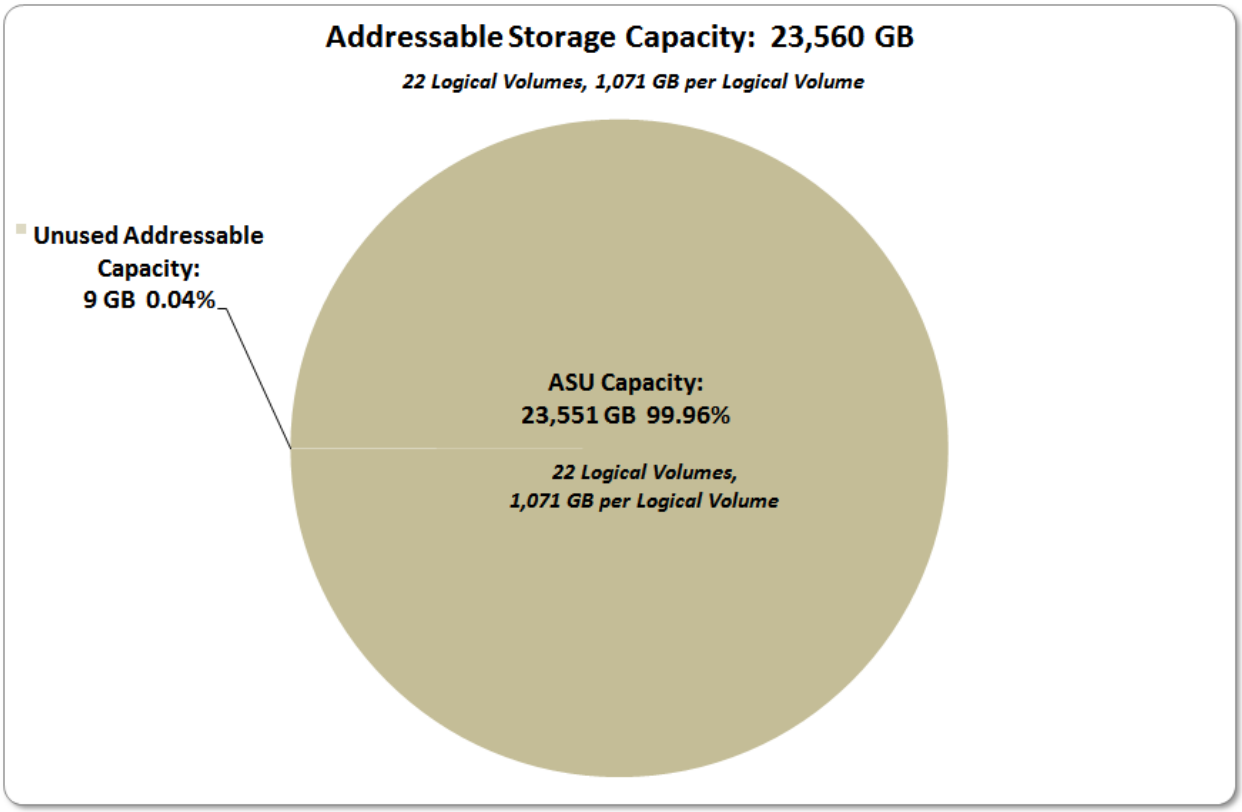
Storage Capacities and Relationships

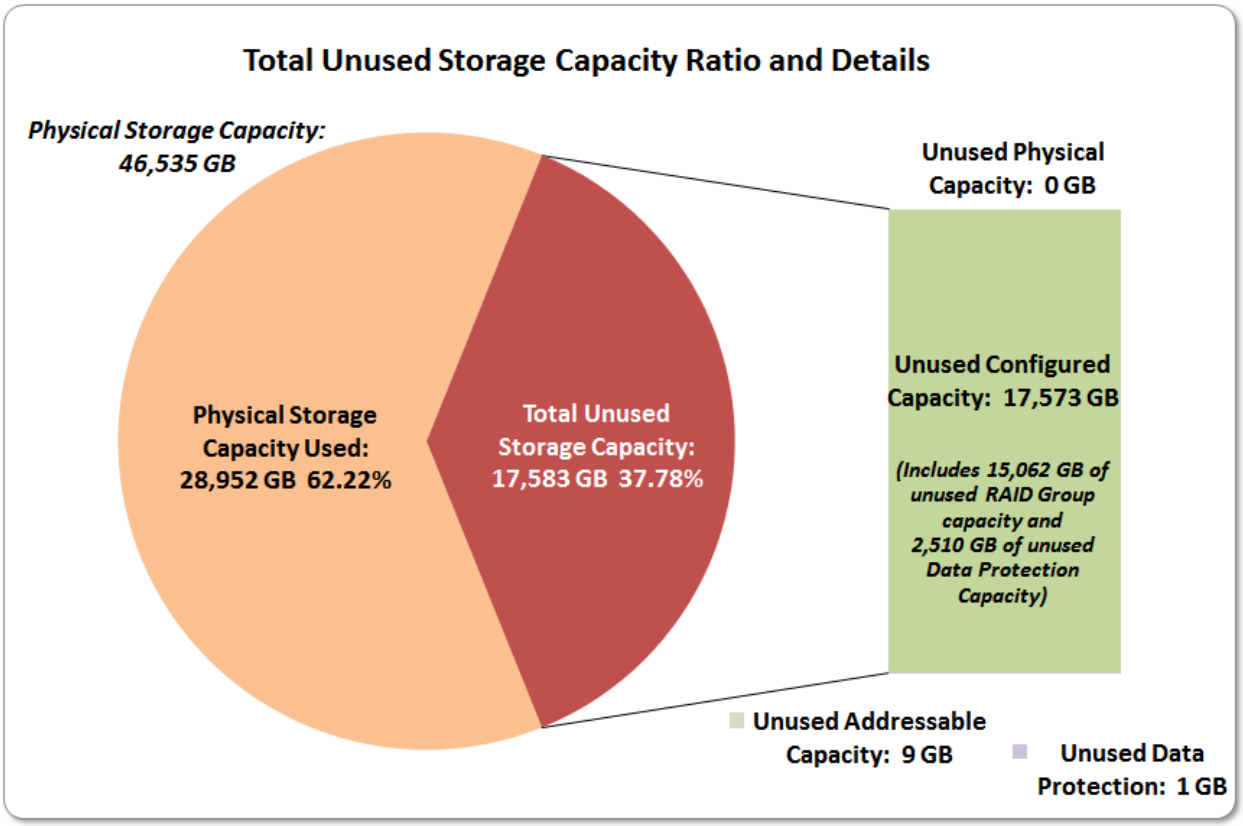
The following four charts and table document the various storage capacities, used in this benchmark, and their relationships, as well as the storage utilization values required to be reported.

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.




Configured Storage Capacity: 45,812 GB
RAID Overhead:
165 GB 0.36%
Configured Storage Capacity Available for Application Use:
45,060 GB 98.36%
Sparing Capacity:
587 GB 1.28%
Addressable Storage Capacity:
23,560 GB 51.43%
Unused Data Capacity:
15,062 GB 32.88%
Data Protection Capacity (used):
3,925 GB 8.57%
Data Protection Capacity (unused):
2,512 GB 5.48%


Addressable Storage Capacity: 23,560 GB
22 Logical Volumes, 1,071 GB per Logical Volume
Unused Addressable Capacity:
9 GB 0.04%
ASU Capacity:
23,551 GB 99.96%
22 Logical Volumes,
1,071 GB per Logical Volume



SPC-2 Storage Capacity Utilization	
Application Utilization	50.61%
Protected Application Utilization	59.05%
Unused Storage Ratio	37.78%

Application Utilization: Total ASU Capacity *(GB)* divided by Physical Storage Capacity *(GB)*.

Protected Application Utilization: Total ASU Capacity *(GB)* plus total Data Protection Capacity *(GB)* minus unused Data Protection Capacity *(GB)* divided by Physical Storage Capacity *(GB)*.

Unused Storage Ratio: Total Unused Capacity *(GB)* divided by Physical Storage Capacity *(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	Product Name	Qty	Unit List Price	Extended LP	Discount %	Discounted Price
ETERD200_ET203AU_182948	ETERNUS DX200 S3 Storage Array	1	$ 107,219.00	$107,219.00	30%	$75,053.30
ET203AU	DX200 S3 Base System Rackmount (AC200V, 2RU) (2.5" type)	1				
ETFEADU	Drive Enclosure - DX100/200 Rackmount (AC200V, 2RU) (2.5" HDD, Dual IOM type)	6				
ETFM42U	Cache Memory - DX200 S3 8GB per CM	2				
ETFCH2F	FC Host Interface, 2 ports DX200 S3 CM & CA#0 (4/8/16Gbps, Host/Remote Connect)	2				
ETFHH2	FC Host Interface, 2 ports - CA#1 (4/8/16Gbps, Host/Remote Connect)	2				
ETFDB3	Disk Drive 2.5" 300GB/10krpm 1x	156				
ETFKM25-L	MiniSAS HD Cable 2.5m	1				
ETFKC05U	AC Power Cords (125V - IEC320-C14, 0.5m)	2				
ETFKC10U	AC Power Cords (125V - IEC320-C14, 1.0m)	3				
ETFKC15U	AC Power Cords (125V - IEC320-C14, 1.5m)	2				
ETFP16U-L	Power Distribution Unit (AC200-240V, 2U, 16 outlets)	1	$1,370.00	$1,370.00	30%	$959.00
LPe16002	Emulex 16Gbps Dual Port Fibre Channel Host Bus Adapter	4	$2,135.00	$8,540.00	20%	$6,832.00
61-343827-003	Fibre Channel Host IF Cable LC/LC - 3m	8	$132.00	$1,056.00	30%	$739.20
	(Provide 24 hour per day / 7days per week 4 hour response maintenance for 36 months)					
ETD200-W025360-AUH	Warranty Service, 36 months Standard, 9x5 phone, NBD response	1	$0.00	$0.00		$0.00
ETD200-U004361-AUH	Warranty Uplift, 36 months Enhanced plus, 24x7 4hr Onsight	1	$16,326.00	$16,326.00	20%	$13,060.80
	SFPs are included.			**Total:**		**$96,644.30**

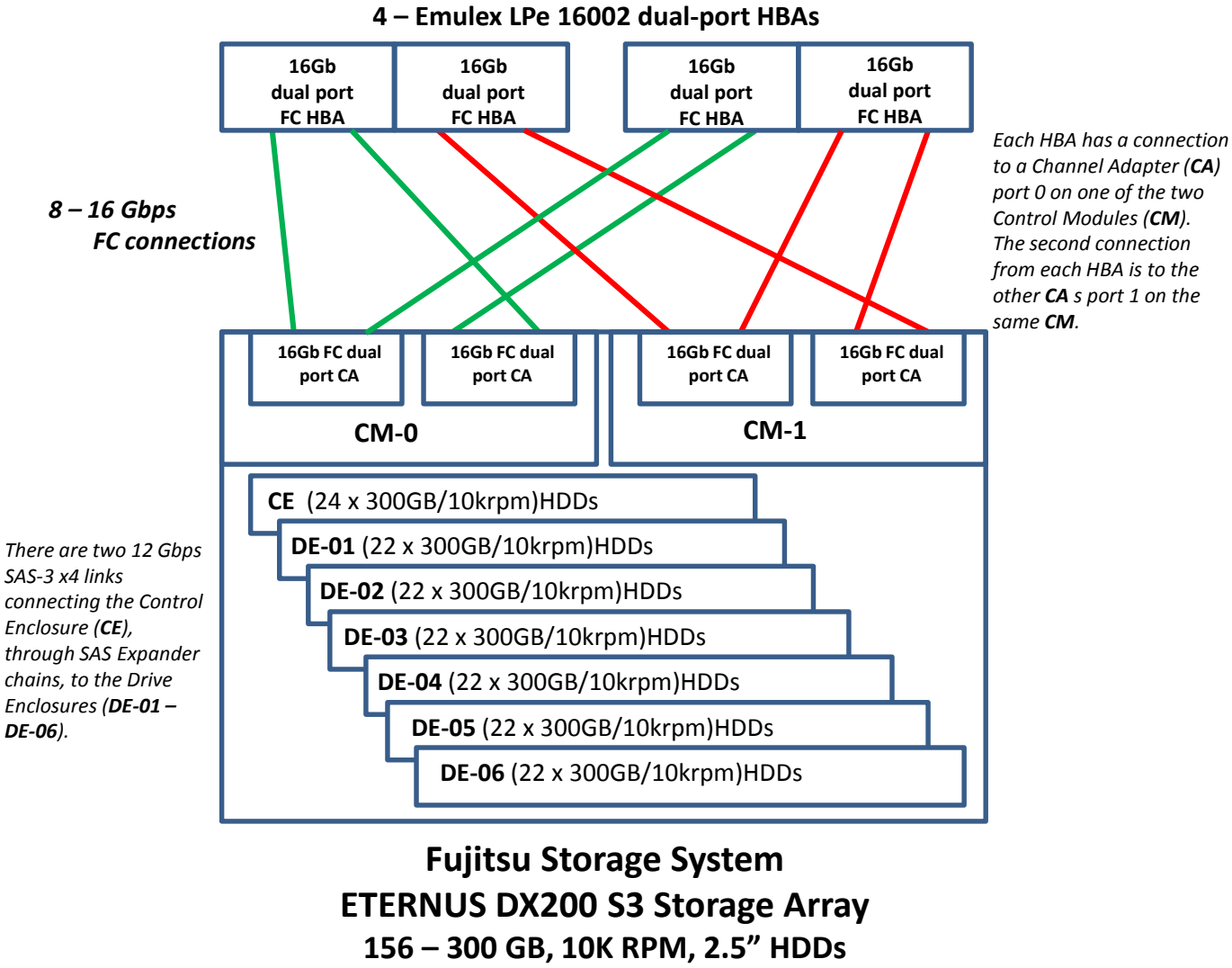
The following pricing includes the following:

- 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 TSC and the Priced Storage Configuration.

Priced Storage Configuration Diagram *(front view)*



Fujitsu Storage System
ETERNUS DX200 S3 Storage Array
156 – 300 GB, 10K RPM, 2.5" HDDs

Priced Storage Configuration Components

Priced Storage Configuration
4 – Emulex LPe 16002 dual-port 16 Gbps FC HBAs
Fujitsu Storage Systems ETERNUS Dx200 S3 Storage Array*Error! Unknown document property name.* 1 – DX200 S3 Control Enclosure with 2 – Control Modules (CM) each with 8 GB cache *(16 GB total)* 2 – Channel Adapters (CA) each with 2 16Gbps FC Host Ports *(4 ports per CA, 8 ports total, 8 ports used)* 1 – SAS Expander Drive Interface with QSFP 12 Gbps SAS-3 *(1 – SAS-3 x4 link per interface, 2 links total, 2 links used)* 24 – 300 GB, 10K RPM, 2.5” HDDs
6 – DX100/200 Drive Enclosures (DE)
156 – 300 GB 10K RPM, 2.5”, HDDS *(24 HDDs in the Control Enclosure, 22 HDDs in each Drive Enclosure)*
1 – Power Distribution Unit *(AC200-240V, 2U, 16 outlets)*