SPC BENCHMARK 2™
EXECUTIVE SUMMARY

INFORTREND TECHNOLOGY, INC.
INFORTREND EONSTOR DS 4024B

SPC-2™ V1.5

Submitted for Review: February 10, 2017
Submission Identifier: B00080

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

Test Sponsor and Contact Information	
Test Sponsor Primary Contact	Infortrend Technology, Inc. – http://www.infortrend.com Jeff Lin – Jeff.Lin@infortrend.com 8F, No. 102, Sec. 3, Jhongshan Rd. Jhonge District , New Taipei City 23544, Taiwan Phone: +866 (2) 2226 0126 x7082
Test Sponsor Alternate Contact	Infortrend Technology, Inc. – http://www.infortrend.com Kevin Ko – kevinHW.ko@infortrend.com 8F, No. 102, Sec. 3, Jhongshan Rd. Jhonge District , New Taipei City 23544, Taiwan Phone: +866 (2) 2226 0126 x8086
Auditor	Gradient Systems, Inc, Walter E. Baker – web@GradientSystems.com 643 Bair Island Road, Suite 211 Redwood City, CA 94063 Phone: (650) 556-9380 FAX: (650) 257-7511

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 10, 2017
Date FDR was submitted to the SPC	February 10, 2017
Date the TSC will be available for shipment to customers	currently available
Date the TSC completed audit certification	February 7, 2017

Tested Storage Product (TSP) Description

EonStor DS 4000 systems deliver top-notch performance in their segment, bringing unrivaled power to SMBs. With their unique dual host board design and 12Gb/s SAS interfaces to internal SAS or SATA disk drives, these systems achieve a massive throughput to meet even highly demanding applications such as media editing. They are also extremely scalable and integrate advanced data services such as SSD Cache, automated storage tiering, and self-encrypting 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 *RAID-6*, which provides double-parity RAID protection against data loss

> **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.
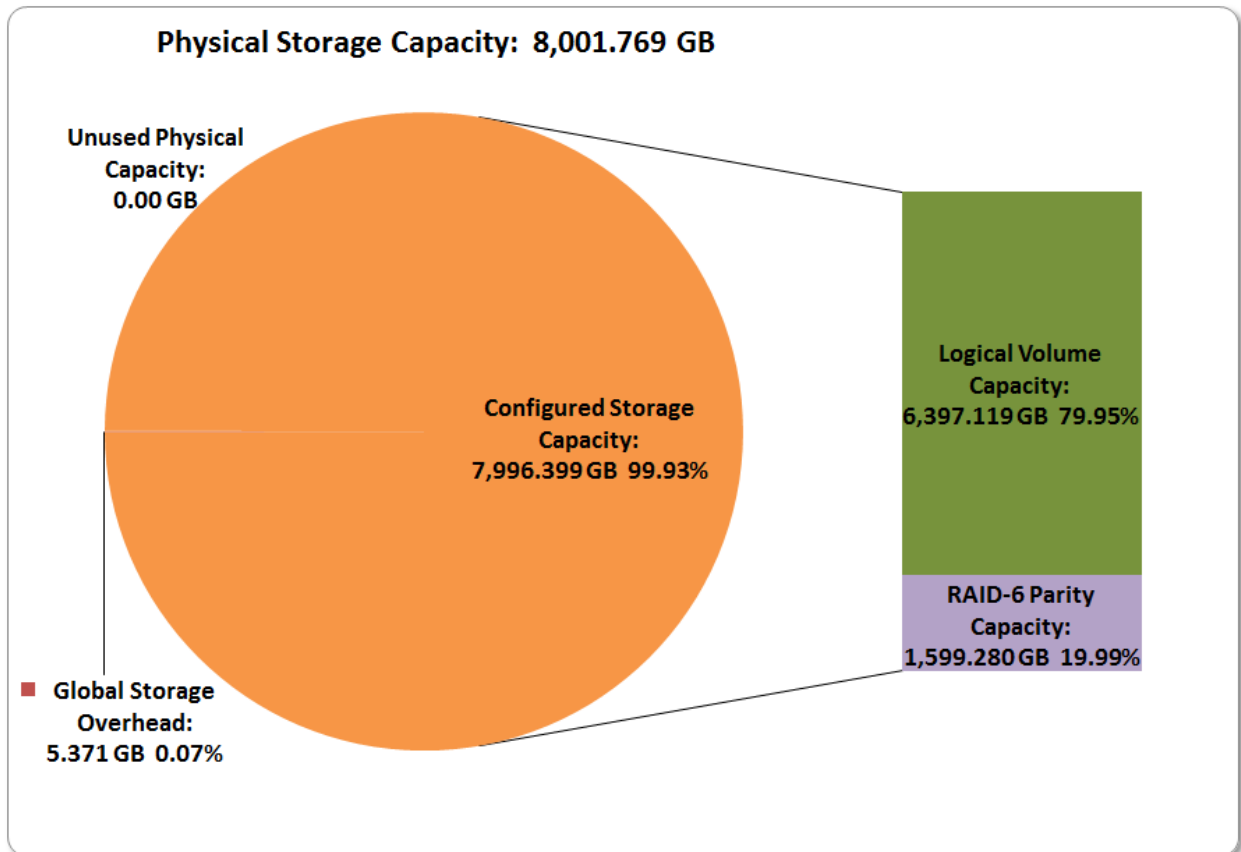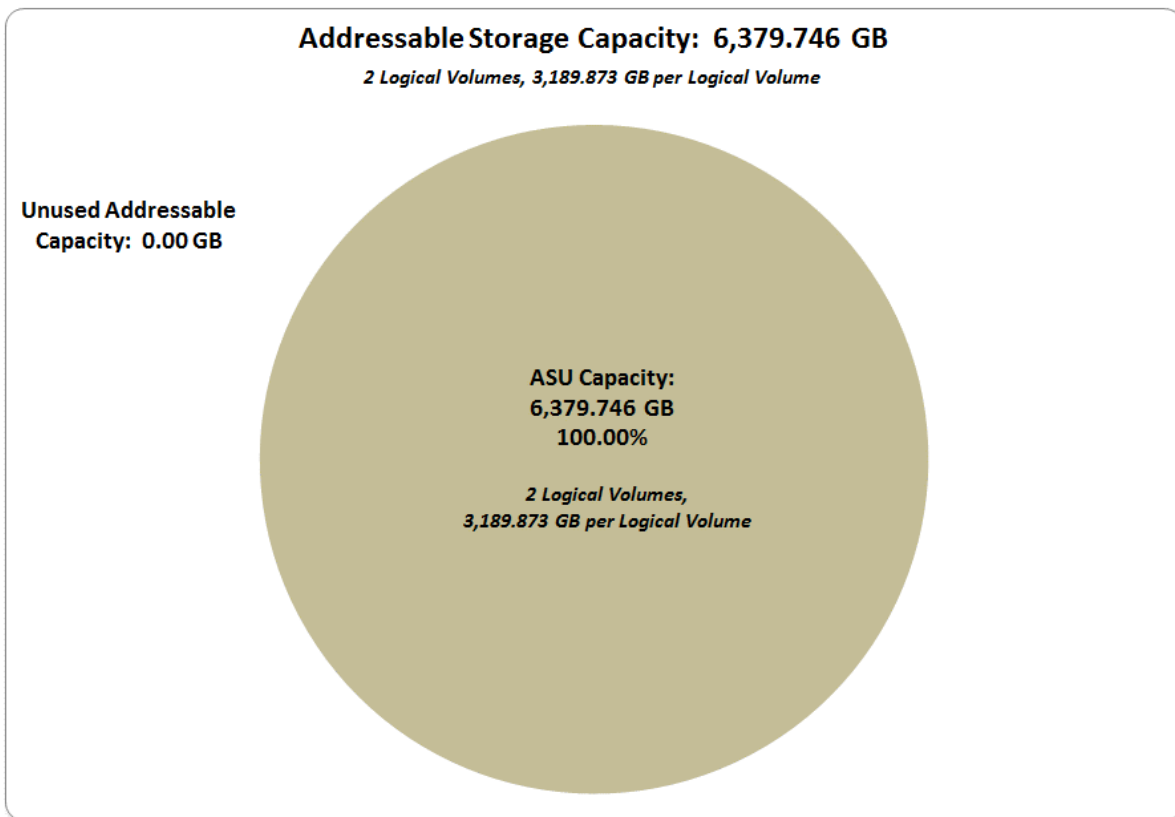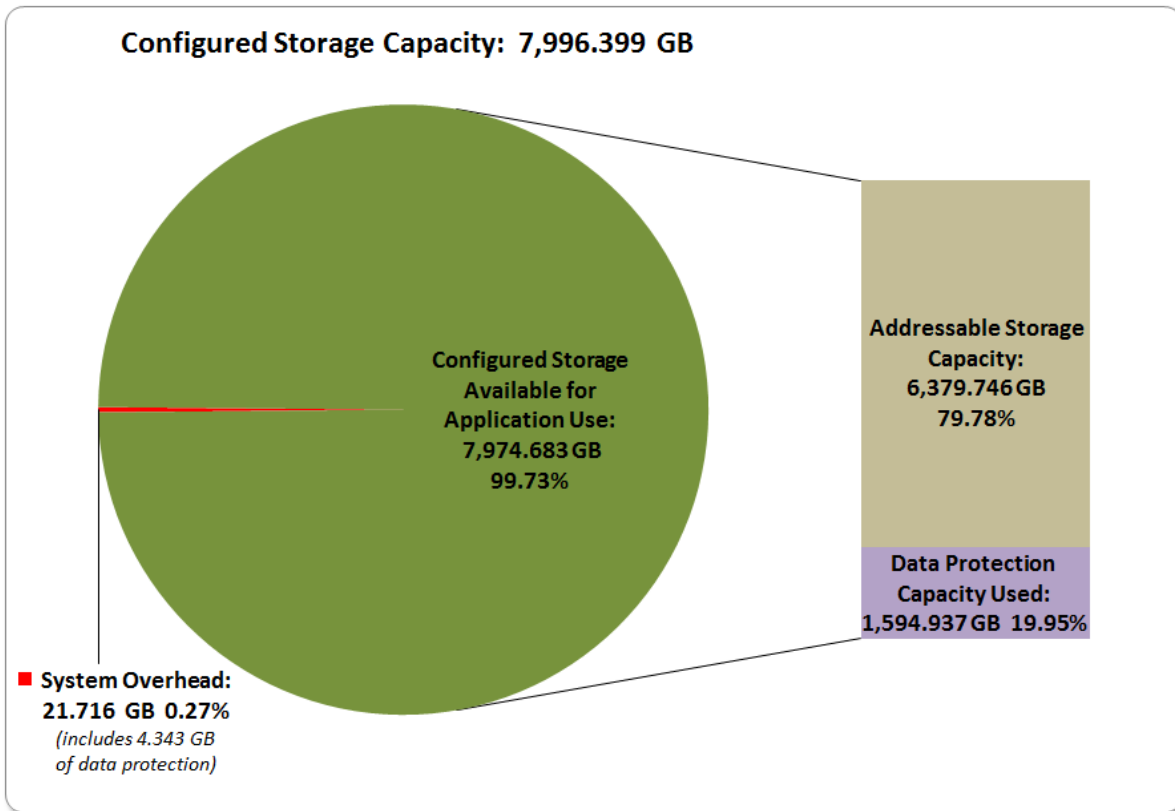
SPC-2 Reported Data *(continued)*

SPC-2 Reported Data				
Infortrend EonStor DS4024 *(16 Gb FC)*				
SPC-2 MBPS™	**SPC-2 Price-Performance**	**ASU Capacity (GB)**	**Total Price**	**Data Protection Level**
10,030.77	$6.80	6,379.746	$68,216.40	Protected 2 *(RAID-6)*
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	9,325.44			$7.32
Write Only:				
1024 KiB Transfer	7,021.76	96	73.14	
256 KiB Transfer	6,717.23	96	69.97	
Read-Write:				
1024 KiB Transfer	10,467.38	96	109.04	
256 KiB Transfer	10,558.37	96	109.98	
Read Only:				
1024 KiB Transfer	10,600.33	96	110.42	
256 KiB Transfer	10,587.57	96	110.29	
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	10,543.26			$6.47
1024 KiB Transfer Size				
4 I/Os Outstanding	10,658.07	96	111.02	
1 I/O Outstanding	10,658.35	96	111.02	
64 KiB Transfer Size				
4 I/Os Outstanding	10,430.83	96	108.65	
1 I/O Outstanding	10,425.79	96	108.60	
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**
	10,223.60	13,000	0.79	$6.67

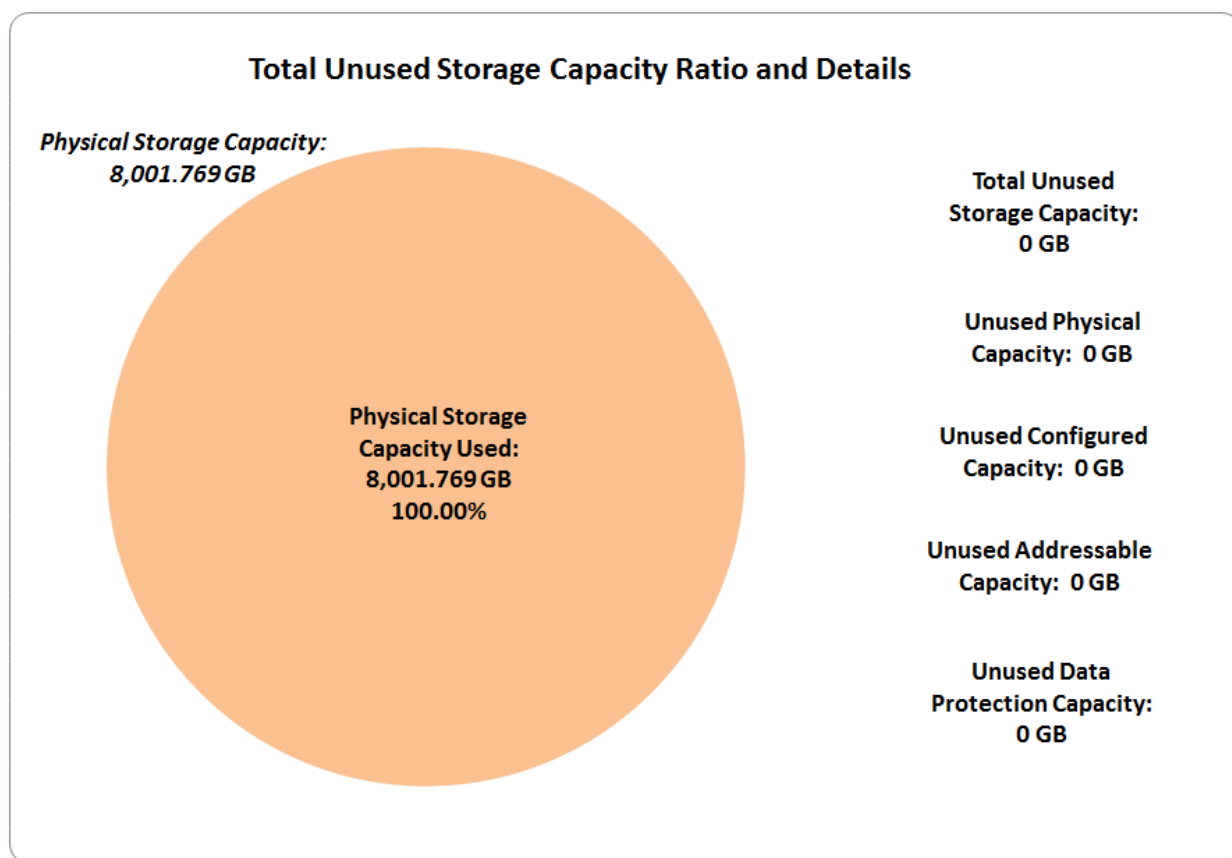Storage Capacities and Relationships

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: 7,996.399 GB

Configured Storage
Available for
Application Use:
7,974.683 GB
99.73%

Addressable Storage
Capacity:
6,379.746 GB
79.78%

Data Protection
Capacity Used:
1,594.937 GB 19.95%

■ **System Overhead:**
21.716 GB 0.27%
*(includes 4.343 GB
of data protection)*

Addressable Storage Capacity: 6,379.746 GB
2 Logical Volumes, 3,189.873 GB per Logical Volume

**Unused Addressable
Capacity: 0.00 GB**

ASU Capacity:
6,379.746 GB
100.00%

*2 Logical Volumes,
3,189.873 GB per Logical Volume*

Total Unused Storage Capacity Ratio and Details

Physical Storage Capacity:
8,001.769 GB

Physical Storage
Capacity Used:
8,001.769 GB
100.00%

Total Unused Storage Capacity: 0 GB

Unused Physical Capacity: 0 GB

Unused Configured Capacity: 0 GB

Unused Addressable Capacity: 0 GB

Unused Data Protection Capacity: 0 GB

SPC-2 Storage Capacity Utilization	
Application Utilization	79.73%
Protected Application Utilization	99.72%
Unused Storage Ratio	0.00%

Application Utilization: ASU Capacity *(6,379.746 GB)* divided by Physical Storage Capacity *(8,001.769 GB)*.

Protected Application Utilization: ASU Capacity *(6,379.746 GB)* plus total Data Protection Capacity *(1,599.280 GB)* minus unused Data Protection Capacity *(0.000 GB)* divided by Physical Storage Capacity *(8,001.769 GB)*.

Unused Storage Ratio: Total Unused Capacity *(0.000 GB)* divided by Physical Storage Capacity *(8,001.769 GB)* and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 23-24 in the associated Full Disclosure Report.

Priced Storage Configuration Pricing

P/N	Description	Quantity	MSRP	Extended Price
DS4024RUCB	EonStor DS 4000 2U/24bay, high IOPS, dual redundant controller subsystem including 4x12Gb/s SAS EXP. ports, 4x1G iSCSI ports +4x host board slot(s), 4x8GB, 2x(PSU+FAN Module), 2x(SuperCap.+Flash module), 24xHDD trays and 1xRackmount kit	1	13,200.00	13,200.00
RFE16G1HIO4-0010	EonStor Converged host board	4	1,260.00	5,040.00
HESTSSS3040-00301	Toshiba Enterprise 2.5" SAS 12Gb/s MLC SSD, 400GB	20	1,445.00	28,900.00
US-PSPHD-3Y304	3 Years PSP 4 - 24/7 Help Desk & Engineer Onsite Services within 4 hours. Parts are prepared by customer (HDDs included)	1	3,354.00	3,354.00
9270CFCCAB06-0010	Optical FC cable, LC-LC, MM-50/125, Duplex, LSZH, O.D.=1.8mm*2, 10 Meters	8	54.00	432.00
9370CSFP16G-0010	16Gb/s Fibre Channel SFP optical transceiver, LC, wave-length 850nm, multi-mode	16	238.00	3,808.00
DDR4RECMF-0010	16GB DDR-IV DIM module for ESDS G7i, ESDS 3000/1000/2000 and ESVA x75 subsystems	8	270.00	2,160.00
BH1EMF311-0010	HBA card, LPe16002B, FC-16G, Dual ports, 1 in 1 package	4	1,921.00	7,684.00
	EonStor DS 4024B spare kit including 1 x RAID Controller w/2,1x16GB DDR-III, 1 x EonStor Converged host board , 1 xToshiba Enterprise 2.5" SAS 12Gb/s MLC SSD 400GB, 1 x PSU, 1 x 16Gb/s Fibre Channel SFP, 1 x Optical FC cable	1	11,218.00	11,218.00
	Totals			75,796.00

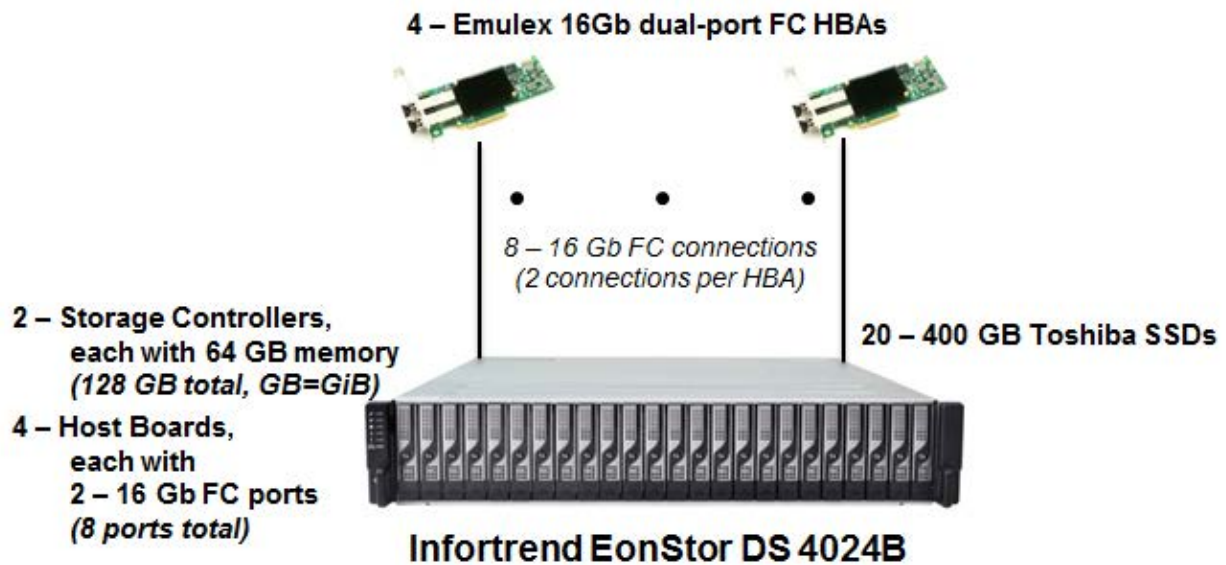| Description	Extended Price	Discount	Discounted Price
Totals	75,796.00	10%	68,216.40

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

4 – Emulex 16Gb dual-port FC HBAs

8 – 16 Gb FC connections
(2 connections per HBA)

2 – Storage Controllers,
each with 64 GB memory
(128 GB total, GB=GiB)

4 – Host Boards,
each with
2 – 16 Gb FC ports
(8 ports total)

20 – 400 GB Toshiba SSDs

Infortrend EonStor DS 4024B

Priced Storage Configuration Components

Priced Storage Configuration
SANWatch 3.0.h.66
4 – Emulex LPe 16002 dual-port 16 Gbps FC HBAs
Infortrend EonStor DS 4024B

1 – EonStor DS4000 2U/24bay, dual redundant controller subsystem which includes:
    128 GiB memory *(64 GiB per controller)*
      4 – EonStor Converged Host Boards
        (2 – 16 Gb FC ports per board, 8 total and used)
      4 – 12 Gb/s SAS EXP ports
      20 – 400 GB Toshiba Enterprise 2.5" SAS 12 Gb/s MLC SSDs