SPC Benchmark 1™
Executive Summary

Infortrend Technology, Inc.
Infortrend EonStor DS2024B

SPC-1 V1.14

Submitted for Review: August 25, 2015
Submission Identifier: A00160

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 0020 x7082
Test Sponsor Alternate Contact	Infortrend Technology, Inc. – http://www.infortrend.com Albert Yen – albert.yen@infortrend.com 8F, No. 102, Sec. 3, Jhongshan Rd. Jhonge District , New Taipei City 23544, Taiwan Phone: +866 (2) 2226 0020 x8020
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	V1.14
SPC-1 Workload Generator revision number	V2.3.0
Date Results were first used publicly	August 25, 2015
Date the FDR was submitted to the SPC	August 25, 2015
Date the Priced Storage Configuration is available for shipment to customers	July 13, 2015
Date the TSC completed audit certification	August 24, 2015

Tested Storage Product (TSP) Description

EonStor DS 2024B is a small form factor (SFF) and high density 2U 24-bay storage designed for 2.5" drives and all-SSD arrays. The EonStor DS 2024B is well suited for SMB and enterprise SAN/IP SAN/DAS applications while providing excellent price-performance. Additional details about the EonStor DS 2024B are available at http://www.infortrend.com/global/products/families/ESDS/2000.

Summary of Results

SPC-1 Reported Data	
Tested Storage Product (TSP) Name: Infortrend EonStor DS2024B	
Metric	**Reported Result**
SPC-1 IOPS™	95,995.33
SPC-1 Price-Performance™	$0.43/SPC-1 IOPS™
Total ASU Capacity	1,338.200 GB
Data Protection Level	Protected 2 *(mirroring)*
Total Price	$41,167.00
Currency Used	U.S. Dollars
Target Country for availability, sales and support	USA

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

SPC-1 Price-Performance™ is the ratio of **Total Price** to **SPC-1 IOPS™**.

Total ASU (Application Storage Unit) **Capacity** represents the total storage capacity available to be read and written in the course of executing the SPC-1 benchmark.

A **Data Protection Level** of **Protected 2** using *Mirroring* configures two or more identical copies of user data..

> **Protected 2:** *The single point of failure of any **storage device** in the configuration will not result in permanent loss of access to or integrity of the SPC-1 Data Repository.*
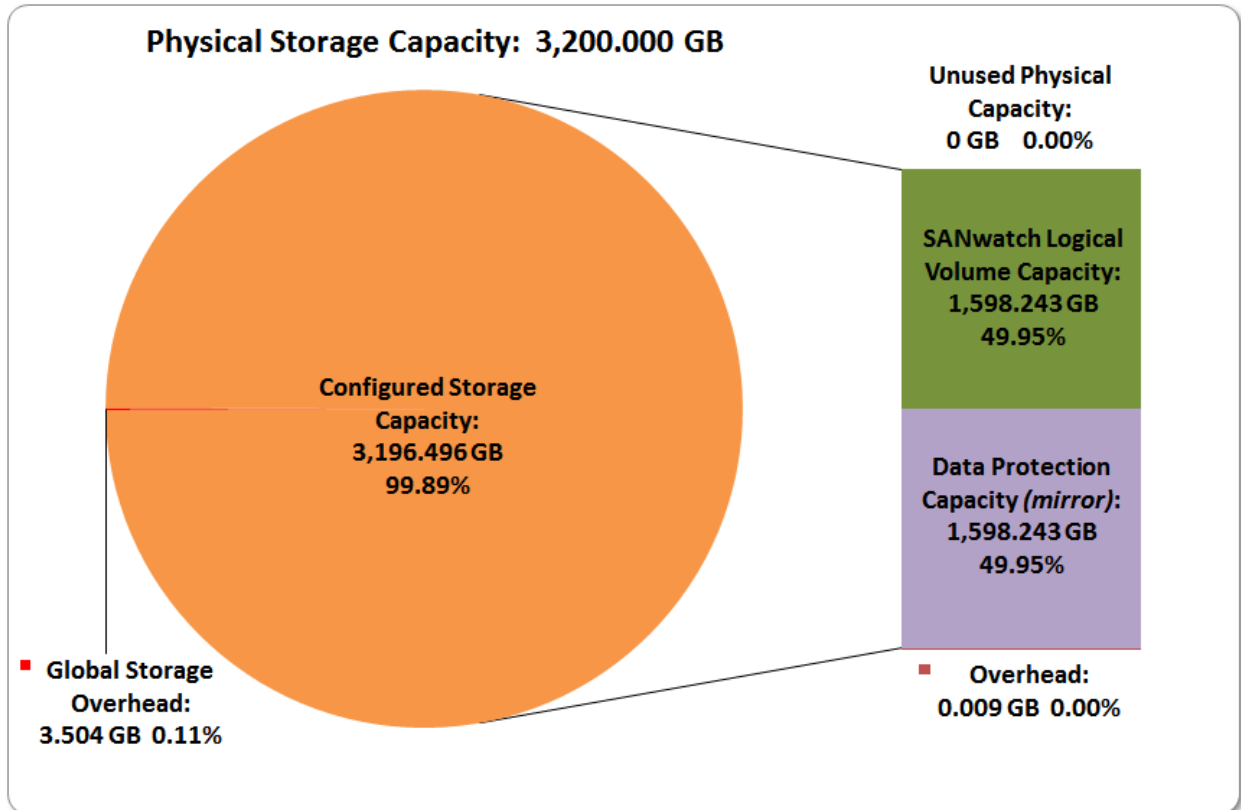
Total Price includes the cost of the Priced Storage Configuration plus three years of hardware maintenance and software support as detailed on page 8.
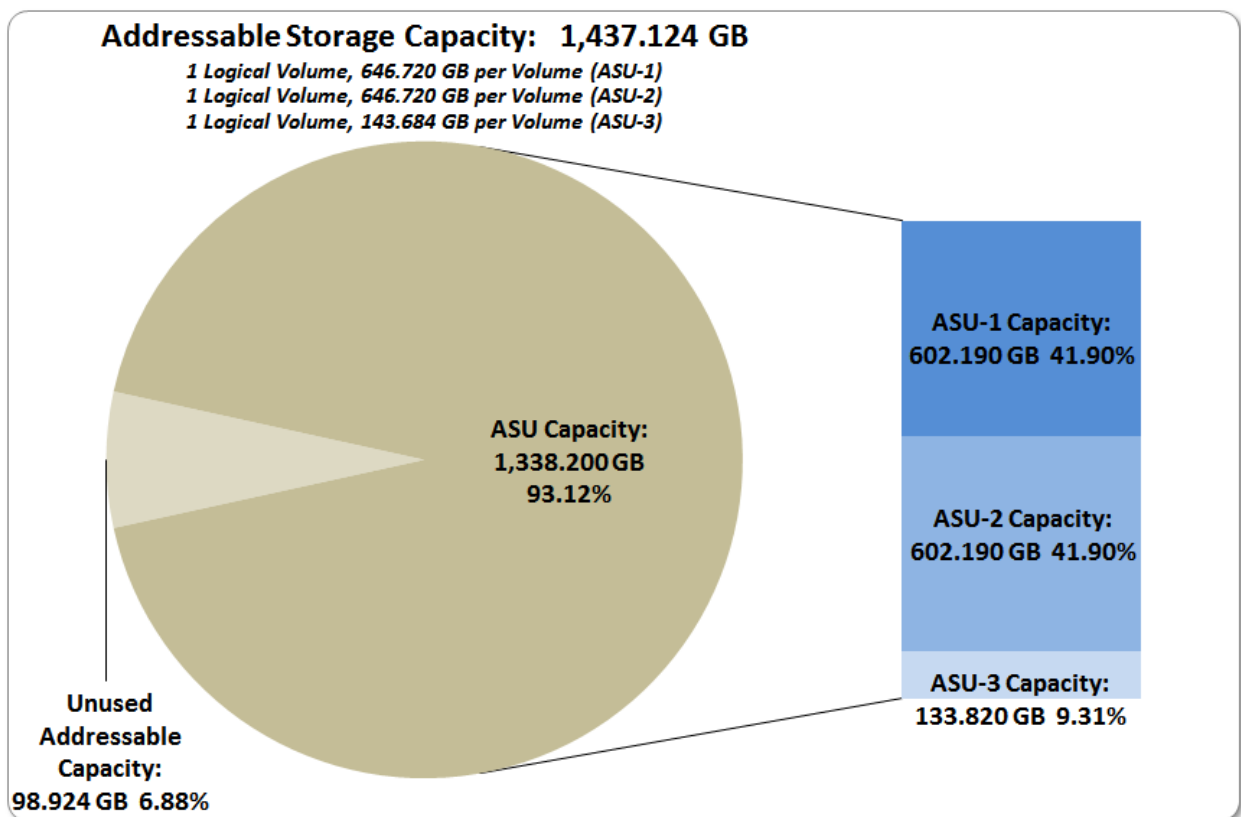
Currency Used is formal name for the currency used in calculating the **Total Price** and **SPC-1 Price-Performance™**. That currency may be the local currency of the **Target Country** or the currency of a difference country *(non-local currency)*.

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.

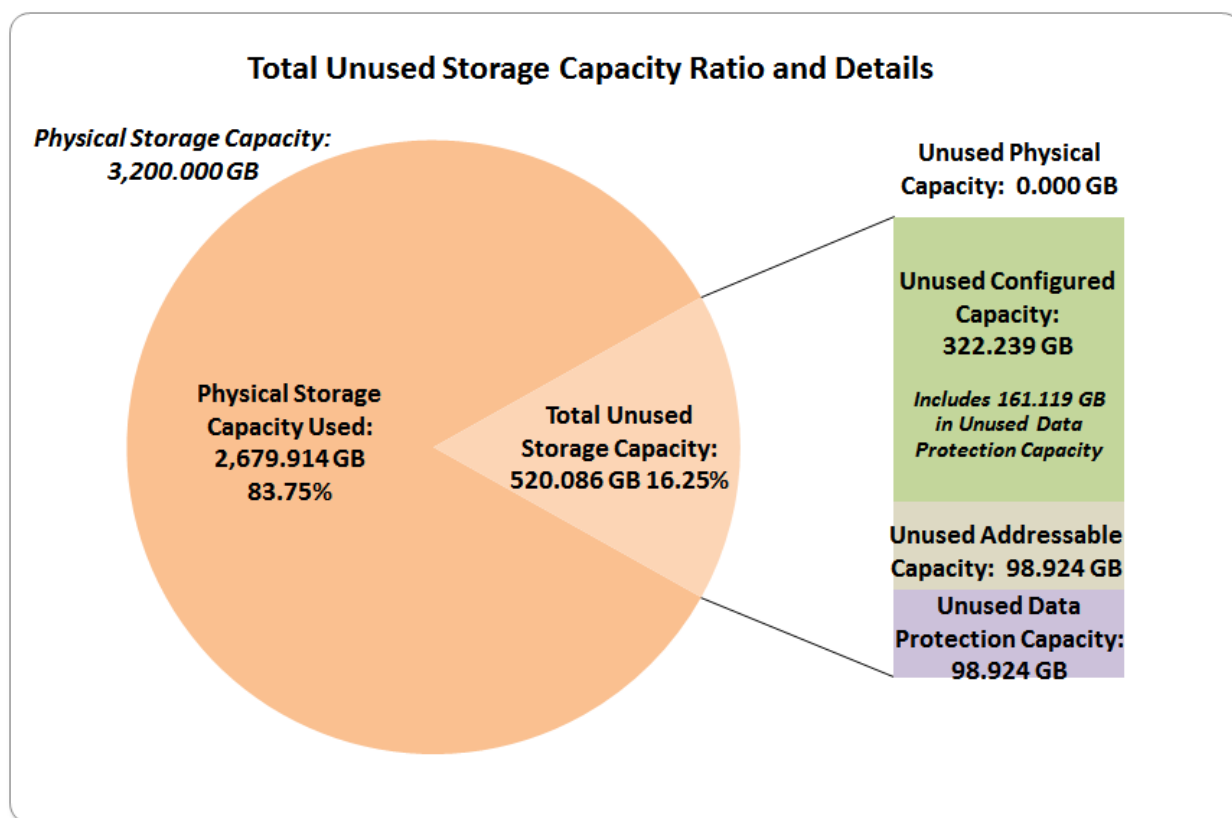## Storage Capacities, Relationships, and Utilization

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.

Physical Storage Capacity: 3,200.000 GB

Configured Storage Capacity: 3,196.496 GB 99.89%

Global Storage Overhead: 3.504 GB 0.11%

Unused Physical Capacity: 0 GB 0.00%

SANwatch Logical Volume Capacity: 1,598.243 GB 49.95%

Data Protection Capacity *(mirror)*: 1,598.243 GB 49.95%

Overhead: 0.009 GB 0.00%

Configured Storage Capacity: 3,196.496 GB

Configured Storage
Capacity Available
for Application Use:
3,196.486 GB
100.00%

Addressable Storage
Capacity:
1,437.124 GB
44.96%

Data Protection
Capacity *(used)*:
1,338.200 41.86%

Overhead:
0.009 GB 0.00%

Unused Configured
Capacity:
322.239 GB 10.08%
Includes 161.119 GB in Unused Data Protection Capacity

Unused Data
Protection Capacity:
98.924 GB 3.09%

Addressable Storage Capacity: 1,437.124 GB
1 Logical Volume, 646.720 GB per Volume (ASU-1)
1 Logical Volume, 646.720 GB per Volume (ASU-2)
1 Logical Volume, 143.684 GB per Volume (ASU-3)

ASU Capacity:
1,338.200 GB
93.12%

ASU-1 Capacity:
602.190 GB 41.90%

ASU-2 Capacity:
602.190 GB 41.90%

ASU-3 Capacity:
133.820 GB 9.31%

Unused
Addressable
Capacity:
98.924 GB 6.88%

Total Unused Storage Capacity Ratio and Details

Physical Storage Capacity:
3,200.000 GB

Unused Physical Capacity: 0.000 GB

Physical Storage Capacity Used: 2,679.914 GB 83.75%

Total Unused Storage Capacity: 520.086 GB 16.25%

Unused Configured Capacity: 322.239 GB

Includes 161.119 GB in Unused Data Protection Capacity

Unused Addressable Capacity: 98.924 GB

Unused Data Protection Capacity: 98.924 GB

SPC-1 Storage Capacity Utilization	
Application Utilization	41.82%
Protected Application Utilization	83.64%
Unused Storage Ratio	16.25%

Application Utilization: Total ASU Capacity *(1,338.200 GB)* divided by Physical Storage Capacity *(3,200.000 GB)*.

Protected Application Utilization: (Total ASU Capacity *(1,338.200 GB)* plus total Data Protection Capacity *(1,598.243 GB)* minus unused Data Protection Capacity *(260.043 GB)*) divided by Physical Storage Capacity *(3,200.000 GB)*.

Unused Storage Ratio: Total Unused Capacity *(520.086GB)* divided by Physical Storage Capacity *(3,200.000 GB)* and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 23-24 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.
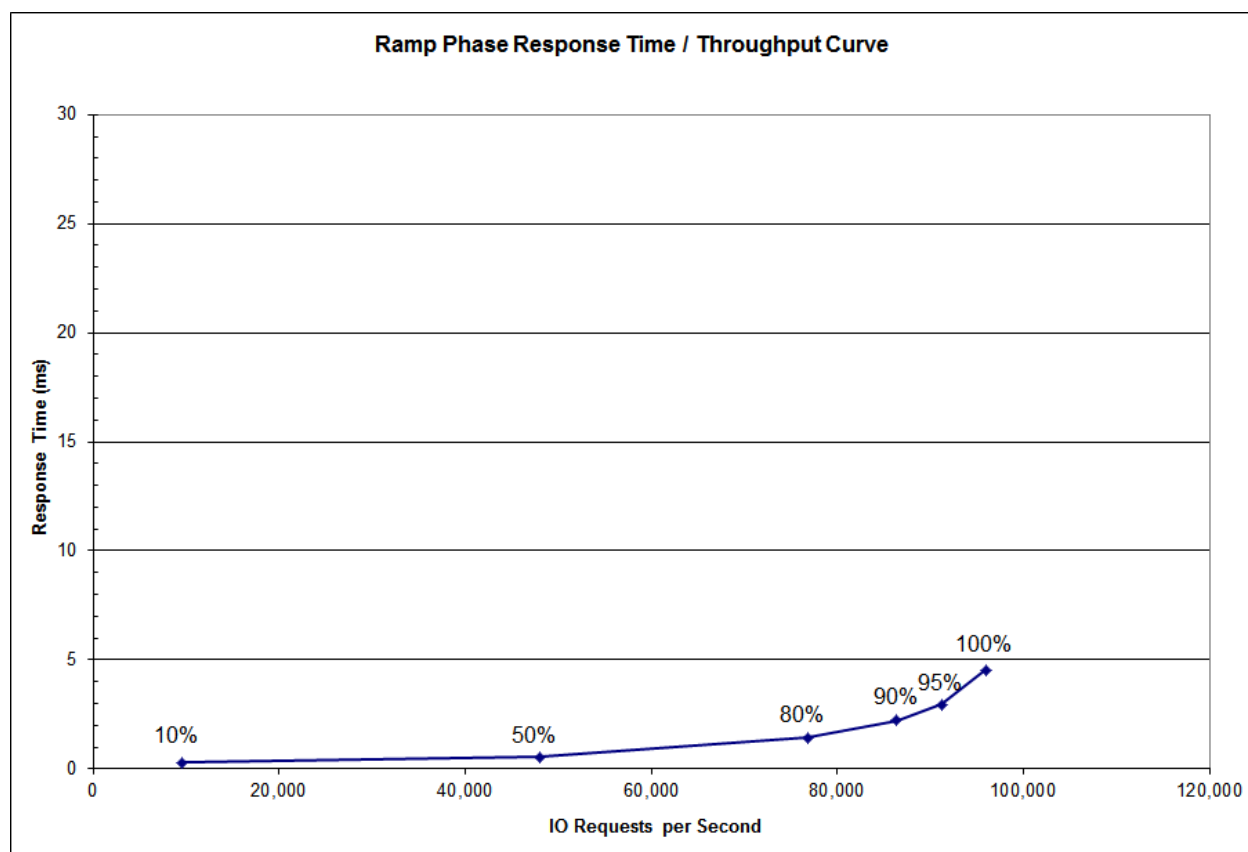
Response Time – Throughput Data

	10% Load	50% Load	80% Load	90% Load	95% Load	100% Load
I/O Request Throughput	9,595.20	48,006.71	76,810.89	86,400.39	91,188.55	95,994.33
Average Response Time (ms):						
All ASUs	0.29	0.55	1.42	2.23	2.95	4.53
ASU-1	0.28	0.55	1.63	2.67	3.62	5.78
ASU-2	0.27	0.47	0.88	1.21	1.49	2.04
ASU-3	0.32	0.60	1.21	1.74	2.18	2.99
Reads	0.25	0.47	1.25	1.99	2.67	4.30
Writes	0.31	0.60	1.53	2.39	3.14	4.69

Priced Storage Configuration Pricing

P/N	Description	Q'ty	MSRP	Extended Price
DS2024R0CB00B	EonStor DS 2000 2U/24bay, Dual Redundant controller subsystem including 2x6Gb SAS EXP. Ports, 8x1G iSCSI ports +2x host board slot(s), 2x2GB, 2x(PSU+FAN Module), 2x (Super capacitor+Flash module), 24xHDD trays and 1xRackmount kit	1	$7,740.00	$7,740.00
RFC16G0HIO2-0010	EonStor / EonStor DS host board with 2 x 16Gb/s FC ports	2	$1,260.00	$2,520.00
HESTSSS3020-00301	Toshiba Enterprise 2.5" SAS 12Gb/s MLC SSD, 200GB, 1 in 1 Packing	16	$895.00	$14,320.00
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	$4,472.00	$4,472.00
DS2024BSK-0010	EonStor DS 2024B spare kit including 1 x RAID Controller, 1 x Host Board w/ 2 x 16Gb FC ports, 1 x Toshiba 2.5" SAS 12Gb/s MLC 200GB SSD, 1 x PSU, 1 x FC SFPs and 1 x FC cables	1	$6,113.00	$6,113.00
9270CFCCAB06-0010	Optical FC cable, LC-LC, MM-50/125, Duplex, LSZH, O.D.=1.8mm*2, 10 Meters	4	$54.00	$216.00
9370CSFP16G-0010	16Gb/s Fibre Channel SFP optical transceiver, LC, wave-length 850nm, multi-mode	4	$286.00	$1,144.00
DDR3NNCMD-0010	8GB DDR-III DIM module for ESDS G7i, ESDS 3000/1000/2000 and ESVA x75 subsystems	4	$200.00	$800.00
BH1EMF311-0010	HBA card, LPe16002B, FC-16G, Dual ports, 1 in 1 package	2	$1,921.00	$3,842.00
	Total			**$41,167.00**

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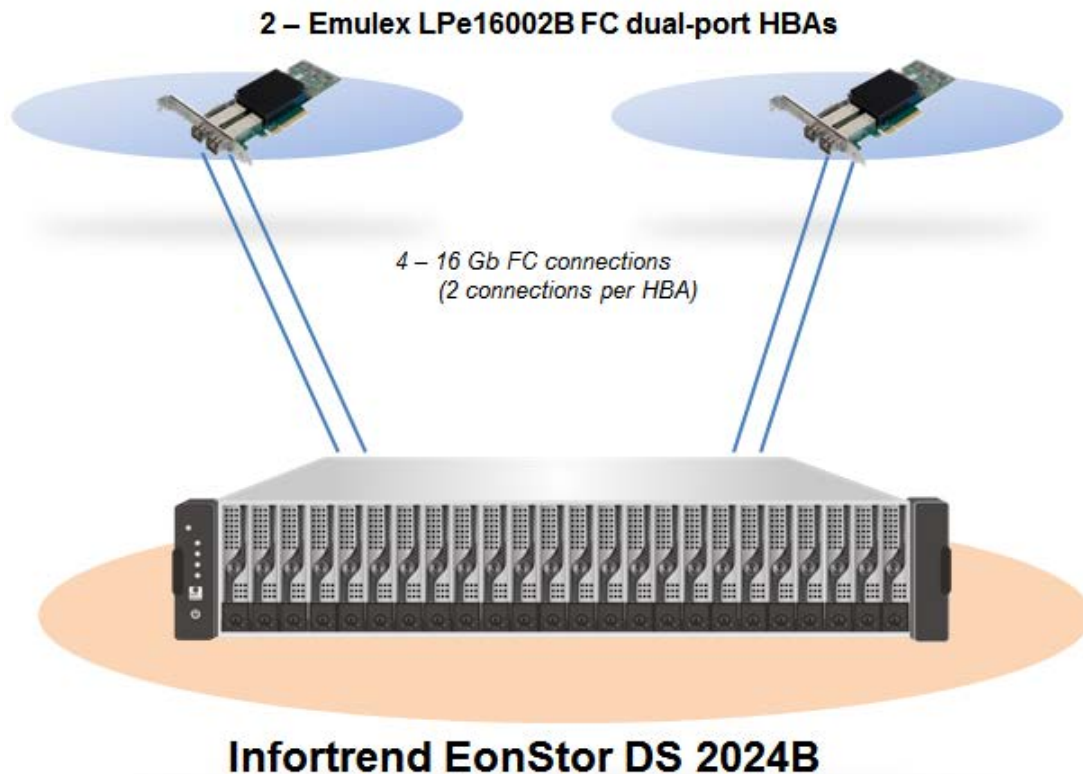
- Acknowledgement of new and existing problems within four (4) hours.

- 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.

The above pricing also includes a spare kit with the components that the customer are required to have available in the case of any hardware failure *("Parts are prepared by customer")*.

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

2 – Emulex LPe16002B FC dual-port HBAs

4 – 16 Gb FC connections
(2 connections per HBA)

Infortrend EonStor DS 2024B

Dual Redundant controller system
with 16 GB cache per controller
(32 GB total)

4 –16 Gb FC ports *(2 ports/controller)*

16 – 6 Gb SAS connections

16 – 200 GB, 12Gb, 2.5" Toshiba
PX02SMF020 MLC SSDs

Priced Storage Configuration Components

Priced Storage Configuration
2 – Emulex LPe16002B-FC dual port 16Gb FC HBAs
Infortrend EonStor DS2024B Dual Redundant controller subsystem   16 GB cache per controller *(32 GB total)* 4 – 16Gb FC ports *(2 ports per controller, 4 ports used)* 16 – backend 6Gb SAS connections *(16 connections used)* 16 – 200 GB 12Gb 2.5" Toshiba PX02SMF020 MLC SSDs