



**SPC BENCHMARK 1™
EXECUTIVE SUMMARY**

**IBM CORPORATION
IBM STORWIZE® V3700 (*TURBO*)**

SPC-1 V1.14

**Submitted for Review: April 18, 2014
Submission Identifier: A00143**

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

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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	April 18, 2014
Date the FDR was submitted to the SPC	April 18, 2014
Date the Priced Storage Configuration is available for shipment to customers	currently available
Date the TSC completed audit certification	April 18, 2014

Tested Storage Product (TSP) Description

IBM Storwize V3700 is the newest addition to the Storwize family of disk systems. Leveraging proven IBM Storwize V7000 and IBM SAN Volume Controller functions and management tools, Storwize V3700 delivers innovation and new levels of storage efficiency with ease of use in an entry disk system to enable organizations to overcome their storage challenges. The Turbo performance option increases the maximum I/O operations per second (IOPS) and throughput of a Storwize V3700 system

Summary of Results

SPC-1 Reported Data	
Tested Storage Product (TSP) Name: IBM Storwize® V3700 (<i>Turbo</i>)	
Metric	Reported Result
SPC-1 IOPS™	32,505.35
SPC-1 Price-Performance™	\$3.80/SPC-1 IOPS™
Total ASU Capacity	10,307.992 GB
Data Protection Level	Protected 1 (<i>mirroring</i>)
Total Price	\$123,616.18
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 1:** 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.

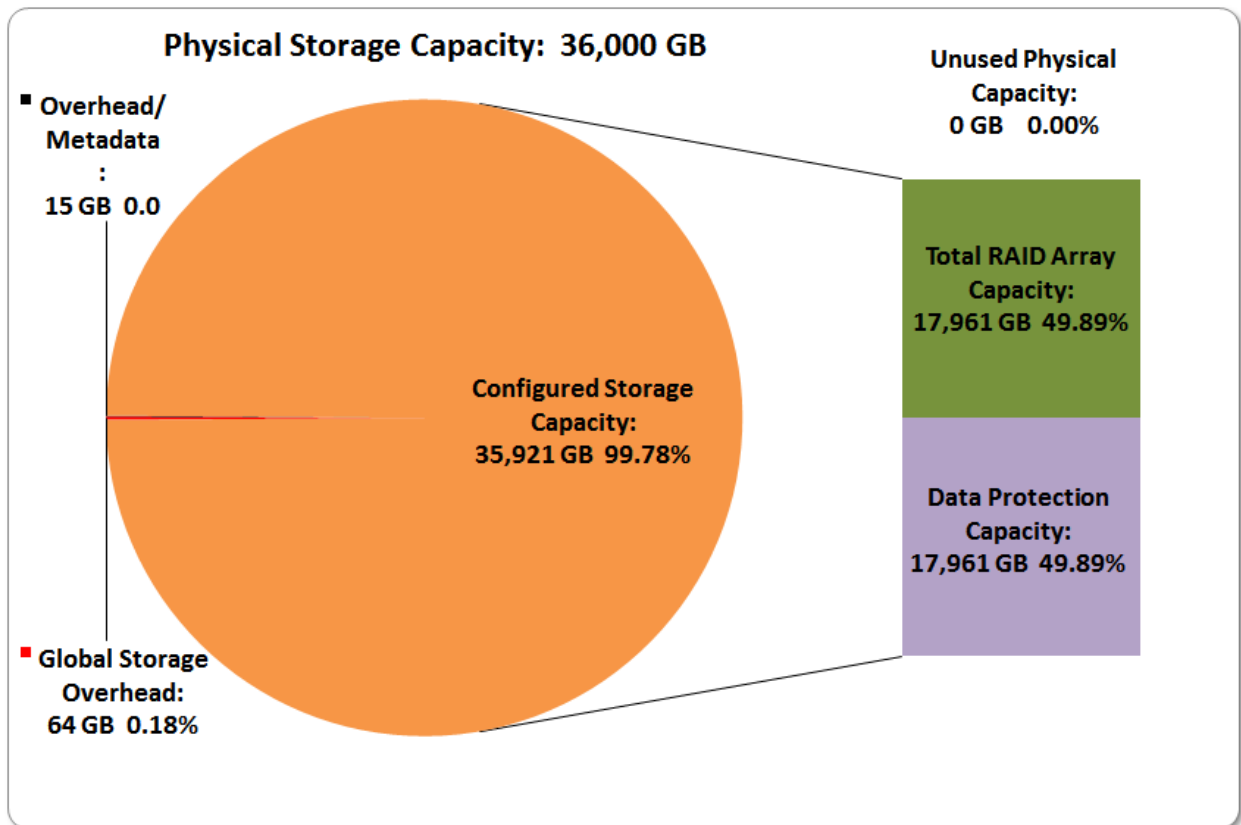
Currency Used is formal name for the currency used in calculating the **Total Price** and **SPC-1 Price-Performance™**. That currency may be the local currency of the **Target Country** or the currency of a difference country (*non-local currency*).

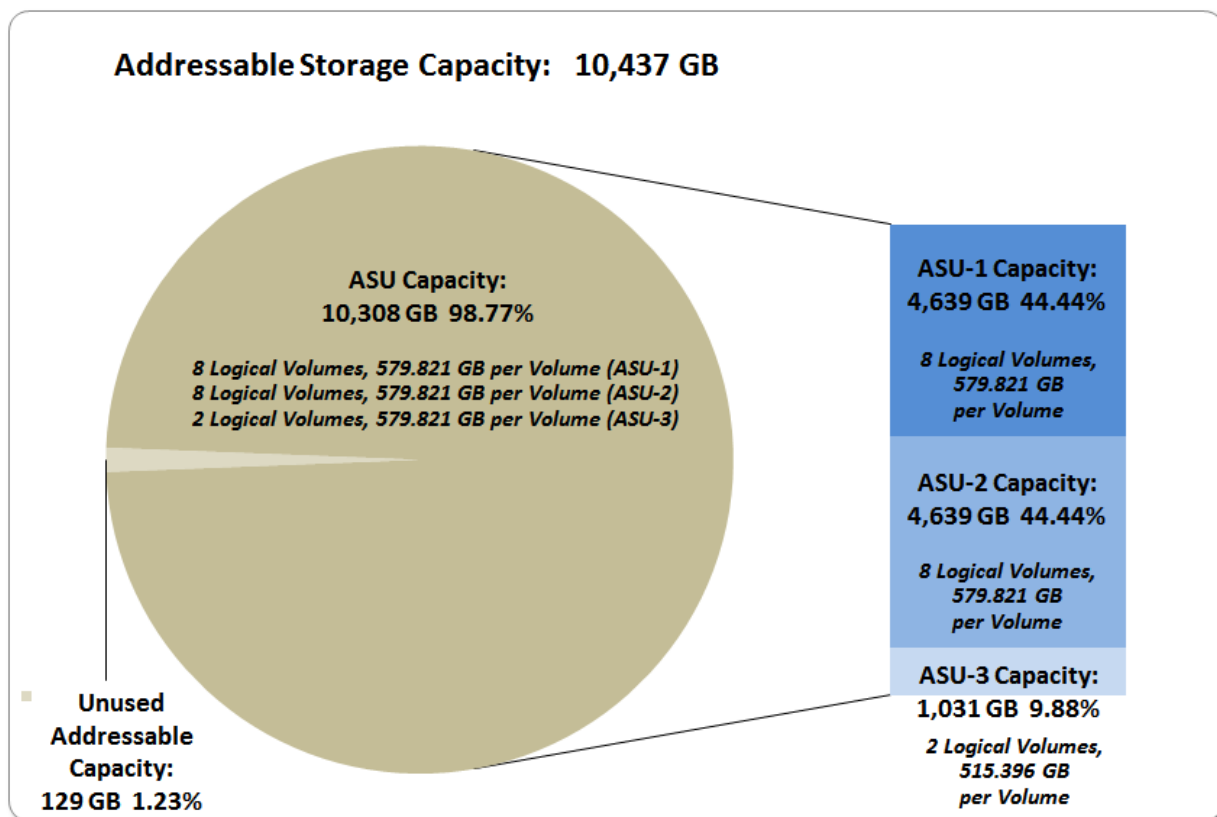
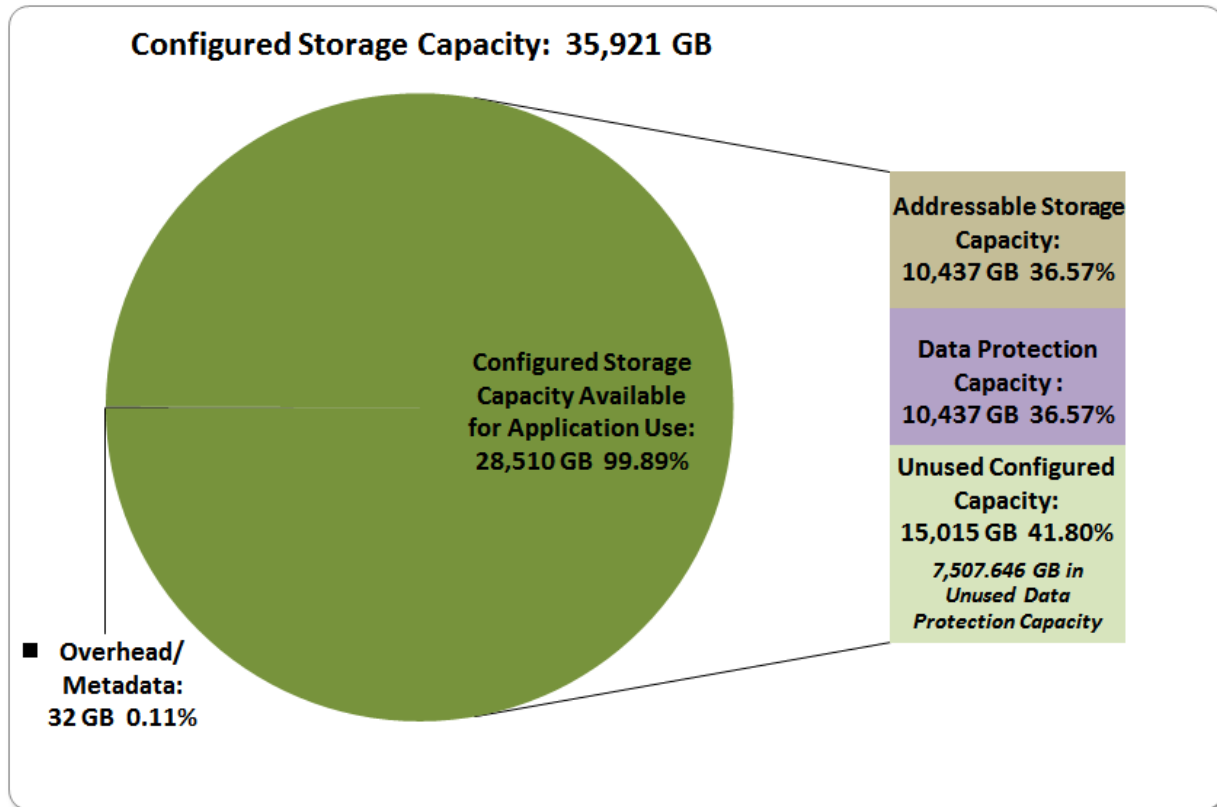
The **Target Country** is the country in which the Priced Storage Configuration is available for sale and in which the required hardware maintenance and software support is provided either directly from the Test Sponsor or indirectly via a third-party supplier.

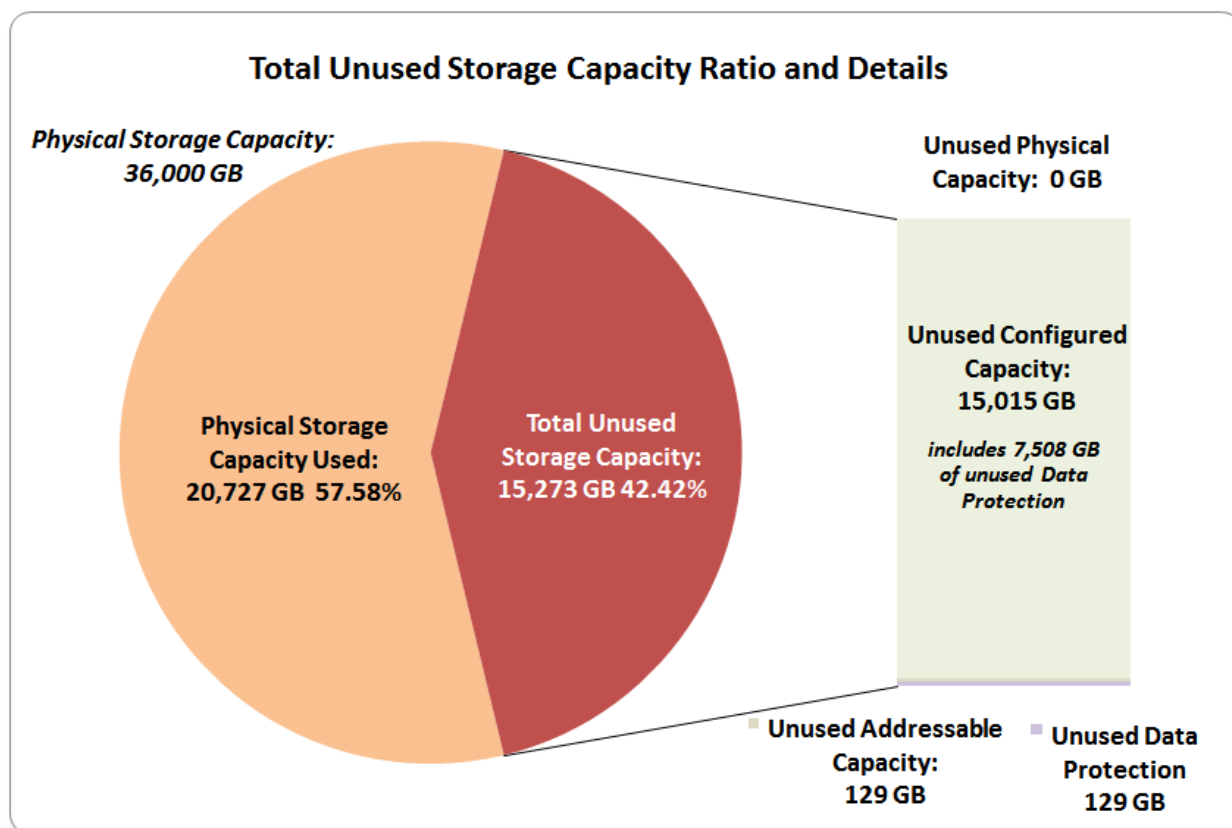
Storage Capacities, Relationships, and Utilization

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.

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-1 Storage Capacity Utilization	
Application Utilization	28.63%
Protected Application Utilization	57.31%
Unused Storage Ratio	42.42%

Application Utilization: Total ASU Capacity (10,307.922 GB) divided by Physical Storage Capacity (36,000.000 GB).

Protected Application Utilization: (Total ASU Capacity (10,307.922 GB) plus total Data Protection Capacity (17,970.522 GB) minus unused Data Protection Capacity (7,636.495 GB)) divided by Physical Storage Capacity (36,000.000 GB).

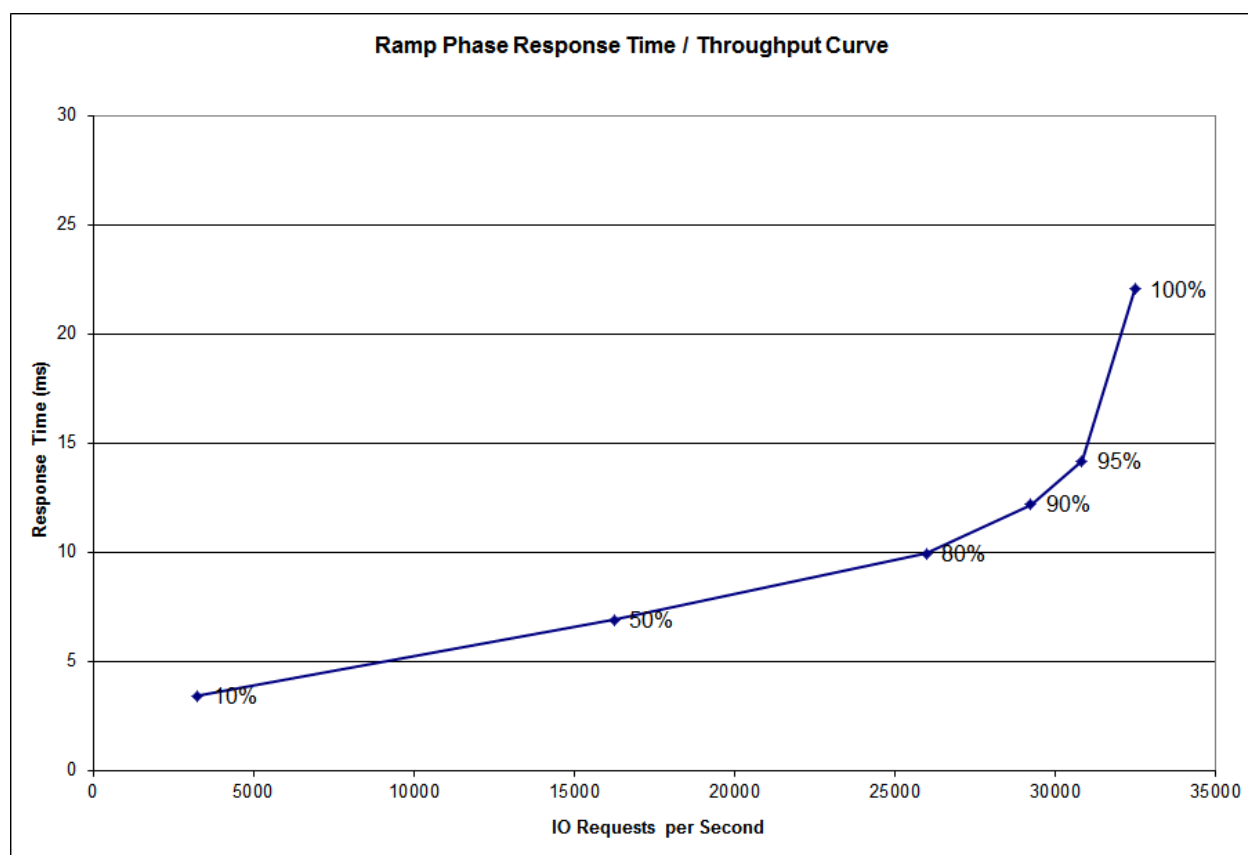
Unused Storage Ratio: Total Unused Capacity (15,272.990 GB) divided by Physical Storage Capacity (36,000.000 GB) and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 24-25 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	3,247.44	16,247.87	25,991.59	29,244.15	30,840.15	32,505.35
Average Response Time (ms):						
All ASUs	3.40	6.90	9.93	12.19	14.19	22.04
ASU-1	3.88	7.09	10.12	12.22	13.98	19.91
ASU-2	3.48	7.43	11.05	13.68	15.78	22.41
ASU-3	2.37	6.28	9.03	11.49	13.95	26.41
Reads	5.31	8.15	11.68	13.85	15.40	18.49
Writes	2.17	6.09	8.79	11.12	13.40	24.36

Priced Storage Configuration Pricing

Description	Qty	Unit Price	extended	% discount	discounted price
V3700 base enclosure (2072-24C)	1	\$8,799.00	\$8,799.00	28	\$6,335.28
V3700 expansion enclosure (2072-24E)	4	\$3,999.00	\$15,996.00	28	\$11,517.12
Turbo performance (ACFA)	1	\$6,850.00	\$6,850.00	28	\$4,932.00
4 GB to 8 GB Cache Upgrade (ACHB)	2	\$2,499.00	\$4,998.00	28	\$3,598.56
15K RPM 300 GB drives (ACLB)	120	\$669.00	\$80,280.00	28	\$57,801.60
4 x 8 Gbps FC card (ACHK)	2	\$1,099.00	\$2,198.00	28	\$1,582.56
Pair of SFPs (ACHS)	2	\$279.00	\$558.00	28	\$401.76
SAS 1.5 m cable (ACTB)	8	\$129.00	\$1,032.00	28	\$743.04
Short wave 5m fibre channel cable (ACSK)	8	\$129.00	\$1,032.00	28	\$743.04
Short wave 25 m fibre channel cable (ACSL)	8	\$189.00	\$1,512.00	28	\$1,088.64
4 x dual port qllogic HBA for xSeries (7915-3579)	4	\$1,849.00	\$7,396.00	0	\$7,396.00
SAN48-5 FC switch (2498-F48 w/24 ports active, 16 SFP)	1	\$24,614.00	\$24,614.00	20	\$19,691.20
HW/SW Total					\$115,830.80
WSU for Hardware					
Storwize V3700 Controller Enclosure	1	\$1,692.00	\$1,692.00	20	\$1,353.60
Storwize V3700 Expansion Enclosure	4	\$1,200.00	\$4,800.00	20	\$3,840.00
Warranty for switch	1	\$3,239.72	\$3,239.72	20	\$2,591.78
Total Warranty/Maintenance					\$7,785.38
Grand Total					\$123,616.18

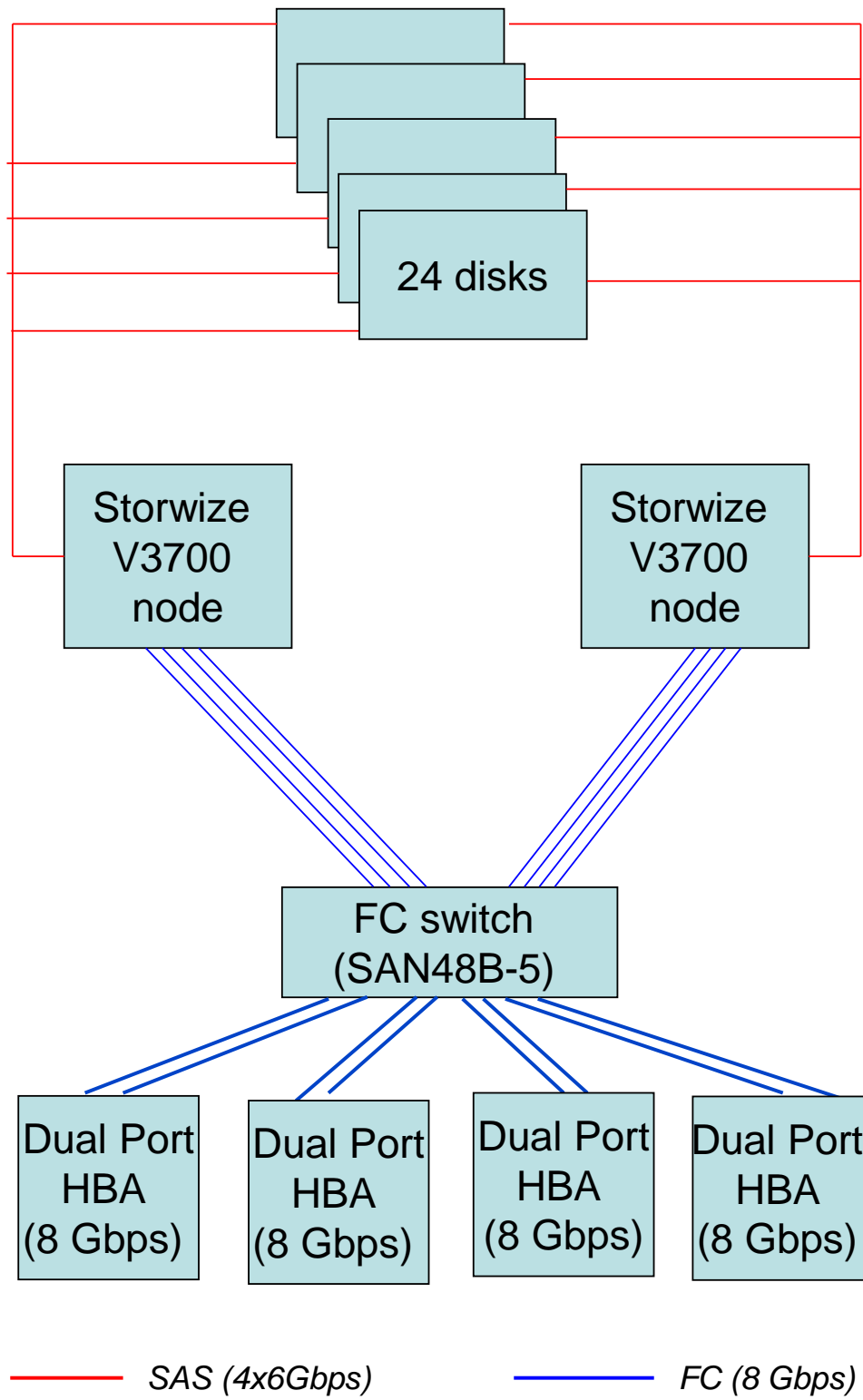
The above pricing includes hardware maintenance and software support for three years, 7 days per week, 24 hours per day. The hardware maintenance and software support provides the following:

- Acknowledgement of new and existing problems with 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.

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



Priced Storage Configuration Components

Priced Storage Configuration
4 – Qlogic dual-port 8 Gbps FC HBAs for xSeries
1 – SAN48-5 FC switch w/24 ports active, 16 SFPs
IBM Storwize® V3700 (Turbo) V3700 base enclosure w/24 slots 2 – Storwize V3700 Cannister Nodes, each with 8 GB memory/cache (<i>16 GB total</i>) 1 – 4-port 8 Gbps FC card (<i>2 total</i>) 8 – 8 Gbps FC front-end connections 1 – 4x6 Gbps SAS connection (<i>4 PHYs</i>) (<i>2 connections total, 8 PHYs total and used</i>)
4 – V3700 expansion enclosures
120 – 300 GB 15K RPM disk drives (<i>24 disk drives per enclosure, base and expansion</i>)