



**SPC BENCHMARK 1™  
EXECUTIVE SUMMARY**

**IBM CORPORATION  
IBM SYSTEM STORAGE  
SAN VOLUME CONTROLLER V6.2  
WITH IBM STORWIZE® V7000 DISK STORAGE**

**SPC-1 V1.12**

**Submitted for Review: January 30, 2012  
Submission Identifier: A00113**

## EXECUTIVE SUMMARY

### Test Sponsor and Contact Information

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### Revision Information and Key Dates

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<b>SPC-1 Specification revision number</b>	V1.12
<b>SPC-1 Workload Generator revision number</b>	V2.2.0
<b>Date Results were first used publicly</b>	January 30, 2012
<b>Date the FDR was submitted to the SPC</b>	January 30, 2012
<b>Date the Priced Storage Configuration is available for shipment to customers</b>	currently available
<b>Date the TSC completed audit certification</b>	January 27, 2012

### Tested Storage Product (TSP) Description

The IBM System Storage SAN Volume Controller (SVC) enables a single point of control for disparate, heterogeneous storage resources to help support improved business application availability and greater resource utilization. SAN Volume Controller is designed to pool storage volumes from IBM and non-IBM storage systems into a single reservoir of capacity for centralized management. The SPC-1 Tested Storage Configuration used SVC Version 6.2 with CG8 storage engines. Each CG8 storage engine is equipped with 24 GB of cache and four 8 Gbps fibre channel ports. The storage engine also features the optional capability, not used to produce this SPC-1 Result, to add 10 Gbps Ethernet or SSD drives managed with EasyTier.

### Summary of Results

SPC-1 Reported Data	
Tested Storage Product (TSP) Name: IBM System Storage SAN Volume Controller v6.2 with IBM Storwize® V7000 disk storage	
Metric	Reported Result
SPC-1 IOPS™	520,043.99
SPC-1 Price-Performance	\$6.92/SPC-1 IOPS™
Total ASU Capacity	97,581.657 GB
Data Protection Level	Protected ( <i>Mirroring</i> )
Total TSC Price (including three-year maintenance)	\$3,598,956.09

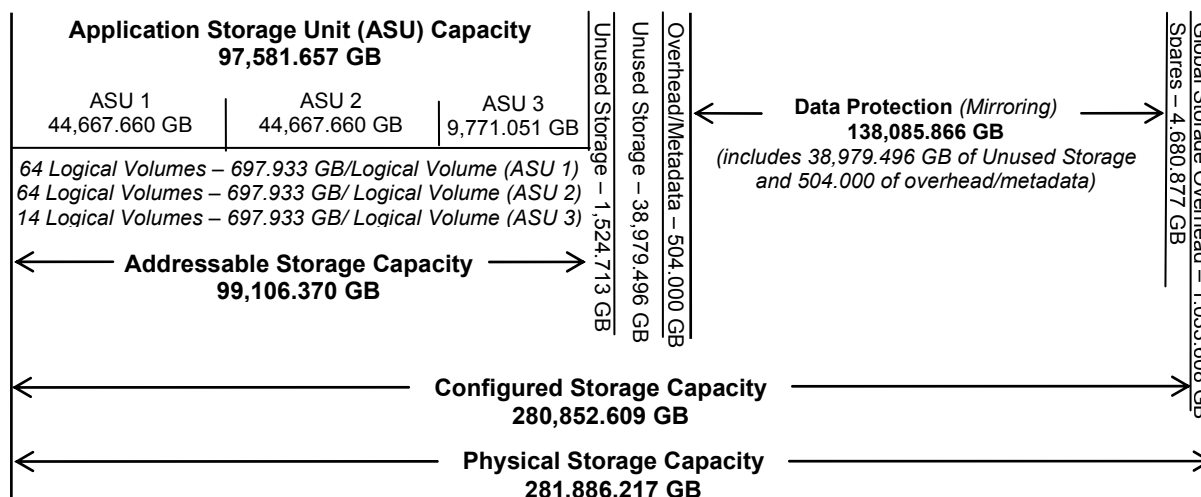
SPC-1 IOPS™ represents the maximum I/O Request Throughput at the 100% load point.

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

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

### Storage Capacities, Relationships, and Utilization

The following diagram 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.



<b>SPC-1 Storage Capacity Utilization</b>	
Application Utilization	34.62%
Protected Application Utilization	69.23%
Unused Storage Ratio	28.74%

**Application Utilization:** Total ASU Capacity (*97,581.657 GB*) divided by Physical Storage Capacity (*281,886.217 GB*)

**Protected Application Utilization:** Total ASU Capacity (*97,581.657 GB*) plus total Data Protection Capacity (*138,085.866 GB*) minus unused Data Protection Capacity (*38,979.496 GB*) divided by Physical Storage Capacity (*97,581.657 GB*)

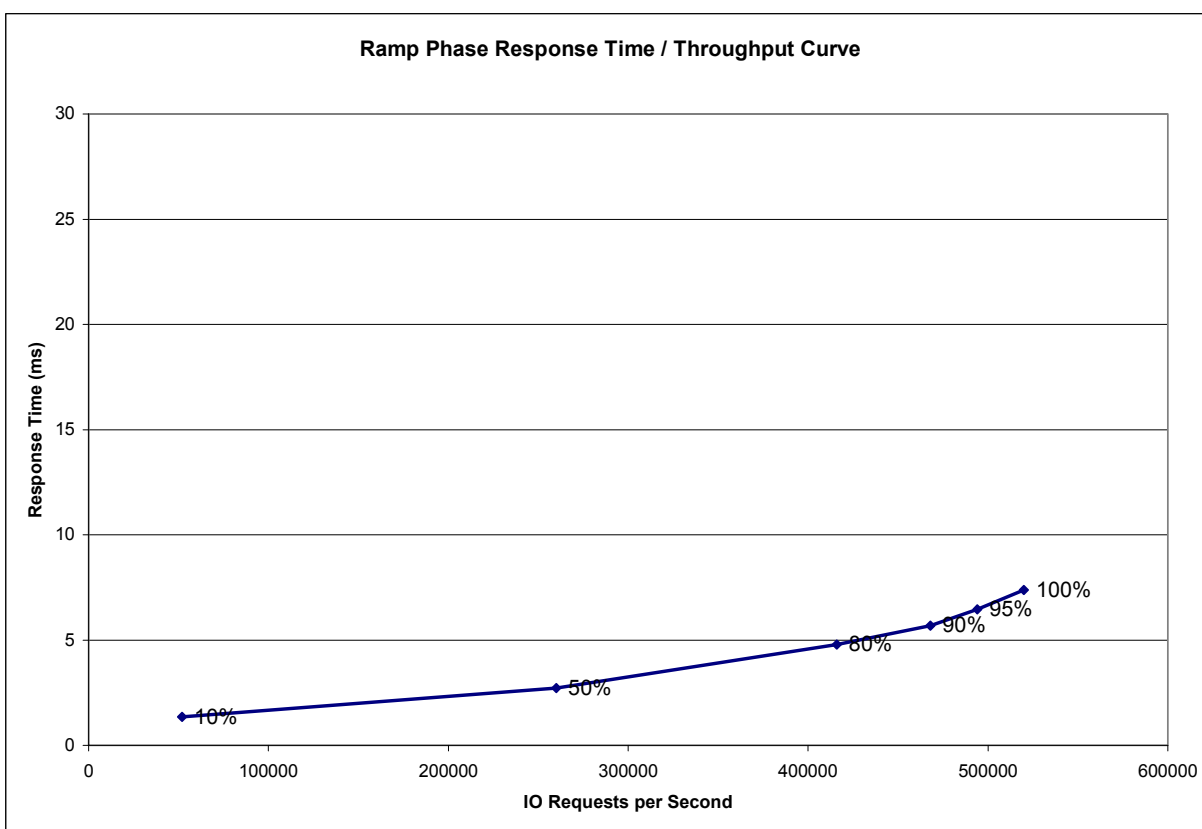
**Unused Storage Ratio:** Total Unused Capacity (*81,008.418 GB*) divided by Physical Storage Capacity (*97,581.657 GB*) and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 22-23 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
<b>I/O Request Throughput</b>	51,988.64	259,998.37	416,002.49	467,993.84	494,027.71	520,043.99
<b>Average Response Time (ms):</b>						
All ASUs	1.35	2.71	4.79	5.69	6.45	7.39
ASU-1	1.81	3.36	5.75	6.76	7.52	8.47
ASU-2	1.42	3.76	6.95	8.27	9.19	10.32
ASU-3	0.35	0.87	1.79	2.31	2.98	3.81
Reads	2.91	5.59	9.52	11.06	12.02	13.17
Writes	0.33	0.84	1.71	2.19	2.83	3.62

## Priced Storage Configuration Pricing

Part Number	Description	Quantity	Unit Price	Unit Maint	List w/ Maint	% discount	Total Price
2145-CG8	SVC Storage Engine Model CG8	8	16,500.00	2,616.00	152,928.00	39	93,286.08
2145-CG8 8115	UPS	8	1,000.00	1,656.00	21,248.00	39	12,961.28
2805-MC2	Master Console	1	5,999.00	1,368.00	7,367.00	39	4,493.87
	SVC Software license (base) up to 150 TB... 150 TB w/ 3 yr SWMA	1	321,680.00	128,672.00	450,352.00	39	274,714.72
7014-T42	19 inch rack	5	5,715.00	888.00	33,015.00	50	16,507.50
2498-B24	24 port fibre channel switch w/ 24 SFPs, 24 ports enabled	4	15,940.00	10,800.00	106,960.00	20	85,568.00
2076-124	V7000 controller w/ 2 SFPs, 24x15K RPM, 146 GB disks	16	48,976.00	4,200.00	850,816.00	39	518,997.76
2076-224	V7000 expansion w/ 2 SAS cables, 24x15K RPM, 146 GB disks	64	29,976.00	2,016.00	2,047,488.00	39	1,248,967.68
	V7000 base software for Cont. + Exp.	80	18,000.00	7,200.00	2,016,000.00	39	1,229,760.00
78Y661	Ethernet switch	2	320.00	60.00	760.00	20	608.00
2076-124 5301	1m fibre channel cable	32	79.00	0.00	2,528.00	20	2,022.40
2076-124 5305	5m fibre channel cable	32	129.00	0.00	4,128.00	20	3,302.40
2076-124 5625	25m fibre channel cable	32	189.00	0.00	6,048.00	20	4,838.40
30R-6650	14ft ethernet cable	48	7.00	0.00	336.00	20	268.80
9117-5735	8 Gbps dual port FC adapter	32	4,583.00	0.00	146,656.00	30	102,659.20
	<b>Total Price</b>						<b>3,598,956.09</b>

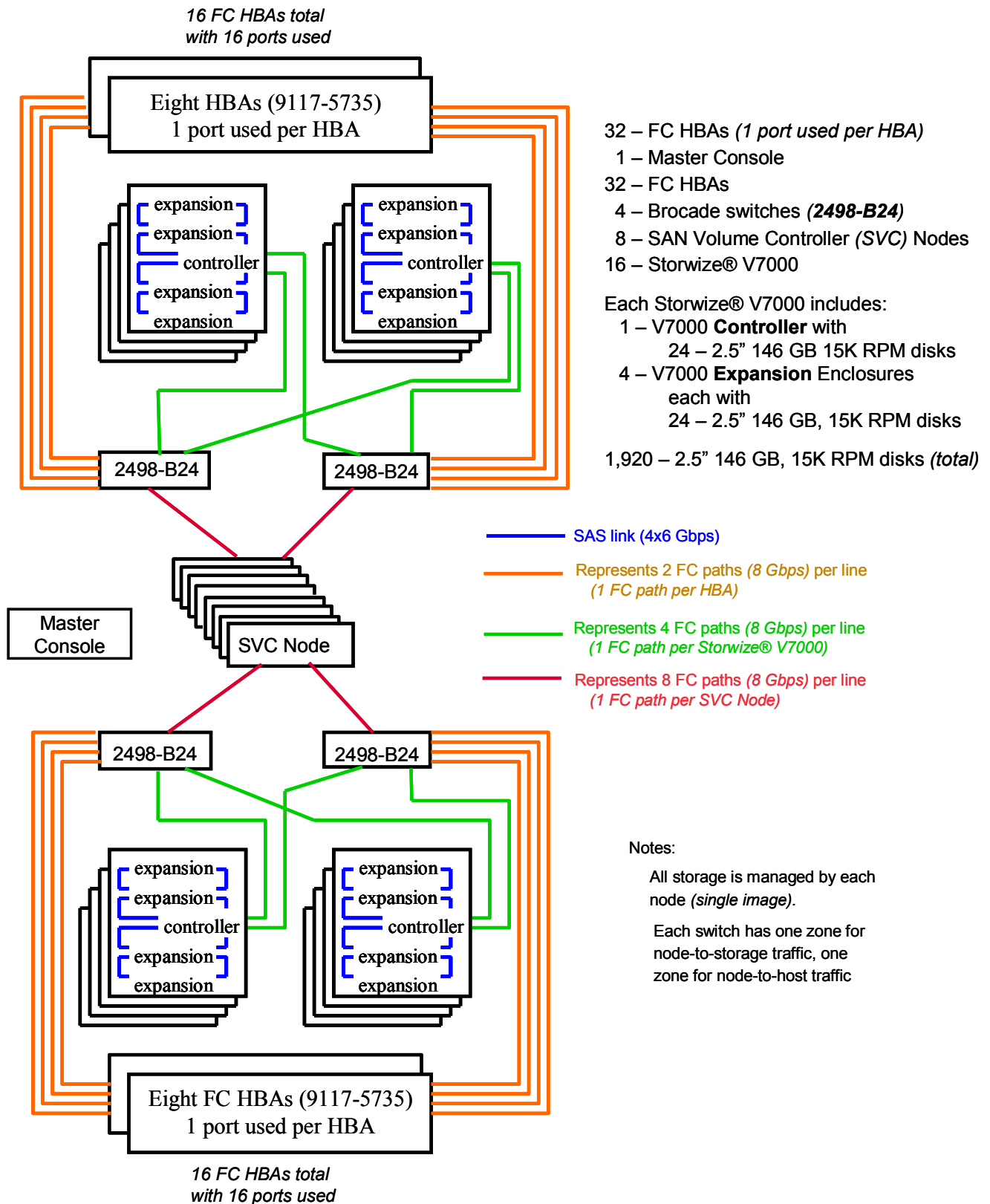
The above pricing includes hardware maintenance and software support for three years, 7 days per week, 24 hours per day. The hardware maintenance and software support provides the following:

- 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 Priced Storage Configuration.

### Priced Storage Configuration Diagram



## Priced Storage Configuration Components

<b>Priced Storage Configuration:</b>
32 – 8 Gbps dual port FC HBAs
<b>IBM System Storage SAN Volume Controller (8 node SVC 6.2 cluster)</b> Each SVC node includes: 24 GB cache 4 – 8 Gbps FC connections <i>(all 4 used for both node to Host System and node to V7000 connectivity)</i>
<b>16 – IBM Storwize® V7000 each with 2 nodes</b> Each V7000 includes: 1 – V7000 Controller with 16 GB cache, 2 SFPs 24 – 2.5" 146 GB, 15K RPM disk drives 2 – front-end 8 Gbps FC connections <i>(2 used)</i> 4 – SAS backend 4x6Gbps connections <i>(4 used)</i> 4 – V7000 Expansion Enclosures each with 24 – 2.5" 146 GB, 15K RPM disk drives <i>1,920 – 2.5" 146 GB, 15K RPM disk drives (total)</i>
4 – 24 port Fibre Channel Brocade switches each with 24 ports enabled and 24 SFPs
1 – Master Console
2 – Ethernet switches
8 - UPS
5 – 19 inch racks