



**SPC BENCHMARK 1™
EXECUTIVE SUMMARY**

**IBM CORPORATION
IBM TOTALSTORAGE®
SAN VOLUME CONTROLLER 1.1.1**

SPC-1 V1.8

Submitted for Review: June 8, 2004

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EXECUTIVE SUMMARY**Test Sponsor and Contact Information**

Test Sponsor and Contact Information	
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Revision Information and Key Dates

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SPC-1 Specification revision number	V1.8
SPC-1 Workload Generator revision number	V2.00.04a
Date Results were first used publicly	June 8, 2004
Date FDR was submitted to the SPC	June 8, 2004
Date the TSC is/was available for shipment to customers	July 25, 2003
Date the TSC completed audit certification	June 4, 2004

Summary of Results

SPC-1 Results	
Tested Storage Configuration (TSC) Name: IBM TotalStorage® SAN Volume Controller 1.1.1	
Metric	Reported Result
SPC-1 IOPS™	44,507.73
SPC-1 Price-Performance	\$15.08/SPC-1 IOPS™
Total ASU Capacity	5,025.112 GB
Data Protection Level	Mirroring
Total TSC Price (including three-year maintenance)	\$671,313.67

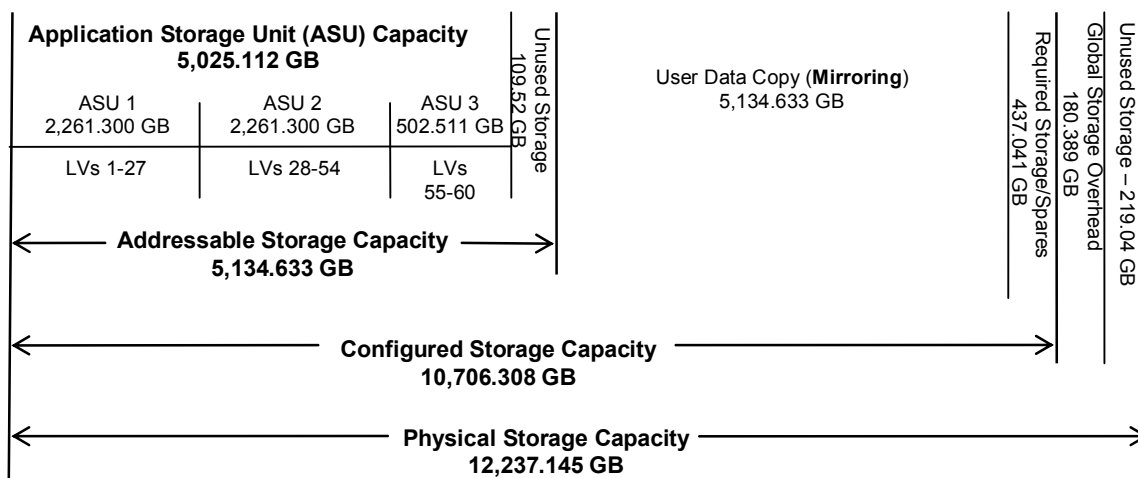
SPC-1 IOPS™ represents the maximum I/O Request Throughput at the 100% load point.

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 Mirroring configures two or more identical copies of user data. Specifically, the Tested Storage Configuration was configured as “RAID 0+1”, striped and mirrored.

Storage Capacities and Relationships

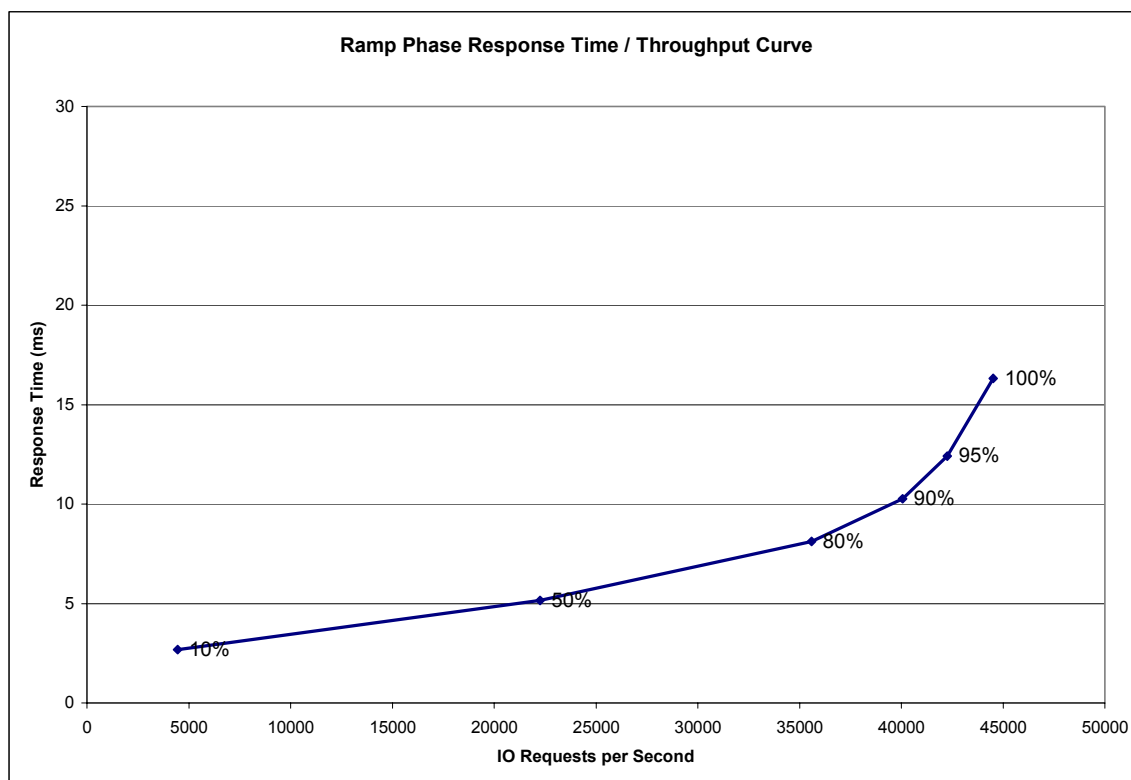
The following diagram documents the various storage capacities, used in this benchmark, and their relationships.



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	4,449.77	22,255.50	35,591.20	40,051.42	42,258.67	44,507.73
Average Response Time (ms):						
All ASUs	2.68	5.15	8.12	10.27	12.42	16.32
ASU-1	3.57	6.54	9.79	11.77	13.62	16.94
ASU-2	3.00	6.36	9.37	11.43	13.38	16.89
ASU-3	0.67	1.66	4.04	6.59	9.46	14.76
Reads	5.95	10.76	14.83	16.58	17.87	20.13
Writes	0.56	1.49	3.76	6.17	8.87	13.84

Tested Storage Configuration Pricing (*Priced Storage Configuration*)

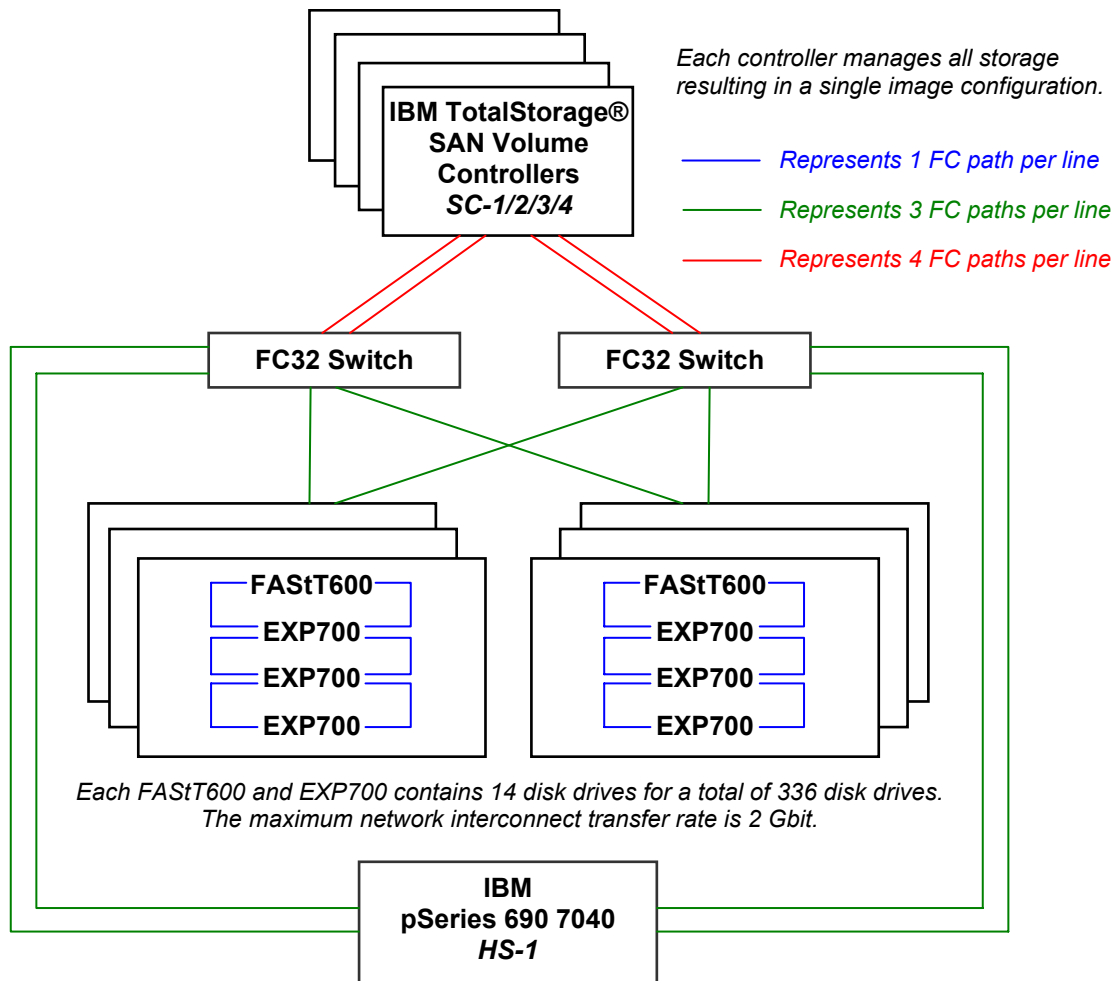
Component	Quantity	List Price	Discount	Unit Price	Total
SVC Processor	4	13,750.00	25%	10,312.50	41,250.00
Dual UPS	1	5,000.00	25%	3,750.00	3,750.00
Master Console	1	7,499.00	25%	5,624.25	5,624.25
SVC Software	1	55,000.00	10%	49,500.00	49,500.00
19 inch rack (7014-T42)	3	6,866.66	50%	3,433.33	10,299.99
32 port fibre channel switch (2109-FC32)	2	58,000.00	42%	33,640.00	67,280.00
Ethernet switch (17P-2423)	1	999.00	42%	579.42	579.42
FAST600 with 14 15K RPM drives (36 GB)	6	30,609.00	20%	24,487.20	146,923.20
EXP700 with 14 15K RPM drives (36 GB)	18	21,610.00	20%	17,288.00	311,184.00
GBIC (included n/c with other components)	140	-	0%	-	-
GBIC (additional)	10	498.75	20%	399.00	3,990.00
Short wave 2Gbit fibre channel cable (25 m)	12	189.00	20%	151.20	1,814.40
Short wave 2Gbit fibre channel cable (5 m)	30	129.00	20%	103.20	3,096.00
Short wave 2 Gbit fibre channel cable (1 m)	48	79.00	20%	63.20	3,033.60
Ethernet cable (7 feet)	9	6.99	0%	6.99	62.91
Ethernet cable (25 feet)	10	14.99	0%	14.99	149.90
2 Gbit fibre channel pSeries HBA adapter (LP9002)	12	930.00	0%	930.00	11,160.00
Maintenance package (2146-4326) standard + 2 years	1	11,616.00	0%	11,616.00	11,616.00
Total Price					671,313.67

The discount listed is the field delegation discount, which is the discount account teams are automatically authorized to offer.

Differences between the Tested Storage Configuration (TSC) and Priced Storage Configuration

There were no differences between the Tested Storage Configuration (TSC) and the Priced Storage Configuration.

Benchmark Configuration/Tested Storage Configuration Diagram



Host Systems:	Tested Storage Configuration (TSC):
UID=HS-1	12 – 2 Gbit FC pSeries HBAs
IBM pSeries 690 7040	UID=SC-1/2/3/4: 4 – TotalStorage® SAN Volume Controllers Per controller: xSeries 335 processor which contains: 2 – 2.4 GHz Intel P4 CPUs 4 GB memory/cache 4 – 2 Gbit FC ports
14 – 1.3 GHz POWER4 CPUs – 2 CPUs/chip 1.5 MB L2 cache per chip 32 MB L3 cache per chip	
24 GB main memory	
AIX 5.1	
PCI/RIO	2 – 32 port FC switches
WG	1 – Ethernet switch
	6 – FAST600 enclosures 18 – EXP700 enclosures 14 – 36 GB, 15K RPM disk drives per enclosure
	3 – 19 inch racks
	1 – Dual UPS