



**SPC BENCHMARK 1™
EXECUTIVE SUMMARY**

IBM CORPORATION

IBM TOTALSTORAGE ENTERPRISE STORAGE SERVER MODEL 800

SPC-1 V1.6

Submitted for Review: December 7, 2002

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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	V1.6
SPC-1 Workload Generator revision number	V1.1
Date Results were first used publicly	December 7, 2002
Date FDR was submitted to the SPC	December 7, 2002
Date the TSC is/was available for shipment to customers	November 22, 2002
Date the TSC completed audit certification	December 7, 2002

Summary of Results

SPC-1 Results	
Tested Storage Configuration (TSC) Name: IBM TotalStorage Enterprise Storage Server Model 800	
Metric	Reported Result
SPC-1 IOPS™	22,999.27
SPC-1 Price-Performance	\$34.88/SPC-1 IOPS™
Total ASU Capacity	3,206.66 GB
Data Protection Level	RAID5
SPC-1 LRT™	2.53ms
Total TSC Price (including three-year maintenance)	\$802,116

SPC-1 IOPS™ represents the maximum I/O Request Throughput at the 100% load point. The SPC-1 IOP™ metric reported was achieved while also ensuring full data integrity of all data written to cache, through the use of non-volatile storage to record a redundant copy of the written data.

Total ASU (Application Storage Unit) Capacity represents the total storage capacity read and written in the course of executing the SPC-1 benchmark. The actual Configured Storage Capacity was 4,211.2 GB, which included the parity required by a Data Protection Level of RAID5. The Configured Storage Capacity utilized 89.40% of the priced Physical Storage Capacity of 4,710.4 GB.

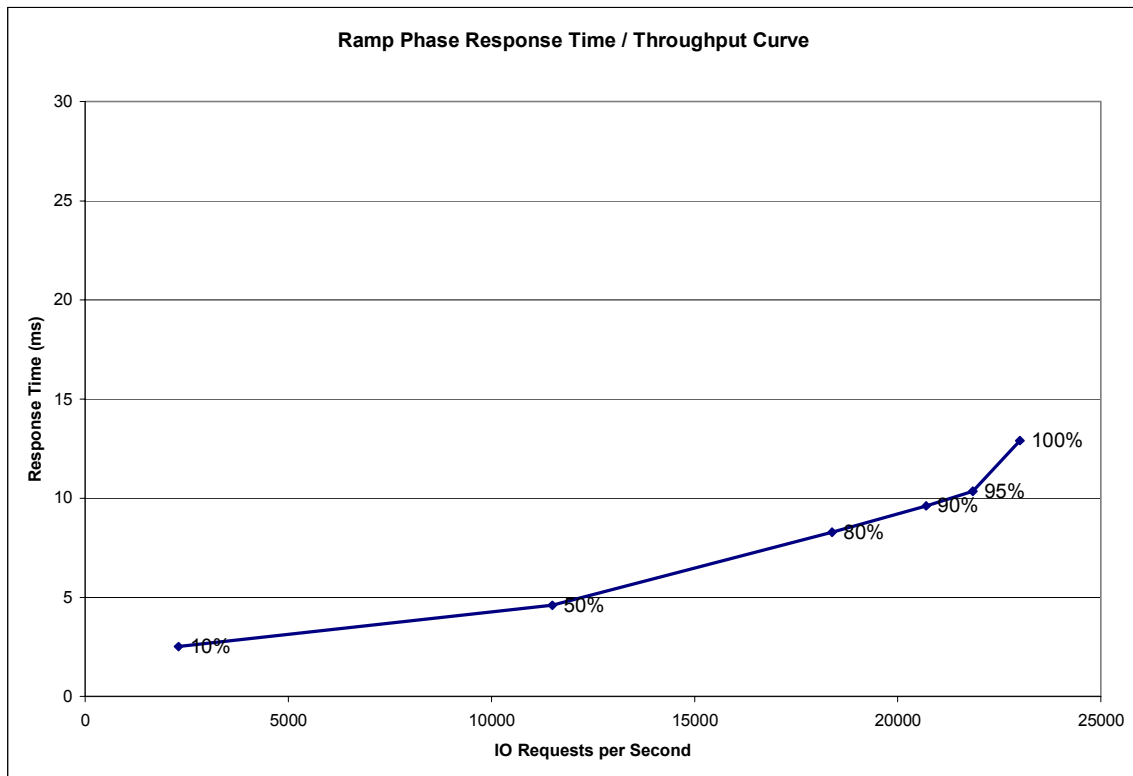
A **Data Protection Level** of RAID5 has user data distributed across disks in an array. Check data corresponding to user data is distributed across multiple disks in the form of bit-by-bit parity.

The **SPC-1 LRT™** metric is the Average Response Time measured at the 10% load point, as illustrated on the next page. SPC-1 LRT™ represents the Average Response Time measured on a lightly loaded Tested Storage Configuration (TSC).

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 100% load point cannot exceed 30 milliseconds or the benchmark measurement is invalid.



Response Time - Throughput Data

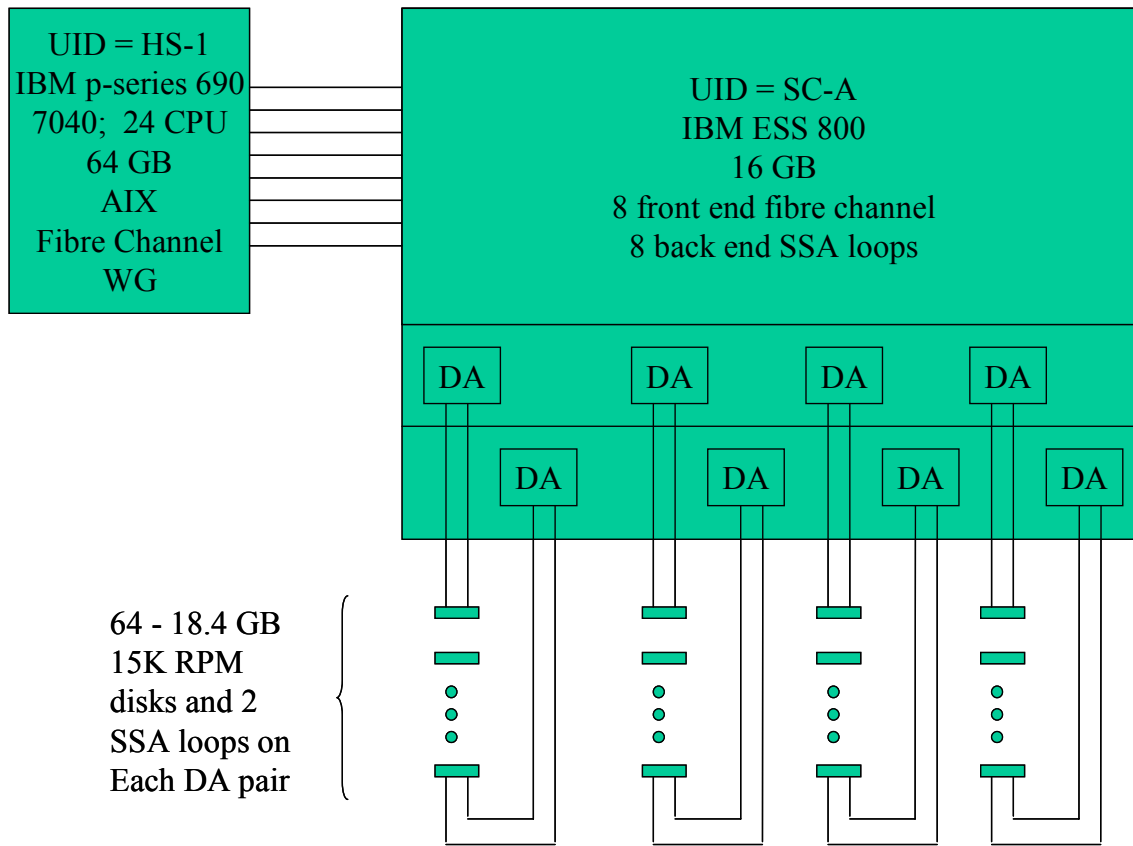
	10% Load	50% Load	80% Load	90% Load	95% Load	100% Load
I/O Request Throughput	2,299.68	11,500.51	18,388.14	20,702.48	21,844.60	22,999.27
Average Response Time (ms):						
All ASUs	2.53	4.60	8.28	9.62	10.34	12.89
ASU-1	3.36	6.15	11.27	13.01	13.90	17.02
ASU-2	2.30	4.88	8.89	10.29	11.03	13.72
ASU-3	0.85	1.17	1.69	2.11	2.48	3.79
Reads	5.33	10.08	18.71	21.49	22.79	27.31
Writes	0.70	1.02	1.49	1.88	2.23	3.51

Tested Storage Configuration Pricing

Product No.	Description	Unit List Price	Quantity	Quantity List Price	Quantity Field Delegation Price
2105-800	ENTERPRISE STORAGE SERVER	208,000.00	1	208,000.00	87,360.00
2142	DISK EIGHT PACK 18.4 GB	38,000.00	32	1,216,000.00	510,720.00
2110	EXPANSION RACK	40,000.00	1	40,000.00	16,800.00
3025	2 GB FC SHORT WAVE ADAPTER	16,000.00	8	128,000.00	53,760.00
3606	TURBO PROCESSOR	208,000.00	1	208,000.00	87,360.00
2717	ESS MASTER CONSOLE	5,000.00	1	5,000.00	2,100.00
4014	16 GB CACHE	80,000.00	1	80,000.00	33,600.00
6228	EMULEX 9000 Adapter for p-series 7040	3,100.00	8	24,800.00	10,416.00
Tested Storage Configuration (TSC) Cost					802,116.00

The above pricing includes 3 year, 24x7 maintenance

Benchmark Configuration/Tested Storage Configuration Diagram



Host System:	Storage System:
IBM p-series 690 7040	IBM TotalStorage ESS 800
UID=HS-1	UID=SC-A
24 1.30GHz POWER4 CPUs 2 CPUs per chip ~1.5 MB L2 cache/chip 32 MB L3 cache/chip	16 GB Cache
64 GB Main Memory	8 – front-end fibre channels
AIX 5.1	8 – back-end SSA loops
Fibre Channel	256 – 18.4 GB 15K RPM disks
WG	Fibre Channel