SPC BENCHMARK 1™

EXECUTIVE SUMMARY

HEWLETT-PACKARD COMPANY
HP STORAGEWORKS ENTERPRISE VIRTUAL ARRAY MODEL 2C12D

SPC-1 V1.6

Submitted for Review: December 6, 2002
Accepted: February 4, 2003

Executive Summary

Test Sponsor and Contact Information

Test Sponsor and Contact Information	
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Auditor	Storage Performance Council www.storageperformance.org Walter E. Baker AuditService@storageperformance.org 1060 El Camino Real, Suite F Redwood City, CA 94063 Phone: (650) 556-9384 FAX: (650) 556-9385

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 6, 2002
Date FDR was submitted to the SPC	December 6, 2002
Date the TSC is/was available for shipment to customers	July 30, 2002 (pricing effective December 2, 2002)
Date the TSC completed audit certification	December 6, 2002

Summary of Results

SPC-1 Results	
Tested Storage Configuration (TSC) Name: hp StorageWorks Enterprise Virtual Array Model 2C12D	
Metric	**Reported Result**
SPC-1 IOPS™	20,096.97
SPC-1 Price-Performance	$23.88/SPC-1 IOPS™
Total ASU Capacity	2,596.3GB
Data Protection Level	Mirroring
SPC-1 LRT™	2.36 ms
Total TSC Price (including three-year maintenance)	$479.860

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. The actual Configured Storage Capacity was 5,193.99 GB, which included the multiple copies of user data required by a Data Protection Level of Mirroring. The Configured Storage Capacity utilized 84.91% of the priced Physical Storage Capacity of 6,117 GB.
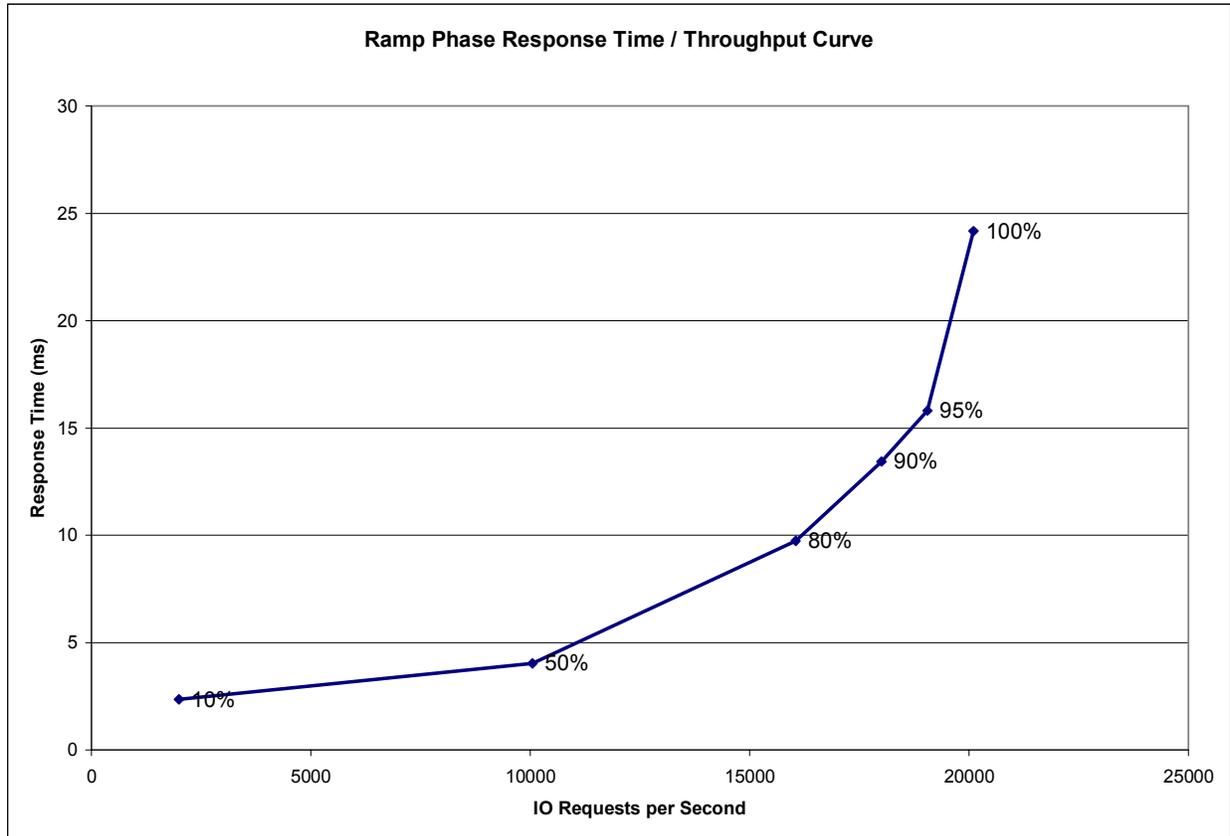
A **Data Protection Level** of Mirroring configures two or more identical copies of user data, maintained on separate disks.

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.
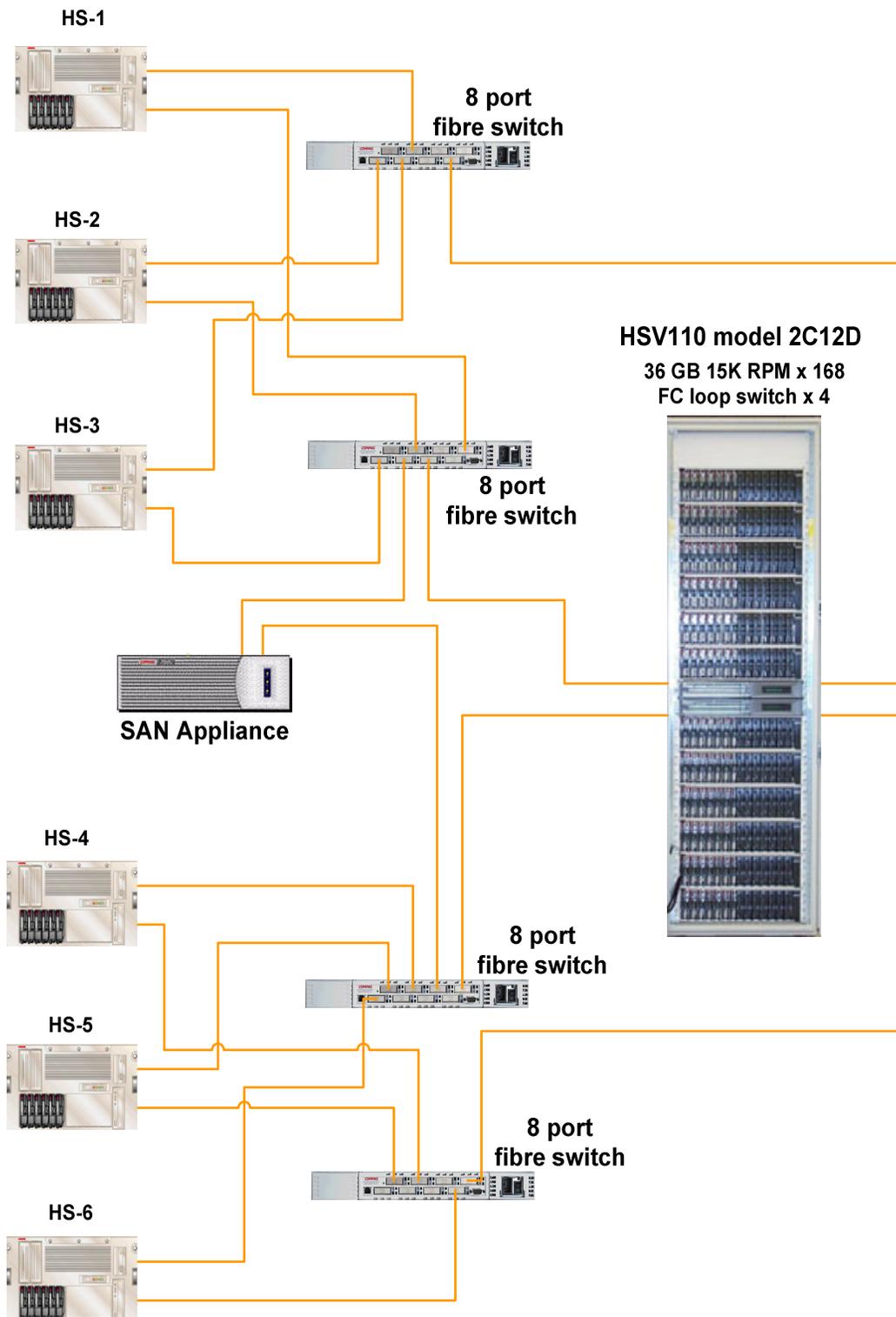

Response Time – Throughput Data

	10% Load	50% Load	80% Load	90% Load	95% Load	100% Load
I/O Request Throughput	1,998.06	10,051.11	16,050.13	18,003.36	19,054.29	20,096.97
Average Response Time (ms):						
All ASUs	2.36	4.03	9.73	13.43	15.81	24.18
ASU-1	3.12	5.35	11.05	14.72	17.60	27.04
ASU-2	3.12	5.12	10.11	13.05	14.41	18.78
ASU-3	0.41	0.74	6.77	10.89	12.63	20.46
Reads	5.43	9.10	13.63	16.17	18.69	26.67
Writes	0.36	0.73	7.20	11.65	13.94	22.55

Tested Storage Configuration Pricing

Part Number	Description / Notes	Qty	List	Extended US List Price	Extended Avg US Sell Price
	Storage Hardware / Software				
283198-B21	EVA, Model 2C12D-B 60Hz	1	$193,020	$193,020	$135,114
236205-B21	36GB FC Drive, 15K	168	$2,100	$352,800	$246,960
258158-888	Configure-To-Order	1	$0	$0	$0
250203-B23	VCS v2.0 Dual HSV Cntlr (base software license)	1	$31,900	$31,900	$22,330
250195-B22	WNT/W2K KIT v2.0 ENT VIR ARY	1	$100	$100	$70
189715-002	Management Appliance II	1	$10,500	$10,500	$7,350
281380-002	Software CarePaq Priority Service Extension	1	$30,941	$30,941	$21,659
	Interconnect Hardware				
258707-B21	SAN Switch 2/8-EL	4	$6,400	$25,600	$22,528
176479-B21	FC PCI HBA for WinNT/X86	12	$1,705	$20,460	$18,005
221692-B22	5-meter LC-LC Multi-Mode Fibre Cable	18	$82	$1,476	$1,299
221470-B21	2Gb/s SFP	14	$369	$5,166	$4,546
	Extended Total			$671,963	$479,860

Benchmark Configuration/Tested Storage Configuration Diagram

Host System (HS-1 – HS-6) Configuration

Quantity	Type	# CPUs	CPU Type	CPU MHz	Memory	Operating System	System I/O Interconnect	HBAs	HBA to Storage Interconnect	Workload Generator
2	ML-530	2	P III Xeon	800	512	Window 2000 Server	PCI	2 x LP952	Fibre Channel	Yes
2	ML-530	2	P III Xeon	933	512	Window 2000 Server	PCI	2 x LP952	Fibre Channel	Yes
1	ML-530	2	P III Xeon	1000	512	Window 2000 Server	PCI	2 x LP952	Fibre Channel	Yes
1	ML-530	2	P III Xeon	1000	768	Window 2000 Server	PCI	2 x LP952	Fibre Channel	Yes

Tested Storage Configuration (TSC) Diagram – Front and Rear View