SPC BENCHMARK 1™

EXECUTIVE SUMMARY

3PAR INC.

3PAR INSERV® F400 STORAGE SERVER

SPC-1 V1.10.1

Submitted for Review: April 27, 2009
Submission Identifier: A00079

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

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Revision Information and Key Dates

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SPC-1 Specification revision number	V1.10.1
SPC-1 Workload Generator revision number	V2.00.04a
Date Results were first used publicly	April 27, 2009
Date the FDR was submitted to the SPC	April 27, 2009
Date the TSC is available for shipment to customers	April 6, 2009
Date the TSC completed audit certification	April 25, 2009

Tested Storage Product (TSP) Description

3PAR designed the 3PAR InServ® F400 Storage Server from the ground up to overcome the limitations of midrange arrays. The midrange storage market has long been conditioned to compromise scalability and performance in order to reduce storage costs and meet shrinking IT budgets. As a result of these constraints, organizations often end up purchasing and deploying multiple midrange arrays to meet their storage needs – resulting in the datacenter sprawl of midrange arrays.

The InServ F400 is the first quad-controller array designed for the midrange. It offers the same innovative cache-coherent mesh backplane architecture and high-end features as the InServ T-Class arrays, but in a scaled-down array tailored to mid-sized deployments. The InServ F400 boasts 3PAR's Mesh-Active architecture, which applies all node resources to each LUN concurrently, delivering far more headroom for application consolidation in a virtualized datacenter. As mixed workloads are generated by application consolidation, the 3PAR Gen3 ASIC in each F400 Controller Node parallelizes metadata processing and data movement to deliver high and predictable levels of performance to all concurrently running applications, and high utilization rates for all purchased resources.

The InServ F400 shares the same 3PAR InForm® Operating System and supports all the same advanced software features as the other members of the InServ family of arrays, including 3PAR Thin Provisioning, 3PAR Virtual Domains, 3PAR Dynamic Optimization, 3PAR Virtual Copy, and 3PAR Remote Copy.

Summary of Results

SPC-1 Results	
Tested Storage Configuration (TSC) Name: 3PAR InServ® F400 Storage Server	
Metric	**Reported Result**
SPC-1 IOPS™	93,050.06
SPC-1 Price-Performance	$5.89/SPC-1 IOPS™
Total ASU Capacity	27,046.695 GB
Data Protection Level	Mirroring
Total TSC Price (including three-year maintenance)	$548,432

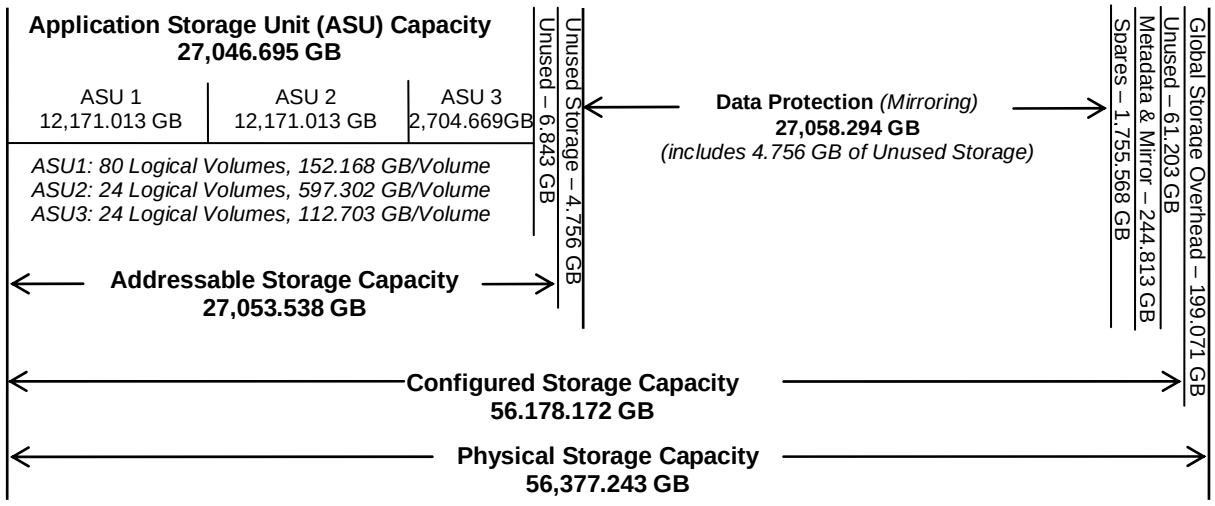
SPC-1 IOPS™ represents the maximum I/O Request Throughput at the 100% load point.

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.

Storage Capacities and Relationships

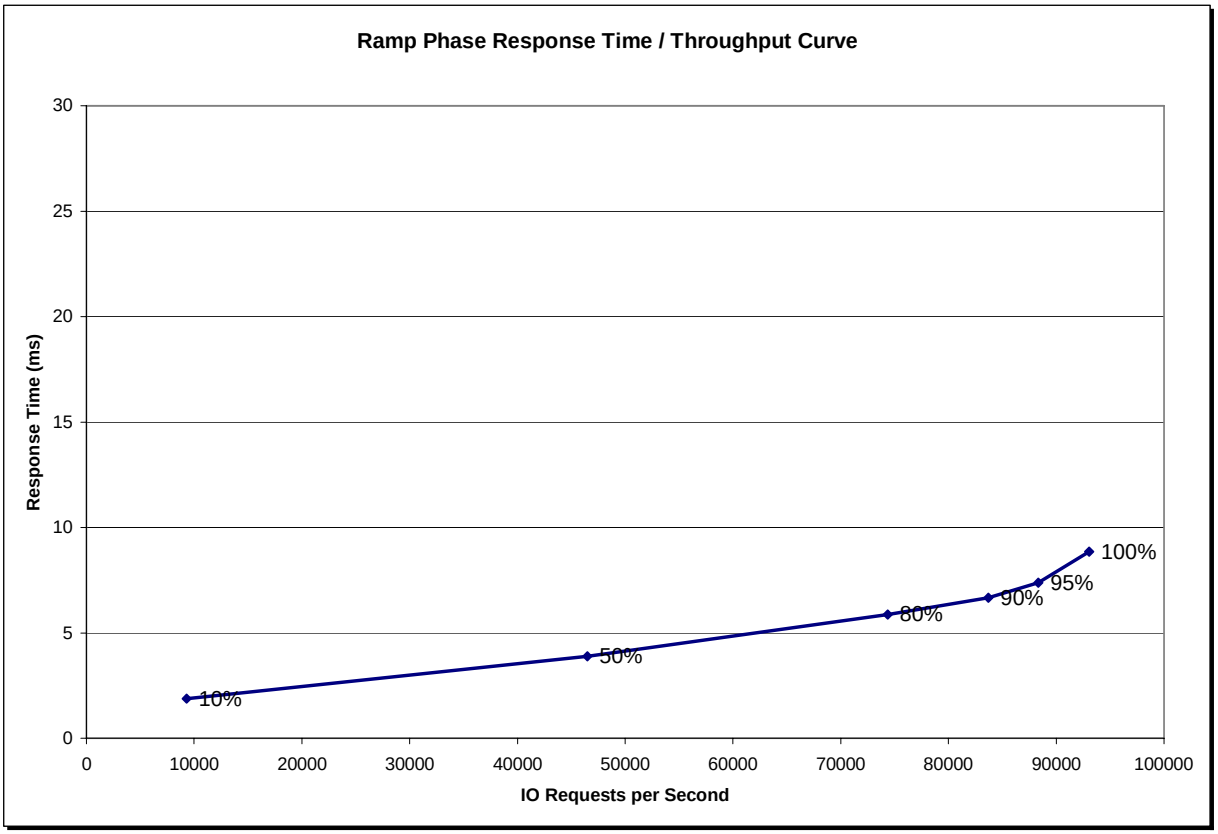
The following diagram documents the various storage capacities, used in this benchmark, and their relationships.



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	9,297.82	46,497.43	74,380.83	83,701.45	88,335.76	93,050.06
Average Response Time (ms):						
All ASUs	1.87	3.89	5.87	6.66	7.37	8.85
ASU-1	2.49	4.76	7.05	7.91	8.61	10.03
ASU-2	1.95	5.52	8.76	9.96	10.84	11.95
ASU-3	0.54	1.34	2.10	2.55	3.22	4.99
Reads	4.01	8.04	12.13	13.61	14.66	16.39
Writes	0.48	1.19	1.79	2.13	2.63	3.94

Tested Storage Configuration Pricing *(Priced Storage Configuration)*

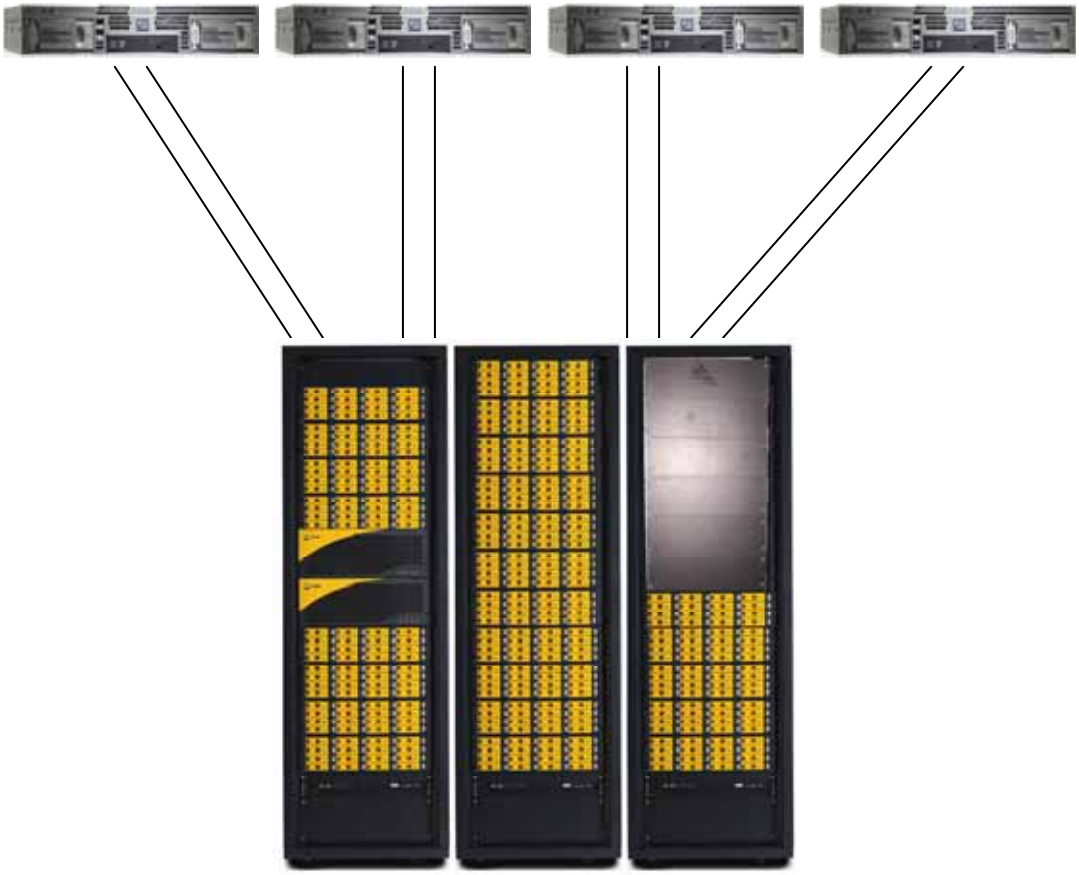
Item	Description	Quantity	Price
980-200013	2.33GHZ F-CLASS CONTROLLER NODE		
	(includes one 4-PORT FC ADAPTER FOR F-CLASS (4 GBIT/S) per node)	2	
980-200017	4GB CONTROL CACHE (2 x 2GB DIMMS) FOR F-CLASS	4	
980-200016	6GB DATA CACHE (3 x 2GB DIMMS) FOR F-CLASS	4	
980-200014	2-PORT FIBRE CHANNEL ADAPTER FOR F-CLASS (4 GBIT/S)	8	
980-200012	INSERV F400 BASE CONFIGURATION		
	(includes two 4-PORT FC ADAPTER FOR F-CLASS (4 GBIT/S))	1	
981-200018	DRIVE CHASSIS (16-DISK, 4GBIT/S)	24	
983-200028	DAISY CHAIN CONNECTOR FOR DRIVE CHASSIS (16-DISK, 4 GBIT/S)	24	
981-200019	4 x 146GB SINGLE-DRIVE MAGAZINES (15K, 4 GBIT/S)	96	
982-200000	2M FIBER CABLE 50/125 (LC-LC)	16	
982-0021	10M FIBER CABLE 50/125 (LC-LC)	32	
982-0023	50M FIBER CABLE 50/125 (LC-LC)	8	
982-200012	2M BASE CABINET FOR F400	1	
982-200013	2M EXPANSION CABINET KIT (WITH REDUNDANT PDU PAIR) FOR F-CLASS	2	
982-0014	REGIONAL KIT, NORTH AMERICA	3	
985-0001	SERVICE PROCESSOR	1	
987-200181	INFORM SUITE (F400) - 4 x 146GB 15K RPM MAGAZINES LTU	96	
985-200222	INSTALLATION AND SET-UP 4 NODES F-CLASS, CABINET	1	
985-200239	HW MAINT 24X7 4HR RESP, PRICE PER NODE FOR 4 NODES F-CLASS	4	
985-200248	INFORM SUITE SW MAINT, PRICE PER NODE FOR 4 NODES F-CLASS	4	
	3PAR InServ F400 Storage Server Package --Includes 3-years Service (24x7 4-Hour Response)		**$ 544,863.80**
QLE2462	Qlogic QLE2462 PCI-EXPRESS Host Bus Adapter	4	**$ 3,568.00**
	Total		**$ 548,431.80**

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

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

Benchmark Configuration/Tested Storage Configuration Diagram

HS 1/2/3/4
Sun Fire X2200 M2 Servers
4 – 4 Gb/s Dual Port HBAs
(1 per server)



SC 1/2/3/4
3PAR InServ® F400 Storage Server
24 GB Data Cache, 16 GB Control Cache
4 – 4 Gb/s QuadPort FC Adapters
8 – 4 Gb/s DualPort FC Adapters
(4 adapters – front-end, 4 adapters – backend)
384 – 146.8 GB 15K RPM Disks

Benchmark Configuration/Tested Storage Configuration Components

Host Systems:	Tested Storage Configuration (TSC):
UID=HS-1/2/3/4	4 – QLE2462 4Gb dual port HBAs *(1 per server)*
4 – Sun Fire X2200 M2 Servers	***UID=SC-1/2/3/4:*** 3PAR InServ® F400 Storage Server 4 – F-Class Controller Nodes 24 GB data cache 16 GB control cache 4 – 4Gb DualPort FC Adapters *(2 ports/adapter used for front-end)* 4 – 4Gb DualPort FC Adapters *(2 ports/adapter used for backend)* 4 – 4Gb QuadPort FC Adapters *(4 ports/adapter used for backend)*
Each server with: 2 – 2.8 GHZ dual core AMD Opteron processors each core with 64 KB I-cache, 64 KB D-cache and1 MB L2 cache	
8192 MB main memory	
Solaris 10 10/08	
PCIe	
WG	2 – 2M Expansion Cabinet Kits
	384 – 146.8 GB, 15K RPM disk drives