SPC BENCHMARK 1™

EXECUTIVE SUMMARY

PILLAR DATA SYSTEMS

PILLAR AXIOM 600 SERIES 3

SPC-1 V1.12

Submitted for Review: April 19, 2011

Submission Identifier: A00104

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	V1.12
SPC-1 Workload Generator revision number	V2.1.0
Date Results were first used publicly	April 19, 2011
Date the FDR was submitted to the SPC	April 19, 2011
Date the priced storage configuration is available for shipment to customers	currently available
Date the TSC completed audit certification	April 18, 2011

Tested Storage Product (TSP) Description

As the first and only storage system to provide system wide Quality of Service (QoS) management across multiple tiers of storage and user controlled I/O prioritization, the Axiom 600 makes an ideal platform for SLA driven private clouds and/or public Hosted and Managed Service Providers. The Axiom, finally breaking the legacy First In First Out (FIFO) I/O queuing model that has inhibited the ability to service I/O requests based on business value vs. which I/O request just happened to get issued first, allows for the perfect alignment of system resources to the importance of an application. This unique ability provides for fully deterministic performance under any multi-tenanted load condition thus insuring that SLA's are met regardless of what other activity is going on.

The Axiom 600: Providing stability in a chaotic world, performance when and where it matters; all without over provisioning or administrative micro-management of your storage system.

Summary of Results

| SPC-1 Reported Data	
Tested Storage Product (TSP) Name: Pillar Axiom 600 Series 3	
Metric	**Reported Result**
SPC-1 IOPS™	70,102.27
SPC-1 Price-Performance	$7.32/SPC-1 IOPS™
Total ASU Capacity	32,000.000 GB
Data Protection Level	Protected *(Mirroring)*
Total TSC Price (including three-year maintenance)	$513,112

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** using *Mirroring* configures two or more identical copies of user data.

Storage Capacities and Relationships

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.
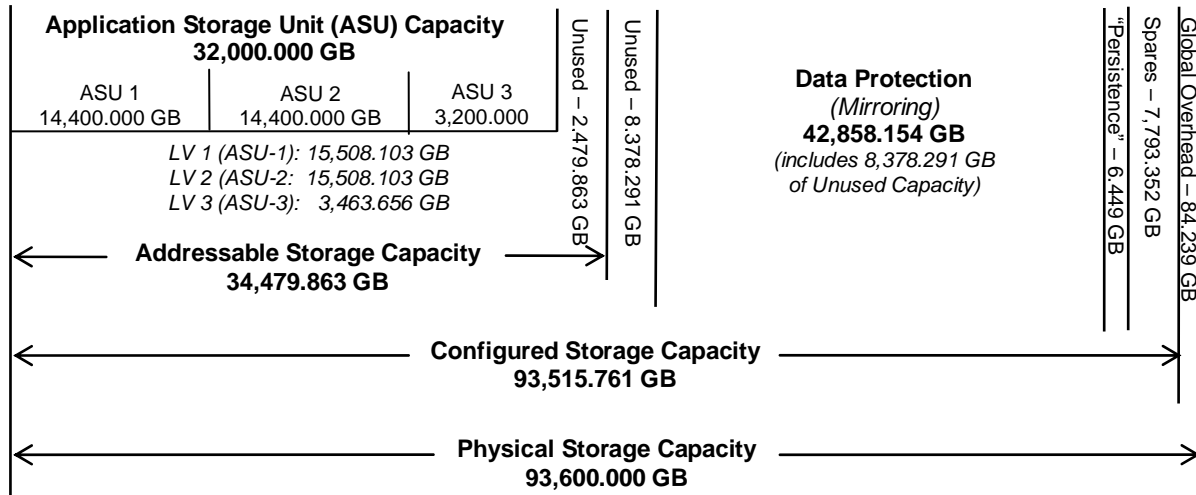
SPC-1 Storage Capacity Utilization	
Application Utilization	34.19%
Protected Application Utilization	71.03%
Unused Storage Ratio	20.55%

Application Utilization: Total ASU Capacity *(32,000.000 GB)* divided by Physical Storage Capacity *(93,600.000 GB)*

Protected Application Utilization: (Total ASU Capacity *32,000.000 (GB)* plus total Data Protection Capacity *(42,858.154 GB)* minus unused Data Protection Capacity *(8,378.291 GB)* divided by Physical Storage Capacity *(93,600.000 GB)*

Unused Storage Ratio: Total Unused Capacity *(19,236.445 GB)* divided by Physical Storage Capacity *(93,600.000 GB)* and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 19-20 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.
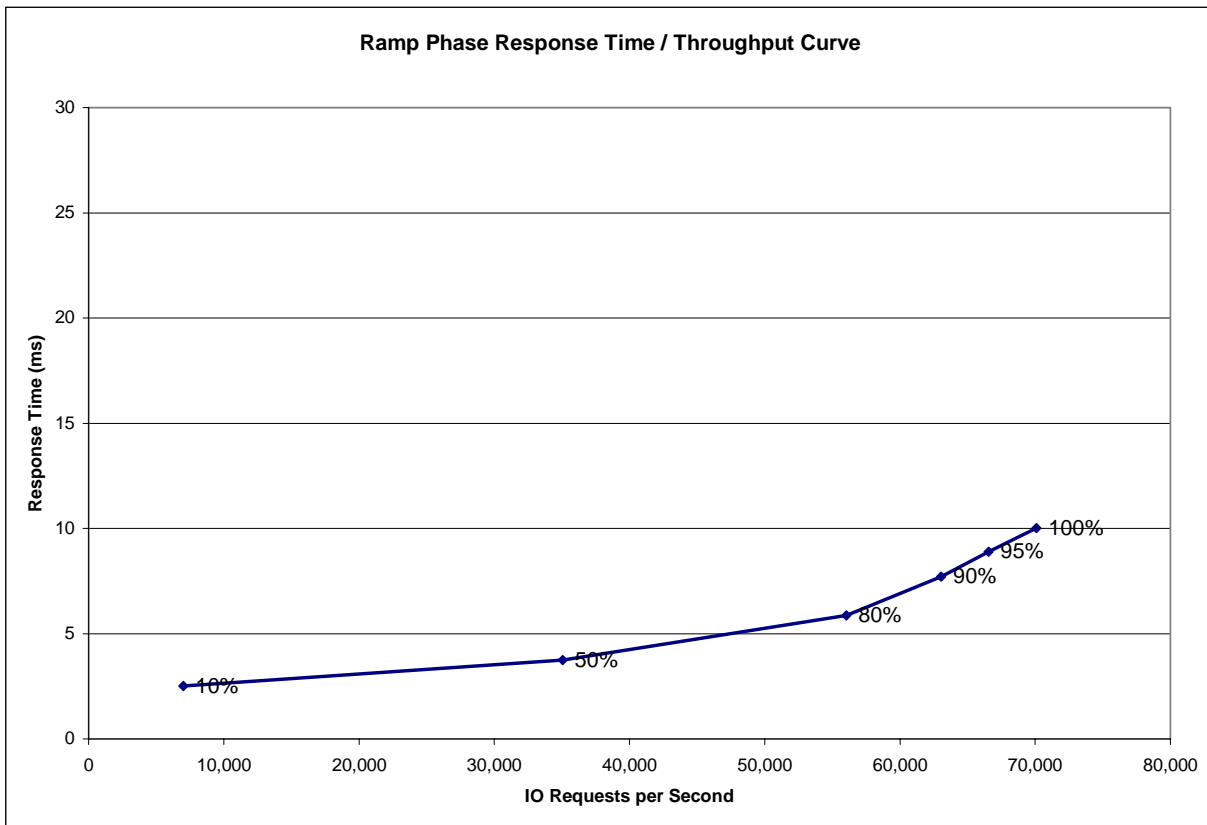
Response Time – Throughput Data

	10% Load	50% Load	80% Load	90% Load	95% Load	100% Load
I/O Request Throughput	7,004.68	35,050.15	56,036.80	63,035.33	66,551.77	70,102.27
Average Response Time (ms):						
All ASUs	2.53	3.75	5.87	7.71	8.90	10.02
ASU-1	3.32	4.87	7.50	9.62	10.96	12.24
ASU-2	3.07	4.72	8.07	10.93	12.73	14.68
ASU-3	0.61	0.93	1.46	2.25	2.88	3.29
Reads	5.50	8.13	12.72	16.20	18.26	20.47
Writes	0.59	0.89	1.41	2.18	2.81	3.22

Priced Storage Configuration Pricing

Description	Quantity	Unit Price	Extended Price	Unit Price	List Extended Price
Axiom 600 8Gb FC SAN Slammer Series 3	2	$ 18,000	$ 36,000	$ 55,000	$ 110,000
2U PILOT,GEN 3,HSF	1	$ 4,290	$ 4,290	$ 7,800	$ 7,800
Brick,FCV2,12x300GB,15K RPM Drives,HSF	26	$ 15,000	$ 390,000	$ 35,000	$ 910,000
2 Slammer Cable Kit	1	$ -	$ -	$ 2,300	$ 2,300
Optical Cable Kit, K2 Brick Installation	26	$ -	$ -	$ 600	$ 15,600
CABINET ASM,42U WITH RAILS,RITTAL,ROHS	2	$ 2,310	$ 4,620	$ 4,300	$ 8,600
ASM,PDU W/ MOUNTING BRACKETS,30A,ROHS	4	$ 573	$ 2,292	$ 1,042	$ 4,168
CBL,PWR,15 FT,NEMA L6-30P,220V,30A,RoHS	4	$ 110	$ 440	$ 200	$ 800
AxiomONE Storage Services Manager and Operating System	1	$ 17,400	$ 17,400	$ 44,500	$ 44,500
AxiomONE Software - Pooled RAID 10	1	$ -	$ -		
AxiomONE Software - Wide Stripe	1	$ -	$ -		
AxiomONE Software - SNMP Protocol	1	$ -	$ -		
AxiomONE Software - FCP Protocol	1	$ -	$ -		
AxiomONE Software Path Management for Windows, Linux, Solaris, HPUX, AIX	1	$ -	$ -		
Axiom 500/600 Software Subscription & Support (3 year)			$ 14,418		$ 19,224
Axiom 500/600 Four Hour Parts Delivery (3 year)			$ 32,272		$ 100,387
QLE2562, x4 PCIe, 8Gb, Dual Port, FC HBA	1	$ 1,490	$ 1,490	$ 1,490	$ 1,490
BRCD,BR-360-0008-A,360,24P,FULL FAB, 8G SWL SFPs,EGM,90 Days Adv Rplcmnt(-A)Srv&Spt	1	$ 7,105	$ 7,105	$ 11,842	$ 11,842
Brocade 300-SVS-4OS-3, 4HR Onsite Support,BR-300,3 Year	1	$ 2,785	$ 2,785	$ 3,094	$ 3,094
TOTAL			**$ 513,112**		**$ 1,239,805**

Discount   58.61%

The above pricing includes a generally available discount of 58.61%.
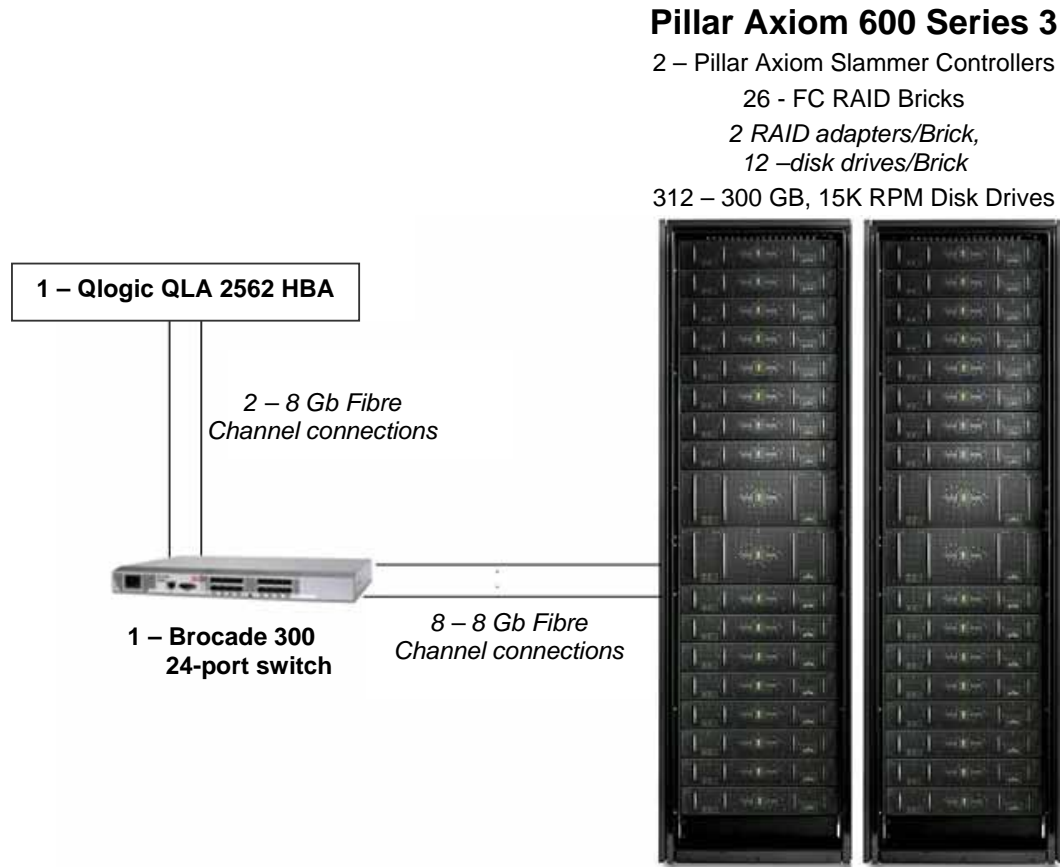
The above pricing includes hardware maintenance and software support for three years, 7 days per week, 24 hours per day. The hardware maintenance and software support provides the following:

- Acknowledgement of new and existing problems with four (4) hours.

- Onsite present 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 Price 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 the Priced Storage Configuration.

Priced Storage Configuration Diagram

Pillar Axiom 600 Series 3

2 – Pillar Axiom Slammer Controllers

26 - FC RAID Bricks

2 RAID adapters/Brick,
12 –disk drives/Brick

312 – 300 GB, 15K RPM Disk Drives

1 – Qlogic QLA 2562 HBA

2 – 8 Gb Fibre
Channel connections

1 – Brocade 300
24-port switch

8 – 8 Gb Fibre
Channel connections

Priced Storage Configuration Components

Priced Storage Configuration Components:
1 – QLA2462 2 port, 8Gb Fibre Channel HBA
Pillar Axiom 600 Series 3   Dual active/active data mover and manager   24 GB cache/controller *(48 GB total)*   8 – 8Gb FC front-end connections/controller *(16 total)*   8 – 4Gb FC backend connections/controller *(16 total)* *all configured disk drives are accessible by each controller* *and by each backend connection*
1 – Brocade 300 24-port switch

26- FC RAID Bricks
     2 – RAID adapters per Brick
     12 – 300 GB, 15K RPM disk drives per Brick
         (312 disk drives total)