SPC BENCHMARK 1™

EXECUTIVE SUMMARY

SUN MICROSYSTEMS, INC.

SUN STORAGE 6180 ARRAY

SPC-1 V1.11

Submitted for Review: October 9, 2009
Submission Identifier: A00084
Revised: August 4, 2010

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

Test Sponsor and Contact Information	
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Revision Information and Key Dates

Revision Information and Key Dates	
SPC-1 Specification revision number	V1.11
SPC-1 Workload Generator revision number	V2.1.0
Date Results were first used publicly	October 9, 2009
Date the FDR was submitted to the SPC	October 9, 2009

Date revised FDR was submitted to the SPC
  Revised Total TSP Price and SPC-1 Price-Performance *(page 3)*
  Revised pricing *(page5)*
  Revised TSC/Priced Storage Configuration differences *(page 6)*
  Revised Priced Storage Configuration component table (*page 7)*
   (revisions highlighted in **red** *on the above pages)*
	August 4, 2010

Date the priced storage configuration is available for shipment to customers	currently available
Date the TSC completed audit certification	October 9, 2009

Tested Storage Product (TSP) Description

The Sun Storage 6180 Array is a modular, rack mountable and scalable array designed specifically to grow with your applications, lowering acquisition and expansion costs. The NEBS Level-3 certified Sun Storage 6180 Array offers 8 gigabits-per-second (Gb/sec) Fibre Channel (FC) host interfaces designed for both direct attached and SAN attached storage. The system features a fully redundant architecture with drive intermixing (FC or SATA-II disk drives) in the same drive enclosure, leverages the existing Common Storage Modules (CSM200) expansion trays for primary and secondary storage requirements. With redundant components, automated path failover and extensive online configuration, re-configuration, dynamic expansion and maintenance capabilities, the Sun Storage 6180 Array is designed to ensure your data is available 24x7x365.

Summary of Results

| SPC-1 Results	
Tested Storage Configuration (TSC) Name: Sun Storage 6180 Array	
Metric	**Reported Result**
SPC-1 IOPS™	26,090.03
SPC-1 Price-Performance	$4.37/SPC-1 IOPS™
Total ASU Capacity	5,145.060 GB
Data Protection Level	Protected *(Mirroring)*
Total TSC Price (including three-year maintenance)	$114,042

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.
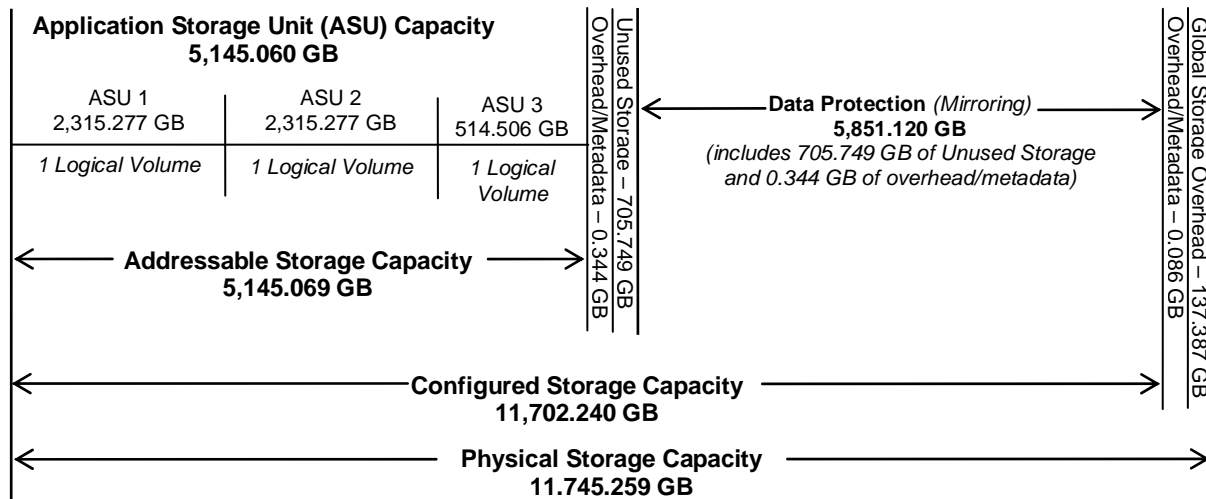
SPC-1 Storage Capacity Utilization	
Application Utilization	43.81%
Protected Application Utilization	87.61%
Unused Storage Ratio	12.02%

Application Utilization: Total ASU Capacity *(5,145.060 GB)* divided by Physical Storage Capacity *(11,745.259 GB)*

Protected Application Utilization: (Total ASU Capacity *(5,145.060 GB)* plus total Data Protection Capacity *(5,851.120GB)* minus unused Data Protection Capacity *(705.749 GB)*) divided by Physical Storage Capacity *(GB)*

Unused Storage Ratio: Total Unused Capacity *(1,411.507 GB)* divided by Physical Storage Capacity *(11,745.259 GB)* and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages **Error! Bookmark not defined.**-**Error! Bookmark not defined.** 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.
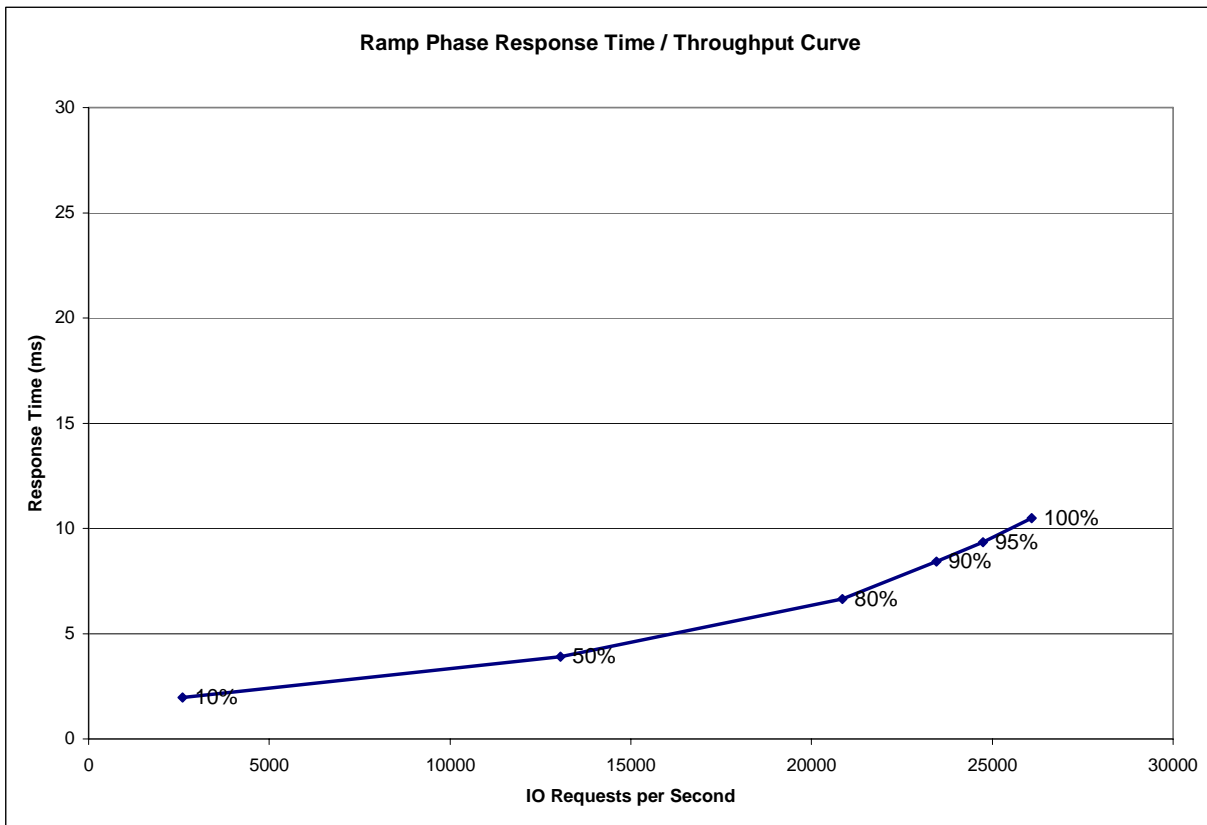
Response Time – Throughput Data

	10% Load	50% Load	80% Load	90% Load	95% Load	100% Load
I/O Request Throughput	2,602.65	13,053.24	20,850.35	23,457.23	24,747.16	26,090.03
Average Response Time (ms):						
All ASUs	1.97	3.91	6.64	8.44	9.35	10.49
ASU-1	2.63	5.09	8.13	9.95	10.82	11.91
ASU-2	2.40	5.20	11.59	16.58	19.09	21.99
ASU-3	0.38	0.83	1.32	1.65	1.98	2.45
Reads	4.47	8.71	14.92	18.97	20.82	23.02
Writes	0.34	0.78	1.26	1.57	1.89	2.33

Tested Storage Configuration Pricing *(Priced Storage Configuration)*

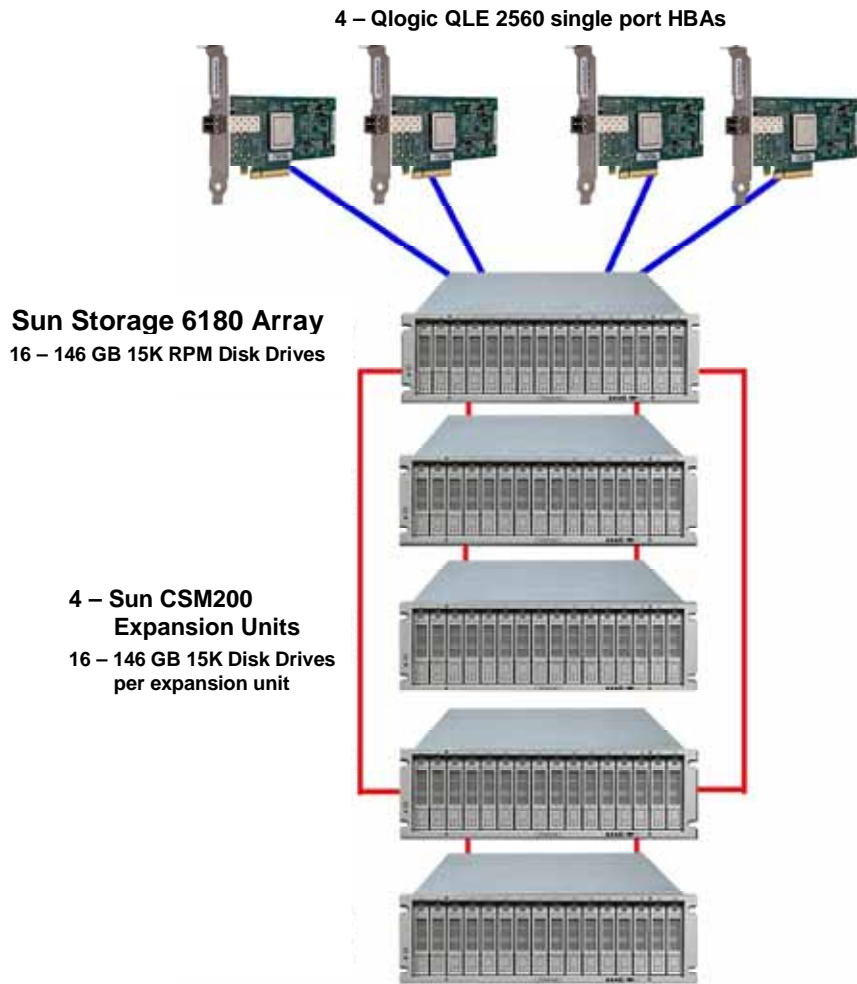| Part Number	Description	Quantity	US List	Total	discount	Ave. Price
TB6180R11A2-0	Sun Storage 6180 array with 4GB cache and 4 * FC host ports, Rack-Ready Controller Tray - Diskless Chassis, 0GB, 0 drives; Includes: 2 * 2GB-cache memory FC RAID Controller cards, 2 * redundant AC power supplies and cooling fans, 2 * FC ports for expansion trays and 4 * 8 Gb/s host ports with shortwave SFPs, 2 * 5M fibre optic cables, 2 * 6M ethernet cables and management software. RoHS-5.	1	$23,995	$23,995	38%	$14,877
XTCCSM2R01A0C2336Z	RoHS-5, Sun StorageTek (tm) CSM200, Rack-Ready Expansion Tray, 336GB, 16 * 146GB 15Krpm 4Gb FC-AL Drives, 2 * I/O Modules, 2 * redundant AC power supplies and cooling fans, 2 * FC ports for expansions, 4 * shortwave SFPs with 2 * LC-LC FC cables. (Standard Configuration)	4	$29,915	$119,660	38%	$74,189
XTC-FC1CF-146G15K	RoHS-6, Sun StorageTek (tm) 6140 array / CSM200, 146GB 15Krpm FC-AL drive	16	$1,495	$23,920	38%	$14,830
X9733A-Z	5M LC-LC Fiber Optic cable	2	$80	$160	38%	$99
SG-XPCIE1FC-QF8-Z	Qlogic single port QLE25620 with SFPs	4	$1,249	$4,996	38%	$3,098
IWU-61804G4P-24-3G	3-yr Gold Service Maintainance for controller tray	1	$3,689	$3,689	38%	$2,287
	- 7/24 coverage					
	- 4 hour resonse time					
IWU-STCSM2-24-3G	- 4 hour resolution					
	3-yr Gold Service Maintainance for CSM200 expansion tray	4	$1,880	$7,520	38%	$4,662
	- 7/24 coverage					
	- 4 hr response time					
	- 4 hour resolution					
				$183,939		$114,042

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

The differences between the TSC and Priced Storage Configuration consisted of the following:

- TSC was configured with 8 host ports *(4 standard, 4 optional)* of which only the 4 standard host ports were used in the audited measurements. The 4 optional host ports, included in the TSC, were not included in the Priced Storage Configuration.

- The TSC was configured with twenty 4 Gbps SFPs, of which sixteen were used. The Priced Storage Configuration included only the required sixteen SFPs.

The above differences, if applied to the TSC, would not have a negative impact on the reported SPC-1 performance.

Priced Storage Configuration Diagram

4 – Qlogic QLE 2560 single port HBAs

Sun Storage 6180 Array

16 – 146 GB 15K RPM Disk Drives

**4 – Sun CSM200
 Expansion Units**

**16 – 146 GB 15K Disk Drives
 per expansion unit**

Priced Storage Configuration Components

Priced Storage Configuration:
4 – Qlogic QLE2560 single port HBAs
SC-1/SC-2: Sun Storage 6180 Array
2 – dual-active controllers with:
2 GB cache per controller *(4 GB total)*
2 – 8 Gb Fibre Channel front-end connections per controller *(4 total, 4 used)*
4 – 8 Gb shortwave SFPs
4 – 5m LC-LC fibre optic cables
4 – 4 Gb Fibre Channel backend connection *(4 used)*
4 – Sun CSM200 expansion unit   each with 4 shortwave SFPs *(4 Gb)* and 2 LC-LC fibre optic cables
80 – 146 GB 15K RPM 15K.6 disk drives *(16 in controller unit, 16 per expansion unit)*

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