SPC BENCHMARK 2™

EXECUTIVE SUMMARY

SUN MICROSYSTEMS, INC.

SUN STORAGE 6780 ARRAY *(8 Gb, RAID-5)*

SPC-2™ V1.3

Submitted for Review: October 28, 2009
Submission Identifier: B00047
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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

Revision Information and Key Dates	
SPC-2 Specification revision number	V1.3
SPC-2 Workload Generator revision number	V1.0
Date Results were first used publicly	October 28, 2009
Date FDR was submitted to the SPC	October 28, 2009
Date the revised FDR was submitted to the SPC All revisions highlighted in red on the pages listed below: Revised pricing and components list *(page 6)* Revised Total Price and SPC-2 Price-Performance *(page 3)* Revised TSC and Priced Storage Configuration differences *(page 6)* Revised Priced Storage Configuration Components table (page 7)	March 12, 2010
Date the TSC will be available for shipment to customers	June 19, 2009
Date the TSC completed audit certification	October 26, 2009

Tested Storage Product (TSP) Description

The Sun Storage 6780 Array is a modular, rack mounted and scalable array designed specifically to grow with your applications, lowering acquisition and expansion costs. and when requirements change, the The Sun Storage 6780 array consists of a minimum of one controller tray and up to 28 expansion trays. The Sun Storage 6780 controller tray (1 x 1) has three cache options — 8 GB, 16 GB or 32* GB (32 GB available Q3 CY2009) – and two host port options – 8 or 16 – 8 Gb per second fibre channel.

The Sun Storage 6780 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 and maintenance capabilities, the Sun Storage 6780 is designed to ensure your data is available 24x7x365.

SPC-2 Reported Data

SPC-2 Reported Data consists of three groups of information:

- The following SPC-2 Primary Metrics, which characterize the overall benchmark result:
  - SPC-2 MBPS™
  - SPC-2 Price Performance
  - Application Storage Unit (ASU) Capacity
- Supplemental data to the SPC-2 Primary Metrics.
  - Total Price
  - Data Protection Level
- Reported Data for each SPC Test: Large File Processing (LFP), Large Database Query (LDQ), and Video on Demand Delivery (VOD) Test.

SPC-2 Reported Data				
Sun Storage 6780 Array *(8Gb, RAID-5)*				
SPC-2 MBPS™	**SPC-2 Price-Performance**	**ASU Capacity (GB)**	**Total Price**	**Data Protection Level**
5,634.17	$47.03	16,383.186	$264,999	RAID-5
The above SPC-2 MBPS™ value represents the aggregate data rate of all three SPC-2 workloads: Large File Processing (LFP), Large Database Query (LDQ), and Video On Demand (VOD)				
SPC-2 Large File Processing (LFP) Reported Data				
	Data Rate *(MB/second)*	**Number of Streams**	**Data Rate per Stream**	**Price-Performance**
LFP Composite	5,103.53			$51.92
Write Only:				
1024 KiB Transfer	3,656.81	48	76.18	
256 KiB Transfer	3,673.48	48	76.53	
Read-Write:				
1024 KiB Transfer	5,222.36	48	108.80	
256 KiB Transfer	5,268.17	48	109.75	
Read Only:				
1024 KiB Transfer	6,400.83	48	133.35	
256 KiB Transfer	6,399.56	48	133.32	
The above SPC-2 Data Rate value for LFP Composite represents the aggregate performance of all three LFP Test Phases: (Write Only, Read-Write, and Read Only).				
SPC-2 Large Database Query (LDQ) Reported Data				
	Data Rate *(MB/second)*	**Number of Streams**	**Data Rate per Stream**	**Price-Performance**
LDQ Composite	6,293.96			$42.10
1024 KiB Transfer Size				
4 I/Os Outstanding	6,341.07	48	132.11	
1 I/O Outstanding	6,392.32	48	133.17	
64 KiB Transfer Size				
4 I/Os Outstanding	6,301.35	48	131.28	
1 I/O Outstanding	6,141.12	48	127.94	
The above SPC-2 Data Rate value for LDQ Composite represents the aggregate performance of the two LDQ Test Phases: (1024 KiB and 64 KiB Transfer Sizes).				
SPC-2 Video On Demand (VOD) Reported Data				
	Data Rate *(MB/second)*	**Number of Streams**	**Data Rate per Stream**	**Price-Performance**
	5,505.00	7,000	0.79	$48.14

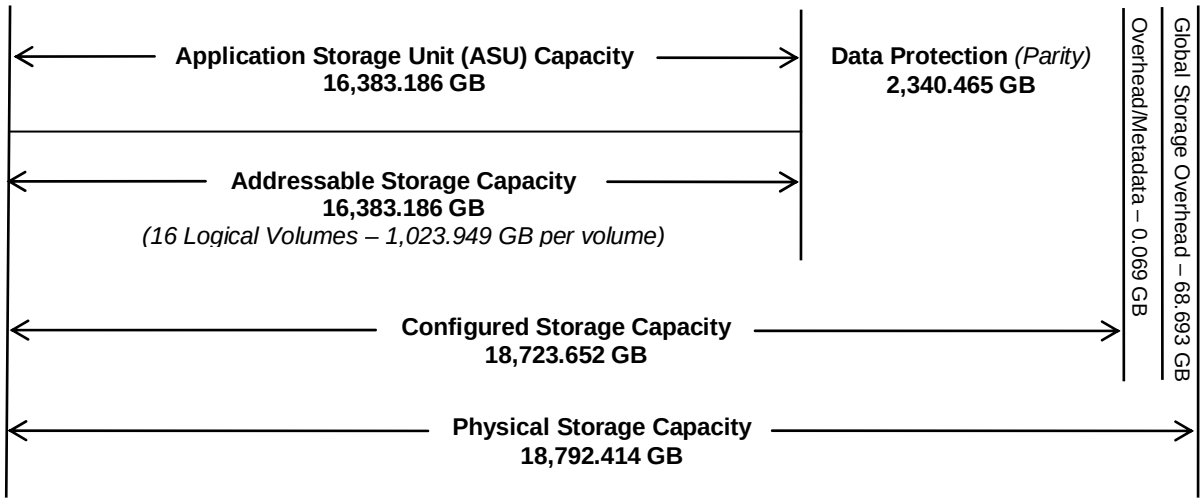
SPC-2 MBPS™ represents the aggregate data rate, in megabytes per second, of all three SPC-2 workloads: Large File Processing (LFP), Large Database Query (LDQ), and Video on Demand (VOD).

ASU (Application Storage Unit) **Capacity** represents the total storage capacity read and written in the course of executing the SPC-2 benchmark.

A **Data Protection Level** of **Protected** using ***RAID-5*** provides data protection by distributing check data corresponding to user data across multiple disks in the form of bit-by-bit parity.

Storage Capacities and Relationships

The following diagram *(not to scale)* 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	87.18%
Protected Application Utilization	99.63%
Unused Storage Ratio	0.00%

Application Utilization: Total ASU Capacity *(16,383.186 GB)* divided by Physical Storage Capacity *(18,792.414 GB)*.

Protected Application Utilization: (Total ASU Capacity *(16,383.186 GB)* plus total Data Protection Capacity *(2,340.465 GB)* minus unused Data Protection Capacity *(0.000 GB)* divided by Physical Storage Capacity *(18,792.414 GB)*.

Unused Storage Ratio: Total Unused Capacity *(0.000 GB)* divided by Physical Storage Capacity *(18,792.414 GB)* and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 22-23 in the Full Disclosure Report.

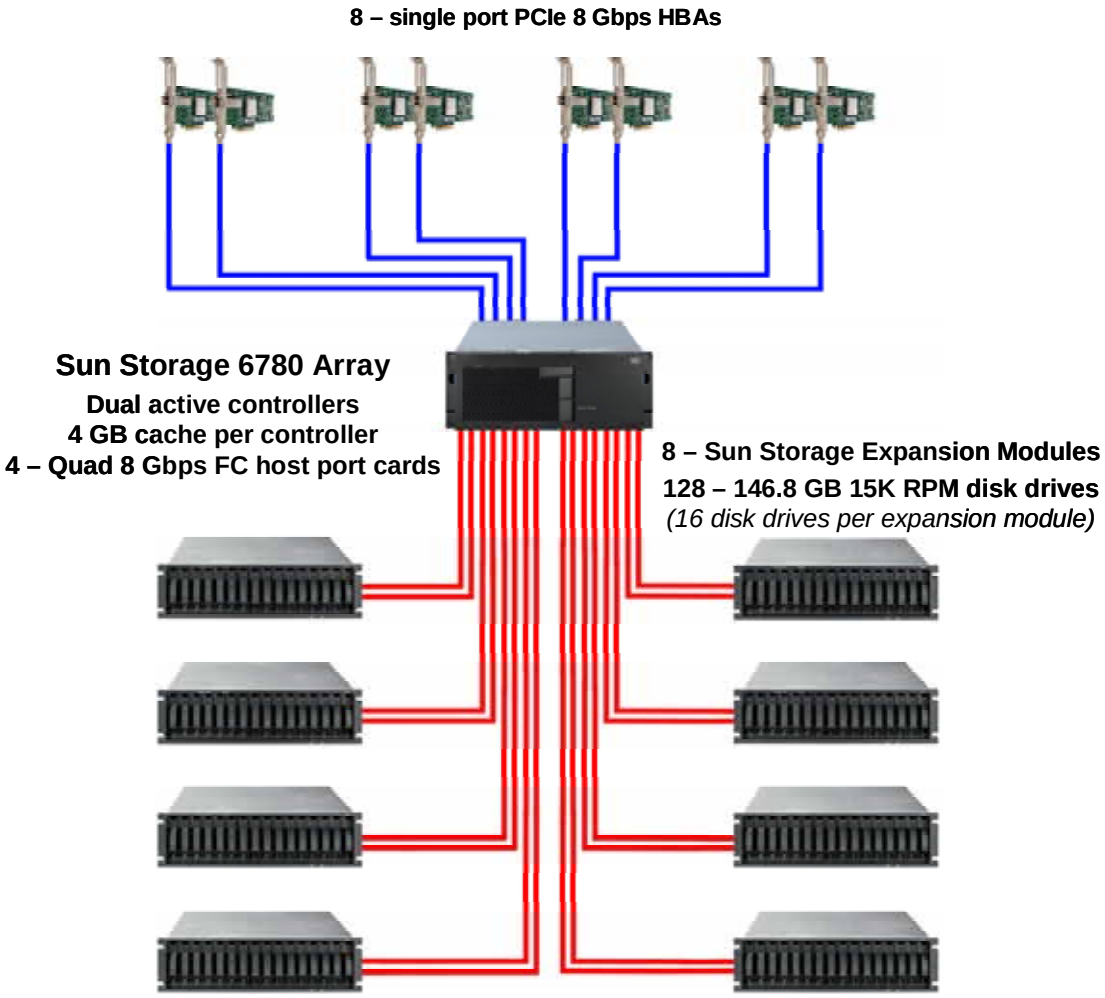
Priced Storage Configuration Pricing

Part Number	Description	Quantity	US List	Total	discount	Ave. Price
XTA6780R11D8EA2-08	Sun Storage 6780 Array, 1x1, 8 GB, 8x8Gb/s FC Host ports	1	$107,495	$107,495	38%	$66,647
	- 2 Controllers w/ 4GB cache each					
	- 2 Quad 8 Gbps FC host port cards					
	- 8 x 8Gb/s FC SFPs included					
	- 2 x 5M LC-LC Fiber Optic cables included					
	- CAM Management Software included					
XTA6780HIC-D8F-UPG	2 Quad 8 Gbps FC host port cards	1	$37,895	$37,895	38%	$23,495
	- 8 x 8Gb/s FC SFPs included					
X9733A-Z	5M LC-LC Fiber Optic cable	6	$80	$480	38%	$298
XTCCSM2R01A0C2336Z	STK CSM200 RM 0x1x16x146G15k	8	$29,915	$239,320	38%	$148,378
	- 16 146GB 15k rpm 4Gb drives					
	- 2 x 5M LC-LC Fiber Optic cables included					
	- 4 x 4Gb/s FC SFPs included					
SG-XPCIE1FC-QF8-Z	8Gb PCIe single port FC Host Based Adapter	8	$1,249	$9,992	38%	$6,195
XTCTIER2-BASE16	16 Storage Domains	1	$7,495	$7,495	38%	$4,647
IWU-ST6780-6-24-3G	3-yr Gold Service Maintainance for controller tray	1	$9,700	$9,700	38%	$6,014
	- 7/24 coverage					
	- 4 hour resonse time					
	- 4 hour resolution					
IWU-STCSM2-24-3G	3-yr Gold Service Maintainance for CSM200 expansion tray	8	$1,880	$15,040	38%	$9,325
	- 7/24 coverage					
	- 4 hr response time					
	- 4 hour resolution					
				$427,417		**$264,999**

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

The differences between the TSC and Priced Storage Configuration were in the quantity of 8 Gbps and 4 Gbps SFPs in each configuration. The TSC was configured with 8 of the 8 Gbps SFPs, which were all used, and 48 of the 4 Gbps SFPs of which 32 were used. The Priced Storage Configuration included 16 of the 8 Gbps SFPs and 32 of the 4 Gbps SFPs.

Priced Storage Configuration Diagram



Priced Storage Configuration Components

Priced Storage Configuration:
8 – single port 8Gb PCIe FC HBAs
SC-1/SC-2: Sun Storage 6780 Array **dual-active controllers with:** 4 GB cache per controller *(8 GB total)* 8 – 8 Gb Fibre Channel front-end connections per controller *(16 total, 8 used – 4 per controller)* 8 – 4 Gb Fibre Channel backend connection per controller*(16 total, 16 used)*
4 – Quad 8 Gbps FC Host Port cards with 16 SFPs *(8 Gbps)*
8 – Sun Storage Expansion Modules with 4 SFPs *(4 Gbps)* per module
128 – 146.8 GB 15K RPM disk drives *(16 disk drives per expansion module)*