SPC Benchmark 2™
Executive Summary

Oracle Corporation
Sun ZFS Storage 7420 Appliance

SPC-2™ V1.3

Submitted for Review: April 12, 2012
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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

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SPC-2 Specification revision number	V1.3
SPC-2 Workload Generator revision number	V1.0
Date Results were first used publicly	April 12, 2012
Date FDR was submitted to the SPC	April 12, 2012
Date the TSC will be available for shipment to customers	currently available
Date the TSC completed audit certification	April 12, 2012

Tested Storage Product (TSP) Description

The Sun ZFS Storage appliances are Oracle's preferred storage appliance for Enterprise Tier 1 environments. The Sun ZFS Storage 7420 Appliance offers innovations in storage, including fully-integrated enterprise class data services, hybrid columnar compression support for Oracle Database, and exceptional performance, all while delivering significant cost savings. These systems feature a common, easy-to-use management interface that requires no additional training, and have the industry's most comprehensive analytics environment to help isolate and resolve issues to minimize impact to your business.

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.

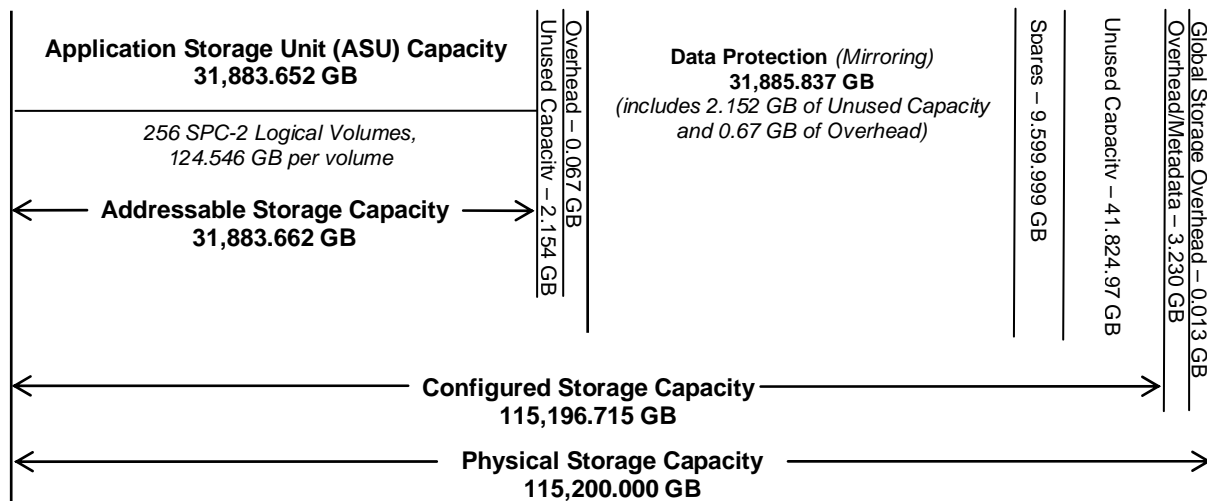| SPC-2 Reported Data				
Sun ZFS Storage 7420 Appliance				
SPC-2 MBPS™	**SPC-2 Price-Performance**	**ASU Capacity (GB)**	**Total Price**	**Data Protection Level**
10,703.69	$35.24	31,883.652	$377,225.38	Protected *(Mirroring)*
The above SPC-2 MBPS™ value represents the aggregate data rate of all three 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	8,457.39			$44.60
Write Only:				
1024 KiB Transfer	6,120.33	256	23.91	
256 KiB Transfer	3,418.79	256	13.35	
Read-Write:				
1024 KiB Transfer	8,985.03	256	35.10	
256 KiB Transfer	4,673.62	256	18.26	
Read Only:				
1024 KiB Transfer	13,721.68	256	53.60	
256 KiB Transfer	13,824.88	256	54.00	
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	13,036.53			$28.94
1024 KiB Transfer Size				
4 I/Os Outstanding	14,284.67	256	55.80	
1 I/O Outstanding	13,963.39	256	54.54	
64 KiB Transfer Size				
4 I/Os Outstanding	11,247.98	256	43.94	
1 I/O Outstanding	12,650.06	256	49.41	
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**
	10,617.15	13,500	0.79	$35.53

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

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	27.68%
Protected Application Utilization	55.35%
Unused Storage Ratio	36.31%

Application Utilization: Total ASU Capacity *(31,883.653 GB)* divided by Physical Storage Capacity *(115,200.000 GB)*

Protected Application Utilization: Total ASU Capacity *(31,883.653 GB)* plus total Data Protection Capacity *(31,883.652 GB)* minus unused Data Protection Capacity *(2.152 GB)* divided by Physical Storage Capacity *(115,200.000 GB)*.

Unused Storage Ratio: Total Unused Capacity *(41,829.278 GB)* divided by Physical Storage Capacity *(115,200.000 GB)* and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 23-24 in the Full Disclosure Report.

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

The TSC was configured with dual-ported HBAs with one port per HBA in use for the SPC-2 measurements. The Priced Storage Configuration substituted single port HBAs for the dual-ported HBAs. That difference, if applied to the TSC, would not have a measureable impact on the reported SPC-2 performance data.
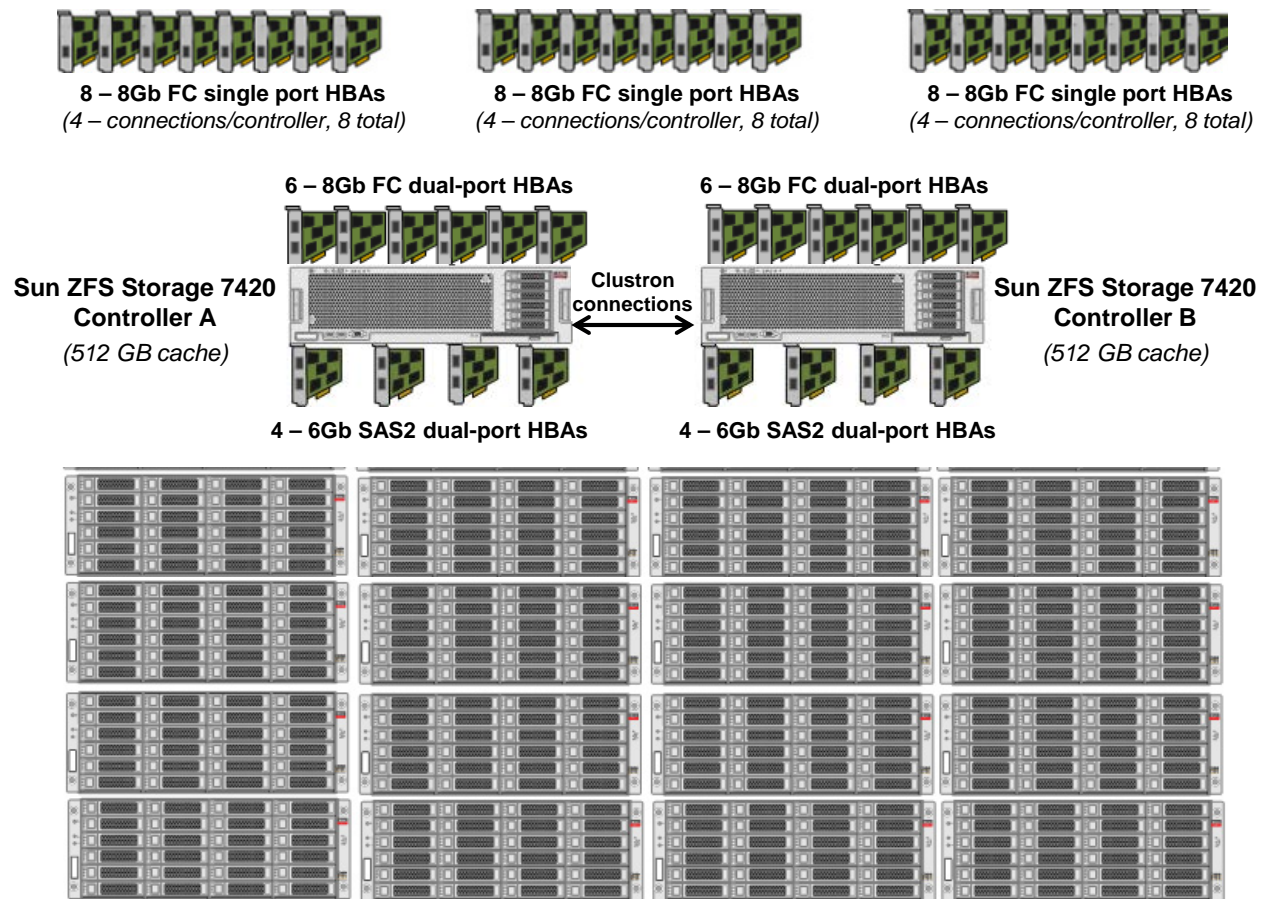
Priced Storage Configuration Pricing

Part Number	Description	Quantity	US List	Total List	Discount	Net Price
TA7420-28A-HA	Sun ZFS Storage 7420: controller for cluster configuration with 2 Intel(R) Xeon(R) X7550 8-core 2.0 GHz processors and 2 SAS- 2 HBAs (for factory installation)	2	$24,493	$48,986	40.00%	$29,392
8505A	Sun Fire X4470 server: 16 GB memory kit with two 8 GB 1066 MHz DDR3 DIMMs (for factory installation)	64	$799	$51,136	20.00%	$40,909
SG-PCIE2FC-QF8-Z	StorageTek 8 Gb Fibre Channel PCIe HBA dual port QLogic (for factory Installation - includes SFPs)	12	$2,399	$28,788	40.00%	$17,273
SG-PCIESAS-GEN2-Z	SAS PCIE 6Gbs dual port	4	$679	$2,716	40.00%	$1,630
TA-2.0M-SAS	2m, Mini, shielded, SAS cable	8	$150	$1,200	40.00%	$720
2350A	Two 8-DIMM riser card (for factory installation)	4	$499	$1,996	20.00%	$1,597
2342A	2x Intel® Xeon® X7550 8-Core 2.00 GHz CPUs (for factory installation)	2	$10,699	$21,398	20.00%	$17,118
SR-JUMP-1MC13	Power cord: Sun Rack 2 jumper, 1 meter, C14RA plug, C13 connector, 13 A (for factory installation)	4	$29	$116	40.00%	$70
DS2-0BASE	Sun disk shelf: base chassis with 2 SAS-2 I/O modules, 2 AC PSUs and 2 cooling fans (for factory installation)	16	$4,905	$78,480	40.00%	$47,088
DS2-4URK-19U	Sun disk shelf: universal rail kit for 19-inch depth racks (for factory installation)	16	$230	$3,680	40.00%	$2,208
7101274	300GB 15K RPM disk	384	$411	$157,824	40.00%	$94,694
SR-JUMP-1MC13	Power cord: Sun Rack 2 jumper, 1 meter, C14RA plug, C13 connector, 13 A (for factory installation)	32	$29	$928	40.00%	$557
SR-1242-N	Sun Rack II, 42U, 1200mm depth, 600mm width, empty shipping only (do not install product inside the rack while it is on this pallet)	2	$2,149	$4,298	20.00%	$3,438
SR-10K-L630-N	Sun Rack II 10kVA PDU, Single Phase, 48 Supplied Amps Max, NEMA L6-30P on 4m captive cords, Data Center Two 30A NEMA L6-30R (30A breakers), 42 C13 and 6 C19 Outlets in 6 Groups, Current Metering.	2	$900	$1,800	20.00%	$1,440
SR-JUMPKIT-N	Jumper Cable Start Up Kit: qty 10 of 1 meter C13 plugs + qty 10 of 2 meter C13 plugs + qty 2 1 meter C19 plugs + Qty 2 2meter C19 plugs	2	$198	$396	20.00%	$317
SG-XPCIE1FC-QF8-N	Sun StorageTek 8 Gb FC PCIe Host Bus Adapter, Single Port Includes Standard and Low Profile Brackets, Low Profile Form Factor, QLogic, RoHS-6 Compliant (includes SFP)	24	$1,249	$29,976	40.00%	$17,986
X9732A-Z-N	2M LC to LC FC Optical Cable RoHS-6 compliant	24	$65.00	$1,560	40.00%	$936
	Oracle Premium Support for Systems: 1-Year 7/24, 2 hour response time.	3		$156,700		$99,854
	TOTALS			*$591,978*		**$377,225**

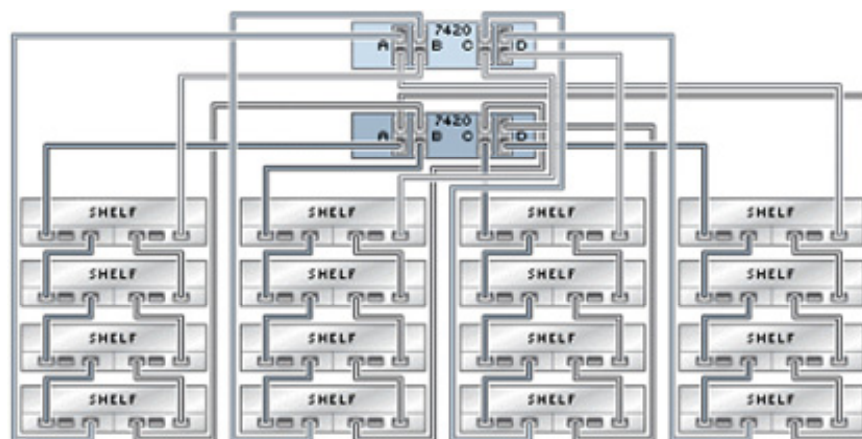The following pricing includes the following:

- Acknowledgement of new and existing hardware and/or software problems within two hours.

- Onsite presence of a qualified maintenance engineer or provision of a customer replaceable part within four hours of the above acknowledgement for any hardware failure that results in an inoperative Priced Storage Configuration component.

Priced Storage Configuration Diagram

8 – 8Gb FC single port HBAs
(4 – connections/controller, 8 total)

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(4 – connections/controller, 8 total)

6 – 8Gb FC dual-port HBAs   **6 – 8Gb FC dual-port HBAs**

Sun ZFS Storage 7420   Clustron   **Sun ZFS Storage 7420**
Controller A   connections   **Controller B**
(512 GB cache)   *(512 GB cache)*

4 – 6Gb SAS2 dual-port HBAs   **4 – 6Gb SAS2 dual-port HBAs**

Oracle Sun ZFS Storage 7420 Appliance
384 – 300 GB, 15K RPM SAS Disk Drives

Back-end SAS wiring diagram

Priced Configuration Components

Priced Storage Configuration Components:
24 – Sun StorageTek 8Gb Fibre Channel PCIe single port HBAs *(includes SFPs)*

Oracle Sun ZFS Storage 7420 Appliance
   2 – Sun ZFS 7420 controllers *(cluster configuration)*
      512 GB cache/memory per controller *(1024 GB total)*
  12 – Sun StorageTek 8Gb Fibre Channel dual-port PCIe HBAs *(includes SFPs)*
   8 – dual-ported SAS-2 HBAs
  24 – 8 Gb FC front-end connections *(12 used)*
  16 – SAS-2 backend connections *(16 used)*

24 – 2m LC to LC FC Optical Cables RoHS-6 compliant
8 – 2m, Mini, shielded, SAS cables
2 – Sun Rack II, 42U with 10KVA PDU, single phase
16 – Sun disk shelf: base chassis   each with 2 SAS-2 IO modules, 2 AC PSUs and 2 cooling fans
384 – 300 GB 15K RPM SAS-2 disk drives