



ORACLE

**SPC BENCHMARK 1™
EXECUTIVE SUMMARY**

**ORACLE CORPORATION
ORACLE SUN ZFS STORAGE 7420C APPLIANCE**

SPC-1 V1.12

Submitted for Review: October 1, 2011

Submission Identifier: A00108

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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-1 Specification revision number	V1.12
SPC-1 Workload Generator revision number	V2.1.0
Date Results were first used publicly	October 1, 2011
Date the FDR was submitted to the SPC	October 1, 2011
Date revised FDR was submitted to the SPC Appendix C was revised to more clearly document the TSC creation and configuration process.	November 30, 2011
Date the Priced Storage Configuration is available for shipment to customers	January 1, 2012
Date the TSC completed audit certification	October 1, 2011

Tested Storage Product (TSP) Description

Oracle's Sun ZFS Storage Appliances are Oracle's leading solution for NAS environments. Sun ZFS Storage Appliances provides high performance and enterprise class stability for business critical cloud computing, virtualization, storage consolidation, data protection and fixed media serving applications, with unique advantages for environments built on Oracle databases, middleware and applications. Sun ZFS Storage appliances leverage a deeply integrated performance-based architecture, rich data services and powerful and user friendly management and analytics tools to enable extreme performance of the storage system, easily adapt to changing business conditions and radically simplify storage management. Sun ZFS Storage Appliances deliver additional economic value bundled data services such as file and block-level protocols including connectivity over InfiniBand, Compression, Deduplication, Thin provisioning, DTrace Analytics, Virus Scan, Snapshots, Triple Mirror, Triple Parity RAID, Phone-home, NDMP, Clustering, etc. As a unified platform, ZFS Storage Appliances can simultaneously optimize NAS and SAN workloads with a broad set of protocol and connectivity options to support consolidation initiatives.

Summary of Results

SPC-1 Reported Data	
Tested Storage Product (TSP) Name: Oracle Sun ZFS Storage 7420c Appliance	
Metric	Reported Result
SPC-1 IOPS™	137,066.20
SPC-1 Price-Performance	\$2.99/SPC-1 IOPS™
Total ASU Capacity	23,703.035 GB
Data Protection Level	Protected (<i>Mirroring</i>)
Total TSC Price (including three-year maintenance)	\$409,933

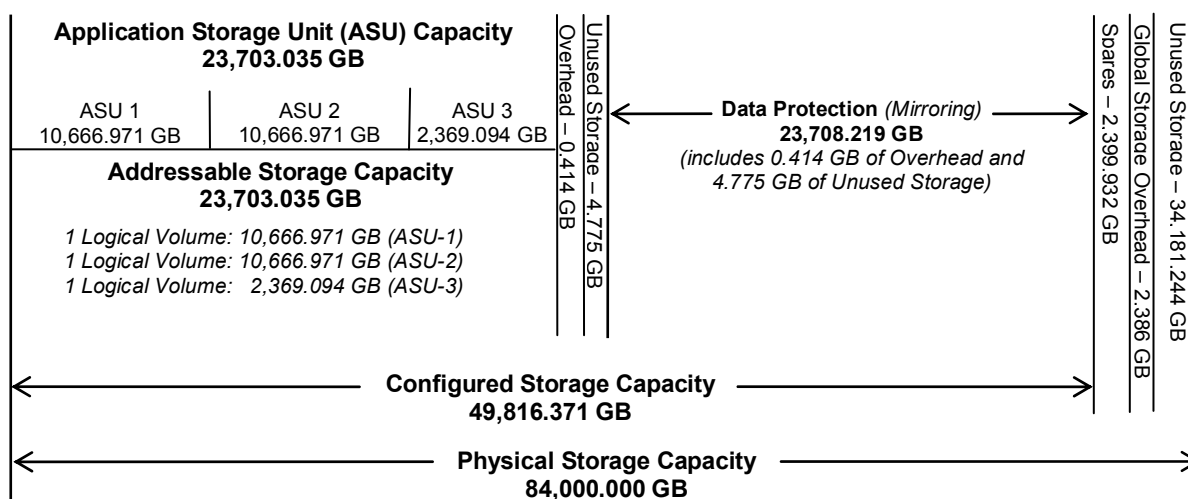
SPC-1 IOPS™ represents the maximum I/O Request Throughput at the 100% load point.

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

Storage Capacities, Relationships, and Utilization

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	28.22%
Protected Application Utilization	56.44%
Unused Storage Ratio	40.70%

Application Utilization: Total ASU Capacity (23,703.035 GB) divided by Physical Storage Capacity (84,000.000 GB)

Protected Application Utilization: (Total ASU Capacity (23,703.035 GB) plus total Data Protection Capacity (23,708.219 GB) minus unused Data Protection Capacity (4.744 GB) divided by Physical Storage Capacity (84,000.000 GB)

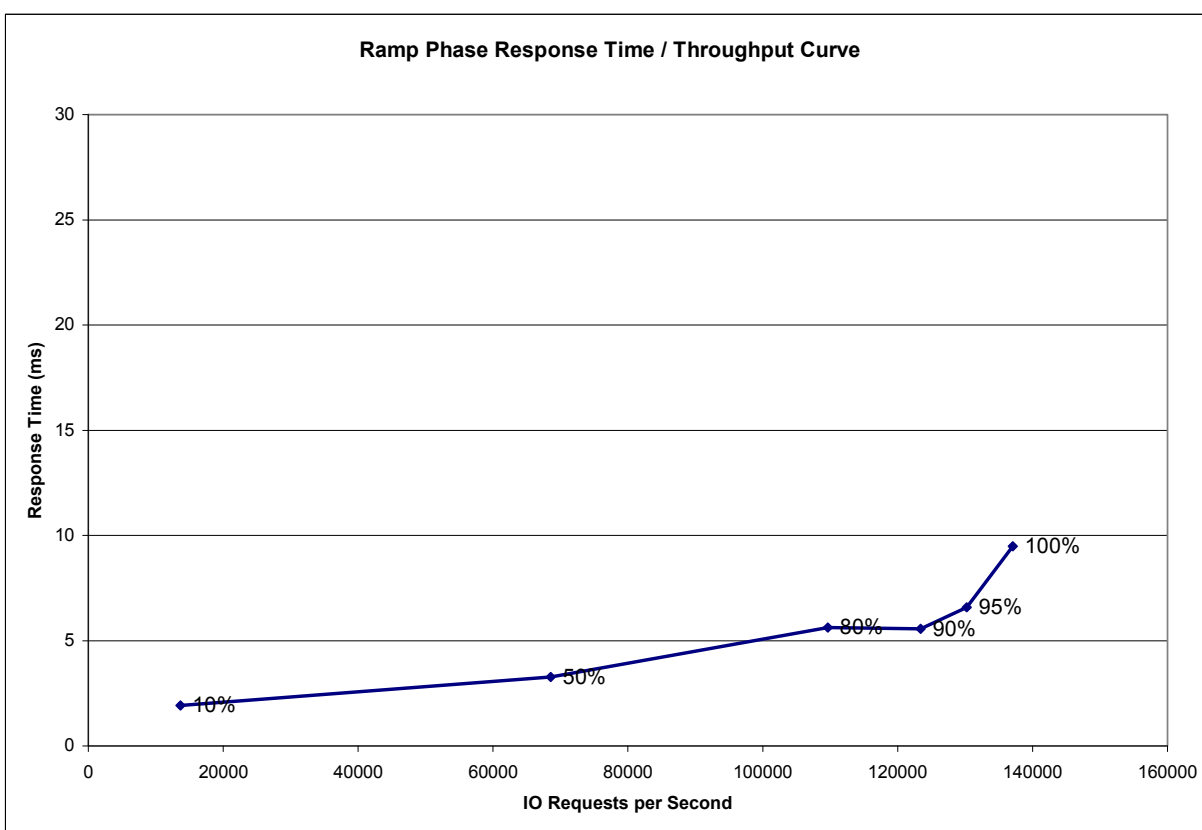
Unused Storage Ratio: Total Unused Capacity (34,191.732 GB) divided by Physical Storage Capacity (84,000.000 GB) and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 21-22 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	13,702.49	68,542.59	109,651.91	123,355.14	130,194.51	137,066.20
Average Response Time (ms):						
All ASUs	1.91	3.26	5.62	5.57	6.60	9.48
ASU-1	2.17	3.69	5.98	6.07	6.98	10.15
ASU-2	2.86	5.24	8.52	9.05	10.54	15.28
ASU-3	0.95	1.49	3.58	2.98	4.06	5.53
Reads	2.17	4.05	6.31	6.95	8.13	12.14
Writes	1.75	2.75	5.17	4.66	5.59	7.75

Priced Storage Configuration Pricing

Part Number	Description	Quantity	US List	Total	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	30%	\$34,290
8505A	Sun Fire X4470 server: 16 GB memory kit with two 8 GB 1066 MHz DDR3 DIMMs (for factory installation)	64	\$799	\$51,136	30%	\$35,795
TA7000-READZ512	one 512 GB SATA SSD 2.5-inch read-flash accelerator with silver marlin bracket (for factory installation)	8	\$3,732	\$29,856	30%	\$20,899
SG-PCIE2FC-QF8-Z	StorageTek 8 Gb Fibre Channel PCIe HBA dual port QLogic (for factory Installation - includes SFPs)	12	\$2,399	\$28,788	30%	\$20,152
SG-PCIESAS-GEN2-Z	SAS PCIE 6Gbs 8 port	4	\$679	\$2,716	30%	\$1,901
TA-2.0M-SAS	2m, Mini, shielded, SAS cable	8	\$150	\$1,200	30%	\$840
2350A	Two 8-DIMM riser card (for factory installation)	4	\$499	\$1,996	30%	\$1,397
2342A	2x Intel® Xeon® X7550 8-Core 2.00 GHz CPUs (for factory installation)	2	\$10,699	\$21,398	30%	\$14,979
333A-25-15-NEMA	Power cord: North America and Asia, 2.5 meters, 5-15P plug, C13 connector, 15 A (for factory installation)	4	\$13	\$52	30%	\$36
DS2-0BASE	Sun disk shelf: base chassis with 2 SAS-2 I/O modules, 2 AC PSUs and 2 cooling fans (for factory installation) Includes two 0.5M, Mini, shielded SAS cables	12	\$4,905	\$58,860	30%	\$41,202
DS2-4URK-19U	Sun disk shelf: universal rail kit for 19-inch depth racks (for factory installation)	12	\$230	\$2,760	30%	\$1,932
7101274	300GB 15K RPM disk	280	\$411	\$115,080	30%	\$80,556
7101197	one SLC SAS-2 SSD 3.5-inch write-flash accelerator with stingray bracket (for factory installation)	8	\$6,536	\$52,288	30%	\$36,602
333A-25-15-NEMA	Power cord: North America and Asia, 2.5 meters, 5-15P plug, C13 connector, 15 A (for factory installation)	24	\$13	\$312	30%	\$218
SG-XPCIE2FC-QF8-N	Sun StorageTek 8 Gb FC PCIe Host Bus Adapter, Dual Port Includes Standard and Low Profile Brackets, Low Profile Form Factor, QLogic, RoHS-6 Compliant (includes SFPs)	6	\$2,399	\$14,394	30%	\$10,076
X9732A-Z-N	2M LC to LC FC Optical Cable RoHS-6 compliant	12	65.00	\$780	30%	\$546
	Oracle Premium Support for Systems: 1-Year 7/24, 2 hour response time.	3		\$155,017	30%	\$108,512
				\$585,619		\$409,933

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:

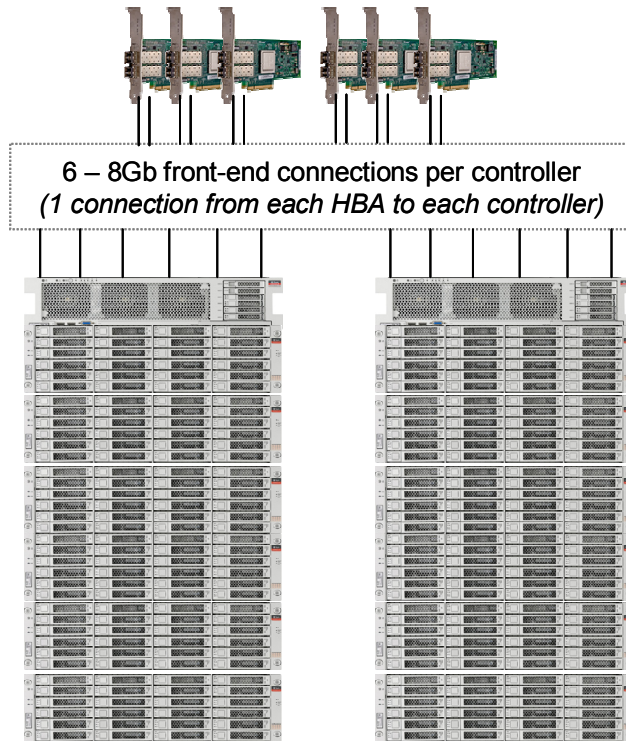
- Acknowledgement of new and existing problems with four (4) hours.
- Onsite presence of a qualified maintenance engineer or provision of a customer replaceable part within four (4) hours of the above acknowledgement for any hardware failure that results in an inoperative Priced Storage Configuration 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

The Tested Storage Configuration included two (2) power distribution units, with associated power cables, and racking for the controllers and disk shelves. Those components were not included in the Priced Storage Configuration. Those components had no influence on the reported performance of the Tested Storage Configuration.

Priced Storage Configuration Diagram

6 – dual-port 8 Gb FC HBAs



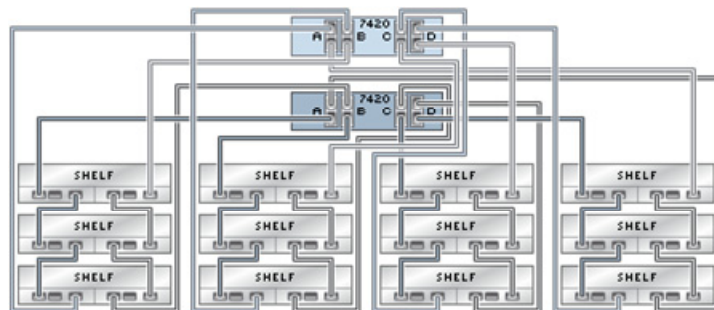
Oracle Sun ZFS Storage 7420c Appliance

(see Priced Storage Configuration Components table for details)

Rear View - Connections

Controller A: 8 – SAS-2 backend connections

Controller B: 8 – SAS-2 backend connections



Priced Storage Configuration Components

Priced Storage Configuration Components:
6 – Sun StorageTek 8Gb Fibre Channel PCIe HBAs <i>(includes SFPs)</i>
Oracle Sun ZFS Storage 7420c Appliance
2 – Sun ZFS 7420 controllers <i>(cluster configuration)</i> 512 GB cache/memory per controller <i>(1024 GB total)</i>
12 – Sun StorageTek 8Gb Fibre Channel PCIe HBAs <i>(includes SFPs)</i> 8 – dual-ported SAS-2 HBAs 8 – 512 GB Solid State Devices <i>(read cache SSDs, 4096 GB total)</i> 8 – 73 GB Solid State Devices <i>(write cache SSDs, 584 GB total)</i>
24 – 8 Gb FC front-end connections <i>(12 used)</i> 16 – SAS-2 backend connections <i>(16 used)</i>
12 – 2m LC to LC FC Optical Cables RoHS-6 compliant
8 – 2m, Mini, shielded, SAS cables
12 – Sun disk shelf: base chassis each with 2 SAS-2 IO modules, 2 AC PSUs and 2 cooling fans
280 – 300 GB 15K RPM SAS-2 disk drives

Note: All HBAs include the required SFPs.