ORACLE ZFS STORAGE APPLIANCE

KEY FEATURES

- Unparalleled integration with Oracle Database
- Optimal storage architecture for enterprise cloud and virtualization
- Dynamic caching between DRAM, flash cache and disk drives
- World record performance in SPC-2[1] benchmark
- Most efficient and economical storage
- Inline data services including compression, deduplication, clones and replication
- Ethernet, Infiniband, and Fibre Channel connectivity
- Advanced, intuitive management and analysis tools

KEY BENEFITS

- Maximize return on Oracle software investments
- Reduced headcount per gigabyte under management
- Extreme performance
- High availability
- Superior price per performance and price per gigabyte
- Lower TCO than competitive systems

Oracle's premier application engineered storage for multiprotocol environments delivers extreme performance, superior efficiency for VM and Cloud storage environments and deep Oracle integration. The Oracle ZFS Storage Appliance is designed to run applications faster and more efficiently, increase business and IT productivity, save valuable resources and reduce risk – lowering total cost of ownership. Further, co-development with Oracle Database maximizes your return on Oracle software investment

Extreme Enterprise Storage Performance

The Oracle ZFS Storage Appliance is based on an advanced hardware and software architecture, including a highly intelligent multithreading storage OS that makes the most of modern enterprise hardware, enabling you to run multiple workloads and advanced data services without performance detriment. Its unique Hybrid Storage Pool architecture automatically caches data on dynamic random access memory (DRAM) or flash to provide optimal performance and exceptional efficiency, while ensuring that data remains safely stored on reliable and high capacity hard-disk drive (HDD) storage. This enables heavily-accessed data to be served mostly from cache for extremely high performance without spindle speed limitations, while securing and storing data on cost-effective HDDs. High-availability features such as active-active controller clustering for failover, a self-healing file system architecture that ensures end-to-end data integrity, and a rich set of enterprise-class data services make the Oracle ZFS Storage Appliance an ideal choice for enterprise storage. Furthermore, the aggressive price point makes it extremely attractive to employ in environments where extreme performance and superior efficiency are required.
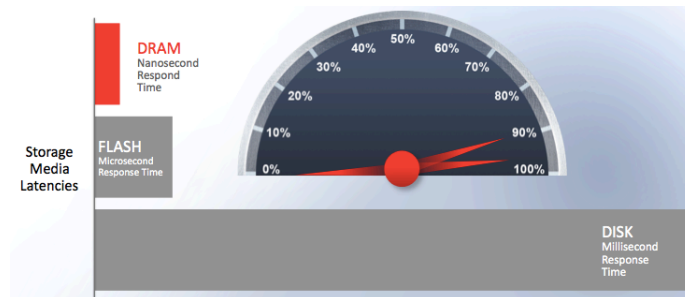

Figure 1. DRAM-Centric architecture

As proof of exceptional performance in varied workloads, Oracle publishes high results in many industry-standard public benchmarks[2].

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[1] Results as of June 25, 2014, for more information go to http://www.storageperformance.org/results SPC-2. Results for Oracle ZFS Storage ZS3-4 are 16,212.66 SPC-2 MBPS™, $12.08 SPC-2 Price-Performance. Full results are available at http://www.storageperformance.org/results/benchmark_results_spc2#BE00002

Superior Efficiency

The Oracle ZFS Storage Appliance features an advanced set of management tools that allow storage administrators to provision and manage storage in less time than is possible with competitors' systems[3]. Rapidly deploying powerful advanced data services such as snapshots, clones, thin provisioning, four different compression algorithms, and replication is possible via the intuitive browser user interface (BUI) or the command line interface (CLI).
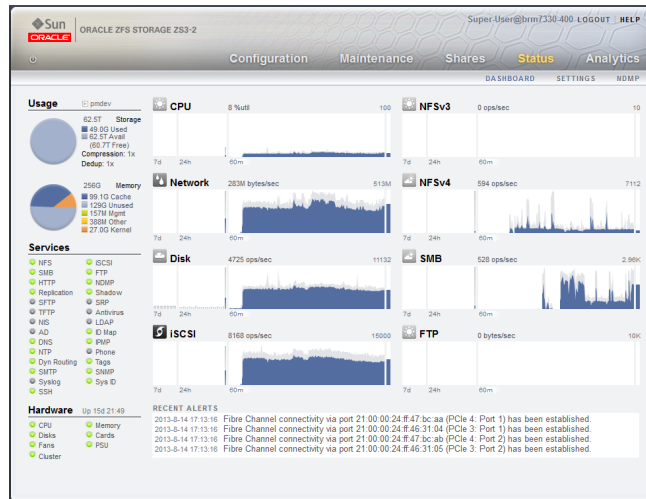

Figure 2. Status view of management software

The DTrace Analytics feature of Oracle ZFS Storage Appliance provides real-time analysis and monitoring functionality, enabling unparalleled fine-grained visibility into disk, controller CPU, networking, cache, virtual machine and other statistics, in a way that uniquely ties client network interface activity back to the disks with everything in between.
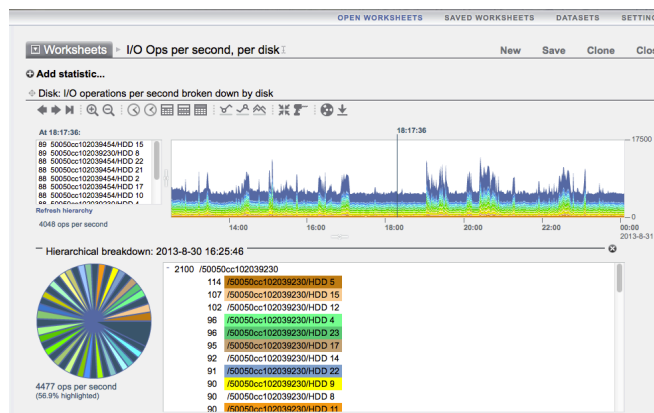

Figure 3. DTrace Analytics example showing I/O Ops per second, per disk

This level of visibility supports rapid identification and resolution of bottlenecks for overall IT system performance tuning and troubleshooting, particularly in large-scale virtual server environments. The Oracle ZFS Storage Appliance management efficiency has a positive and tangible resource impact, evident in Oracle IT testing and independent studies: the Oracle ZFS Storage Appliance improves headcount per gigabyte under management metrics by speeding administrative tasks, resulting in significant operational cost savings.

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Oracle Integration

The Oracle ZFS Storage Appliance offers deep integration with Oracle Database to dramatically reduce risk and increase efficiencies. Through engineering, developing, testing and supporting hardware and software together, Oracle storage delivers unique advantages to ensure Oracle software runs fastest and most efficiently on Oracle storage. Co-engineered with Oracle software and with countless documented solutions and best practices, Oracle ZFS Storage Appliance removes guesswork from configuring the total system for success.

- **Oracle Snap Management Utility for Oracle Database**
  The Oracle Snap Management Utility for Oracle Database is a standalone management tool engineered to work with the Oracle ZFS Storage Appliance. It provides database administrators with an efficient and automatic way to create logical backups, and restore, clone, and provision Oracle Database when one or more databases are stored on the Oracle ZFS Storage Appliance. The Oracle Snap Management Utility for Oracle Database reduces costs while increasing overall business productivity in demanding test/development environments, reducing product development cycles.

- **Management plug-ins for Oracle Enterprise Manager and Oracle Storage Connect**
  The plug-in for Oracle Enterprise Manager provides monitoring for all Oracle ZFS Storage Appliance models for end-to-end management visibility. The Oracle Storage Connect plug-in enables Oracle VM to provision and manage the Oracle ZFS Storage Appliance for streamlined virtualization implementation. These plug-ins enable easier implementation, better visibility and holistic management efficiencies.

- Oracle **Hybrid Columnar Compression**
  Enterprises running archival Oracle Database workloads for data warehousing or mixed workloads can achieve 10x to 50x reductions in their data volumes and they can accelerate queries by 3x to 8x by using Oracle Hybrid Columnar Compression on the Oracle ZFS Storage Appliance. Available only on Oracle storage, this capability helps you achieve 3x to 5x reductions in your storage footprint and associated data center costs.

- **Oracle Intelligent Storage Protocol**
  Exclusive to Oracle Database 12c and the ZFS Storage Appliance is the advanced communication path called Oracle Intelligent Storage Protocol. Oracle Intelligent Storage Protocol enables the storage to communicate with Oracle Database with greater insight and granularity than ever before. Oracle Database sends metadata to the Oracle ZFS Storage Appliance about each I/O, allowing the storage to intelligently process I/O and automatically and dynamically tune itself for optimal performance, enabling over 65% percent savings in manual administration time.
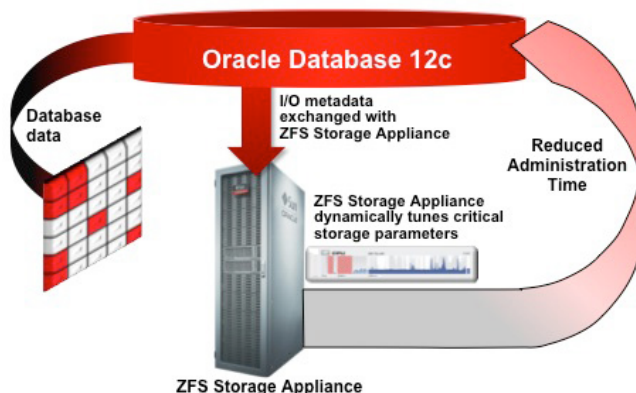

Figure 5. Oracle Database 12*c* and Oracle Intelligent Storage Protocol

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Virtualization and Cloud Integration

Virtualization and cloud workloads have fundamentally changed the stresses placed on storage subsystems. Traditional storage architectures that rely on disk spindles for performance (either conventional OR flash) are poorly designed to meet the challenge. Layer upon layer of abstraction, combined with highly consolidated infrastructure, can inadvertently overwhelm backend disk capabilities. Oracle ZS3 storage has a vastly superior design for these highly consolidated environments. Symmetric multiprocessing is part of the core OS, and has been for more than 20 years. Massive DRAM cache, and software that optimizes its use, allow up to 90% of I/O to come from the fastest possible medium - an order of magnitude faster than flash disks. This dramatic consolidation capability is complimented by fine-grained analytics capabilities that allow administrators to find and resolve issues on a per-VM basis.

Hardware Architecture and Configuration Options

The Oracle ZFS Storage Appliance is based upon three primary components:

- Software: A unique, intelligent storage OS with enterprise-class data services, robust data protection and Hybrid Storage Pool technology that manages the dynamic caching. DTrace Analytics is included in the base system.

- Controller: A robust, powerful storage controller based on cost effective, enterprise-grade Oracle x86 servers that contain the compute power, DRAM, and read flash. Optional dual-controller cluster configurations provide high availability with rapid failover.

- Storage: Enterprise grade disk enclosures that contain SAS hard disk drives and write flash accelerators for high performance, high availability persistent storage.

Two controller models are available:

- **Oracle ZFS Storage ZS3-2**: midrange enterprise multiprotocol storage system ideal for use in performance intensive workloads at an attractive price point

- **Oracle ZFS Storage ZS3-4**: high-end enterprise multiprotocol storage system for workloads demanding extreme performance and scalability at a price point that rivals competitors' midrange and high-end systems

Both models use the same intelligent storage OS and enterprise SAS disk enclosures, but feature different storage controllers to meet the appropriate level of performance required for particular environments.

Optional Software

In addition to the rich software suite included with the base system, remote replication, clones, and Oracle Snap Management Utility for Oracle Database are available as separately licensed software features.

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Oracle ZFS Storage Appliance Specifications		
	Oracle ZFS Storage ZS3-2	**Oracle ZFS Storage ZS3-4**
Architecture	Single controller or dual controller HA cluster with external disk shelf storage (stated specs assume active-active cluster)	Single controller or dual controller HA cluster with external disk shelf storage (stated specs assume active-active cluster)
Processor	4x 8-core 2.1 GHz Intel® Xeon® Processors	8x 10-core 2.4GHz Intel® Xeon® Processors
DRAM Cache	512 GB or 1 TB	2 TB
Read Flash Cache	0 - 12.8 TB	0 - 12.8 TB
Storage Configurations		
Configuration Options	• 6 TB to 1.5 PB scalability • Attach 1-16 disk shelves for storage • Choose 20 or 24 HDDs per disk shelf • If 20 HDDs, choose 0-4 SSD write accelerators per disk shelf	• 6 TB to 3.5 PB scalability • Attach 1-36 disk shelves for storage • Choose 20 or 24 HDDs per disk shelf • If 20 HDDs, choose 0-4 SSD write accelerators per disk shelf
Disk Shelf / HDD Options	• DE2-24C: 4 TB SAS-2 3.5" 7,200 RPM HDDs • DE2-24P: 300 GB / 900 GB SAS-2 2.5" 10,000 RPM HDDs	
Standard and Optional Interfaces		
Integrated network	8x 10Gb Base-T Ethernet ports	8x 1Gb Base-T Ethernet ports
Optional network connectivity	1 Gigabit Ethernet, 10 Gigabit Ethernet, QDR Infiniband HCA, 8Gb FC HBA, 16Gb FC HBA	
Optional tape backup HBA	Dual channel 8Gb/16Gb FC HBA	
Maximum ports per system		
1GbE/10GbE Base-T/10GbE Optical/IB/8Gb FC/16Gb FC	32/16/16/16/16/16	40/16/24/16/16/16
Environmental		
Non-operating temperature/humidity (standalone, non-rack system)	-40°C to 70°C (-40°F to 158°F), up to 93% relative humidity, non condensing	
Altitude (operating)	Up to 3000m, temperature is derated by 1C per 300m of elevation above 900m	
Regulations (Meets or Exceeds the Following Requirements)		
Safety	IEC 60950, UL/CSA 60950, EN60950, CB Scheme with all country differences	
RFI/EMI	FCC CFR 47 Part 15 Class A, EN 55022 Class A, EN 61000-3-2, EN 61000-3-3, EN 300-386	
Immunity	EN55024:1998+A1:2001:+A2:2003	

Power and Thermal			
Item Description		Typical	Maximum
Oracle ZFS Storage ZS3-2 (controller only)	Power (w)	379 w	889 w
	Thermal (BTU/hr)	1293 BTU/hr	3,032 BTU/hr
Oracle ZFS Storage ZS3-4 (controller only)	Power (w)	926 w	1741 w
	Thermal (BTU/hr)	3161 BTU/hr	7,988 BTU/hr
DE2-24C	Power (w)	469 w	699 w
	Thermal (BTU/hr)	1,600 BTU/hr	2,385 BTU/hr
DE2-24P	Power (w)	325 w	699 w
	Thermal (BTU/hr)	1,108 BTU/hr	2,385 BTU/hr
Note: The Oracle ZFS Storage ZS3-4 is compatible with 200-240VAC sources only. All other items listed above are compatible with 100-120 v AC or 200-240 v AC sources.			

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Physical Specifications		
Oracle ZFS Storage ZS3-2 (controller only)	Height	87 mm (3.43 in.)
	Width	445 mm (17.52 in.)
	Depth	527.8 mm (20.78 in.)
	Weight	18.5 kg (40.8 lbs.)
Oracle ZFS Storage ZS3-4 (controller only)	Height	129.85 mm (5.1 in)
	Width	436.5 mm (17.2 in.)
	Depth	732 mm (28.8 in.)
	Weight	38.5 kg (85 lbs) max
DE2-24C (fully loaded with drives)	Height	175 mm (6.89 in.)
	Width	483 mm (19 in.)
	Depth	630 mm (24.8 in.)
	Weight	46 kg (101.41 lb)
DE2-24P (fully loaded with drives)	Height	87.9 mm (3.46 in.)
	Width	483 mm (19 in.)
	Depth	630 mm (24.8 in.)
	Weight	24 kg (52.91 lb)

Oracle ZFS Storage Appliance Software	
Included Features	Details
Oracle Intelligent Storage Protocol	Oracle Database 12c sends metadata to the ZFS Storage Appliance about each I/O, enabling storage to dynamically tune itself for optimal performance
File system	Oracle Solaris ZFS (128-bit addressability)
File-level protocol	NFS v2/v3/v4, SMB1/2, HTTP, WebDAV, FTP/SFTP/FTPS
Block-level protocol	ISCSI, Fibre Channel, iSER, SRP, IP over InfiniBand, RDMA over InfiniBand
Data compression	Four distinct compression options to balance data reduction with performance for specific workloads
Hybrid Columnar Compression	3x to 5x reduction in storage footprint with existing Oracle Databases for **OLTP,** data warehousing, or mixed workloads
Data deduplication	Inline, block-level deduplication
Monitoring	DTrace Analytics (for system tuning and debugging); dashboard monitoring for key system performance metrics; plug-in available for Oracle Enterprise Manager
Automated serviceability	"Phone Home" capability with automatic case creation, configurable alerts
RAID	Striping, mirroring, triple-mirroring, single-parity RAID, double-parity RAID, triple-parity RAID, wide stripes
Remote management	HTTPS, SSH, SNMP v1/v2c, IPMI, RESTful API, OpenStack Cinder
Snapshots	Read only, restore, Microsoft Volume Shadow Copy Support (VSS)
Directory services	NIS, AD, LDAP
Data security	Checksum data and metadata, antivirus quarantine
Network services	NTP, DHCP, SMTP
Backup	NDMP v3/v4, ZFS NDMP
Local replication	Replication within same Oracle ZFS Storage Appliance configuration (single or cluster)

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Separately Licensed Features	Details
Clones	Writable snapshots
Remote replication	Replication from one Oracle ZFS Storage Appliance product to another. 1:N, N:1, manual, scheduled, or continuous
Oracle Snap Management Utility for Oracle Database	Fast, efficient, and automatic way to back up, restore, clone, and provision Oracle Database when one or more databases are stored on Oracle ZFS Storage Appliance

Oracle Support

Oracle Premier Support Services provides the complete system support you need to proactively manage your Oracle storage systems, with swift resolution and rapid-response hardware service when problems do arise, keeping your business information available 24/7.

With Oracle Advanced Customer Support Services, you get mission critical support with a focused support team, proactive guidance to tailor storage systems for optimal performance and increased competitiveness, and preventative monitoring to help you achieve high availability and optimized system performance.

For more information about Oracle Support and Oracle Advanced Customer Support Services, please speak with your Oracle representative or Oracle authorized partner, or visit http://www.oracle.com/support or http://www.oracle.com/acs

Oracle Upgrade Advantage Program

The upgrade advantage program (UAP) is a trade-in program that offers up-front discounts on new Oracle systems for the trade-in of older Oracle and Competitors' eligible systems. Oracle also provides free return shipping and free state-of-the-art recycling of the old system so you don't need to worry about the disposal of hazardous waste.

For more information about UAP go to:
http://www.oracle.com/us/products/servers-storage/upgrade-advantage-program/index.html

Contact Us

For more information about Oracle ZFS Storage Appliance, visit oracle.com or call +1.800.ORACLE1 to speak to an Oracle representative.

Hardware and Software, Engineered to Work Together

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