INCREASING EFFICIENCY WITH EASY AND COMPREHENSIVE STORAGE MANAGEMENT

Storage management has become a key ingredient for success with today’s data-intensive application environments. From the workgroup to the enterprise, Oracle’s Sun ZFS Storage Appliance software simplifies storage management and enables you to increase application performance and reliability while also driving down costs. An easy-to-use interface and comprehensive analytics gives you everything you need to increase storage efficiencies and quickly resolve issues.

Facing High Costs and Growing Complexity

High costs, demanding throughput requirements, and growing complexity are driving the need for a new approach to today’s storage solutions — one that can yield greater storage efficiency as well as simplified storage management. Storage administrators often have too little time or lack the proper tools to optimize performance and efficiency for their storage environments. As a result, application performance often suffers.

Sun ZFS Storage Appliance Software

Sun ZFS Storage Appliance software enables you to achieve unmatched simplicity and ease of use through revolutionary business analytics functionality, an easy-to-use graphical management interface, and a rich set of data services. It also includes the Hybrid Storage Pool feature to enable breakthrough performance and scalability at dramatically lower prices by transparently optimizing performance across multiple types of storage media.

Transparent Optimization with Hybrid Storage Pools

Hybrid Storage Pools provide the foundation that enables Sun ZFS Storage Appliance to deliver radically simplified storage and breakthrough economics. As shown in Figure 1, the Hybrid Storage Pool is composed of optional flash-memory devices for acceleration of reads and writes, high-capacity or high-performance disks, and DRAM memory, all managed transparently as a single data hierarchy.

Your application simply interacts with the file system without requiring knowledge of Hybrid Storage Pools or the underlying storage media. Sun ZFS Storage Appliance software transparently manages the process of copying frequently accessed data into the read cache and then satisfying read requests from the most optimal path. This intelligent management of the read cache can deliver dramatic gains in random read performance when leveraging low latency media such as solid-state disks (SSDs).

UNPRECEDENTED OBSERVABILITY, COST-SAVING PERFORMANCE
ACCELERATION, AND SUPERIOR DATA PROTECTION

KEY FEATURES

- Unprecedented observability with DTrace Analytics software
- Automated optimization across multiple storage tiers with Hybrid Storage Pools
- Support for Oracle Hybrid Columnar Compression with Oracle Database
- Greater capacity efficiency with both data compression and deduplication
- Support for triple mirroring to help increase random read performance for applications such as databases
- Protection from as many as three drive failures with triple parity RAID
- Seamless multiprotocol integration and secure data sharing between Microsoft Windows, Linux, and UNIX clients

KEY BENEFITS

- Easy for administrators to find and fix issues as well as optimize performance
- Reduced storage footprint, energy use, and cost with Oracle Hybrid Columnar Compression for Oracle Databases
- Ability to deliver greater performance at less cost
- Reduced storage complexity and increased efficiency
- Up and running in minutes, not hours or days
- Increased data integrity and reduced risk of data loss
Figure 1. Hybrid Storage Pools transparently manage data placement.

Writes to disk are also accelerated by using a temporary write cache, based on write-optimized SSDs. Writes are then quickly acknowledged so that the application can continue processing without waiting until the data is written to the high-capacity storage area as a background task.

**Breakthrough Economics**

The Sun ZFS Appliance achieves breakthrough cost savings by leveraging the Hybrid Storage Pool, a deeply integrated performance-based architecture, with the industry’s richest set of base software features and the most powerful, user-friendly management and analytics tools, all combined with an industry-leading Oracle standard hardware platform. This enables support for business-critical applications and allows you to adapt to changing business conditions.

**Increased Storage Efficiency**

Save data center floor space and reduce storage acquisition costs by improving storage efficiency with the Sun ZFS Storage Appliance onboard deduplication and compression features. Oracle’s deduplication technology virtualizes your data to save space. One physical copy can represent many logical copies, eliminating the need for redundant copies of the same data. And Oracle’s compression technology reduces the size of data, across a wide range of data types, to be stored and thereby saves more space. The combination of deduplication and compression significantly reduces storage needs and helps to conserve data center floor space and energy.

**Unprecedented Observability**

DTrace Analytics software, a feature of the Sun ZFS Storage Appliance, provides the industry’s only comprehensive and intuitive analytics environment. Administrators have all of the tools they need to quickly identify and diagnose system performance issues, perform capacity planning, and debug live storage and networking problems before they become challenging for the entire network. The real-time analysis and monitoring functionality utilizes built-in instrumentation to provide in-depth analysis of key storage subsystems, helping administrators quickly identify the source of performance bottlenecks.
Figure 2: DTrace Analytics enables you to quickly identify application bottlenecks.

Figure 2 shows an example of the kind of data that can be visualized with DTrace Analytics. The top part of the screen shows the CPU utilization across four CPUs, and the bottom graph highlights NFS throughput in operations per second broken down by latency. This information can be used to identify CPU or I/O bottlenecks across the storage systems. You can then drill into the applications running on those systems to find out why. This level of observability is an industry first and enables you to identify application bottlenecks that might previously have gone undetected.

Reduced Risk with Industry-leading Data Protection

With the Sun ZFS Storage Appliance advanced data protection features, you can be assured that the data you store is precisely identical to the data later read and processed by your business-critical applications. The ZFS file system includes proactive error detection and self-healing capabilities, which eliminate silent data corruption, detect faults, and take action to prevent re-occurrences. Proactive error detection algorithms perform automatic data integrity checking and correction that includes block-level checksums and self-healing at the block level. In addition, the Sun ZFS Storage Appliance software is the only software that protects your data from as many as three drive failures with triple-parity RAID. With disk drives getting larger and many organizations implementing wider striping across more drives for increased performance, triple parity further reduces the risk of data loss. Triple mirroring, another advanced data protection feature, also offers a great way to increase random read performance for applications such as databases.

Superior Oracle Integration

The Sun ZFS Storage Appliance is integrated with Oracle applications such as Oracle Database, Oracle VM, and Oracle Enterprise Manager, to automate and simplify common storage management-related tasks, as shown with the following two application integrations.

- **Oracle Hybrid Columnar Compression for Oracle Database**
  Enterprises with NAS-based Oracle Databases with in-database archives for OLTP, data warehousing, or mixed workloads, can achieve 10x to 50x reductions in their data volumes by using Oracle Hybrid Columnar Compression on the Sun ZFS Storage Appliance. Unique to Oracle storage, this capability helps customers achieve 3x to 5x reductions in their storage footprints by replacing their existing storage with the Sun ZFS Storage Appliance, and significant performance gains because the data is moved in compressed format.

- **Oracle Snap Management Utility for Oracle Database**
  The Oracle Snap Management Utility for Oracle Database is a standalone management tool specifically engineered to work with the Sun ZFS Storage Appliance. It provides an efficient and automatic way to back up, restore, clone, and provision Oracle Databases that are stored
on the Sun ZFS Storage Appliance, saving costs while increasing overall business productivity.

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<th>Features</th>
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<td>High Performance</td>
<td>Hybrid Storage Pool for transparent optimization across multiple tiers of storage</td>
<td>Superior application performance and simplified storage management</td>
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<td>DTrace Analytics to identify the source of performance bottlenecks</td>
<td>Reduced downtime and faster application performance due to quick isolation of performance issues</td>
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<td>Increased Utilization</td>
<td>Oracle Hybrid Columnar Compression</td>
<td>3x to 5x reduction in storage footprint for customers with existing NAS-based Oracle Databases with in-database archives for OLTP, data warehousing, or mixed workloads</td>
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<td>Built-in compression</td>
<td>Reduced storage costs without adding overhead to the server for compression and decompression processing</td>
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<td>Deduplication so that one physical copy can represent many logical copies of data</td>
<td>Reduced data storage costs by cutting data storage requirements across a wide range of data types</td>
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<td>Clones*</td>
<td>Easy creation of a copy of production data for testing, development, simulation, etc.</td>
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<td>Thin provisioning, allowing physical space to be allocated on an as-needed basis</td>
<td>Greater investment protection and more efficient utilization</td>
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<td>Data Protection</td>
<td>Automatic data integrity checking and correction</td>
<td>Increased data integrity</td>
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<td>Remote replication*</td>
<td>Enables remote copy of data from one appliance of Sun ZFS Storage Appliance to another, for disaster recovery, disk-to-disk backup, distribution, etc.</td>
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<td>Local replication</td>
<td>Replication of data within same appliance of Sun ZFS Storage Appliance, for additional level of data protection</td>
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<td>Flexibility to choose different RAID architectures including triple-parity RAID, which protects against up to three drive failures</td>
<td>Reduced risk of data loss and ability to meet performance and reliability needs for different applications</td>
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<td>Triple mirroring</td>
<td>Increased reliability and increased random read performance</td>
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<td>Snapshots</td>
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<td>I/O multipathing to eliminate single points of failure</td>
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<td>Manageability and Usability</td>
<td>Simultaneous access to both Windows and UNIX environments</td>
<td>Easier sharing of data between users</td>
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<td>Browser-based administration tools</td>
<td>Simplified administration and reduced management costs</td>
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<td>Shadow data migration</td>
<td>Time and money savings when migrating data from legacy storage devices</td>
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<td>Active-active clustering with transparent failover between nodes</td>
<td>Simplified management while delivering increased data availability</td>
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<td>Oracle Snap Management Utility for Oracle Database</td>
<td>Fast, efficient, and automatic way to back up, restore, clone, and provision Oracle Databases that are stored on the Sun ZFS Storage Appliance</td>
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</table>

* Remote replication, clones, and Oracle Snap Management Utility for Oracle Database are separately licensed software features.
Warranty
Visit oracle.com/sun/warranty for Oracle's global warranty support information on Sun products.

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

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Hardware and Software, Engineered to Work Together