*ESG Lab Brief*

# Oracle ZFS Storage ZS4-4

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***Abstract:*** *ESG Lab validated the next-generation performance and cost benefits of the Oracle ZFS Storage ZS4-4 appliance by auditing the latest results from Oracle's SPC-2 testing.*

## Background

The continued growth of data has created some concerns for IT. Managing storage requirements has become far too complex and strict budget requirements are forcing the hands of IT administrators to make a change. IT managers are looking past the short-term results of IT purchasing decisions and focusing more on long-term implications, making ROI and TCO key considerations for justifying IT investments. And it is not just about solutions that meet budgetary requirements, but also solutions that can provide greater storage efficiency, enterprise-class performance, and advanced storage analytics.

## Oracle ZFS Storage ZS4-4

The ZS4-4 is Oracle's fourth-generation, unified ZFS storage appliance offering organizations enterprise-class data services, performance, and operational efficiency. The application-engineered storage system is designed to run applications as fast and efficiently as possible, while helping to increase productivity and lower total cost of ownership by maximizing return on existing Oracle software investments.

The appliance is built on an architecture with a symmetric multi-processing and multi-threaded operating system that is designed to deliver maximum efficiency by utilizing all CPU cores and threads. The highly scalable ZFS file system is layered on the hardware to integrate with multi-layer caching for improved read and write performance. This technology, called Hybrid Storage Pool, makes it possible for the ZFS storage appliance to significantly increase performance without sacrificing capacity. The Hybrid Storage Pool is a DRAM-centric architecture that uses an intelligent set of algorithms to not only manage I/O, but also to deliver extremely fast performance. The DRAM-based storage appliance is capable of handling application workloads in memory and also uses read and write optimized SSDs as cache, delivering microsecond latencies for read and synchronous write operations. Finally, by combining the use of an adjustable record size of up to 1MB and the ability to bypass the ZFS intent log, large block sequential workloads receive an additional significant boost in performance.


The ZS4-4 builds upon the success of its predecessor by offering a purpose-built appliance with a goal of exceeding performance expectations and maximizing system efficiency. DRAM, SSDs, and CPUs are all key hardware components of the storage architecture. When compared with the ZS3-4, the fourth-generation hardware comes with a 50% increase in CPU cores, 50% increase in DRAM, 70% increase in InfiniBand performance, and double the bandwidth, all while delivering twice the number of IOPS from read and write SSDs.

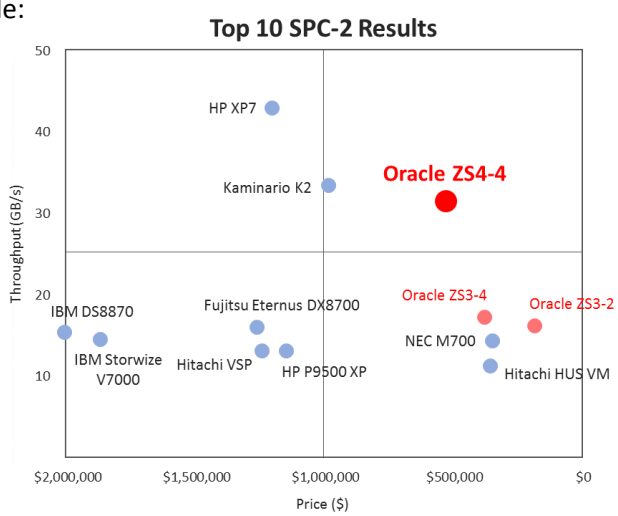
The technology is complemented by a comprehensive suite of enterprise software with a long list of data services that work for supported data protocols ranging from file-level NFS and SMB, to block-level Fibre channel and iSCSI. Data services like Hybrid Columnar Compression can yield up to ten to 50 times better storage efficiency in NAS-based Oracle database archiving for data warehousing and OLTP environments, while DTrace Analytics provide visual, real-time storage analytics, allowing customers to better utilize storage resources and reduce future purchases by identifying, troubleshooting, and resolving infrastructure bottlenecks.

## Next-generation Performance and Savings

ESG Lab audited published results from the SPC-2 benchmark suite performed on a ZS4-4 storage appliance. The SPC-2 application-level industry-standard benchmark suite is maintained by the Storage Performance Council. SPC-2 testing generates three distinct workloads designed to emulate the execution of business-critical applications that require the movement of large-scale, sequential data. The applications are characterized predominately by large I/Os organized into one or more concurrent sequential patterns. The three workloads include:

- Large File Processing – Applications in a wide range of fields, which require simple sequential processing of one or more large files such as scientific computing and large-scale financial processing.
- Large Database Queries – Applications that involve scans or joins of large relational tables, such as those performed for data mining or business intelligence.
- Video on Demand – Applications that provide individualized video entertainment to a community of subscribers by drawing from a digital film library.

When comparing the top ten SPC-2 results of industry-leading storage vendors, the Oracle ZS4-4 falls in a distinct category of being the first $500,000 storage system to break the 30 GB/s throughput threshold. Just two other systems yield higher throughput performance, but at a cost of $1,000,000+. This remarkable feat offers organizations an impressive price/performance point of just $17.09/MB/s, representing a significant reduction of 42% from the only other two vendors that yield higher throughput. It should be noted that along with the Oracle ZS4-4, two earlier-generation Oracle ZFS storage appliances also appear in the top five from a pure performance standpoint, while the Oracle ZS3-2 ranks first in price/performance. This shows the performance, efficiency, and cost savings that can be achieved with Oracle solutions.




| Vendor | GB/s | $/MB/s | Price |
|---|---|---|---|
| HP XP7 | 43.01 | $28.30 | $1,217,462 |
| Kaminario K2 | 33.47 | $29.79 | $997,348 |
| **Oracle ZS4-4** | **31.48** | **$17.09** | **$538,050** |
| Oracle ZS3-4 | 17.24 | $22.53 | $388,472 |
| Oracle ZS3-2 | 16.2 | $12.08 | $195,916 |
| Fujitsu Eternus DX8700 | 16.04 | $79.40 | $1,275,163 |
| IBM DS8870 | 15.42 | $131.21 | $2,023,742 |
| IBM Storwize V7000 | 14.58 | $129.14 | $1,883,036 |
| NEC M700 | 14.41 | $25.10 | $361,612 |
| Hitachi VSP | 13.15 | $95.38 | $1,254,093 |
| HP P9500 XP | 13.15 | $88.34 | $1,161,504 |
| Hitachi HUS VM | 11.27 | $32.64 | $368,065 |

*Based on Top Ten SPC-2 results as of March 2015

## The Bigger Truth

With storage requirements becoming harder to manage, applications demanding higher levels of throughput, and storage growth causing increased complexity, IT managers have an uphill battle. Optimizing the performance and efficiency of an IT infrastructure on a strict budget is all but impossible, as the push from upper management to do more with less has never been stronger. A storage solution providing greater storage efficiency and performance, as well as effective monitoring and analytic tools, is becoming a necessity for IT professionals.

Oracle's fourth-generation ZFS storage appliance continues to expand on the success of its predecessors by further optimizing storage performance and efficiency while reducing TCO and ROI. ESG Lab confirmed that the combination of performance and price as shown by the recently published SPC-2 results puts Oracle in a category of its own. As the first storage offering to break the 30 GB/s throughput threshold while being priced in the $500,000 range, Oracle is uniquely positioned as a storage price/performance industry leader.

The Oracle ZFS Storage ZS4-4 was purpose-built to combat the ever-growing requirements related to storage environment efficiency. The appliance allows organizations to increase performance and reduce IT costs through the use of advanced analytics, simple management tools, and multiple levels of data protection. If you're rethinking your storage infrastructure strategy and in need of storage solution to optimize all aspects of your business, ESG Lab suggests taking a look at the latest Oracle ZFS Storage Appliance, the ZS4-4.