Solution Showcase

Oracle ZFS Storage Appliance ZS7-2: A Powerful Alternative to Traditional NAS

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Abstract: For more than a decade, Oracle has developed and enhanced its ZFS Storage Appliance, giving its users a formidable unified and enterprise-grade storage offering. The latest release, ZS7-2, boasts upgraded hardware and software and is a timely reminder that more users might do well to evaluate this offering. It has a trifecta of advantages: (1) its notable performance, price-performance, and flexibility are all improved in this new release; (2) there is a surprisingly inclusive set of functionalities, including excellent storage analytics that were developed even before analytics became a contemporary "must-have"; and (3) there's a compelling group of "better together" elements that make ZFS Storage Appliance a particularly attractive choice for both Oracle Database environments and users that want to seamlessly integrate a cloud component into their IT infrastructure. Given the proven abilities of Oracle's prior models, it's also safe to assume that the new ZS7-2 will outperform other major offerings across multiple workloads, including high-performance NAS, Oracle Database, applications, and backup and restore.

Market Landscape and Product Overview

The shortness of this report is a great reason to dispense with the often obligatory and invariably self-apparent proclamations about the massive growth of data and its categoric importance to IT. Suffice it to say that fast(er) and big(ger) are descriptors that remain as important as ever in the storage world, *but* what matters more today is the increasing importance of such things as business and IT outcomes, application integration, and the cloud: Applications drive everything, meaning that storage systems can neither be evaluated nor deployed as standalone anymore—even though some vendors would like to suggest that. While the products still matter for sure, it is vendors' and users' broader strategies and, therefore, how any given product fits into them, that form the real contemporary storage story.

A Primer on Oracle ZFS Storage Appliance

From this perspective, Oracle ZFS Storage Appliance is a perfect example of an application-focused storage and data protection system. Its raw specifications translate to breakneck speed and will no doubt mean that this latest version will continue Oracle's winning streak in multiple industry benchmarks. While "specsmanship" is just a game of vendor "leap-frog," it's the enhanced ecosystem contribution that Oracle's storage delivers that really matters. Some of its architectural elements, such as the extensive use of DRAM as a data cache, can be thought of as a "sophisticated brute-force" approach to driving fast I/O; while others, like the super-smart ZFS storage analytics and its extensive integrations with Oracle Database, are "elegant optimizers." Perhaps that gives us a headline summary for ZFS Storage: balanced, sophisticated, brute-force elegance!

The basics: Oracle ZFS Storage Appliance offerings are DRAM-accelerated all-flash, disk, or hybrid storage systems that are very fast, highly scalable, dramatically easy to use, and all-inclusive. There'll be no surprise that they're perfectly matched to the Oracle stack, yet they also handle concurrent mixed workloads with ease. There are powerful internal efficiencies, with up to 90% of I/Os served from the TBs of DRAM, *but* even the basics aren't <u>that</u> basic: The products have always excelled in industry-standard benchmarks, being literally orders of magnitude better in both raw speed *and* price/performance than industry norms. Additionally, the ZFS Analytics software is highly granular and collects data in real time, which enhances system manageability and can reduce the steps necessary to identify issues by up to two-thirds. Furthermore, when it comes to security–which remains the most important current IT priority chosen by the largest percentage of ESG research respondents[1]–ZFS Storage delivers built-in, end-to-end granular encryption and key management, together with strong authentication and access control, all hardened with checksum protection. The fact that this is all consistent with the Oracle Database approach is no accident and it brings us to the final crucial aspects of the ZFS Storage value proposition.

The far-from-basic: These *unique enhancements* come via Oracle's co-engineering of ZFS Storage Appliance with Oracle Database and Oracle Engineered Systems. Being tightly integrated as a part of the "red stack" gives Oracle a distinct and sustainable advantage in driving *more effective capacity and performance* from its storage systems when they are attached to Oracle Database and applications. Additionally, ZFS Storage Appliance is a key component in Oracle's hyper-focus on the pragmatic use of hybrid cloud.

- **Database Integrated Management** provides end-to-end management and support, meaning, for example, that DBAs can take control of everything from storage provisioning to cloning and data protection, and even have their own integrated database with storage performance analysis and optimizations.

- **Oracle Intelligent Storage Protocol (OISP2)** helps optimize database storage performance by eliminating the overhead of standard storage protocols. It uses private communications with Oracle Database to auto-discover, auto-tune, and even prioritize critical database I/Os so that optimal performance and efficiency can be maintained without extensive DBA involvement.

- **Hybrid Columnar Compression (HCC) and Automatic Data Optimization (ADO)** combine to deliver dramatic data placement and capacity efficiencies—as much as a 10-50X reduction in required storage capacity! This not only saves money *but* also helps improve performance by speeding-up database queries, since more data is held in the database servers, which means that large amounts of I/O are eliminated.

There's *no* user that does *not* want faster, more efficient and more effective data storage, management, and protection. That is especially true for mission-critical applications such as Oracle Database, where ZFS Storage Appliance delivers at the top of the class.

The Oracle ZFS Storage Appliance ZS7-2 Platform

As mentioned in the abstract, this latest version of the product has numerous valuable enhancements, and its announcement is an excellent reason to (re)acquaint ourselves with the compelling value—and market-changing elements—that were always a part of the Oracle ZFS Storage Appliance offering. While that is the main thrust of this paper, here are the headlines for the new release:

- ! **New hardware and software**: ZFS Storage is now built on a single, scalable controller platform, and boasts impressive raw specifications—for example, up to 3.8 PB of flash and 11.5 PB of disk per controller; Oracle's testing shows that raw performance improves from the prior model by up to 48%, with price-performance improved up to

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[1] Source: ESG Master Survey Results, *2018 IT Spending Intentions Survey*, December 2017.

33%. The latest OS8.8 software—a multi-threaded SMP OS taking full advantage of all cores—delivers a slew of enhancements across performance, availability, security, predictable multi-tenancy, and manageability.

- ! **Improved simplicity, flexibility, and performance:** ZFS Storage Appliance delivers more performance per node than market-leading alternatives, but without introducing scale-out-complexity; this is important to be able to dynamically support a wide range of use cases, including Oracle Database, software development, video streaming, backup and recovery, private and public clouds, and VFX rendering. In fact, multiple use cases can be further consolidated by Oracle's ability to have all-flash and HDD storage pools in a single ZFS Storage Appliance, so users don't have to have different systems from different vendors to meet their needs for high-performance and high-capacity storage. And for improved configuration flexibility, users can now have up to a 2.5x increase in 10GbE and Fibre Channel throughput (including new 32Gb FC connectivity), as well as up to 67% more I/O cards for flexible deployments in multi-protocol environments.

Analysis: Value and Relevance

ZFS Storage Appliance Value: there are two value streams to consider. The "generic"—yet compelling—value of ZFS Storage Appliance as simply a darned fine storage system, and then there is the "specific" extended value that ZFS Storage can deliver when supporting Oracle Database environments.

Clearly, the hardware and software are both updated and improved in this new ZFS Storage Appliance ZS7-2 platform. It's a combination of power and practicality that can perhaps be thought of as something akin to a high-end Porsche Cayenne Turbo S SUV; there's plenty of each element for just about anyone. And yet Oracle sells its system at a "regular vehicle" price. Combining that with its intelligent use of DRAM, ease of management, and even the ability to reduce software license needs by making servers run faster, creates a very attractive TCO proposition—something that matters a lot in the real world, where the largest percentage of respondents to ESG research have continually reported TCO to be one of the most important user criteria for selecting storage systems[2].
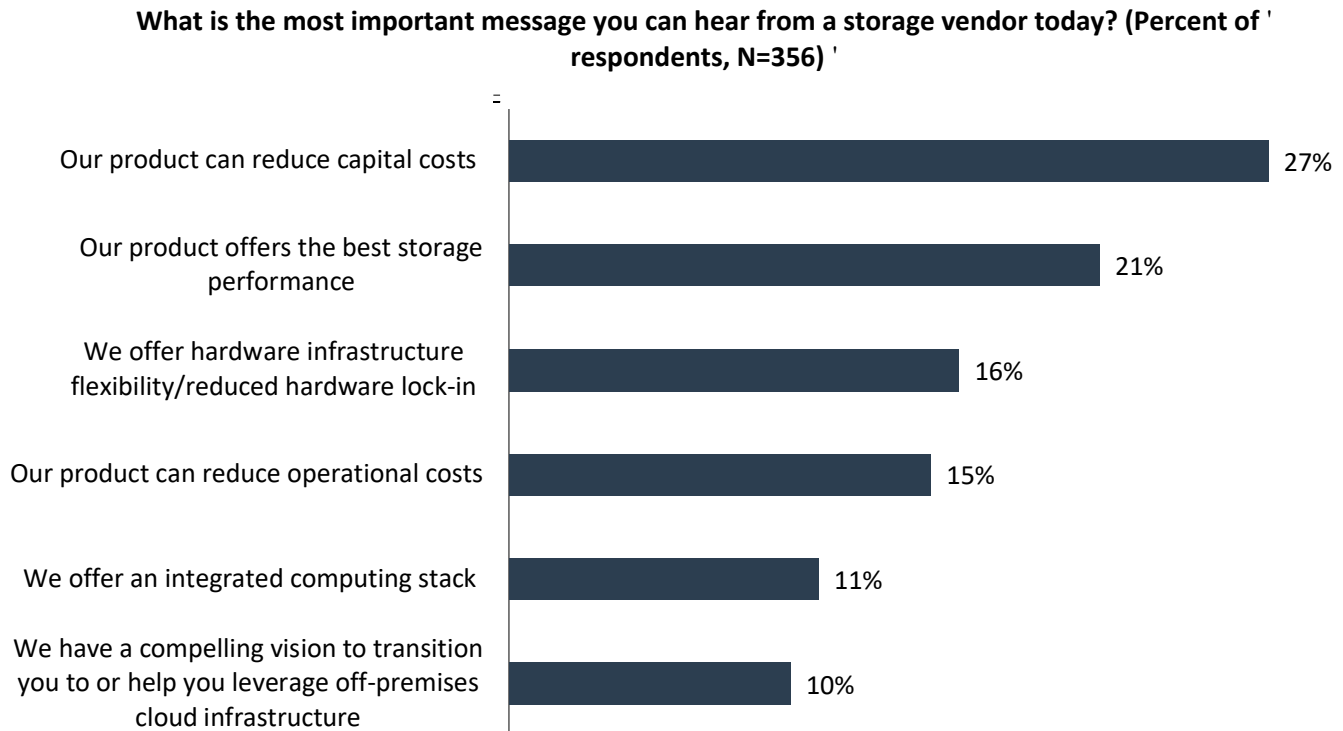
Talking of the "real world," ZFS Storage Appliance also delivers broad ability and ease-of-use. It's an excellent workhorse for anything that requires the fast and efficient movement of lots of data—for instance, loading data warehouses and doing backup, or for video rendering, IT/chip design processes—while its low latency ability is excellent for virtual machine environments of any flavor. In both arenas, the highly multi-threaded nature of its OS means that multiple I/O requests and sophisticated contemporary services like encryption (which is enhanced in ZS7-2 in several ways), compression, and analytics can be handled with headroom to spare.

ZFS Storage Appliance Market Relevance: the best engineering is all for naught if the resulting product does not resonate with the market and what users want. So, what *do* users want to hear from their existing and potential storage system vendors?

It's obvious from reviewing Figure 1 that Oracle's ZFS Storage is a compelling offering in many regards[3]—this report has already covered how it offers dramatic performance and can help contain both capital and operational expenses. Moreover, it can certainly and convincingly be argued that the "Oracle Stack" is just about the most integrated/converged platform available—from database to cloud. So, let's consider a couple of other key factors that have not yet been covered.

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[2] Most recently in ESG Research Report, *Software-defined Storage (SDS) Market Trends*, February 2017.
[3] Source: ESG Master Survey Results, *2017 General Storage Trends*, November 2017.

Figure 1. Most Important Message Organizations Can Hear from a Storage Vendor Today '

What is the most important message you can hear from a storage vendor today? (Percent of ' respondents, N=356) '

Message	Percent
Our product can reduce capital costs	27%
Our product offers the best storage performance	21%
We offer hardware infrastructure flexibility/reduced hardware lock-in	16%
Our product can reduce operational costs	15%
We offer an integrated computing stack	11%
We have a compelling vision to transition you to or help you leverage off-premises cloud infrastructure	10%

Source: Enterprise Strategy Group

Today, leveraging the public cloud is a prerequisite in most IT and data hierarchies: with the ZFS Storage Appliance, users can easily move operations back and forth between their on-premises solutions and Oracle's Public Cloud, whether it's for flexibility, cost, data protection, or compliance needs. Oracle's approach is, again, one of optimization-through-integration since it offers congruent protocols, access, security and applications across the two environments. Indeed, ZFS Storage is a key data platform *for* the Oracle Public Cloud, with over 1.5 exabytes deployed there. This is important because, as ESG research found, 74% of respondent users say that architectural congruence between their on-premises and public cloud facilities is either critical or very important.[4]

Two other things: Firstly, users are of course required to be using multiple Oracle components in order to unlock and maximize all the unique "better together" benefits, but there's a great deal of "quid" relative to the limited "quo," and pragmatic users will likely find the decision easily makes itself. Secondly, traditional NAS architectures and systems can create filer sprawl and consume more power, cooling, racks, conduit, and floor space than is either desirable or optimal these days. IT organizations that change to a ZFS Storage Appliance might well be "pleasantly shocked" with the resulting performance difference; to say they would feel a marked improvement would be an understatement, a bit like saying dinner at a top Michelin-starred restaurant is merely an improvement on a sandwich late on a Sunday night train.

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[4] Source: ESG Research Report, *The Cloud Computing Spectrum, from Private to Hybrid,* March 2016.

The Bigger Truth

To reuse a word from the abstract, this latest iteration of Oracle ZFS Storage continues the vendor's trifecta of compelling elements: (1) it again ramps the product specifications, so as to deliver increased value for myriad applications; (2) it continues Oracle's "better together" functionalities that come from integrated development with the Oracle Database and Engineered Systems teams; and (3) it is both wrapped in, and an integral component of, Oracle's strategic focus on the cloud as a seamless part of IT.

The ZS7-2 announcement does not change the essence of ZFS Storage Appliance; that remains DRAM/flash, Database, and cloud integration. It does, however, give us pause to remember why this system is so valuable to begin with. And here's the point: while there are some commodity elements *within* storage these days, that doesn't *make* storage systems themselves commodities. Storage doesn't exist in a vacuum; there are vital links to applications and the cloud, with enormous possibilities for optimization—speed, function, costs—at all those points. Standalone storage systems, however good, simply can't deliver these integration values, because they don't have the "optics" between the database and the storage. Choosing the right storage matters, and Oracle ZFS Storage Appliance is an excellent—indeed obvious—choice for anyone running Oracle Database—and lots more besides.

For IT professionals weighing storage decisions, the Oracle ZFS Storage ZS7-2 Platform can be summarized thus: It is simply better in-and-of itself (being an improved product iteration); it is also likely to perform better in many regards than current traditional NAS systems; and (being a co-engineered system) it is categorically "better together" for you if used as part of an Oracle Database and applications environment.

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