Oracle ZS3 Storage: The Value of Integration

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Abstract: *Although it's hard to imagine Oracle doing anything quietly, that's exactly what has happened with its ZFS-based storage appliance. Developed and improved for nearly a decade, it has become   formidable unified and enterprise-grade storage offering without a lot of fanfare. The latest version—ZS3—has   trifecta of advantages: the prerequisite enhanced performance an   scalability that is the wont of all new storage systems,   surprisingly inclusive set of functionalities (including class-leading analytics), and an extended group of "better together" elements that make this a particularly compelling offering for Oracle Database users. While the product has been speaking for itself by gaining market share, Oracle looks poised to increase its volume…in both senses of the word.*

Oracle's New ZS3 Storage

Oracle has just announced and delivered the latest version of what was once known as the Oracle Sun ZF Storage Appliance. The new offering sports a shorter name—Oracle ZS3—but that's the only product element or specification that has been reduced! As the storage world moves from its hardware-focused roots to the current semantic love affair with all things "software-defined," Oracle is one of a small group of vendors placing the emphasis for storage o   focus o   applications and data. It calls the ZS   "Application Engineered Storage." This is partly about *suitability* for   number of applications (virtual environments, for instance) but it is also very specifically about   symbiotic *integration* with specific applications (Oracle databases are the prime example).

The essence of the ZS3's raw foundational capabilities has not changed.[1] It was already a comprehensive storage solution. The new version, of course, sports considerably more scalability (for once we will eschew the motherhood and apple pie comments about data growth—we all know it's happening), but it is the performance boost and "better together" application integration that truly sets this product apart. The progress in performance—and truly impressive specifications and abilities have always marked this product family—is crucial in our contemporary IT world of increasing virtualization, application demands, and user expectations. But even that, to be fair, is an area of focus for many vendors. This is not to discount its value, merely to place extra focus o   the unique offerings Oracle has to dynamically and automatically integrate applications and storage so as to provide special functions (detailed below) that drive operational and financial advantages by reducing the need for storage capacity and administration.

Market Progress: While still a relatively small part of the overall Oracle mix, Oracle storage revenue nonetheless exceeded $1B in 2012, making the company one of the bigger "chasing" players in the space: Oracle knows that storage incumbency is hard to change, but the flip side is of course that there's plenty of market left for it to attack; and it is this growth potential that is no doubt attractive to an organization whose core business is simultaneously getting harder to increase, but which also provides fertile soil for Oracle storage to plant its wares. The ZFS Storage Appliance has shown the benefits already – Oracle now boasts approximately 400   customers, running over 10000 systems for in excess of 100M run hours. Again, Oracle realizes it is not number one in any of these categories *but* it is proving both its credibility and providing an aura of acceptability of change…for example, claiming that it is gaining roughly 15   wins per quarter from the major incumbent competitors. Furthermore there is over 225PB of ZF   Storage Appliance supporting the 15M database transactions per hour and 25M users of the Oracle Cloud, plus its own IT and product development. Now, with the new ZS3 and its enhanced application integration, it is intending to turn u   the market volume – in both senses of the word.

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[1] This brief does not replace or replicate   datasheet. For   full description of the ZS   visit Oracle.com; and for   more analytical exploration of the product's underlying basics, see the following ESG White Paper: *Oracle Sun ZFS Storage Appliance: Coming of Age Story* September 2012.

Key Features and Functions

The Basics

At the end of the day this is a storage system, so a few highlights of the "headline" specifications must be included. In essence the new product is up to twice as fast as, and offers u to three times the capacity of, the prior generation. It comes in two basic variants:

- ZS3-2 can reach 15TB cache, 768TB capacity, with   PCIe slots
- ZS3-4 can reach 25TB cache, 3.5PB capacity, with 1 PCIe slots

Both offer a full range of connectivity (10GbE, 40Gb IB, 16Gb FC), while a fully configured dual controller ZS3-4 system also includes 2TB of DRAM![2] Existing efficiency tools such as Oracle's Hybrid Storage Pools dynamically optimize data placement, and are supported by new additions such as an enhanced cache architecture that incorporates in-memory deduplication and parallel access sequencing. The overall impact has been measured for price/performance and raw performance using industry benchmarks that place ZS3 firmly with the "big boys"—its SPC-2 numbers (17.2GB/s at $23/MB/s) are around 5 times better than some common alternatives while its SPECsfs results of 451k IOPS at 700ms are definitely major league, and more than enough for even many large and complex enterprise storage deployments.

Key "Better Together" Abilities

While all these "basics" constitute an impressive and more-than-competitive storage system, it is the "application engineered" integrated functions that are worthy of special note. These "better together" technologies were what Oracle promised after acquiring Sun, and this new announcement adds 2 more abilities to the one it already had. They are each accretive in being able to provide operational and financial value and, in simple terms, are possible because the Oracle database and applications are Oracle-storage-aware, and vice versa. While each is a specific capability they are all part of a *fully automated database-to-storage tuning and compression capability:*

- **Hybrid Columnar Compression** (HCC) is not new, but is valuable inasmuch as it can dramatically reduce the physical storage capacity requirements for Oracle databases by u to an astounding 50X. This not only saves both Capex and Opex but also speeds database queries (which in turn can of course save and/or make money for organizations).
- **Oracle Intelligent Storage Protocol** (OISP) is a new software facility that provides "metadata hints" from the database to the storage that can eliminate the—often literally hundreds of—hours that users of even "advanced" storage systems spend tuning their storage and databases for optimal performance (Oracle claims an average of 65% reduction in such manual tuning times). Think of this as moving from a synchromeshed stick-shift or sequential manual transmission to the latest 8-speed dual clutch automatic gearbox with F1-style paddle shifters that is simultaneously fully integrated with the engine management system and has knowledge of the upcoming road, traffic, and intended destination.
- **Automatic Data Optimization** (ADO) is the other new functionality. It increases Oracle Database 12c efficiency and performance, by dynamically moving data across different types of storage based o heat maps of data usage patterns, not just by tiering but also by simultaneously using the HCC compression mentioned above to multiply the benefits. This means different algorithms and degrees of effort, not only for varying types of data but also across data lifecycles. It is the epitome of "different horses for different courses." ZS and Oracle Database 12c will now automatically determine which data sets should be compressed for deep archival and which should be left uncompressed for more frequent accessibility.

The potential value of these three abilities is not only significant to users, of course, but is also crucial to Oracle as it provides a key lever, with hard $ signs attached, that it can use to encourage the otherwise difficult task—frankly, this applies pretty much however good one's raw storage system is—of persuading its customers to pass over their traditional storage supplier and move to, or at least add, Oracle storage to their current environment.

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[2] Oracle's measurement of its user base shows that DRAM ends up serving 70-90% of user I/Os, contributing to the system's stellar performance.

Market Implications & Relevance

Of course, the storage market is valued at tens of billions of dollars so there is   lot being bought every day and plenty of room for a $1B player—especially one with reach and brand recognition like Oracle—to grow. So, what is the user relevance of what ZS3 can deliver? Let's look at this from the product perspective and then the market perspective.

In terms of the product, ZS3 has all the right qualities, bells and whistles, and support to appeal to a broad swath of users, whether they are Oracle customers or not. It is extremely broad in capability, unified, and flexible. In addition, it offers very high performance, and is highly cost-efficient in terms of TCO. Who says these are the "right qualities'? Users do, as shown in the following ESG research, which asked respondents to rank the most important messages that storage vendors could deliver. [3]

Table 1. The Most Important Messages That Storage Vendors Can Deliver

What is the most important message you can hear from a storage vendor today? Please rank the following messages from 1 to 8 in terms of their importance (with 1 being *most* important and 8 being *least* important). (N 418)	
Message	**Rank**
Our product offers the best storage performance	1
Our product has the lowest price per terabyte ($/TB)	2
Our product can reduce operational costs (e.g., staff, power cooling, etc.)	3
Our product can solve specific application(s) performance challenges	4
Our product can enable a specific business process	5
We offer an integrated computing stack (i.e., server, storage, networking, etc.)	6
We enable the management of heterogeneous storage vendors/systems	7
We have a compelling vision to transition you to cloud computing	8

Source: Enterprise Strategy Group, 2013.

As the data shows, performance (ranked #1) and TCO (CAPEX is ranked number 2 and OPEX number 3) are the most important messages. Oracle storage can also deliver against most of the other items on the list. And it goes beyond simply messaging: we know that cost reduction initiatives (which is a decent proxy for TCO) is the business initiative that the largest amount of research respondents indicated would impact their organizational IT spending decisions in this year's annual IT spending intentions ESG research survey.[4] Furthermore, we know from quantitative field research that ESG has previously conducted for Oracle of its ZF   Storage Appliance installed base, that the product's *TCO has been the number one reason for it to be bought* while nearly three quarters (72%) of respondents said that *the performance of ZFS was better than, or much better than, other vendors' storage* systems that their organizations had used.[5] With the new ZS3 representing a material increase in both performance and TCO over the prior generation, its market applicability is clear.

And, as already explained, the ZS   product gets even more attractive if the target buyer is an Oracle Database user. The combination of OISP (which matters when staff resources are stretched or limited) with HCC and ADO (which attack costs by reducing storage capacity demands) can reduce TCO and improve performance, which have already been shown to be the prime desires of IT users.

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[3] Source: ESG Research Report, *2012 Storage Market Survey* November 2012.
[4] Source: ESG Research Report: *2013 IT Spending Intentions Survey* January 2013. 44% of respondents chose it, placing it 13% ahead of the number two choice.
[5] Source: ESG White Paper: *Oracle Sun ZFS Storage Appliance: A Coming of Age Story* September 2012.

Turning to look at things from a market perspective, the potential for the Oracle ZS3 also looks rosy. This is for   couple of key reasons:

1) Convergence and an application focus are the current names of the game. I.T. is increasingly about delivering business value and is way less focused on the "how" than achieving the appropriate "what" (this being a business outcome—in other words,   successful application). Oracle (that's the overall Oracle of course) has a huge play here. Even the original idea that a "converged stack," of which Oracle is perhaps the most complete example in business IT, can lead to being trapped is being subsumed by both the potential for better value, a general acceptance, and the knowledge that users don't have to limit themselves to one stack for everything (think of the way that multiple server hypervisors are becoming the norm, for instance).

2) Oracle has   massive customer base that should be more than amenable to at least hear its storage message. Regardless of the improved "better together" benefits that the ZS3 offers in those places, let's remember that Oracle is in its own way the incumbent in such users and, indeed, the application groups there can sometimes be something of an "inside track" compared to the infrastructure groups. The opportunity that the base represents leads to an interesting internal debate at Oracle—should it even try to sell elsewhere? The answer to date is an emphatic "yes," if for no other reasons than most users are heterogeneous to some degree and if Oracle is to be   genuine storage leader, it must play, at least to some degree, in the heterogeneous sandbox.

Of course all is not perfect for Oracle's storage group: it still lacks awareness and focus (sometimes even *within* Oracle and definitely within its "captive" base). Moreover, Oracle represents such a commercial threat in a market that is moving to convergence that just about everyone else in the storage world would prefer to lose to *anyone other* than Oracle...meaning that it attracts more than a healthy dose of FUD. This of course explains Oracle's determined effort to promote the fact that it has achieved relevance and something of a critical mass with its ZFS Storage Appliance—now to be ZS3—storage product (beginning to state numbers, talking of its significant own use, and so on). Ironically even that focus can cause a problem; just about no one only buys one storage platform and Oracle's necessarily strong emphasis o   its flagship product can create the illusion of a point-product opportunism…whereas, of course, the reality is that Oracle can cover the storage hierarchy—all the way from all-flash, through the ZFS Backup Appliance to tiered storage management software and to massive (68 exabyte-scale!) archival tape systems.

Th   Bigger Truth

The bottom line here is pretty simple and does not have to be—as all too often is required in IT and storage—full of finesse and subtlety. First and foremost, the ZS3 product line offers exceptionally high performance, and is well tuned to today's market needs in terms of providing a very attractive TCO. Luckily, those things are key user requirements! Secondly, the extended "application engineered" capabilities of the ZS   when operating with Oracle databases are the very embodiment of the company's "better together" strategy, and, of course, the flip side is also true: Oracle Database users that are not operating Oracle storage should at least consider it (whether immediately or at the next regular buying cycle will be situation dependent) because there are likely to be significant financial and operations benefits of which they are not partaking.

So, why hasn't Oracle storage taken over the world just yet? Well, natural conservatism and "incumbency stickiness" on the one hand and lack of accurate awareness on the other. Oracle can do a lot about the latter itself; the former takes longer. However, users (whether running Oracle software or not) are likely to be pleasantly surprised when they do take   look at ZS3. Oracle needs to promote and parlay the successes of its existing storage users to gradually nibble away at the broader available market. Those existing storage users in turn will find that their storage budgets will buy them a lot more with ZS3, whether that's data warehousing/business intelligence, virtualization, video streams, e-mails, backups…or, of course, database queries. Oracle certainly has the tools—product, support, time and money—to do this and its new ZS   opens the door to that opportunity wider than ever before.