



Skyera Solid State Disk — Making SSD Affordable for the Enterprise

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Management Summary

Choices. They are all around us. Some are trivial, some are significant. When we go out for dessert, do we go with the yogurt or do we splurge for the rich ice cream? They may cost the same in cash, but the price we have to pay later is not. Skip the scale tomorrow morning. Then there are the expensive choices, an automobile for example. Do you select the high-performance machine or one with better mileage? What is more important cost or style? Remember that cost involves more than just the acquisition price; you must consider operational costs as well, the total cost of ownership. In the ideal world, you can have the auto with high-performance, great mileage, low acquisition price, and style. However, we do not live there. No one does.

This is especially true in the data center where performance, capacity, cost, and reliability all play out in the decisions for the acquisition of storage. Regardless of the size of your data center, all of these factors play a role. Ease-of-use is also a critical factor, as many smaller data centers cannot afford the kind of staff found in an enterprise data center, where server specialists coexist with storage specialists who combine with networking specialists to deliver the integrated solutions upon which the enterprise depends. What do we know about storage? We know that it is growing in capacity more than ever before. In fact, storage is doubling every 12 to 18 months and access to that storage is becoming more critical every day as the business depends upon that data to maintain, and grow, market share or increase services to users. Today, storage comes in all forms and capacities. The IT staff can deploy hard disk drives (HDDs) in a variety of forms: from high-performance disk for mission-critical (Tier 1) data to high-capacity drives for secondary uses (Tier 2) such as backup or archiving to tape for long-term (Tier-3) storage requirements. Recently, the data center has seen a spate of solid-state disks (SSDs) appear for the most urgent requirements (often called Tier-0). Unfortunately, due to the acquisition cost, many IT staffs have had to shy away from this low-capacity, high cost media. Not any more!

In June, a new enterprise appeared on the scene, Skyera Inc., promising to deliver a high performance and high capacity system at a price comparable to today's HDD SANs, the best of both worlds. They have created a radical new architecture, designed from the ground up to deliver more speed, reliability, and efficiency than the competition without complexity. To learn more about Skyera, please read on.

The Data Center Storage Dilemma

The data center has been experiencing a period of unprecedented growth. With new applications being added every day, the amount of enterprise storage required to support them is doubling every year. Because of this growth, all enterprises have been forced to change the IT paradigm in their data center, consolidating multiple application servers onto fewer platforms, in order to reduce the TCO of the IT infrastructure by:

- Reducing the number of servers proliferating within the data center,

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- Limiting the number of administrators required to maintain them,
- Reducing data center energy consumption,
- Reducing maintenance costs, and
- Limiting the amount of floor space in use.

In order to help effect that transition, the IT staff has been virtualizing these on consolidated servers, in order to achieve higher CPU utilization and to reduce software licensing costs, thus creating a much denser environment.

These applications have data access requirements that range from primary access for mission- and business-critical applications, to secondary access for data files, such as archiving stores. In order to support this variety of needs, the more sophisticated data center, traditionally has deployed multiple tiers of storage, from Tier 1 Fibre Channel disks, to Tier 2 SATA disks, and down to Tier 3 tape for long-term storage, with each tier providing more capacity at less cost per TB. More recently, a new tier of high-performance storage is being deployed – Tier 0, solid-state disks (SSDs) with the fastest access times to data available, outside of server cache, but also with the highest unit cost.

The deployment of Tier 0 storage must be considered carefully and applied only to those applications that can deliver the best ROI from its use. Many data centers have deployed multiple arrays of HDDs, often SAS, with only 10% utilization, in order to deliver the required IOPS¹. The cost of this architecture is very high, due to the number of devices that must be procured, the energy and capacity often wasted, and floor space consumed. By replacing HDDs with SSDs and automated-tiering software, the staff can reduce the TCO even if the individual SSDs have a higher unit acquisition cost, *but how much more can the data center afford?*

Cloud storage is another area that has gained in popularity recently. Unfortunately, the savings that are achieved in relocating your data to an off-site location often can be overwhelmed by the poor performance when you need to retrieve it. Creating a multi-tier environment with local SSD storage as a cache for frequently used information and using the cloud for the benefits achieved from the deployment of high-volume devices, may be the best strategy.

Additionally, in order to ensure a common image for VDIs that may have been deployed throughout an enterprise, some data centers want to boot their servers from networked storage. How-

ever, the slow loading of HDDs, especially during the “rush hours” around at the start of the day, have caused them to avoid the practice. Deployment of SSDs will enable the read performance required and also will speed up updates and maintenance.

In addition, the performance, reliability and durability of SSDs, compared to that of HDDs, are also of major concern when contemplating the deployment of SSDs. Obviously the “solid state” nature of SSDs provides a significant reliability advantage over the mechanical nature of disks. Hard disk’s head movement over spinning media can only lead to more errors than are seen with SSDs. Enterprise SSDs typically are fabricated with single-level cell (SLC) Flash memory (noted for higher durability over multi-level cell (MLC) SSDs). However, cost, capacity, performance (IOPS), and density of storage are all key factors in determining the TCO of the storage environment.

A new start-up has just appeared on the data center radar: Skyera, with a staff possessing a deep understanding of SSD technology and the capability to provide significant innovation in the data center storage environment.

Who is Skyera?

Skyera is a startup with a staff well-grounded in the fundamentals of solid-state storage. With years of experience devoted to overcoming the issues that have plagued the acceptance of SSDs and dedicated to the acceleration of its adoption as an enterprise storage standard, Skyera has committed itself to innovative technological leadership for the data center.

While some question the cost of SSDs and others doubt the maturity of the technology as a data center storage standard, Skyera has moved forward by changing the way SSDs are deployed. While some IT pundits question the capacity of SSDs, Skyera has moved forward with innovative techniques to improve the density and capacity of solid state storage. Skyera has changed the paradigm of SSD storage.

Skyera has addressed the cost issue by creating an all-Flash memory storage solution that can be sold at a price comparable to HDD-based SANs at native capacity, before compression and data deduplication are turned on, at under \$3 per GB. This is a third-generation device-, controller-, and network-level solution from Skyera, putting them in the forefront of solid-state development. In terms of capacity, Skyera has implemented a 1U solution with half-depth form factor to provide the highest native density for a capacity capability of greater than 1PB, with compression and data deduplication.

¹ Input/Output Operations per Second.

Skyera's technology addresses every potential bottleneck in the data path between the server and Flash, delivering up to 10M IOPS per node. This represents a performance improvement of 100 times over legacy HDD systems. Skyera's goal to improve the reliability and MTBF² of Flash memory has been achieved with a "fall-in-place" architecture, an improved life amplification algorithm, and a proprietary, intelligent RAID technology with error correction code, resulting in more than 10 times performance improvement. For energy efficiency, Skyera's *Skyhawk*, consumes less than 500W, ten times lower than traditional disk.

The Skyera Skyhawk System

Skyhawk is a system-level solid-state storage system combining storage and network connectivity. It achieves greater performance, reliability, and efficiency than traditional legacy SSD solutions. It has been designed from the ground up rather than forcing SSDs into an existing HDD platform. It uses a system-wide approach to the design, development, and integration of the full technology stack, including the Flash and RAID controllers, storage blades, communication bus, and network interface, along with an automated, policy-driven tier management system, to ease the staff burden.

It has a proprietary system-level Flash controller to enable the early adoption of new Flash technologies, and native support of storage functions with an advanced system-level Flash management to provide for a faster, denser storage appliance that can withstand Flash shortcomings. Skyhawk features innovative, new Flash endurance techniques, enabling the data center to deploy consumer-level, low-cost MLC³ Flash in enterprise applications with a life expectancy of five years. This is a result of Skyera's innovative, proprietary algorithms that dynamically tune the partitions throughout the life of the Flash, enabling the controller to adapt to different Flash behaviors as the media ages. No existing Flash memory controller can achieve this level of endurance. With a proprietary *RAID-SE* technology, Skyhawk can support a low write-amplification with maximum speed.

Skyhawk will provide enterprise organizations with the best cost per GB for non-mission-critical storage requirements. With a unit capacity from 5TB to 44TB (native) in a 1U form factor, Skyhawk has a 20 times denser storage capacity

² Mean Time Between Failures.

³ The typical multi-layer cell (MLC) solution has a lower reliability rating than single-layer cell (SLC) solutions. By increasing error correction codes, you can compensate for the lower reliability and extend the life of MLC devices.

Exhibit 1 — Key System/Software Features

- Proprietary SSD Controllers
- Hardware Compression
- In-line data deduplication
- AES 256 encryption
- LUN management and thin provisioning
- Snapshots and clones
- Multi-path support
- Consistency groups
- Performance monitoring

Source: Skyera

and at reduced costs when compared to HDD solutions (by reducing over-provisioning and lowering power/cooling costs). It provides high performance and easy maintenance with plug-and-play-connectivity to facilitate deployment. These features are enabled via a unique set of system and software features, as shown in Exhibit 1, above).

Conclusion

Skyera has assembled a world-class team to execute an innovative solid state strategy based upon the first system-level MLC Flash memory controller. With Skyhawk, Skyera technology has delivered the first complete solid-state storage system for the enterprise for under \$3 per GB. It enables the data center to satisfy their SSD requirements in the smallest form factor available with an efficient scale-out architecture. It reduces capacity requirements with hardware-based, selectable compression and in-line data deduplication.

With its proprietary Flash controller and advanced Flash management, Skyhawk delivers the performance and ease-of-use required in any environment, SMB, mid-sized, or enterprise. With its high-endurance enhancements, Skyhawk enables the data center to deploy consumer-grade MLC for critical enterprise application requirements, including the cloud, delivering 100x higher performance with a 10 times lower energy consumption at price parity.

In short, Skyhawk delivers the kind of performance, reliability, and ease-of-use that any enterprise can easily deploy. At the same time, Skyhawk will reduce the floor space required for storage in your data center. If these features match your IT requirements, then you should look closely at Skyhawk. It may be the solution that you seek.



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