



Starkey Mortgage Wins Green Lender Award for Virtualized Desktop Deployment

Mortgage loan originator recognized for utilizing Fusion ioMemory™ ioDrive® cards and Citrix XenApp virtualization to minimize infrastructure, reduce power consumption, and deliver outstanding performance.

Solution Focus

- Citrix XenApp (VDI)
- VMware

Summary of Benefits

- **Faster** application performance for better user experience and increased productivity
- **Reduced** performance-related help desk tickets
- **Improved** performance without increasing maintenance, power, and cooling costs
- **Reduced** burden on SAN and extended SAN investment
- **Reduced** network traffic to extend network investment

The Challenge

With over 400 employees distributed across branches in 13 states, Starkey Mortgage's IT staff has its work cut out for them, but Chief Information Officer Bill Burke has always looked at such challenges as an opportunity instead of a hurdle. Bill told us, "Starkey Mortgage has long viewed IT as a way to gain competitive advantage instead of being a black hole of infrastructure spending."

One way Bill's IT team has accomplished this is by virtualizing its entire end-user experience with Citrix XenApp. "In 2007, we moved from a physical server environment to a VMware-backed Citrix XenApp environment," Bill explained. "This greatly reduced our IT staff's workloads, reduced the cost of workstations, and even reduced workstation power consumption because fewer apps were running on them and required less RAM."

But as the size of Starkey Mortgage's workforce grew, performance became a problem. Bill said, "As we added employees, our SAN began to struggle during peak traffic times. Security and compliance auditing tasks added to the VM performance workload. We knew that I/O was the bottleneck, so our engineering team began looking for the best solution."

The Solution

Starkey Mortgage's IT team evaluated several technologies and after meeting with SanDisk® representatives, determined that SanDisk's Fusion ioMemory ioDrive cards were the best solution.

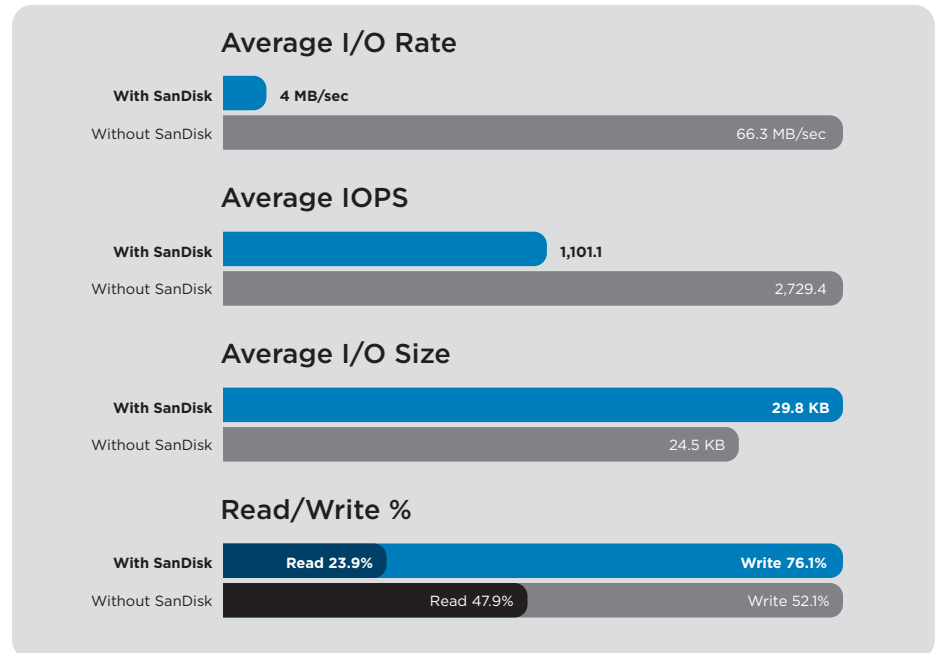
Bill said, "We looked at some flash solutions that would improve SAN performance, but these solutions would have required additional investment in network infrastructure and increased our system's complexity and power requirements. SanDisk's approach of putting data in the server just made more sense."

Benchmarking

The first thing Bill's team did was to baseline the performance of the storage systems. He looked at the performance of his SAN storage for a 60-day period prior to installing Fusion ioMemory solutions and then compared the performance for the ensuing 60-days. The results, shown below, demonstrated significant improvement in efficiency and load reduction.

"We first deployed the system to our power users and asked them for honest critiques. The results were much better than we'd anticipated."

Bill Burke,
Chief Information Officer
Starkey Mortgage



Powering Productivity and Positive User Experience

Bill's tests show that the majority of the read requests are now being serviced from the ioDrive cards. This provides a dramatic improvement in the latency of the system, reducing it by over four times. CPU utilization more than doubled, going from around 12% to around 30% sustained utilization.

The true test came when Bill's team deployed and gathered feedback from application users. The combination of high IOPS with the ioDrive card's industry-leading low latency delivered a user experience that far surpassed Bill's expectations.

"We first deployed the system to our power users and asked them for honest critiques," said Bill. "The results were much better than we'd anticipated. One user told us, 'The performance is fantastic, wonderful, marvelous.'"

Help for the Help Desk

Another benefit of a better user experience was in the reduction of performance-related complaints received by the help desk.

Brian Klesc, Lead Network Engineer, told us, "Before we had SanDisk, Windows would page idle applications and services to disk. Users returning to a paged application would find it slow to load or even disconnected from Citrix entirely. These types of complaints are less common now. Since SanDisk came on the scene, we've noticed significant and immediate improvements throughout the company."

Boot Storms Eliminated

Starkey tested several SanDisk-powered XenApp servers with 92 concurrent users on a single ESXi server, with the following results:

- No boot storms. Even with 92 users accessing the server at the same time, desktops instantiate as soon as users log on.
- Virtually eliminated write latency. Even peak loads of 87,000 write requests produced no measurable latency.
- Ultra-fast reads. The rapid write request service eliminated read queues, greatly improving read performance. The SanDisk-powered server achieved a satisfying 90,000+ read requests in 4 milliseconds.

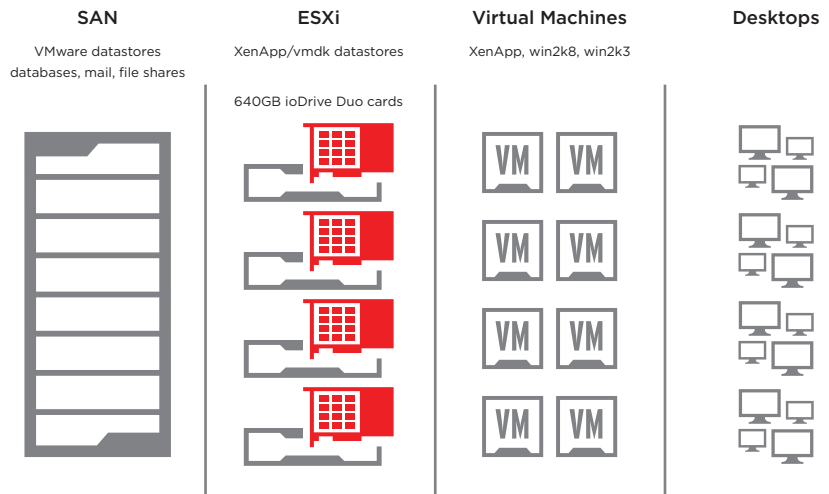
“At first I thought we had made a mistake somewhere in our testing, since we had never seen zero latency before. I actually asked one of the engineers to take a second look and verify that we were truly seeing no latency even during peak demands.”

Greater End-to-end Efficiency

In addition to improving performance, the ioDrive cards allowed Bill's team to improve the end-to-end efficiency of Starkey Mortgage's entire virtual desktop infrastructure. Implementing ioDrive cards allowed Bill's team to increase its virtual desktop infrastructure performance profile without adding infrastructure or increasing system complexity.

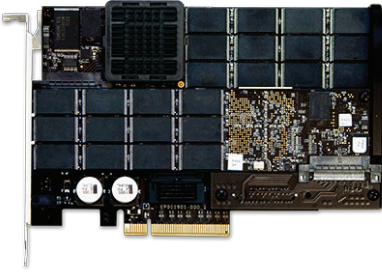
“Moving the XenApp applications onto ioDrive cards in the ESX servers greatly improved the speed at which XenApp served applications without adding more servers,” Bill said. “It also reduced the I/O burden on our SAN, so our databases could run faster while maintaining our HA profile. Additionally, it reduced the amount of data going over our network, giving us room to grow there as well. In essence, we significantly scaled performance without scaling maintenance and energy costs.”

System Overview



Virtualization server specs:

- 4 Dell R910 servers, quad-core Intel Xeon X7560 processor, 256GB RAM
- OS: VMware ESXi 4.1
- Applications: Citrix XenApp
- ioDrive Duo 640GB MLC



Fusion ioMemory™ - ioDrive® Duo

Summary

Implementing ioDrive cards in their Citrix XenApp environment gave Starkey Mortgage the following benefits:

- **Faster** application performance for better user experience and increased productivity
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Bill is very happy with the performance the ioDrive cards delivered to Starkey Mortgage's virtual desktop infrastructure system and is now targeting other areas where SanDisk solutions can improve performance without scaling infrastructure.

About Starkey Mortgage

Starkey Mortgage is a privately held mortgage banking company headquartered in Plano, Texas. The company has offices in Texas, Colorado, Arkansas, North Carolina, South Carolina, Tennessee, Georgia, Alabama and Oklahoma. Starkey Mortgage is consistently ranked in the top 30 companies in the U.S. for mortgage originations with a retail-only presence. With over a decade of commitment to establishing and maintaining relationships, Starkey Mortgage differentiates itself by fostering a corporate environment where people truly come first.

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The performance results discussed herein are based on internal Starkey Mortgage use of Fusion ioMemory products. Results and performance may vary according to configurations and systems, including drive capacity, system architecture and applications.

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