LLog Exploration Finds Dramatic Increases in Productivity with Fusion ioMemory™ Solutions

15 Times Faster Generation of 3D Models Gives LLog a Competitive Edge

Summary of Benefits

- **Fifteen times faster** cross-line displays
- **Four times faster** timeslice generation
- **Three times faster** compleximage generation using a virtual machine running on the ioDrive
- Geoscientists **gain significant productivity** with rapid data access and image generation.

The Challenge

LLog's IT Manager, Terry Hovis, closely monitors the ability of his team to process the datasets used in appraisals. The datasets are large—30GB at the low end to upwards of 900GB for a complete project. Given this size, much time is spent to pull these datasets into memory, run the job and derive crossline and timeslice images from the larger dataset. Only after the images appear on-screen can the highly skilled geophysicists start to do the job of interpretation. Since geophysicists interpret hundreds of these images a day, any delay will significantly reduce productivity.

The challenge becomes even greater in the last few weeks leading up to an oil-and-gas lease auction (which happens at least twice a year). Lease bids can reach tens to hundreds of millions of dollars. Since leases can run up to ten years in length, correctly evaluating a bid decision is essential in this highly competitive environment.

The SanDisk® Solution

Hovis brought in Fusion ioMemory ioDrive® flash solutions to see how much time the new devices would save using their existing 32-bit Seismic Micro-Technology KINGDOM geosciences workflow application on their network. The result? As Hovis put it, "Our interpreters were very impressed with the simple introduction of the ioDrive card and their immediate productivity gains—gains clearly apparent to the geophysicists in the dramatic reduction in their 'downtime' when manipulating large datasets."

Terry ran tests with a typical workload of crossline and timeslice generation on his system. (A crossline is a vertical slice of the seismic 3D subsurface image "cube". A timeslice is a horizontal layer of the cube.)

Test	Hard Disk	ioDrive	Result
Crossline Generation	30 Seconds	2 Seconds	15 Times Faster
Timeslice Generation	90 Seconds	22 Seconds	4 Times Faster

Testbed: 30GB dataset, Dell Precision 690, 500GB SATA300 7200RPM, RAID 0 HDD; Fusion ioMemory 160GB ioDrive card

The tests showed dramatic improvement using the ioDrive card—saving more than half the time spent on image generation. In the future, Hovis expects an upgrade to the 64-bit version of SMT KINGDOM will show even greater performance benefits.

Next, Hovis tested the ioDrive card against their most time-consuming problem—running a large-scale timeslice image involving 4.5 million nodes (involving hundreds of square miles of seismic data). In the past, the generation of these types of images would take all night and was run in a batch process. The user's system would be locked at 100% utilization and unavailable then for any other work—requiring the overnight operation.
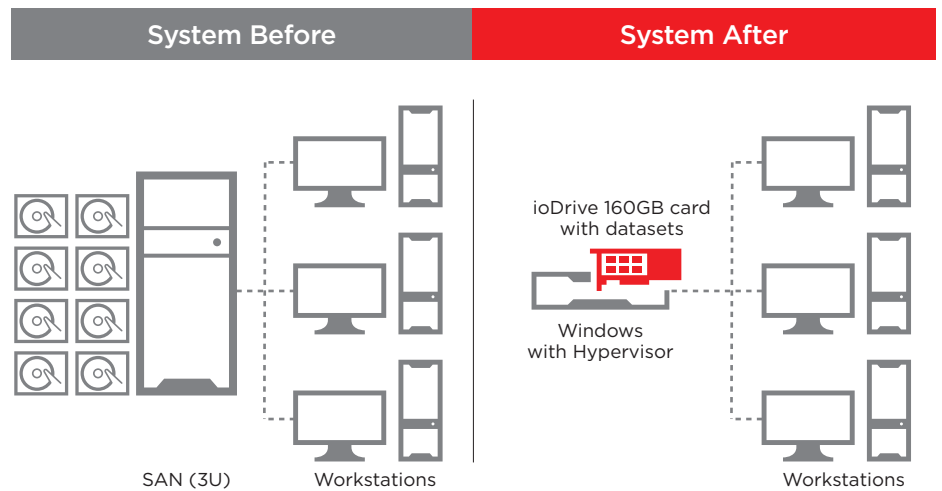
For this test, Hovis ran his SMT application on a virtual machine (a Windows 2008 Server running Hyper-V) with the SMT instance running completely on the ioDrive card to process the job.

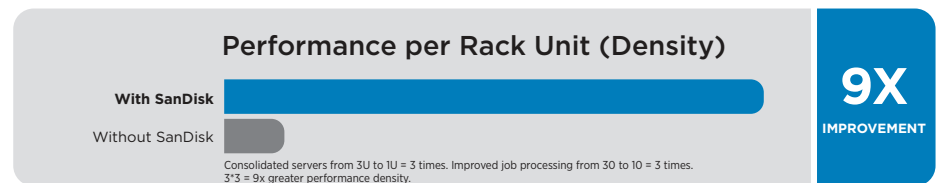| Test	Hard Disk	ioDrive	Result
Timeslice Generation of 4.5 million nodes	30 minutes @ 100% CPU utilization	10 minutes with 0% CPU utilization	3 times faster

Testbed: Dell Precision 690, 500GB SATA300 7200RPM, RAID 0 HDD; Fusion ioMemory 160GB ioDrive card on Windows Server 2008 with Hyper-V using a Windows XP virtual machine
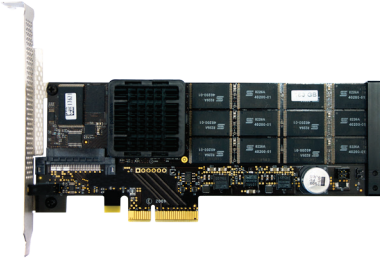
Not only was the image generated three times faster using the ioDrive card, but multiple jobs could now be run in parallel even during working hours. This would free the local server and workstation so the geophysicist could remain productive in what used to be considered "lost time."

System Overview

System Before	System After

SAN (3U)   Workstations

ioDrive 160GB card with datasets

Windows with Hypervisor

Workstations

- Jobs run in serial on each workstation
- Each job takes roughly 30 minutes to complete
- All jobs had to be run in the corporate office

- Jobs run in parallel on multiple virtual machines
- Jobs on virtual machines complete in 10 minutes
- All jobs can now be run either locally or remotely

Performance per Rack Unit (Density)

With SanDisk

Without SanDisk

Consolidated servers from 3U to 1U = 3 times. Improved job processing from 30 to 10 = 3 times.
3*3 = 9x greater performance density.

9X
IMPROVEMENT

SanDisk®
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Fusion ioMemory™ - ioDrive®

The Results

In both the workstation and server tests, the ioDrive card cut in half the amount of time spent "waiting" for data to become available. With the ioDrive card, LLog's geophysical team could now process more surveys per day—providing a significant competitive advantage in the quality of their bids. With the ioDrive card, the team now has the flexibility to do image analysis remotely. Finally, the ioDrive card enabled LLog's highly skilled employees to be dramatically more productive and give the company a compelling advantage in the high stakes oil-and-gas industry..

Summary

1. Fifteen times faster cross-line displays
2. Four times faster timeslice generation
3. Three times faster complex image generation using a virtual machine running on the ioDrive card
4. Geoscientists gain significant productivity with rapid data access and image generation.

About the Company

Llog Exploration Company, LLC. of Metairie, LA., is one of the most active oil-and-gas exploration companies in the Gulf of Mexico. As one of the Oil and Gas Financial Journal's Top Ten of privately-held exploration and production companies, evaluating and exploiting potential and existing finds is critical for the company.

The key to this discovery and development process is to transform volumes of seismic survey data into a clear picture of the sub-surface domain. The oil and gas industry has greatly improved its precision in finding hydrocarbon deposits by using these 3D subsurface maps. Geoscientists create and interpret hundreds of images from these maps to make the "go-no go" decision on whether to participate in oil-and-gas lease auctions. An inaccurate appraisal could lead to the famous "Dry Hole."

The goal for LLog's geoscience team is to accurately locate and estimate the amount of recoverable hydrocarbons in a given parcel. For an independent exploration company like LLog, the difference between a dry hole and a producing well can directly impact company profitability.

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At SanDisk, we're expanding the possibilities of data storage. For more than 25 years, SanDisk's ideas have helped transform the industry, delivering next generation storage solutions for consumers and businesses around the globe.