LLog Case Study

LLog Exploration Finds Dramatic Increases in Productivity with Fusion-io

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

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 like LLog, the difference between a dry hole and a producing well can directly impact company profitability.

The Challenge

LLog's IT Manager, Terry Hovis, closely monitors the ability of his team to process the datasets used in these appraisals. These 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 happen at least twice a year). Lease bids can reach tens to hundreds of millions of dollars. Since leases can run to ten years in length, correctly evaluating a bid decision is essential in this highly competitive environment.

Client
Llog Exploration Company, LLC. Metairie, LA.

IT System Details
- Users: Oil & Gas geoscientists
- Application: Seismic Micro-Technology KINGDOM geoscientific workflow software
- Workstations: Dell Precision 690
- Server: Dell PowerEdge 2950 running Windows 2008 Server
- NAS System: NetApp filer
- Network: Gigabit Ethernet

Challenge
- Geoscientists lose significant productivity each day waiting to retrieve data and seismic image generation.
- Sharply increased workload in the three weeks prior to oil and gas lease auctions limits the ability to accurately assess parcels and reduce risk.

Our Solution
80GB and 160GB ioDrive devices in the server and in workstations

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

FUSION-iO

"The pressure is on as the auction approaches," says LLog's Hovis. "Our geophysicists work right up to the auction deadline evaluating all relevant survey and mapping information to make the best decision."

The Solution By the Numbers

Hovis brought in Fusion-io's ioDrive Solid-state Storage devices 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 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-io 160GB ioDrive

The tests showed dramatic improvement using the ioDrive—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 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 to process the job.

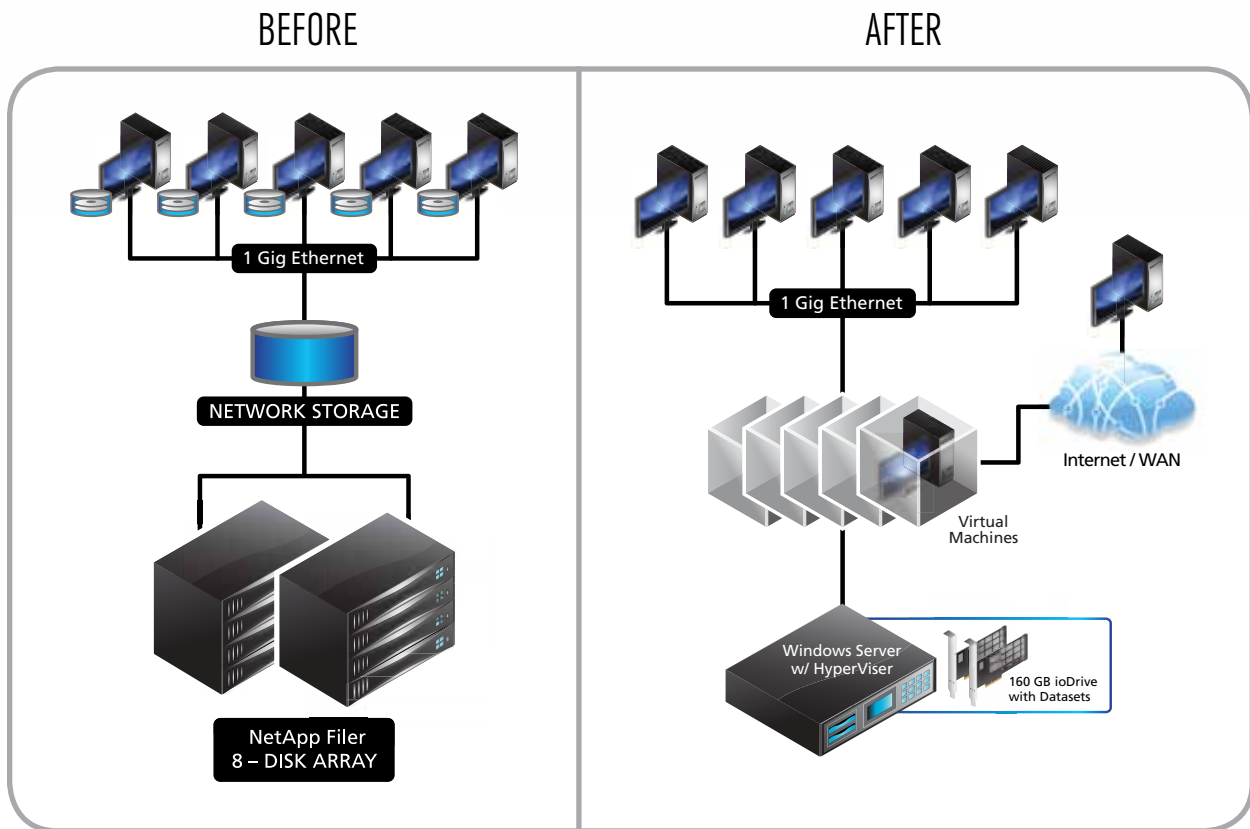| TEST	HARD DISK	ioDrive	RESULT
Timeslice Generation of 4.5 million nodes	30 minutes @ 100% CPU utilization	10 minutes with 0% CPU utilization	3 times faster

Testbed: Dell Precision 690, 500GB SATA300 7200RPM, RAID 0 HDD; Fusion-io 160GB ioDrive 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, 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".

"Using the ioDrive as a virtual machine also revealed an added bonus for us," says Hovis. "Not only did it make local geophysicists more productive, it also would allow multiple groups remote access to the virtual machines as if they were in the office." Hovis added "Our geophysicists can now run last-minute jobs overnight or on weekends without having to drive 35 miles to the office to do the analysis.

BEFORE

1 Gig Ethernet

NETWORK STORAGE

NetApp Filer
8 – DISK ARRAY

AFTER

1 Gig Ethernet

Internet / WAN

Virtual
Machines

Windows Server
w/ HyperViser

160 GB ioDrive
with Datasets

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

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

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Striking Oil

In both the workstation and server tests, the ioDrive *cut in half* the amount of time spent 'waiting' for data to become available. With the ioDrive, 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, the team now has the flexibility to do image analysis remotely. Finally, the ioDrive 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.