

**ION Geophysical** processes huge amounts of data to provide its oil and gas industry clients with 2D and 3D subsurface images in prospective hydrocarbon basins. By installing FlashBlade™ solutions from Pure Storage, ION can process more data in less time and more effectively use its high performance computing resources, delivering better service to its exploration and production customers.



#### BUSINESS TRANSFORMATION

FlashBlade enabled ION to utilize all of its resources and increase data center throughput, making it possible for ION to more quickly and cost-effectively deliver subsurface insights without compromise, informing customers' critical exploration and production decisions.

#### GEO

North America

#### INDUSTRY

Oil & Gas, Services, Technology

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Jim Dolan,  
Manager, HPC Worldwide Support

#### FLASHBLADE GIVES ION GEOPHYSICAL A SEISMIC SHIFT IN STORAGE PERFORMANCE

ION Geophysical is a leading provider of seismic data and processing services to the global oil and gas industry. Its services are of critical importance to oil and gas companies who utilize processed, imaged, and interpreted seismic data as a primary resource to determine where to explore and produce hydrocarbons. Processing seismic data is extremely data- and compute-intensive.

“There is a tremendous amount of data which must pass through many computer intensive workflows. The process involves a large set of distinct geophysical algorithms which are applied in sequence, followed by iterative imaging and model estimation algorithms, where each iteration requires all of the data to pass through it. As the number of iterations increase, a more accurate earth model is determined, which allows more focused and accurate imaging of the subsurface,” observed Gary Martin, Director of HPC & Software Development for ION.

“One of our fundamental selling points is that we can provide a detailed three-dimensional depth image of the subsurface,” said Jim Dolan, Manager of HPC Worldwide Support at ION. “With the knowledge that image and interpretation provides, E&P companies can make a decision whether, and where, they will drill. So, it’s a crucial step in the exploration and processing (E&P) lifecycle.”

The amount of data can be staggering. A single imaging product in the range of 40,000 square kilometers (or about 15,500 square miles) will require in the low hundreds of terabytes of raw data. “And that’s just the one copy,” Martin noted. “There would be multiple intermediate copies of that data, each of which would have to be written out to disk.”

#### MORE BANDWIDTH NEEDED TO SUPPORT CRITICAL APPLICATIONS

As complicated as their work is, ION faced a critical problem in early 2016 that was simple to explain. “Our biggest challenge was bandwidth. Our legacy storage systems could not deliver data to the servers fast enough to keep them all busy. We had compute resources sitting idle while storage systems were maxed out,” recalled Martin.

ION was clear about what it needed. “Given the volumes of data we deal with, raw capacity is one aspect. The other is bandwidth between storage and compute systems. Both of these measures are critically important,” Dolan noted. “We had some legacy storage systems that had enough capacity, but the bandwidth didn’t keep up with the demands of our processors. It was bandwidth that led us to Pure Storage.”

**COMPANY:**

ION Geophysical  
[www.iongeo.com](http://www.iongeo.com)

**USE CASE:**

- High Performance Computing

**CHALLENGES:**

- Extremely large surveys with dense data (many hundreds of TB) required large storage bandwidth on non-large block sequential reads.
- Restricted bandwidth of legacy storage system slowed ION performance, and threatened some high profile project deadlines.
- Servers were not fully utilized for seismic data processing, wasting investment and slowing delivery of results to clients.

**IT TRANSFORMATION:**

- A FlashBlade system in 4U offers the same bandwidth as 50 full racks of legacy storage.
- FlashBlade serves up data so efficiently that servers are now optimally utilized.
- Compact FlashBlade footprint resulted in operating cost savings, and a more than two-thirds reduction in the staff needed to manage storage.

“Our two FlashBlade systems have required virtually no maintenance.”

Jim Dolan,  
 Manager, HPC Worldwide Support

ION pursued a suggestion by a former colleague that it consider Pure Storage. At the time, Pure was just beginning to offer customers its FlashBlade product. FlashBlade is the first all-flash storage system purpose-built for modern analytics — architected from the ground-up to deliver a powerful cloud-era data platform that is fast, compact, infinitely scalable and easy to manage. FlashBlade is designed for customers who need high-bandwidth parallel storage to support data-intensive applications involving parallel processing, such as the seismic imaging conducted by ION.

ION arranged for a proof of concept trial of a FlashBlade chassis containing 15 blades, each with 8TB raw capacity.

**CONSOLIDATING KEY WORKLOADS ON ALL-FLASH**

“Based on successful results from initial testing, we eventually migrated some production workloads to FlashBlade,” Dolan said. “The performance, ease of deployment, reliability, and provision of NFS as its native file system were major pluses. It dropped right into our infrastructure and compute environment and was effective from day one.”

Although the proof of concept (POC) officially ran for several weeks, “early on it was clear we could run it in a production environment with outstanding results.”

During the POC, “we saw bandwidth that exceeded our expectations and data delivery that was higher than we thought possible,” Dolan said. Even more remarkable, according to Dolan, is the compact size of the FlashBlade system. “It’s just 4U, about 1/10th of a rack, but provides the same bandwidth as 50 racks of our legacy storage sitting in the same data center. It’s extraordinary.”

The FlashBlade architecture is a perfect fit for ION’s needs. “We put data on the FlashBlade system that is always being read at a high rate, which takes pressure off the other storage systems used for less data-intensive applications,” Martin noted. “In particular, we are using it for Kirchhoff imaging, which is particularly stressful for storage. In Kirchhoff, the data is read over and over. The reads are relatively small block I/O and are highly random from a storage perspective.

**KEY APPLICATIONS GET BIG PERFORMANCE BOOST**

“With our legacy storage, other applications using the shared storage would grind to a halt whenever we ran a Kirchhoff workload, so we had to throttle back the Kirchhoff. However, FlashBlade handles it flawlessly, allowing the legacy storage clusters to handle their workloads without interruption. As a result, our entire workforce gets what they need when they need it.”

The characteristics of Kirchhoff imaging, Dolan observed, are what FlashBlade was made for. “These workloads read the same data over and over and just hammers the storage. We make very effective use of the servers, but it’s hard on the storage. The ability of FlashBlade to provide unprecedented IOPS and bandwidth delivers an order of magnitude improvement in the delivery of data to compute nodes, and that future-proofs us as we grow our compute footprint and adapt new compute architectures.”

Added Martin, “After a couple of lean years due to the E&P industry downturn, our clients want to see their partners cost-effectively produce excellent results in less time. So, it’s really critical that we have the ability to use all of our compute capability on whatever workloads we are facing. With FlashBlade, we run all our clusters all the time. That means we do more work in the same amount of time.”

Some of ION’s contracts call for potential penalties if deadlines are not met, and the addition of FlashBlade has reduced concerns about meeting timelines.

“We have been working on some very large multi-client projects that have very aggressive timelines, and there was some skepticism in the industry and internally that we would be able to do it,” Martin reported. “Not only have we been able to achieve those very aggressive timelines, but we’ve exceeded them and provided higher quality images than our clients expected. It surprised a lot of people and Pure has played a part in our success.”

For ION clients, the improvements provided by FlashBlade “means clients have more time to analyze our imaging products and more time to make critical decisions about leasing and drilling,” Dolan said.

### STORAGE AUTOMATION IMPROVES OPERATIONAL EFFICIENCY

FlashBlade also delivers several benefits to the IT staff at ION’s main data center in Houston.

“Our two FlashBlade systems have required virtually no maintenance,” Dolan observed. “In contrast, we have a full-time team of three people whose primary task is to keep the legacy storage running. We replace 30 to 50 disks in an average week. With FlashBlade, we now have resources we can devote to other, higher priority projects.”

Reliability and resiliency also are big positives for FlashBlade.

“Our experience with Pure Storage has been that it achieved 100% uptime,” Martin said. “One of the key capabilities of the FlashBlade architecture is that it distributes the load across all the compute nodes. So even if you happen to lose a blade, that data isn’t isolated on that one node.”

The ION team found the ease of installation and management of Pure Storage equipment to be a key contributor to operational efficiency. “You start writing data the same day you open the box,” Dolan said. “That’s a big difference from the experience we had with large-scale legacy storage, which typically involved forklifting many racks of equipment and big cabling operations. Pure is plug-and-play, and you can start production work right away. That is a game-changing experience.”

Another key factor driving ION’s decision to acquire multiple FlashBlade platforms is the Pure Evergreen™ Storage business model. This unique program guarantees customers access to the latest technology through non-disruptive upgrades that preserve investment for up to 10 years.

“With Evergreen, you never have to pay for the same gigabyte twice,” Dolan said. “You don’t have to buy something and then forklift a replacement every 3 to 5 years. That is a very valuable investment protection model.”

“FlashBlade has been a big plus for us,” Martin concluded. “Without it, we would have had to mothball some of our servers, which would have prevented us from delivering projects to clients on time. Now, we are meeting or exceeding our deadlines, and delivering a better product to customers at the same time.”

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Gary Martin,  
Director, HPC & Software Development



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