Abstract

This white paper summarizes the findings from two sets of tests performed independently by EMC in the Celerra® labs. Each test compared the performance and scalability of the SeisWorks® 3D seismic data analysis and interpretation application on traditional network-attached storage (NAS) to that of EMC Celerra with MPFS. EMC Upstream Application Accelerator helped achieve I/O throughput improvements up to 4.6 times over traditional NAS.
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Executive summary
The SeisWorks® 3D application from Landmark Software runs on an EMC® Celerra® with the EMC Upstream Application Accelerator, and a tested configuration delivered superior results over traditional network-attached storage (NAS) in the following areas:

- **Performance** – The time required to render 3D project data in SeisWorks dramatically reduced wait time for geoscientists. I/O throughput improvements of up to 4.6 times were achieved over traditional NAS using the EMC Upstream Application Accelerator.

- **Scalability** - As more seismic workstations are added to the infrastructure, this solution scales by providing greater I/O bandwidth through the use of multiple data paths to the Celerra NAS array. Higher throughput results in shorter elapsed time for data access and seismic rendering operations.

- **Application transparency** - EMC Upstream Application Accelerator works seamlessly with all seismic interpretation and analysis applications, so no application changes are required to get the benefits of increased performance and scalability, consolidated cost reductions, and manageability of NAS storage with Celerra and the EMC Upstream Application Accelerator.

Introduction
This white paper summarizes the findings from two sets of tests performed independently by EMC that compared the performance and scalability of the SeisWorks 3D seismic data analysis and interpretation application on traditional network-attached storage (NAS) to the performance and scalability on EMC Celerra. It discusses the test environment, variables, and results.

**Audience**
This white paper is intended for geoscientists who use applications like SeisWorks to interpret seismic data and for the information technology staff who support the infrastructure on which SeisWorks runs.

SeisWorks 3D software
SeisWorks 3D software provides 3D viewing and interpretation capabilities and easy-to-use interpretation productivity tools to support and enhance horizon and fault interpretation. It is an industry standard for 3D seismic data analysis and interpretation. With SeisWorks 3D software, interpreters can work with a 2D project and multiple 3D projects concurrently for great interpretation flexibility.

Combining SeisWorks with EMC Celerra and EMC Upstream Application Accelerator provides the following benefits:

- **Rendering performance:** With typical NAS solutions, geoscientists must wait for seismic data to be rendered. For large datasets waiting can be disruptive to a geoscientist’s thought process. EMC Upstream Application Accelerator significantly reduces the time required to render variable density or wiggle traces for interpretation and analysis. In fact, EMC Upstream Application Accelerator can return results two to three times faster than traditional NAS solutions using NFS.

- **Scalability:** Traditional NFS environments are limited by the number of physical Ethernet connections to the NAS solution. NFS connections are optimized with EMC Upstream Application Accelerator by using the multiple paths to deliver metadata and data separately. Metadata operations use conventional IP connections while data operations use iSCSI or Fibre Channel for read and write operations. This offloading or separating data from metadata allows for additional iSCSI or FC connections directly to the back-end storage array, and thereby delivers a highly scalable architecture as additional seismic workstations are added into the EMC Celerra Upstream Application Accelerator environment.
**Infrastructure test environment**

The storage configuration tested consisted of an EMC Celerra NS-480 unified storage platform with iSCSI connectivity between six Dell seismic application workstations and the Celerra NS-480. The network switch was a Cisco Catalyst 6509.

The EMC Upstream Application Accelerator file system was created and optimized across 20 disk spindles using 4 GB fibre drives with 300 GB capacities each.

Single and dual iSCSI paths on the Dell workstations were used for block-based data read and write activity directly to the storage in the NS-480 unified storage platform.

![Test environment diagram](image-url)

*Figure 1. Test environment*
Test variables and iterations

Two sets of tests were performed by EMC in our Celerra labs. Each test compared the performance of traditional NAS to that of EMC Celerra with EMC Upstream Application Accelerator. Tests were conducted to measure the throughput as well as the elapsed wall clock time to render files using variable density with the same test bed and same file system.

Prior to every test iteration, each seismic workstation was rebooted to eliminate any effects of operating system or MPFS caching on the client, and to ensure repeatability of the test results.

Test results

EMC Upstream Application Accelerator improved the aggregate I/O throughput measured in megabytes per second by an average of 4.6 times on a 64 GB seismic file over the traditional NFS protocol. When measured by wall clock response time, the speed to perform variable density rendering of the 64 GB project was an average of 2.5 times faster than NFS.
Figure 2. Comparison of MB/s (top graph) and seconds (bottom) in testing
Conclusion

EMC Celerra with the EMC Upstream Application Accelerator provides significant performance advantages for Landmark Software’s SeisWorks application over traditional NFS, particularly for seismic operations requiring high-bandwidth I/O between shared NAS storage and the seismic workstations.

The performance advantage is delivered by the Celerra NS-480 configured with the EMC Upstream Application Accelerator to accelerate data transfer between the Celerra storage and the seismic application workstations by providing separate transports for file data and metadata. EMC Upstream Application Accelerator achieves this by sending CIFS and NFS metadata traffic over IP to the Celerra, while all file read and write data passes over high-performance SAN iSCSI directly to the integrated storage array.

In other words, Celerra and the EMC Upstream Application Accelerator deliver all of the traditional operational benefits of NAS in terms of consolidated storage, manageability, and file sharing, while at the same time delivering the performance and scalability benefits of traditional SAN block storage architectures by sending large read and write operations directly to the back-end storage array.

Testing at EMC labs is ongoing to further quantify the benefit of using EMC Upstream Application Accelerator across a broader portfolio of Landmark’s interpretation applications.

About Landmark

Landmark's integrated software and services help the upstream oil and gas industry turn critical information into useful knowledge. With this knowledge, our clients can see further, deeper, more accurately, and more comprehensively than ever. So they can make better decisions with less risk than ever. Landmark Software is a division of Halliburton. With more than 50,000 employees in approximately 70 countries, Halliburton serves the upstream oil and gas industry throughout the lifecycle of the reservoir – from locating hydrocarbons and managing geological data; to drilling and formation evaluation, well construction and completion; and optimizing production through the life of the field. Visit the company’s website at www.halliburton.com.

About EMC

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