



FOUNDED BY BRIGHAM AND WOMEN'S HOSPITAL
AND MASSACHUSETTS GENERAL HOSPITAL

CASE STUDY

Partners Healthcare Cuts Latency of Cloud-based Storage Solution Using Mellanox's InfiniBand Technology

Challenge

Partners HealthCare Systems, founded in 1994 by Brigham and Women's Hospital and Massachusetts General Hospital, is a non-profit, integrated health care system and teaching affiliate of Harvard Medical School. Partners offers patients a continuum of coordinated high-quality care including primary care and specialty physicians, community hospitals, academic medical centers driving state of the art research, and specialty facilities.

Over the past few years, ever-increasing advances in the resolution and accuracy of medical devices and instrumentation technologies have led to an explosion of data in biomedical research. Clinical imaging instruments, such as MRI systems and CAT scanners, are taking more images per unit time and each has far more pixels per image. EKG, EEG and other clinical monitoring instruments that previously did not store data digitally, or did so discretely, are now doing so while continuously monitoring subjects with ever-increasing sensitivities. Additionally, new advances in genetic and molecular technologies are producing instruments that are higher in throughput and less costly per experiment, all of which result in generating very large amounts of data that requires storage.

As these technologies enable deeper resolution of data, the quantity of data generated grows, so does the need for the capacity to support its storage and access. For example, typical experiments at Partners three years ago generated tens to hundreds of gigabytes. Similar experiments using the new instrumentation today generate approximately five terabytes of information that needs to be interpreted by the investigator. This trend is expected to continue unabated over the next few years. As a result, collecting and managing the data so it can be

accessed using practical methods, has become a challenge.

Traditionally, researchers use a portion of their grant money to purchase computer equipment that is then managed and maintained through these same grant resources. However, Cloud-based research computing as an alternative is compelling for these researchers and their budgets. In both operational and capital dollars, as the amount of data grows, so do the cost associated with growing their own computer systems. By implementing a Cloud-based solution, resources and costs can be distributed to the researcher based on demand while being managed centrally through dedicated systems engineers.

Solutions

Partners recognized early on that a Cloud-based research compute and storage infrastructure could be a compelling alternative for their researchers. Not only would it enable them to distribute costs and provide storage services on demand, but it would save on IT management time that was spent fixing all the independent research computers distributed across the Partners network. Partners understood that they needed to deliver a solution that was flexible enough to address individual researchers' compute technology needs while remaining affordable to the investigator. Finally, since Partners researchers are geographically dispersed and need to store and access data and run analyses quickly regardless of location, the solution needed to be Cloud-based.

By building it on their own, using open source technology, Partners was able to develop a solution that kept both initial and future costs in check, while offering flexibility to grow with

their needs. They needed to be able to offer more compute resources for less money than the researchers could purchase themselves. The solution, which Partners offers as a service to its users, runs on Sun Fire X4500 servers and X64 Gateways and the Samba Windows interoperability suite of programs for Linux and Unix and provides approximately 300 terabytes of capacity. Additionally, they chose to use a Gluster file system which offered a compelling alternative to traditional clustered file system offerings.

“Gluster offers an open sourced method to aggregate disparate storage hardware and provide a simple, easy to manage, high performance file system which saves resources and money,” said Brent Richter, Director, Enterprise Research Infrastructure & Services.

Initially, Partners Healthcare chose Ethernet as the network transport technology. As demand grew the solution began hitting significant performance bottlenecks, particularly during read/write of 100’s of thousands of small files. The issue was found to lie with the interconnect—Ethernet created problems due to its high natural latency. Because of the structure of the file system used by Partners researchers, its performance was dependent on latency. As more concurrent jobs and small files were added to the system, the latency of the Ethernet became a significant factor in limiting overall performance. This manifested itself as lengthy delays to the end-users. They needed a way to scale up the capacity of their Cloud system without increasing the wait time for customers.

In order to provide a scalable low latency solution, Partners Healthcare turned to InfiniBand from Mellanox, a leading supplier of connectivity solutions. InfiniBand from Mellanox has the lowest latency on the market today and can scale linearly.

Results

With support from Mellanox, Gluster and Sun, Partners Healthcare tested the InfiniBand solution to see if it would significantly decrease latency and

provide higher sustained throughput and capacity. They replaced the Ethernet using a mini-cluster of direct connected InfiniBand storage and ran a set of jobs in which they had a previous benchmark.

“We were looking at a worst case scenario problem with tens of thousands of files to transfer per user. Collectively it was not a large amount of data, but represented a very large amount of files. Using Ethernet for a typical transfer took over 50 minutes, creating frustrating delays for our customers and problems in scaling. InfiniBand brought the transfers down to under a minute and provides linear scalability to the system,” said Richter.

“InfiniBand complements the Gluster file system on the storage end, especially in a challenging environment such as Partners, where performance is key to providing the lowest latency and quickest response times for their customers,” said Hitesh Chellani, CEO and co-Founder of Gluster, Inc.

Partners Healthcare has since transferred InfiniBand into its production environment and expanded their initial storage to almost double the original footprint. By integrating InfiniBand into the storage solution, Partners Healthcare was able to reduce latency close to zero and increase its performance, providing their customers with faster response and higher capacity.



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