



USC INI

Dell EMC helps neuroscientists fast-track path to vital clinical discoveries

ESSENTIALS

Industry

Scientific research

Organization Size

Approximately 140 employees

Business Challenge

- Large volumes of brain images required for advanced research
- Traditional storage limited performance and scale of studies

Results

- Accelerated image throughput from 220,000 to 350,000 IOPS
- Increased scale of research data sets from 400 terabytes to one petabyte
- Retained 30 percent additional website traffic during news spikes
- Decreased storage administration staffing resources from 100 to 20 percent of an FTE

Solutions

- Dell EMC Isilon
- Dell EMC SmartConnect
- Dell EMC SmartPools
- Dell EMC SnapshotIQ
- Dell EMC XtremIO
- VMware, MySQL, LAMP, NGINX

INSTITUTE PROVISIONS ONE-PETABYTE RESEARCH DATA SETS ON THE FLY

Piecing together how the human brain functions is an extremely complex puzzle. USC Mark and Mary Stevens Neuroimaging and Informatics Institute (INI) plays a vital role in solving these problems. At INI, scientists access the most advanced tools and technologies to make unprecedented breakthroughs in treatments for brain injury and disease.

INI houses the largest collection of research neurological scans on earth, attracting researchers from every continent. As the volume and granularity of these images increase, the institute's storage capacity has grown at 100 to 150 terabytes per year. The challenge was that INI's previous disk and tape storage could not scale or deliver the performance to meet ever-expanding research demands.

To address this issue, INI deployed Dell EMC Isilon scale-out storage for its entire library of brain scans, complemented by Dell EMC XtremIO all-flash storage to run its VMware environment. The Dell EMC solution enables INI to ensure fast, global access to brain scans required for advanced clinical research and sustain high performance for websites announcing the latest discoveries.

ENVIRONMENT

INI deployed 63 Dell EMC Isilon NL-Series nodes to provide 5.5 petabytes of available storage in a high-performance computing (HPC) infrastructure that includes Cisco Unified Computing System (UCS). The institute has populated Isilon with 2.5 petabytes of active data—primarily brain scan images accessed globally by 8,000 scientific and clinical researchers. Isilon also supports MySQL applications running on bare-metal servers, which extract, transform, and load (ETL) images when requested by researchers.

The institute relies on Isilon software, including SmartConnect, SmartPools, and SnapshotIQ, for streamlined storage administration and data protection. In addition, INI uses 17 Isilon accelerators and Dell EMC NetWorker to back up Isilon data to tape.

Dell EMC XtremIO provides INI with storage for 140 VMware virtual machines (VMs)—about 75 percent of its compute environment. The VMs run a variety of web services such as LAMP and Tomcat supporting 55 websites.

Integrated Media Technologies (IMT), a Dell EMC partner, architected and implemented INI's complete HPC solution.

Jason Kranitz, IMT's senior vice president of sales, remarks, "Our goal was to build a best-of-breed HPC solution and integrate a complete technology stack from Dell EMC and Cisco. The results are impressive."

FASTER ACCESS TO NEUROIMAGING DATA

With Isilon, INI enabled faster access to neuroimaging data. In fact, performance continually increases as it adds Isilon nodes. For example, INI's initial 33 Isilon nodes delivered throughput of 220,000 I/O per second. Since adding 30 nodes, throughput increased to 350,000 I/O per second.

Grace Liang-Franco, INI's senior administrator, comments, "Isilon's performance has been amazing. Our researchers can get at large data sets much faster and perform more complex studies that ultimately lead to new health discoveries."

In fact, Isilon performance is so good that INI performs ETL on images in advance of researcher requests, further accelerating access.

Dr. Arthur Toga, INI's director, notes, "Isilon lets us pre-process and hot-store images so researchers can access them on the fly instead of waiting for the ETL step."

ACCELERATED RESEARCH AT A WHOLE NEW SCALE

A couple of years ago, a typical research project would use a 400-terabyte data set that researchers ran studies against for two or three months. Now with Isilon, that same process is on-demand at petabyte scale.

"We're supporting massive research initiatives on Isilon where we provision a petabyte of storage on the fly... This lets researchers test and refine theories dynamically and accelerate the pace of discovery."

Dr. Arthur Toga, Director, USC Mark and Mary Stevens Neuroimaging and Informatics Institute

"We're supporting massive research initiatives on Isilon where we provision a petabyte of storage on the fly," says Toga. "We then discard it almost as fast once the researchers are ready to move on. This lets researchers test and refine theories dynamically and accelerate the pace of discovery."

Liang-Franco adds, "With Isilon, we're able to offer more resources and tools than other institutes. That not only brings in more researchers, but also makes us an attractive candidate for grants that are so vital for funding our work."

MORE TIME FOR IT TO INNOVATE

Because funding is always tight, INI depends on IT running efficiently. Isilon plays a big role by providing high reliability and simple administration.

Toga explains, "Management of Isilon is quite lightweight. We only have 20% of an FTE across three people devoted to managing it. Before Isilon, we needed at least 100% of an FTE to administer a dramatically smaller environment.

"And since Isilon runs trouble-free, we have more time to write tools for our database developers so they can be more efficient and productive."

SNAPPIER WEBSITE PERFORMANCE

Another important function at INI involves announcing its research offerings and breakthroughs on the web. This falls on XtremIO, which delivers much-needed performance and VMware integration for INI's virtualized resources.

Organization Overview

USC Mark and Mary Stevens Neuroimaging and Informatics Institute applies imaging and information technologies toward researching brain structure and function. Part of the prestigious University of Southern California (USC), the institute helps scientists from around the world to better understand the brain and achieve discoveries that lead to therapies, preventions and cures for brain injury and disease.

"With XtremIO, we can horizontally scale VMs extremely fast," says Toga. "If a researcher gets on the news with a big discovery and our websites get hammered, we can toss out a few extra clones of storage in less than a minute to handle the traffic."

"Now, we're retaining about 30 percent more traffic when people click on our home page soon after some big news breaks," Liang-Franco reports. "Things in general are snappier, so people stay on our websites longer and have a better experience. It's a nice big circle of improvement."

CLEARs THE WAY FOR UNENCUMBERED RESEARCH

As INI continues to broaden its research capabilities, Isilon and XtremIO provide the robust capabilities to meet its diverse application demands.

For example, XtremIO handles a growing number of VMs with ease. With compression and deduplication, XtremIO reduces storage growth and ensures efficient storage utilization.

"When we need to scale, we simply add another brick onto XtremIO," Toga remarks. "It's that easy."

Complementary to XtremIO, Isilon can take on the full brunt of requests for neurological images regardless of workload intensity.

Toga reflects, "A storm of compute activity can hit the Isilon and there's zero impact on our virtualized resources hosted on XtremIO. If needed, we could even put VM clones on the Isilon for failover."

"The Isilon and XtremIO combination is very powerful for us because we no longer need to worry about unpredictable spikes in demand," he continues. "Instead, we can focus more on supporting the scientists and the important life-changing work they do every day."

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