NetApp®

UCLA Speeds Time to Market for Research with HPC Infrastructure on NetApp

idre

Customer Profile

The University of California, Los Angeles (UCLA) is a top-ranked public research university with a mission to create, disseminate, preserve, and apply knowledge for the betterment of the global society. The university's Institute for Digital Research and Education (IDRE) is an arm of the UCLA Office of Information Technology dedicated to maintaining UCLA's position as a world leader in research. IDRE is a cooperative of faculty and technologists working to support, advance, and guide a campus-wide collective of research and innovative scholarship using high-performance computing (HPC), data visualization, and analysis of large datasets.

The Challenge
Supporting groundbreaking research

From human genetics to brain imaging to Egyptology, UCLA researchers are involved in every field of research. IDRE's primary goal is to make sure that UCLA's HPC infrastructure is competitive with other world-class research universities, and one of its key directives is supporting the Hoffman2 Shared Research Cluster. Professors such as Zvi Bern, whose research challenges established beliefs

about particle physics, depend on the Hoffman2 cluster to run experiments and obtain results.

"Supporting our research community effectively is essential to our ability to attract and retain the best faculty," says Scott Friedman, PhD, chief technologist for research computing at UCLA IDRE. "Securing funding for research is increasingly competitive. Our challenge is providing scientists with the best possible HPC resources to run experiments and get their results published quickly, while making the most efficient use of our limited funding."

IDRE is efficient indeed, maintaining a 95% utilization rate on the Hoffman2 cluster and running more than 20 million compute jobs every month. IDRE provides storage capacity to researchers on demand, and as datasets grew larger, researchers began to notice slow performance when the cluster was under heavy load. The network-attached storage (NAS) devices supporting Hoffman2 were becoming a bottleneck to results.

"We ran the risk of researchers abandoning Hoffman2 and building their own HPC clusters, which is not as

efficient or scalable as a central shared research cluster," says Friedman. "We needed to provide our research faculty with a storage solution that could scale without performance degradation."

Space, power, and cooling were also challenges, because UCLA prefers to remain within its existing data center while finding ways to be more energy efficient.

The Solution
High-density storage for research computing
To address researchers' needs, Friedman and his team evaluated a variety of storage solutions for compute jobs running on Hoffman2 that require a high number of input/output operations per second (IOPS). They decided to deploy a dual-controller NetApp E-Series storage system connected by Fibre Channel to a two-node NetApp V6290 storage system to provide a NAS gateway. The NetApp V6290 systems are connected to a pair of Cisco® Nexus® 5496 switches.

NetApp Professional Services performed the installation. "We needed a true partner to help us succeed and believe we have that with NetApp," says Friedman. "The team listened to our needs, proactively offered their HPC expertise, and collaborated with us to make sure the solution met our peak performance requirements for research."

Virtualizing the high-performance E-Series system with the V6290 gives UCLA all the benefits of NetApp FAS series storage, including multiprotocol support, NetApp OnCommand® Unified Manager, and the NetApp clustered Data ONTAP operating system. With clustered Data ONTAP, UCLA can keep its NetApp storage available to the Hoffman2 cluster while performing maintenance, adding or

upgrading controllers, or load-balancing for capacity or performance.

IDRE runs its file-based engineering workloads using the NFS protocol. As legacy storage servers reach end of life, IDRE is moving CIFS shares to NetApp, improving overall storage density. "NetApp's multiprotocol flexibility is helping us consolidate," says Friedman. "And with the density that the NetApp E-Series offers, we're taking up one-third less rack space than with our previous storage, with much less power usage."

Business Benefits
Offering 24/7 availability for HPC storage
IDRE no longer needs to take storage offline for maintenance or spend valuable engineering time moving data around. Storage is available to the cluster 24/7, with consistent performance to accommodate high-I/O experiments in genomics and other data-intensive fields.

"With NetApp behind our high-IOPS computing, researchers have confidence in our cluster again," says Friedman. "We're also reclaiming hours of engineering time each week, because management of the NetApp storage is so straightforward."

Scaling with no downtime and no penalties
One constant in research computing is that datasets continue to grow. As UCLA's storage needs expand, IDRE can seamlessly add disk shelves or controller nodes to the cluster to scale capacity or processing power without downtime.

"Scalability is the number-one reason we went with NetApp," says Friedman. "With NetApp clustered Data ONTAP, we can actually scale to improve performance, instead of taking a performance hit when we add capacity."

Improving time to market for new discoveries
With NetApp, UCLA can bring research results to market faster and improve its already high standing among research institutions worldwide. For example, Professor Bern's innovative technique to analyze particle processes has been published in Scientific American and it is helping physicists decipher problems previously thought to be unsolvable.

"The coin of the realm at UCLA is driving research forward," says Friedman. "We depend on NetApp to help IDRE support that goal with reliable, high-performance storage for research computing. Ultimately, we'll be able to secure more grant funding and award more PhDs based on research conducted with our HPC infrastructure."

SOLUTION COMPONENTS

NetApp Products
NetApp V6290 storage systems with clustered Data ONTAP 8.2

NetApp E5400 storage system

NetApp OnCommand Unified Manager

Environment
Applications: Research-specific solvers and academic applications

Operating System: Red Hat Linux®

Network: Cisco Nexus 5000 series switches

Protocols
NFS

CIFS

FC-SAN

NetApp Professional Services
Storage System Implementation Services

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