

Northern Arizona University

Case Study

Nexenta 'Future Proofs' Storage for Academic Researchers' HPC Environment

Flagstaff, AZ
www.nau.edu/hpc
HPC Research Team



Summary

Challenge: The HPC cluster required a larger, reliable, feature-rich storage system for intermediate/archival storage

Solution: NexentaStor

Platform: Dell, SanDisk, Mellanox

Use Case: Centralizing long-term storage for HPC and campus

Benefits:

- Delivers infrastructure flexibility to future proof the HPC environment
- Achieves high levels of compression (1.7X on average) across all data shares
- Maintains data integrity with zero data corruption
- Lowers TCO with "hands-off" high-capacity storage

Business Overview

Northern Arizona University (NAU) is a public university offering undergraduate, graduate, and professional degrees. Originally founded in 1899, NAU today has 4,629 faculty and staff who administer 91 undergraduate and 60 graduate degree programs that include 69 online degree programs. NAU's main Flagstaff campus accommodates more than 21,000 students; an additional 2,200 students are enrolled in NAU's extensions throughout the state of Arizona; and more than 5,100 students are enrolled in online courses. The centralized Information Technology (IT) Services Department must make sure everything runs smoothly for students, faculty and administrators. This includes telecommunication services; network infrastructure; Internet connectivity; Web services such as payroll, HR, enrollment and financial aid; remote desktop support; specialized academic software packages for both Windows and Mac environments; and more.

“The initial setup was easy to complete, in just a couple of days,” observed Coffey. “Working with Nexenta engineers to get the product mingling properly with InfiniBand was pleasurable. Since the implementation (about one year ago), it’s been hands off, requiring minimal maintenance, which is a big deal for us.”

Christopher Coffey
HPC Research Administrator
Northern Arizona University

Challenges

Within NAU's centralized IT Services Department is a high-performance computing (HPC) team dedicated to supporting the extensive research conducted by NAU faculty and graduate students in the areas of astronomy, bioinformatics, computational chemistry, cropland mapping, human microbiome analysis and microbial genomics. This research generates big data items such as genome maps, Landsat images and complex chemistry data sets. As recently as 2014, this research was processed in computer systems within NAU's individual research labs located throughout the different schools and departments comprising the university. As the data sets grew, they exceeded the capacity and compute power of the individual labs themselves. NAU's HPC Research Administrator, Christopher Coffey, and his team were charged with centralizing the compute processing and storage for both archival and intermediate access to provide reliable cost-effective storage located locally to the HPC cluster. Coffey investigated storage options that were compatible with the university's HPC system, which consists of Dell servers and Mellanox's InfiniBand/Virtual Protocol Interconnect (VPI) switches with Connect X3 cards.

System Configuration

- 616 TB
- NexentaStor
- Dell PowerEdge R730 and Dell PowerVault MD3060
- 256 GB
- 172x 4TB NL-SAS disks, 2x SanDisk Optimus Ultra SSD's for write cache or ZIL
- 2x 10Gbe Link Aggregation Control Protocol (LACP) bands in production
- Via Mellanox SwitchX-2® (SX6036), FDR InfiniBand fabric, Connect X3 hosts

Solution and Benefits

Solution

After reviewing a variety of storage options including SAN-based RAID systems, and roll-your-own ZFS solutions, Coffey and his team felt none compared with the richness of features, flexibility and ZFS support offering they found in Nexenta's industry-leading Software-Defined Storage (SDS). In addition to the robustness of its storage offering, Nexenta partners with every major supplier to the data center ecosystem. Nexenta's and Mellanox's engineers have integrated and configured a next-gen, reliable, feature-rich storage infrastructure that leverages Mellanox's FDR InfiniBand VPI switches and host adapters along with Nexenta's award-winning storage. Over the shared back-end Mellanox network fabric, Nexenta's native 10Gbe connectivity seamlessly integrates with the InfiniBand fabric performing with the lowest possible latency and highest possible efficiency, for both small/random and large/sequential workloads. Together, the Nexenta and Mellanox solution provides full-featured, Network File System (NFS) and Server Message Block (SMB) object services that enable shared-storage across the cluster, and campus, petabyte-scale active archives, and support for big answers from NAU's research facilities.

Benefits

The Nexenta solution has benefited both NAU's HPC team and its researchers. The Nexenta SDS, which originated from OpenZFS, allows NAU's HPC team to easily backup file systems to other ZFS storage systems for disaster recovery. According to Coffey, the GUI front-end is very powerful and makes management of ZFS shares "a breeze."

"What we weren't expecting is how the system's reliability and ease of management create a stress-free environment for allocating and maintaining storage space for research projects," Coffey said.

Having archival/intermediate storage with compression, and snapshot capability that is local to the HPC cluster via high-speed interconnect is highly valued by NAU researchers. This saves them time because they do not have to move data back and forth from their labs. The snapshots further enable researchers to quickly retrieve original or lost files locally on the cluster via NFSs, or via SMBs from around campus. In addition, the system removes the need for any prep steps prior to moving data into place for analysis.

Coffey's team values how the compression achievable from Nexenta's solution saves money by reducing the actual footprint of the datasets. The virtual nature of the software-defined storage extends the purchased physical storage beyond what is normally possible, according to Coffey.



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