

# Enhance availability of storage services with NFS

The Dell Technologies Validated Design for HPC NFS Storage can simply and reliably provide primary or secondary HPC storage with the Red Hat® Enterprise Linux® Network File System (NFS) on Dell EMC PowerEdge servers and PowerVault storage.

## Customer Results

### 23.5 quadrillion

mathematical operations per second with multiple HPC storage systems<sup>1</sup>

### 15 petabytes

of HPC storage at 200 GB/s aggregate read/write speeds<sup>2</sup>

### 15,000 CAT

iterations over a weekend<sup>3</sup>

Rapid advancements in technology have brought the power of high performance computing (HPC) and artificial intelligence (AI) to an array of industries and organizations. But as HPC and AI go mainstream, the flood of information generated will push data repositories to multiple petabytes and even exabytes. This massive onslaught of data drives demand for highly available storage.

HPC/AI systems often require a common shared file system for applications and tools, making file sharing one of the cornerstones. Storage solutions based on the Network File System (NFS) protocol are widely used for HPC clusters because NFS is a time-tested package that comes standard with most Linux® distributions, including Red Hat® Enterprise Linux. NFS is also easy to set up and can be supported by a Linux systems administrator, reducing costs for additional staff or support.

NFS provides a robust storage file system for primary storage in small to medium HPC clusters where simplicity, reliability and cost are the primary design factors. It can also be used for larger clusters with lower I/O needs. In systems with higher I/O requirements, NFS can be used as a secondary storage repository for home directories, application storage and longer-term data storage.

This engineering-validated design for NFS is cost-efficient, reliable storage with the right combination of features and performance to speed HPC workload productivity. This solution leverages the Red Hat Enterprise Linux High Availability Add-On with a two-node cluster to enhance availability of storage services and help maintain data integrity.

## Validated Design and performance benchmarking

The [Validated Design for HPC NFS Storage](#) outlines the performance of a high availability configuration of the engineering-validated design for NFS storage with the Red Hat Enterprise Linux High Availability Add-On. The performance benchmarking results show that the latest solution design delivers better sequential and random I/O performance than the previous release.

<sup>1</sup> [Operation Frontera](#), accessed September 2021..

<sup>2</sup> [HPC5, The most powerful non governmental supercomputer in the world](#), accessed September 2021.

<sup>3</sup> [High Performance Computing Drives Cummins' Industry Leading Engine Design and Development](#), July 2019.

The technical paper includes NFS on Dell EMC PowerEdge servers with Dell EMC PowerSwitch and InfiniBand® networking and Dell EMC PowerVault storage. A table of recommended solution components guides solution configuration based on your unique mix of applications and workloads. Dell Technologies HPC and AI experts are available to help you design a solution for your specific needs. And [Dell Technologies Services](#) — ranging from consulting and education to deployment and support — are available when and where you need them.

File servers	Storage subsystem	System networking	Operating system
PowerEdge R750 Server with dual Intel® Xeon® 6346 Scalable processors	PowerVault ME4084 with support for up to 1,008TB raw space	<ul style="list-style-type: none"><li>PowerSwitch S3048-ON (internal)</li><li>ConnectX®-6 with NVIDIA® InfiniBand® QM8700 HDR100</li></ul>	Red Hat Enterprise Linux with Network File System (NFS) and Red Hat High-Availability Add-On

## Resources

- See the [Validated Design](#)
- View reference architectures and performance benchmarks on the [InfoHub](#) and at [hpcatdell.com](#).
- Learn about the [Dell Technologies HPC & AI Innovation Lab](#).
- Join the Dell Technologies HPC Community at [dellhpc.org](#).

## Learn more

[delltechnologies.com/hpc](#)  
[delltechnologies.com/referencearchitectures](#)

## Red Hat and Dell Technologies

Dell Technologies and Red Hat partner to harness innovation and deliver integrated solutions, services and support.

Red Hat Enterprise Linux is the world's leading enterprise Linux platform<sup>4</sup>. It's an open-source operating system from which you can scale existing apps — and roll out emerging technologies — across bare-metal, virtual, container and all types of cloud environments.

Dell Technologies enables organizations to modernize, automate and transform their data center using industry-leading converged infrastructure, servers, storage and data protection technologies. Businesses get a trusted foundation to transform their IT and develop new and better ways to work through hybrid cloud, big data solutions and the creation of cloud-native applications.

