

Dell PowerScale Storage for High Performance Computing

Reduce complexity and optimize performance and scalability for HPC storage.

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Essentials

- Simplicity at scale with up to 186PB of raw capacity in a single 252-node cluster
- A choice of all-flash, hybrid and archive nodes with multi-cloud and native cloud solutions
- Operational flexibility with multiprotocol support
- NVMe and QLC-enabled nodes for the highest performance
- Edge, core and cloud deployment flexibility
- Reduced costs with unmatched storage efficiency
- Built-in robust federal grade security features and integrated cyber protection
- Broad ISV ecosystem with 250+ ISV tests and validations supported by deep industry experience

Storage is critical for HPC

For many organizations, high performance computing (HPC) is an important source of competitive advantage. Storage costs represent 20–30% of the total HPC investment, so selecting the best storage solution for HPC is critical for optimizing spend. To do this, storage systems must be engineered correctly. Storage for HPC systems has to deliver the throughput and capacity required to handle rapid data growth and the increased demands presented by the convergence of advanced analytics, artificial intelligence (AI) and other workloads.

Emerging commercial workloads in realms such as life sciences, media and entertainment, financial services, manufacturing and automotive are driving the need for a variety of storage types with a mix of price/performance profiles for different aspects of HPC storage. Standard enterprise storage solutions don't meet the demands of HPC. Enterprises need storage that is optimized for HPC workloads.

Dell PowerScale storage for HPC

Dell PowerScale is an optimized HPC storage solution that delivers the throughput and capacity needed to manage rapid data growth and increased demands from a wide range of workloads. [PowerScale storage](#) with the OneFS operating system is designed to reduce complexity and optimize performance for data-intensive HPC workloads. PowerScale gives you scalable HPC storage that eases adoption and management to enable today's powerful HPC systems to deliver transformative decision making, business growth and operational efficiencies.



PowerScale OneFS Operating System

OneFS delivers one filesystem with a simple plug-and-play design that can start small and scale to nearly any size to support the most demanding workloads. PowerScale OneFS was designed to help you consolidate workloads, reduce footprint and optimize storage resources.

Protect Your Investment

New PowerScale all-flash platforms coexist seamlessly in the same cluster with your existing PowerScale and Isilon nodes to drive your traditional and modern applications.



Use policies to automatically move data to the right tier without changing the path.



Simultaneously read and write through any protocol.



Seamlessly scale to handle any unstructured data workload.

PowerScale: Helping you get the most from your HPC storage investments

Simplicity

Dell PowerScale is designed to simplify HPC storage without requiring specialized training or expertise.

- PowerScale can unify your HPC storage — scratch, file and archive — on a single storage platform with a single OneFS operating system.
- PowerScale clusters can be built using different node types, and the OneFS operating system combines the node pools into its single namespace, using policies to automatically move data to the right tier without changing the path.
- PowerScale is the only system in the market that offers native, simultaneous access to the same data using any of the following protocols: NFS, CIFS, HDFS and Swift.
- Because the storage is so easy to manage, it requires fewer IT resources for storage administration than traditional storage systems, further enhancing IT efficiency.

Performance

- PowerScale storage with OneFS optimizes performance with the ability to deploy tiered storage and automatically move workloads across storage types based on their performance profiles.
- With support for HPC and multiple protocols, including S3, there is no protocol conversion required, resulting in higher performance.
- Support for all-flash and NVMe means OneFS can help you accelerate processes and workflows for demanding workloads like AI, machine learning (ML) and deep learning (DL).

Scalability

- PowerScale provides highly flexible scale-out storage on a grow-as-you-go basis, eliminating the need for overprovisioning.
- Whether it is hosting file shares or home directories or delivering high-performance data access for applications like analytics, video rendering and life sciences, PowerScale can seamlessly scale to handle any unstructured data workload.
- The scale-out network-attached storage (NAS) architecture of PowerScale means that each node adds capacity, performance and resiliency to the cluster. With up to 252 nodes in a cluster, you can scale both capacity and performance in a few minutes to meet your specific business needs — all without any additional IT burden.

Commercial HPC use cases

Dell Technologies has proven expertise in building, deploying and supporting HPC solutions across a number of verticals. The following are just a few examples.



Life sciences

The computing power of HPC is the key to using medical data to save lives and protect health — better, faster and with lower costs. Use cases for life sciences organizations include:

- **Healthcare research** — Speed and improve research outcomes including genomics, proteomics, bioinformatics, cryo-EM and neuroscience.
- **Pharmaceutical** — Transform the process of drug development by speeding processes such as drug discovery, computational chemistry, molecular dynamics, precision medicine and clinical trials.
- **Genomics** — Get the compute power necessary to solve the mystery of the human genome.
- **Population health** — Harness advanced epidemiology and vaccine development capabilities.



Media and entertainment

Multiple aspects of this industry have taken a huge leap forward with the power of HPC. Common workloads include:

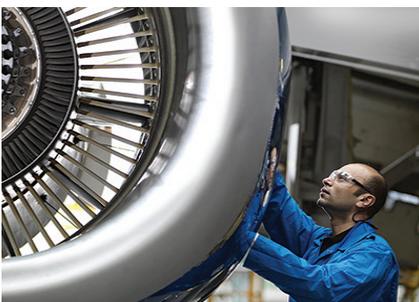
- **Visual effects (VFX) and computer-generated imagery (CGI)** — Create more realistic effects faster by speeding image modeling, animation and editing.
- **Immersive entertainment** — Enhance virtual reality (VR), augmented reality (AR) and gaming with the power for a new generation of immersive experiences.
- **Content management and delivery** — Save time and costs using HPC power to transcode massive amounts of streaming media in real time and push it out to millions of consumers on the devices of their choice.



Financial services

Both established financial services groups and financial technology (fintech) upstarts are seeking to capitalize on HPC to improve returns and attract and retain more customers. Use cases include:

- **Algorithmic and high-frequency trading (HFT)** — Get instant, actionable insights to optimize trades.
- **Risk analysis including Monte Carlo simulations** — Monitor and evaluate thousands of risk factors.
- **Pricing** — Set optimal pricing for a variety of financial products, calibrating in real time.
- **Fraud protection** — Use algorithms to detect suspicious behavior and anomalies in real time.



Digital manufacturing and automotive

Manufacturers use HPC to power the specialized software that helps create innovative products and grow market share and revenue while cutting costs and improving quality. Typical workloads include:

- **Structural analysis** — Increase computational efficiency, so users can complete more analyses in less time with fewer errors.
- **Computational fluid dynamics (CFD)** — Use simulations to predict fluid behavior faster and more accurately to help keep to tight development schedules.
- **Noise, vibration and harshness (NVH)** — Identify and reduce NVH prior to prototyping to save time and costs.
- **Autonomous driving** — Capture and crunch massive amounts of streaming data to enable self-driving vehicles.

“To have Dell Technologies come out to the studio and suggest a pathway forward, not just for the moment, but for the future, was invaluable.”

— Nadine Bates,
Co-Founder and CEO,
Like a Photon Creative¹

“We’re able to compute data and gather statistics and do analysis within a five-minute window.”

— David Brzozowski Jr.,
Chief Technology
Officer, Medacis²

“We’re now much more agile, we pivot quickly and we deliver benefits in a much more seamless way.”

— Chris Hicks,
Chief Information Officer,
McLaren Group³

Customer success stories

Like a Photon Creative

120% increase

in productivity

2 weeks faster

time to market

Watch the video case study: [Like a Photon Creative](#)

Medacis[®] healthcare AI analytics

5 minutes

compared to 24 hours
for analysis

**99.99%
availability**

for storage

Millions saved

by upholding service-level
agreements

Watch the video case study: [Medacis Uses AI to Advance Healthcare Analytics](#)

McLaren[®] Racing HPC for computational fluid dynamics (CFD)

100,000

data points per second

Every 20 minutes

there is a data-driven
engineering change

Real-time

transmission of data
from the edge to the
core HPC system

Read the customer story: [Driven to innovate on the track and beyond](#)

- [Like a Photon Creative](#) animation studio creates exceptional content on tiny budgets with PowerScale enhancing productivity by 120%.
- [Animal Logic](#) brings animated videos to life with 10X greater throughputs.
- [ebb³](#) redefines digital workspaces with Dell Technologies, using HPC to deliver secure virtual desktops and high performance applications to any location and any device.

Read more [customer stories](#).

Building your HPC storage solution

Powerful, scalable HPC storage that eases adoption and management is the key to delivering transformative decision making, business growth and operational efficiencies. As a leader in the HPC space for decades, Dell Technologies has a comprehensive portfolio of PowerScale storage designed to reduce complexity and optimize results for enterprise HPC workloads.

¹ Dell Technologies case study, [Like a Photon Creative](#), accessed March 2023.

² Dell Technologies case study, [Medacis Uses AI to Advance Healthcare Analytics](#), accessed March 2023.

³ Dell Technologies case study, [Driven to innovate on the track and beyond](#), accessed March 2023.

Scratch Storage for Embarrassingly Parallel Workloads

Scratch storage for embarrassingly parallel workloads is used by applications such as rendering, genomics and Monte Carlo simulations. PowerScale excels at scratch storage for these embarrassingly parallel workloads, which refers to breaking down a problem into discrete tasks and concurrently using multiple compute resources to solve the problem.

HPC storage types and recommended PowerScale systems

Scratch storage for embarrassingly parallel workloads

Scratch data is used during the computational phase of HPC. Scratch storage requires large scale capacity, high performance and high bandwidth with the ability to offload results to durable storage to protect against failures, making all-flash a good fit.

PowerScale all-flash solutions accelerate demanding workloads like scratch storage for embarrassingly parallel workloads with extreme performance and efficiency.

Filesystem (project) storage

Filesystem project and/or home directory storage resides in storage for a long period of time and does not require high performance. It has a range of capabilities, optimized to provide the performance or bandwidth you need, and it is flexible and cost efficient.

File data is persistent because it is used to capture and collaborate on results. Filesystem storage has a mix of bandwidth and throughput needs, making hybrid flash storage a good fit. PowerScale hybrid nodes handle large-scale filesystem workloads while lowering your costs.

Archive storage

Many commercial enterprises need to archive data to maintain compliance or protect intellectual property (IP). Archive storage is typically cost-effective without demanding performance requirements. PowerScale archive storage is the lowest-cost way to store and protect data and provide easy scalability.

All-flash Extreme performance and compression	Filesystem Performance, capacity and value	Archive Capacity and economics
		
PowerScale all-flash: <ul style="list-style-type: none"> • F900 • F800/F810 • F600 • F200 	PowerScale hybrid NAS: <ul style="list-style-type: none"> • H700 • H7000 • H600 • H500 • H5600 • H400 	PowerScale archive scale-out NAS: <ul style="list-style-type: none"> • A300 • A3000 • A200 • A2000

Bringing it all together: Dell PowerScale OneFS

The Dell PowerScale OneFS operating system gives you simplicity at scale, intelligent insights and the ability to have any data anywhere it needs to be. OneFS powers all Dell PowerScale storage solutions, enabling simplified and centralized management of HPC storage across tiers with a variety of software features:

- **SmartPools** provide rule-based movement of data through the tiers within a storage cluster while keeping data within the same namespace, which can be especially useful in large enterprise HPC environments.
- **SmartConnect** optimizes performance, resource utilization and availability by enabling intelligent client connection load balancing and dynamic NFS failover and failback of client connections across storage nodes through a single host name.
- **DataIQ** enables teams to locate, access and manage data and gain a holistic view across heterogeneous storage systems with a single pane of glass.
- **AutoBalance** enables teams to add nodes quickly and easily without downtime, manual data migration or application logic reconfiguration, saving precious IT resources.

“Our partnership with Dell Technologies allows us to take advantage of the full breadth and depth of their compute, storage, networking and security solutions.”

— David J. Brzozowski Jr,
Chief Technology Officer,
Medacis²

Proven results

Dell Technologies holds leadership positions in some of the biggest and largest-growth categories in the IT infrastructure business, and that means customers can confidently source information technology needs from Dell Technologies.

- #1 in servers⁴
- #1 in converged and hyperconverged infrastructure (HCI)⁵
- #1 in storage⁶
- #1 storage software⁷

See [Dell Technologies Key Facts](#).

Dell HPC solutions power 18 of the world's [TOP500 Supercomputers](#) and 21 of the [GREEN500 Supercomputers](#).⁸

⁴ IDC WW Quarterly Server Tracker CY22Q2. Leader in x86 server units and server revenue.

⁵ IDC WW Quarterly Converged Systems Tracker CY22Q2.

⁶ IDC Quarterly Enterprise Storage Systems Tracker CY22Q2.

⁷ IDC WW Storage Software and Cloud Services Tracker CY22Q2.

⁸ Top500, The List. The 60th [Top500 List](#) and the [Green500 List](#) were published November 15, 2022, in Dallas, TX.

Why choose Dell Technologies for HPC storage

Adoption of HPC is expanding into enterprise environments, and often the technology behind HPC is evolving so quickly that enterprises do not have HPC experts on staff or the time required to design, deploy and manage solutions at the pace required.

Dell Technologies has been a leader in the advanced computing space for more than a decade, with proven products, solutions and expertise. Dell Technologies has a team of AI, HPC and analytics experts dedicated to staying on the cutting edge, testing new technologies and tuning solutions to your applications to help you keep pace with this constantly evolving landscape.

- Schedule an [executive briefing](#) and collaborate on ways to reach your business goals.
- The Dell Technologies [HPC & AI Innovation Lab](#) in Austin, Texas, is the flagship innovation center. It's staffed by a dedicated group of computer scientists, engineers and subject matter experts who actively partner and collaborate with customers and other members of the HPC community. The team engineers HPC and AI solutions, tests new and emerging technologies and shares expertise including performance results and best practices.
- We are committed to providing you with choice. We want you to get what you need and have a great experience working with us. If we don't have what you need, we'll tell you who does. We believe in being open, and we publish our performance results.
- Dell Technologies is the only company in the world with a portfolio that spans from workstations to supercomputers, including servers, networking, storage, software and services.
- Because Dell Technologies offers such a wide selection of solutions, we can act as your trusted advisor without trying to sell you a one-size-fits-all approach to your problem. That range of solutions has also given us the expertise to understand a broad spectrum of challenges and how to address them.
- Dell Technologies offers modernized [services](#) to help you streamline complexity and bring new IT investments online as quickly as possible. Leverage our 30+ years of experience for efficient and reliable solution deployment to accelerate adoption and return on investment (ROI) while freeing IT staff for more strategic work.
- [Dell APEX](#) and [Payment Solutions](#) help you maximize your IT budget and get the technology you need today. Our portfolio includes traditional leasing and financing options, as well as advanced flexible consumption products.

Learn More

- [Dell.com/HPC](#)
- [PowerScale storage](#)
- Join the Dell HPC community: [DellHPC.org](#)

