DELL Technologies

Dell EMC PowerScale Storage for High Performance Computing

Reduce complexity and optimize performance and scalability for HPC storage.

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Storage is critical for HPC

High performance computing (HPC) adoption is growing rapidly across a variety of industries and customer types. While research and engineering HPC workloads continue to grow and expand, artificial intelligence (AI) and high-performance data analysis (HPDA) are also mainstreaming in commercial enterprise.

However, HPC storage might be getting overlooked during this market acceleration. According to Hyperion Research, "Storage is the linchpin and common denominator for [HPC]. Without reliable, performant 24/7 access to secure and trusted data whenever, wherever, and however it's required, the scientific discoveries and business value for HPC/AI/HPDA solutions would not be possible."[1]

At the same time, HPC storage solutions are complex and becoming more so with growing enterprise adoption of advanced computing workloads such as AI and HPDA. 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. However, solutions need to be carefully designed with management simplicity and scalability to drive bottom line value for HPC.

Dell Technologies is dedicated to mainstreaming access to the HPC resources you need to discover and compete. Our experts can help you craft powerfully simple HPC storage systems that balance storage performance and capacity with your business outcomes.

Dell EMC 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.

Dell Technologies has what you need

Dell Technologies has the expertise and experience to provide you with the power of HPC at a price point and commitment level that makes sense for your project.

Expertise and guidance

The technology behind HPC is evolving quickly, so you may not have HPC experts on staff, or your team may simply not have the time to design, deploy and manage solutions at the pace required. While HPC might seem like the latest IT trend, Dell Technologies has been a leader in the advanced computing space for over a decade, with proven products, solutions and expertise. Dell Technologies has a team of AI, HPC and data 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.

Dell EMC PowerScale storage for HPC

For many organizations, HPC is — or is becoming — an important source of competitive advantage. An optimized HPC storage solution delivers the throughput and capacity needed to manage rapid data growth and increased demands from a wide range of workloads. Dell EMC 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.

Solutions customized for your environment

Dell Technologies uniquely provides an extensive portfolio of technologies to deliver the advanced computing solutions that underpin successful HPC implementations. With years of experience and an ecosystem of curated technology and service partners, Dell Technologies provides innovative solutions, workstations, servers, networking, storage and services that reduce complexity and enable you to capitalize on a universe of data.

[1] Hyperion Research white paper, HPC Storage: The Unsung Hero of HPC Solutions, October 2020.

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

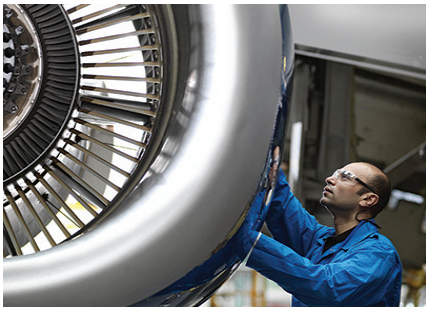
Multiple aspects of this industry have taken a huge leap forward with the power of HPC. Common workloads include:

- **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.

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.

Using 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.

Dell Technologies: Helping you get the most from your HPC investments

Challenge: "Our environment is already complex. HPC and AI will add complexity."
Optimizing storage for HPC across disparate platforms requires a deep understanding of input/output (I/O) profiles, workloads, use cases, data types and deployment models. IT complexity leads to lag times for deployment of new resources, as staff time and skills are stretched thin trying to respond to a growing user base requiring support for more and different types of applications that require fast, consistent storage performance at scale.

Simplicity

Dell EMC 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. Plus, 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. This avoids copying data between storage systems, which saves both time and costs. Because the storage is so easy to manage, it requires fewer IT resources for storage administration than traditional storage systems, further enhancing IT efficiency.

Challenge: "We need to optimize performance for HPC workloads."
You are investing in HPC to speed workloads, so you naturally want the best performance for your investment. However, designing HPC storage systems to match your workload requirements across scratch, file and archive requires a great deal of expert planning and configuration.

Performance

Dell EMC 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 the high-performance, multi-protocol S3, all data can simultaneously read and write through any protocol with no need to migrate and copy data from a secondary source. 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).

Challenge: "We need to be able to scale to accommodate more users and applications."
The commercial applications of HPC are nearly limitless, and as lines of business start seeing results, demand will only grow. Storage scaling needs to be quick, simple and seamless to avoid disruptions and enable HPC to keep delivering value to the business.

Scalability

Dell EMC PowerScale provides highly flexible scale-out storage with precisely the right amount 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.

"One of the beautiful things about [PowerScale] is it doesn't get more complex as it scales."

— Angelo Rivano, Chief Technology Officer at Important Looking Pirates[2]

Customer success stories

Important Looking Pirates visual effects

Scale to 3.6 petabytes	4X increase	2.5X increase
from 300 terabytes in one year	in rendering jobs over 18 months	in throughput

Read the case study: Innovative artistry shines at visual effects studio

Medacist® healthcare AI analytics

5 minutes	99.99% availability	Millions saved
compared to 24 hours for analysis	for storage	by upholding service-level agreements

Watch the video case study: Medacist Uses AI to Advance Healthcare Analytics

McLaren® Racing HPC for computational fluid dynamics (CFD)

100,000	Every 20 minutes	Real-time
data points per second	there is a data-driven engineering change	transmission of data from the edge to the core HPC system

Read the case study: Data-driven innovation starts at racing's edge

"Our Agfa Enterprise Imaging platform cut our customers' imaging turnaround times significantly."

— Miriam Ladin, Director of Marketing and Communications, Agfa HealthCare North America[3]

- Sentara® Healthcare advances patient treatment and reduces costs by millions of dollars.
- 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.
- Agfa® HealthCare takes a more holistic, patient-centric approach to medical imaging.
- Ebb3 redefines digital workspaces with Dell Technologies, using HPC to deliver secure virtual desktops and high performance applications to any location and any device.
- Zenuity generates 4.4 PB data per month to advance autonomous driving software.

Read more customer stories.

[2] Dell Technologies case study, Innovative artistry shines at visual effects studio, July 2019.

[3] Dell Technologies case study, Advanced imaging boosts patient outcomes, September 2020.

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 Dell EMC PowerScale storage designed to reduce complexity and optimize results for enterprise HPC workloads.

HPC storage types and recommended Dell EMC PowerScale systems

Scratch storage

Scratch data is used during the computational phase of HPC. Scratch storage requires large raw 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. Dell EMC PowerScale all-flash solutions accelerate demanding workloads with extreme performance and efficiency.

Filesystem (project) storage

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. Dell EMC 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. Scalable, high-capacity storage designed for enterprise archive is a good fit for HPC archive. Dell EMC PowerScale archive storage is the lowest-cost way to store and protect data assets while providing high-speed accessibility.

Scratch Extreme performance and compression	**Filesystem** Performance, capacity and value	**Archive** Capacity and economics
		
PowerScale all-flash: • F900 • F600 • F800/F810 • F200	PowerScale hybrid NAS: • H600 • H500 • H5600 • H400	PowerScale archive scale-out NAS: • A200 • A2000

Bringing it all together: Dell EMC PowerScale OneFS

The Dell EMC 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 EMC 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 quickly and easily adding nodes without downtime, manual data migration or application logic reconfiguration, saving precious IT resources.

"Our systems never stop running. [PowerScale] is a rock-solid platform that is at the absolute top of its game. We sleep much better now."

— Angelo Rivano, Chief Technology Officer at Important Looking Pirates[2]

Services and financing

Dell Technologies is with you every step of the way, linking people, processes and technology to accelerate innovation and enable optimal business outcomes.

- Consulting Services help you create a competitive advantage for your business. Our expert consultants work with companies at all stages to help you plan, implement and optimize solutions that enable you to unlock your data capital and support advanced techniques, such as HPC.
- Deployment Services 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.
- Support Services driven by AI and DL will change the way you think about support with smart, ground-breaking technology backed by experts to help you maximize productivity, uptime and convenience. Experience more than fast problem resolution—our AI engine proactively detects and prevents issues before they impact performance.
- Payment Solutions from Dell Financial Services 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.
- Dell Technologies APEX offers a simple approach that gives you a wide range of consumption models, payment solutions and services so you can optimize for a variety of factors while realizing more predictable outcomes.
- Managed Services can help reduce the cost, complexity and risk of managing IT so you can focus your resources on digital innovation and transformation while our experts help optimize your IT operations and investment.
- Residency Services provide the expertise needed to drive effective IT transformation and keep IT infrastructure running at its peak. Resident experts work tirelessly to address challenges and requirements, with the ability to adjust as priorities shift.

"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, Medacist[4]

Why choose Dell Technologies for HPC storage

We're committed to advancing AI, HPC and data analytics, and we've dedicated a great deal of resources toward that goal.

- Schedule an executive briefing and collaborate on ways to reach your business goals.
- Dell Technologies Customer Solution Centers are staffed with computer scientists, engineers and Ph.D.s who are subject matter experts in a variety of disciplines.
- 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.

Customer Solution Centers

Our global network of dedicated Dell Technologies Customer Solution Centers are trusted environments where world-class IT experts collaborate with you to share best practices, facilitate in-depth discussions of effective business strategies and help your business become more successful and competitive. Dell Technologies Customer Solution Centers reduce the risks associated with new technology investments and can help improve speed of implementation.

[4] Dell Technologies case study, Medacist Advances Healthcare Analytics with AI running on Dell EMC PowerEdge and PowerScale, January 2021.

Learn more

- delltechnologies.com/hpc
- delltechnologies.com/powerscale
- Join the Dell HPC community: dellhpc.org

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 servers[5]
- #1 in converged and hyperconverged infrastructure (HCI)[6]
- #1 in storage[7]
- #1 cloud IT infrastructure[8]

See Dell Technologies Key Facts.

Contact us

To learn more, visit delltechnologies.com/hpc or contact your local representative or authorized reseller.

AI Experience Zones

Curious about AI and what it can do for your business? Run demos, try proofs of concept and pilot software in Singapore, Seoul, Sydney, Bangalore and other Customer Solution Centers. Dell Technologies experts are available to collaborate and share best practices as you can explore the latest technology, get the information and hands-on experience you need for your advanced computing workloads.

HPC & AI Innovation Lab

The Dell Technologies HPC & AI Innovation Lab in Austin, Texas, is the flagship innovation center. Housed in a 13,000-square-foot data center, it gives you access to thousands of Dell EMC servers, three powerful HPC clusters, and sophisticated storage and network systems. 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.

HPC & AI Centers of Excellence

As data analytics, HPC and AI converge and the technology evolves, Dell Technologies worldwide HPC & AI Centers of Excellence provide thought leadership, test new technologies and share best practices. They maintain local industry partnerships and have direct access to Dell and other technology creators to incorporate your feedback and needs into their roadmaps. Through collaboration, Dell Technologies HPC & AI Centers of Excellence provide a network of resources based on the wide-ranging know-how and experience in the community.

Take the next step, today.

Dell Technologies HPC storage expertise can help you fast-track projects and results. With an extensive portfolio, years of HPC experience and an ecosystem of curated technology and service partners, Dell Technologies is ready to help you to capitalize on the promise of HPC for enterprise workloads.

Whether you're looking to expand your existing capabilities or get started with your first project, HPC storage from Dell Technologies helps you get the resources you need. Contact your Dell Technologies representative to find out more, today.

[5] IDC, WW Quarterly x86 Server Tracker, 1Q2021, Vendor Revenue & Shipments, June 10, 2021.

[6] IDC, WW Quarterly Converged Systems Tracker, 4Q2020, Vendor Revenue, March 18, 2021.

[7] IDC, WW Quarterly Enterprise Storage Systems Tracker, 1Q2021, June 10, 2021.

[8] IDC, WW Quarterly Enterprise Infrastructure Tracker: Buyer and Cloud Deployment, 1Q2021, Vendor Revenue, July 1, 2021