



Accelerate Discovery and Innovation with High Performance Computing

Technology and expertise for discovery and innovation

Go ahead. Dream big.

Discovery and innovation have always started with great minds dreaming big. As analytics, high performance computing (HPC) and artificial intelligence (AI) continue to converge and evolve, they are fueling the next industrial revolution and the next quantum leap in human progress. And with the help of increasingly powerful technology, you can dream even bigger.

Dell Technologies will be there every step of the way, with the technology you need to power tomorrow's discoveries and the expertise to bring it all together, today.

463 exabytes

of data will be created each day by 2025.¹

20%

compound annual growth rate for HPC and AI in the cloud.²

70%

of organizations will have operationalized AI architectures by 2025.³

The convergence of HPC and AI is driven by data

The data-driven age is dramatically reshaping industries and reinventing the future. As vast amounts of data pour in from increasingly diverse sources, leveraging that data is both critical and transformational. Whether you're working to save lives, understand the universe, build better machines, neutralize financial risks or anticipate customer sentiment, data informs and drives decisions that impact the success of your organization — and shapes the future of our world.

Analytics, HPC and AI are technologies designed to unlock the value of your data. While they have long been treated as separate, the three technologies are converging as it becomes clear that analytics and AI are both data problems that require the power, scalable compute, networking and storage provided by HPC.

Formerly the domain of specialists using expensive, proprietary supercomputers, recent advances in compute, networking and storage technologies have made HPC — and thus analytics and AI — more widely available. This changes the game for more traditional HPC and puts AI within reach for a wider range of users. For example, enterprises that have been collecting data for years can now analyze historical data using AI algorithms to gain faster market insights, increase efficiency and recognize higher return on investment (ROI) for data-driven investments.

That's why organizations of all sizes and in a broadening array of industry verticals are leveraging powerful HPC solutions to run the analytics and AI applications that help them answer bigger questions and make more amazing discoveries, faster, to keep pace with competition that's coming from every angle.

¹ Tech Trend, "[How Much Data is Produced Every Day in 2021](#)," May 2021.

² Gabriel Consulting Group, "[HPC Cloud: The Dell Way](#)," April 2021.

³ Gartner, Inc., "[The 4 Trends That Prevail on the Gartner Hype Cycle for AI, 2021](#)," September, 2021.

“We’re excited to be joining forces with Dell to complement its wide range of customizable HPC solutions with our optimized data center services. Dell has long been at the forefront of HPC innovation. We share Dell’s commitment to making HPC solutions more agile, less complex and more affordable for our customers. We are looking forward to working even more closely with Dell’s growing community of HPC and AI users to help them accelerate their innovation cycles in a way that’s both cost effective and sustainable.”⁴

— Dominic Ward, CEO
Verne Global

The expertise, technology and partnerships to advance the state of the art for HPC solutions

Dell Technologies is helping expand the boundaries of this exciting new frontier with HPC solutions designed to help you solve complex problems faster than ever. In fact, we’re one of the only companies in the world with a portfolio for analytics, AI and HPC that spans workstations, servers, networking, storage and services. In addition, Dell Technologies HPC and AI experts are active innovators and collaborators in the worldwide technical community dedicated to advancing HPC and AI. Our goal is to enable more organizations like yours to leverage advanced analytics and AI to do what you do best — change the world.

HPC solutions for workgroups to the TOP500

With an extensive portfolio, years of experience and an ecosystem of curated technology and service partners, Dell Technologies provides Validated Designs, workstations, servers, networking, storage and services that reduce complexity and provide the HPC performance and efficiency required for analytics and AI.

Validated Designs

Dell Technologies Validated Designs for HPC, AI and Analytics are optimized rack-level systems with servers, software, networking, storage and services designed to speed time to results with the confidence of an engineering-validated solution, while enabling business without boundaries.

- **Validated Designs for HPC** are scalable systems tested and tuned for specific vertical-market applications such as life sciences, digital manufacturing and research.
- **Validated Designs for AI** help make AI simpler with designs enabling you to get faster, deeper insights delivered with proven AI expertise.
- **Validated Designs for Analytics** make it easier to create value with your data while simplifying, protecting and securing the data landscape.
- **Validated Designs for HPC Storage** unlock the value of your data with scalable systems for NFS, PixStor and/or BeeGFS storage.

Workstations

Dell Precision workstations

[Dell Precision workstations](#) deliver state-of-the-art personal computing, including extensive memory, outstanding processors and graphics to run scientific calculations, remote visualization, 3D industrial designs, engineering simulations and digital content creation at peak performance to help you save time and control costs.

Servers

Future-proof your information technology with [PowerEdge servers](#). Built for scale-out workloads like HPC, AI and analytics, Dell EMC PowerEdge servers deliver high-performance computing with the latest processors, accelerators, memory, NVMe and other storage. You can scale efficiently and predictably with a wide range of configuration and connectivity options.

The [Dell EMC PowerEdge T550](#) is a flexible two-socket tower server that balances expandability and performance. It supports advanced technologies for enterprise-class workloads: AI and inferencing, virtualization, medical imaging, data analytics, and software-defined storage.

⁴ Verne Global, [Verne Global Achieves Dell Technologies Platinum Partner Status](#), accessed November 2021.



Server Accelerators

PowerEdge servers accommodate from one to 16 accelerators inside.

- GPUs can offload portions of a workload, while the remainder of the code runs on the CPU, improving overall application performance by an order of magnitude.
- FPGAs can execute certain types of algorithms up to 100X faster than traditional solutions with less CPU time consumed.⁵ FPGAs can be programmed at the hardware to accelerate specific tasks.
- IPUs hold the complete machine learning model inside the processor accelerator to accelerate AI inference up to 600X.⁶
- See performance results at hpcatdell.com.

The [Dell EMC PowerEdge XE8545 Server](#) is a two-processor server with up to four NVIDIA V100 GPUs connected with NVLINK™ direct GPU-to-GPU interconnect designed to speed communication between GPUs an order of magnitude faster than PCIe. With up to 32x DDR4 DIMMs and up to 10x 2.5" SAS/SATA (HDD/SSD) NVMe drives, this server is built for acceleration.

The [Dell EMC PowerEdge C6520 Server](#) has up to four independent two-processor servers in 2U with up to 16 DDR4 DIMMs, up to 24x 2.5" SAS/SATA (HDD/SSD) NVMe drives and M.2 boot storage. It's also available with direct contact liquid cooling (DCLC) to support higher-wattage processors for increased performance, energy efficiency and rack-level density.

The [Dell EMC DSS 8440 machine learning server](#) is a two-processor server with up to 16 accelerators, a high-performance switched PCIe fabric for rapid I/O, and up to 10 local NVMe and SATA drives for optimized access to data. The DSS 8440 has an open architecture, based on industry-standard PCIe fabric, allowing for customization of accelerators, storage options and network cards.

Custom [modular data centers and edge data centers](#) are self-contained units that can feature power, cooling, gateways and can host up to several racks of IT. They are designed with the security, environmental and performance capabilities to be placed in remote locations where real estate space is limited.

⁵ The Next Platform, "[How the FPGA Can Take on CPU and NPU Engines and Win](#)," July 2021.

⁶ EET Asia, "[Graphcore IPU vs. NVIDIA GPUs: How They're Different](#)," December 2020.

“We have ASU engineers on my team working directly with the Dell engineers on the Omnia team. We’re working on code and providing feedback and direction on what we should look at next. It’s been a very rewarding effort.”⁷

— Douglas Jennewein,
Senior Director of ASU
Research Computing

Software

Omnia open source software

[Omnia](#) is an open-source, Ansible®-based software stack designed to automate the deployment of mixed-workload clusters, giving IT the agility to run AI, HPC and analytics workloads in the same environment, with a single pane of glass for cluster provisioning, deployment and management, with easy-to-use point-and-click templates for building environments.

VMware

With [VMware](#), you can capture the benefits of virtualization for HPC workloads while delivering performance that is comparable to bare metal. The VMware approach to virtualizing HPC adds a level of flexibility, operational efficiency, agility and security that cannot be achieved in bare-metal environments—enabling faster time to insights and discovery.

Bright Cluster Manager®

[Bright Cluster Manager](#) lets you deploy clusters over bare metal with single-pane-of-glass management for the hardware, software and users. System administrators can get clusters up and running quickly and keep them running reliably throughout their lifecycle — all with the ease and elegance of a full-featured, enterprise-grade cluster manager.

OpenHPC

Dell Technologies supports the [OpenHPC Collaborative Project](#), a community effort to aggregate a number of common ingredients required to deploy and manage HPC clusters including provisioning tools, resource management, I/O clients, development tools and a variety of scientific libraries.

Data Science Provisioning Portal

The Data Science Provisioning Portal provides self-service access to hardware resources along with a comprehensive set of AI libraries and frameworks such as TensorFlow, reducing the steps it takes to configure a data scientist's workspace to just five clicks to obtain faster, deeper AI insights.

Modular Data Center Management

Dell EMC Modular Data Centers have a command center to monitor and manage IT, cooling and power modules. The MDC programmable logic controller interfaces with the infrastructure subsystems and communicates to the network operations center, or building management system via Modbus remote terminal unit or TCP.

Systems Management

Dell EMC [OpenManage](#) software can discover, monitor, manage, update, and deploy your PowerEdge server infrastructure from nearly anywhere. Dell EMC [storage software](#) provides data management, local and remote protection, and ecosystem integration.

Networking

Dell Technologies open networking enables IT managers to build an application-agnostic infrastructure and simplify data center management with standard automation tools and standards-based open platforms.

Dell EMC switches

[Dell EMC PowerSwitch S5200-ON Series Switches](#) provide state-of-the-art, high-density open networking 25GbE top-of-rack and 100GbE spine/leaf switches to meet the growing demands of today's HPC/AI compute and storage traffic.

⁷ Dell Technologies case study, “[Arizona State University Accelerates Research with HPC.](#)” June 2021.

“The HPC & AI Innovation Lab gives our customers access to cutting-edge technology. Customers can bring us their workloads, and we can help them tune a solution before the technology is readily available.”

—Garima Kochhar,
Distinguished Engineer

[Dell EMC Networking Z9100-ON Series Switches](#) are 10/25/40/50/100GbE fixed switches for high performance computing environments. With 32 ports of 100GbE, 64 ports of 50GbE, 32 ports of 40GbE, 128 ports of 25GbE or 128 ports 10GbE and two SFP+ ports of 10GbE/1GbE/100MbE, you can conserve rack space and simplifying migration to 100Gbps.

Gen-Z Consortium

Dell Technologies is a founding member of the [Gen-Z Consortium](#), dedicated to creating a next-generation interconnect that will bridge existing solutions while enabling unbounded innovation.

Data Storage

Unprecedented growth in the amount of data created by analytics, artificial intelligence and other high performance computing makes fast, scalable and resilient storage an imperative.

Direct-attached storage (DAS)

The [Dell EMC PowerEdge R750 Server](#) supports up to 8TB of memory with compelling performance, I/O bandwidth and storage to address data requirements for analytics, AI/ML and HPC.

The [PowerEdge XE7100](#) lowers your cost per gigabyte for storage while helping you meet the needs of an exascale future. It packs up to 100 hot-serviceable 3.5-inch drives in 4U. Available with either one or two server nodes, the XE7100 can deliver up to 1.6PB of storage to tackle demanding storage environments.

Network-attached storage (NAS)

[Dell EMC PowerScale scale-out NAS](#) storage, with the OneFS operating system, is ideal for data-intensive environments requiring collection, storage and transmission of large-scale data sets. Choose from all-flash, hybrid and archive NAS with up to 924TB capacity, 250K IOPS and 15 GB/s per chassis.

Object storage

[Dell EMC ECS Enterprise Object Storage](#) is available in multiple consumption models — software defined, as a turnkey appliance, or as a service. ECS empowers organizations of all sizes to economically store and manage unstructured data at any scale, for any length of time. Starting at 60TB, the EX300 can grow to petabyte scale while the EX3000 scales to 11.5PB per rack.

Storage-Area Network (SAN) storage

[Dell EMC PowerVault ME4 Series](#) provides entry-level block storage that scales to 4PB and supports native iSCSI, Fibre Channel and SAS. These simple, fast, affordable storage arrays are designed for versatility, with choice of drive types, 2U or 5U base systems and expansion enclosures.

“Our partnership with Dell Technologies has been a cornerstone to a lot of work that we've done, and has enabled TGen to stay ahead of the pack, and be a leader in precision medicine.”⁸

— James Lowey, CIO, TGen

⁸ Dell Technologies case study, “[Setting the pace of progress](#),” accessed November 2021.



VMware for HPC

With [Virtualized HPC](#) using VMware®, you can capture the benefits of virtualization for HPC workloads.

The [latest VMware vSphere® edition](#) has been custom-built with analytics and HPC workloads in mind.

See a [VMware HPC system design](#) that demonstrates how virtualization and HPC technologies work together to deliver a secure, elastic, fully managed, self-service, virtual HPC environment.

“The extreme performance... has enabled Cambridge University to provide a world-class cloud-native supercomputer for driving research that will benefit all of humankind.”⁹

— Paul Calleja, Director of Research Computing, Cambridge University

Multi-Cloud

Leveraging a multi-cloud approach spanning a variety of public, private and hybrid cloud resources, Dell Technologies and partner cloud solutions allow organizations to transform IT by improving IT agility, controlling costs and reducing business risk.

Dell Technologies APEX

[APEX](#) delivers IT infrastructure solutions for a range of data and workload requirements, enabling you to accelerate innovation, adapt to evolving requirements and stay in control of IT operations. Options include: Infrastructure Services, Cloud Services and Custom Solutions.

Partner Cloud

Dell Technologies [Cloud Service Providers](#) provide infrastructure as a service (IaaS), platform as a service (PaaS), software as a service (SaaS), managed services and more. Strong industry partnerships enable you to enjoy a seamless hybrid cloud experience by extending into Microsoft® Azure®, Amazon Web Services® (AWS), Google® Cloud Platform™ and 200 other cloud partners on a subscription, lease or pay-per-use basis.

[R-Systems®](#) helps organizations build highly intelligent public, private and hybrid cloud environments. Specializing in high performance computing, this team is experienced in cloud architecture construction, re-platforming, application development, SaaS and PaaS platform migration.

[Verne Global](#) helps you craft your own infrastructure and push the boundaries of innovation on an industry-leading platform built on Dell EMC PowerEdge servers, storage and networking, and housed in Verne Global's HPC-optimized, cost-effective Iceland data center.

[DXC Technology](#) can help you work in harmony with applications on-premises, in the cloud and at the edge. With DXC, you can adopt and scale cloud solutions globally while integrating with your traditional IT infrastructure. Rapidly modernize applications, migrate the right workloads, and securely manage your hybrid environment.

⁹ Inside HPC, “[Research Centers at Cambridge and Durham Universities Add NVIDIA, Dell EMC HPC Resources](#),” April 2021.

“For people who need to do analytics or machine learning and process lots of data, we are bringing together on one system high levels of compute and high levels of I/O... With all those things together, this machine can be used to deliver data-centric research to new and emerging communities.”¹⁰

—Dr. Paul Calleja, Director of Research Computing Services, University of Cambridge

Services

From design and implementation to support and systems management, Dell Technologies offers a comprehensive services portfolio for analytics, HPC and AI, including on-premises and managed systems, as well as those in the cloud. Dell partners with you every step of the way, linking people, processes and technology to accelerate innovation and enable optimal business outcomes.

- [Services for High Performance Computing](#) are delivered by certified experts to help you get the business value of advanced computing. The services include assessment, workshop, testing, proofs of concept and production implementation. These experts help determine where advanced computing is a good fit for your organization. They also help you build your own internal team of experts through knowledge transfer.
- [Deployment Services](#) help you streamline complexity and bring new IT investments online as quickly as possible. Leverage our 30-plus 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 deep learning 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.

Why choose Dell Technologies for HPC and AI

Dell Technologies is different

Dell Technologies is committed to advancing analytics, AI and HPC, and we’ve dedicated resources toward that goal.

- Come in for an [executive briefing](#) and collaborate on ways to reach your business goals.
- 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. If we can’t do it, we’ll tell you someone who can. 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.

¹⁰ Dell Technologies case study, [Accelerating Scientific Discovery](#), March 2020.

“Using our HPC cluster from Dell EMC, we are able to complete calculations that are 10 times larger than what has previously been possible – and more cost-effectively.”¹⁵

— Dr. Alistair Basden,
HPC Technical Manager,
Durham University

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 Customer Solution Centers help reduce the risks associated with new technology investments and can help improve speed and ease of implementation.

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 explore the latest technology and get the information and hands-on experience you need for your advanced computing workloads.

HPC & AI Innovation Lab

The [HPC & AI Innovation Lab](#) in Austin, Texas, is our 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 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, these Centers of Excellence provide a network of resources based on the wide-ranging know-how and experience in the community.

Proven results

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

- #1 in servers¹¹
- #1 in converged and hyper converged infrastructure (HCI)¹²
- #1 in storage¹³
- #1 enterprise infrastructure¹⁴

See [Dell Technologies Key Facts](#).

¹¹ IDC, [WW Quarterly x86 Server Tracker, 2Q2021](#), Vendor Revenue & Shipments, September 9, 2021.

¹² IDC, [WW Quarterly Converged Systems Tracker](#), Vendor Revenue, March 2021.

¹³ IDC, [WW Quarterly Enterprise Storage Systems Tracker, 2Q2021](#), September 9, 2021.

¹⁴ IDC, [WW Quarterly Enterprise Infrastructure Tracker: Buyer and Cloud Deployment, 2Q2021](#), Vendor Revenue, October 2021.

¹⁵ Dell Technologies case study, [A universe of data](#), accessed November 2021.

Translational Genomics Institute (TGEN)

7-8 hours

instead of two weeks
to process a genome¹⁶

12 trillion

operations per second¹⁶

1 million

CPU hours per month¹⁶

Customer successes

- [TGen](#) uses advanced computing to fight rare diseases.
- [Durham University](#) uses efficient and scalable HPC to support cosmological studies and other scientific investigations.
- [AeroFarms](#)[®] is using image recognition and classification to adjust nutrients, light and other factors to improve crop yield, taste and texture.
- [Konica Minolta](#)[®] integrates Internet of Things (IoT), AI and ML to process up to 300 medical images in a single scan and animate them in minutes.
- [University of Pisa](#) gains greater flexibility and value from its IT infrastructure with Dell EMC hardware and VMware virtualization software.
- [OTTO Motors](#)[®] is using autonomous vehicles/robots in supply chain fulfillment/inventory management.
- [Epsilon](#)[®] uses AI for marketing services and real-time content.

Let's get started

Learn more about how you can quickly deploy an HPC system that's ready to power AI and analytics workloads. Contact your Dell Technologies or authorized partner sales representative, join the HPC Community at dellhpc.org, and visit delltechnologies.com/hpc to learn more.

¹⁶ Dell Technologies Case Study, [Groundbreaking research with life-changing results](#), October 2020.

Contact us

To learn more, visit delltechnologies.com/hpc or [contact](#) your local representative or authorized reseller.