

# High Performance Computing and AI Solutions Portfolio

Technology and expertise to help you accelerate discovery and innovation

# Go ahead. Dream big.

Discovery and innovation have always started with great minds dreaming big. As artificial intelligence (AI), high performance computing (HPC) and data analytics 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<sup>1</sup>

## 44X ROI

Average return on investment (ROI)  
for HPC<sup>2</sup>

## 83% of CIOs

Say they are investing in AI  
and machine learning.<sup>3</sup>

### 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.

AI, HPC and data analytics 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 big-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 AI available using small clusters and workstations. 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 data 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.

<sup>1</sup> Seed Scientific, "[How Much Data is Generated Every Day?](#)" January 2021.

<sup>2</sup> HPC Wire, "[The ROI on HPC? \\$44 in profit for every \\$1 in HPC.](#)" September 2020.

<sup>3</sup> PR Newswire, "[Sapphire Ventures Releases the 2020 CIO Innovation Index: Startup Engagement Trends for the Crisis CIO.](#)" September 2020.



“We want our customers to be able to do things... that they can’t do by themselves, so it’s really important to have vendor partners like Dell Technologies to enable us on the hardware side to be able to physically push the envelope.

“Frankly, if Dell Technologies wasn’t there to do that, well, we’d have to build it ourselves. We’re used to doing that, but we have become comfortable with the way Dell EMC supports the type of innovation that Verne Global is all about.”

—Tate Cantrell,  
CTO 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 AI, HPC and data analytics that spans workstations, servers, networking, storage and services. In addition, Dell 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 computing 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 Ready Solutions, workstations, servers, networking, storage and services that reduce complexity and provide the HPC performance and efficiency required for data analytics and AI.

#### Ready Solutions

Dell EMC Ready Solutions for AI, HPC and Data Analytics are optimized rack-level systems with servers, software, networking, storage and services. These scalable architectures are built with best-in-class solution stacks to deliver speed, confidence and savings.

- **Dell EMC Ready Solutions for HPC** are scalable systems tested and tuned for specific vertical-market applications such as life sciences, digital manufacturing and research.
- **Dell EMC Ready Solutions for AI** help make AI simpler with designs enabling you to get faster, deeper insights delivered with proven AI expertise.
- **Dell EMC Ready Solutions for Data Analytics** speed time to insight with architectures, integrated systems and services optimized for big data analytics.
- **Dell EMC Ready Solutions for HPC Storage** make it easier to unlock the value of your data with scalable systems for NFS®, Lustre®, PixStor™ and BeeGFS® storage along with the Dell EMC Data Accelerator, one of the world’s fastest open-source, NVMe™ storage solutions.

#### 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.



## 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 1,000X faster than traditional solutions with less CPU time consumed.<sup>4</sup> FPGAs can be programmed at the hardware to accelerate specific tasks.
- **IPUs** provide massively parallel, low-precision, floating-point computing with more than 1,000 processors that communicate with each other to share the complex workload required for machine learning.

See performance results at [hpcatdell.com](https://hpcatdell.com).

## Servers

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

The [Dell EMC PowerEdge T640 Server](#) delivers fast insights with two processors and up to four GPU accelerators under your desk or in a rack. With up to 32x 2.5" hard drives, up to eight NVMe drives and 2x 10GbE connections, this server capacity can grow with your data and your team.

The [Dell EMC PowerEdge XE8545](#) combines the highest core counts (128) of the new generation of AMD EPYC processors, the most GPU memory and bandwidth available today to break through the bounds of AI computing. This two-processor server has four NVIDIA A100 GPUs with NVIDIA® NVLINK™ and up to 10 x 2.5" hot-swappable hard drives.

The [Dell EMC PowerEdge C6520 Server](#) supports four two-socket compute nodes in a 2U chassis with air and Direct Contact Liquid Cooling (DCLC) options to power the highest-performing processors. It supports eight memory channels per CPU, up to 16 DDR4 DIMMs @ 3,200MT/s DIMM speed. It also supports PCIe Gen 4 and up to six NVMe drives per node. This makes the PowerEdge C6520 an ideal server for HPC, high performance data analytics (HPDA), financial modeling and high frequency trading (HFT).

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 and 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.

<sup>4</sup> XILINX, "[High Performance Computing Advantages](#)," June 2021.

“[The Great Lakes cluster] is an example of where we were able to come up with a unique solution with Dell Technologies and its partners to make sure that we weren’t overinvesting but were able to meet the needs of our different user bases. We are grateful for that.”

—Brock Palen,  
Director of Advanced  
Research Computing –  
Technology Services,  
University of Michigan

“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

## Software

### 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.

### Omnia

[Omnia](#) configures Dell EMC PowerEdge servers running standard RPM-based Linux OS images into clusters capable of supporting HPC, AI, and data analytics workloads. It uses Slurm®, Kubernetes, and other packages to manage jobs and run diverse workloads on the same converged solution. It is a collection of Ansible playbooks, is open source, and is constantly being extended to enable comprehensive workloads.

### 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 Dell EMC 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](#) systems management solutions can discover, monitor, manage, update and deploy your PowerEdge server infrastructure from nearly anywhere. Dell Technologies [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 [PowerScale] Isilon gives us a simple scale-out solution to manage and consume petabytes of data and to expedite genome processing from weeks to hours. When it comes to research that saves lives, where seconds matter, we rely on Dell EMC.”

—James Lowey,  
CIO, TGenI

#### 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.

[Dell EMC Networking Z9100-ON Series Switches](#) are 10/25/40/50/100GbE fixed switches for HPC 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 simplify migration to 100Gbps.

#### NVIDIA Mellanox InfiniBand

[NVIDIA Mellanox® SB7800 Series Switch IB-2 InfiniBand® EDR 100Gb/s Switches](#) deliver high bandwidth with low latency for the highest server efficiency and application productivity — ideal for HPC applications. You can get 36 ports at 100Gb/s per port and can scale out to hundreds of nodes.

#### Gen-Z Consortium

Dell 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, AI and other HPC workloads makes fast, scalable and resilient storage an imperative.

#### Direct-attached storage (DAS)

The [Dell EMC DSS 7000](#) series lowers your cost per gigabyte for storage while helping you meet the needs of an exascale future. It packs up to 90 hot-serviceable 3.5-inch drives in 4U. Available with either one or two server nodes, the DSS 7000 can deliver up to 1.26PB of storage to tackle demanding storage environments.

#### Network-attached storage (NAS)

[Dell EMC PowerScale Isilon scale-out NAS](#) storage, with the PowerScale 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 15GB/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 exabyte scale while the EX3000 scales to 8.6PB 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.



## VMware for HPC

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

The [latest vSphere edition](#) has been custom-built with big data 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 cloud computing augments what we are able to do. That was enabled through the Dell partnership with Alces. They aren’t looking just at the hardware environment. They bring in other companies...so the overall solution is exactly what the customer requires.”

—Cliff Addison, Advanced Research Computing,  
University of Liverpool

## Hybrid cloud

Leveraging a multi-cloud approach spanning a variety of public, private and hybrid cloud resources, Dell Technologies help you to transform IT by improving agility and reducing costs and risks.

## HPCaaS

Dell Technologies can help you get the resources you need to compete, with scalable, flexible HPC delivered with white glove managed services. The opportunity to pay per use for HPC resources in the cloud helps you access HPC on demand, speed time to results, and pay as you go, simplified.

## Apex Cloud Services

[APEX Cloud Services](#) offer integrated compute, storage, networking, and virtualization resources that enable consistent, secure infrastructure and operations for your workloads across public and private clouds. With a simple way to order and manage cloud resources, you can now easily build the cloud of your choice with solutions tailored for your most pressing business needs.

## Apex Custom Solutions

[APEX Custom Solutions](#) let you create your own on-demand environment with infrastructure and services you customize to order. Deploy a pay-per-use consumption model or an enterprise-scale managed utility. [Flex on Demand](#) from Dell Financial Services allows you to pay only for the technology you need, with payments that adjust up or down to match usage.

## APEX Infrastructure Services

With [APEX Infrastructure Services](#) you can benefit from resources that are owned and maintained by Dell Technologies, so you can focus on high-value priorities. Get the technology you need in a fraction of the time and scale resources on demand.

“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.”

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

#### 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. IT resources can be extended to Amazon Web Services (AWS), Microsoft Azure, Google Cloud Platform and 4,200+ cloud partners via subscription or lease.

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

All types of organizations rely on Dell Technologies and [Verne Global](#) to build and support sustainable, turnkey HPC infrastructures they simply can't get from typical cloud service providers.

[DXC Technology](#) can help you 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.

#### 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 AI and HPC.
- [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 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, groundbreaking 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.



“There are a lot of advantages to working with Dell. We laid out our requirements and the people at Dell took those requirements and developed exactly what we needed... It was very nice to be able to hand this off to people who are experts in the field, who understood what our requirements were, and who could give us a product that actually met those requirements.”

—Thomas McCauley,  
Caterpillar Autonomous  
Mining Program

## Why choose Dell Technologies for HPC and AI

### Dell is different.

Dell Technologies is committed to advancing HPC and AI.

- Schedule 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 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 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 at our Customer Solution Centers in Singapore, Seoul, Sydney, Bangalore and more. 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 AI, HPC and data analytics converge and the technology evolves, the 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.

## Mastercard turns<sup>9</sup>

# 2.2B

cards

# 160M

transactions an hour

# 52B

transactions a year into intelligence with 1.9M rules to help protect customers from fraud

## 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 one provider.

- #1 in servers<sup>5</sup>
- #1 in converged and hyperconverged infrastructure (HCI)<sup>6</sup>
- #1 in storage<sup>7</sup>
- #1 cloud IT infrastructure<sup>8</sup>

See [Dell Technologies Key Facts](#).

## Customer successes

- [Mastercard](#)<sup>®</sup> is using AI to protect their customers from fraud.
- [Medacis](#) empowers healthcare providers to gain drug diversion insight and keep patients and hospitals safe with data analytics and AI enabled by PowerEdge servers and PowerScale storage.
- [AeroFarms](#)<sup>®</sup> is using image recognition and classification to adjust nutrients, light and other factors to improve crop yield, taste and texture.
- At [Simon Fraser University](#), scientists are tracking viruses by their DNA to contain and treat outbreaks faster.
- [University of Pisa](#) is using deep learning technologies from Dell for DNA sequencing, encoding DNA as an image.
- [OTTO Motors](#)<sup>®</sup> is using autonomous vehicles/robots in supply chain fulfillment/inventory management.
- [Epsilon](#)<sup>®</sup> uses AI for marketing services and real-time content. See more [customer case studies](#).

<sup>5</sup> IDC, [WW Quarterly x86 Server Tracker, 1Q2021](#), Vendor Revenue & Shipments, June 10, 2021.

<sup>6</sup> IDC, [WW Quarterly Converged Systems Tracker, 4Q2020](#), Vendor Revenue, March 18, 2021.

<sup>7</sup> IDC, [WW Quarterly Enterprise Storage Systems Tracker, 1Q2021](#), June 10, 2021.

<sup>8</sup> IDC, [WW Quarterly Cloud IT Infrastructure Tracker](#), Vendor Revenue, January 2021.

<sup>9</sup> Dell Technologies white paper, "[Fighting fraud the smart way — with data analytics and artificial intelligence](#)" September 2020.

## Let's get started.

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

## Contact us

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