

HPC & AI Innovation Lab

Dedicated to designing solutions while staying on the leading edge of new and emerging technologies



You've got the power

High performance computing (HPC) gives you the power to break new ground, make important discoveries, and solve some of the most important challenges of our time. But there are always bigger questions — and bigger data sets — on the horizon, requiring HPC solutions to keep pace with the speed of innovation.

That's why Dell Technologies is committed to enabling more organizations in industry, research and government to use HPC solutions for more innovations and discoveries than any other HPC systems vendor in the world. This passion for innovation has helped make Dell Technologies an industry leader in HPC clusters, storage, networking and software. We've built a nexus of collaboration in the industry, exemplified by the Dell Technologies HPC & AI Innovation Lab.

Working with the HPC community to go further, faster

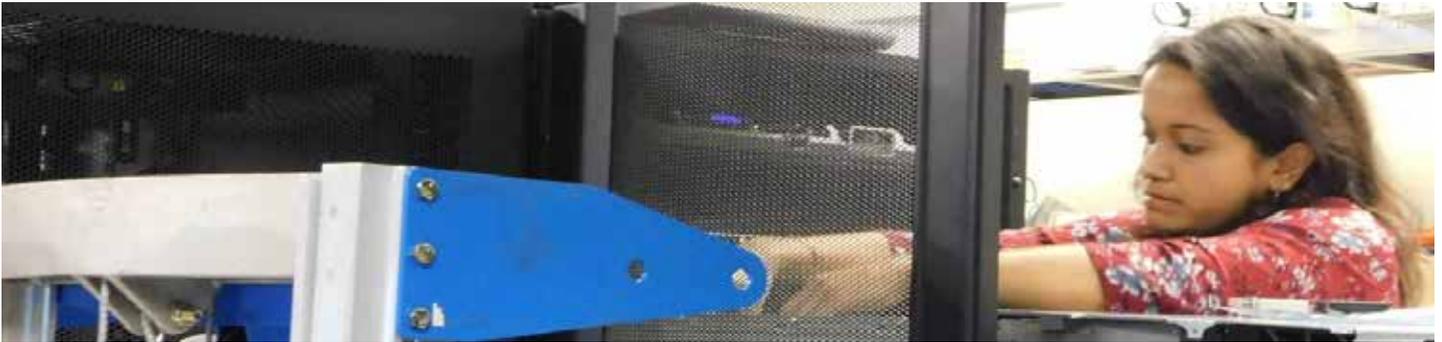
The Dell Technologies HPC & AI Innovation Lab encompasses a 13,000-square-foot data center devoted to high-performance computing and artificial intelligence (AI). It houses thousands of servers, a wide range of storage and network systems.

But the Lab is more than world-class infrastructure. Bringing together HPC operational excellence and expertise, it is 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 gets and provides early access to new technologies, integrates and tunes clusters, benchmarks applications, develops best practices, and publishes their results.

When you engage with the Lab, you work directly with these experts to design a solution for your unique HPC workloads. The opportunity to develop and test your configuration with an expert team prior to deployment reduces risk, and because your HPC system is tuned for optimized performance from day one, your team can get to results faster. And that means your organization can recognize a better return on investment.

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

—Garima Kochhar, Distinguished Engineer



“The Lab is staffed by engineers with advanced degrees and many years of industry experience in domains such as mechanical engineering and bioinformatics. We also have engineers with computer science backgrounds, providing expertise in file systems, interconnects and HPC management tools.”

—Onur Celebioglu,
Sr. Distinguished Engineer,
ISG CTIO, HPC and
Emerging Workloads

Leveraging the Dell Technologies HPC & AI Innovation Lab

Typical HPC & AI Innovation Lab projects

While the list of potential projects is virtually limitless, some common projects include:

- Cluster comparison: Test your workload on three different clusters to see which one delivers the best performance.
- System parameter sweep: Set up a system test bed to find out what combination of core count, memory and processor speed optimizes application performance.
- Accelerator test comparison: Find out which accelerator works best for your needs.
- Efficiency tuning: Determine the optimum basic input/output system (BIOS) and other settings and configurations for your applications.
- Network testing: Figure out which HPC network is best for your application performance requirements.
- Storage system optimization: Build and test HPC storage and file systems, tiered or otherwise, for optimum performance.

Industry expertise

This team of cross-disciplinary engineers often build systems for the following industries.

Research: Quickly develop HPC systems that match the unique needs of a wide variety of workloads, involving complex scientific analysis.

Life sciences: Accelerate time-to-insight for a range of applications, including drug design, cancer research, agriculture, forensics, genomics and bioinformatics.

Computer aided engineering and design (CAE/CAD): Reduce software licensing cost with HPC systems tuned for digital manufacturing.

High-performance data analytics (HPDA): Explore the possibilities of machine learning, deep learning and AI with benchmarked and optimized HPDA system configurations.

Oil and gas: Fuel the algorithms that will revolutionize oil and gas exploration by precisely pinpointing oil and gas reserves.

“Many people are excited about being able to evolve neural networks in ways that are inspired by biology, and it’s increasingly clear that we need a different type of hardware to do that. And that’s what we have with the Zenith cluster in the Dell Technologies HPC & AI Innovation Lab.”

—Dr. Pierre Bellec,
Scientific Director of the
Courtois Project on Neuronal
Modelling (NeuroMod)

Zenith, Rattler and Minerva Systems

The HPC & AI Innovation Lab has three powerful clusters: Zenith, Rattler and Minerva, which the team continuously expands and improves. In addition, the HPC & AI Innovation Lab has an extensive collection of processor models, RAM sizes, a full spectrum of Dell EMC servers, switches, storage, accelerators and adapters available for testing and exploring solution configurations.

Zenith

The Zenith cluster is the result of a partnership between Dell Technologies and Intel®. Teams use it for benchmarking, workload evaluations and a wide range of artificial intelligence, high performance data analytics and high performance computing projects.

Zenith includes Intel Xeon® Scalable Processors, data center storage solutions, adapters, software and tools. Projects include [image classification to identify disease in X-rays](#), [MRI scan matching to thoughts and actions](#), and [building faster neural networks to drive recommendation engines](#).

Component	Configuration
Servers	144x PowerEdge C6520 192x PowerEdge C6420 servers 4x PowerEdge R740 servers
Processors	2nd and 3rd generation Intel Xeon Scalable processors
Memory	192GB at 2,933MHz per C6420 512GB at 3,200MHz per C6520
Operating System	Red Hat® Enterprise Linux®
Host channel adapter (HCA) card	NVIDIA® Quantum™ High Data Rate (HDR) 100 and 200 InfiniBand®
Storage	931TB HPC BeeGFS® High Capacity 1.9PB HPC BeeGFS High Capacity 174TB PowerScale Isilon F800 all-flash NAS storage

As of November 2021.



“Dell’s HPC & AI Innovation Lab is enabling new levels of application efficiency and innovative research capabilities. Together, we are helping build the solutions of the future.”

—Gilad Shainer,
NVIDIA Networking

Rattler

The Rattler cluster is the result of a partnership among Dell Technologies and NVIDIA®. The system is designed to showcase extreme scalability by leveraging GPUs with NVLINK™. Rattler not only accelerates traffic between GPUs inside servers, but also between servers with InfiniBand interconnect. Teams use this system for application-specific benchmarking and workload characterizations.

Dell Technologies and NVIDIA have a long history of collaboration, contributing HPC clusters — along with numerous best practices and application case studies — to the HPC Advisory Council, enabling the HPC community to use best-in-class systems for application optimization, HPC outreach and education.

Component	Configuration
Servers	48x PowerEdge XE8545 servers 6x PowerEdge C4140 5x PowerEdge R750xa 1x PowerEdge R740
Processors	Intel Xeon Scalable and AMD EPYC™ processors
Accelerators	NVIDIA GPUs
Memory	30TB
Operating System	Red Hat Enterprise Linux
HCA card	NVIDIA Quantum High Data Rate (HDR) 100 and 200 InfiniBand
Storage	931TB HPC BeeGFS High Capacity 1.9PB HPC BeeGFS High Capacity

Minerva

The Minerva system results from collaboration with AMD, featuring PowerEdge C6525 servers with second-generation AMD EPYC processors, InfiniBand HDR200 and BeeGFS storage. This cluster highlights the latest server engineering designed to take advantage of the latest cores, memory bandwidth and PCIe Gen4 throughput technologies. Engineering, partners and customers access the system for benchmarking, application characterizations, and solution optimization.

Component	Configuration
Servers	256x PowerEdge C6525 12x PowerEdge R6525
Processors	2nd and 3rd generation AMD EPYC processors
Memory	256GB at 3,200 MT/s per server
Operating System	Red Hat Enterprise Linux
HCA card	NVIDIA Quantum HDR200 InfiniBand
Storage	931TB HPC BeeGFS High Capacity 1.9PB HPC BeeGFS High Capacity

“Dell has been one of the important leaders in the high performance computing industry from the technology side for several years... High performance computing is a community, and that's where this kind of leadership in different areas becomes important because that focus becomes a nexus of innovation and collaboration in the industry.”

—Addison Snell, Analyst,
Intersect360 Research

Why choose Dell Technologies

Dell Technologies is committed to your success in HPC and AI

- Come in for an [executive briefing](#), and collaborate on ways to reach your business goals.
- In addition to the [HPC & AI Innovation Lab](#), the [Customer Solution Centers](#) and [Centers of Excellence](#) are available with 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. 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 offers such a wide selection of solutions, you can trust Dell has the expertise to understand a broad spectrum of challenges and how to address them.

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 servers¹
- #1 in converged and hyper-converged infrastructure (HCI)²
- #1 in storage³
- #1 cloud IT infrastructure⁴

See [Dell Technologies Key Facts](#).

Customer Solution Centers

Dell Technologies' global network of dedicated [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. These Customer Solution Centers can reduce the risks associated with new technology investments and can help improve speed and ease of implementation.

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 technology and solution 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.

¹ IDC [WW Quarterly Server Tracker](#), Vendor Revenue, September 2021.

² IDC [WW Quarterly Converged Systems Tracker](#), Vendor Revenue, March 2021.

³ IDC [WW Quarterly Enterprise Storage Systems Tracker](#), Vendor Revenue, September, 2021.

⁴ IDC [WW Quarterly Cloud IT Infrastructure Tracker](#), Vendor Revenue, July 2021.



Let's get started

All of the resources and expertise in the Dell Technologies HPC & AI Innovation Lab is for you, to help you reduce the risk in making technology decisions, and enhance application-system performance so your teams can reach answers faster.

You are invited to access the Lab to evaluate technologies, see how scaling affects workloads, and compare various technologies. Simply contact your Dell Account Executive and let them know you would like to access the lab. They will arrange for you to talk with an HPC specialist about your proof of concept, technology comparison, benchmarking and/or other projects.

Join the HPC Community at dellhpc.org, visit delltechnologies.com/innovationlab to learn more. Take an [online interactive tour of the HPC & AI Innovation Lab](#). Review the engineering team's findings in their blogs, performance reports and white papers at hpcatdell.com and on the [Dell Technologies InfoHub](#).

Contact us

To learn more, [contact](#) your local representative or authorized reseller.