DELLTechnologies

Dell EMC Ready Solutions for HPC Life Sciences

Make breakthroughs faster with the power of High Performance Computing

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40%
of health systems report
they are already using AI.[1]

93%
of healthcare leaders agree
AI is absolutely essential,
very important or important
to their strategy.[1]

"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."[2]

—James Lowey, CIO, TGen

Get life-changing answers, faster

Advanced computing technologies, such as data analytics, artificial intelligence (AI) and
High Performance Computing (HPC), are the key to using medical data — better, faster
and with lower costs — to save lives. While they have existed as separate technologies
for many years, the three are converging as the industry comes to understand that the
powerful, scalable compute, networking and storage provided by HPC is required for
analytics and AI.

This convergence will enable human/machine partnerships, reshaping the ability of the
life sciences to prevent, detect and treat disease. Advanced computing is already having
a profound impact on the industry; faster processing speeds and AI algorithms that are more
sensitive than the human eye are already enabling earlier diagnoses, reducing treatment
times, accelerating genetic analysis and speeding development of personalized healthcare.

Dell Technologies has what you need
Expertise and guidance
The technology around data analytics, HPC and AI is emerging quickly, so your team may
not have had time to design, deploy and manage solution stacks optimized for new or
emerging technologies. While AI might seem like the latest IT trend, Dell Technologies
has been a leader in HPC for over a decade, with proven products, solutions and expertise.
Dell Technologies has a team of data analytics, HPC and AI 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 Ready Solutions for HPC
The advantage in today's marketplace goes to the data driven enterprise. For many
organizations, HPC is — or is becoming — an important source of competitive advantage.
An optimized HPC solution delivers the compute, throughput and capacity needed to
manage the rapid data growth and increased workload demands presented by advanced
data analytics and other enterprise workloads. Dell EMC Ready Solutions for HPC simplify
design, speed configuration and ordering of systems with standardized building blocks
tested for life sciences applications.

Solutions customized for your environment
Dell Technologies uniquely provides an extensive portfolio of technologies to deliver
the advanced computing solutions that underpin successful data analytics and AI
implementations. With an extensive portfolio, 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 the promise of the data analytics, HPC and AI.

[1] AI in Healthcare, "AI in Healthcare 2020
Leadership Survey Report: 7 Key Findings."
Accessed July 2020.

[2] Dell Technologies case study, "Setting the
pace of progress." Accessed July 2020.

Do any of these challenges sound familiar?

"Designing, deploying and tuning infrastructure with little IT expertise or support is complex and time-consuming."
Each aspect of an HPC solution is interconnected and impacts the overall performance of the solution, including performance, reliability, access protocols, scalability, ease-of-management, price, power and more. Building a solution from scratch that addresses each one of these requirements can be complex and time-consuming. Dell EMC Ready Solutions for HPC Life Sciences can reduce deployment time and speed time to production.

"Providing the performance required for life sciences workloads is challenging."
Software-licensing costs and application-specific performance are greatly affected by solution design, and finding the right mix for both can be difficult. Code optimization can take advantage of the latest technologies. Dell EMC Ready Solutions for HPC Life Sciences feature industry-specific designs tuned by Dell Technologies engineers and industry experts specifically for life sciences workloads.

"We need scalability to handle rapidly growing data sets."
The growth of life sciences data is pushing data repositories to incredible sizes. Life sciences researchers can generate and consume data at such speed that multiple petabytes to exabytes are becoming commonplace. And the data requirements around performance and capacity keep increasing rapidly. The design of Dell EMC Ready Solutions for HPC Life Sciences can make it easy to manage and scale over time.

Why Dell EMC Ready Solutions for HPC Life Sciences?

Dell Technologies has invested to create a portfolio of Ready Solutions designed to simplify the configuration, deployment and management of HPC solutions. They provide trusted designs that have been tested, optimized and tuned for key use cases. They include the servers, storage, networking, software and services that have been proven in our labs and in customer deployments. The modular building blocks provide a customizable yet validated approach for deploying new clusters, or upgrading existing systems.

Ready Solutions for HPC Life Sciences have been designed to speed time to production, improve performance with purpose-built solutions, and scale easier with modular building blocks for capacity and performance.

Faster time to production

Better performance

Easier scalability

Faster time to production
The faster your system is up and running, the faster you can find the answers. Dell EMC Ready Solutions are engineered hardware and software stacks designed to shorten the time to architect a new solution by 6–12 months.[3] Dell Technologies Services ranging from consulting and education to integration and support are available as needed, so you can spend more time focusing on life sciences.

Better performance

Dell Technologies is committed to helping more people make more innovations and discoveries than any other HPC solutions provider in the world. To that end, Dell Technologies engineers and industry experts have worked in collaboration with customers and partners to design these solutions specifically for life sciences workloads. The Dell Technologies HPC & AI Innovation Lab works closely with customers and partners to integrate, test and optimize these solutions for your applications and workloads, with a focus on efficiency, performance and reliability.

Easier scalability

Dell EMC Ready Solutions for HPC help customers get the optimal IT infrastructure for today — and tomorrow. That means creating solutions with scalable building blocks to meet evolving needs over time. Dell EMC Ready Solutions for HPC are built on modular building blocks that can be configured and ordered in a simplified process that enables you to scale easily to meet new capacity and performance demands. The extensive track record of Dell Technologies with servers, storage, networking and services enables delivery of holistic solutions that work from day one, with an eye toward the future.

Customer success stories

Beijing Genomics Institute

288.5 TFLOPS peak performance	**20%** TCO reduction compared to previous solution	**70GB** I/O speed

Read the case study: Using a modular architecture to understand the mysteries of life.

Tsinghua University's Protein Technology Center

4X increase in compute power	**50%** reduction in IT complexity	**75–80%** reduction in compute time

Read the case study: Science computing supports near-atomic structural studies.

Dana-Farber Cancer Institute, Harvard Medical School and Peking University

~2PB of storage	**1,000X** faster averaging compared to previous solution

Read the case study: Leveraging HPC Hardware to Run Next-generation Molecular Imaging Analysis.

- TGen uses advanced computing to fight rare diseases.
- Partners Healthcare uses advanced analytics to transform patient health.
- Peking University uses Cryo-EM supported by 2PB of storage to open new frontiers in biochemistry.
- Bumrungrad International Hospital uses advanced computing to support personalized care models.
- CSIRO uses HPC to double the computational power available for AI-enabled bionic vision.
- Tsinghua University Protein Technology Center uses HPC to reduce biological research complexity by 50%.

"The HPC clusters from Dell Technologies are critical to our research missions that highly depend on the analysis of big data generated from highly automated cryo-electron microscopes."[4]

—Dr. Youdong "Jack" Mao, Assistant Professor of Biop Peking University

Technical Specifications

The options in the following tables serve as a starting point for a customizable, yet engineering-tested solution. A Dell Technologies HPC specialist will assist you with designing an HPC solution for your specific needs. See performance results at hpcatdell.com.

Dell EMC Ready Solutions for HPC Life Sciences

Explore Virtual Rack at
http://esgvr.dell.com/

Specifications			
PowerEdge servers	Compute nodes	**Choice of:** R440, R640, R740/xd, R940, C4140, C6420	R6515, R7515, R6525, R7525, C6525
	Processors	Intel® Xeon® Scalable	AMD® EPYC™ 7000 series
	Accelerator nodes	**Choice of:** PowerEdge C4140 PowerEdge R740	**Choice of accelerators:** NVIDIA® T4, P40, V100 In PowerEdge C4140, V100 16GB and 32GB SXM2 and PCIe
Software	Bright	Red Hat® Enterprise Linux® Bright Cluster Manager® Mellanox® OFED NVIDIA CUDA®	Intel Fabric Suite (IFS) Omni-Path Dell Deployment Toolkit Dell EMC OpenManage
	OpenHPC	Red Hat Enterprise Linux OpenHPC Mellanox OFED IFS	Note: OpenHPC does not have accelerator support Dell Deployment Toolkit Dell EMC OpenManage
Networking			
Omni-Path (OPA) for Intel-based servers	OPA Host Fabric Interface (HFI)	Intel HFI adapter 100 series 1 port PCIe x16	
	OPA switches	Dell Networking H1000 Edge series: H1048 and H1024 Dell Networking H9100 series	
	OPA IFS driver stack	10.9	
InfiniBand® (IB)	IB host channel adapters	Mellanox ConnectX®-5 EDR single port, Mellanox ConnectX-3 FDR dual port, or Mellanox ConnectX-6 HDR	
	IB switches: HDR, FDR and EDR	Mellanox SwitchX®-6xxx series Mellanox SB 77xx and 78xx series Mellanox MSB 78xx series Mellanox QM-8700 series	
	Drivers	Mellanox OFED	
Ethernet	NICs	1, 10, 25, 40GbE (full and low profile)	
	Dell EMC PowerSwitch	Z and S series	
Storage	NFS	Dell EMC Ready Solutions for HPC NFS Storage	
	Lustre®	Dell EMC Ready Solutions for HPC Lustre Storage	
	PowerScale	Dell EMC PowerScale Scale-out NAS Storage	
	SAS RAID Controller	PERC 10	

Genomics
Sequence and assemble more genomes, faster

Since 2009, some of the world's leading genomic researchers have engaged Dell Technologies to provide HPC clusters that can analyze data faster, and in some cases, provide the insight needed to help save lives. Using lessons learned from this pioneering work, as well as ongoing collaboration with genomic researchers, Dell Technologies created a solution for genomics.

For next generation sequencing (NGS) and de novo assembly applications and workloads, this solution is designed to speed time to production, improve performance and scale more easily with modular building blocks.

Specifications			
Servers			
PowerEdge Servers	1x R440, 1x R640	8x C6420 sleds	1x R740xd for de novo assembly
Processor	2x Intel Xeon Gold 6230 @2.1Ghz 20 cores	Choice of: 2x Intel Xeon Gold 6242 @2.8Ghz, 16 cores; 6248 @2.5Ghz, 20 cores; or 6252 @2.1Ghz, 24 cores	2x Intel Xeon Gold 6248R @3Ghz, 24 cores
Memory	12x 16GB RDIMM, 2666MT/s, dual rank	Choice of: 24x 8GB RDIMM, 2933MT/s dual rank, 24x 16GB RDIMM, 2933MT/s dual rank, or 24x 32GB RDIMM, 2933MT/s dual rank	12x 16GB RDIMM, 2666MT/s dual rank with 3TB SDM 12x Intel Optane™ DC persistent memory 120Gb each
System	HBA330 controller adapter, low profile	PERC H330, H730P or H740P RAID controller	
Local disks (storage)	10x 1.92TB SATA SSD	2x 750GB Intel Optane DC P4800X and Intel Memory Drive Technology (IMDT) 4x 480GB 12Gbps mixed use SAS SSDs	
Network adapter	1x Mellanox ConnectX-6 HDR100	1x Mellanox ConnectX-6 HDR100 or Mellanox ConnectX-5 EDR	
Networking			
Storage	Mellanox Quantum™ MQM8790 HS2R (HDR) or SB7890 (EDR)		
Management	PowerSwitch S3048 ON		
Software (optional, tested, recommended)			
Operating system	Red Hat Enterprise Linux or CentOS		
Cluster management	Bright Cluster Manager		
Server management	iDRAC Enterprise OpenManage		
Bioinformatics tools for genomics	BioBuilds™		
Genome analysis	GATK		
Genome assembler	SPAdes		
Storage			
Ready Solutions for BeeGFS® Storage — High Capacity, Large			
Services			
Consulting, education, hardware deployment and support, remote management, cloud options, financing			

"We test every piece of hardware, believe it or not, Dell EMC is the only server that can hold up to the type of work that we are pounding on these boxes. Other boxes will fail, and we will end up with them down. And so a big reason that we have Dell EMC servers is because they are bulletproof — you can drop them on their head and they still run — and they are fast."[5]

—Christopher Sullivan, Assistant Director for Biocomputing, Center for Genome Research and Biocomputing, Oregon State University

"In the last 12 months, we have sequenced around 8,000 to 9,000 patient samples across our genomics programs, and all of that has been processed through our hardware supplied by Dell."[6]

—Dr. Thomas R. Connor, bioinformatics lead for the Public Health Wales Pathogen Genomics Unit

Services and financing

Dell Technologies 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.
- Education Services offers courses and certifications in data science and advanced analytics through self-paced online labs and instructor-led workshops.
- Deployment Services has the experience, expertise and best practices to enhance your success with data analytics, HPC and AI solutions. With a proven track record of success in thousands of engagements worldwide, you can rely on Dell Technologies as your partner.
- Support Services experts can provide comprehensive hardware and collaborative software support 24x7 for optimal system performance and minimized downtime. ProSupport includes next-business-day on-site service with four- and eight-hour parts-and-labor response options, and escalation management with customer-defined severity levels. You can also opt for ProSupport Plus to get a technology service manager, a single point of contact for your support needs.
- Once the HPC system is deployed, Remote Cluster Management services can help keep IT running smoothly with proactive monitoring and management of the entire HPC solution.
- Financial Services offers a wealth of leasing and financing options to help you find opportunities when your organization faces decisions regarding capital expenditures, operating expenditures and cash flow.

[5] Dell Technologies case study, "Revving up Research," May 2019.

[6] Dell Technologies case study, "Unleashing the Power of Genomics," January 2020.

"Realizing the vision of Big Science that is delivered from our extensive research and clinical development efforts, from basic research to cancer genomics, requires new technology collaboration."[7]

—Shawn N. Murphy, MD, PhD, Corporate Director of Research Information Systems and Computing, Partners HealthCare

Why choose Dell Technologies for data analytics, HPC and AI

We're committed to advancing data analytics, HPC and AI.

- Come in for an executive briefing and collaborate on ways to reach your business goals.
- Dell Technologies Customer Solution Centers are staffed with computer scientists, engineers and 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 at hpcatdell.com.
- Dell Technologies is the only company in its class 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, the Dell Technologies team can understand a broad spectrum of challenges and how to address them without a one-size-fits-all approach.

Customer Solution Centers

Our 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. Dell Technologies Customer Solution Centers reduce the risks associated with new technology investments and can help improve speed 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, and Bangalore 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 Technologies 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.

Winner of the coveted HPCwire Editors' Choice Award for Best Use of High Performance Data Analytics.[8]

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 servers[9]
- #1 in converged and hyper-converged infrastructure (HCI)[10]
- #1 in storage[11]
- #1 cloud IT infrastructure[12]

See Dell Technologies Key Facts.

Take the next step, today

Don't wait to find out how Dell Technologies can simplify and speed life sciences applications and workloads. Contact your Dell Technologies or authorized channel partner representative for more details.

[8] HPCwire, "2018 HPCwire Awards – Readers' & Editors' Choice," November 2018.

[9] IDC WW Quarterly Server Tracker, Vendor Revenue, June 2020.

[10] IDC WW Quarterly Converged Systems Tracker, Vendor Revenue, June 2020.

[11] IDC WW Quarterly Enterprise Storage Systems Tracker, Vendor Revenue, June 2020.

[12] IDC WW Quarterly Cloud IT Infrastructure Tracker, Vendor Revenue, June 2020.

Contact us

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

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