

# Dell EMC Ready Solutions for HPC Life Sciences

Make medical breakthroughs faster with the power of high performance computing

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**US\$25.2 billion**

global life science analytics market<sup>1</sup>

**12.1% CAGR**

2018 through 2024<sup>1</sup>

**81%**

of healthcare leaders expect humans and machines to work as teams<sup>3</sup>

**79%**

of healthcare leaders have invested or will invest in AI<sup>3</sup>

## Why care about HPC life sciences

### Save more lives

The entire life sciences industry is in a state of transformation, driven by new technologies that empower physicians, clinicians and researchers to collect unprecedented amounts of data. Advances in genomics, proteomics, microscopy, imaging and many more areas have created an avalanche of data that can be used to improve patient outcomes.

For many years, high performance computing (HPC) has been enabling clinicians to use complex, compute-intensive algorithms to provide faster and more accurate outcomes. However, technology has advanced to the point that the human element of programming and evaluating the data has become a bottleneck. Thus, advancing the quality and speed of medical breakthroughs now requires new approaches for data analytics, interpretation and practical application.

Advanced computing technologies, such as data analytics, artificial intelligence (AI) and HPC, are the key to using medical data to save lives and protect health — better, faster and with lower costs. 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 data analytics and AI to excel.

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.

### Tap into a fast-growing market

The global HPC market, including healthcare and biosciences, is anticipated to grow with 25.2% CAGR from 2018–2026.<sup>2</sup> With Dell EMC leading the charge, high performance computing is “mainstreaming,” which is driving market growth in small and medium HPC solutions — and creating opportunity for those who are prepared to work with customers in this expanding vertical.

### Make more money

HPC sales often grow to include workstations, servers, storage, networking, data center options, software and services — exponentially increasing your deal size.

### Don't go it alone

Dell EMC is committed to growing our HPC business, and you're an important part of that effort. We've put a team of HPC experts at your disposal to help you at any step of the process, in any region of the world. They can even help you identify new opportunities and mine for opportunities within your current accounts.

<sup>1</sup> Energias Market Research, “[Global Life Science Analytics Market to Witness a CAGR of 12.1% during 2018-2024](#),” January 2019.

<sup>2</sup> Acumen Research and Consulting, “[High Performance Computing Market is anticipated to grow with 25.2% CAGR during th forecast time period 2018-2026](#),” December 2018.

<sup>3</sup> Dell EMC Infographic, “[Preparing for Human - Machine Partnerships in Healthcare](#),” May 2018.

## 2,314 exabytes

of medical data predicted by 2020<sup>4</sup>

## 96 samples/day

using HPC, compared to 30 hours for a single sample previously<sup>4</sup>

## Advanced computing workloads

Life sciences applications have a foundation of data analysis, visualization, modeling and simulation, numerical computation and algorithmic development. These are the hallmarks of high performance computing, and Dell EMC is a leader in this space, with an extensive portfolio ranging from workstations to supercomputers, wrapped with the security that life sciences organizations require.

### Genomics and proteomics

#### Identify disease sooner and treat it more effectively

The study of genes and the proteins they express impacts multiple life sciences fields including oncology, pharmacology, rare and undiagnosed diseases, and infectious diseases. Advanced computing techniques can be used to guide decisions about care, reveal future disease susceptibilities or flag existing pathogenic variations — faster and with significantly lower error rates than other methods. For example, HPC enables researchers to sequence DNA much faster than ever before, and AI can be trained to identify patterns within genetic data sets and make predictions about an individual's odds of developing a disease or responding to certain interventions.

### Computational chemistry and molecular dynamics

#### Transform the process of drug discovery

Traditionally, new drug discovery has resulted from researchers mixing chemicals in the lab to see what they could come up with. But as new discoveries become more elusive and the industry becomes more competitive, life sciences researchers have increasingly turned to computational chemistry and molecular dynamics simulations to aid the process of drug discovery and design. While HPC alone can speed these workloads to improve time to discovery, integrating AI enables the creation of “hyper-predictive” models for identifying chemical compounds that will make better drug candidates. This will significantly impact the clinical development pipeline, reducing both costs and time to market for new drugs.

### Bioinformatics

#### Understand biological data faster

Bioinformatics began when researchers first realized the power of computer databases to store and manage large data sets. But today, the sheer quantity of biological data is outpacing traditional methods for data storage and analysis. AI can be used to catalog these vast data stores and extract hidden knowledge in existing data. Other bioinformatics applications supported by AI include in silico experiments and simulations, complex systems analysis, drug discovery and design and therapy optimization. The impact of advanced computing on bioinformatics can be profound, with faster, deeper analysis shortening time to discovery and reducing costs.

### Cryo-electron microscopy

#### Visualize better

Cryo-electron microscopy (cryo-EM) enables the 3D visualization of proteins at a near-atomic level to help scientists visualize and understand how biomolecules function and interact. There are a wide range of use cases for advanced computing and cryo-EM, including aiding in developing new pharmaceuticals and therapies such as innovations in cancer immunotherapy and precision medicine. The technology is already delivering significant insights in areas like immunology and cancer research, as well as cardiovascular and neurodegenerative diseases.

<sup>4</sup> Dell EMC ebook, “[Making digital transformation in healthcare a reality](#),” February 2018.

## Target customers

<b>Characteristics</b>	<b>Small and medium life sciences and healthcare organizations</b>			
<b>Workload characteristics</b>	Life sciences applications are typically built in-house and require purpose-built solutions that focus on individual use cases. Workloads tend to involve: <ul style="list-style-type: none"> <li>• Hundreds of applications, codes and toolkits</li> <li>• Large (1–2TB RAM) applications such as graphics, genomic assembly</li> <li>• Performance bottlenecks created by input/output (I/O) or RAM</li> </ul>			
<b>Use cases</b>	Research — genomic and bioinformatic research	Healthcare — clinical trials, emerging therapies and precision medicine	Government and industry — agriculture, pharmaceuticals and biotechnology	Machine learning — radiological imaging, clinical data analysis, research and clinical data trend analysis
<b>Decision makers</b>	<ul style="list-style-type: none"> <li>• CIO/CTO</li> <li>• IT directors</li> </ul>		<ul style="list-style-type: none"> <li>• Directors of life science research</li> <li>• Directors of research and development</li> </ul>	
<b>Key questions to ask</b>	<ul style="list-style-type: none"> <li>• Do you have sufficient resources to run sequencers/microscopes/simulations?</li> <li>• Is the current wait time for results acceptable?</li> <li>• How would reducing the time spent waiting for results impact productivity?</li> </ul>			

## Customer challenges

**“Designing, deploying and tuning infrastructure with little IT expertise or support is complex and time-consuming.”**

HPC for life sciences has traditionally been custom-built. In addition, each aspect of an HPC solution is interconnected and impacts the overall performance of the solution: 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. Customers may also need code optimization to take advantage of the latest technologies. Dell EMC Ready Solutions for HPC Life Sciences feature industry-specific designs tuned by Dell EMC engineers and industry experts 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 starting to become 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 extend storage and networking on-premises over time.

## Faster time to production

## Better performance

## Easier scalability

Winner of the coveted HPCwire Editors' Choice Award for Best Use of High Performance Data Analytics.<sup>5</sup>

“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.”<sup>6</sup>

—James Lowey, CIO,  
TGen

## 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.](#)

## Dell EMC has what customers need

### Expertise and guidance

The technology around data analytics, HPC and AI is emerging quickly, so your team may not have had time to develop all the skills required to design, deploy and manage solution stacks optimized for new workloads. While AI might seem like the latest IT trend, Dell EMC has been a leader in the advanced computing space for over a decade, with proven products, solutions and expertise. Dell EMC 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, high performance computing 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, configuration and ordering of systems with standardized building blocks that are tested for life sciences applications.

### Solutions customized for your environment

Dell EMC 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 EMC 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.

<sup>5</sup> HPCwire, “[2018 HPCwire Awards – Readers' & Editors' Choice](#),” November 2018.

<sup>6</sup> Dell EMC ebook, “[Making digital transformation in healthcare a reality](#),” February 2018.

## Why buy Dell EMC Ready Solutions for HPC Life Sciences?

Dell EMC has invested to create a portfolio of Ready Solutions designed to simplify the configuration, deployment and management of high performance computing systems. They provide trusted designs that have been optimized, tested and tuned for a variety of key use cases. They include the servers, storage, networking, software and services that have been proven in our labs and in customer deployments to meet workload requirements and customer outcomes. The modular solution building blocks provide a customized yet validated approach, for customers deploying new clusters, scaling or upgrading their existing environments.

### Faster time to production

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.

### Better performance

#### Faster time to production

For healthcare and life sciences projects, every hour closer to discovery and results can impact people's lives. Dell EMC Ready Solutions are engineered hardware and software stacks designed to shorten the time to architect a new solution by 6–12 months.<sup>7</sup> Dell EMC Services ranging from consulting and education to integration and support are available as needed so you can spend more time focusing on the science.

### Easier scalability

#### Better performance

Dell EMC is committed to helping more people make more innovations and discoveries than any other HPC solutions vendor in the world. To that end, Dell EMC engineers and industry experts have worked in collaboration with Dell EMC customers and partners to design these solutions specifically for life sciences workloads. The Dell EMC HPC and AI Innovation Lab works closely with customers and partners to integrate, test and optimize these solutions, 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. Dell EMC's extensive track record with servers, storage, networking and services enables us to implement holistic solutions that work from day one, with an eye toward the future.

<sup>7</sup> Forrester Research commission by Dell EMC, "[The Total Economic Impact of Dell EMC Ready Solutions for AI, Machine Learning with Hadoop](#)," August 2018.

## What do I sell?

The options below serve as a starting point for a customized yet validated solution. See performance results at [hpcatdell.com](http://hpcatdell.com).



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

### Ready Solutions for HPC Life Sciences Specifications

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

“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.”<sup>8</sup>

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

## Why choose Dell EMC for data analytics, HPC and AI

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

- Come in for an [executive briefing](#) and collaborate on ways to reach your business goals.
- Dell [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 EMC 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 EMC 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.

### Dell Customer Solution Centers

Our global network of 21 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 Customer Solution Centers reduce the risks associated with new technology investments and can help improve speed of implementation.

### Dell EMC HPC and AI Centers of Excellence

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

### Dell EMC 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, Korea, Australia, India and Japan in [Customer Solution Centers](#). Dell EMC 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.

### Dell EMC HPC and AI Innovation Lab

The Dell EMC HPC and 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, two powerful HPC clusters, and sophisticated storage and network systems. It's staffed by a dedicated group of computer scientists, engineers and Ph.D. 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.

<sup>8</sup> Dell EMC ebook, "[Making digital transformation in healthcare a reality](#)," February 2018.



“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.”<sup>9</sup>

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

#### Solution highlights

- [Dell EMC PowerEdge Servers](#) enhance performance across the widest range of applications with highly scalable architectures and flexible internal storage.
- [Dell EMC Ready Solutions for HPC NFS Storage](#) are reliable, easy to administer and have very good performance within certain boundaries.
- [Dell EMC Ready Solutions for HPC Lustre Storage](#) allow customers to tap into the power and scalability of Lustre with simplified installation, configuration and management features.
- [Bright Cluster Manager for HPC](#) enables the deployment of clusters over bare metal with a management view that spans the hardware, operating system, software and users.

## Services and financing

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

- [Dell EMC Big Data Vision Workshop](#) focuses on big data for business leaders. We have a unique methodology to identify and prioritize a single use case with a combination of implementation feasibility and business value. It’s a three week engagement that applies research, interviews and data science expertise and techniques to the organization — culminating in a one day workshop for your team to identify and agree on a use case and path forward. This approach sets Dell EMC apart from the “bring in a bunch of technology and see what it can do” approach that’s pushed by many vendors.
- [Dell EMC Consulting Services](#) are delivered by certified experts to help you get the business value of advanced computing. The services include an 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 at each step.
- [Dell EMC Education Services](#) offers courses and certifications in data science and advanced analytics through self-paced online labs and instructor-led workshops.
- [Dell EMC Deployment](#) experts have 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 EMC as your partner.
- [Dell EMC Support](#) 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, who serves as a single point of contact for your support needs.
- Once the HPC cluster is deployed, [Dell EMC Remote HPC Cluster Management](#) services help keep it running smoothly with proactive monitoring and management of the entire HPC solution.
- [Dell 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.

<sup>9</sup> Dell EMC case study, “Revving up research,” June 2019.

## Resources

[hpc\\_interest@dell.com](mailto:hpc_interest@dell.com)  
[machine\\_learning\\_interest@dell.com](mailto:machine_learning_interest@dell.com)  
[InsideDell](#)  
[Sales Portal](#)  
[hpcatdell.com](http://hpcatdell.com)  
[dell EMC.com/hpc](http://dell EMC.com/hpc)

“The HPC clusters from Dell EMC are critical to our research missions that highly depend on the analysis of big data generated from highly automated cryo-electron microscopes.”<sup>10</sup>

—Dr. Youdong “Jack”  
Mao, Assistant Professor  
of Biophysics, Peking  
University

## Proven results

Dell EMC 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 information technology needs from Dell EMC.

- #1 in servers<sup>11</sup>
- #1 in converged and hyper converged infrastructure (HCI)<sup>12</sup>
- #1 in storage<sup>13</sup>
- #1 cloud IT infrastructure<sup>14</sup>

See [Dell Technologies Key Facts](#).

## Customer successes

- [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%.

## How to get started

Whether you’re an HPC expert or just getting familiar with this exciting new territory, you don’t have to go it alone. Take the next steps to win HPC business, today.

Schedule time with a Dell EMC HPC Solutions Specialist:

[HPC\\_NA\\_Sales\\_Team@Dell.com](mailto:HPC_NA_Sales_Team@Dell.com)

[EMEA\\_HPC\\_Team@Dell.com](mailto:EMEA_HPC_Team@Dell.com)

[APJ\\_HPC\\_Team@Dell.com](mailto:APJ_HPC_Team@Dell.com)

[HPC\\_Latam@Dell.com](mailto:HPC_Latam@Dell.com)

<sup>10</sup> HPCwire, “[A catalyst for scientific breakthroughs: Cryo-EM and HPC](#),” December 2018.

<sup>11</sup> IDC [WW Quarterly Server Tracker](#), Vendor Revenue, June 2019.

<sup>12</sup> IDC [WW Quarterly Converged Systems Tracker](#), Vendor Revenue, June 2019.

<sup>13</sup> IDC [WW Quarterly Enterprise Storage Systems Tracker](#), Vendor Revenue, June 2019.

<sup>14</sup> IDC [WW Quarterly Cloud IT Infrastructure Tracker](#), Vendor Revenue, June 2019.

