

Validated Designs for HPC Life Sciences

Make breakthroughs faster with the power of High Performance Computing

Table of Contents

| | |
|--|-----------|
| Get life-changing answers, faster. | 2 |
| Dell Technologies has what you need.. | 2 |
| Common challenges | 3 |
| Why Dell Technologies Validated Designs for HPC Life Sciences | 3 |
| Faster time to production | 3 |
| Better performance | 4 |
| Easier scalability | 4 |
| Customer success stories | 4 |
| Technical specifications. | 5 |
| HPC Life Sciences | 5 |
| Genomics with BioBuilds | 6 |
| Genomics with NVIDIA Clara Parabricks | 7 |
| Services and financing | 8 |
| Why choose Dell Technologies | 9 |
| Customer Solution Centers | 9 |
| AI Experience Zones | 9 |
| HPC & AI Innovation Lab | 9 |
| HPC & AI Centers of Excellence | 9 |
| Proven results | 10 |
| Take the next step, today | 10 |

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 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 AI.

This convergence will reshape the ability of the life sciences to prevent, detect and treat disease. Advanced computing is already having a profound impact on the industry. For example, AI algorithms are more sensitive than the human eye, enabling earlier diagnoses and helping reduce treatment times.

Dell Technologies has what you need.

Expertise and guidance

The technology around 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 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 Technologies Validated Designs for HPC

For many organizations, HPC is 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 artificial intelligence and other workloads. Validated Designs are workload-optimized rack-level systems with servers, software, networking, storage and services to scale faster with the confidence of an engineering-tested solution while enabling business without boundaries.

Solutions customized for your environment

Dell Technologies uniquely provides an extensive portfolio of technologies to deliver the advanced computing solutions that underpin successful 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 analytics, AI and HPC.

¹ AI in Healthcare, “[AI in Healthcare 2020 Leadership Survey Report: 7 Key Findings](#),” accessed November 2021.

² Dell Technologies case study, “[Setting the pace of progress](#),” accessed November 2021.

Common challenges

“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, 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 Technologies Validated Designs for HPC Life Sciences can help reduce deployment time and speed time to production.

“Getting the best price-performance of systems 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 Technologies Validated Designs for HPC Life Sciences feature industry-specific designs tuned by Dell Technologies engineers and industry experts specifically for the price-performance of 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. Dell Technologies Validated Designs for HPC Life Sciences can make it easy to manage and scale over time.

Why Dell Technologies Validated Designs for HPC Life Sciences

Dell Technologies has invested to create a portfolio of Validated Designs to scale faster with the confidence of engineering-tested solutions while enabling business without boundaries. They provide proven solutions that have been tested, optimized and tuned for key applications, workloads and 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, scaling or upgrading existing environments.

Faster time to production

Validated Designs 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

Easier scalability

Faster time to production

The faster your system is up and running, the faster you can find the answers.

Dell Technologies Validated Designs 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.

³ Channel Buzz, “[Dell Technologies releases three AI-focused Dell EMC Ready solutions.](#)” November 2020.

“In the future, we believe data will guide every medical decision. That's why technology will be key for every healthcare company.”⁴

—Kiyotaka Fujii, President of Global Healthcare at Konica Minolta

Better performance

Dell Technologies is committed to helping 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 life sciences applications, with a focus on efficiency, performance and reliability.

Easier scalability

Dell Technologies Validated Designs for HPC help you get the optimal IT infrastructure for today — and tomorrow. That means creating solutions with scalable building blocks to meet evolving needs over time. Dell Technologies Validated Designs for HPC are built on modular building blocks that enable you to easily scale 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

Medacis

5 minutes

instead of 24 hours for analytics

Millions

of dollars saved

13% savings

while growing from 600 to over 2,000 clients

Read the case study: [Advancing healthcare analytics and saving lives.](#)

Konica Minolta

IoT, AI and machine learning integrated in a seamless solution

Up to 300 medical images processed in a single scan

Minutes to animate scans

Read the case study: [Realizing X-ray that moves using technology that transforms.](#)

Translational Genomics Research Institute (TGen)

Same day clinical results

8 hours to sequence a genome instead of two weeks

Read the case study: [Groundbreaking research with life-changing results.](#)

- The [UK National Health Service](#) is collaborating with university partners to transform public health and personalized medicine with the power of HPC.
- [Wellcome Sanger Institute](#) accelerates scientific discovery and innovation with higher-speed, more reliable access to biomedical research data.
- [UZ Brussel](#) boosts hospital services with HPC systems built on Dell EMC PowerEdge servers.
- [San Diego Supercomputer Center](#) architects for mixed workloads at massive scale.
- [University of Cambridge](#) capitalizes on the UK's largest academic supercomputer to power data-driven science.

Read more [customer case studies](#).

⁴ Dell Technologies case study, “[Realizing X-ray that moves using technology that transforms.](#)” accessed November 2021.

Technical specifications

The options in the following tables serve as a starting point for an engineering-tested solution. A Dell Technologies HPC specialist can assist you with designing an HPC solution for your specific needs. See performance results at hpcatdell.com and on the [InfoHub](#).



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

HPC Life Sciences

| Configuration options | |
|--|--|
| PowerEdge Servers | |
| Server options | Intel® Xeon® Scalable: R650, R750, R750xa, R950, C6520 AMD® EPYC™: R6525, C6525, XE8545 |
| Accelerators | NVIDIA® A100, A40 with NVIDIA CUDA® |
| Adapter | NVIDIA® ConnectX-6 HDR with OFED driver |
| NICs | 1, 10, 25, 40, 100GbE |
| Switches | |
| Top of rack | NVIDIA Quantum™ QM8700 series HDR |
| Management | PowerSwitch S, N and Z series Ethernet |
| Software (optional, tested, recommended) | |
| Operating system | Red Hat® Enterprise Linux® |
| Cluster management | Bright Cluster Manager® |
| Server management | iDRAC Enterprise |
| Storage | |
| Dell EMC Validated Designs for HPC NFS, BeeGFS® or PixStor™ Storage Dell EMC PowerScale Family with OneFS | |
| Services | |
| Consulting, education, hardware deployment and support, remote management, cloud options, financing | |

Solution highlights

- [Dell EMC PowerEdge servers](#) enhance performance across the widest range of applications with highly scalable architectures and flexible internal storage.
- [Dell Technologies Validated Designs for HPC Storage](#) include designs for NFS, PixStor or BeeGFS, all created to speed deployment of HPC storage systems with confidence while saving resources.
- [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.

Genomics with BioBuilds

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 help 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.

| Configuration options | | | |
|---|--|---|--|
| 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 NVIDIA ConnectX®-6 HDR100 | 1x NVIDIA ConnectX-6 HDR100 or ConnectX-5 EDR | |
| Networking | | | |
| Storage | NVIDIA 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 | | | |
| Validated Designs for BeeGFS® Storage — high capacity, large | | | |
| Services | | | |
| Consulting, education, hardware deployment and support, remote management, cloud options, financing | | | |

Genomics with NVIDIA Clara Parabricks

Accelerate secondary analysis for next-generation sequencing

Keeping up with the pace of genetics research requires the ability to handle large — and growing — data sets. The secondary analysis phase of NGS can take minutes or days depending on the available software, computing and storage resources. When you're talking about the difference between life and death, a few days can be too long to wait. Having the secondary analysis resources to keep pace with the rate of raw NGS data generation is critical for preventing analysis backlogs.

For NGS secondary analysis, both the Dell PowerEdge XE8545 and the PowerEdge R7525 can process more than 20 50x WGS per day using NVIDIA Clara® Parabricks™.⁵

| Specifications | | | |
|---|--|--|--|
| Servers | | | |
| PowerEdge servers | 1x R650 | 1x XE8545 | 1x R7525 |
| Processors | 2x Intel Xeon Silver 4314 processors | 2x AMD EPYC 7543 32-core processors Accelerators: 4x NVIDIA A100-SXM4-40GB | 2x AMD EPYC 7543 32-core processors Accelerators: 3x NVIDIA A100-80GB |
| Memory | 16 x 16 GB 3200 MT/sec DIMMs | 16x 32 GB 3200 MT/sec DIMMs | 16x 32 GB 3200 MT/sec DIMMs |
| System | PERC H345 RAID controller | PERC H755 RAID controller | PERC H755 RAID controller |
| Local disks (storage) | 2x 480 GB Mixed-Use SATA SSD RAID 1 | OS Storage: 2x 480GB mixed use SATA SSD RAID 1 Optional: 8x Dell, 3.2TB, Enterprise, NVMe, Mixed Use RAID 0 | OS Storage: 2x 480GB mixed use SATA SSD RAID 1 Optional: 8x Dell, 3.2TB, Enterprise, NVMe, Mixed Use RAID 0 |
| Network adapter | NVIDIA ConnectX-6 HDR100 | NVIDIA ConnectX-6 HDR100 | NVIDIA ConnectX-6 HDR100 |
| Networking | | | |
| Storage | NVIDIA QM8790 Quantum HDR 200 Gb/s edge switch | | |
| Management | Dell PowerSwitch N3224T-ON | | |
| Software (optional, tested, recommended) | | | |
| Operating system | Red Hat Enterprise Linux | | |
| Cluster management | Bright Cluster Manager | | |
| Server management | iDRAC Enterprise OpenManage | | |
| Bioinformatics tools | NVIDIA Clara Parabricks | | |
| Storage | | | |
| Validated Design for HPC BeeGFS High-Capacity Storage | | | |
| Services (optional) | | | |
| Consulting, education, hardware deployment and support, remote management, cloud options, financing | | | |

⁵ Dell Technologies, "Dell Technologies Validated Design for Genomics with NVIDIA Clara Parabricks On AMD-powered Dell PowerEdge," April 2022.

“Our partnership with Dell Technologies allows us to take advantage of the full breadth and depth of their compute, storage, networking and security solutions.”⁶

—David J. Brzozowski Jr., Chief Technology Officer, Medacis

“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.”⁷

—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.
- [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.

⁶ Dell Technologies case study, [Advancing healthcare analytics and saving lives](#), January 2021.

⁷ Dell Technologies case study, [“Unleashing the Power of Genomics”](#), January 2020.

“We can cover much more ground and we can make much more impact in many different diseases. We have to look deeply into the data to find the important facts in data that otherwise might be lost.”⁸

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

Why choose Dell Technologies

We're committed to advancing HPC and AI.

- Schedule an [executive briefing](#) and collaborate on ways to reach your business goals.
- Dell Technologies worldwide [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.
- 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 team can understand a broad spectrum of challenges and ways 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, 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 [Dell Technologies HPC & AI Innovation Lab](#) in Austin, Texas, is a 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 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.

⁸Dell case study, "[Big data, bigger impact](#)," accessed November 2021.

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 servers⁹
- #1 in converged and hyper-converged infrastructure (HCI)¹⁰
- #1 in storage¹¹
- #1 enterprise infrastructure¹²

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.

⁹ IDC, WW Quarterly x86 Server Tracker, Vendor Revenue & Shipments.

¹⁰ IDC, WW Quarterly Converged Systems Tracker, Vendor Revenue, March 2022.

¹¹ IDC, WW Quarterly Enterprise Storage Systems Tracker, Vendor Revenue, March 2022.

¹² IDC, WW Quarterly Enterprise Infrastructure Tracker: Buyer and Cloud Deployment, Vendor Revenue.

Contact us

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

