DELL Technologies

DELL TECHNOLOGIES POWERSTORE FOR EPIC IN HEALTHCARE

Advance patient care with scalable all-flash data storage for your Epic EHR environment

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Executive summary

Digital transformation continues to accelerate across all industries as organizations seek to increase efficiencies while responding to rapidly evolving trends and end user demands. Healthcare in particular is undergoing dramatic transformations in just about every area of care delivery due to the exponential growth in the amount of data,[1] the general trend of digital adoption,[2] and the increased use of data analytics.[3] In just the last couple of years alone we have seen a much greater reliance on digital health services and data-driven outcomes, particularly in the areas of telehealth, medical imaging, and remote monitoring.

Some of the most important data comes from wearables, IoT devices, and bedside biomedical devices. These connected devices monitor patients constantly and generate massive amounts of data, especially in critical-care environments with multiple instruments, providing valuable insights into a patient's condition. Although much of the granular data goes unused today, stored medical data holds great promise in being able to deliver better, more proactive patient care and a more personalized approach to medicine.

According to a recent analyst report, the majority of healthcare organizations are most interested in using data to improve patient care while reducing costs.4 Doing so, however, requires that data be readily accessible in real time, especially at the point of care. Healthcare providers are leveraging electronic health record (EHR) platforms like Epic to achieve this level of on-demand data accessibility.

Top Trend in Healthcare: Unlocking the Value of Patient Data

Leveraging patient data to improve outcomes is a top priority for healthcare providers.[4] Doing so requires efficiently storing massive amounts of data acquired from disparate sources while providing care providers with real-time access to patient information from their EHR platforms at the point of care. To accommodate, CIOs are investing in storage appliances that are scalable, flexible, and secure.

To support their EHR and data management needs, healthcare organizations require an agile, secure, and efficient storage infrastructure. Legacy storage systems often lack the needed performance, data efficiency, automation, and security to keep pace with today's complex IT ecosystems. Consequently, many healthcare organizations are turning to modern, scalable storage appliances designed to support their rapidly expanding EHR environments.

Key data storage attributes for an always-on healthcare environment

To improve patient outcomes and reduce costs, healthcare IT must deliver the following six core data storage capabilities without tradeoffs:

1. Excellent performance for real-time access to patient data

2. Robust reliability and availability without disrupting clinical workflows

3. Increased efficiency in order to consolidate the complex repositories of clinical and administrative data and to provide anywhere, anytime access to critical patient information

4. Sufficient scalability to manage any influx of new data and devices as they are developed

5. Resilient security to protect patient data despite being prime targets for cyberattacks

6. Easy-to-use manageability for complex healthcare ecosystems composed of end-user technologies, applications, and infrastructure

The future of storage is here

Dell Technologies PowerStore is scalable, all-flash storage built from the ground up with next-generation technology. Combining the advantages of cutting-edge storage hardware with the flexibility and simplicity of modern software design, PowerStore delivers all six of the needed key capabilities without tradeoffs so that healthcare organizations can realize better outcomes faster.

PowerStore for Epic

PowerStore addresses the performance and reliability requirements of Epic by providing a data-centric, intelligent, and adaptable infrastructure that transforms and mobilizes both traditional and modern EHR workloads. Designed for the data era, this next-generation storage solution is engineered for value, flexibility, and simplicity. As it eliminates traditional tradeoffs in performance, scalability, and storage efficiency, healthcare teams benefit by always having ready access to patient data at the point of care while healthcare IT benefits from PowerStore's adaptable and flexible architecture, which facilitates deploying EHR applications at the edge as needed.

Architect your Epic deployment to be future-ready

With PowerStore, healthcare organizations can rely on the performance and innovative design attributes needed to support their EHR deployments from day one. Within a year of its release, PowerStore has become a standard to run Epic Operational Databases (ODB) and Analytical Databases.

A data-centric design

PowerStore is performance optimized featuring a unified architecture for any workload.
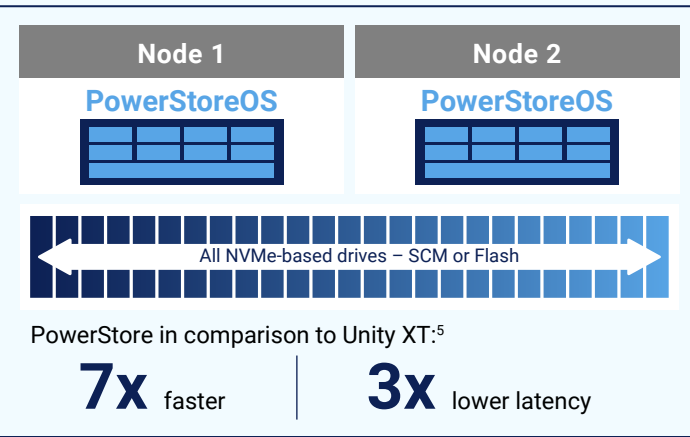
High-performance storage for all workloads

In any EHR environment, performance is key. With its unified block and file architecture, PowerStore can accelerate performance for all types of workloads, including EHR, ERP, relational databases, cloud-native environments, and other types of repositories.

In today's healthcare data environments, there are also multiple types of connectivity channels, including NVMe-oF, Fibre Channel, and SMB for Epic block and file workloads, in addition to iSCSI and NFS. PowerStore is uniquely able to deliver unified storage (including physical, virtual, block, file, or container-based storage) for all these connectivity protocols, storing all types of data side by side, with the performance and efficiency needed for each of the various healthcare workloads. Due to the flexible design of the appliance, health IT can segregate individual data inside of a single cluster for a specific workload, as well as move workloads between appliances as needed.

With end-to-end NVMe, intelligent, "always-on" data reduction (including zero detection, deduplication, and compression) and the option for Storage Class Memory (SCM) and SSDs, PowerStore offers up to seven times the performance of previous platforms in an Epic environment (Figure 1).[5]

Figure 1. Optimized for performance: PowerStore's data-centric design featuring end-to-end NVMe Flash or SCM in a containerized architecture delivers enhanced resource utilization and performance that keeps pace with application and system growth.

Node 1	Node 2
PowerStoreOS	PowerStoreOS

All NVMe-based drives – SCM or Flash

PowerStore in comparison to Unity XT:[5]

7x faster | **3x** lower latency

High data availability for 24x7x365 healthcare environments

In health IT, data availability and security are more than business requirements. They are often matters of life and death. There needs to be consistency of read and write environments with little to no latency. PowerStore nodes are active-active, architected for 99.9999% availability[6] and data is always protected by the included Dynamic Resiliency Engine (DRE), even as configurations change over time.

High data efficiency to streamline EHR workloads

In healthcare, the ability to store the most amount of data in the smallest footprint possible is paramount, especially as EHR workloads increasingly input massive amounts of data from various edge devices and systems. Deduplication and compression can help maximize capacity, but the process must not compromise data integrity nor result in downtime, especially in mission-critical healthcare environments. PowerStore's fully automated data services include intelligent data reduction, optimizing performance and capacity at the same time to consolidate the tremendous influx of data to streamline EHR workflows efficiently, without interruptions (Figure 2).

Figure 2. Always-on data reduction: The dashboard is from an array at a children's hospital in the United States running multiple operational databases (IRIS).When combined with snapshots and thin provisioning, data efficiency increased to 13.6:1.[7]
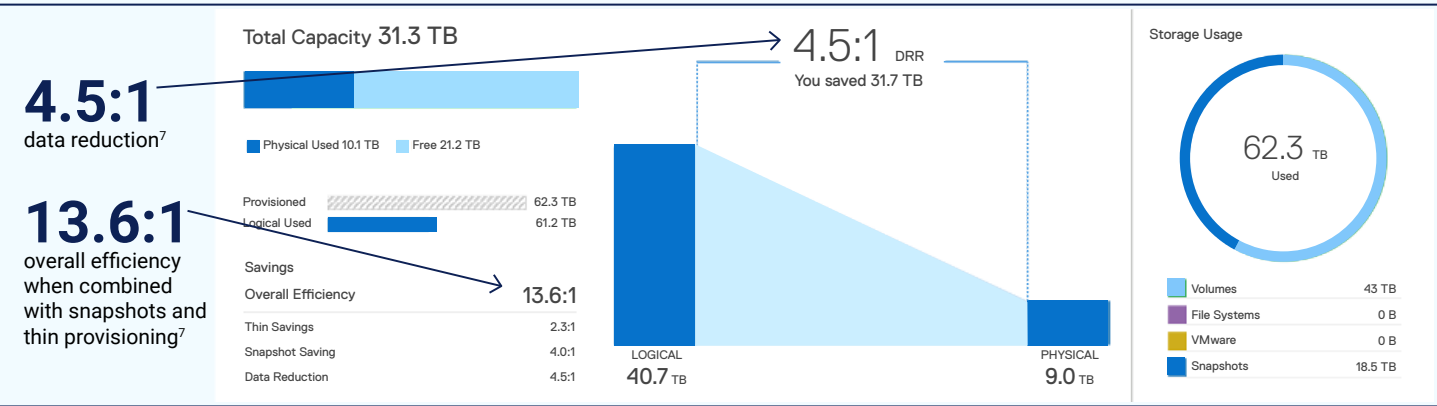
4.5:1 data reduction[7]

13.6:1 overall efficiency when combined with snapshots and thin provisioning[7]

Total Capacity 31.3 TB

Physical Used 10.1 TB   Free 21.2 TB

4.5:1 DRR
You saved 31.7 TB

| Provisioned | 62.3 TB |
| Logical Used | 61.2 TB |

Savings	
Overall Efficiency	13.6:1
Thin Savings	2.3:1
Snapshot Saving	4.0:1
Data Reduction	4.5:1

LOGICAL **40.7** TB   PHYSICAL **9.0** TB

Storage Usage

62.3 TB Used

Volumes	43 TB
File Systems	0 B
VMware	0 B
Snapshots	18.5 TB

Figure 3. Scale up, scale out architecture: PowerStore uses clustering technology to independently scale up system processing power up to 2.8 PBe per appliance, and scale out in a single management domain to eight active-active nodes for up to 11.3 PBe per cluster.[8]
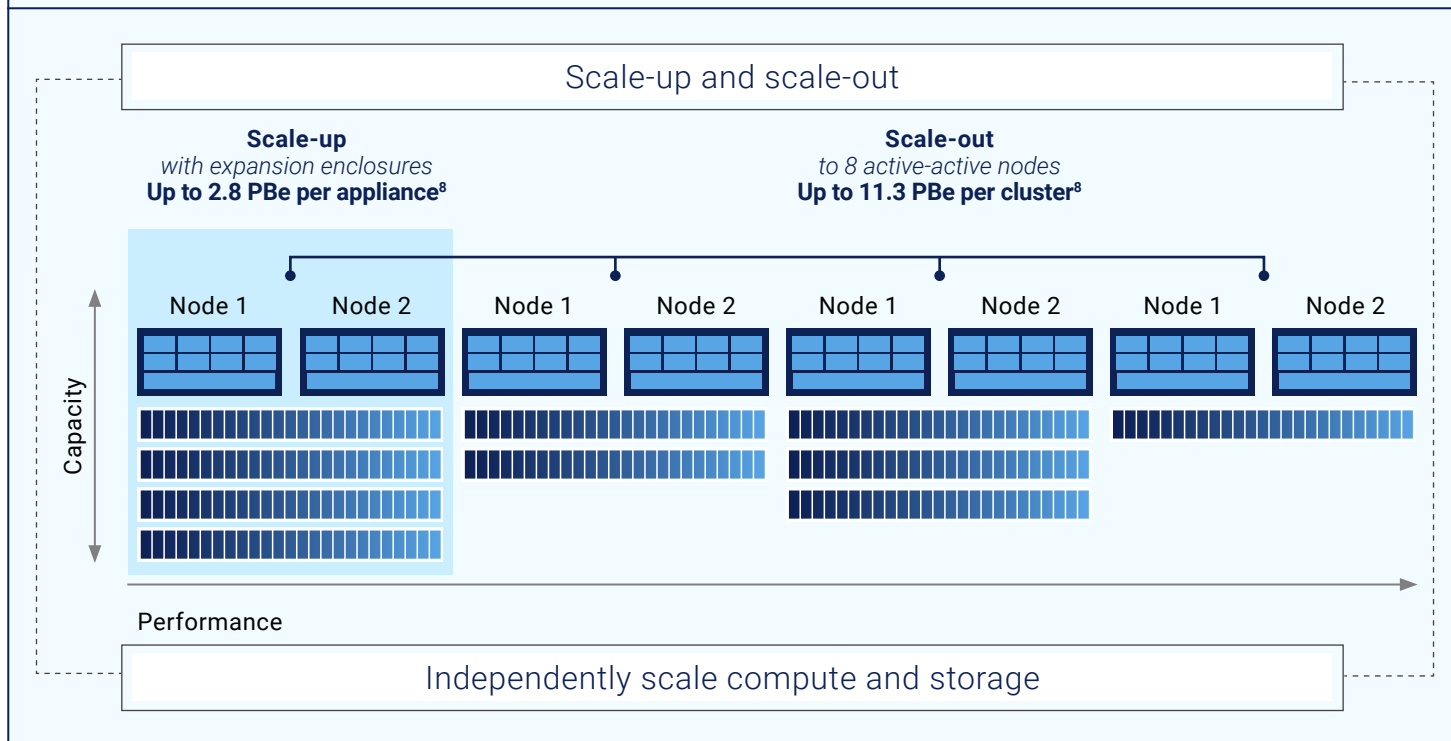
With a small 2U initial footprint, PowerStore can still meet network and data-retention requirements while supporting multiple data types, simplified management, and advanced replication to core data centers. Data can be collected at the edge and aggregated in larger data sets for creating algorithms. The guaranteed 4:1 storage efficiency helps reduce the burden of retaining massive amounts of data.[7]

Scale-up and scale-out

PowerStore's adaptable architecture helps to increase speed and workload mobility, offering choice, predictability, and investment protection and enabling healthcare organizations to meet their current clinical and research data demands today and scale up quickly and efficiently tomorrow. For consistency in read and write with low latency, PowerStore's capacity and performance can be scaled independently, and each active-active appliance can scale up to over 2.8 PBe effective capacity.[8] In a single management domain, it can also scale out to 11.3 PBe in a cluster environment, with seamless data mobility among appliances (Figure 3). This flexibility allows mixing and matching of appliance models, each with their own distinct storage parameters (memory, drive capability, and configuration).

Built-in security for patient data

Patient data is a prime target for hackers. PowerStore's software architecture protects data by isolating individual components of the operating system as microservices. This architecture simultaneously improves performance, fault tolerance, and security, ensuring that health information is accessible to the right people, hardened against errors, and protected from unauthorized access. Always-on Data at Rest Encryption (D@RE) further protects confidential information by restricting access only to those with valid keys and by enabling secure cryptographic erasure when data is no longer needed.

Intelligent automation

A programmable infrastructure with an autonomous appliance

Efficiency in management is also a crucial consideration in healthcare IT. PowerStore features autonomous, consistent operations including a programmable infrastructure designed to simplify management, streamline DevOps, and automate workflows. IT departments can easily configure, deploy, and manage resources while built-in automation and machine learning (ML) proactively search for anomalies and optimize system resources. For example, predictive analyses keep IT departments ahead of the curve by projecting when capacity limits will be reached. Migrating applications non-disruptively to PowerStore is also easy, typically only requiring seven clicks.[9]

Figure 4. Proactive Storage Health Monitoring: CloudIQ gives you an at-a-glance view of storage systems' health issues, prioritizing them so you can see the most imminent risk and providing recommendations so you can quickly resolve issues. Health scores are based upon component, configuration, performance, capacity, and data protection status.
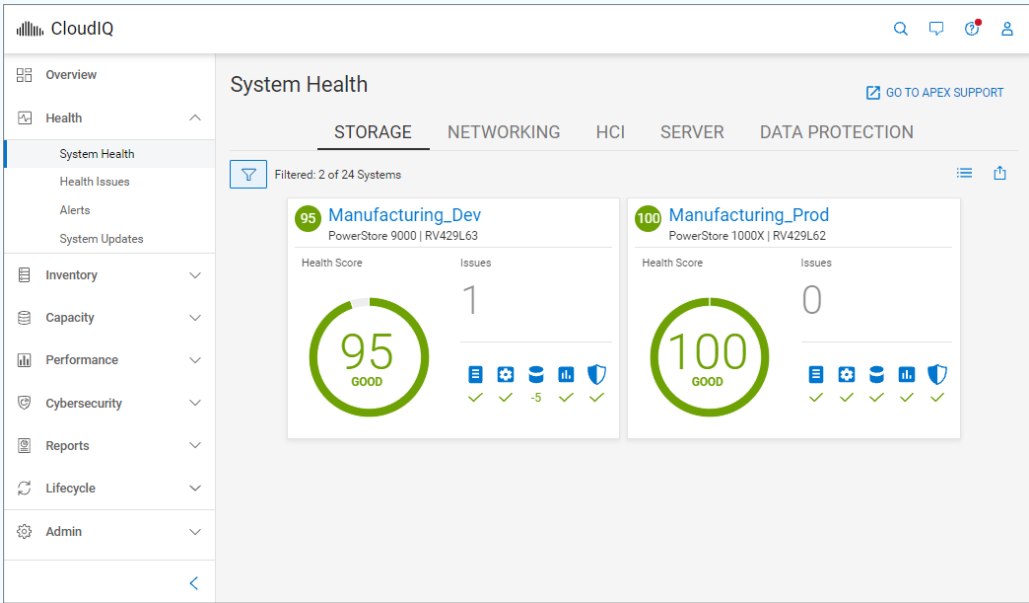
CloudIQ: cloud-based monitoring and analytics for your Dell Technologies storage environment

Included in Dell Technologies service contracts at no additional cost, CloudIQ is a cloud-native AIOps application that leverages machine learning and predictive analytics to proactively monitor the overall health, performance, and capacity of PowerStore storage and the complete line of Dell Technologies infrastructure systems. Surveys indicate that CloudIQ enables users to resolve issues 2X to 10X faster than before[10] (Figures 4).

It's a comprehensive application available via your browser or mobile device (iOS or Android) that provides:

- Health and cybersecurity notifications and recommendations
- Performance anomaly detection and impact analysis
- Capacity full projections
- Reclaimable storage identification
- Configuration change tracking
- Customizable reporting
- API for application integration and automation
- and more

In addition to proactive health, performance, and capacity monitoring, CloudIQ monitors for infrastructure cybersecurity vulnerabilities (Figure 5). It continuously compares actual security configurations to your desired configurations, notifies you of misconfigurations, and recommends actions for remediation. This eliminates manual inspection and lowers risk.

CloudIQ also monitors Dell Technologies servers, data protection, and networking equipment—including data protection in public clouds. Customizable reports, both scheduled and real time, enable you to create views of specific systems and groups of systems based on location, applications, or other criteria to optimize productivity.

As CloudIQ is hosted on Dell Technologies infrastructure, it is highly available and fault tolerant, and using Secure Remote Services, it provides sophisticated point-to-point encryption over a dedicated VPN, multifactor authentication, customer-controlled access policies, and RSA digital certificates to ensure that all your system telemetry data is securely transported to Dell Technologies.

Figure 5. Proactive Storage Cybersecurity Monitoring: CloudIQ gives you an at-a-glance view of storage systems' vulnerabilities due to misconfiguration of infrastructure components' security settings, and recommends actions to quickly re-establish a secure posture. Recommendations are based on NIST 800-53 r5 and NIST 800 – 209 standards and Dell engineering best practices.
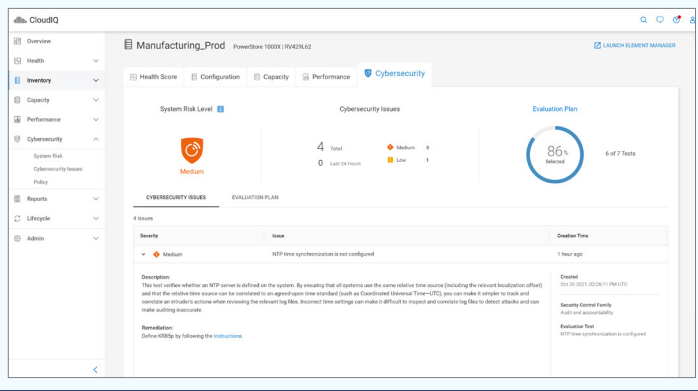
Figure 6. Example Workload – Epic Reference Architecture for PowerStore: Dell Technologies has developed an Enterprise Reference Architecture based on optimal storage and backup and recovery configurations to meet Epic's availability and performance requirements. This reference architecture provides healthcare providers with the flexibility to select customized configurations that address their specific workload requirements.
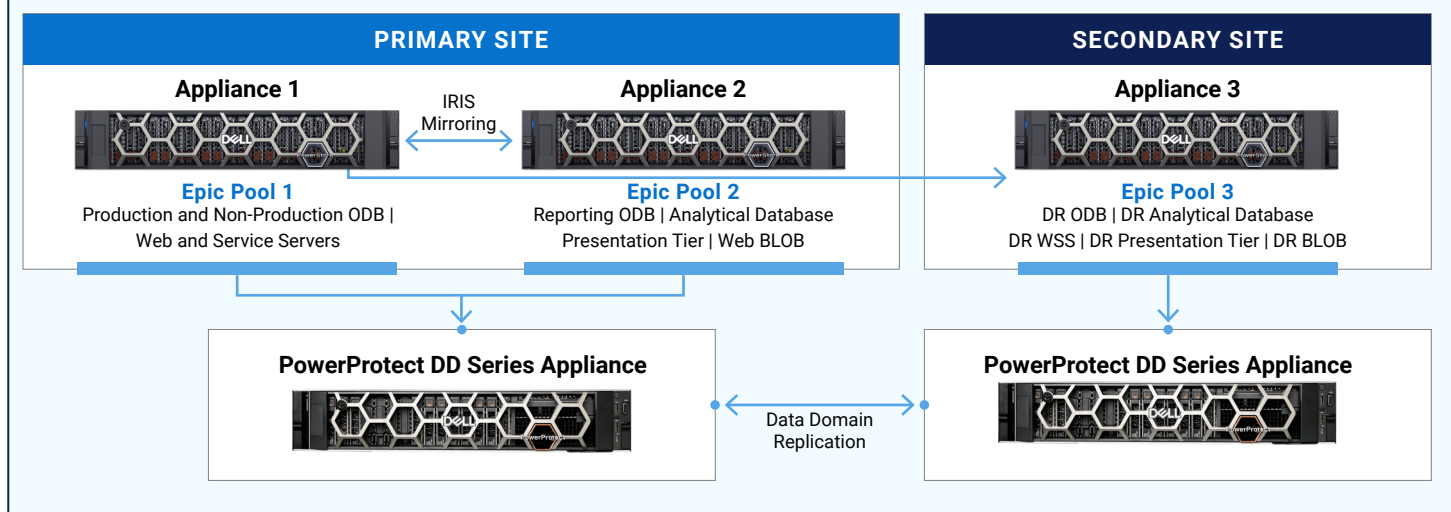
Because CloudIQ is built on a cloud development platform, updates are automatic through an agile development cycle, ensuring zero interruption to daily operations as Dell Technologies engineers enable new monitoring, analytics, reporting, and other new features. This enables healthcare organizations to accelerate time to value with no installation, hosting, upgrading, or other administration requirements. Overall, users report that CloudIQ saves them an average 9 hours per week to perform typical administrative tasks.[10]

An adaptable architecture

PowerStore's modern and highly adaptable design enables both speed and application mobility. Flexible deployment options spanning across the edge and core, and in some cases cloud, enable health IT to provision new applications inside the PowerStore architecture without disruption.

Exclusive with PowerStore, Dell Technologies Anytime Upgrade keeps all systems seamlessly up to date.[11] There is no longer a need for data migration. Instead, data-in-place upgrades are performed on any PowerStore appliance with no downtime and no outage to service to meet the rigorous demands of the healthcare environment.

With the power of scale-out architecture along with Anytime Upgrades, health IT can scale out at any time to better address spikes in data storage demands, to introduce new workloads, or to provide better overall performance across the environment. When needed, they can also modernize the infrastructure with data-in-place upgrades.

An Epic Reference Architecture

In alignment with the Epic Hardware Configuration Guide, the PowerStore for Epic reference architecture spans the primary data center and the disaster-recovery data center to deliver the needed high availability and reliability to keep your deployment up and running (Figure 6).

PowerStore for Epic deployments

PowerStore provides organizations with enterprise-grade unified storage platforms for block, file, and vVol data while enabling flexible growth and intelligent scale-up and scale-out of appliance clusters. Choose from varying model options to provide the right data-centric, intelligent, adaptable storage platform for your Epic environment (Table 1).

Table 1. The PowerStore Family: PowerStore 500 through 9000 appliances utilize dual active-active storage nodes and a container-based software architecture to provide maximum adaptability with upwards of 3.7 PB of raw capacity with scale-out cluster.

PowerStore T Family						
	500	**1000**	**3000**	**5000**	**7000**	**9000**
Min/Max Drives	6/25	6/96	6/96	6/96	6/96	6/96
Raw Capacity (Min/Max)	1.2 PBe / 2.8 PBe	4.8 PBe / 11.36 PBe	4.8 PBe / 11.36 PBe	4.8 PBe / 11.36 PBe	4.8 PBe / 11.36 PBe	4.8 PBe / 11.36 PBe
CPU per Appliance	2 x Intel® CPUs, 24 cores per Array, 2.2 GHz	4 x Intel® CPUs, 32 cores per Array, 1.8 GHz	4 x Intel® CPUs, 48 cores per Array, 2.1 GHz	4 x Intel® CPUs, 64 cores per Array, 2.1 GHz	4 x Intel® CPUs, 80 cores per Array, 2.4 GHz	4 x Intel® CPUs, 112 cores per Array, 2.1 GHz
Memory per Appliance	192 GB	384 GB	768 GB	1152 GB	1536 GB	2560 GB
Protocols	iSCSI, FC, NVMe-oF, vVols, SMB, NFS	iSCSI, FC, NVMe-oF, vVols, SMB, NFS	iSCSI, FC, NVMe-oF, vVols, SMB, NFS	iSCSI, FC, NVMe-oF, vVols, SMB, NFS	iSCSI, FC, NVMe-oF, vVols, SMB, NFS	iSCSI, FC, NVMe-oF, vVols, SMB, NFS

Front view

Back view

Get started with a trusted partner platform

Modern infrastructure encourages peace of mind because it brings data right to the heart of patient care. Dell Technologies PowerStore provides the key features for satisfying the needs of both medical teams and IT departments without compromising either one. This solution provides real-time performance, the reliability needed for clinical workflows, critical efficiency for patient information, excellent scalability, robust security, and easy manageability—a no-compromise solution for the healthcare needs of today while providing the essential foundation to be able to adapt to what comes next.

Learn more at **Dell.com/healthcare** and **@DellTechHealth** | **#TransformHIT**

1. Global Healthcare Data Market Demonstrates a Spectacular Growth by 2028. February 5, 2021. neighborwebsj.com/tag/healthcare-data-growth/

2. Grand View Research Report: Digital Health Market Size, Share & Trends Analysis Report By Technology (Healthcare Analytics, mHealth), By Component (Software, Services), By Region, And Segment Forecasts, 2021 - 2028. February 2021. grandviewresearch.com/industry-analysis/digital-health-market

3. Healthcare Analytics Market to Reach US $118.2 Billion by 2027 Globally | CAGR: 31% | UnivDatos Market Insights. 21 Jan, 2021. prnewswire.com/in/news-releases/healthcare-analytics-market-to-reach-us-118-2-billion-by-2027-globally-cagr-31-univdatos-market-insights-844214700.html

4. Healthcare Analytics Market by Type (Descriptive, Prescriptive, Cognitive), Application (Financial, Operational, RCM, Fraud, Clinical), Component (Services, Hardware), Deployment (On-premise, Cloud), End-user (Providers, Payer) - Global Forecast to 2026 Markets and Markets. marketsandmarkets.com/Market-Reports/healthcare-data-analytics-market-905.html

5. Based on Dell analysis comparing PowerStore 9000 4x cluster to Unity XT 880 running 70/30 random read/write mix, 8K block size with compression and deduplication active, March 2020. Actual performance will vary based on configurations and usage and manufacturing variability.

6. Based on the Dell Technologies specification for Dell Technologies PowerStore, April 2020. Actual system availability may vary.

7. Live Epic customer hosting multiple operational databases (IRIS) achieved 4.5:1 data reduction (compression and dedupe) and 13.6:1 overall efficiency inclusive of snapshot savings. A 4:1 average rate is guaranteed across customer applications. Rates for individual applications may vary. See Future-Proof Program terms and conditions for details.

8. Assumes a 4:1 average data reduction. Actual results may vary, depending on data types.

9. Based on Dell analysis of minimum effort required to execute non-disruptive migration of volume group using PowerStore's built-in migration tools for Unity, SC Series, PS Series and VNX arrays, March 2020. Actual results will vary.

10. Based on a Dell Technologies survey of CloudIQ users conducted May through June 2021. Actual results may vary.

11. Requires purchase of ProSupport and either "Standard" or "Select" Anytime Upgrade option (where available) at point of sale to qualify. Additional terms and conditions apply.

*Epic does not certify storage products or technologies. Instead, they provide feedback on storage products and technologies based on both results in the test lab and customer experience. The information Epic gathers does not guarantee that a particular product or technology will or will not work. It is also important to note that lab testing and the size of their existing customer base is generally insufficient to be able to judge a technology or product as being reliable. However, in some cases, lab testing and design review can be used to judge a technology as unsuitable. In addition, Epic does not have data for all possible features that can be used in a given product, for example, SAN replication.

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