

Dell PowerMax

World's most secure mission-critical storage¹

ESSENTIALS

- ✓ New trusted, intelligent, continuously modern storage powers performance demanding mission-critical workloads while simplifying operations and saving capacity with data reduction.
- ✓ End-to-End NVMe and next-generation Dynamic Fabric architecture eliminates traditional storage boundaries, delivers massive scalability, low latency, and high availability
- ✓ Modernize and ensure sustainability without disruption with data-in-place Anytime Upgrade and [Future-proof program](#)

Trusted Innovation

- **Consolidate all workloads** – multi-node NVMe scale-out architecture consolidates open systems, mainframe, file, IBM i storage. Up to 7x² more capacity per array
- **Efficiency without compromise** – 14x³ more capacity per rack unit, 80% power savings per terabyte⁴, global inline data reduction with 4:1 data reduction guarantee⁵ (3:1 for mainframe)¹²
- **Performance optimized** – new Dynamic Fabric technology with RDMA over NVMe, 2x faster performance⁶, 50% better response times.⁷
- **Enhanced virtualization** – integrated VMware vVols and SRDF for mission-critical workloads

Intelligent Automation

- **Workload optimization** – automated workload placement/resource optimization across arrays
- **Streamlined NVMe/TCP setup** – up to 44% less time to configure NVMe/TCP resources⁸
- **Integrated management** – fully integrated File management for set up, changes, replication

Cyber Resiliency

- **Most secure storage** – designed for Zero Trust security architectures⁹, hardware root of trust, secure boot, digitally signed firmware updates
- **Intrinsic protection** – from unauthorized access via multi-factor authentication for admin access through RSA SecureID (two-factor)
- **Anomaly detection** – continuous cyberattack anomaly detection and alerting through CloudIQ
- **Cyber recovery** – most granular cyber recovery at scale recovers more data from cyberattacks, enabled by up to 65M secure snaps per array¹⁰



Today's mission-critical applications require a new approach to enterprise storage infrastructure

In today's digital economy, unparalleled software innovation, multi-cloud agility and advancements in workflow automation have given organizations the opportunity to leverage data to become disruptive and innovative. To keep pace with business demands and capitalize on this opportunity, organizations need to reduce the time between data creation and innovation. However, they face numerous headwinds. Data is growing exponentially and is more diverse and distributed than ever before. In addition, organizations are struggling to breakdown internal operational silos while protecting their IT infrastructure from sophisticated cyber security threats and increase developer productivity.

To address these challenges, organizations need trusted and innovative enterprise storage that provides unparalleled performance, scalability, and security at scale without compromise. Dell's next-gen PowerMax is designed to be secure, intelligent, and always modern so that businesses can fully unlock the power of data.

The latest PowerMaxOS 10 software builds on decades of software innovation to provide trusted, intelligent, secure storage for the most demanding mission-critical workloads while simplifying operations. Based on NVMe Dynamic Fabric technology, the new PowerMax systems eliminate traditional storage boundaries in every possible dimension—performance, scalability, capacity, security—to meet the increasing demands of traditional workloads and next generation cloud-based applications.

Built to consolidate

PowerMax is designed to consolidate demanding mixed workloads through its extreme levels of performance and unprecedented response times. Its modern scale-up and scale-out architecture is ideal for relational databases, real-time analytics, demanding transaction processing workloads and big data applications that require uncompromising uptime and extremely low latency.

Dell's newest PowerMax systems consist of two models, the PowerMax 2500 and 8500, that are offered with inclusive software bundles to simplify ordering. The PowerMax 2500 delivers high performance in a compact package storing up to 7x more capacity (8PB^e) in half the rack space compared with previous models. Along with its high efficiency design, the 2500 supports the full complement of rich data services for open systems, mainframe, file, and virtual environments.

The PowerMax 8500 delivers leading performance at scale for the most demanding mixed workloads requiring predictable performance with always-on availability. The 8500 delivers up to 2x faster performance and 50% lower response times with up to 18PB^e of capacity¹¹ compared with previous models. Like the PowerMax 2500, the 8500 can easily consolidate open systems, mainframe, file, and virtualized storage to simplify operations, significantly reduce TCO, and increase return on investment.

Both models incorporate the latest technologies needed to meet stringent service levels and gain a [competitive advantage](#) – powerful Intel® Xeon® Scalable processors, high-speed cache, RDMA over NVMe, and 100Gb InfiniBand to name a few.

The 2500 and 8500 offer several advantages for delivering the highest storage performance, resiliency, and efficiency through cutting-edge flexible RAID technology. Flexible RAID provides more usable storage capacity by leveraging granular storage media, load balancing, and several RAID options – RAID 1, 5, 6.

And the combination of Dynamic Fabric technology along with flexible RAID allows every node to access every drive and single-drive upgrades to increase storage capacity at your pace.

Both models also support key IBM zSystems technology that can deliver high performance for mainframe environments including zHyperLink for extremely low latency reads and 32 Gb FICON supporting the new IBM z16.

High Efficiency

PowerMax delivers leading efficiency with global inline deduplication and compression, space-efficient secure snapshots, up to 80% power savings per terabyte, and thin provisioning. Its inline deduplication and compression have virtually zero impact on performance, can be used with all PowerMax data services, and are turned on/off by application (volume) for maximum flexibility.

PowerMax 2500 and 8500 ship with Dell's 4:1 data reduction guarantee for open systems workloads and 3:1 data reduction guarantee for mainframe storage (an industry-first) to maximize efficiency in any environment.

Integrated File

PowerMax 2500 and 8500 systems incorporate the latest 64-bit file services and active-active nodes along with new levels of resiliency and seamless Unisphere management integration. The new models boost resiliency by adding SRDF/S (synchronous) remote replication for high availability File services.

Intelligent Automation

PowerMax systems are designed with intelligent automation in mind. They support advanced AIOps, DevOps and containers to streamline operations and eliminate redundancy, so IT practitioners can focus on strategic initiatives.

Each system brings autonomous storage to life with built-in machine learning that uses predictive analytics and pattern recognition to maximize performance with no management overhead. Automated storage provisioning for open systems workloads is accomplished by using a simple REST API saving considerable time and effort. And PowerMaxOS 10 provides the industry's first software defined NVMe/TCP utility for storage resource automation, resulting in 44% less time to setup NVMe/TCP resources. NVMe/TCP helps lower deployment costs, reduces SAN design complexity, and allows for building a highly scalable PowerMax storage environment for mission-critical workloads.

Multi-Array Workload Optimization

Multi-array workload planner analyzes the storage infrastructure across multiple PowerMax / VMAX arrays and recommends the best place to host workloads for optimal performance and resource utilization. Built-in data movement technology provides seamless data mobility across PowerMax and VMAX arrays by using array-based orchestration and replication services to automatically discover, configure, and migrate data online.

CloudIQ Health Checks

Dell's [CloudIQ](#) mobile application gives administrators faster time to insight; with all the information needed to take quick action and efficiently manage their storage environment. It enables proactive monitoring and predictive analytics to deliver alerts, aggregate PowerMax health scores, and provide proactive assistance with actionable insights and recommended remediation – all from the cloud and from your mobile devices free of charge.

DevOps Automation and Containers

PowerMax customers can seamlessly consume storage infrastructure as code in a variety of [development and automation environments](#) using powerful APIs, SDKs, plugins for VMware automation tools like vRO and vRA, and modules for the most popular configuration management tools like Ansible.

PowerMax supports a major shift in software development by being the first major enterprise storage solution to implement the Container Storage Interface (CSI) driver standard to enable containerized storage workloads to optimize productivity.



NVMe/TCP with SFSS

SmartFabric Storage Software

Industry's first automated end-to-end NVMe/TCP deployment

End-to-end Automation
Compute-Network-Storage

Ease of Use
Capabilities similar to FC

Standards Based
Enhancements to NVMe standards

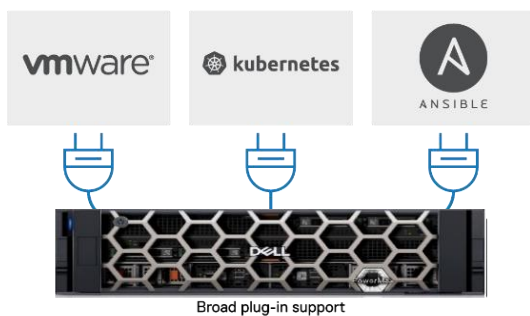
Simplify NVMe Adoption
Migration path from iSCSI

Broad Ecosystem
Dell & 3rd party infrastructure, OS

Up to **44%**
Less time*

* Based on Dell analysis, compared to iSCSI configuration, March 2022

Automated, end-to-end workflows



Cyber Resiliency

PowerMax is equipped with unmatched cyber resiliency to ensure always-on operations and prevent, detect, and recover from possible cyberattacks. It is designed for robust Zero Trust security architectures that protect high value information at each point in a potential data breach.

Prevent

PowerMax is purpose-built to prevent unauthorized access to system resources. Each model incorporates intrinsic security features and comprehensive access controls to safeguard company data. These features include:

- *Hardware root of trust (HWRoT)* represents the foundation on which all secure operations of PowerMax depend. HWRoT contains the keys used for cryptographic functions and enables a secure boot process, preventing system boot if firmware is tampered with.
- *Firmware updates* require a digital signature before updates can be applied.
- *Hardware-based data encryption* through self-encrypting drives (SEDs) ensures protection in case a drive is removed from the system.
- *Secure access controls and tamper proof audit logs* protect from unauthorized access through secure logs of all events on PowerMax.
- *Multi-factor authentication for Admin Access (MFA)* provides 2-factor authentication to management access using RSA SecureID.

Detect

CloudIQ is a powerful application used to track system health through pattern recognition and advanced analytics. Through CloudIQ Cybersecurity, users can define legal configurations for PowerMax, monitor the system, and receive alerts if the array is out of compliance.

CloudIQ is also able to track data patterns and detect anomalies, including changes to data reduction rates, to establish if ransomware or malware may have infected the system. Once suspicious anomalies are detected, CloudIQ alerts IT management to take corrective action.

Recover

PowerMax utilizes secure, immutable snapshots to provide the industry's most granular cyber recovery at scale, maximizing data recovery in seconds from a cyberattack. Administrators can set snapshot policies for up to 65 million secure snapshots to optimize recovery point objectives (RPO) and minimize data loss. Several options also exist for native cyber recovery from a secure vault for open systems and mainframe storage on PowerMax. PowerMax cyber vault isolates open systems data from the production network in a secure vault by implementing an SRDF airgap solution with secure snapshots.

Mission-critical availability

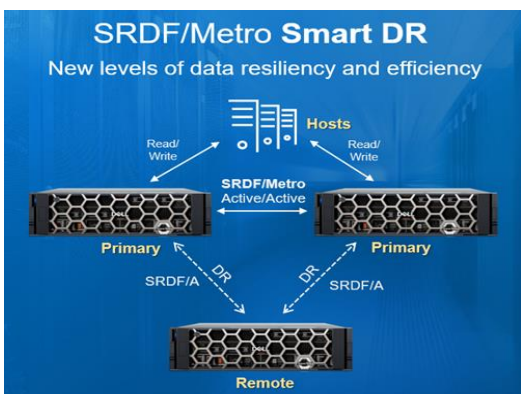
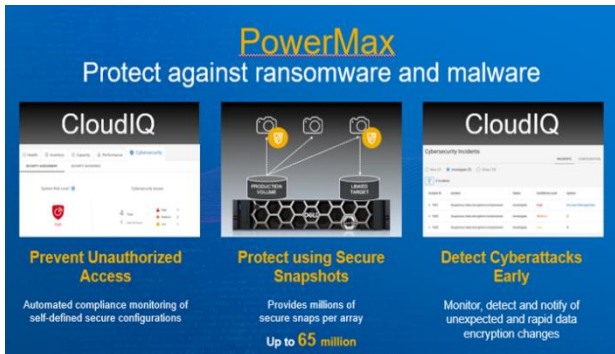
PowerMax sets the standard for mission-critical availability. Whether it's proven active-active data center replication to comply with stringent BC/DR requirements, non-disruptive PowerMaxOS upgrades in under six seconds, or continuous data integrity checks, PowerMax delivers the highest levels of data availability for your mission-critical applications.

SRDF software, the gold standard in disaster recovery, provides unmatched flexibility and massive scalability (supports up to 2,000 replication groups) to deliver remote replication over extended distances or across multiple sites.

Remote RAID, inherent in the design of SRDF/S replication, provides over 1000x less risk of data loss¹³ from multiple drive failures in a RAID 5 group than RAID 6 by servicing all host reads and writes from the remote site with minimal performance impact. Finally, VPLEX offers additional levels of data availability for PowerMax 2500 and 8500 deployments requiring VPLEX replication solutions.

Reliable data protection

SnapVX provides space-efficient local snapshots that can be used for localized protection and recovery and other use cases including development/test, analytics, backups, and software patching. SnapVX secure



FUTURE-PROOF PROGRAM



immutable snapshots prevent accidental or malicious deletion, retaining them for a specified period. In addition, integrated copy data management (iCIMS) enables application-consistent, on-array copy orchestration with critical applications like Oracle, SQL, and VMware enabling operational recovery and copy repurposing.

Mainframe environments can leverage the power of the Dell GDDR Cyber Protection Automation (zCPA) feature and SRDF with PowerMax snapshots to automate copy creation and preservation of data being protected in any mainframe cyber vault.

Continuously modern storage for sustainability and energy cost challenges

Dell's Future-Proof Program takes the worry out of buying storage. Purchasing PowerMax qualifies for the 3-Year Satisfaction Guarantee, Hardware Investment Protection, 4:1 Data Reduction Guarantee for open systems and 3:1 Data Reduction Guarantee for mainframe storage.

Anytime Upgrade

Anytime Upgrade offers non-disruptive data-in-place upgrades to next-generation technology where PowerMax nodes can be upgraded non-disruptively while preserving existing drives and expansion enclosures, without requiring additional purchases. With PowerMax, infrastructure can be modernized without disruption, without downtime, and without impacting applications.

Storage as-a-service Infrastructure

Dell's APEX Flex on Demand provides you with elastic capacity, where we work with you to right-size capacity for your workloads as they shrink and grow over time. You gain immediate access to buffer capacity on PowerMax should you need it, while only paying for the technology you use. And your payment adjusts up or down to match your actual usage. Combine the scalability and cyber resiliency of PowerMax with the agility and flexibility of APEX Flex on Demand.

Backed by experts

Dell's consulting [services](#) experts know what it takes to harmonize business and IT needs. Our outcome focused approach accelerates your ability to deliver cloud platforms, workforce experiences, advanced applications, and achieve a resilient business. Dell Technologies ProConsult Advisory Services facilitate a plan for beneficial and lasting change. Our AS-IS/TO-BE methodology, the foundation of our services, deeply analyze your current and desired state. Having a clearer understanding of these can help you realize the business benefits of modernization faster, more reliably and with lower risk. Our services are designed to develop and execute strategies that achieve measurable outcomes aligned to your vision, in six weeks or less.

Dell APEX custom solutions
Create your own on-demand as-a-Service environment and view invoices and usage.

Dell APEX FLEX ON DEMAND
Pay-per-use flexible consumption model for all Dell Technologies infrastructure.

Dell APEX DATA CENTER UTILITY
Usage-based solution to enable a managed utility service at enterprise scale.

<p>Elastic capacity Dynamically scale up or down.</p>	<p>Metered usage Monthly payments with predictable rates.</p>	<p>Reduced costs Align investment with resource usage.</p>	<p>Value-added services Agreement can include needed services.</p>
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1. Based on Dell internal analysis of cybersecurity capabilities of Dell PowerMax versus cybersecurity capabilities of competitive mainstream arrays supporting open systems and mainframe storage, March 2022.
2. Based on Dell internal analysis comparing Effective Storage Capacity of the PowerMax 2500 compared with the PowerMax 2000, 3/2022. Actual storage capacities will vary.
3. Based on Dell internal analysis comparing Effective Storage Capacity per rack unit of the PowerMax 2500 compared with the PowerMax 2000, March 2022. Actual storage capacities will vary.
4. Based on Dell internal analysis comparing power (kVA) per effective terabyte of the PowerMax 2500 compared with the PowerMax 2000, March 2022.
5. Based on Dell's Future-Proof program that offers 4:1 data reduction guarantee based on PowerMax data reduction tools (dedupe and data compression) for open systems storage, March 2022. Actual data reduction rates will vary.
6. Based on Dell internal testing using the IOPS (8K) benchmark test comparing PowerMax 2500 RAID rebuild times (RT) against PowerMax 2000 RAID RT, March 2022. Actual RAID RT will vary.
7. Based on Dell internal testing using the OLTP benchmark comparing the PowerMax 2500 against the PowerMax 2000, March 2022. Actual response times will vary.
8. Based on Dell analysis comparing NVMe/TCP resource configuration with SFSS compared to iSCSI configuration, March 2022. actual performance will vary.
9. Based on Dell internal analysis of cybersecurity capabilities of PowerMax compared to Dell's seven pillars of Zero Trust arch, 3/2022
10. Based on Dell PowerMax specification of 65M snaps per PowerMax compared with mainstream high-end storage arrays, 3/2022.
11. Availability expected in Q1 2023
12. Based on Dell's Future-Proof program that offers 3:1 data reduction guarantee based on PowerMax data reduction tools (dedupe and data compression) for mainframe storage, April 2022. Actual data reduction rates will vary.
13. Based on Dell internal analysis of PowerMax using SRDF/S with RAID 5 compared with PowerMax RAID 6, April 2021. Actual availability results will vary.



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