

# Dell PowerMax

Industry's most secure<sup>1</sup> and energy-efficient mission-critical storage<sup>2</sup>

### ESSENTIALS

- ✓ New trusted, intelligent, continuously modern storage powers performance demanding mission-critical workloads while simplifying operations with AI-driven storage automation.
- ✓ 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 Dell's [Future-Proof Program](#).

### Trusted Innovation

- **Consolidate all workloads** – multi-node NVMe scale-out architecture consolidates open systems, mainframe, file, and IBM i workloads
- **Breakthrough efficiency** – up to 2.8x more IOPS/watt<sup>3</sup>, up to 82% reduction in greenhouse gases<sup>4</sup>, inline data reduction with [5:1 data reduction guarantee](#)<sup>5</sup> and 3:1 DRR guarantee for mainframe<sup>6</sup>
- **Performance optimized** – Dynamic Fabric technology with NVMe/RDMA, 2x faster performance<sup>7</sup>, 50% better response times<sup>8</sup>
- **Always-on availability** – eliminates unplanned downtime/data loss with unmatched async, sync, metro, multi-site remote replication, and SmartDR

### Intelligent Automation

- **AI-driven dynamic cache optimization engine** reduces response time latency by dynamically optimizing cache layout
- **Autonomous health checks** – uses predictive analytics and self-healing to fix potential issues before they occur
- **Integrated management** – fully integrated File management for setup, changes, replication tasks

### Cyber Resiliency

- **Most secure storage** – [designed to accelerate Zero Trust adoption](#)<sup>10</sup>, built-in hardware root of trust, secure boot, digitally signed firmware updates
- **Intrinsic protection** – from unauthorized access via multi-factor authentication, SecureID, YubiKey
- **Anomaly detection** – continuous ransomware anomaly detection with the industry's first cyber intrusion detection for mainframe<sup>11</sup> (zCID)
- **Cyber recovery vault** – secure air gap solution isolates data from the production network; fast and the most granular cyber recovery at scale (65M snaps per array)<sup>12</sup>



## Today's mission-critical applications require an innovative approach to enterprise storage infrastructure

In today's digital economy, organizations have the opportunity to harness the power of data for disruption and innovation. However, they face various challenges such as exponential data growth, diverse data sources, and the need to break down operational silos while ensuring cybersecurity and developer productivity.

To overcome these challenges, organizations require trusted and efficient enterprise storage that offers exceptional performance, scalability, and security. Dell's next-gen PowerMax is designed to meet these needs, providing secure, intelligent, and always modern storage that enables businesses to fully unleash the potential of their data.

The latest release, PowerMaxOS 10.2, builds upon decades of software innovation to deliver trusted AI-driven efficiencies for mission-critical workloads. PowerMax leverages NVMe Dynamic Fabric technology to eliminate traditional storage limitations in areas such as performance, capacity, energy efficiency, and security. This ensures that the PowerMax systems can meet the demands of both traditional workloads and next-generation cloud-based applications.

### Built to consolidate

PowerMax is designed to consolidate demanding mixed workloads through 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 an inclusive software bundle to simplify ordering. The PowerMax 2500 delivers high performance in a compact package storing up to 7x more capacity (8PB<sup>e</sup>) in half the rack space<sup>13</sup> 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<sup>e</sup> of capacity 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 for customers to meet stringent service levels and gain a [competitive advantage](#) – powerful Intel® Xeon® Scalable processors, high-speed dynamic cache, NVMe/RDMA, InfiniBand, and intelligent power distribution units (iPDUs) with rack-based power monitoring and altering to name a few.

The 2500 and 8500 offer several advantages for delivering the highest storage performance, resiliency, and energy-efficiency through innovative 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. New RAID 6 (24+2) configurations deliver an unprecedented 92% storage efficiency. This groundbreaking efficiency allows organizations to significantly reduce costs while maximizing their storage capacity.

The combination of Dynamic Fabric technology along with flexible RAID allows every node to access every drive providing [single-drive upgrades](#) to increase storage capacity at your pace.

Both models support mainframe workloads and 32Gb FICON connectivity. An industry first, Cyber Intrusion Detection for mainframe (zCID), continuously monitors IBM z/OS data access rates relative to a user-managed rule set, issuing alerts if an intrusion is detected. PowerMax 8500 also supports IBM zHyperlink reads<sup>14</sup>.

### Breakthrough Efficiency

PowerMaxOS 10 adds real-time power and environmental monitoring and alerting based on usage. The intelligent power distribution units (iPDUs) ship standard with each 2500 and 8500 tracking power for all components in the rack (storage, switches, and servers). And customers can use the latest dynamic data mobility software to easily move workloads across data center locations to maximize power efficiency and reduce electricity costs. And customers can monitor power usage for the array and at the data center level with an Open Manager Enterprise plugin.

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

PowerMax 2500 and 8500 ships with Dell's unmatched [5:1 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 are equipped with the latest 64-bit file services and active-active nodes, seamlessly integrated with Unisphere management. These arrays enhance resiliency by introducing SRDF/S (synchronous) remote replication, ensuring high availability for File services.

### AI-Driven Automation

PowerMax systems are designed with AI-driven 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 pattern recognition and predictive analytics to maximize performance with no management overhead. With autonomous health checks, intelligent thresholds, and self-healing, issues are resolved without impacting operations. And with the new bulk API capability, the time required to access performance insights is reduced by up to 96%<sup>9</sup>. These features combine to enhance operational efficiency and streamline storage management processes.

### Multi-Array Workload Optimization

Multi-array workload planner analyzes the storage infrastructure across multiple PowerMax arrays and recommends the best place to host workloads for optimal performance and resource utilization. Dynamic data mobility 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 to optimize storage utilization.

### APEX AIOps Infrastructure Observability

Dell's [APEX AIOps infrastructure observability](#) (APEX AIOps) mobile application gives administrators faster time to insight; with all the information needed to take quick action and efficiently manage their storage resources. 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 available from your mobile devices free of charge. Once an issue is identified, approaching full capacity or loose cabling, proactive remediation recommendations are sent for corrective action. And the new AIOps Assistant saves valuable time when optimizing your IT infrastructure.



New AIOps Assistant

INFRASTRUCTURE OBSERVABILITY

Get custom, high-quality answers in seconds

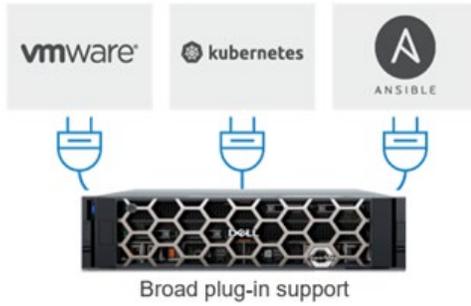
Natural language synthesis of information from Dell's 133,000+ Knowledge Base article archive

Access from every screen

Save hours of research, resolve issues faster

For PowerMax and all Dell infrastructure!

## Automated, end-to-end workflows



## 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.

## Cyber Resiliency

PowerMax is equipped with [unmatched cyber resiliency](#) to ensure always-on operations that prevent, detect, and recover from possible cyberattacks. It is engineered to accelerate Zero Trust adoption, adheres to STIG standards, appears on the U.S. DoD Approved Products list, supports TLS 1.3, and safeguards sensitive data at every stage in the event of a potential 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 including:

- **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 optional 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 or YubiKey.

### Detect

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

PowerMax tracks data patterns and detects anomalies, including changes to data reduction rates and unusual access patterns, to establish if ransomware or malware may have infected the system. After detecting suspicious anomalies, IT personnel can promptly implement corrective measures.

Cyber intrusion detection for z systems (zCID), an industry first, enables continuous monitoring and inspection of data access rates, then alerts and triggers actions if a limit is exceeded. zCID works in concert with SnapVX and zDP to ensure that if an intrusion is suspected, data that is being snapped and therefore, protected, can easily be recovered.

### 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 per array to optimize recovery point objectives (RPO) and minimize data loss. Several options exist for native cyber recovery from a secure vault for open systems and mainframe storage on PowerMax.

Cyber Recovery Services for PowerMax, a new Dell Professional Service, isolates open systems data from the production network in a secure vault by implementing an SRDF airgap with secure snapshots. In the event of a cyber attack, customers can quickly recover using native PowerMax software.

## Mission-critical availability

PowerMax sets the standard for mission-critical availability. Whether it is 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 to deliver remote replication over extended distances and across multiple sites to meet your disaster recovery objectives.

## 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 immutable snapshots prevent accidental or malicious deletion, retaining them for a specified period.

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

## Ultra-Fast direct back and recovery

Storage Direct Protection for PowerMax offers game-changing performance and multicloud agility for backup and recovery. With speeds of up to 46 TB/hour for backups<sup>15</sup> and 21 TB/hour for restores<sup>16</sup>, the PowerMax native integration with PowerProtect Data Domain appliances protects your data at ultra-fast speeds with a simple, intuitive user interface. PowerMax integration with PowerProtect Data Domain provides recovery flexibility, multicloud support, and seamless management of backups and restores with PowerProtect Data Manager.

## Continuously modern storage

Dell's [Future-Proof Program](#) takes the worry out of buying storage. Purchasing PowerMax qualifies for the 3-Year Satisfaction Guarantee, Hardware Investment Protection, 5:1 Data Reduction Guarantee for open systems, and 3:1 Data Reduction Guarantee for mainframe storage with no assessment required.

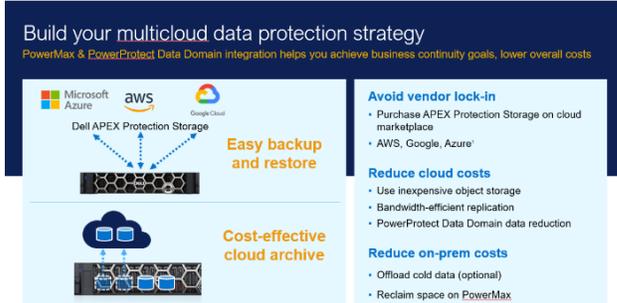
## Multicloud agility

PowerMaxOS 10 enables customers to unlock multicloud flexibility and optimize on-prem and cloud resources. RiverMeadow Cloud Mobility for Dell provides workload mobility between PowerMax and cloud. It's an intuitive, easy-to-use SaaS platform that orchestrates workload mobility between a source and target environment.

Dell APEX Subscriptions provide elastic capacity, where we work with you to right-size capacity for your workloads as they shrink and grow over time. Your payment adjusts up or down to match your actual usage so you only pay for what you use.

## 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 and workforce experiences, and achieve a resilient business. Dell's ProConsult Advisory Services facilitate a plan for beneficial and lasting change. Our AS-IS/TO-BE methodology, the foundation of our services, deeply analyzes your current and desired state. Having a clearer understanding of these can help you realize the business benefits of modernization faster and with lower risk.



# FUTURE-PROOF PROGRAM



<sup>1</sup> Based on Dell's internal analysis of cybersecurity capabilities of Dell PowerMax versus cybersecurity capabilities of competitive mainstream arrays supporting open systems and mainframe storage, April 2024.  
<sup>2</sup> Based on Dell's analysis of published product specs and features impacting power usage of PowerMax versus competitive mainstream arrays supporting open systems and mainframe storage operating at 8PBe, June 2024.  
<sup>3</sup> Based on Dell's internal testing comparing IOPS per watt for PowerMax 2500 vs. PowerMax 2000 using the 8K random writes workload, August 2024.  
<sup>4</sup> Based on Dell's internal analysis of total CO2 emissions over 5 years for PowerMax 2500 at 8PBe (5kW) vs. 6 PowerMax 2000s at 8PBe (27.5kW), July 2024.  
<sup>5</sup> Based on Dell's Future-Proof program that offers 5:1 data reduction guarantee based on PowerMax data reduction tools (dedupe and data compression) for open systems storage, August 2024. Actual data reduction rates will vary.  
<sup>6</sup> 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 2024. Actual data reduction rates will vary.  
<sup>7</sup> Based on Dell's internal testing using the Sequential Read Hits (128K) GB per second benchmark and IOPS per FC port benchmarks (within a single array) comparing PowerMax 8500 to PowerMax, April 2024.  
<sup>8</sup> Based on Dell's internal testing using the OLTP benchmark comparing the PowerMax 2500 against the PowerMax 2000, April 2024. Actual response times will vary.  
<sup>9</sup> Based on Dell's internal testing of time to access performance statistics using PowerMaxOS 10.2 bulk API automation vs. PowerMaxOS 10 API scripts, August 2024. Actual time savings may vary.  
<sup>10</sup> Based on Dell's internal analysis of cybersecurity capabilities of Dell PowerMax compared to Dell's seven pillars of Zero Trust architectures, April 2024.  
<sup>11</sup> Based on Dell's internal analysis comparing PowerMax 2500/8500 cyber intrusion detection for mainframe storage to mainstream mainframe offerings, August 2024.  
<sup>12</sup> Based on Dell's analysis of PowerMax cyber recovery scalability vs competitive enterprise arrays, April 2024. Assuming an RPO of 10 minutes for 2 days and 60 minutes for 7 days, more than 2 million snaps are required, based on an average number of 5000 volumes configured in PowerMax.  
<sup>13</sup> Based on Dell's internal analysis comparing the Effective Storage Capacity per rack unit (1.75") of PowerMax 2500 compared with PowerMax 2000, April 2024. Actual storage capacities will vary.  
<sup>14</sup> zHyperlink reads.  
<sup>15</sup> Based on Dell's internal testing for PowerMax 2500 and PP DD9900 using the Epic GeneratorIO for a single storage group backup, March 2024. Actual performance may vary.  
<sup>16</sup> Based on Dell's internal testing for PowerMax 2500 and PP DD9900 using the Epic GeneratorIO for a single storage group restore, March 2024. Actual performance may vary.

LEARN MORE ABOUT POWERMAX