

DELL EMC VMAX ALL FLASH

ESSENTIALS

- Leverage advanced 3D NAND flash to consolidate high-demand transaction processing and decision support workloads
- Achieve consistent 350 microsecond response times at massive scale for extreme-growth hybrid cloud environments
- Process up to 6.7 million IOPS at sub-1ms latency with up to 576 CPU cores and multi-threading technology
- Accelerate time to deployment with streamlined appliance-based packaging and easy non-disruptive migrations
- Leverage inline compression for new or existing VMAX data sets while maintaining high performance and operating all VMAX data services
- Protect vital open systems and mainframe information at six-nines availability via SRDF, the gold standard in remote datacenter replication and DR
- Create hundreds of snapshots per volume to optimize decision support, application testing, and business analytics with TimeFinder SnapVX
- Run rapid backup and restore for Oracle, SQL, Exchange deployments with Dell EMC ProtectPoint; backup directly from VMAX to Data Domain and eliminate app server overhead

Mission-Critical Storage at Scale

All flash arrays are accelerating the pace of business transformation as IT professionals search for the most relevant technologies to modernize their operation and drive down operational and capital expenditures. As flash prices rapidly decline, capacity points exceed spinning disk, and data reduction techniques advance, more organizations are evaluating, testing, and deploying all-flash solutions to tackle the most demanding mixed workloads that span across the modern datacenter.

Dell EMC VMAX All Flash arrays are architected to solve the CIO challenge of embracing a modernized flash-centric datacenter for mission-critical applications while simultaneously simplifying, automating, and consolidating IT operations. VMAX All Flash is engineered for the latest, high density flash technology and to specifically exploit the rich set of data services of VMAX All Flash. These data services address the new requirements of the modern datacenter while continuing to deliver the reliability and mission-critical availability Dell EMC customers have relied on for years.

Scalable Performance

- Leverage advanced multi-core/multi-threading algorithms and a flash-optimized design to meet strict SLAs for high-demand online transaction processing (OLTP), virtualized applications, and high-growth Oracle and SQL databases
- Scale out performance and scale up capacity to achieve millions of IOPS, PBs of capacity, and predictable performance (350 microsecond response time)

Mission-Critical Availability

- Mission-critical availability architecture with advanced fault isolation, robust data integrity checking, and proven non-disruptive hardware and software upgrades
- Six-nines availability for 24x7 operations using SRDF software, the gold standard for multi-site remote replication and DR

Hyper Consolidation

- Achieve massive consolidation with support for mixed open, mainframe, IBM i, and file storage on the same system simplifying management and significantly lowering overall TCO
- Consolidate multiple concurrent workloads and multi-PBs of capacity both on premise and through tiering to cloud storage



Consolidation with Confidence

As the industry's most reliable platform for cloud scale consolidation, VMAX All Flash enables organizations to grow, easily share, and cost effectively manage massive amounts of block, file, open systems, and mainframe storage. VMAX All Flash is the leader in maintaining consistently high performance levels while running thousands of mixed workloads concurrently on a single VMAX All Flash array—you'll be able to deliver predictable and responsive service, even at massive scale.

Purpose-Built for Extreme Performance

For enterprises that require petabyte-level scale, the VMAX All Flash is purpose-built to easily manage high-demand, heavy-transaction workloads while storing petabytes of vital data. The VMAX All Flash hardware design features the turbo-charged Dynamic Virtual Matrix Architecture that enables extreme speed and consistent sub-millisecond response time.

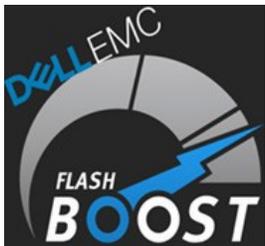
The VMAX All Flash architecture can scale beyond the confines of a single system footprint to deliver scalable performance where needed. It enables hundreds of multi-core Intel CPUs to be pooled and allocated on-demand to meet the performance requirements for dynamic mixed workloads. This is achieved through powerful multi-threading and the industry's first dynamic, user controlled core allocation so no workload is starved of resources.

The core element of VMAX All Flash is the V-Brick. Each V-Brick has one engine, two DAEs, and usable capacity with fully redundant components. Flash Capacity Packs are used to scale up to 4 PB. The VMAX All Flash scales by aggregating up to eight V-Bricks as a single system with fully shared connectivity, processing, and capacity resources. Each V-Brick supports up to 72 CPU cores for blazing-fast performance scaling to a maximum of 576 cores per array.

Flash-Optimized

Engineered for 3D NAND flash, VMAX All Flash outperforms solutions that offer flash drives as add-ons to traditional arrays that are designed for 15K RPM disk drives. VMAX All Flash eliminates bottlenecks with FlashBoost technology to deliver the highest performance and the lowest latency for read-intense OLTP applications, while leveraging huge write caching to drive down response times on heavy write workloads and greatly reduce write amplification.

VMAX All Flash arrays leverage the latest electronics and flash technology to super-charge the most demanding dynamic environments. Each VMAX All Flash model offers advanced 3D NAND flash, Intel Broadwell multi-core processors, InfiniBand 56 Gb/s interconnect technology, PCIe Gen 3 I/O, and native 6 or 12 Gb/s SAS drive infrastructure.



Inline Compression

VMAX All Flash delivers a net 4:1 overall storage efficiency benefit for typical transactional workloads when inline compression is combined with snapshots and other HYPERMAX OS space saving capabilities. VMAX inline compression minimizes footprint while intelligently optimizing system resources to ensure the system is always delivering the right balance of performance and efficiency. VMAX All Flash inline compression is granular, performance optimized, and flexible.

- **Granular:** VMAX All Flash compression operates at the Storage Group (application) level so customers can target those workloads that provide the most benefit. Compression can also be applied to existing data that was written prior to the availability of inline compression.
- **Performance optimized:** VMAX All Flash is smart enough to make sure very active data is not compressed until it becomes less active. This allows the system to deliver maximum throughput leveraging cache and SSD technology, and ensures that system resources are always available when required.
- **Flexible:** VMAX All Flash inline compression works with all data services including TimeFinder SnapVX, SRDF, embedded NAS, and encryption—something other vendors cannot deliver.

Every VMAX All Flash array is shipped with compression hardware and can take advantage of this capability. And Dell EMC even provides a 4:1 storage efficiency guarantee with VMAX All Flash arrays.

Unmatched Flexibility

VMAX All Flash introduces unmatched breakthroughs in performance density and packaging designed to reduce costs and fit all of your datacenter needs. Each VMAX 450F, 850F, and 950F array can store up to 480 high-density drives and deliver a complete VMAX All Flash engine on a single floor tile—that's an industry first of up to 1.7M IOPS in a single rack. And VMAX 250F supports up to 1 PB of effective capacity in just half a rack, delivering 2 times the performance and 2 times the capacity in half the rack space compared with previous models.

For maximum agility, VMAX All Flash racks can be separated by up to 25 meters to avoid columns and other obstacles in a datacenter without a need to ever reserve empty floor tiles for future array growth. And all VMAX All Flash arrays support industry standard 19-inch racks and optional third-party racking to conform to your datacenter infrastructure.



Streamlined Software Packaging

VMAX All Flash arrays are built for simplicity and ease of ordering with appliance-based packaging that combines both hardware and software elements. VMAX All Flash systems ship with the F software package. Customers can easily add the FX package to deploy the higher value data services listed below.

“F” Package

- HYPERMAX OS
 - NDM Migration Tools, VVols, Inline Compression, QoS***
- Embedded Management
 - Unisphere, DB Storage Analyzer, REST APIs
- Local Replication Suite
 - TimeFinder SnapVX
- AppSync iCDM Starter Bundle

À la carte:

<ul style="list-style-type: none"> • SRDF/S SRDF/A • SRDF/Metro • D@RE • eNAS • Unisphere 360 	<ul style="list-style-type: none"> • Dell EMC Storage Analytics • Storage Resource Manager • ProtectPoint • PowerPath Full • RecoverPoint • AppSync Advanced
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“FX” Package

Everything in F Suite +

- Data at Rest Encryption**
- SRDF/S/A/STAR Replication Suite*
- SRDF/Metro*
- Storage Resource Manager
- eNAS**
- Unisphere 360
- AppSync Advanced
- PowerPath or PP/VE (75 licenses)

À la carte:

- ProtectPoint
- RecoverPoint
- Dell EMC Storage Analytics

* FX includes software license, hardware must be configured and ordered.
** Factory configured
*** Services levels plus host IO limits.

Note: Above software applies to open systems configurations.

HYPERMAX: Open, Extensible Hypervisor

VMAX All Flash leverages the industry’s first open storage and hypervisor converged operating system, HYPERMAX OS. It combines industry-leading high availability, I/O management, quality of service, data integrity validation, storage tiering, and data security with an open application platform.

HYPERMAX OS features the first real-time, non-disruptive storage hypervisor that manages and protects embedded services by extending high availability to services that traditionally would have run external to the array. It also provides direct access to hardware resources to maximize performance. The hypervisor can be non-disruptively upgraded and supports embedded management and embedded NAS.

Scalable Management Across Arrays

Dell EMC Unisphere for VMAX is an intuitive management interface that allows IT managers to maximize human productivity by dramatically reducing the time required to provision, manage, and monitor VMAX All Flash storage assets.

Unisphere delivers the simplification, flexibility, and automation that are key requirements to accelerate the transformation to the hybrid cloud. For customers who frequently build up and tear down storage configurations, Unisphere for VMAX makes reconfiguring the array even easier by reducing the number of steps required to delete and repurpose volumes.

Unisphere 360 software aggregates and monitors up to 200 VMAX arrays across a single datacenter. This solution is a great option for customers running multiple VMAX All Flash arrays with embedded management (eManagement) and who are looking for ways to facilitate better insights across their entire datacenter. Unisphere 360 provides storage administrators the ability to view site-level health reports for every VMAX or coordinate compliance to code levels and other infrastructure maintenance requirements. Customers can leverage the simplification of VMAX All Flash management, now at datacenter scale.

iCDM with TimeFinder SnapVX

[Integrated copy data management \(iCDM\)](#) provides exceptional customer value by enabling application-consistent, on-array copy orchestration. TimeFinder SnapVX software features zero-impact snaps, simple user-defined names, faster snapshot creation/expiration, cascading, compatibility with SRDF, and support for legacy VMAX replication capabilities like TimeFinder Clone, VP Snap, and Mirror (emulation mode). SnapVX reduces replication storage costs by up to 10 times with its space-efficient snapshot technology, meaning it is optimized for cloud scale and enables expansion of up to 16 million snaps per array. Customers can create up to 256 snapshots and establish up to 1024 target volumes per source device, providing read/write access as space-efficient snapshots or full clones. And customers can leverage secure snaps to prevent accidental or malicious snapshot deletion.

Dell EMC AppSync is an advanced copy management software application that integrates seamlessly with VMAX All Flash arrays to enable iCDM. It offers a simple way to create and consume local and remote copies of VMAX All Flash. AppSync delivers application consistency with critical applications like Oracle and VMware, enabling operational recovery and copy repurposing.

Non-Disruptive Migration

VMAX non-disruptive migration enables existing VMAX 1 and VMAX 2 customers to migrate workloads live to a new VMAX All Flash or VMAX3 array without taking the applications offline. This capability is built into the latest HYPERMAX OS and simplifies the migration user experience by reducing the number of steps required to migrate data by 65 percent.

Customers can now perform non-disruptive migrations on their own or leverage Dell EMC's exceptional professional services for more complex migrations. VMAX non-disruptive migration software makes VMAX tech refresh incredibly compelling for customers moving to the VMAX All Flash modern datacenter. Customers migrating from VMAX 1 or 2 arrays can even maintain SRDF/S and SRDF/A replication on the existing VMAX while migrating to VMAX All Flash or VMAX3 arrays.

Data at Rest Encryption

VMAX All Flash Data at Rest Encryption provides hardware-based, on-array encryption, protecting block and file storage from unauthorized access when drives or arrays are removed from the datacenter. This technology eliminates the need for drive erasure services and allows for rapid decommissioning and repurposing of arrays, while helping achieve regulatory compliance. Encryption offers intelligent key management that is easy to implement and maintain. Administrators can leverage automated embedded key management since there is no manual user intervention required to manage VMAX encryption keys or leverage external Key Management Interoperability Protocol (KMIP) Enterprise Key Managers (EKM), which allows IT security managers to implement a centralized platform for managing cryptographic keys and applications. All VMAX data services are compatible with data at rest encryption.

Dynamic Host I/O Limits

VMAX All Flash Host I/O Limits (Quality of Service controls for VMAX) support defining limits to enforce service levels and make application performance even more predictable. Users can set maximum IOPS and/or throughput limits on a per application basis. VMAX All Flash automatically balances the limits across directors and ports and supports two levels of cascaded limits to simplify performance management in multi-application, multi-tenant, and cloud environments.

Mission-Critical Availability

VMAX All Flash reliability, availability, and serviceability (RAS) make it the ideal platform for open systems and mainframe environments requiring mission-critical availability. These arrays are architected to provide six-nines of availability in the most demanding, mission-critical environments. VMAX All Flash availability, redundancy, and security features are listed below.

MISSION-CRITICAL AVAILABILITY WITH VMAX ALL FLASH

Eliminate Costly Downtime	Exceed Stringent Replication SLAs (RTO, RPO)	Eliminate Planned Downtime	Ensure 100% Data Integrity, Avoid Data Breach
			
Proven 6 Nines of Availability Advanced Fault Isolation, map-out faulty memory DIMMS, mirrored memory no single points of failure	Gold Standard in Multi-Site Replication Proven Disaster Recovery and rapid restart; 3-site, 4-site Replication, Active-Active SRDF	Non-Disruptive HW and SW Upgrades Continuous IO through parallel microcode NDUs, upgrade HYPERMAX O/S within seconds	T10 DIF Data Coding Single Bit Error Correction, validation checksum through T10 DIFF, Data at Rest Encryption

- No single points of failure—all components are fully redundant to withstand any component failure
- Completely redundant and hot-pluggable field-replaceable units (FRUs) to ensure repair without taking the system offline
- RAID protection levels 5 and 6 to match different data protection requirements, with the RAID members distributed among power zones in disk array enclosures (DAEs) to assure high availability (HA) even if an entire power zone fails
- Mirrored cache, where the copies of cache entries are distributed to maximize availability
- Vault to flash ([NVMe](#)) with battery backup to allow for cache de-stage to flash and an orderly shutdown for data protection in the event of a power failure
- Active-active datacenter replication via SRDF/Metro with read/write access to both Site A and Site B ensures instant data access during a site failure
- Fully non-disruptive upgrades, including loading HYPERMAX Operating System software from small updates to major releases
- T10 DIF data coding, with extensions for protections against lost writes and SnapVX secure snaps to prevent accidental or malicious snapshot deletion
- Extensive fault detection and isolation, allowing early wear-out detection and preventing the passing of bad data as good
- All flash cache data vault capable of surviving two key failures, ensuring that the system comes back even when something was broken before the vault and something else fails when returning from the power cycle
- Support for thermal excursions with graceful shutdown if, for example, a datacenter loses air conditioning
- Integrated data protection for Oracle, Microsoft SQL, Microsoft Exchange via Dell EMC ProtectPoint backup and rapid restore combines the gold standards in backup with industry leading SRDF replication technology

Symmetrix Remote Data Facility (SRDF)

The SRDF family of software is the industry gold standard for remote replication in mission-critical environments. Built for the industry-leading VMAX hardware architecture, the SRDF family of solutions is trusted globally for disaster recovery and business continuity. The SRDF family offers unmatched deployment flexibility and massive scalability to deliver a wide range of distance replication capabilities. It consists of the following options: SRDF/S (synchronous option for zero data loss), SRDF/A (asynchronous option for extended distances), SRDF/Star (multi-site replication option), SRDF/CG (consistency groups for federated data sets across arrays), and SRDF/Metro (for active/active datacenter replication).

Heterogeneous Replication (RecoverPoint)

Dell EMC RecoverPoint provides replication with multiple recovery points to restore applications instantly to a specific point in time, leveraging snap-based replication on VMAX All Flash. Applications are protected using asynchronous heterogeneous replication using DVR-like recovery across the Dell EMC block storage portfolio (VMAX/XtremIO/Unity/VNX). RecoverPoint minimizes network utilization with unique bandwidth compression and deduplication, significantly reducing network bandwidth consumption.

Future-Proof Storage Loyalty Program

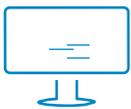
VMAX is part of the [Future-Proof Storage Loyalty Program](#), which is designed to provide investment protection with a set of world class technology capabilities and programs that will enable Dell EMC's Storage products to provide value for the entire lifetime of customers' applications. It is unique in that it is available to customers at no additional cost either in terms of higher maintenance price or higher product price. The Future-Proof Storage Loyalty Program for VMAX consists of the following benefits: 3 Year Satisfaction Guarantee, 4:1 All Flash storage efficiency guarantee, Never Worry Data Migrations, Hardware Investment Protection, All-Inclusive Software and Clear Price Maintenance.

Dell EMC Global Services

VMAX All Flash platforms include a limited hardware warranty.* VMAX All Flash hardware and software maintenance contracts offer 24x7 access to technical expertise, online services, remote monitoring and problem resolution, on-site services, and premium software maintenance providing 24x7 access to technical expertise and rights to new releases of the software at no additional charge.

Dell EMC Global Services provides the strategic guidance and technology expertise that organizations need to address their business and information infrastructure challenges and to derive the maximum value from their information assets and investments. Ask your Dell EMC sales representative about the specific services that can benefit your organization.

* Warranties may vary outside of the United States. Contact your Dell EMC representative for local warranty and service terms and conditions.



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