

EMC Symmetrix V-Max — In a New Era, High-End Storage Lives On

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Management Summary

EMC's recent announcement of the new *Symmetrix V-Max* is proof that high-end storage has been redefined once again. Traditionally, we think of high-end enterprise storage as having the greatest *scalability*, *availability*, and *performance*. These characteristics still define the high end, because enterprises expect it to support their most demanding and critical applications – the ones that represent the heartbeat of the business and cannot go down. But being the biggest, fastest, and most robust is no longer enough. High-end storage must also be:

- **Manageable** – Simplifies management through automation, wizards, and streamlined configuration
- **Tiered** – Provides multiple, distinct storage service levels through a variety of drives (e.g., flash, Fibre Channel, SATA) and RAID types, non-disruptive migration between tiers, and priority controls for workload quality of service
- **Flexible** – Purpose-built for the virtual data center, with dynamic and efficient partitioning and provisioning

These new high-end characteristics bring greater flexibility, efficiency, cost-effectiveness, ease of use, and consolidation of a broader range of workloads and data storage requirements. They reflect the values of a new era, where resourcefulness, efficiency, and simplicity are valued more than sheer power and complexity. They also reflect an evolution toward a fully virtual data center, where IT resources are unchained from the underlying hardware and delivered as dynamic, efficient, and flexible services.

The new *Symmetrix V-Max* offers improvements in all six traditional and virtual-world attributes. Compared to the *Symmetrix DMX-4* (the current high-end market leader), it can deliver twice the performance, twice the connectivity, and nearly three times the usable capacity. EMC added a significant new feature, called *Auto-provisioning Groups*, that streamlines storage provisioning for both physical and virtual server environments. It greatly reduces the amount of time required to provision volumes. Of course, the *Symmetrix V-Max* has additional points of integration with VMware and other virtual server environments. It also supports second-generation enterprise flash drives with higher capacities. Finally, there is a new version of *SRDF* that lowers the cost of combining synchronous and asynchronous technologies for disaster recovery.

Read on for details about EMC's latest high-end Symmetrix storage platform.

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March Toward the Virtual Data Center

The new EMC *Symmetrix V-Max* is best understood in context of the ongoing shift toward virtual computing. Virtualization is the ability to abstract logical images from the underlying physical resource. The flexibility it provides can increase resource utilization, simplify provisioning, and improve availability. Applications and infrastructure environments easily can grow, shrink, and even be moved. Furthermore, virtualization is a key enabler of concepts like cloud and utility computing.

For all of these reasons, data centers are marching inexorably toward virtualization. It is important for a modern storage system to “play well” in these virtual environments. It should support a variety of workloads and scale for greater consolidation. It should be flexible, efficient, and easy to provision, while actively supporting virtual server environments. This shift toward the virtual data center is the primary driver behind the capabilities in EMC’s new high-end Symmetrix storage platform.

The Symmetrix V-Max

EMC introduced the first Symmetrix storage platform in 1990, and the *Symmetrix V-Max* is yet another in a series of significant product evolutions over nearly 20 years. The enhancements fall into several categories.

Manageability

Possibly the most significant element of this announcement is the work that EMC has done to ease the management of these systems. Manageability serves as an enabling technology for deploying storage at the scale required in the virtual data center. Large-scale virtual environments can have thousands of virtual machines (VMs). While enterprises still expect high-end storage to deliver sophisticated and robust data protection, simplicity of management and provisioning at the high end is now a necessity.

The Symmetrix V-Max has a new feature called *Auto-provisioning Groups* that streamlines storage provisioning for VMs and physical servers. By setting up group profiles for storage, ports, and initiators, it can reduce the amount of time and complexity required to provision in large server environments by 90% or more.

Another feature called *Virtual Provisioning*

that allocates space-efficient virtual volumes¹ (*more details below*) has been enhanced and simplified to provision capacity in fewer steps. Compared to the *Symmetrix DMX-4*, it requires only 32 clicks and 9 minutes to configure a storage pool that used to require 435 clicks and 30 minutes.²

Scalability

Architecture determines the degree to which a structure can scale. For instance, a wood-framed house can reach only a few stories in height and remain sound, while a skyscraper constructed with steel I-beams can reach over a hundred stories.

The Symmetrix V-Max features a new *Virtual Matrix Architecture* that is designed to scale beyond the DMX’s *Direct Matrix Architecture*. (See *Exhibit 1: Virtual Matrix Architecture*, at the top of the next page.) Its key feature is the ability to share all CPU, memory, host ports, and disk resources across a collection of fault-tolerant V-Max Engines – the main processing and control elements of the system – while scaling out in a modular fashion, potentially even beyond the limits of a cabinet or frame. This enables linear scale out of performance, capacity, and connectivity resources. As compared to the Symmetrix DMX-4, the Symmetrix V-Max offers twice the number of host ports, with up to 128 ports per system, and twice the back-end disk drive connections, with up to 128 ports, 2,400 disks, and 2.1 PB (usable) currently. Its multi-core 2.3 GHz processors also deliver twice the number of IOPS³ in a smaller footprint. (See *Exhibit 2: Symmetrix V-Max System Capacity*, also on the next page.)

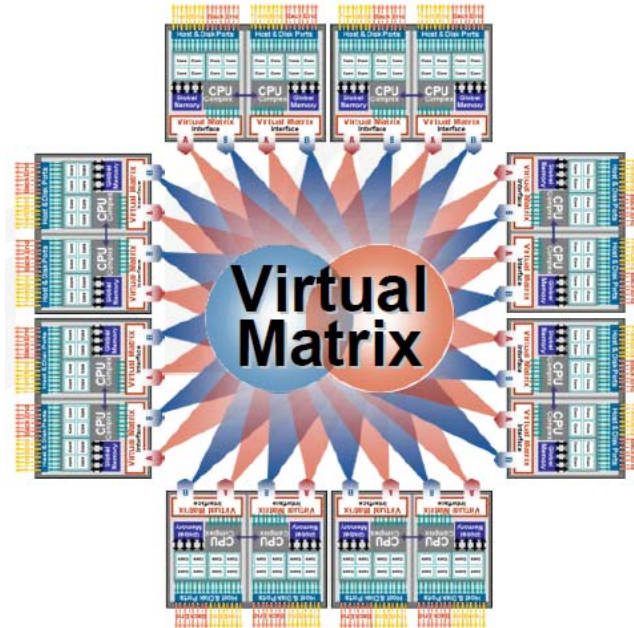
The first Symmetrix V-Max starts with one fault-tolerant engine and scales to eight. The Virtual Matrix Architecture allows the system to function as a single entity or image. It also establishes a foundation for even greater scalability in the future. The Symmetrix V-Max will eventually support federated systems where literally dozens of Symmetrix Engines combine to form a single system image with tens of thousands of drives and host ports. This is high-end scalability on an altogether new level.

¹ Also known as *thin provisioning*.

² Specifically, create a 10 TB storage pool, associate 158 thin volumes, and map volumes to 32 ports.

³ That is, transaction-processing performance.

Exhibit 1 — Virtual Matrix Architecture of Symmetrix V-Max



Source: EMC

Performance

The Symmetrix V-Max delivers 2.6 times more IOPS than the DMX-4⁴, which is nearly triple the transaction-processing performance. The Virtual Matrix Architecture and multi-core processors contribute significantly to this boost. The Symmetrix V-Max is also more cost-effective on a per-IOPS basis. At the high end, the V-Max delivers twice the IOPS per dollar than the DMX-4 4500, making it potentially a lower-cost solution for transaction-intensive environments.

eration enterprise flash drive (EFD) technology with more advanced circuitry and capacities of 200 and 400 GB – nearly three times the first generation of flash drives of just one year ago.^{5,6}

High Availability

Enterprises expect high-end storage platforms, like the Symmetrix V-Max, always to remain online, because the applications they support are mission-critical to business operations. Planned or unplanned downtime is unacceptable because of the potentially enormous losses it could cause.

Exhibit 2 — EMC Symmetrix V-Max System Capacity

Maximum number of V-Max Engines	8
Max host ports	128
Max disk connections	128
Max number of disk drives	2,400
Maximum usable capacity	2.1 PB
Microprocessors	2.3 GHz multi-core
Maximum global cache	1 TB

Source: EMC

To support high availability, the Symmetrix V-Max offers a new version of *SRDF* for cost-effective synchronous replication at asynchronous distances. Called *SRDF/EDP (Extended Distance Protection)*, it performs synchronous replication to a streamlined pass-through array, which then replicates asynchronously to a remote failover site. The pass-through array does not require capacity to store a mirror of the original volume, nor does it require host servers,

The Symmetrix V-Max has up to 1 TB of global cache, dynamically shared by all system resources. For workloads with ultra-fast performance requirements, it also offers second-gen-

⁵ See [The Clipper Group Navigator](http://www.clipper.com/research/TCG2008002.pdf) dated January 14, 2008, entitled *EMC Symmetrix DMX to Offer Flash Drives for Ultra-High Performance* and available at <http://www.clipper.com/research/TCG2008002.pdf>.

⁶ For a backgrounder on solid-state drives, see *A New Tier of Storage Appears - Faster, Solid-State Drives State Their Case* in the February 10, 2009, issue of *Clipper Notes*, available at <http://www.clipper.com/research/TCG2009006.pdf>.

⁴ Comparing a full system configuration with RAID 5 and Fibre Channel disks.

making it a lower-cost configuration. It receives synchronous writes, holds them in cache, and forwards them asynchronously to the remote site. By EMC's estimates, the cost of this streamlined synchronous target⁷ is half that of a traditional full configuration, due to lower hardware, software, drive, maintenance, and energy costs.

The pass-through array can also be another production system located in the same local or metro area. In that case, both production systems act as the synchronous target for the other, and then both copy asynchronously to the same remote failover site. The new Symmetrix also has built-in compression that is twice as efficient at replication over long distances.

For virtual server environments with VMware, *Hyper-V*, or *Xen*, *EMC PowerPath* software running on host servers provides advanced load balancing and failover across all storage channels. It maximizes performance across channels and provides continuous operation in the event of a channel or switch failure. The Symmetrix V-Max also integrates SRDF with VMware *SRM (Site Recovery Manager)* for remote failover and failback in virtual environments.

Tiered Storage

High-end storage is, first and foremost, for demanding, mission-critical workloads, but it is no longer exclusively for these workloads. It should be able to house secondary data cost-effectively for less-demanding workloads in the same system through tiered storage. The reason is to enhance the return on investment. A high-end storage system represents a significant IT investment. While mission-critical applications may be the primary motivation for acquiring one, enterprises want to be able to leverage all of that performance and capacity for other purposes, such as file systems or backup to disk. Tiered storage makes it cost-effective. Furthermore, consolidating additional workloads on the system streamlines storage management and backup/recovery practices. Thus, the financial justification for a high-end investment is strengthened.

The Symmetrix V-Max provides a substantial platform for tiered storage. It supports numerous drive types with different price-performance characteristics:

- **Second-generation EFDs** – Nearly 10 times faster than Fibre Channel drives and 98% more energy efficient on a per-IOPS basis, but also more expensive. They are appropriate for very performance-sensitive workloads. Gen2 drives are more robust and offer larger 200 and 400 GB capacities.
- **Fibre Channel drives** – High-performance disk drives with 15K and 10K rotational speeds and capacities ranging from 73 GB to 450 GB.
- **SATA II drives** – High-capacity drives with lower pricing and higher capacities ranging from 500 GB to 1 TB.

Enterprises can store data with performance requirements ranging from ultra-fast to moderate at corresponding price points. By parsing datasets according to their performance requirements and employing all three drive types instead of only Fibre Channel, enterprises can actually pay less for drives, power, and cooling while increasing the overall performance profile. Tiered storage is smart storage.

Virtual LUN technology in the Symmetrix V-Max allows administrators to migrate LUNs non-disruptively between tiers. For maximum flexibility, migrations can occur between different drive and RAID types. Local and remote replication is not interrupted during these migrations, so data remains fully protected.

Finally, dynamic cache partitioning and priority controls in the Symmetrix enable it to distinguish between workloads and allocate cache and disk read I/O according to their priority. Administrators can employ these features to ensure applications receive appropriate qualities of service in terms of performance and availability.

Flexibility – For the Virtual Data Center

A high-end storage system should be purpose-built to meet the requirements of the virtual data center. First, it should be easily partitioned and provisioned in a way that maximizes the flexibility and resource utilization of the system. Second, it should integrate effectively into a broader virtual IT infrastructure, especially a virtual server environment. Virtualization is the now and the future of IT because it allows infrastructure to adapt to evolving business and customer requirements, maximizes utilization of scarce compute, network, and storage resources, and simplifies

⁷ Total cost of ownership over a 3-year period.

management. The bottom line is more cost-effective and flexible IT.

Symmetrix V-Max offers a number of features and enhancements for delivering on the requirements of this virtual data center. It has added enhancements to EMC's existing Virtual Provisioning feature. Now, it not only improves utilization by allocating virtual capacity to hosts while provisioning physical capacity as needed from a common pool, but can also "shrink" virtual pools when applications no longer need the space, allowing it to reclaim the capacity. Hosts think they "own" more capacity than they actually do, and the Symmetrix provides the capacity as they consume it. This feature greatly improves overall capacity utilization while reducing management overhead from frequent provisioning. It also avoids application downtime from out-of-space conditions. This enhanced version can create larger volumes (up to 256 GB) and virtually provision all drive and RAID types. The Virtual LUN technology mentioned previously also facilitates virtualization through non-disruptive data movement.

The Symmetrix V-Max is designed to integrate with and support hypervisor technologies for server virtualization, including the market-leading VMware. It provides a plug-in for VMware Site Recovery Manager (SRM) as well as support in EMC *Replication Manager*, so virtual machines (VMs) can leverage SRDF replication for automated disaster recovery *and failback*. EMC's storage management console *ControlCenter 6.1* maps virtual machines with storage resources and provides a summary view. It also finds storage that is no longer used by a VM (i.e., orphaned storage) and frees it up for other purposes. EMC PowerPath provides sophisticated load balancing and failover across storage channels for VMs. Symmetrix features like Auto-provisioning Groups, Virtual Provisioning, and Virtual LUN also work well in virtual environments because they simplify provisioning, increase capacity utilization, and facilitate dynamic data mobility.

Conclusion

As you would expect, the Symmetrix V-Max takes a big leap forward in the "raw power" attributes of scale and performance. It would not be high-end storage without a commanding position here. Nevertheless, the platform also takes a leap forward in tiered storage for a wide range of workloads and require-

ments, much simpler manageability, and greater efficiency and flexibility through virtualization and support for virtual environments.

EMC has evolved the Symmetrix V-Max to keep pace with the changing requirements of a new era. **High-end storage lives on – the new EMC Symmetrix V-Max is proof positive.**



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