

**EMC[®] Symmetrix[®] V-Max[™] Update
to the *Choosing a Data Migration
Solution for EMC Symmetrix TechBook***

Technical Note

P/N 300-009-234

REV A01

April 14, 2009

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Executive summary

The EMC® Symmetrix® V-Max™ Series with Enginuity™ is a new offering in the Symmetrix family. Built on the strategy of simple, intelligent, modular storage, it incorporates a new scalable fabric interconnect design that allows the storage array to seamlessly grow from an entry-level configuration into the world's largest storage system. The Symmetrix V-Max provides improved performance and scalability for demanding enterprise storage environments while maintaining support for EMC's broad portfolio of platform software offerings.

The Enginuity operating environment for Symmetrix version 5874 is the latest Enginuity release supporting the Symmetrix V-Max storage arrays. With the release of Enginuity 5874, Symmetrix V-Max systems now deliver new software capabilities that improve capacity utilization, ease of use, business continuity, and security. EMC Solutions Enabler 7.0 and Symmetrix Management Console (SMC) 7.0 include new actions and options to manage the enhanced features in Enginuity 5874.

The Symmetrix V-Max also maintains customer expectations for high-end storage in terms of availability. High-end availability is more than just redundancy; it means nondisruptive operations and upgrades, and being "always online." Beyond previous Symmetrix generations, V-Max provides:

- ◆ Nondisruptive expansion of capacity and performance at a lower price point
- ◆ Sophisticated migration for multiple storage tiers within the array
- ◆ The power to maintain service levels and functionality as consolidation grows
- ◆ Simplified control for provisioning in complex environments

The purpose of this document is to describe some of the key features of the Symmetrix V-Max and to identify specific changes that relate to material presented in the *Choosing a Data Migration Solution for EMC Symmetrix TechBook*. New features for EMC data migration solutions need to be taken into account when deciding on the best migration solution to use. Specifically, new SRDF®, Open Replicator for Symmetrix, and Enhanced Virtual LUN Technology features provide additional data migration options that were not available previously. These enhancements must be understood in order to choose the best migration solution.

Introduction

The purpose of this document is to provide an update to the information presented in the *Choosing a Data Migration Solution for EMC Symmetrix TechBook* that includes all relevant enhancements provided in Symmetrix V-Max systems, Enginuity release 5874, and Solutions Enabler 7.0.

First, Symmetrix V-Max and Enginuity 5874 features will be presented in the summary format used in section 5.3 of the *Choosing a Data Migration Solution for EMC Symmetrix TechBook*.

Next, Symmetrix Remote Data Facility (SRDF) enhancements including SRDF/Extended Distance Protection (SRDF/EDP) and four-site SRDF, will be described. (This information extends the material presented in chapter 6 of the TechBook.)

Then, Open Replicator for Symmetrix enhancements, including support for using TimeFinder/Snap devices as the source devices for a cold push, will be described. Changes in support for TimeFinder/Mirror will also be described. (This information extends the material presented in chapter 7 of the TechBook.)

Next, Virtual LUN technology enhancements, including the ability to change the RAID protection when migrating devices within a Symmetrix V-Max, will be described. (This information extends the material presented in section 8.3 of the TechBook.)

Then, new Solutions Enabler 7.0 commands and enhancements to selected commands will be introduced. (This information extends the material presented in section 9.3 of the TechBook.)

Next, details on how PowerPath Migration Enabler (PPME) works with two additional underlying technologies, hostcopy and SYMCLONE, will be provided. (This information extends the material presented in section 9.2 of the TechBook.)

Finally, a new use case for Virtual LUN technology will be introduced. (This information extends the material presented in chapter 12 of the TechBook.)

Audience

As with the *Choosing a Data Migration Solution for EMC Symmetrix TechBook*, the intended audience for this technical note is storage administrators, system administrators, capacity planners, Chief Information Officers (CIOs), and anyone tasked with determining a data migration solution. Readers are expected to be familiar with the

information presented in the *Choosing a Data Migration Solution for EMC Symmetrix TechBook*.

Symmetrix V-Max summary features

In this section, the Symmetrix and Enginuity model features for the Symmetrix V-Max and Enginuity 5874 are presented in the same summary format used in section 5.3 (Symmetrix product history) of the *Choosing a Data Migration Solution for EMC Symmetrix TechBook*. The intention of this section is to enable quick checking of support for data migration features based on the Symmetrix arrays and Enginuity levels present in the existing and target migration environments.

Symmetrix V-Max SE and Symmetrix V-Max Series



Figure 1 Symmetrix V-Max SE and Symmetrix V-Max systems

Requires Enginuity release 5874

Key hardware features enhancements

- ◆ One to eight V-Max Engines (each includes two directors and up to 64 GB of memory each)
- ◆ All directors have 4 GB/s connectivity
- ◆ Maximum configuration limits (combinations may be limited based on configuration):

- 2 - 16 director boards
- Up to 128 Fibre Channel ports
- Up to 64 FICON ports
- Up to 64 GigE/iSCSI ports
- No ESCON support
- 40-2400 disk drives

Provisioning enhancements

- ♦ Up to 256 GB maximum device size
- ♦ Up to 60 TB maximum meta size
- ♦ New Autoprovisioning device masking methodology using initiator, port, and storage groups
- ♦ RAID-5 data devices supported in thin pools

Business continuance and migration enhancements

- ♦ Enhanced Virtual LUN Technology supports local tiered storage migration between RAID levels
- ♦ Open Replicator support for cold push from TimeFinder/Snap VDEV source devices
- ♦ TimeFinder®/Clone emulation used instead of native TimeFinder/Mirror
- ♦ SRDF®:
 - Increased number of RDF groups – up to 64 per RDF Director; up to 250 per Symmetrix
 - SRDF/Extended Distance Protection (SRDF/EDP)
 - Full RDF connectivity: 5874 to 5874, 5874 to 5773
 - RDF migration only: 5874 to 5671

SRDF enhancements

SRDF/Extended Distance Protection (SRDF/EDP)

Enginuity 5874 introduces SRDF/EDP, an extension of cascaded RDF that uses a new diskless R21 device referred to as a DLDEV. The DLDEV device has no disk storage and temporarily stores writes received from the R1 and owed to the R2 in Symmetrix cache. The R21 DLDEV device must be on a Symmetrix running Enginuity 5874. The R1 and R2 devices can be on a Symmetrix running either Enginuity 5874 or 5773. SRDF/EDP requires an additional license key.

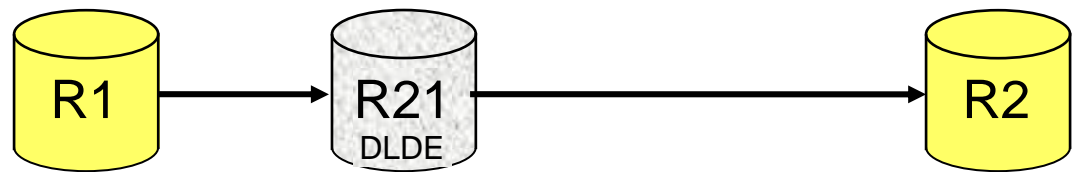


Figure 2 SRDF/Extended Distance Protection

The name “Extended Distance Protection” denotes how the remote R2 is beyond the distance where SRDF/S would be used, yet still contains a replica of the R1 at a lower hardware resource cost than other three-site SRDF solutions. As far as disk storage goes, Extended Distance Protection is effectively a two-site SRDF solution. Using a DLDEV R21 in place of a standard R21 device alters the migration environment requirements and capabilities affecting the options for choosing a data migration solution. A DLDEV R21 device does not require any associated disk storage, thereby freeing up the R21 site Symmetrix from needing that resource. However, DLDEV R21 devices will utilize more cache and cannot support Adaptive Copy Disk Mode on the R21 → R2 leg (Adaptive Copy Write Pending Mode and SRDF/A are supported). In addition, secondary use of the DLDEV R21 device by a host local to the Symmetrix that contains it is not possible because DLDEV devices cannot be presented to a host.

Four-site SRDF data migration

A four-site SRDF configuration can be thought of as a two-site data migration of an existing two-site SRDF configuration to a new two-site SRDF configuration. Previously, customers wanting to migrate an existing two-site SRDF configuration would use concurrent SRDF to replicate (migrate) from the existing source array to the new source array, sever the existing source array pair-to-new source array pair relationships, and then fully replicate between the new source and new target array. During the latter cycle the production data would either be unprotected, or production applications would need to remain down until the new source and target arrays were fully synchronized providing full remote protection. With four-site SRDF data migration, replication from the existing source array to both the new source array and new target array is performed simultaneously. This enables a cutover to the new two-site configuration with minimal application downtime, and with no production data exposure. Four-site SRDF data migration is available as the *Dual-Site SRDF Migration Service* from EMC.

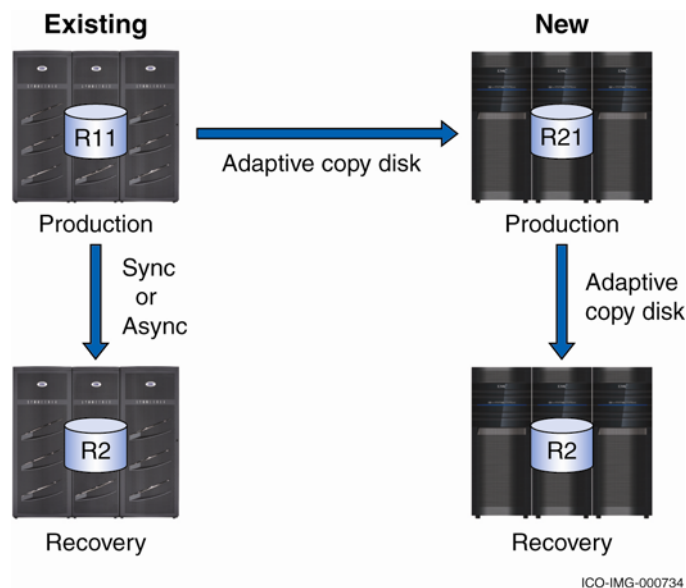


Figure 3 Four-site SRDF data migration

Open Replicator for Symmetrix enhancements

There are a number of enhancements to Open Replicator that may affect the choice of a data migration solution: support for using TimeFinder/Snap virtual devices (VDEVs) as the source devices for a cold push, support for hot or cold pull of AS/400 (iSeries) devices from a remote Symmetrix, and modifications to existing interaction rules with SRDF.

Using VDEVs as source devices for a cold push

When an Open Replicator cold push operation is used to migrate data, usually a point-in-time copy of production devices is created so that the migration can proceed while the production devices are still in use. In the past this copy needed to be a full copy created using either TimeFinder/Clone or TimeFinder/Mirror. With Enginuity 5874, Solutions Enabler 7.0, and SMC 7.0, a TimeFinder/Snap VDEV (Virtual Device) can be used as a source volume instead. Unlike the target devices used to hold a TimeFinder/Clone or TimeFinder/Mirror copy, which must be equal (or greater) in size than the corresponding production data devices, VDEV devices can be significantly smaller. (Best practice is for VDEV devices to consume less than 30 percent of the amount of space needed to store a full copy of the production volumes.) The difference in resource requirements for the point-in-time copy of the

production devices might affect the choice of data migration solution.

Support for pull of an AS400 device from a remote Symmetrix

Prior to Enginuity 5874, Symmetrix devices with an AS400 (iSeries) emulation type were not supported for Open Replicator use. With Enginuity 5874, an AS400 *control* device can be used in an Open Replicator pull operation from a *remote* Symmetrix device. The ability to use Open Replicator for AS400 emulation type devices provides a new choice of data migration when data stored on this type of device needs to be migrated.

Modifications to existing interaction rules with SRDF

Prior to Enginuity 5874 and Solutions Enabler 7.0, certain interactions between Open Replicator and SRDF operations were blocked. If the existing environment required certain SRDF operations to continue unimpeded regardless of Open Replicator operations or would not permit the SRDF link state to change from the RW (Read Write or Ready) state to allow an Open Replicator pull operation, then Open Replicator was not an available choice for the data migration solution.

The following SRDF operations are no longer blocked when an Open Replicator *control* device is in the Created or Recreated state:

- ◆ SRDF establish or resume when the R2 is an Open Replicator *control* device
- ◆ SRDF restore when the R1 is an Open Replicator *control* device

The following Open Replicator operation is no longer blocked when the SRDF link is in the RW state:

- ◆ Open Replicator pull operation

TimeFinder/Mirror support changes in Enginuity 5874

Enginuity 5874 no longer supports native TimeFinder/Mirror operations. However, TimeFinder/Mirror commands scripts are still supported using the TimeFinder/Clone emulation feature. This likely has no effect on the data migration solution chosen. It is possible for there to be some differences in performance because native TimeFinder/Mirror and TimeFinder/Clone work through different mechanisms in the Symmetrix. In general TimeFinder/Clone performance meets or exceeds native TimeFinder/Mirror performance. To reduce the effect on other applications when TimeFinder/Clone copies are made, it may be appropriate to utilize Dynamic Cache Partitioning to limit clone cache use.

Enhanced Virtual LUN Technology

The Symmetrix Virtual LUN technology that enables data migration within an array without host or application disruption has been significantly enhanced in Enginuity 5874. Key enhancements include the ability to:

- ◆ Migrate to a different RAID protection type
- ◆ Migrate leaving all local and remote replication intact
- ◆ Perform Symmetrix control (i.e., replication) operations while a migration is in progress (The Symmetrix configuration file is locked for a much shorter time.)
- ◆ Migrate multiple Symmetrix Logical Volumes (SLVs) in a session
- ◆ Concurrently migrate up to four migration sessions in a single Symmetrix

Solutions Enabler 7.0 provides the new `symmigrate` command and SMC 7.0 provides new wizards to manage Virtual LUN migrations. The enhancements to the Symmetrix Virtual LUN technology make it a potential migration solution in more situations.

For more information reference the *Best Practices for Nondisruptive Tiering via EMC Symmetrix Virtual LUN Technical Note*.

New Solutions Enabler commands

The following two new commands were introduced in Solutions Enabler 7.0:

- ◆ **symaccess** — Administer Symmetrix Masking Views using initiator, storage, and port groups.
- ◆ **symmigrate** — Migrate the physical disk space associated with a Symmetrix device to a different data protection scheme, or to disks with different performance characteristics.

PowerPath Migration Enabler (PPME) enhancements

PowerPath Migration Enabler works with two additional underlying technologies that were not included in the *Choosing a Data Migration Solution for EMC Symmetrix TechBook*. When using either the `hostcopy` or `SYMCLONE` underlying technologies, PPME benefits data migrations in the same three significant ways: by greatly reducing or eliminating application disruption due to the migration, reducing migration risk,

and simplifying migration operations.

PPME host-based copy (hostcopy)

PPME works in conjunction with the host operating system to migrate data from the specified source logical unit to the target logical unit. A hostcopy migration does not use or require a direct connection between the arrays containing the source and target logical units. Hostcopy can be used to migrate plain text data, or it can be used to migrate data to/from an encrypted logical unit. Hostcopy migrations consume host resources similar to Open Migrator/LM, and PPME provides parameters that control host-resource usage, along with operations to pause and resume a hostcopy migration. PPME hostcopy can migrate data at the LUN level, while Open Migrator/LM can migrate data at any level in the I/O stack.

PPME SYMCLONE

PPME SYMCLONE technology refers to the migration of data between devices within a Symmetrix system using TimeFinder/Clone. PPME can be used in this way to nondisruptively migrate data while changing the RAID protection type in Symmetrix DMX™ systems. PPME SYMCLONE can be used when the source and target are of equal size, or when the target is larger than the source. Enhanced Virtual LUN Technology in Enginuity 5874 can be used to perform nondisruptive migrations while changing the RAID protection type (without the need for PPME SYMCLONE).

For more information reference the *EMC PowerPath Migration Enabler User Guide*.

Virtual LUN solution use case

In this use case, the customer wants to migrate a large amount of data within a Symmetrix array from a higher to lower tier as part of their Information Lifecycle Management (ILM) strategy. In their Symmetrix V-Max, the source data resides on tier-1 Fibre Channel 15k rpm RAID-1 protected disks and the desire is to move the data to tier-2 SATA-II RAID-6 protected disks. The application cannot tolerate any downtime.

Simple selection model

Briefly apply the simple selection model:

- a. The migration is within a Symmetrix V-Max array indicating that Virtual LUN technology may provide the best migration solution.

- b. SRDF cannot be used within a single Symmetrix array.
- c. EMC Open Replicator for Symmetrix cannot be used within a single Symmetrix array.
- d. Choice A seems effective, so it is not necessary to use a host based tool.

The next step is to add some of the complexity that may validate this solution selection or require the selection of an alternate solution.

Existing and target environments

Apply the full selection model steps 2-3:

- ◆ Existing Symmetrix V-Max
 - Running Enginuity 5874
 - Data on Tier-1 Fibre Channel 15k rpm RAID-1 protected disks
 - Space available to add additional tier-2 disk capacity
- ◆ Application hosts
- ◆ PowerPath 5.0 is installed, means use of PowerPath Migration Enabler (PPME) possible for zero host downtime
- ◆ Little excess CPU capacity or I/O bandwidth available for migration use
- ◆ Target data location
 - Tier-2 1 TB SATA-II drives added to the configuration of the same Symmetrix V-Max

Business factors

Full selection model step 5:

- ◆ Capital budget sufficient for new tier-2 disk storage
- ◆ Project budget includes Virtual LUN license but no contracted services costs
- ◆ Current allocated space for the application is nearly fully utilized; additional storage is needed very soon
- ◆ ILM strategy: new tier-2 storage must be lower cost and due to aging of the data, will be accessed less often and therefore lower performance is acceptable
- ◆ Application cannot tolerate downtime
- ◆ Local replication (TimeFinder/Clone) already in use to create a copy used for data mining operations

Symmetrix V-Max migration software

Full selection model steps 4 and 6:

- ◆ Virtual LUN technology
 - Fully transparent, nondisruptive data migration between storage tiers and between RAID protection schemes
- ◆ TimeFinder/Clone
- ◆ Available for local data replication within a single Symmetrix array
- ◆ Nondisruptive data copying between storage tiers and between RAID protection schemes
- ◆ No provision for nondisruptive application redirection to data in its new location without PPME
- ◆ Reuse of existing data mining local replication copy would require full synchronization

EMC host migration and migration management software

Full selection model steps 4 & 6:

- ◆ Solutions Enabler 7.0:
 - Includes CLI interface `symmigrate` command for scripting the Virtual LUN migration
 - Includes CLI interface `symconfigure` command to provision the new tier-2 storage
- ◆ Symmetrix Management Console:
 - Includes GUI interface for Virtual LUN migration functionality, and may be used for setup, monitoring, or troubleshooting
 - Includes GUI interface to provision new tier-2 storage
- ◆ PowerPath Migration Enabler (PPME):
 - Supports SYMCLONE as the underlying technology to copy data between tiers within the Symmetrix array
 - Enables zero interruption to the application, providing a method to switch the application target transparently to the application
 - Includes CLI interface for scripting the migration using `powermig`
 - Migration Enabler mirrors I/O to keep the source and target LUNs synchronized throughout the migration process
 - Installation of PPME can also be done without application interruption because PowerPath 5.0 is already installed

Alternate solution summary

Full selection model step 6:

PPME SYMCLONE

Evaluate a potential PPME SYMCLONE solution:

- ♦ Meets criteria of lowering costs, migrating from tier-1 to tier-2 data, and changing the RAID protection scheme within the Symmetrix array
- ♦ Meets criteria for zero application interruption
- ♦ Greater performance impact than a Virtual LUN solution
- ♦ Requires interruption and full synchronization of an existing local TimeFinder/Clone replica

EMC Invista with PPME

Evaluate a potential EMC Invista® with PPME solution:

- ♦ Meets criteria of lowering costs, migrating from tier-1 to tier-2 data, and changing the RAID protection scheme within the Symmetrix array
- ♦ Greater performance impact than the Virtual LUN solution, also impacting the SAN with moving data out and back into the same Symmetrix array
- ♦ Meets criteria for zero application interruption
- ♦ Requires additional capital equipment and contracted services that were not justified by a specific business requirement for virtualization
- ♦ May not be aware of the potential benefits of implementing virtualization, and a discussion for exploring the option is probably worthwhile

Multiple host migration solutions

Evaluate potential host migration solutions:

- ♦ Meets criteria of lowering costs, migrating from tier-1 to tier-2 data, and changing the RAID protection scheme within the Symmetrix array
- ♦ Requires host resource capacity for the migration that is not available

- ◆ Only PPME hostcopy meets the criteria for zero application interruption

Conclusion

The introduction of Symmetrix V-Max systems running Enginuity release 5874, Solutions Enabler 7.0, and SMC 7.0 includes new features for EMC data migration solutions that may effect the choice of the best migration solution. New potential solutions include the use of SRDF/Extended Distance Protection (SRDF/EDP), four-site SRDF, using TimeFinder/Snap devices as the source devices for an Open Replicator cold push, and changing the RAID protection when migrating devices using Enhanced Virtual LUN Technology. Additionally, the ability of PowerPath Migration Enabler (PPME) to work with additional underlying hostcopy and SYMCLONE technologies provides new potential data migration solutions.

This technical note introduced these new options as additions to the data migration selection model presented in the *Choosing a Data Migration Solution for EMC Symmetrix TechBook*.

References

- *Choosing a Data Migration Solution for EMC Symmetrix TechBook*
- *New Features in EMC Enginuity 5874 for Symmetrix Open Systems Environments white paper*
- *Best Practices for Nondisruptive Tiering via EMC Symmetrix Virtual LUN Technical Note*
- *EMC Solutions Enabler Symmetrix SRDF Family CLI Product Guide*
- *SRDF/Extended Distance Protection for Open Systems Feature Sheet*
- *EMC Solutions Enabler Symmetrix Open Replicator CLI Product Guide*
- *EMC Solutions Enabler Symmetrix TimeFinder Family CLI Product Guide*
- *EMC Solutions Enabler Symmetrix Array Controls CLI Product Guide*
- *EMC Symmetrix Enginuity Release Notes (multiple release levels available)*
- *EMC Solutions Enabler Version 7.0 Release Notes*

- *EMC Symmetrix Management Console Version 7.0 Release Notes*
- *EMC PowerPath Migration Enabler User Guide*

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