

Dell EMC PowerMax and VMAX All Flash: GDPS and Advanced Copy Services Compatibility

Abstract

This white paper introduces the Dell EMC™ PowerMax and VMAX™ All Flash optional copy services features of Compatible Peer and Compatible Native Flash for Mainframe. In addition, this paper outlines supported features and provides guidelines on implementation of those features with versions of GDPS.

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Executive summary

In addition to the Dell EMC™ native Symmetrix™ Remote Data Facility (SRDF™) remote copy technologies Dell EMC offers compatibility remote copy features which enable PowerMax and VMAX™ [All Flash arrays](#) to perform many of the same remote copy technologies traditionally available on IBM® DASD subsystems. With these optional features, customers can use PowerMax and VMAX [All Flash arrays](#) transparently in the most widely accepted Geographically Dispersed Parallel Sysplex PPRC and Hyperswap Manager (GDPS™¹) deployments, without any additional Dell EMC software, without modifications to GDPS and enabled for all planned and unplanned actions.

Audience

This white paper is for the following audience:

- Storage architects
- Storage administrators
- System administrators
- Operations staff
- Data center personnel managing VMAX storage arrays within GDPS environments.
- Dell EMC staff and partners managing VMAX storage arrays within GDPS environments

This paper introduces Dell EMC's compatibility features: PPRC, and Compatible Native Flash™ (FlashCopy). It shows how those features are employed with PowerMax and VMAX [All Flash arrays](#) in GDPS deployments. These technologies constitute a significant portion of the foundational technologies of the business continuity solutions of IBM GDPS/HM service offerings.

¹GDPS, GDPS/XRC, GDPS/PPRC, GDPS/GM, GDPS/MzGM, GDPS/GM, GDPS/MGM are trademarks of IBM Corp.

1 Introduction to compatible copy services technologies

Remote copy definition and operation does not require GDPS. However these remote copy technologies are frequently deployed with GDPS, especially when constructed in a business continuity solution. Depending on the particular version of GDPS and its deployment configuration, one or more compatible features are required on a PowerMax and VMAX All Flash array. The following table matches Dell EMC's Compatibility Features with IBM's Remote Copy features and specific GDPS offering.

Common name (official IBM product name)	Dell EMC microcode feature name	GDPS offering
(Metro Mirror – PPRC) PPRC-XD (Global Copy)	Compatible Peer	GDPS Metro/GDPS HM
FlashCopy V2	Compatible Native Flash	All versions of GDPS

1.1 Compatible Peer (PPRC)

Compatible Peer provides synchronous replication and remote copy technology between two volumes in different PowerMax and VMAX [All Flash](#) DASD subsystems. Compatible Peer supports all Metro Mirror (PPRC synchronous) and Global Copy (PPRC/XD) directives as employed by GDPS. Compatible Peer also responds to all PPRC interfaces: TSO commands, Copy Services Manager, TCP-R, ANTRQST API and ICKDSF. Compatible Peer is implemented upon SRDF by enabling the PowerMax and VMAX All Flash to conform to PPRC operations issued over a FICON channel for both planned operations and in response to unplanned events. Compatible Peer is managed entirely by PPRC directives and GDPS; PowerMax and VMAX [All Flash arrays](#) with Compatible Peer require no additional Dell EMC software support for planned or unplanned operations.

Operationally, Compatible Peer supports unplanned GDPS autonomic operations for both FREEZE and HyperSwap^{TM2}. PowerMax and VMAX All Flash arrays with Compatible Peer reports primary DASD Subsystem failures and PPRC secondary write failures to the initiating z/OS enables GDPS to initiate its autonomic operations to ensure continuous availability in the case of HyperSwap or preserve data consistency at the secondary DASD in the case of FREEZE. VMAX arrays also respond to the GDPS directives when unplanned events originate on non-EMC DASD.

To support the preservation of dependent write consistency by automation systems such as GDPS, Compatible Peer supports LCU based CESTPATH's CGROUP(Y) definition. This provides a variable long busy timer setting, notification of a failure to write to secondary DASD to the system initiating the write, and responds to the CGROUP FREEZE and CGROUP RUN directives.

Compatible Peer also supports PPRC synchronous and PPRC/XD operational modes for quick copy operations during initial copy operations or resynchronization following a FREEZE or HyperSwap. Compatible Peer responds to GDPS's CQUERY monitoring of percent copied, enabling GDPS to manage a low impact resynchronization operation.

² HyperSwap is a trademark of IBM Corp.

PowerMax and VMAX All Flash arrays with Compatible Peer support all planned GDPS SCRIPT directives and panel operations. This means no SCRIPT changes are required of existing scripts when replacing existing DASD subsystems with PowerMax and VMAX All Flash arrays.

Compatible Peer's logical PPRC PATHs are defined using transparent path and volume definitions in GDPS/PPRC's GEOPARM. Dell EMC Customer Support can assist customers with the CESTPATH and GDPS/PPRC's GEOPARM link definitions or provide documentation on the definition of the physical links.

Compatible Peer supports the FailOver/FailBack definition of PPRC volumes, an important enabling technology and performance enhancement to quickly enable resynchronization after a FREEZE or HyperSwap.

Compatible Peer supports Split Freeze Policy Definitions (PRIMARYFAILURE and PPRCFAILURE) and enables Enhanced Conditional Freeze Detection.

Support is also provided for PPRC Soft Fence which prevents users from accidentally accessing the original PPRC primary volumes after HyperSwap or PPRC Primary failure. Customers can use IBM's Basic HyperSwap for continuous availability on PowerMax and VMAX All Flash arrays with Compatible Peer along with z/OS and Tivoli Storage Productivity Center for Replication and Copy Services Manager.

When Compatible Peer is used on a PowerMax and VMAX All Flash family array running HYPERMAX OS , support is included for the new zHyperWrite function. The zHyperWrite function is exploited by DB2 and IMS in PPRC environments enabled for HyperSwap to write directly to the PPRC primary and secondary volumes that contain the active log datasets, bypassing PPRC replication for write I/Os and improving response time for this performance critical component of these DBMSs. The zHyperWrite with PPRC HyperSwap Environment must be controlled by GDPS or Copy Services Manager.

1.2 Compatible Native Flash (FlashCopy V2)

Compatible Native Flash provides "point in time" copy technology between two volumes in the same PowerMax and VMAX All Flash array and is Dell EMC's implementation of FlashCopy. FlashCopy is typically deployed to provide point-in-time copies either to preserve disaster recovery readiness during resynchronization, as a capability for testing disaster recovery operations in parallel with production remote copy or as capacity for actual disaster recovery operations. FlashCopy is frequently deployed in GDPS/PPRC implementations and in almost all GDPS/XRC implementations.

With Compatible Native Flash installed and configured on PowerMax and VMAX All Flash DASD subsystems FlashCopy relationships are simply defined in the GDPS GEOPARM. No Dell EMC-specific software is required for Compatible Flash's definition or operation.

Also, with PowerMax and VMAX All Flash Virtual Provisioning technology, a thin device (TDEV) can be defined as space efficient and used with any application without compromising performance or exhibiting the limitations of Space Efficient FlashCopy.

Remote Pair FlashCopy^{TM3} is also supported in Compatible Native Flash with Compatible Peer. Remote Pair FlashCopy (Preserve Mirror) provides support for dual FlashCopy relationships between primary PPRC FlashCopy devices and secondary PPRC FlashCopy devices. This support allows mirroring to continue in full duplex state while performing FlashCopy operations. It also maintains HyperSwap availability in GDPS/PPRC

³ Remote Pair Flashcopy is a trademark of IBM Corp.

environments, enabling customers to have greater choice in their storage purchases, as well as to implement a true two-vendor strategy.

Remote Pair FlashCopy helps to reduce bandwidth requirements and data movement across the links for improved performance and resiliency in addition to maintaining PPRC's duplex state during FlashCopy operations. Remote Pair Flashcopy is only supported between two PowerMax and VMAX All Flash pairs, and not between VMAX running Enginuity 5876. It is not available for a pair where one side runs Enginuity 5876 and the other HYPERMAX OS 5977 or later. Remote Pair Flashcopy on PowerMax and VMAX All Flash family arrays is only available at HYPERMAX OS 5977.811.784 or later.

Using Compatible Features with IBM's GDPS Business Continuity Solutions:

GDPS is a suite of licensed software and implementation services offered by IBM to manage business continuity. It is built on top of and extends the functionality of native remote copy technology. There are several variants of GDPS that provide a framework and manage the different remote copy technologies (PPRC, XRC, FlashCopy and Global Mirror) and their implementation over different topologies. VMAX All Flash Arrays can always be deployed in GDPS/PPRC AND GDPS/Hyperswap Manager offerings.

GDPS implementations are solutions with many deliverables involving sysplex operations, sysplex definition, z System processor definition, LPAR definition, BCPII configuration, z/OS automation, inter-site connectivity and DASD storage. They are multi-disciplinary implementations undertaken by a team of subject matter experts, usually under the direction of an experienced solutions architect who has implemented GDPS previously. Dell EMC's implementation role is confined directly to the PowerMax and VMAX All Flash DASD subsystem and those issues relevant to the implementation of operations related to storage and remote copy operations, such as:

- Configuration
- Connectivity
- Feature implementation
- Definition of VMAX arrays to GDPS,
- Field support and problem determination related to VMAX DASD subsystems and the remote copy.

1.3 GDPS/Hyperswap Manager

Deployment of PowerMax and VMAX All Flash arrays in GDPS/HyperSwap Manager requires:

- Activation of the Compatible Peer feature⁴ on paired PowerMax and VMAX All Flash systems
- SRDF FCP linkage⁵ between the PowerMax and VMAX All Flash DASD subsystems for PPRC remote copy
- FICON connectivity between the production systems and PowerMax and VMAX All Flash DASD subsystems
- Definition of GDPS/PPRC UTILITY devices in all LCUs with volumes remotely copied by PPRC.

GDPS/PPRC requires consistent deployment of the FREEZE GROUPs, non-FREEZE GROUPs, local DASD for GDPS-K systems (not remotely copied), limited sharing of DASD outside the sysplex and PowerMax and VMAX All Flash device addressing for HyperSwap. In addition, GDPS/PPRC requires specific connectivity

⁴ RDF linkage in a HyperSwap can utilize direct connectivity.

and IO GEN definition. PowerMax and VMAX All Flash arrays with Compatible Peer satisfy all these requirements, including HyperSwap's employment of alternate sub-channel support.

PowerMax and VMAX All Flash DASD subsystems are included in the GDPS/PPRC policy by defining the PPRC logical paths, PPRC volume pairing, any optional FlashCopy relationships and the un-mirrored GDPS/PPRC Utility Devices in the GDPS/PPRC GEOPARM.

Compatible Peer supports only CKD DASD and control is supported only from a FICON host channel interface.

Non-Disruptive State Save (NDSS) requests are supported by the PowerMax and VMAX All Flash arrays. NDSS is intended for capturing diagnostic information on demand within the VMAX when certain problems occur in GDPS/PPRC environments.

PowerMax and VMAX 950 All Flash Arrays also support PPRCSUM, for summary event notification on error conditions to reduce message traffic, and Storage Controller Health Messages for PPRC link status change notifications in a GDPS environment.

1.4 Unsupported GDPS architectures

Dell EMC has not implemented a compatible Global Mirror feature. Consequently, PowerMax and VMAX All Flash arrays do not support the Global Mirror based solution GDPS/GM nor its 3-site implementation GDPS/MGM. Similarly, the PowerMax and VMAX All Flash does not support z/OS Global Mirror (formerly XRC) and as a result cannot be deployed in a GDPS/XRC or GDPS/MzGM environment. While PowerMax and VMAX All Flash do support Metro Mirror (PPRC), there is no support at this time for Multi Target Metro Mirror, and hence no support for the GDPS/Metro (dual leg) service offering.

2 Dell EMC commitment to compatibility features

In addition to the hardware development efforts, Dell EMC has made significant investments to ensure successful implementation of the PowerMax and VMAX All Flash family of arrays with compatibility features.

2.1 Implementation of new features (May 2017)

Dell EMC licenses from IBM the 2107 Attachment Specification which includes FICON features such as HyperPAV, zHPF and zHyperWrite as well as Advanced Copy Services features. Dell EMC provides full support for zHPF and is committed to full channel compatibility. Dell EMC implements Advanced Copy Services features based on market acceptance and customer demand.

As an example, Query Host Access (QHA) CCW support was added with HYPERMAX OS 5977 and PowerMax and VMAX All Flash arrays. QHA is used to determine if a device has active FICON path groups and is exploited by several host applications including GDPS and the ICKDSF utility parameter VERIFY OFFLINE to check for LPAR access before initializing a volume. zHyperwrite compatibility has been implemented to enable DB2 and IMS to bypass PPRC replication in a HyperSwap enabled environment.

2.2 Implementation of new features (2018)

Dell EMC software continues to be enhanced to ensure FlashCopy and further channel compatibility. Dell EMC now supports multiple incremental FlashCopy operations. Previously IBM only allowed one incremental FlashCopy relationship per device and Dell EMC software would honor that limitation. Now that FlashCopy supports multiple incremental relationships per source volume, Dell EMC will now support this new functionality.

For channel compatibility, Dell EMC now supports SuperPAV. SuperPAV extends HyperPAV to include the ability to share PAV aliases across logical subsystems. This logical progression is derived from previous PAV functionality (StaticPAV, Dynamic PAV, HyperPAV and now SuperPAV). The benefit is that this feature should reduce total alias volumes addresses. With the reduction of alias volumes addresses, customers can now dedicate more addresses to their base volumes.

3 Conclusion

If your choice is the traditional Advanced Copy Services PPRC, XRC and FlashCopy, with or without GDPS, Dell EMC can help with your implementation with the family of arrays and optional features.

PowerMax and VMAX All Flash arrays with optional features provide a dependable solution supporting GDPS/PPRC and GDPS/HM implementations. When customers buy PowerMax and VMAX All Flash with compatible features they can expect not only compatible operations, but in addition they enjoy:

- Innovation with PowerMax and VMAX All Flash arrays: particularly with regards to the management of tiered solutions and Failover/Failback operations.
- A comprehensive Virtual Provisioning solution with built-in space efficiency which is not restricted to use as a FlashCopy backup target.
- Investment protection: PowerMax and VMAX All Flash arrays with compatible features supports GDPS operations without any changes to GDPS's SCRIPTs, policies or panels.
- Choice: with the licensing of the compatible features you also enjoy licensing for Dell EMC's native replication technologies and the two technologies can run side-by-side within the same array.

For additional information regarding compliant PowerMax and VMAX All Flash models, configurations and Engenuity/HYPERMAX OS release level pre-requisites please consult the Dell EMC Support Matrix or contact your local Dell EMC representative.

A Technical support and resources

[Dell.com/support](https://www.dell.com/support) is focused on meeting customer needs with proven services and support.

[Storage technical documents and videos](#) provide expertise that helps to ensure customer success on Dell EMC storage platforms.