

## **IBM GDPS versus EMC's newly announced GDDR** Josh Krischer

*Josh Krischer is an expert advisor with 37 years of experience in high-end computing, storage, disaster recovery, and data center consolidation. While currently working as an independent analyst, he was a Research Vice-President at Gartner, covering enterprise servers and storage from 1998 until 2007. During his tenure at Gartner he exclusively covered GDPS and storage-subsystem-based remote copy technologies and lectured on these subjects at many worldwide IT events, including Gartner conferences and symposia, industry and educational conferences, and major vendor events.*

On 12<sup>th</sup> February 2007, at the SHARE conference in Tampa, Florida, EMC announced the EMC<sup>®</sup> Geographically Dispersed Disaster Restart (GDDR) Solution as a solution for automated disaster recovery with EMC's Symmetrix DMX storage subsystem. EMC positioned GDDR as directly competitor to IBM's GDPS<sup>®</sup> a solution which IBM has been delivering for almost a decade and which has more than 360 installations in production in 32 countries.

### **IBM's GDPS**

GDPS is a multi-site application availability solution with fast recovery time and highly automated control. It manages application availability in and across sites for both planned maintenance and unplanned situations such as site failure or full-blown disaster. GDPS was initially designed for mainframe z/OS systems, but with continuous development was later enhanced to support select open systems platforms, as well.

GDPS is a 'product' which a customer licenses and deploys thru IBM Global Technology Services (formerly IGS). Once the installation and testing are completed the customer is self sufficient in operation, modifications, configuration changes, updates etc.. GDPS includes resource sharing, data-sharing, workload balancing and certain aspects of continuous availability which are provided by the Parallel Sysplex clustering technology, and data mirroring for data availability. There are several versions of GDPS, including the following two-site implementations:

- GDPS/PPRC, which is based on IBM PPRC (Peer-to-Peer Remote Copy, synchronous) technology. This implementation has been available since November 1998.
- GDPS/XRC, which is based on IBM XRC (Extended Remote Copy, Asynchronous– software based remote copy) technology. This implementation has been available since November 2000.
- GDPS/PPRC HM supports IBM HyperSwap Technology. This implementation has been available since February 2005.
- GDPS/GM is a GDPS version using IBM Global Mirroring asynchronous remote copy technology. This implementation has been available since October 2005.
- GDPS/MzGM capability, based upon Metro Mirror and z/OS Global Mirror (formerly XRC), as three site capability since November 2000.

A full, hardware remote copy, three-site GDPS implementation was available in June

2006. Called GDPS/MGM, the three-site implementation leverages two types of storage array remote based mirroring technologies from IBM: Metro Mirror (formerly PPRC) and Global Mirror.

The most commonly used GDPS implementation is GDPS/PPRC, which includes Parallel Sysplex, PPRC-compatible remote copy and automation technology. Key functions of GDPS are to maintain data consistency and data integrity. If data is not consistent at the recovery site, a time-consuming recovery is usually required, which could take days. Also, resolving data conflicts and reconciling the status of key information can further delay recovery.

Data consistency in synchronous remote copy has been widely misunderstood by vendors and users. Early versions of IBM PPRC used an attribute called "CRIT Yes/No," which, if set to yes, would stop critical applications upon error detection. The CRIT attribute was an abbreviated indication of "critical" meant to identify data related to business-vital applications. A comparable function in EMC's SRDF replication software was called "Domino Effect." Because these functions didn't work as expected for both common and critical errors, they were considered impractical and seldom used. To ensure data consistency related to "rolling disasters" both IBM and EMC developed more specialized techniques such as "Consistency groups", which include all volumes related to a specific application and new commands, such as "RUN/FREEZE. EMC, to become PPRC compatible and to enable its storage participation in GDPS subsequently licensed these command's specifications from IBM.

These functions may suspend remote copy operations of "consistency group (s)" upon detections of errors in connection with the secondary subsystems in order to preserve data consistency. To ensure fast recovery, the analysis and suspension (freezing) should be automated; therefore, automation is one of the vital parts of IBM GDPS. Upon detection of a potential disaster, GDPS executes the data mirroring "freeze" policy which was chosen by the customer, and, based on a policy that has been set, quiesces the applications at the primary site and starts them at the recovery site.

IBM GDPS is agnostic to disk storage subsystems, as long as they support the required levels of PPRC and XRC architectures compatibility, which means that any of the high-end subsystems from EMC, Hitachi Data Systems, HP, IBM and Sun/StorageTek can participate individually or in mixed configurations. In addition to disk storage subsystems, GDPS also supports Peer-to-Peer Virtual Tape Server (PtP VTS) tape virtualization technology. In addition to these features GDPS has numerous other capabilities, detailed as follows:

### **Open LUN management**

GDPS evolved from mainframe disaster recovery automation to data center automation. Many applications may use multiple platforms such as SAP with a mainframe-resident database and the application on another platform. In such cases mainframe disaster recovery is not sufficient to provide robust end-to-end business continuity.

Recent PPRC architecture updates allow System z to issue PPRC commands against Open System LUNs and it includes the capability for the disk subsystem to report mirroring errors via SNMP traps. The GDPS/PPRC Freeze function is implemented both for mainframe volumes, as well as for LUNs on other platforms, ensuring cross-platform

data consistency for “hybrid” applications with data dependencies. GDPS/PPRC Open LUN management capability allows PPRC management for both System z and other data platforms from a single point of control, providing a complete disaster recovery solution for applications that span heterogeneous systems.

### **GDPS/PPRC Multiplatform Resilience for Linux for System z (a.k.a. xDR)**

xDR expands GDPS/PPRC functionality to Linux for System z and provides disaster recovery for customers with distributed hybrid applications that span z/OS and Linux for System z (e.g., WebSphere ). This is an important capability because Linux for System z continues to gain popularity among mainframe users. Currently more than a thousand mainframes have Integrated Facility for Linux (IFL) engines installed.

### **HyperSwap function**

The HyperSwap function is probably the most important business continuity and availability improvement for IBM mainframes. While disasters seldom occur in reality, disk subsystem failures are far more likely. In current integrated and complex application environments – assuming a highly available data-sharing Parallel Sysplex environment – disk becomes a single point of failure for the entire Sysplex. The HyperSwap function, which is used by multiple GDPS solutions, is controlled by GDPS automation. Use of HyperSwap can eliminate an outage caused by planned maintenance or disk failure by reducing the time needed to switch disks between sites to a matter of seconds and allowing the primary site to use the secondary site disk storage subsystems.

### **Capacity Back-UP (CBU)**

A best practice in mainframe disaster recovery planning is to purchase provision of additional processors, which can be activated in an emergency to compensate for lost capacity. This option enables business-critical applications to run with appropriate service levels without up-front investment for “spare” capacity. GDPS can automatically activate the CBUs in case of a disaster.

### **Peer-to-Peer Virtual Tape Server (PtP VTS) support**

In many cases there is a correlation between the data on disk and on tape. If an event occurs that triggers all disk secondary subsystems to be frozen, then all PtPVTS systems in the tape “Freeze Group” will also suspend their remote copy operations. This ensures data consistency across both disk and tape.

### **Management of “other”- System z Operating Systems**

GDPS can now manage other System z production operating systems, such as, Linux for System z, z/VM, and VSE/ESA. The operating systems must run on servers that are connected to the same Hardware Management Console (HMC) Local Area Network (LAN) as the Parallel Sysplex cluster images.

### **GDPS enhanced recovery support**

GDPS/PPRC V3.3 features an enhancement that significantly reduces recovery time by ensuring that data on the secondary disk storage subsystems and the Coupling Facility (CF) structures are time-consistent. Prior to the V3.3 release, GDPS discarded all CF structures at the secondary site when restarting workloads. This resulted in a temporary loss of “changed” data in CF structures and required time to restore the lost CF data.

This functionality, also called “CF structure duplexing,” is a pre-requisite to GDPS enhanced recovery support and is especially significant for customers using DB2® data sharing, IMS(TM) with shared DEDB/VSO, or WebSphere® MQ shared queues.

**GDPS/PPRC 3.4 (31<sup>st</sup> March 2007) major enhancements:**

- New HYPERSW RECOVER command greatly simplifies the procedure for making the secondary disks usable following a freeze event.
- Multiplatform Resilience for System z (xDR) extensions - the Multiplatform Resilience for System z (xDR) capability has been extended to support Linux for System z images running native in a System z LPAR using CKD disks.
- The GDPS/PPRC operator interface has been modernized by deploying Web Graphical User Interface (GUI) which improves operator productivity.
- Additional enhancements to GDPS/XRC, GDPS /GM and GDPS/MGM.

**EMC’s Geographically Dispersed Disaster Restart (GDDR)**

The objective of the newly announced GDDR is similar to that of the GDPS: providing automated failover and restart operations in multi-site IBM mainframe environments. EMC’s GDDR is a software package that can be licensed and installed by an end-user, however, EMC strongly recommends using professional services for implementation and customization. GDDR supports only the last two generations of EMC’s high-end storage subsystem: DMX-2 and -3 series. GDDR features AutoSwap, which is similar to IBM’s HyperSwap feature.

In its product announcement, EMC claims that:

*“GDDR software is faster to deploy, easier to manage and up to 50% less expensive than existing solutions. Competitive offerings typically require lengthy planning processes, complex custom scripting, extended debug and test periods, and expensive, long term service contracts.”*

In one presentation, EMC states the cost of an average two-sites GDDR installation at \$750,000 and contrasts it with the price of \$ 2,000,000 for a comparable GDPS installation. Another benefit of GDDR mentioned by EMC is the support of multiple Sysplex(es) in the three-site configuration.

As opposed to GDPS, which is well documented, EMC has been hesitant so far to publish detailed technical specifications for GDDR, so the information in the following two paragraphs has been extracted from available public information.

GDDR is built as a CA-OPS/MVS application which provides intersystem communication and event monitoring services (message traffic). Unicenter CA-OPS/MVS Event Management and Automation enables users to automate operations from a single point of control and analyze system events and status. It also provides automation controls for messages, commands, policies, procedures, and recovery. GDDR uses IBM Hardware HMC Application Programming Interface (API) communication with the production systems, interaction with operating systems to start/stop workloads and IPLing the

systems. As statement of direction EMC mentioned future automated activation of CBUs.

Currently GDDR supports two and three sites configurations. Two sites connected by Symmetrix Remote Data Facility/Synchronous (SRDF/S) and three sites connected by SRDF/S and Symmetrix Remote Data Facility/Asynchronous (SRDF/A) in an SRDF/Star configuration. SRDF/S and SRDF/A are EMC's respective technologies for synchronous and asynchronous remote copy. SRDF/Star provides multi-site business continuity protection by allowing concurrent SRDF/S and SRDF/A operations from the same source volumes with the ability to incrementally establish an SRDF/A session between the two remote sites in the event of a primary site outage.

### **EMC GDDR versus IBM GDPS**

In order for a new product to compete effectively with an established, proven solution, it must deliver unique and meaningful functionality or it must deliver acceptable functionality at significant cost savings. It does not seem that EMC's GDDR is fulfilling either promise.

The biggest difference between IBM GDPS and EMC GDDR is that the latter supports only the last two generations of EMC's Symmetrix DMX disk subsystems, as opposed to IBM GDPS, which supports any mainframe-compatible subsystem, either singularly or in mixed configurations. There are very few "DMX only" mainframe data shops, which means that the sales potential of the product could be quite limited. With limited product success, the prospectus for GDDR development could be grim. By contrast, IBM GDPS is not only widely deployed, but also continuously developed, with new releases coming every year, at the end of March (e.g. see above, the March 31, 2007 enhancements).

One of EMC's strongest arguments in prompting the GDDR is the lower price compared to IBM GDPS; however the comparison that EMC presented is far from being realistic. According to IBM a typical average price for full two-site configuration of GDPS/PPRC is \$580K-640K and includes the license & implementation hours. An average annual maintenance fee is approximately \$20,000 (U.S.), which is significantly lower than the typical 15 to 20 percent of the initial sales list price. The EMC solution price of \$750,000 (U.S.) quoted in the EMC press release is potentially higher than IBM's pricing for a typical deployment, not 50 percent lower as EMC claims. Additional pricing aspect that should be considered is the price of the storage subsystems. Experience indicates that users purchasing from one storage vendor can pay on average double or more the average market price. For an average data center the price difference can be several millions dollars in the period of four to five years.

Also the current inability to activate the "sleeping" CBUs may have financial impact on users requiring fast, automated recovery, forcing them to buy extra (potentially un-used) capacity at the recovery site instead of paying a significantly lower price for CBU provision. CBU provision is between 5 and 10 percent of processor price.

Compared with IBM GDPS, which supports all mainframe operating systems, including z/OS, Linux for System z, z/VM, and VSE/ESA, EMC GDDR supports only z/OS, which



potentially limits the sales opportunities for the product. EMC GDDR also does not support Virtual Tape Servers, which are popular among mainframe users. Additionally, GDDR does not support CF structure duplexing which is key to Recovery Time Objectives (RTO) reduction, as explained previously.

It is important to note that EMC's claims that GDDR software is faster to deploy and easier to manage have not yet been field-validated. So far, EMC has presented only one reference customer. Additionally, EMC's claim that GDDR is customer-installable (compared to IBM's GDPS, which requires IBM Global Technology Services) is not consistent with its strong recommendation to use GDDR implementation and customization services. GDPS is serviced by IBM only, which owns both the operating system and the GDPS software. In contrast, GDDR may require cooperation between EMC (the GDDR owner), IBM (the operating system owner) and Computer Associates (the CA-OPS/MVS owner). This cooperation may lead to "finger pointing" and complicated co-ordination situations when disaster strikes and recovery does not work as planned.

### **Three-site configuration**

This section applies solely to pure IBM or EMC configurations. Both EMC GDDR and IBM GDPS support three-site configurations (terminology for EMC is "Star" and for IBM "GDPS Metro/Global Mirror" or GDPS/MGM –a.k.a multi-target GDPS) however, there are differences in the asynchronous remote techniques used by each vendor. EMC SRDF/A keeps modifications (writes) in a cache and periodically transfers the information in consistent data groups called "delta sets" to the secondary site. The interval between successive delta set transfers is usually set to the default value of 30 seconds. This keeps the secondary copy a maximum of 60 seconds (two delta sets) behind the primary copy.

SRDF/A sends only the final set of information at the end of the "capture delta set" process by implementing a so called "write folding" process. The effectiveness of the write-folding technique on reducing the required bandwidth depends on the locality of reference and the application.

Unlike EMC SRDF/A, IBM Global Mirror does not collect the modifications in cache, but uses its "track bit map" technique. To minimize Recovery Point Objectives (RPO) IBM Global Mirror transmits groups of consistent data to the secondary site every few seconds. IBM claims the average lag time is in the range of three to five seconds, which is shorter than EMC SRDF/A. Because SRDF/A is keeping the modifications in cache, the Symmetrix DMX may need more cache to keep cache hit ratios and performance within acceptable ranges, in particular during periods of heavy write workloads. EMC's Symmetrix DMX cache is fully mirrored as opposed to having separate Non-Volatile-Storage (NVS), as featured in IBM's high-end storage subsystems. IBM storage subsystems automatically adjust the frequency of the updates at the remote site.

A benefit of EMC SRDF/A is the mode change feature that allows a link to be dynamically switched between synchronous and asynchronous modes. Instead of suffering performance penalties resulting from synchronous mode (EMC SRDF/S), the remote copy function can automatically switch to asynchronous mode (SRDF/A) and

may return to synchronous mode without full-volume resynchronization. This automatic mode change can occur only if the distance between the sites does not exceed the limits of the synchronous remote copy. However, this is seldom the case with three-site configurations where the planners want to locate the third site out of the region.

**Market Impact Forecast**

Any competition, even if not delivering the same functionality, can be positive for end-users. EMC's claims against IBM GDPS requiring complex custom scripting and extended debug and test periods is in fact a benefit of IBM Global Technology Services (GTS) service and not a disadvantage. The backing of GTS is an endorsement that IBM GDPS is a robust, proven solution. Any user investing in such disaster recovery scheme needs assurance that it will work when required. EMC GDDR is lacking many of the functions that IBM GDPS delivers today, although it could benefit from EMC's formidable marketing prowess. EMC's efforts to market GDDR could pave the road for IBM to sell more GDPS, similar to the situation in the nineties when IBM, through the marketing campaign of PPRC and XRC, drew attention to disaster recovery needs, which EMC leveraged to its own advantage with SRDF.