GDPS® Update & Implementation

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Session 6876

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IBM Corporation
Agenda

- What is GDPS?
- Continuous Availability of Data (single site) & Metro Distance Continuous Availability / Disaster Recovery (two sites)
- Extended Distance Disaster Recovery (two sites)
- Continuous Availability and Disaster Recovery (three sites)
- Application End-to-End Continuous Availability / Disaster Recovery
- GDPS 3.7 Update
- Summary
What is GDPS?
Disruptions affect more than the bottom line …

… with enormous impact on the business

- Downtime costs can equal up to 16 percent of revenue
- 4 hours of downtime severely damaging for 32 percent of organizations
- Data is growing at explosive rates – growing from 161EB in 2007 to 988EB in 2010
- Some industries fine for downtime and inability to meet regulatory compliance
- Downtime ranges from 300–1,200 hours per year, depending on industry

Aspects of Availability

High Availability
Fault-tolerant, failure-resistant infrastructure supporting continuous application processing

Continuous Operations
Non-disruptive backups and system maintenance coupled with continuous availability of applications

Disaster Recovery
Protection against unplanned outages such as disasters through reliable, predictable recovery
Best D/R practice is blend tiers of solutions in order to maximize application coverage at lowest possible cost. One size, one technology, or one methodology does not fit all applications.

RPO = Recovery Point Objective - how much data to recreate?
RTO = Recovery Time Objective - how long being without service?
What is GDPS?

- Integrated / Automated solution
- Manages application and data availability in and across sites
  - Monitors systems, disk & tape subsystems
  - Manages planned and unplanned activities
    - System/disk maintenance / failure
    - Site maintenance / failure
- Builds on proven high availability technologies
  - Clustering
  - Remote copy (disk and tape)
  - Automation
- Easy to use interface
  - Intuitive panel interface
  - Simple scripting
GDPS Policy Based Automation Actions

- D/R team dependencies?
  - Network connectivity
  - Travel to D/R site
- Remove systems from Sysplex
- Perform disk reconfiguration
- Perform tape reconfiguration
- Perform CF reconfiguration
- Perform CDS reconfiguration
- Perform Capacity Backup & On/Off Capacity On Demand Activation.
- Shut down discretionary workload on Site 2

- Modify activation profile on HMC
  - Target server
  - IPL Address
- IPL Prod LPARs
- Respond to NIP messages
- Initiate application startup
The right level of business continuity protection for your business – 
**GDPS family of offerings**

- **GDPS®**: An end-to-end disaster recovery solution to enable:
  - Automated recovery removes people as Single Point of Failure
  - A single point of control across enterprise

### Continuous Availability of Data Within a Data Center
- Single Data Center
- Applications remain active
- Near-continuous availability to data
- **GDPS/PPRC HM**

### Continuous Availability / Disaster Recovery Metropolitan Region
- Two Data Centers
- Systems remain active
- Automated D/R across site or storage failure
- No data loss
- **GDPS/PPRC HM GDPS/PPRC**

### Disaster Recovery at Extended Distance
- Two Data Centers
- Automated Disaster Recovery
- “seconds” of Data Loss
- **GDPS/GM GDPS/XRC**

### Continuous Availability Regionally and Disaster Recovery Extended Distance
- Three Data Centers
- Data availability
- No data loss
- Extended distances
- **GDPS/MGM GDPS/MzGM**
Continuous Availability of Data (Single Site) or Metro Distance Continuous Availability & D/R Protection (Two Sites)
GDPS/PPRC HyperSwap: Near Continuous Data Availability

- Designed to provide continuous availability of data for System z
  - Facilitated by new PPRC microcode functionality and z/OS® IOS code

- GDPS/PPRC HyperSwap™ is:
  - Integration of very fast swapping of PPRC’d disk subsystems with z/OS, System z hardware, and GDPS
  - Switching to alternate copy of System z data can be accomplished in seconds to minutes
  - Supported on Synchronous PPRC

- Intended benefits:
  - Designed to offer continuous availability of data
    - Disk maintenance
    - Site maintenance
    - Data migration
    - Disk failure
    - Site failure
  - Fast and scalable System z Enterprise Data Center swap: scales to very large configurations
  - Repeatable, reliable, confident recovery: No operator interaction, GDPS automation managed

Source: IBM Market Intelligence
What is GDPS/PPRC? (Metro Mirror)

- Multi-site base or Parallel Sysplex environment
- Remote data mirroring using PPRC
- Manages unplanned reconfigurations
  - z/OS, CF, disk, tape, site
  - Designed to maintain data consistency and integrity across all volumes
  - Supports fast, automated site failover
  - No or limited data loss - (customer business policies)
- Single point of control for
  - Standard actions
    - Stop, Remove, IPL system(s)
  - Parallel Sysplex Configuration management
    - Couple data set (CDS), Coupling Facility (CF) management
  - User defined script (e.g. Planned Site Switch)
  - PPRC Configuration management

Planned and Unplanned exception conditions
Extended Distance Disaster Recovery (Two Sites)
What is GDPS/XRC? (z/OS Global Mirror)

- Virtually unlimited distance
- Multi-Storage Vendor
- GDPS manages remote copy
  - Extended remote copy (XRC)
  - Asynchronous
  - Minimal (seconds) data loss
- Failover initiated by user

GDPS/XRC manages:
- XRC failover automation
- FlashCopy, CBU, PtP VTS

GDPS 3.6 Updates (z/OS, zVM & zLinux Data)
- Multiple Reader Support
- Extended Distance Ficon
- GDPS/MzGM w/HyperSwap IR
- SDM Mips offloaded to zIIP Engines

Once initiated, failover is totally automated
- Recovery of secondary disks
- Activation of CBU
- Reconfiguration of the recovery site servers
- Restart of production systems in the recovery site

Writes time-stamped and sorted before committed
What is GDPS/GM? (Global Mirror)

- z/OS and open systems data
- K-sys activities
  - Manages multiple Global Mirror sessions
  - Sends device info, scripts, alerts to R-sys
- R-sys activities:
  - Secondary disk recovery, CBU activation, activate backup LPARs, IPLs systems.

GDPS K-sys
GDPS R-sys
Capacity Back Up (CBU)
Discretionary

Global Mirror over Unlimited Distance
Continuous Availability and Disaster Recovery (Three Sites)
Cascading vs Multi-target Configurations

GDPS/MGM (Cascading: A->B->C)
GDPS/PPRC

Comments
- No data loss
- System z & distributed
- Scalable bandwidth (trade-off RPO)
- A to C network connectivity required for IR
- If A fails, A restarted in B and DR maintained
- If B fails, reconfig needed to restore DR

GDPS/MzGM (Multi-target: A->B, A->C)
GDPS/PPRC

Comments
- No data loss
- Multi Storage Vendor
- System z only
- Peak bandwidth (no RPO impact)
- B to C network connectivity required for IR
- Mitigates system logger overhead (XRC+)
- Maturity
- If A fails, A restarted in B and reconfig needed to restore DR
- If B fails, no reconfig needed to restore DR
GDPS/MzGM w/HyperSwap Incremental Resync

- Incremental resync B → C if Site1 or A-disk fails
- Maintains disaster recovery position
- **Improved RTO**

Optional: CFs / Prod systems in Site2

**Recommended for FlashCopy**
Heterogeneous Platform Extensions
xDR Overview

• Extends GDPS to support not only z/OS but also Linux on System z
  • Disk error detection
  • Heartbeat for sanity checks
  • Re-IPL in place
  • Coordinated Site Takeover
  • Coordinated HyperSwap

• Requires:
  • GDPS
  • System Automation for Multiplatforms
  • Linux
    • SLES or RHEL if running as guest under z/VM
    • SLES if running native in its own partition
  • VM, if Linux is running on z/VM
Continuous Availability for z/OS and Linux for System z

Linux on System z can also run natively in its own partition

Coordinated recovery for planned unplanned events z/OS and Linux for System z
Evolution of an Enterprise wide solution

Single Unix/Linux/Win Server

Cluster

Site 1

Site 1

Parallel Sysplex

Single System z

GDPS

System z

Site 1

Site 2+

Site 1

Site 1

Site 1

Site 2+

Enterprise wide solution

GDOC

Open Systems

IBM-AIX, Sun-Solaris, HP-UX, Linux, Windows

IP Network

IP Network

Disk

Disk

Disk

Disk

Evolution of an Enterprise wide solution
GDPS and GDOC Integration

- Geographically Dispersed Open Clusters (GDOC)
  - Multi-vendor solution, runs on Unix, Linux, VMWare, and Windows
  - Disk independent (HW or SW mirroring)
  - Central point of control
    - Planned and unplanned site switch
    - Monitoring, Testing
  - Includes IBM integration, consulting and project management
  - Leverages Veritas Cluster Server (Symantec)

- GDPS and VCS ~ DCM
  - Coordinated recovery across System z and open
  - Data replication management
  - Automated server management
  - Workload management
  - Recovery management

GDPS/XRC
GDPS/PPRC
GDPS Distributed Cluster Manager (DCM) for VCS

- **GDPS/PPRC + GCO VCS-managed synch replication for distributed servers**
  - Enables cross-platform communication between System z™ and non-System z systems (IBM-AIX, SUN-Solaris, HP-UX, Linux, VMWare, Windows)
  - Offers coordinated site switch for planned and unplanned outages
  - VCS can detect incidents and notify GDPS
    - DCM related failures
    - GDPS issues takeover prompt depending on policy and manage failover

- **GDPS/XRC + GCO VCS-managed async replication for distributed servers**
  - Enables cross-platform communication between System z™ and non-System z systems (IBM-AIX, SUN-Solaris, HP-UX, Linux, VMWare, Windows)
  - Offers coordinated site switch for planned and unplanned outages
  - GDPS/XRC can issue a takeover prompt
    - DCM related failures
    - XRC suspension events
  - Potential reduction of problem determination time thus reducing total RTO

- **GDPS/GM + GCO VCS-managed async replication for distributed servers**
  - Enables cross-platform communication between System z and non-System z systems (IBM-AIX®, SUN-Solaris, HP-UX, Linux®)
  - Coordinated site switch for planned and unplanned outages
  - VCS can detect incidents and notify GDPS
  - GDPS issues takeover prompt depending on policy and manage failover
  - Potential reduction of problem determination time, reducing RTO
GDPS Family Support for Tivoli SA Application Manager

z/OS Sysplex

SA Application Manager

SA
AppMan

Clustered Applications

Site 1

Site 2

PPRC

GDPS K-System

GDPS
GDPS and SA AppMan Integration

- GDPS manages servers, data replication and has site awareness
  - System z scope for servers
  - System z and open systems scope for data replication
- SA AppMan automation manages applications
  - End to end scope,
  - Cross cluster dependencies,
  - Resource grouping (customer defined)
- Shouldertapping between GDPS and SA AppMan automation

SA Application Manager was previously called SA for Multi-Platform End-to-End
GDPS 3.7 Update
GDPS V3.7 – Enterprise-wide Continuous Availability & D/R solution

- Improved coordinated heterogeneous planned and unplanned events:
  - **Extending the platforms supported**
    - Already support IBM AIX, HP-UX, Linux, Sun Solaris, VMWare ESX
    - New: Microsoft Windows servers support added with GDPS V3.7
  - **Multiple xDR enhancements**
    - Dynamic changes to GDPS/PPRC options without SA for MP refresh
    - Coordinated startup/shutdown of z/VM and guests
    - z/VM guests HyperSwap I/O timing trigger
  - **Low impact initial copy / resync for distributed LUNs using GDPS/PPRC**
GDPS V3.7 – Enterprise-wide continuous availability and D/R solution

- Improved scalability:
  - UCB constraint relief with Metro Mirror secondary in alt subchannel set

- Increased availability:
  - GDPS/ Metro Global Mirror (GDPS/MGM) incremental resync tool
    - Reduces exposure from hours down to minutes

- Simplified system management:
  - Simpler installation / maintenance with less manual definitions
  - Freeze policy simplified and extended with additional options
  - BCPii automatic reconnect
  - Additional GDPS Health Checks
GDPS/PPRC HyperSwap & HyperSwap Manager
Alternate Subchannel sets for Metro Mirror Secondary Disk

✓ z/OS subchannels used for
  ✓ Primary disk
  ✓ Secondary disk
  ✓ FlashCopy Targets
  ✓ HyperPavs & PAVs
✓ Metro Mirror secondaries now in alternate subchannel set
✓ Allows up to 64K pairs
✓ GDPS/PPRC
  GDPS/PPRC HyperSwap Manager

Metro Mirror secondaries in different logical subchannel set

Allows larger disk configuration
GDPS/MGM w/HyperSwap Incremental Resync – Phase 1 w/GDPS 3.6.

- Incremental resynch A → C if Site 2 or B-disk fails
- Maintains disaster recovery position
- Improved RTO

Optional CFs / Prod systems in Site2
Non-z: Unix, Linux, Linux on z, Win

Recommended for FlashCopy
Continue to have DR protection while restoring B copy

Incremental copy when B disk available

Can avoid full volume copies

Reduces exposure from hours to minutes
zEnterprise Business Continuity using GDPS

- Management of Metro Mirror or Global Mirror remote copy configurations
  - Open LUN management
  - Data consistency across z/OS and distributed systems running in zBX

- Infrastructure management solution for z/OS and Linux applications on System z (guests or running native)
  - xDR support
  - Data consistency, HyperSwap, Planned/Unplanned site switches

- Management and coordination of
  - Planned and unplanned outages
  - z196 and distributed servers in zBX using clustering solutions
  - Distributed Cluster management (DCM) support for
    Tivoli System Automation Application Manager (SA AppMan)
    Veritas Cluster Server (VCS)

System z is the Business Continuity management hub
Summary
GDPS Value Proposition

The Ultimate Availability Solution

Customer Focus

Support

Open Industry Standards

Investment Protection

Product Maturity

Customer Acceptance

Value

Experience

Commitment

Vision

- +550 GDPS licenses installed in 38 countries worldwide
- Proven technology, automated, and repeatable result
- Complete implementation by experienced consultants

- GDPS supports industry accepted, open replication architectures (PPRC, XRC, GM, and FC)
- Architectures licensed by all enterprise storage vendors
- GDPS qualification program

- Easily upgradeable
- Common code base for each product

- Generally available since 1998
- Suite of products
- E2E capability
- Several years of Sys z production experience
- CA/DR best of breed
- Continually enhanced

- GDPS Design Council
- Synergy with IBM development labs
- Incorporates several IBM patents
- Dedicated dev & solution test lab
- New V.R every year

- Fully supported via standard IBM support structure
- Fixes through normal Sys z channels

"Using the GDPS/PPRC HyperSwap technology is a significant step forward in achieving continuous availability. The benefits in our GDPS environments are that planned switches of the disk configuration took 21-33 seconds without application outage. The user impact time of unplanned disk reconfigurations was 9-16 seconds; with 8 seconds to swap a configuration of over 4,600 PPRC volume pairs. Without HyperSwap planned and unplanned reconfigurations had resulted into a service outage of almost two hours in our Sysplex/GDPS with 10 systems."

Wolfgang Dungl, Manager of Availability, Capacity and Performance Management
Wolfgang Schott, GDPS Project Manager

iT-AUSTRIA
A History of Growth & Enhancement

GDPS is IBM’s Industry-Leading Continuous/High Availability & Recovery IT Infrastructure Solution

- Open industry standards
- Customer acceptance
- Investment protection
- Established Solution
- Customer focus
- IBM support

Vision

Experience

Commitment


- GDPS/PPRC Announced
- GDPS/XRC available
- GDPS/MzGM available
- 1st 100 licenses installed
- GDPS/PPRC FlashCopy
- GDPS/PPRC Tape support
- 1st cross-platform data freeze across z/OS and Open Systems Data (open LUN)
- MOP Solution Test Platform established
- GDPS/PPRC: Planned & unplanned HyperSwap
- GDPS/XRC: FlashCopy
- GDPS 3.1 GA
- GDPS/PPRC Storage Manager (SM) available
- 1st GDPS Design Council
- GDPS/PPRC HyperSwap Manager (HM) available
- GDPS/Global Mirror (GM) available
- GDPS/Metro/Global Mirror (MGM) available
- GDPS Vendor qualification program
- xDR for Guest Linux on z
- xDR for native Linux on z
- GDPS Distributed Cluster Manager (DCM) - 1st solution to provide an entire data center failover/fallback
- GDPS/MGM Incremental Resync (Stg 1)
- GDPS/MzGM Incremental Resync
- GDPS 3.7 GA (3/10)
- GDPS/PPRC/HM Alternate subchannel set support
- 7th GDPS Design Council (6/10)
- 12th year anniversary (11/10)
- +550 licenses installed
GDPS Demographics (thru June 30, 2010)

One or two site GDPS installations

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<thead>
<tr>
<th>Product</th>
<th>Installs</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>RCMF/PPRC</td>
<td>52</td>
<td>9.5%</td>
</tr>
<tr>
<td>RCMF/XRC</td>
<td>16</td>
<td>2.9%</td>
</tr>
<tr>
<td>GDPS/PPRC HM</td>
<td>77</td>
<td>14.0%</td>
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<tr>
<td>GDPS/PPRC</td>
<td>278</td>
<td>50.5%</td>
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<tr>
<td>GDPS/XRC</td>
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<td>16.4%</td>
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<tr>
<td>GDPS/GM</td>
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<td>6.7%</td>
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<tr>
<td>Totals</td>
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<td>100.0%</td>
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Three site GDPS installations

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<thead>
<tr>
<th>Product</th>
<th>Installs</th>
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<tbody>
<tr>
<td>GDPS/MzGM *</td>
<td>35</td>
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<tr>
<td>GDPS/MGM **</td>
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GDPS solution by Industry sector

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<th>Sector</th>
<th>Installs</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Communications</td>
<td>36</td>
<td>6.5%</td>
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<tr>
<td>Distribution</td>
<td>25</td>
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<tr>
<td>Finance</td>
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<td>73.1%</td>
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<tr>
<td>Industrial</td>
<td>28</td>
<td>5.1%</td>
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<tr>
<td>Public</td>
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<tr>
<td>Internal IBM</td>
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<tr>
<td>SMB</td>
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<td>0.7%</td>
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<tr>
<td>Total</td>
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<td>100.0%</td>
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GDPS solution by geography

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<th>Major Geo</th>
<th>Installs</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>AG</td>
<td>133</td>
<td>24.2%</td>
</tr>
<tr>
<td>AP</td>
<td>82</td>
<td>11.3%</td>
</tr>
<tr>
<td>EMEA</td>
<td>355</td>
<td>64.5%</td>
</tr>
<tr>
<td>Totals</td>
<td>550</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

* - GDPS/MzGM consists of GDPS/PPRC HM or GDPS/PPRC and GDPS/XRC. The GDPS licenses are counted in the prior table.

** - GDPS/MGM consists of GDPS/PPRC HM or GDPS/PPRC and GDPS/GM. The GDPS licenses are counted in the prior table.
Additional Information

- Detailed GDPS Presentation and Information e-mail:
  - gdps@us.ibm.com

- White Papers:
  - Business Continuity Considerations and the IBM eServer zSeries
  - GDPS - The Ultimate e-business Availability Solution – GF22-5114
  - IBM Storage Infrastructure for Business Continuity – redp4605 (Red Paper)

- Publications:
  - GDPS Family of Offerings Introduction to Concepts and Capabilities - SG24-6374 TotalStorage Disaster Recovery Solutions Redbook – SG24-6547
  - z/OS Advanced Copy Services – SC35-0428
  - ESS Copy Services on zSeries Redpiece - SG24-5680
  - ESS Copy Services on Open Redpiece – SG24-5757

- GDPS Services Offerings
  - GDPS Announcement
  - GDPS/XRC Announcement

- www.ibm.com/servers/eserver/zseries/gdps
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Merci