Geographically Dispersed Parallel Sysplex (GDPS®) Update & Implementation

Bob Kern (bobkern@us.ibm.com)
IBM Corporation

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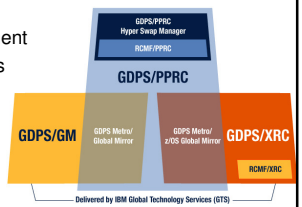
Agenda

- GDPS® Overview
- GDPS V3.8 enhancements
  - Availability
  - Scalability
  - Simplified System Management
  - New & Improved GDPS tools
- Summary



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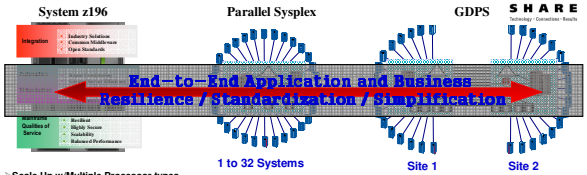
System z Availability Spectrum

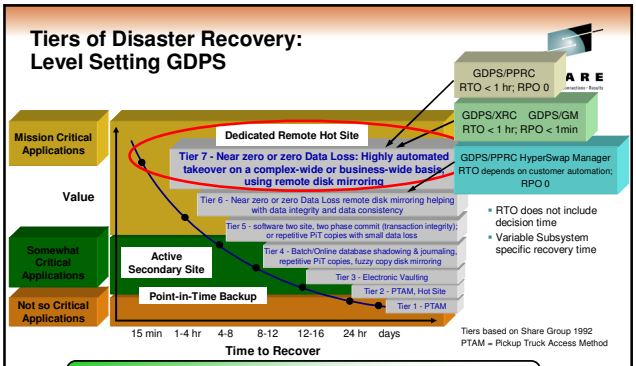


- Scale Up w/Multiple Processor types
- Built-In Redundancy
- Policy Based Workload Mgt. (WLM)
  - Multiple Workloads / higher utilization
- Dynamic Provisioning
  - CoD, CIU, CBU, OOCoD, CPM
  - Dynamic PU reassignment
  - HiperDispatch
- Virtualization
  - LPARs
  - zVM/LINUX – 100 LINUX Servers
  - HyperSockets – network in a box
- Concurrent Maintenance
- Linux IFL / zAAPs, zIIPs
- w/ICF – Clustering in a Box
- CEC, Disk, Data are SPOFs

- "Shared Everything"
- Single Image/Single Point of Control
- Near Continuous Application Availability
  - Protection from SW/HW Failures
  - Address Planned/Unplanned Outages
  - Rolling IPL's
- Flexible, Non-disruptive Growth
- Scale out – 1 -32 Systems
  - Scales better than SMPs
- Dynamic Workload/Resource Management
  - WLM (based on business priorities)
  - IRD, CPM
- Infrastructure Simplification
- Disk and Data are a SPOF

- Protects against site failures
  - Planned or Unplanned
- Autonomic / Automated
  - RTO < 1 hours
- Metro/Global data mirroring
  - Sync (PPRC) – 200km
  - Async (XRC) – any distance
- HyperSwap
  - Protects against disk failures
  - zOS, and zLinux under zVM
- Business Policy based
  - No/Some Data Loss
- Application Independent

Tiers of Disaster Recovery: Level Setting GDPS



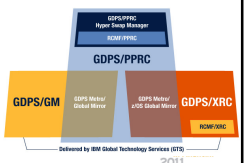
Best D/R practice is blend tiers of solutions in order to maximize application coverage at lowest possible cost . One size, one technology, or one methodology does not fit all applications.

RPO = Recovery Point Objective - how much data to recreate?

RTO = Recovery Time Objective - how long being without service?

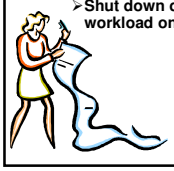
What is GDPS?

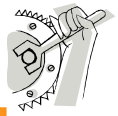
- Integrated / Automated solution
- Manages application and data availability in and across sites
  - Monitors systems, disk & tape subsystems
  - Manages planned and unplanned activities
    - System/disk maintenance / failure
    - Site maintenance / failure
- Builds on proven high availability technologies
  - 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





Done with GDPS Automation

GDPS family of offerings

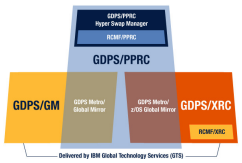
***GDPS®*: An end-to-end disaster recovery solution to enable:**

- Automated recovery removes people as Single Point of Failure
- A single point of control automating D/R for heterogeneous systems

Continuous Availability of Data Within a Data Center	*Continuous Availability / Disaster Recovery Metropolitan Region*	*Disaster Recovery at Extended Distance*	*Continuous Availability Regionally and Disaster Recovery Extended Distance*
Single Data Center Applications remain active Near-continuous availability to data	Two Data Centers Systems remain active Automated D/R across site or storage failure No data loss	Two Data Centers Automated Disaster Recovery "seconds" of Data Loss	Three Data Centers Data availability No data loss Extended distances
GDPS/PPRC HM	GDPS/ PPRC HM GDPS/PPRC	GDPS/GM GDPS/XRC	GDPS/MGM GDPS/MzGM

GDPS 3.8 Availability

- Simplified Freeze Policy
- xDR - HyperSwap support for Fixed Block disk
- xDR extended monitor function
- STP and Sysplex Timer recovery
- CPC and CEC Awareness



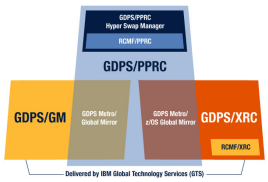
Simplified Freeze Policy

– GDPS 3.7 SPE Available

- Provides GDPS with more accurate information about the cause of a disk freeze event.
- Together with improved policy options, helps provide more options to achieve zero RPO (no data loss).
- DS8000 provides GDPS with the ability to query the secondary disk subsystem in order to understand what caused the freeze and take the appropriate action.
- New "freeze" policy – based on additional information on DS8K PPRC Suspend reason.
  - PRIMARYFAILURE=[SWAP|GO|STOP]
    - SWAP means Freeze&HyperSwap
    - GO means Freeze&Go
    - STOP means Freeze&Stop
  - PPRCFAILURE=[GO|STOP|COND]
    - GO means Freeze&Go
    - STOP means Freeze&Stop
    - COND means Freeze&Go if not a DR event and Freeze&Stop if a potential DR event
- Consistent handling of triggers:
  - Always treated as primary failure trigger:
    - IOS002A no paths available
    - IEA491E with primary device write failure indication
- Preregs
  - GDPS - PM24113 SPLIT FREEZE POLICY & FALSE FREEZE SUPPORT
  - z/OS / DFDSS - OA33031 & OA31313 SUPPORT FOR QUERY STORAGE CONTROLLER STATUS FOR GDPS
  - DS8K - R5.1 & above

GDPS 3.8 xDR

- xDR DS8000 SCSI disk support for HyperSwap
  - SCSI (Fixed Block Architecture) devices
  - Near-continuous disk availability for native Linux environments
- xDR extended monitor function
  - GDPS monitors native Linux and z/VM guest xDR environments for conditions that would prevent a HyperSwap from succeeding.
    - Orphaned pointers
    - Channel paths to secondary disks online (Native & Guest)
    - Proxy system disk not PPRCed (Guest)
    - Minidisk caching must not be enabled (Guest)
    - Mdraid disks must be synchronized (Native)
    - Root file system must not be read-only (Native)
  - Extends GDPS HyperSwap monitoring to xDR environment
  - Raises alerts so customers can fix the problem is before it can impact a HyperSwap.
  - Used to help having the system reset after unplanned HyperSwap
  - Prevents planned HyperSwap which would cause non-ready systems to reset



Existing GDPS/PPRC Timer Support

- z/OS can recognize if an LPAR is a K-Sys
  - Puts K-Sys into local timing mode up to 80 minutes
    - Instead of spinning with sync WTORs
    - Allows Ksys to complete any in progress Freeze
  - Facilitates situation analysis before replying to WTORs
    - Review PPRC status
    - Review status of other resources
    - Remove 'guessing game' about whether safe and which systems to restart
  - Ksys continues to perform normal SFM actions

Improved Recovery Time
Reduced Operator Intervention

Timer Automation enhancements GDPS/PPRC, GDPS/PPRC HM

- Server Time Protocol (STP) and Sysplex Timer recovery and network management
  - Automatically reply to disabled console WTORs when loss of synchronization is detected
  - Automatically reconfigure an STP Coordinated Timing Network (CTN).
  - Provides:
    - Improve recovery times
    - Simplify operations
    - Helps prevent potential subsystem and application time outs
    - Potentially preventing a production outage.
  - Planned actions
    - Deactivate of the server hosting the Stratum 1.
  - Unplanned actions
    - Define a server to be the clock source in the recovery site

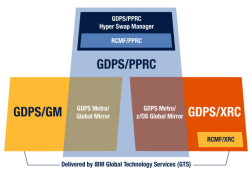
Improved RTO and system management

CPC and LPAR awareness in z/OS

- Enables GDPS to track the CPC and LPAR locations where GDPS systems are running.
- Allows GDPS to better control recovery situations.

GDPS 3.8 Scalability

- IPL Protection Support
  - Helps prevent system from being IPL'ed on wrong set of disks
- z/VM XRC time stamping support
- GDPS/XRC UCB Constraint Relief
- GDPS/XRC can be paired with up to 7 GDPS/PPRC Configs



IPL Protection
GDPS/PPRC, GDPS/PPRC HM

- Prevents a system to be IPLed on the wrong set of disks
  - After a HyperSwap followed by DASD RECOVER or DELPAIR
  - Disk on both sites are "PPRC primary Suspended"
- IPL done only from GDPS primary site
  - Helps prevent overlaying production data when mirroring restarted
- Environments
  - GDPS/PPRC HyperSwap Manager
    Verify Load and IODV volume addresses are on GDPS primary site
    Quiesce system if IPLed from wrong set of disk
  - GDPS/PPRC IPL protection
    Enhanced protection prevents loading from wrong set of disk.
    Checks z/OS, z/VM and native zLinux systems

Protects environment after HyperSwap
Helps prevent data overlays

XRC timestamping support for z/VM guests
GDPS/XRC, GDPS/MzGM

- Provides cross platform consistency between one or more z/VM LPARs and their guests with z/OS LPARs.
  - z/VSE
  - z/VM
  - zTPF
  - z/OS
- Allows z/VM and guests to participate in GDPS/XRC solutions
  - Data managed by multiple coupled SDMs
  - Provides support for large z/VM environments.
- Exploits Server Time Protocol (STP) facility to ensure time consistency.

Extends XRC environment

UCB Constraint Relief
GDPS/XRC

- Removes restriction that all devices in a GDPS/XRC configuration be defined and identified with unique device addresses.
- GDPS can bypass checking for unique device addresses
  - Allows duplicate device addresses to be used across SDM systems
  - Increases the number of devices that can be managed in a GDPS/XRC configuration.
- Additional UCB constraint relief provided with
  - Allows the FlashCopy target devices to be defined only in the GDPS Controlling system but not to be defined in the SDM systems.
  - Support for a 'no UCB FlashCopy' where the FlashCopy targets need not be defined to any systems in the GDPS.

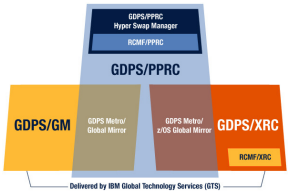
Increases number of devices supported

GDPS/XRC 3.8 Can be Paired with up to 7 GDPS/PPRC Systems under GDPS/MzGM

- The Number of nodes that can be defined to the GDPS/MzGM SNA Communication Facility has been increased from 10 to 15.
- Can now define up to seven GDPS/PPRC environments, each with two control systems to be managed by a single GDPS/XRC environment.

GDPS 3.8 - Simplified Systems Management

- FlashCopy Suspend support for incremental FlashCopy
- Persistent reserve Clean up for Open Systems
- HyperSwap Concurrent Copy Session Cleanup



Zero Suspend for incremental FlashCopy GDPS/XRC

- Improved FlashCopy performance
- Less data to copy
  - Persisting FlashCopy relationship is created between the source and target devices.
  - Changes to the source device since the last FlashCopy are tracked.
  - Only tracks changed since the last copy are flashed.

Can reduce impact of a FlashCopy on SDM operations

Persistent RESERVE cleanup for Open LUNs
GDPS/PPRC and GDPS/PPRC HM

- Persistent reserves prevent resynchronization of PPRC when these disks are the secondary, target devices for PPRC. GDPS will now, optionally reset any persistent reserve on Open LUN (FB) target devices when a PPRC resynchronization is performed.

Simplifies removal of persistent reserves

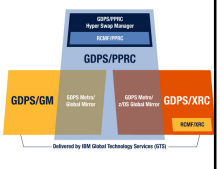
HyperSwap / Concurrent Copy Session Clean-up
GDPS/PPRC and GDPS/HM

- Automates cleanup of control information pertaining to concurrent copy operations on the former primary disks.
- Clean up is required before the former primary disk can be established as the PPRC mirroring target.
- Concurrent Copy (CC) allows point-in-time backup of data sets or volumes with a minimal update serialization window.
  - Control information kept in storage subsystem cache
- Removal of "orphaned" CC control information prevents:
  - Failure of planned HyperSwaps
  - Failure of future CC tasks
  - Failure of "Start Secondary"

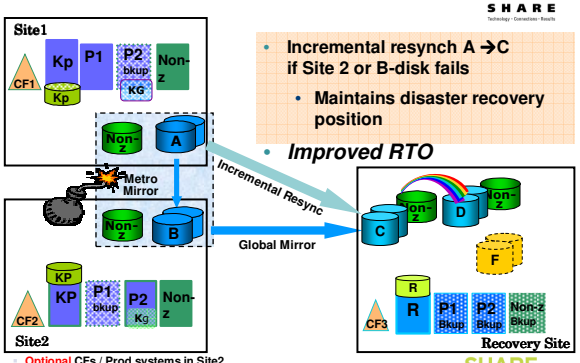
Simplified system management

GDPS 3.8 - New & Improved Tool Support

- GDPS/MGM Incremental Resynchronization (IR) tool – Phase 3
  - Supports planned HyperSwap of data between two local copies of the disks, which enables you to toggle between the two synchronous copies of the data.
- GDPS/PPRC Preserve Mirror Tool – Alternate subchannel support toleration
  - PPRC secondary devices can be defined in an alternate subchannel. This facilitates making GDPS configuration changes for those customers exploiting GDPS alternate sub-channel support.
- GDPS/PPRC Configuration Checker Tool
  - Identifies devices defined in production systems that are not under GDPS management control
- Global Mirror Monitor integrated into GDPS/GM
- GDPS Console Interface Tool
  - Allows operators to issue GDPS script commands or execute GDPS scripts from the systems console.
- GDPS/GM Copy Once
- Query Services



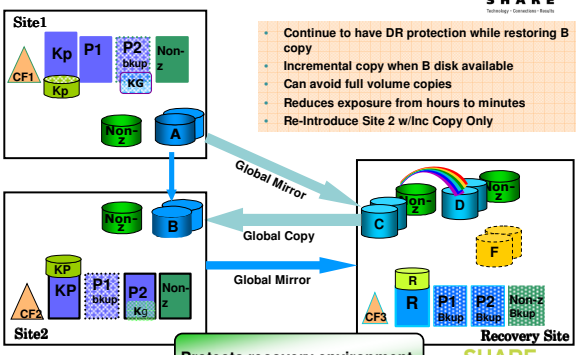
GDPS/MGM Incremental Resync (Previously)



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

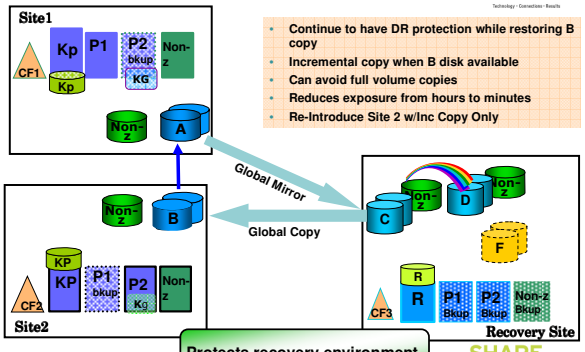
Optional CFs / Prod systems in Site2
Non-z: UNIX®, Linux, Linux on z, Windows®

GDPS/MGM Incremental Resync Tool



- 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
- Re-Introduce Site 2 w/Inc Copy Only

GDPS/MGM Incremental Resync Tool



- Continue to have DR protection while restoring B copy
- Incremental copy when B disk available
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- Reduces exposure from hours to minutes
- Re-Introduce Site 2 w/Inc Copy Only

GDPS/PPRC Preserve Mirror Tool support for alternate Subchannel sets

GDPS/PPRC and GDPS/PPRC HM

- Extended to support PPRC secondary devices defined in an alternate sub-channel.
- Facilitates GDPS configuration changes when exploiting alternate sub-channel.
- The Preserve mirror tool is designed to:
  - Start PPRC
  - Bring new devices to duplex state
  - Add them to the GDPS configuration
  - Monitor progress
- Keeps disk Fr… …ring an initial copy.
- "As is" tool for GDPS …

Availability

GDPS/PPRC 3.8 - Configuration Checker tool

- Identifies devices defined in production systems that are not under GDPS management control.
- Devices may be accidentally left out from the GDPS configuration so regularly running this tool would help installations to catch and correct such errors.
- This can help verify that the entire production environment is protected, avoiding possible data integrity issues.

- Configurations:
  - (2-site) GDPS/PPRC, GDPS/HM
  - (3-site) GDPS/MzGM or GDPS/MGM running with GDPS/PPRC or GDPS/HM

Global Mirror Monitor integrated into GDPS/GM
GDPS/GM and GDPS/MGM

- Integrates existing Global Mirror Monitor tool into GDPS/GM

- Capabilities include:
  - Generates alerts and messages based on a defined policy
  - Creates detailed performance and behavioral data
    - Problem diagnosis and performance reporting
  - View recent performance data for a Global Mirror session
  - Take automatic actions based on particular events or situations.
    - Statesave to gather diagnostic information
    - Pausing Global Mirror

- Both CKD and FB disk supported

Operational simplicity

GDPS/GM 3.8 - Copy Once

- Targeted for volumes with heavy updated datasets but not critical for recovery
  - Paging datasets,
  - temporary datasets

- Disk can be mirrored only on user initiated occasions
- Only mirror the volumes when new datasets are allocated
  - Establish a Global Copy session between the production and recovery site.
  - First pass of replication allocates datasets on the recovery site volumes
  - After first pass, terminate the Global Copy session

- CKD or FB formatted disk
- 3.8 SPE. Target 2Q 2011

Can provide improved mirroring performance

Console Interface (GCI) tool

- Allows operators to issue GDPS script commands or execute GDPS scripts from the systems console.

- Allows operators to issue GDPS script commands or execute GDPS scripts from the systems console.

- Provides an additional alternative when performing GDPS operations.

Simplified Operations

New GDPS V3.8 Health Checks

- Helps ensure best practices are adhered to
- Helps identify setup changes as environment changes

- GDPS/PPRC xDR Installation Health Checker
  - Checks the setup of the xDR environment
  - Helps ensure required installation and customization tasks have been performed correctly.
  - xDR native Linux and guest Linux on System z environments.

Improved System Management and Availability

Query Services Enhancement

- Queries on GDPS monitored resources.
  - Systems — z/OS images within this GDPS-Plex
  - DASD — Primary and secondary disk and SSIDs
  - HyperSwap — HyperSwap related information
  - Monitors — Monitor statistics
  - Environment — General information about the GDPS environment
  - All — All of the above

- Returns information about the GDPS 'environment'
  - GDPS product, Version/Release
  - GEOPARM dataset/member name Freeze action
  - CKD/FB disk last config load time etc.

New with GDPS V3.8

- GDPS/PPRC, GDPS/PPRC HM, and GDPS/GM

Allows customer to extend GDPS automation with their own

Removal of functions

- The following were removed in GDPS Release 3.8
  - P/DAS support in GDPS/PPRC and RCMF/PPRC
  - GDPS network management functions for SNA
  - ACTIVATE command for IPLing systems.
    - LOAD will remain as the only supported method to IPL systems.

Agenda

- GDPS Overview
- GDPS V3.8 enhancements
  - Availability
  - Scalability
  - Simplified system management
  - New GDPS Tools
- Summary

GDPS V3.8 – Enterprise-wide HA & D/R

- **Availability**
  - Reduced impact of false freezes
  - STP and Sysplex Timer recovery
  - HyperSwap support for FB disk
  - Extended Monitoring
  - LPAR and CEC Awareness
- **Scalability**
  - UCB Constraint Relief for GDPS/XRC
  - XRC timestamping support for z/VM guests
  - IPL Protection
- **Simplified system management**
  - Zero Suspend FlashCopy for Incremental FlashCopy
  - Automated cleanup of persistent reserve and Concurrent Copy data
- **New & Improved GDPS tools**
  - GDPS/MGM Inc. Resync tool – Ph 3
  - Preserve Mirror Tool – Alt. Subch. sets
  - GDPS/PPRC Configuration Checker
  - GM Monitor integrated into GDPS/GM
  - Copy Once - Device support
  - GDPS Console Interface tool
  - Installation verification program for xDR
  - Query Services

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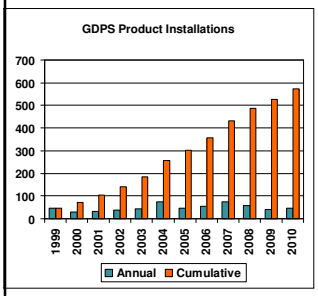
GDPS
The Enterprise-wide Continuous Availability and Disaster Recovery Solution

GDPS Demographics (thru YE10)



One or two site GDPS installations by product type

RCMF/PPRC	52	9.1%
RCMF/XRC	16	2.8%
GDPS/PPRC HM	75	13.1%
GDPS/PPRC	292	51.0%
GDPS/XRC	92	16.1%
GDPS/GM	45	7.9%
Totals	572	100.0%

Three site GDPS installations by product type

GDPS/MzGM *	36
GDPS/MGM **	27

GDPS solution by Industry sector

Communications	36	6.3%
Distribution	26	4.5%
Finance	418	73.1%
Industrial	29	5.1%
Public	49	8.6%
Internal IBM	10	1.7%
SMB	4	0.7%
Total	572	100.0%

GDPS solution by geography

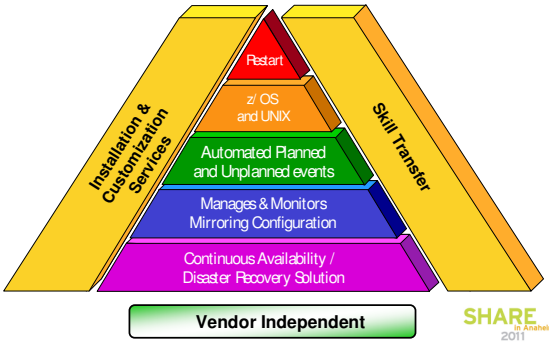
AG	147	25.7%
AP	66	11.5%
EMEA	359	62.8%
Totals	572	100.0%

* GDPS/MzGM consists of GDPS/PPRC HM or GDPS/PPRC and GDPS/XRC. 22 of 37 have PPRC in the same site. the licenses are counted in the prior ta
** GDPS/MGM consists of GDPS/PPRC HM or GDPS/PPRC and GDPS/GM. 12 of 27 have PPRC in the same site. the licenses are counted in the prior tab

GDPS: Continuous Availability & Disaster Recovery

- **Mature**
  - 572+ implementations world-wide since 1998
  - Many customer references
- **Flexibility**
  - Synchronous and/or Asynchronous remote copy
  - 1, 2, or 3 site
  - Easily customized automation
- **Multi-Vendor**
  - Allows multi-vendor policy
- **Heterogeneous Data/Platform Management**
  - Open LUN management (GDPS/PPRC, GDPS/GM)
  - Multiplatform Resiliency for System z
  - Distributed Cluster Manager (DCM)
    - VCS: GDPS/PPRC, GDPS/XRC, and GDPS/GM
    - SA AppMan: GDPS/PPRC

A comprehensive HA & D/R solution,



Additional Information

- **Web sites:**
  - GDPS **www.ibm.com/systems/z/gdps**
  - Parallel Sysplex **www.ibm.com/systems/z/pso**
  - Bus Resiliency z **www.ibm.com/systems/z/resiliency**
  - Bus Resiliency **www.ibm.com/systems/business_resiliency**
- System z **www.ibm.com/systems/z/hardware**
  Storage **www.ibm.com/systems/storage**
  Redbooks® GDPS Family: An Introduction to Concepts and Capabilities
  www.redbooks.ibm.com/abstracts/sg246374.html?Open
- **GDPS Web Site White Papers and Presentations**
  - GDPS: The Ultimate e-business Availability Solution
  - IBM Implementation Services for GDPS/Global Mirror
  - GDPS Business Continuity Solutions
  - Consistency Groups in a Nutshell
  - DS6000™ / DS8000™ Data Replication
  - GDPS Solutions
- **e-mail:** **gdps@us.ibm.com**

Questions?

- **What are your questions**