



## Les solutions GDPS® : Introduction

The Enterprise-wide  
Continuous Availability / Disaster Recovery Solution

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## Marques



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# Agenda



- **Introduction**
- **Les offres GDPS**
  - Continuous Availability of Data within a Data Center
    - GDPS/PPRC Hyperswap Manager
  - Continuous Availability / Disaster Recovery within a Metropolitan Region
    - GDPS/PPRC
  - Disaster Recovery at Extended Distance
    - GDPS/XRC
    - GDPS/Global Mirror
  - Continuous Availability Regionally and Disaster Recovery at Extended Distance
    - GDPS Metro / Global Mirror
    - GDPS Metro / z/OS Global Mirror
  - Continuous Availability and Disaster Recovery at Extended Distance
    - GDPS/Active-Active
  - Extensions to Heterogeneous Platforms
    - Open LUN Management
    - Multiplatform Resiliency for System z (xDR)
    - Distributed Cluster management (DCM)
- **Conclusion / Compléments**



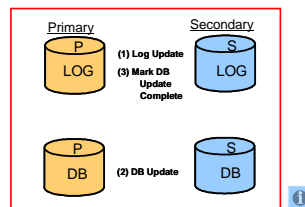
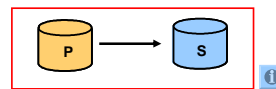
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# Business Continuity – Points importants



- Déterminer ses objectifs de Continuité de Business
  - **Recovery Time Objective** : durée de re-démarrage (indisponibilité du service)
  - **Recovery Point Objective** : données "perdues" (à re-crée...)
  - **Network Recovery Objective** : durée pour "basculer" le réseau
- Choisir le mode approprié de Réplication des Données
  - Synchron ( Metro Mirror (PPRC) )
  - Asynchrone ( z/OS Global Mirror (XRC), Global Mirror )
- Gérer la Cohérence des Données
  - **Indispensable**
    - Redémarrage rapide (Database **Restart versus Recovery**)
    - Intégrité des données
  - Avec Metro Mirror (PPRC) :
    - Consistency Group / FREEZE
    - CRITICAL attribute
  - Avec z/OS Global Mirror(XRC) ou Global Mirror :
    - Inhérente à l'architecture de réplication
- Automatisation
  - Nécessaire
  - Gestion opérationnelle simplifiée
  - Fiabilité / Répétabilité
  - Opérations de recovery (incidents/sinistres)

RTO / RPO / NRO



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## What is GDPS?

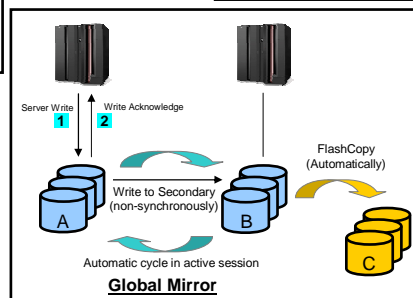
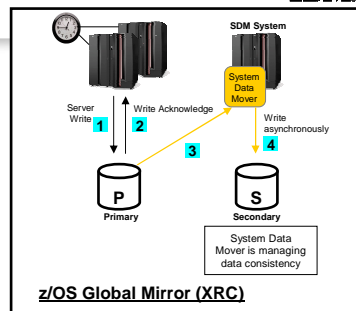
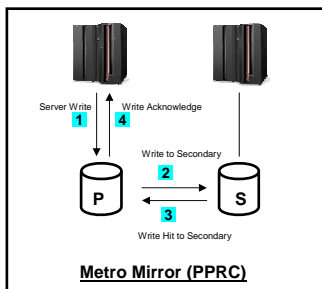


- Manages application and data availability in and across sites
  - Monitors systems, disk & tape subsystems
  - Manages planned and unplanned activities
    - System/disk maintenance / failure
    - Site maintenance / failure
  - Manages planned and unplanned activities across platforms
    - Multiplatform Resiliency for System z (xDR)
    - Distributed Cluster Management (DCM)
- Builds on proven high availability technologies
  - Clustering
  - Remote copy (disk and tape)
  - Automation
- Integrated / Automated solution
- Easy to use interface
  - Panel/GUI interface
  - Policy based commands



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## Solutions de Remote Copy PPRC, XRC et Global Mirror



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# Les solutions GDPS



- There are multiple GDPS service products under the GDPS solution umbrella to meet various customer requirements for Availability and Disaster Recovery

GDPS/PPRC HM	GDPS/PPRC	GDPS/GM & GDPS/XRC	GDPS/MGM & GDPS/MzGM	GDPS/Active-Active
<p><b>Continuous Availability of Data within a Data Center</b></p> <p>Single Data Center Applications remain active</p> <p>Continuous access to data in the event of a storage subsystem outage</p> <p>RPO=0 &amp; RTO=0</p>	<p><b>Continuous Availability / Disaster Recovery within a Metropolitan Region</b></p> <p>Multi-site workloads can withstand site and/or storage failures</p> <p>A/S RPO=0 &amp; RTO&lt;1 hr or A/A RPO=0 &amp; RTO mins</p>	<p><b>Disaster Recovery at Extended Distance</b></p> <p>Two Data Centers Rapid Systems Disaster Recovery with "seconds" of Data Loss</p> <p>Disaster recovery for out of region interruptions</p> <p>RPO secs &amp; RTO &lt;1 hr</p>	<p><b>Continuous Availability Regionally and Disaster Recovery Extended Distance</b></p> <p>Three Data Centers High availability for site disasters Disaster recovery for regional disasters</p> <p>A/S RPO=0 &amp; RTO&lt;1 hr or A/A RPO=0 &amp; RTO mins and RPO secs &amp; RTO &lt;1 hr</p>	<p><b>Continuous Availability, Disaster Recovery, and Cross-site Workload Balancing at Extended Distance</b></p> <p>Two or More Data Centers All sites active</p> <p>RPO secs &amp; RTO secs</p>
<p><b>Components</b></p> <p>Tivoli - NV, SAz STG - System z, DSK, PPRC GTS - GDPS code, Services</p>	<p>Tivoli - NV, SAz, SA MP, AppMan STG - System z, DSK, PPRC, VTS GTS - GDPS code, Services</p>	<p>Tivoli - NV, SAz STG - System z, DSK, GM, XRC GTS - GDPS control, Services</p>	<p>Tivoli - NV, SAz STG - System z, DSK, MGM, MzGM GTS - GDPS code, Services</p>	<p>Tivoli - NV, SAz AIM - Multi-site Workload Lifeline IM - DB2 &amp; IMS replication STG - System z, DSK, GC GTS - GDPS code, Services</p>
<p>RPO - Recovery Point Objective (data loss)    Synch replication →</p> <p>RTO - Recovery Time Objective (downtime)    Asynch replication →</p>				

# Agenda



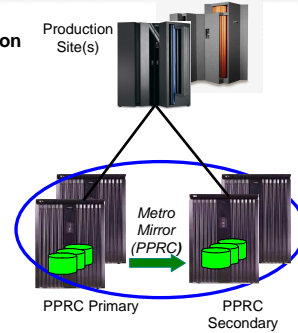
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# GDPS/PPRC HyperSwap Manager Functional Overview



- **Single point of control to manage the remote copy configuration**
  - Monitoring / Alerts
  - System z and distributed data
    - Distributed data "frozen" to maintain data consistency
- **Planned / Unplanned HyperSwap**
- **Data consistency in the event of failures or disaster (Freeze)**
- **FlashCopy support**
  - Auto initiated by GDPS prior to resynchronization
  - User initiated
- **User interface through panels**
  - Status and planned actions
  - Facilitates Primary/Secondary disk swaps for Planned Disk/Site Maintenance

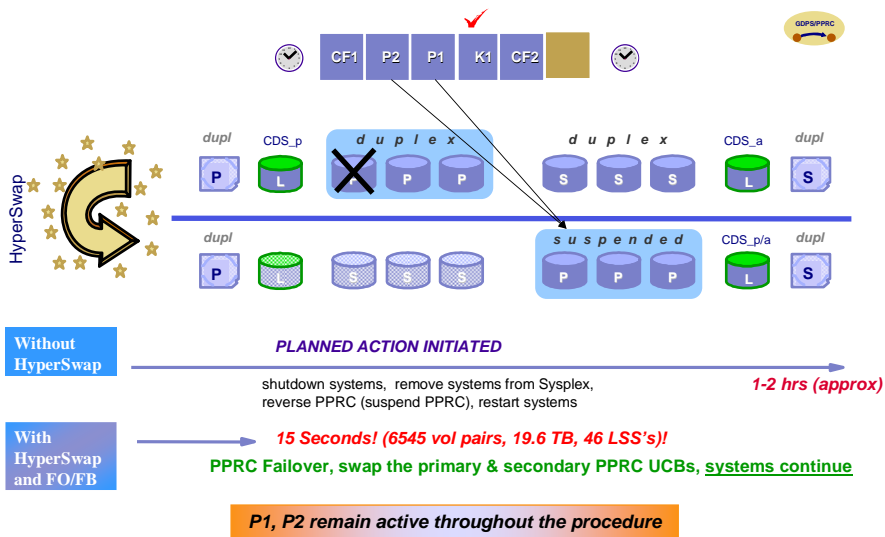


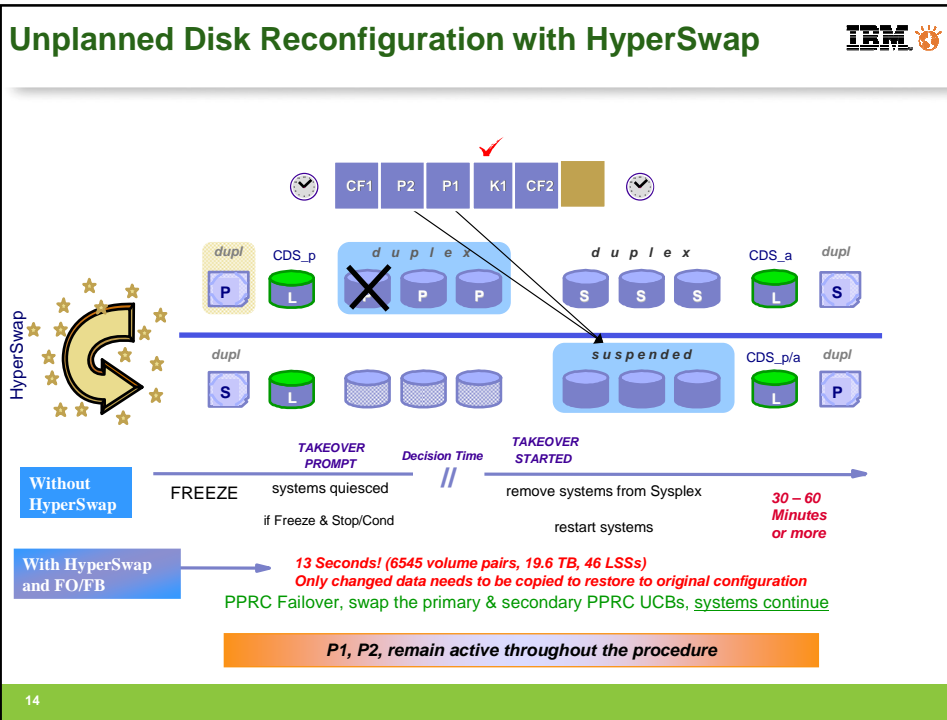
**HyperSwap Triggers**

- **Hard Failure Triggers**
  - I/O errors
  - Boxed devices
  - Control Unit failures
  - Loss of all channel paths
- **"Soft Failure"- I/O response time triggers**
  - z/OS (IOT threshold)
  - z/VM and z/VM guests, including Linux guests (SOD)

**Supports Failover / Failback**

# Planned Disk Reconfiguration with HyperSwap



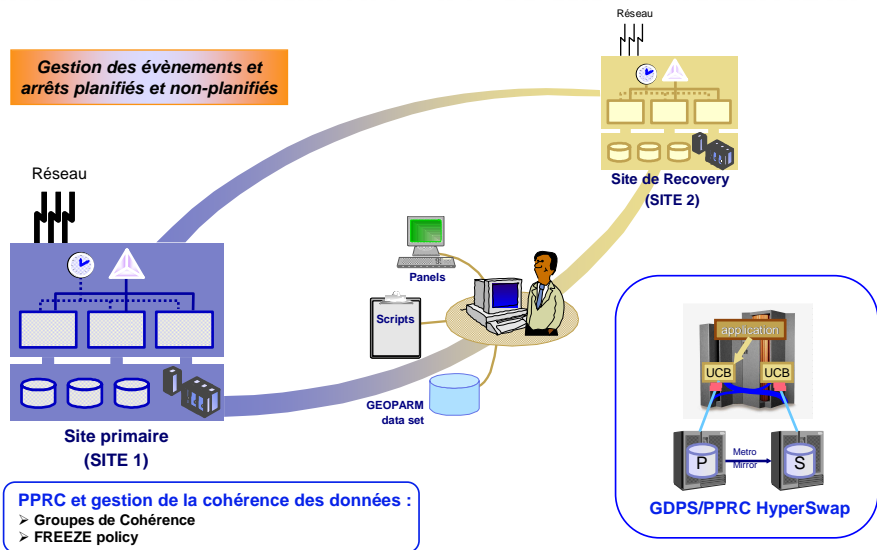


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- |                |                     |
|----------------|---------------------|
| Availability   | Planned Outage      |
| Restartability | Unplanned Outage    |
| Recoverability | Disaster Protection |

# GDPS/PPRC – Schéma de principe

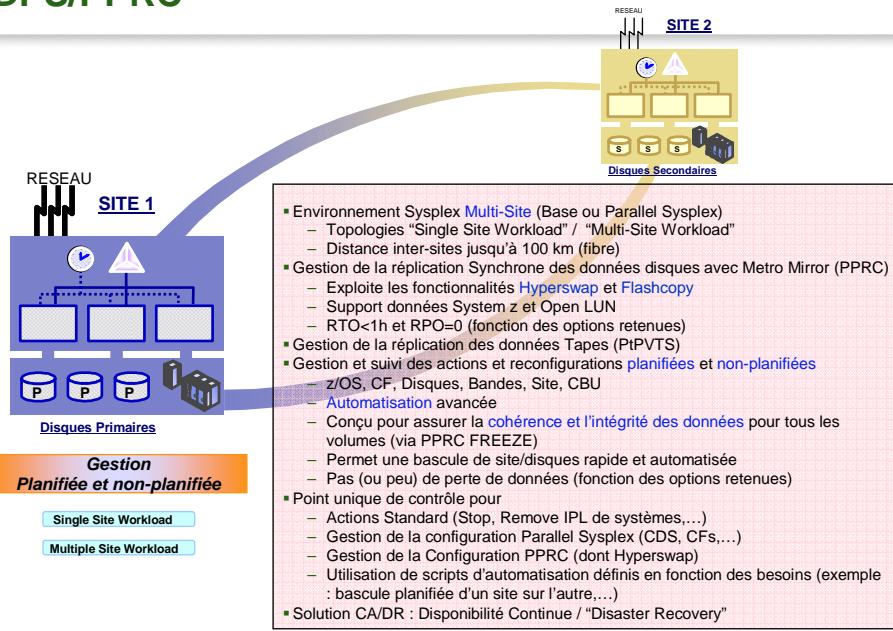


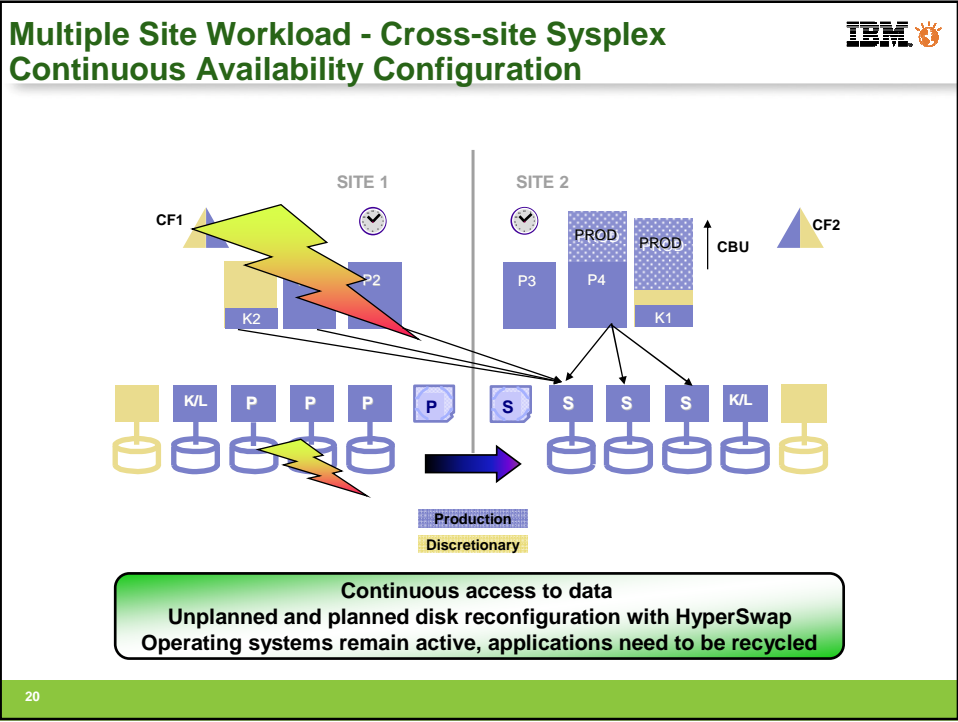
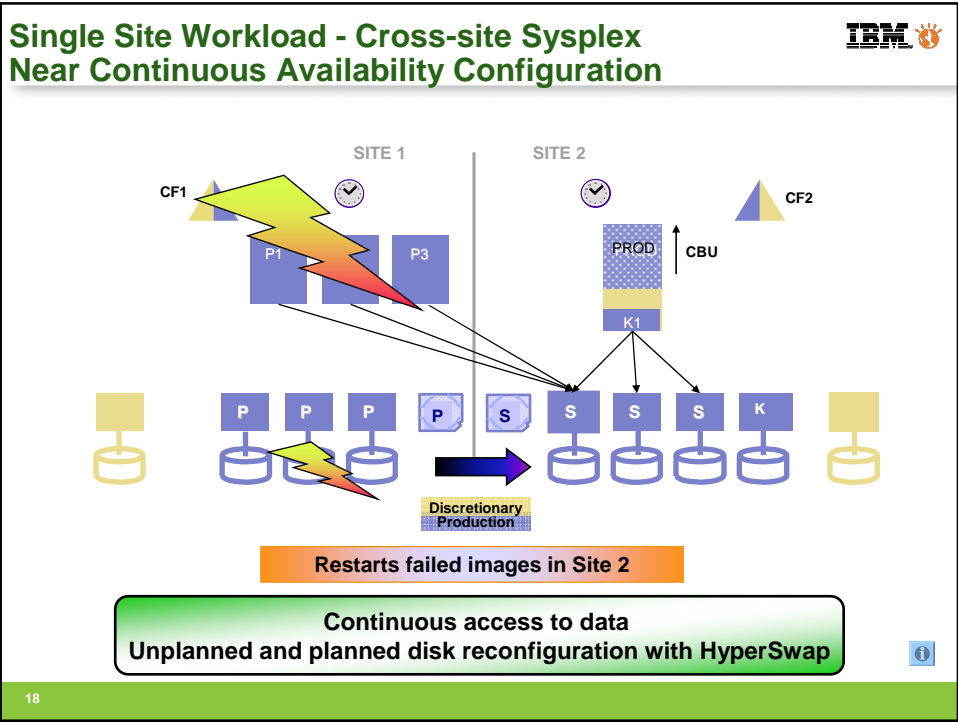
Gestion des évènements et arrêts planifiés et non-planifiés



PPRC et gestion de la cohérence des données :  
 > Groupes de Cohérence  
 > FREEZE policy

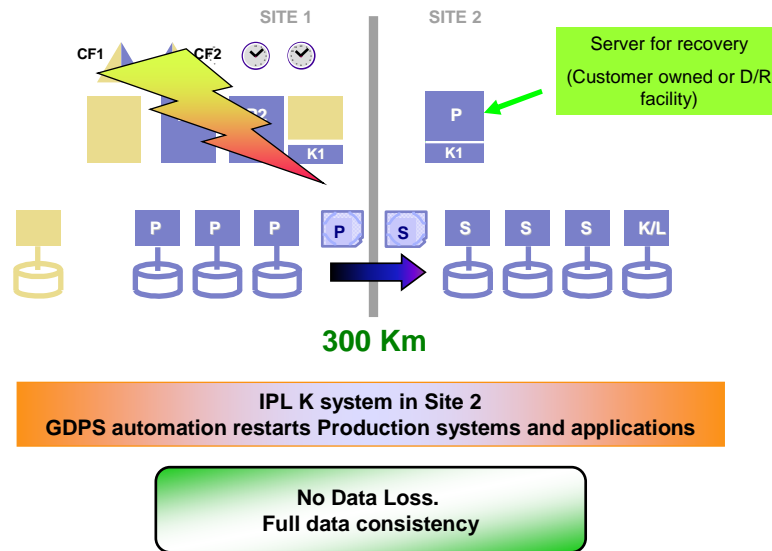
# GDPS/PPRC







## Single Site Workload (BRS configuration)



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## Agenda

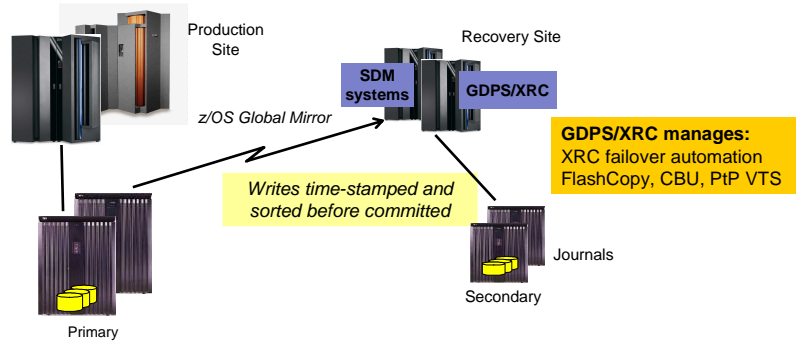


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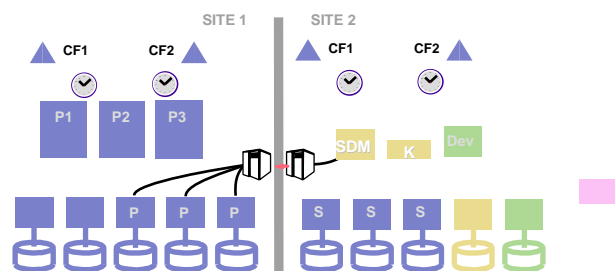
## GDPS/XRC (z/OS Global Mirror)



- **Manage XRC**
  - **Manage SDMs**
  - **Manage FlashCopy**
  - **Virtually unlimited distance**
- **Once initiated, totally automated failover**
    - **Recovery** of secondary disks
    - **Activation** of CBU
    - **Shut down** SDM / discretionary LPARs
    - **Reconfiguration** of the recovery site servers
    - **Restart** of production systems in the recovery site

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## GDPS/XRC

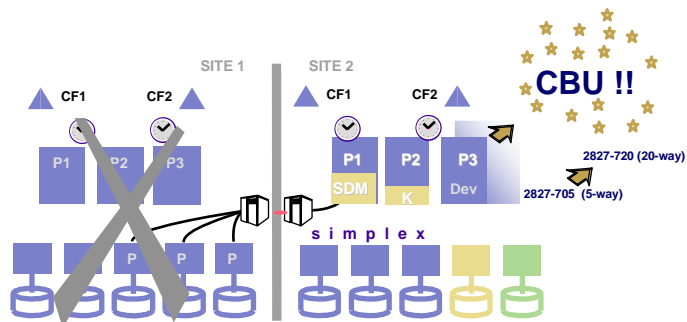


- Production system can be
  - No, Base, or Parallel Sysplex environment
  - SUSE Linux Enterprise Server (SLES) 8 or higher
- System Data Mover(s) and the Controlling system must be in the same Sysplex

**Automates recovery of production environment**  
**Automates invocation of CBU**

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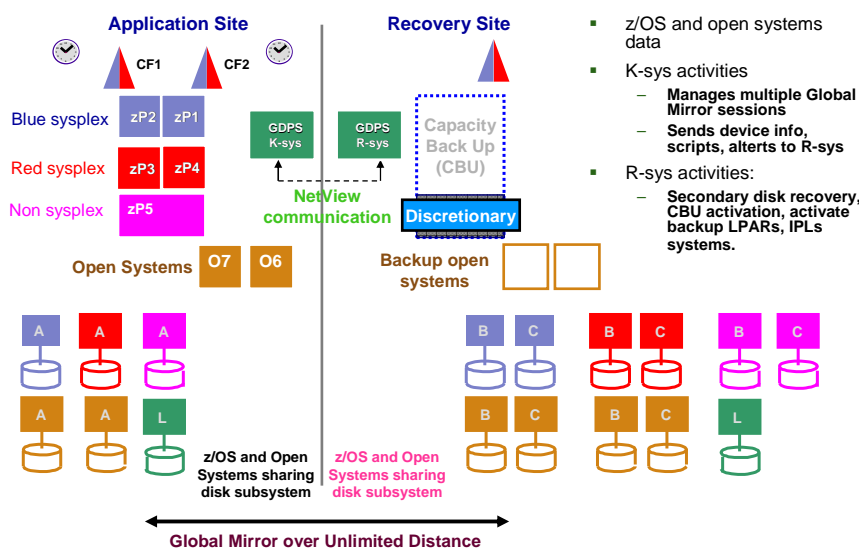
## GDPS/XRC - Primary Site Failure



- Production system can be
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  - SUSE Linux Enterprise Server (SLES) 8 or higher
- System Data Mover(s) and the Controlling system must be in the same Sysplex

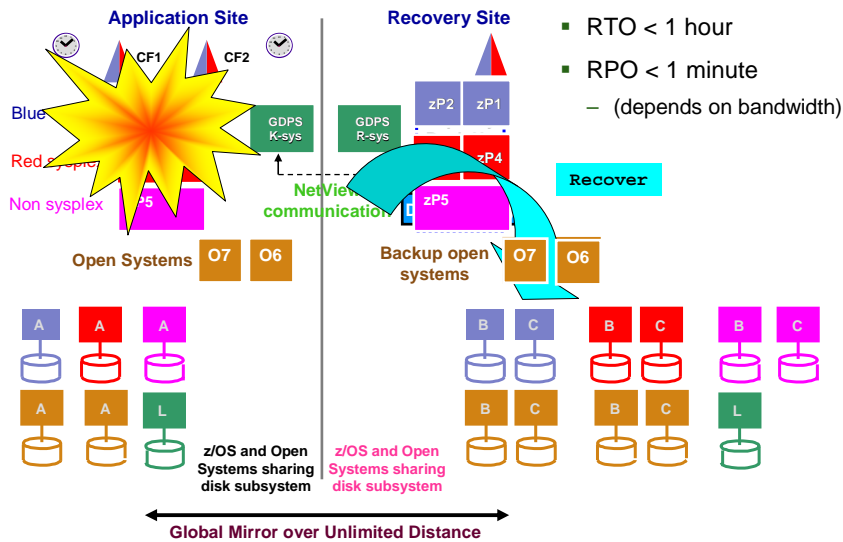
**Automates recovery of production environment**  
**Automates invocation of CBU**

## Global Mirror Configuration



- 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.

## Global Mirror Configuration...

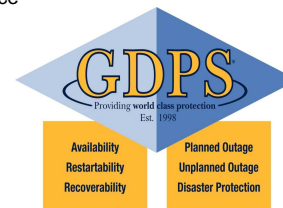


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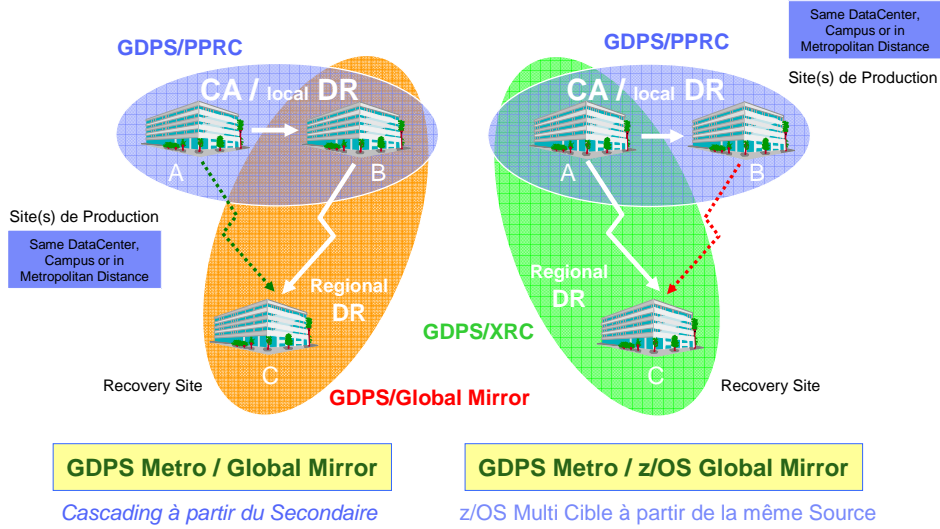


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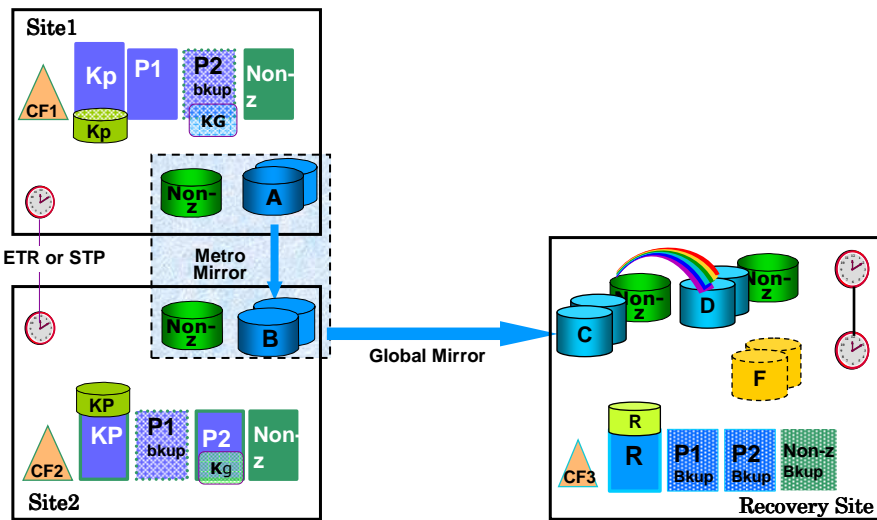
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# Topologies 3 sites IBM / Solutions GDPS



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# GDPS/MGM Configuration

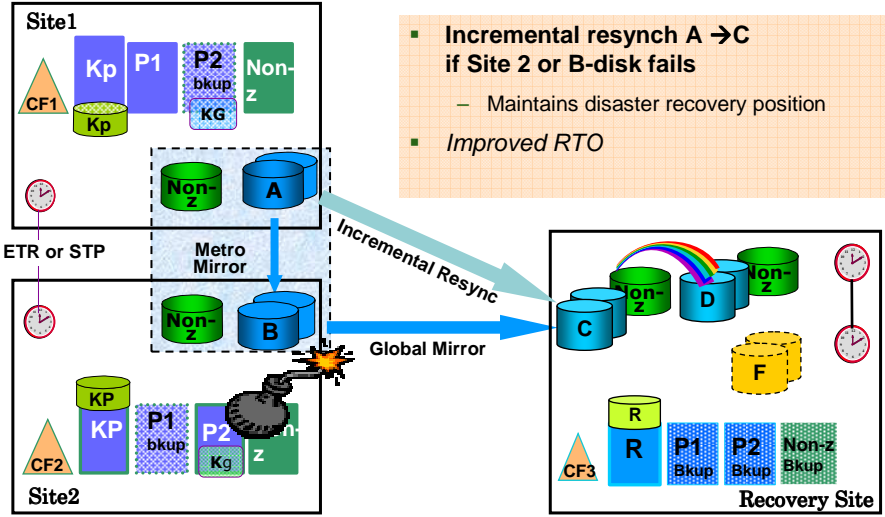


- Optional CFs / Prod systems in Site2
- Non-z: Unix, Linux, Linux on z, Win

Recommended for FlashCopy

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# GDPS/MGM Incremental Resync



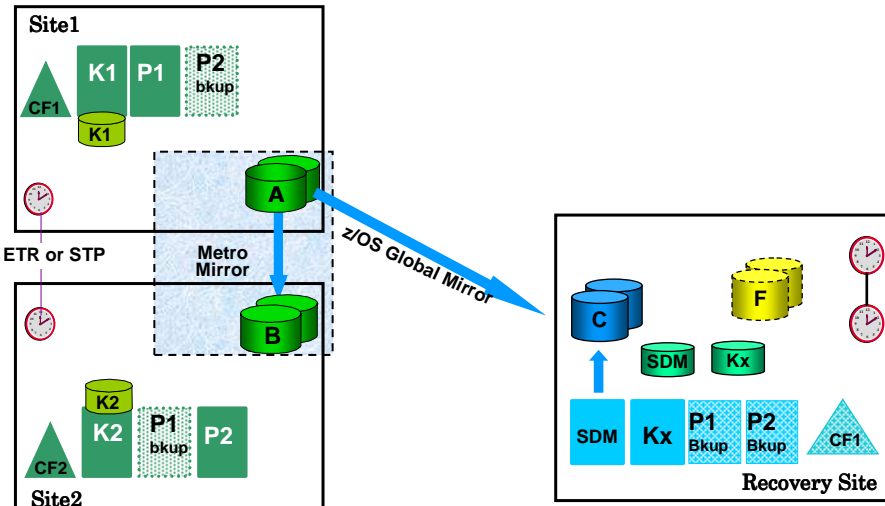
- Incremental resynch A → C if Site 2 or B-disk fails
  - Maintains disaster recovery position
- Improved RTO

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

Recommended for FlashCopy

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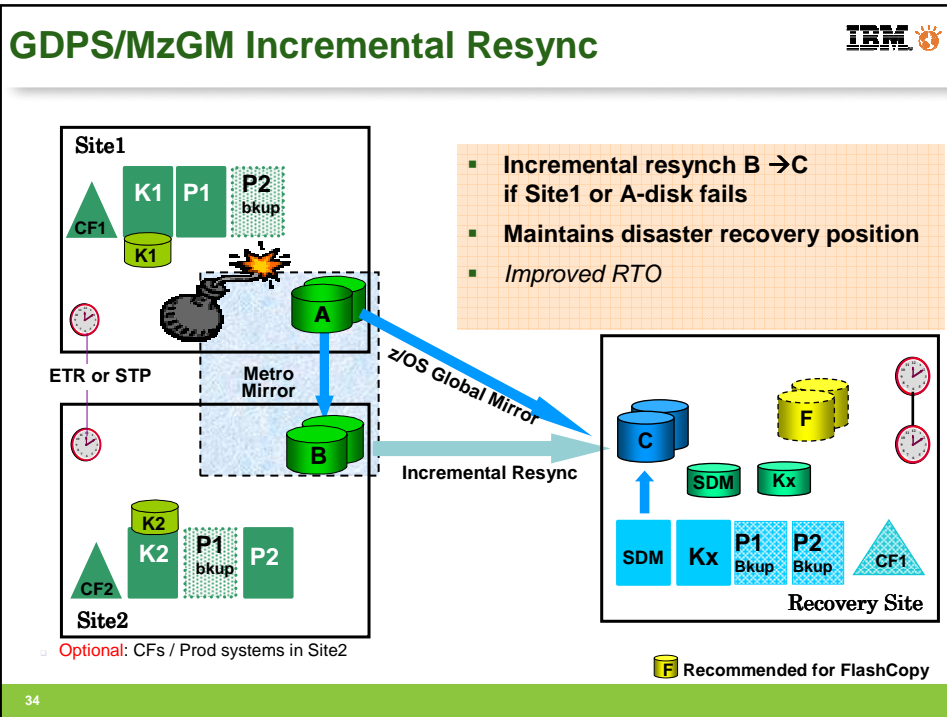
# GDPS/MzGM Configuration



- Optional: CFs / Prod systems in Site2

Recommended for FlashCopy

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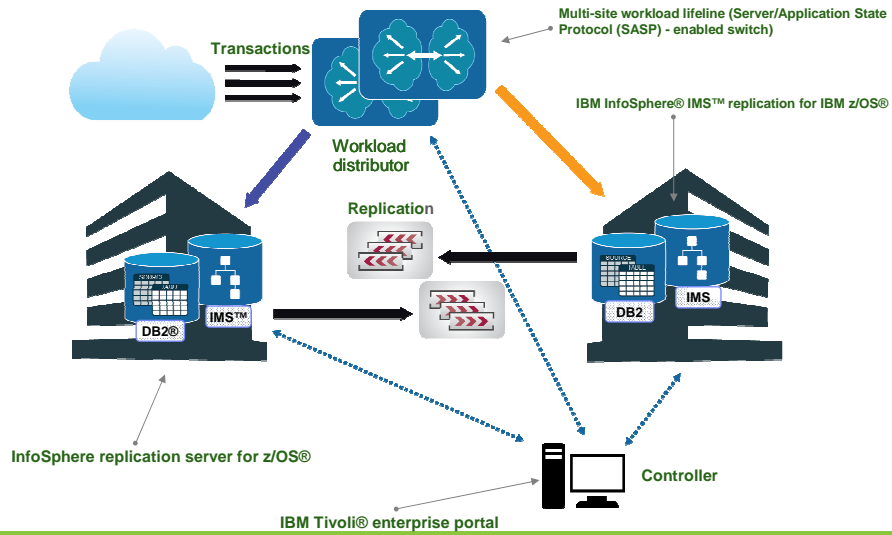
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Availability Restartability Recoverability	Planned Outage Unplanned Outage Disaster Protection
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## A graphical view of the IBM GDPS® Active/Active solution Concept



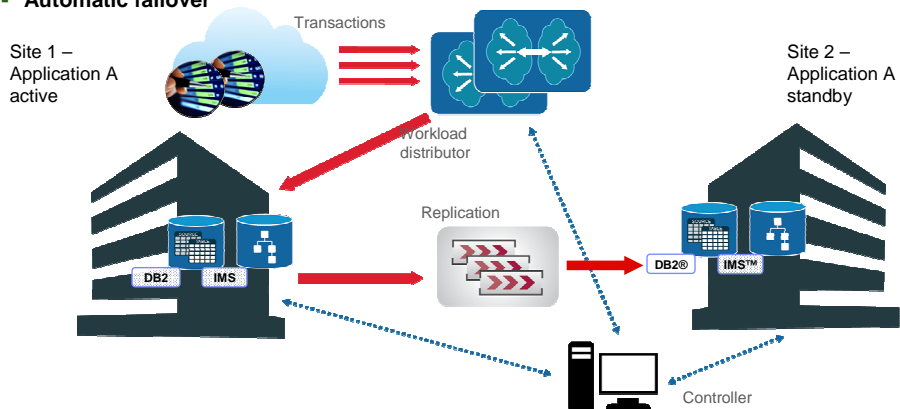
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## GDPS® active-standby configuration



### GDPS® active-standby configuration

- Static routing
- Automatic failover



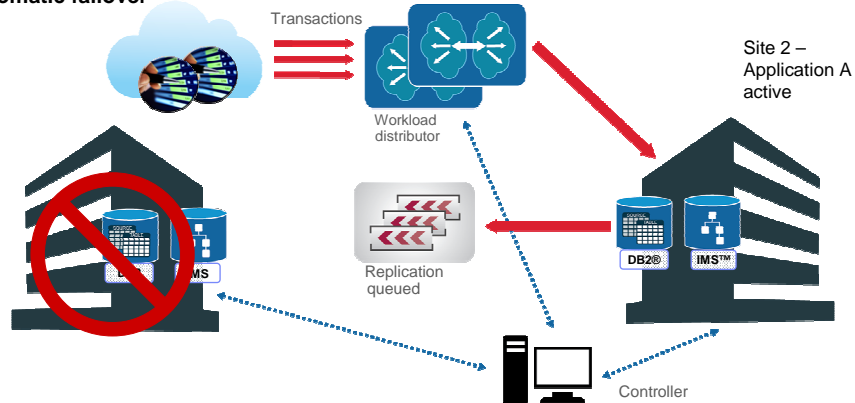
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## GDPS® active-standby configuration



- Static routing
- Automatic failover



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## GDPS Active/Active Sites Configurations



- **Configurations**
  - Active/Standby – GA date 30<sup>th</sup> June 2011
  - Active/Query – Statement Of Direction\*
- A configuration is specified on a workload basis
- A workload is the aggregation of these components
  - **Software:** user written applications (eg: COBOL programs) and the middleware run time environment (eg: CICS regions, InfoSphere Replication Server instances and DB2 subsystems)
  - **Data:** related set of objects that must preserve transactional consistency and optionally referential integrity constraints (eg: DB2 Tables, IMS Databases)
  - **Network connectivity:** one or more TCP/IP addresses & ports (eg: 10.10.10.1:80)

\* This statement represents the current intention of IBM. IBM development plans are subject to change or withdrawal without further notice. Any reliance on this statement of direction is at the relying party's sole risk and does not create any liability or obligation for IBM.

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## What is a GDPS Active-Active Environment ?



- Two Production Sysplex environments (also referred to as sites) in different locations
  - One active, one standby – for each defined workload
  - Software-based replication between the two sysplexes/sites
    - IMS and DB2 data is supported
- Two Controller Systems
  - Primary/Backup
  - Typically one in each of the production locations, but there is no requirement that they are co-located in this way
- Workload balancing/routing switches
  - Must be Server/Application State Protocol compliant (SASP)
    - RFC4678 describes SASP

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## What SW make up a GDPS/Active-Active environment ?

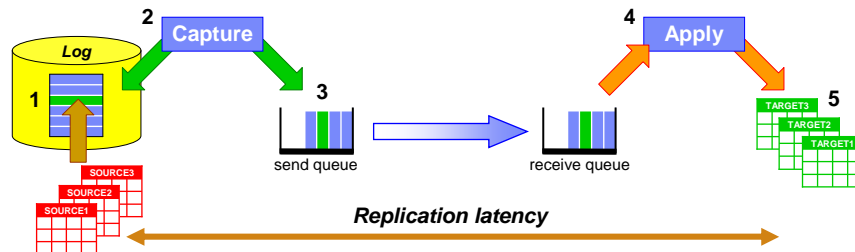


- **GDPS/Active-Active**
- **IBM Tivoli NetView for z/OS**
  - IBM Tivoli NetView for z/OS Enterprise Management Agent (NetView agent)
- **IBM Tivoli Monitoring**
- **System Automation for z/OS**
- **IBM Multi-site Workload Lifeline for z/OS**
- **Middleware – DB2, IMS, CICS...**
- **Replication Software**
  - IBM InfoSphere Replication Server for z/OS (DB2)
  - IBM InfoSphere IMS Replication for z/OS
- **Optionally the Tivoli OMEGAMON XE suite of monitoring products**

Integration of a number of software products

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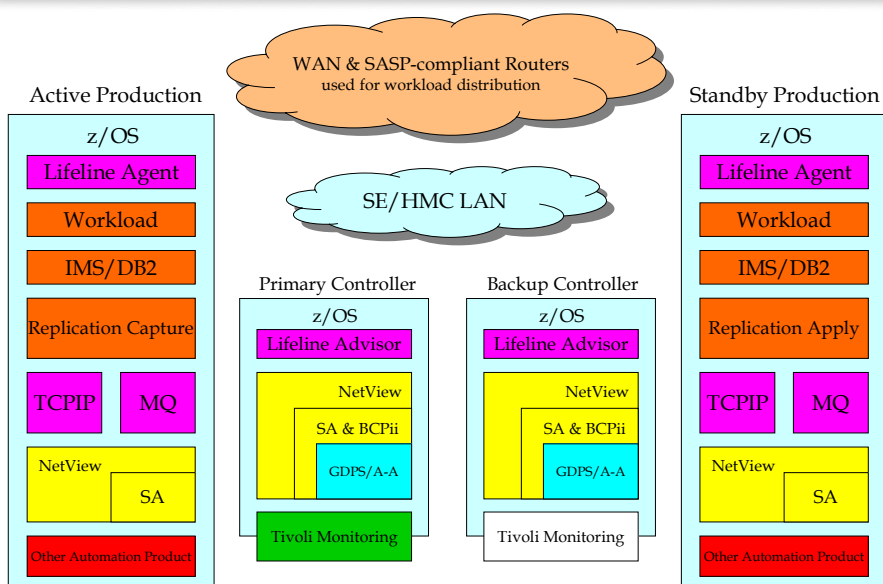
## Software Replication technique (DB2 example)



1. Transaction committed
2. Capture read the DB updates from the log
3. Capture put the updates on the send-queue
4. Apply received the updates from the receive-queue
5. Apply copied the DB updates to the target databases

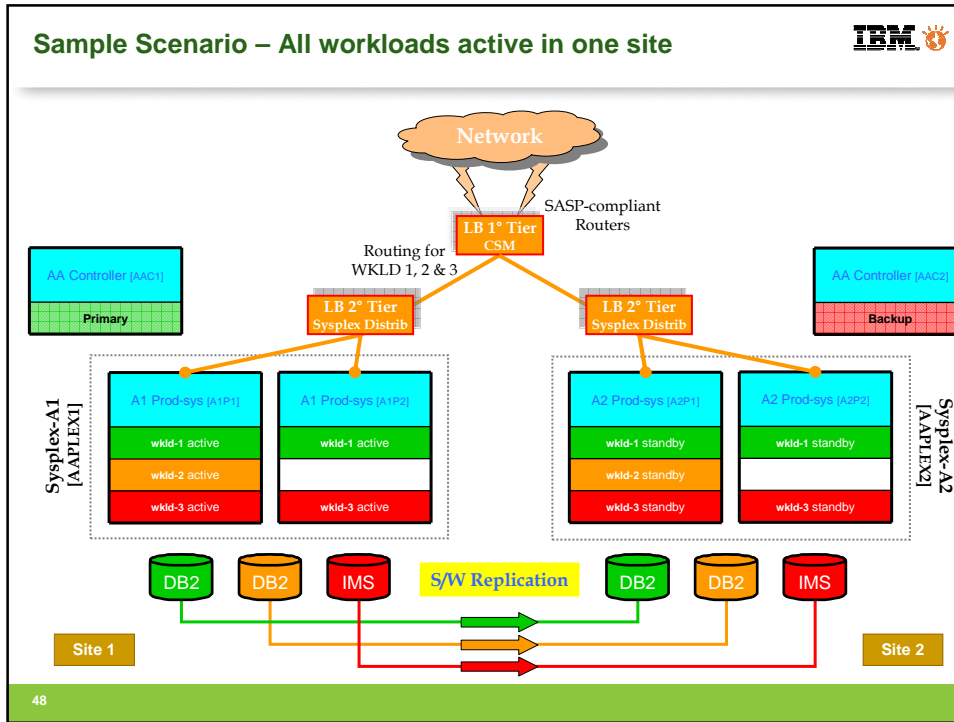
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## Architectural Building Blocks



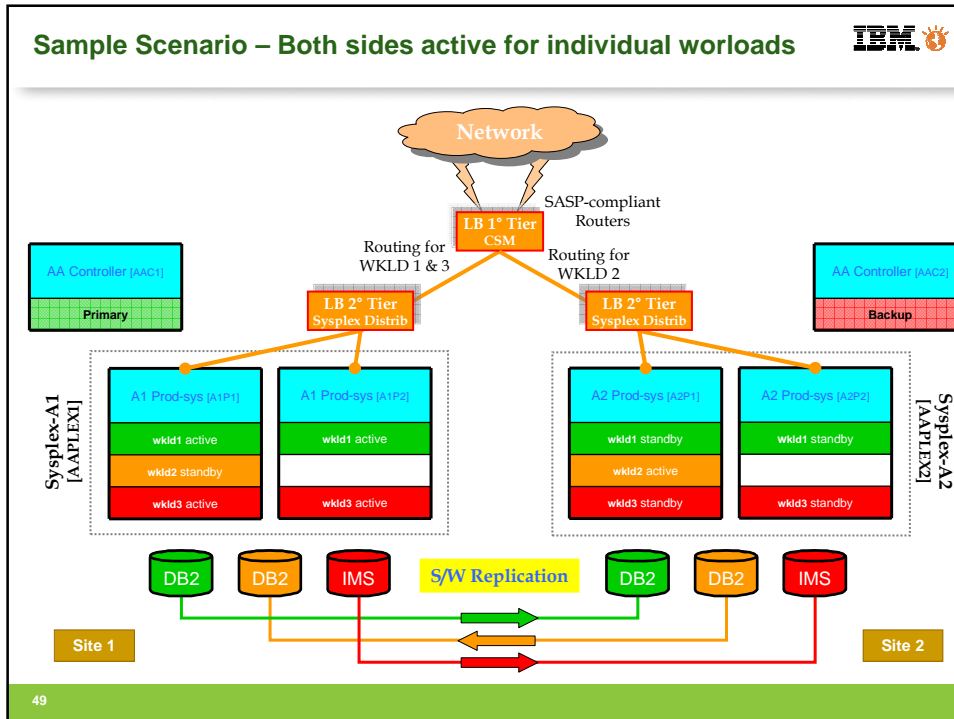
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### Sample Scenario – All workloads active in one site



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### Sample Scenario – Both sides active for individual workloads



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## GDPS/Active-Active for two (or more) active data centers – unlimited distance availability and D/R using automatic workload switch



CA, DR, & Cross-site Workload Balancing at Extended Distance

Two or more Active Data Centers

Automatic workload switch in seconds; seconds of data loss



GDPS/A-A

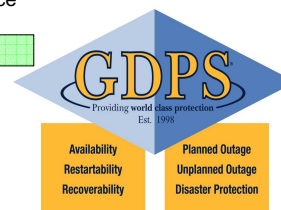
- Manages availability at a workload level
- Provides a central point of monitoring and control
- Manages SW based replication between sites
- Provides the ability to perform a controlled workload site switch
- Provides near-continuous data and systems availability and helps simplify disaster recovery with an automated, customized solution
- Reduces recovery time and recovery point objectives – measured in seconds
- Facilitates regulatory compliance management with a more effective business continuity plan
- Simplifies system resource management
- This is a fundamental paradigm shift from a failover model to a continuous availability model

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## Agenda



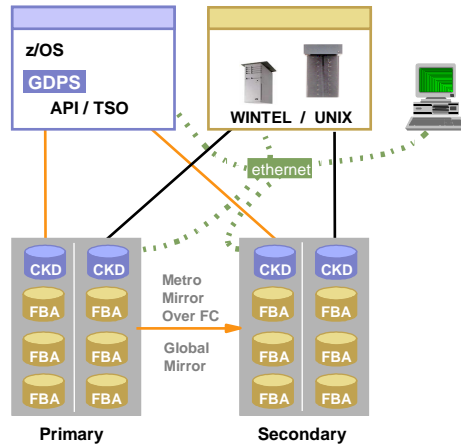
- Introduction
- Les offres GDPS
  - Continuous Availability of Data within a Data Center
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    - GDPS/Active-Active
  - Extensions to Heterogeneous Platforms
    - Open LUN Management
    - Multiplatform Resiliency for System z (xDR)
    - Distributed Cluster management (DCM)
- Conclusion / Compléments



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## Open LUN Management

GDPS/PPRC, GDPS/PPRC HM (Single site or 2 sites), GDPS/GM

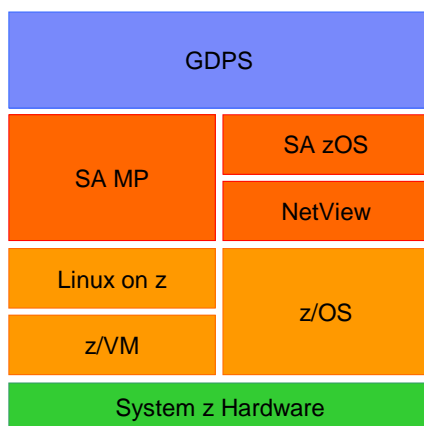


- Data consistency across **z/OS and distributed systems**
- GDPS single point of control
  
- Supports cross-platform or platform level Freeze
  - Suspends reported through SNMP alert
  
- GDPS/PPRC
- GDPS/PPRC HM
- GDPS/GM

**Enterprise-wide Disaster Recovery with data consistency!**

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## GDPS/PPRC Multiplatform Resiliency for System z (xDR)

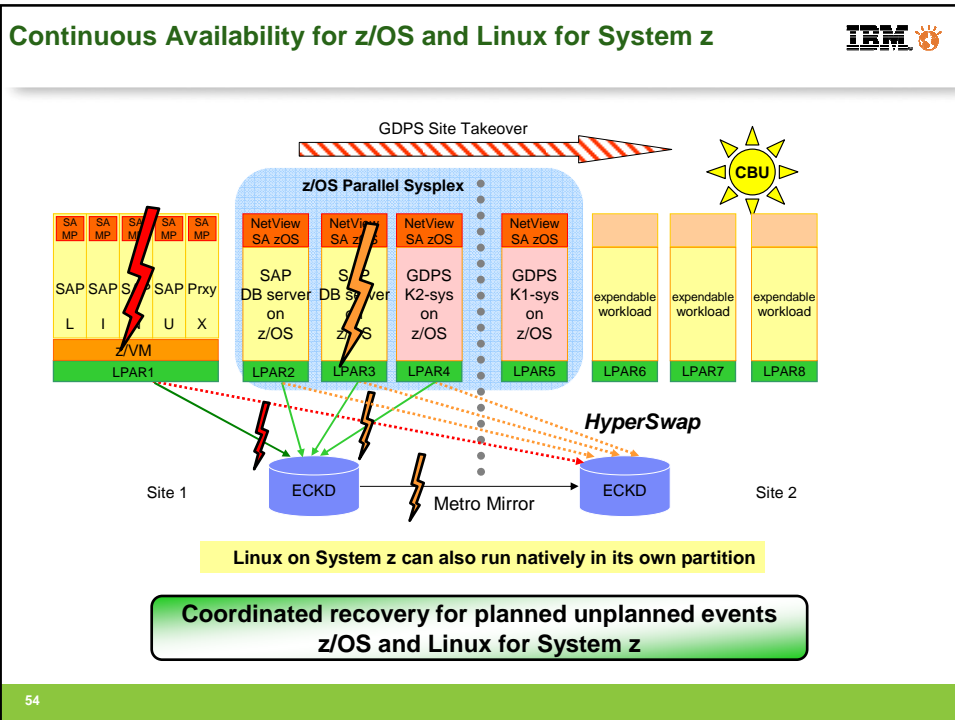


Business Continuity solution for z/OS and Linux applications on System z

- Leverage of existing and proven solutions
  - GDPS
  - SA z/OS
  - IBM Tivoli System Automation for Multiplatform (SA MP)
- Coordinated cross platform business resiliency for operating systems (OS) running on System z hardware
- Integration point of z/OS and Linux on System z

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

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- ### xDR provides ...
- **Coordinated recovery from a Linux for System z node or cluster failure**
    - GDPS will be made aware of a failure of a node or cluster by monitoring for heartbeats from all nodes
    - GDPS can automatically re-IPL a failing node or all nodes in the failing cluster
    - Data consistency across System z, Linux and/or z/VM
  - **Disk Subsystem maintenance (planned actions)**
    - Swap non-disruptively z/VM and its guests or native Linux from primary to secondary PPRC devices
  - **Disk Subsystem failure (unplanned actions)**
    - swap non-disruptively z/VM and its guests from primary to secondary PPRC devices following a failure that GDPS understands as HyperSwap trigger
  - **Single point of control to manage disk mirroring configuration**
- Coordinated recovery for planned and unplanned events  
z/OS and Linux for System z**
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## Distributed Cluster Management (DCM)



- **“End-to-end recovery solution”**
  - Provides management and coordination of:
    - Planned and unplanned outages
    - System z and distributed servers using clustering solutions
  - Helps optimize operations across heterogeneous platforms
  - Helps meet enterprise-level RTO and RPO
- **DCM function added to GDPS**
  - Main management code runs in GDPS
  - GDPS DCM agent code runs on one of the distributed servers in each cluster
- **DCM support for**
  - Veritas Cluster Server (VCS)
  - Tivoli System Automation Application Manager (SA AppMan)
- **Highly recommend IBM Geographically Dispersed Open Clusters (GDOC) services**

Integrated, Automated, Industry-unique

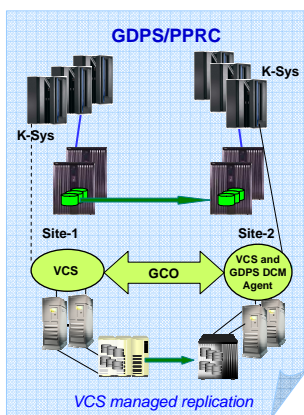
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## GDPS (PPRC/XRC/GM) DCM for VCS



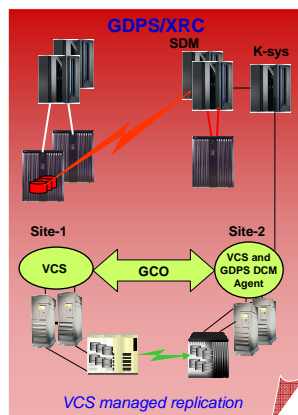
### CA / DR within a metropolitan region

Two data centers - systems remain active; designed for no data loss



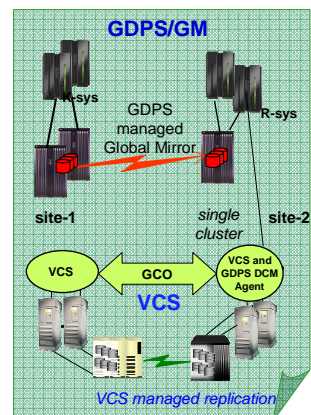
### DR at extended distance

Rapid systems recovery with only "seconds" of data loss



### DR at extended distance

Rapid systems recovery with only "seconds" of data loss



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## GDPS / VCS Integration

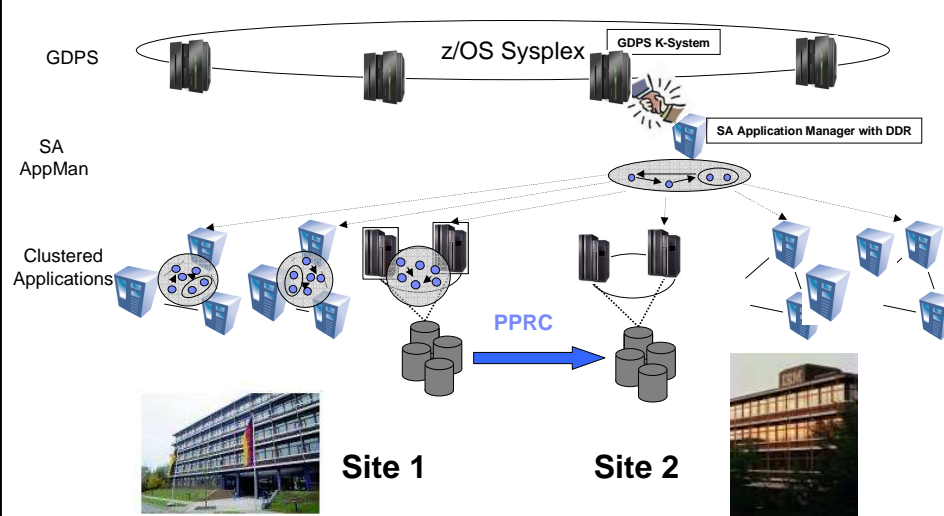


Example :

- **GDPS detects a resource failure**
- **GDPS will offer takeover actions, based on policy and failure**
- **After operator response, takeover script executed**
  - GDPS performs necessary actions to switch z/OS resources
  - GDPS instructs each DCM agent to switch applications for VCS cluster
  - Each agent acknowledges notification
  - VCS will execute requested action
  - Each agent will notify GDPS of action taken

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## IBM Tivoli SA Application Manager – Integration with GDPS Distributed Disaster Recovery (DDR)



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## DCM and IBM Tivoli SA AppMan



- **GDPS manages servers, data replication and has site awareness**
  - System z scope for servers
  - System z and non-System z systems scope for data replication
- **SA AppMan automation manages applications**
  - End to end scope,
  - cross cluster dependencies,
  - resource grouping (customer defined) to arbitrary abstraction level
- **Cross-notification between GDPS and SA AppMan automation**

SA Application Manager was previously called SA for Multi-Platform End-to-End



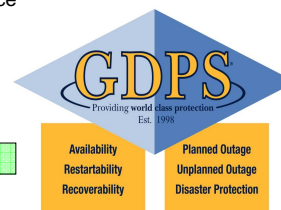
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## Agenda



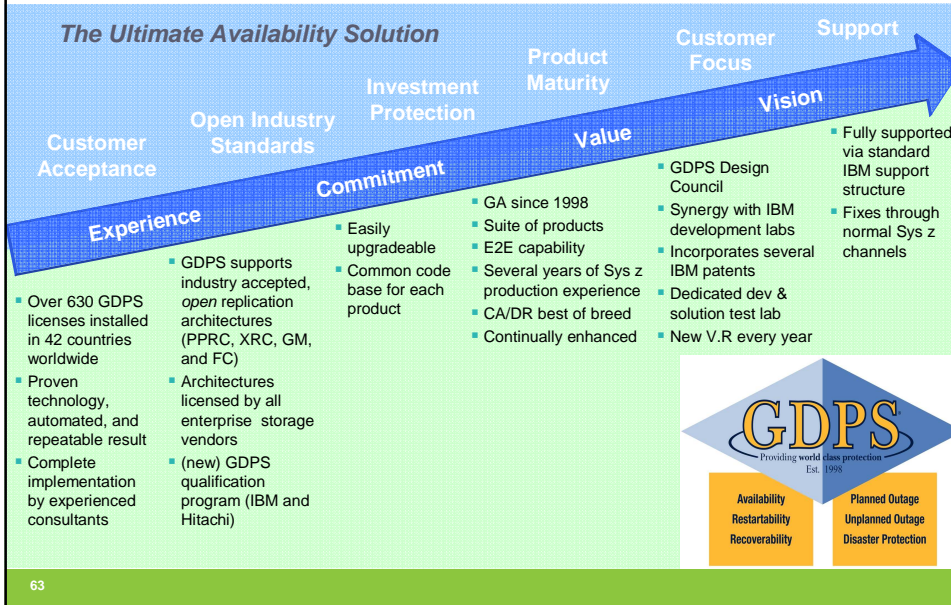
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### Conclusion / Compléments



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## GDPS Value Proposition



## Documentation



- IBM Redbooks :**
  - <http://www.redbooks.ibm.com/>
  - GDPS Family - An Introduction to Concepts and Capabilities SG24-6374-07 (*Draft 08*)
- IBM GDPS web site**
  - <http://www-03.ibm.com/systems/z/advantages/gdps/>
- IBM System z Business Resiliency web site**
  - <http://www-03.ibm.com/systems/z/advantages/resiliency/index.html>
- IBM Parallel Sysplex web site**
  - <http://www-03.ibm.com/systems/z/advantages/pso/index.html>

