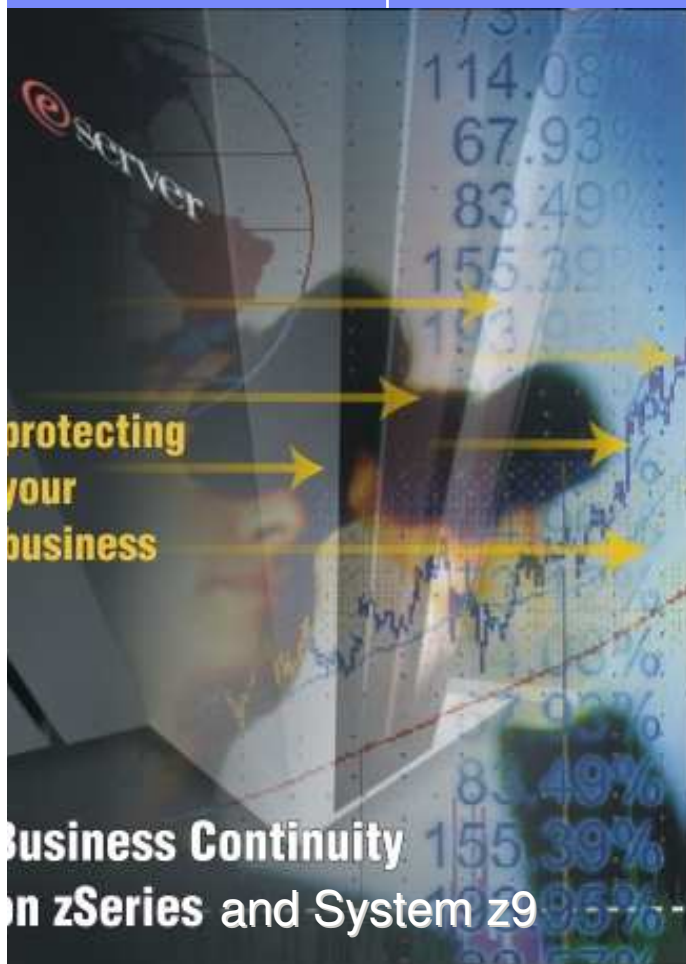




IBM zSeries and System z9



GDPS® Technical Detail

The IBM e-Business Availability Solution

GDPS@us.ibm.com

ON DEMAND BUSINESS™



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Agenda

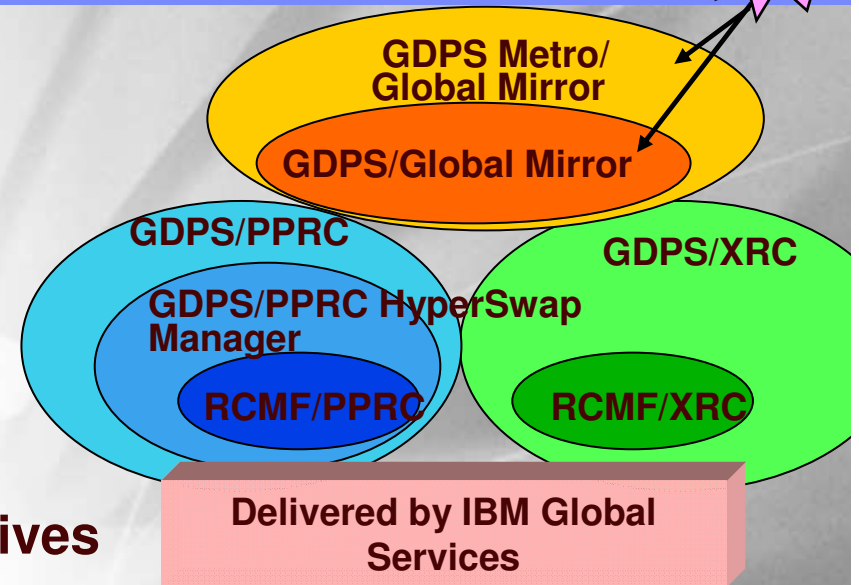
- **Business Continuity Overview**
 - Business Continuity Objectives
 - Need for Data Consistency
 - GDPS overview
- **Continuous Availability (CA) of Data within a Single Site**
 - Disk Maintenance and Disk Failures with HyperSwap Manager
- **Metropolitan Distance CA/Disaster Recovery (D/R) Solution (2 sites)**
 - Configuration Options
 - Planned and Unplanned Site Reconfiguration with HyperSwap
 - Open LUN Management
- **Unlimited Distance D/R Solution (2 sites)**
 - GDPS/XRC
 - GDPS/Global Mirror
- **CA/DR Solution (3 sites)**
 - z/OS® data only
 - z/OS® and Open data
- **Summary**
 - Reference Customer Experiences





Business Continuity Overview

- ✓ **Business Continuity Objectives**
- ✓ **Tiers of Disaster Recovery**
- ✓ **Synchronous vs. Asynchronous**
- ✓ **Need for Time Consistency**
- ✓ **What is GDPS**

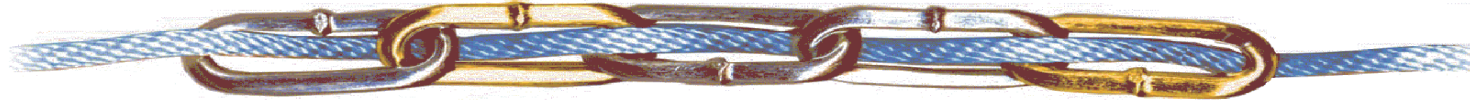


Business Continuity



Business Continuity is not simply IT Disaster Recovery... it is a management process that relies on each component in the business chain to sustain operations at all times.

- Effective Business Continuity depends on ability to:
 - Reduce the risk of a business interruption
 - Stay in business when an interruption occurs
 - Respond to customers
 - Maintain public confidence
 - Comply with requirements:
 - Audit
 - Regulator/Legislative
 - Insurance
 - Health and Safety



People

Facilities

Business
Processes

Infrastructure

Applications

... An end-to-end Business Continuity program is only as strong as its weakest link



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

Protection of critical business data

Operations continue after a disaster

Recovery is predictable and reliable

Costs are predictable and manageable

Business Continuity Objectives



■ Determine your Objectives for Business Continuity (by application)

– Recovery Time Objective (RTO)

- how long can you afford to be without your systems?

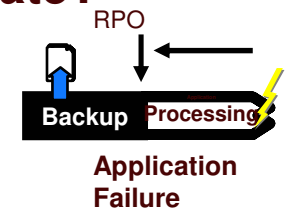


– Recovery Point Objective (RPO)

- when it is recovered, how much data can you afford to recreate?

– Network Recovery Objective (NRO)

- how long to switch over network?



■ Determine cost / recovery time curve

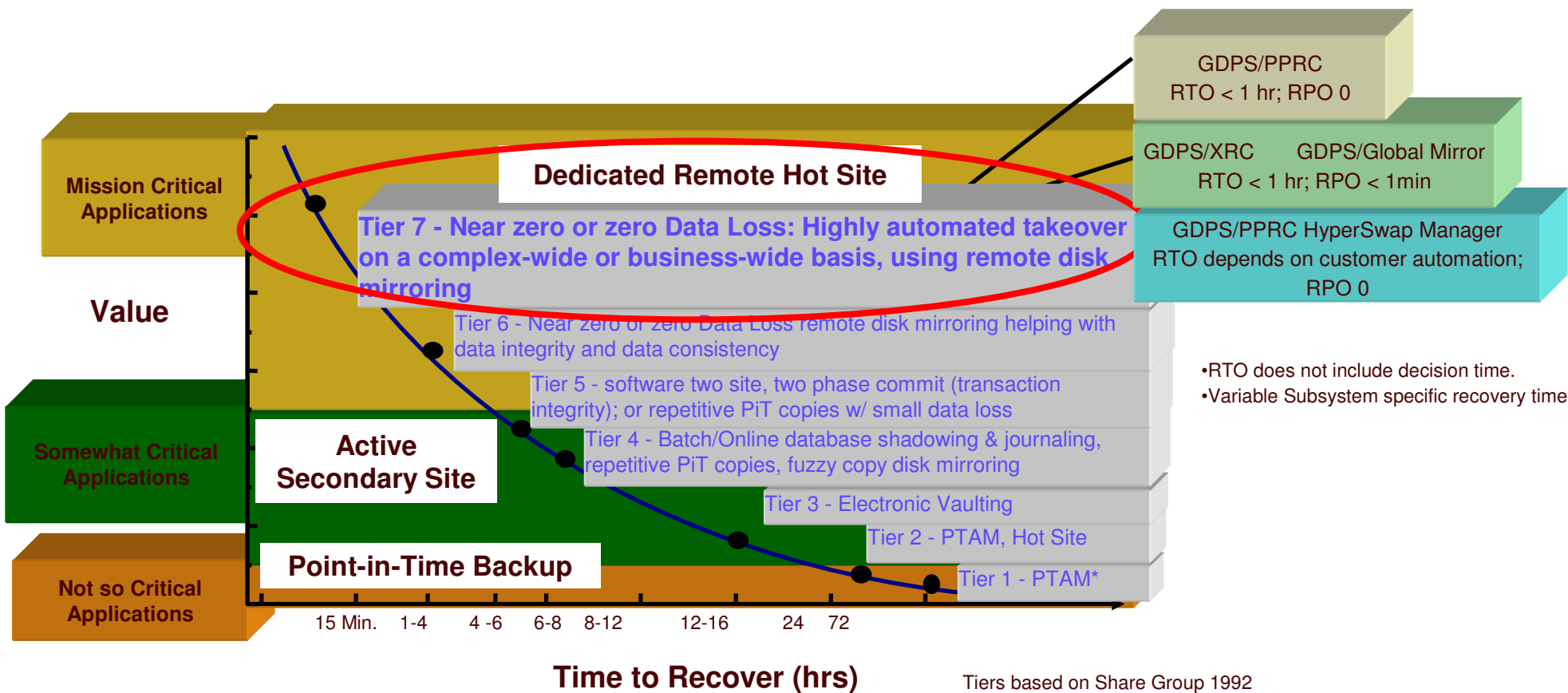


- If I spend a little more, how much *faster* is Disaster Recovery?
- If I spend a little less, how much *slower* is Disaster Recovery?

Determining the cost vs. RTO recovery curve is the key to selecting proper solution(s)



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



Lessons Learned About IT Survival

- Repeated Testing before a disaster is crucial to successful recovery after a disaster
 - TTWYR – Test The Way You Recover
 - RTWYT – Recover The Way You Test
- After a disaster, everything is different
 - Staff well-being will be 1st priority
 - Company will benefit greatly from well-documented, tested, available and automated (to the extent possible) recovery procedures
- May be necessary to implement in-house D/R solution to meet RTO/RPO
- Plan geographically dispersed IT facilities
 - IT equipment, control center, offices, workstations, phones, staff, . . .
 - Network entry points
- Installed server capacity at second data center can be utilized to meet normal day-to-day needs
- Failover capacity can be obtained by
 - Prioritizing workloads
 - Exploit new technology: Capacity Back Up (CBU)
- Data backup planning and execution must be flawless
 - Disk mirroring required for <12hr RTO (need 2x capacity)
 - Machine-readable data can be backed up; not so for paper files
- Check D/R readiness of critical suppliers, vendors



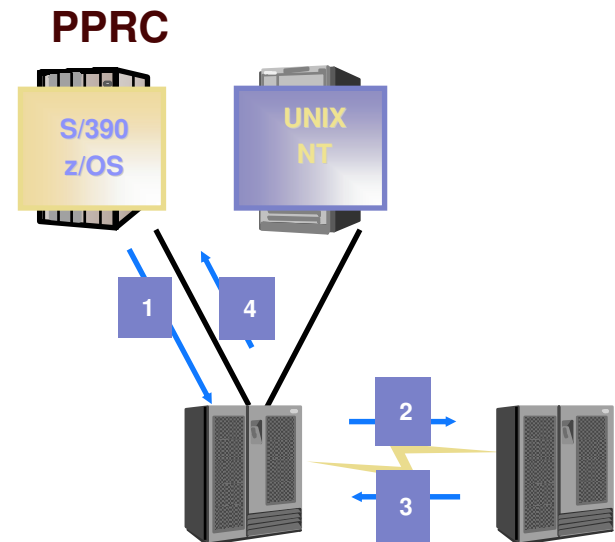
Interagency Paper on Sound Practices to Strengthen the Resilience of the U.S. Financial System [Docket No. R-1128] (April 7, 2003)

- 1. Identify clearing and settlement activities in support of critical financial markets**
- 2. Determine appropriate recovery and resumption objectives for clearing and settlement activities in support of critical markets**
 - ...core clearing and settlement organizations should develop the capacity to **recover and resume** clearing and settlement activities within the business day on which the disruption occurs with the overall goal of achieving recovery and resumption **within two hours** after an event.
- 3. Maintain sufficient geographically dispersed resources to meet recovery and resumption objectives.**
 - Back-up arrangements should be as far away from the primary site as necessary to avoid being subject to the same set of risks as the primary location.
 - The effectiveness of back-up arrangements in recovering from a wide-scale disruption should be confirmed through testing.
- 4. Routinely use or test recovery and resumption arrangements.**
 - One of the lessons learned from September 11 is that testing of business recovery arrangements should be expanded.

PPRC and XRC Overview

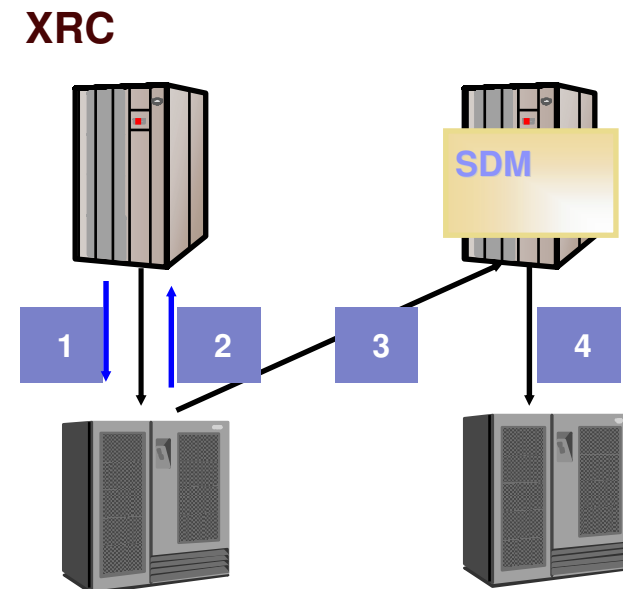
PPRC (Metro Mirror)

- Synchronous remote data mirroring
 - Application receives “I/O complete” when both primary and secondary disks are updated
- Typically supports metropolitan distance
- Performance impact must be considered
 - Latency of 10 us/km

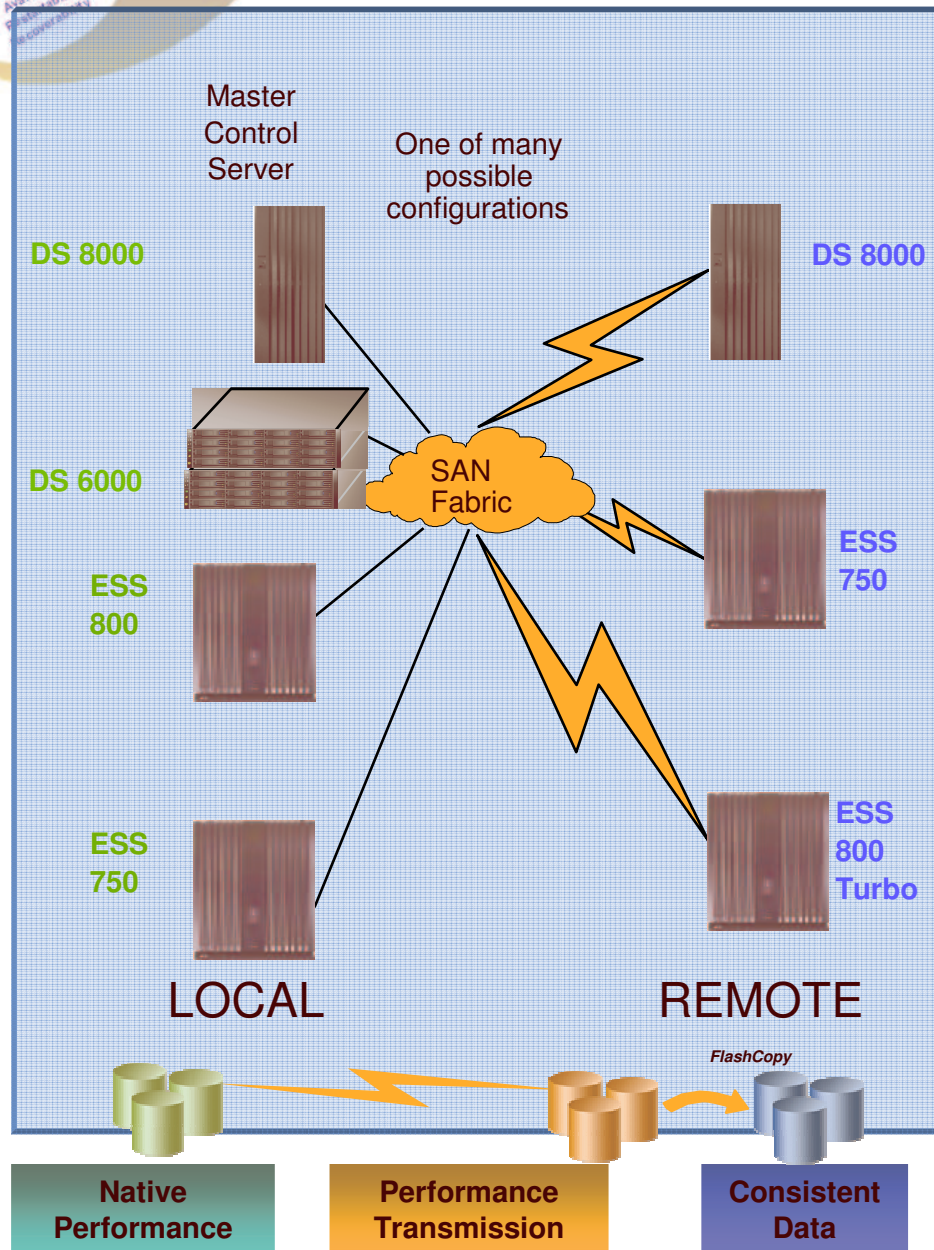


XRC (z/OS Global Mirror)

- Asynchronous remote data mirroring
 - Application receives “I/O complete” as soon as primary disk is updated
- Unlimited distance support
- Performance impact negligible
- System Data Mover (SDM) provides
 - Data consistency of secondary data
 - Central point of control



Storage Consolidation and Disaster Recovery with IBM TotalStorage Global Mirror



■ Designed to Provide:

- **Global Distance:** Two-site, unlimited distance, data consistent asynchronous disk mirroring
- **Heterogeneous:** Data can span zSeries® and open systems data, and can contain a mix of zSeries and open systems data
- **Scalability:** Consistency Group supported across up to 17 total ESSs in Global Mirror session (with RPQ)
- **Flexibility:** Many possible configurations
- **Application Performance:** Native
- **Mirroring Performance:** Two ESS Fibre Channel disk mirroring links per ESS sufficient for almost all workloads

■ Intended Benefits

- **Autonomic:** No active external controlling software required to form consistency groups
- **Saves cost:** No server cycles required to manage consistency groups
- **Lowers TCO:** designed to provide improved performance, global distances, and lower costs



Business Impact Analysis - Synchronous vs. Asynchronous

Business Impact Analysis

- **Maximum acceptable *response time impact***
- **Maximum acceptable *transaction loss by business process (RPO)***
- **Distance between production and recovery sites**

- **SYNCHRONOUS** remote copy:
 - Use when ***response time impact*** is acceptable
 - Use when distance is short
 - Use when no data loss is ***the objective***
 - ***Often best choice for fastest recovery***
 - **Tradeoff:**
 - ***Meet goal of No data loss & potential CA***
 - vs**
 - ***Application impact & short distance***

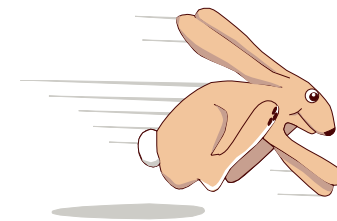
- **ASYNCHRONOUS** remote copy:
 - Use when ***smallest possible impact*** to primary site performance is ***required***
 - Use when unlimited distance is ***the objective***
 - ***Use when minimal loss of data is acceptable***
 - **Tradeoff:**
 - ***Negligible appl. impact & unlimited distance***
 - vs**
 - ***Minimal data loss***



Today's Business Continuity Objectives Demand Rapid Database Availability

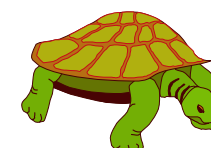
■ Achieve Application and Database Restart

- Consistent, repeatable, fast
- Database Restart: To start a database application following an outage without having to restore the database
 - This is a process measured in minutes



■ Avoid Application and Database Recovery

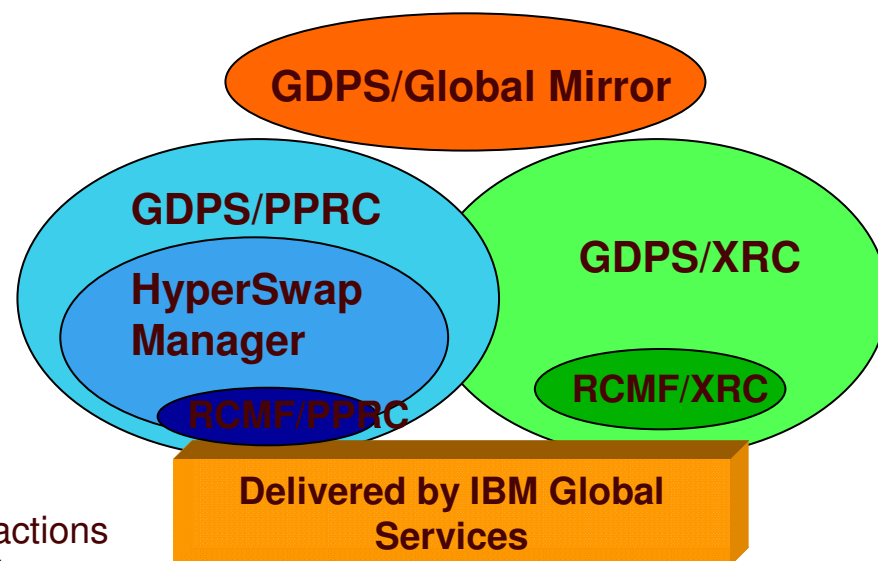
- Unpredictable recovery time, usually very long and very labor intensive
- Database Recovery:
 - Restore last set of Image Copy tapes and apply log changes to bring database up to point of failure
 - This is a process measured in hours or even days





What is GDPS?

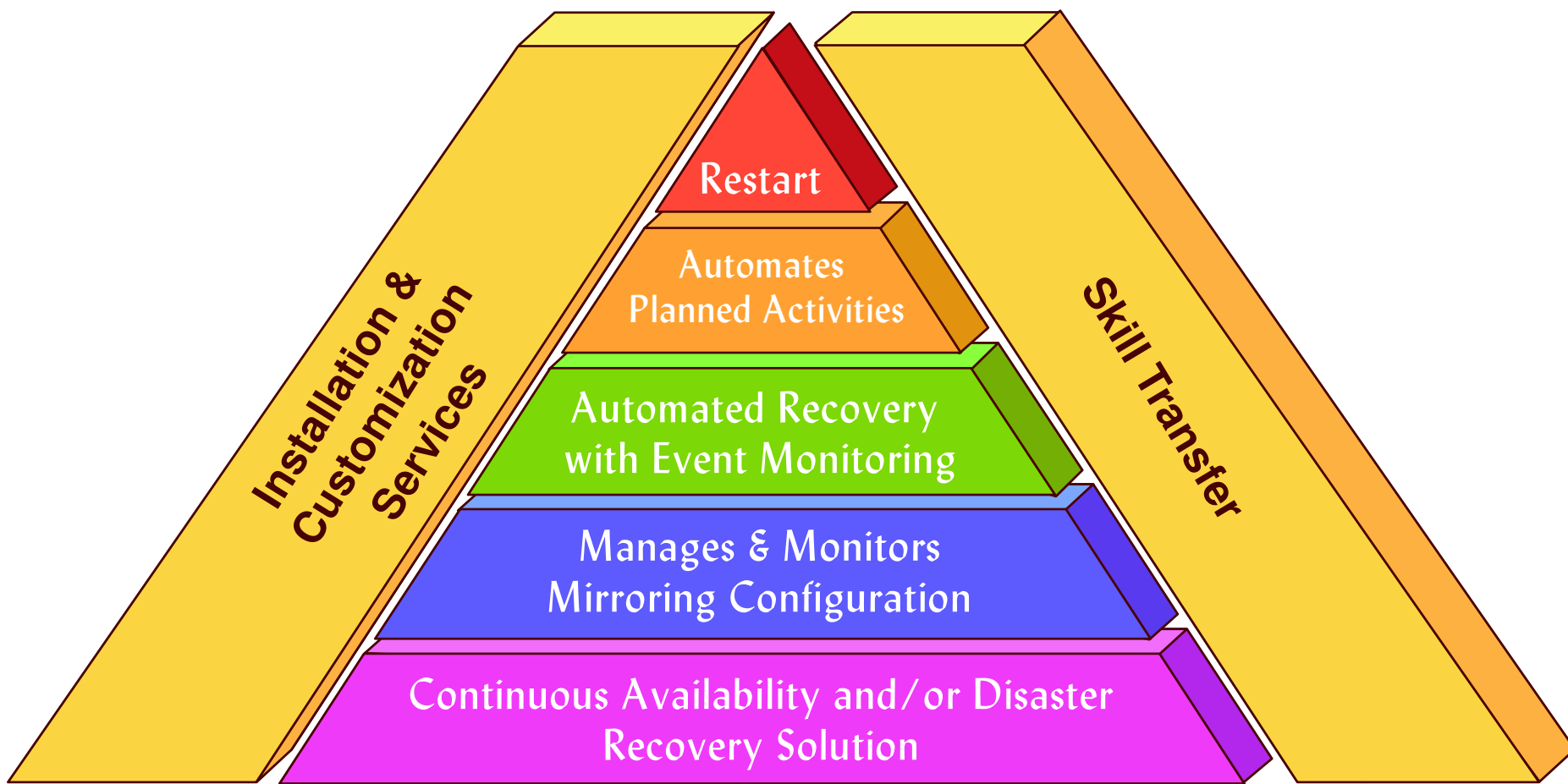
- **Integrated automated solution that manages application and/or data availability in and across sites**
 - Builds on proven high availability technologies
 - Clustering
 - Remote Copy (Disk and Tape)
 - Automation
- **Manages both planned and unplanned exception conditions**
 - System or site maintenance
 - System or site failure
 - D/R validation testing using PIT copy
- **Continuous availability possibilities**
 - With HyperSwap technology
- **Easy to use End-User interface through**
 - Intuitive Panel Interface - status and planned actions
 - Simple Scripting - planned and unplanned actions
- **Delivered as a solution offering by IBM IGS**
 - Consultancy and experience sharing
 - Synergistic implementation approach
- **Flexible options to meet a variety of requirements**



Designed for Continuous Application & Data Availability
Single point of control
Delivered through IBM Services



GDPS offers a comprehensive solution, not just remote copy technology





Automation: Critical for successful rapid recovery and continuity

- The benefits of automation:
 - Allows business continuity processes to be built on a reliable, consistent recovery time
 - Recovery times can remain consistent as the system scales to provide a flexible solution designed to meet changing business needs
 - Reduces infrastructure management cost and staffing skills
 - Reduces or eliminates human error during the recovery process at time of disaster
 - Facilitates regular testing to help ensure repeatable, reliable, scalable business continuity
 - Helps maintain recovery readiness by managing and monitoring the server, data replication, workload and the network along with the notification of events that occur within the environment

Automate - Automate - Automate



GDPS Solutions - Synchronous

Continuous Availability of Data (Single Site)

Solution	Target Customer	Value
GDPS/PPRC HyperSwap Manager (Single site)	Parallel Sysplex	Continuous Availability of Data

Metropolitan Distance CA/DR (2 sites)

Solution	Target Customer	Value
RCMF/PPRC	Disk Mirroring	PPRC Management Ease of Use
GDPS/PPRC HyperSwap Manager	Entry Level Disaster Recovery (DR)	Planned & Unplanned reconfiguration RPO=0; RTO depends on customer automation
GDPS/PPRC Sysplex/PPRC across 2 sites Prod systems in same site or Prod systems in 2 sites)	DR for zSeries and Open Data Continuous zSeries Data availability	Planned & Unplanned reconfiguration RPO=0; RTO< 1 hr
GDPS/PPRC BRS configuration Sysplex in one site PPRC across 2 sites	DR for zSeries and Open Data	Planned & Unplanned reconfiguration RPO=0; RTO< 4 hrs



GDPS Solutions - Asynchronous

Unlimited Distance D/R (2 sites)

Solution	Target Customer	Value
RCMF/XRC	Disk Mirroring	XRC Management Ease of Use
GDPS/XRC	DR (zSeries Only)	Site failover RTO < 1 hr; RPO < 1 min
GDPS/Global Mirror	DR (zSeries & Open data)	Site failover RTO < 1hr ; RPO < 1 min

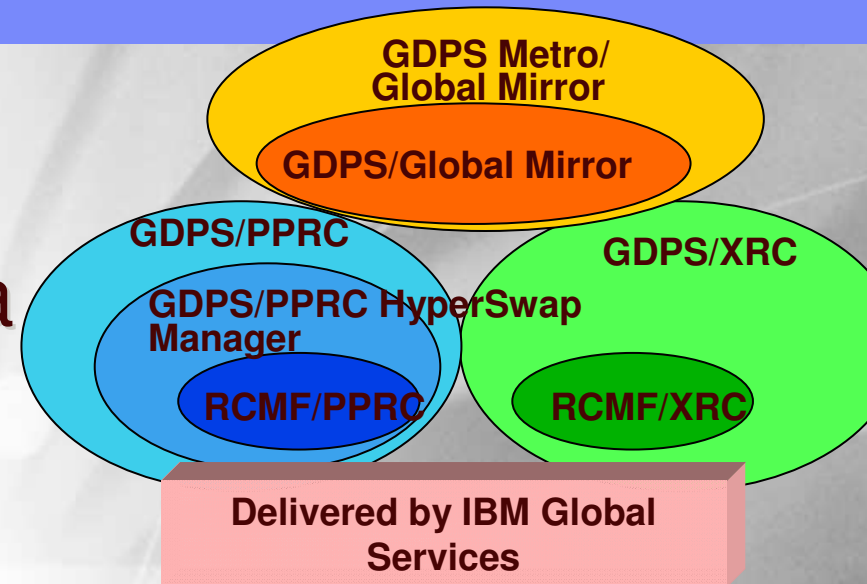
CA/DR 3 sites (Metro + Unlimited Distance)

Solution	Target Customer	Value
GDPS/PPRC & GDPS/XRC (z/OS data only)	Economically essential businesses; Ultimate Bus Continuity	Metro distance CA for zSeries data & unlimited distance DR
GDPS Metro/Global Cascading (z/OS & Open Data)	Economically essential businesses; Ultimate Bus Continuity	Metro distance CA & unlimited distance DR





Continuous Availability of data within a single site



- ✓ **Capacity Backup (CBU) technology**
- ✓ **HyperSwap technology**
- ✓ **GDPS/PPRC HyperSwap Manager**
- ✓ **Unplanned and Planned disk reconfiguration w/ HyperSwap**

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Capacity BackUp Upgrade (CBU)

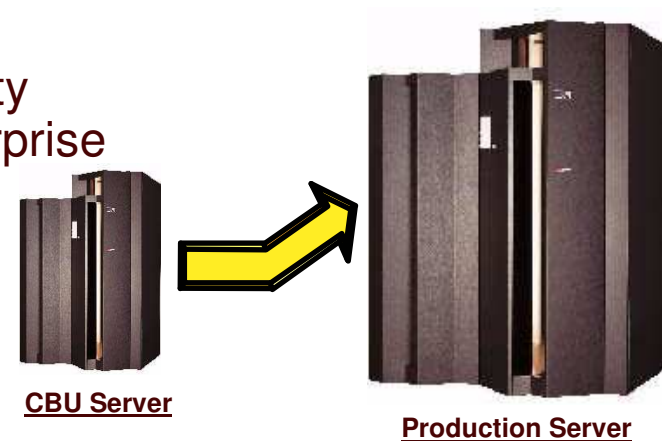


■ Who Needs It?

- Any business with a requirement for increased availability or Disaster Recovery

■ What Is It?

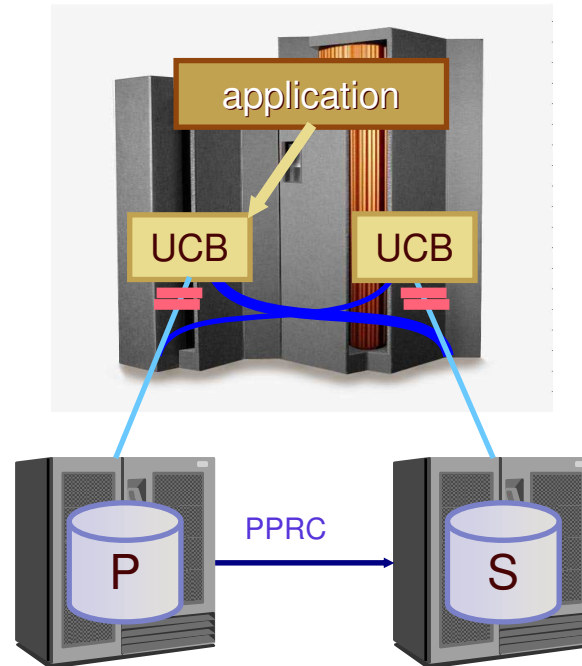
- Provides the ability to nondisruptively increment capacity temporarily when capacity is lost elsewhere in the enterprise
- Dual Microcode Loads
 - Provide two machine configurations in one box
- Take advantage of "spare" PUs
- Significant cost savings possible
 - Standby MIPS cost can be eliminated
 - IBM Software license charges on standby MIPS can be reduced or eliminated
- Configure memory and channels to support production workload



■ How Can I Use It?

- Adjacent machines in the same location
- Multiple images in the same Parallel Sysplex® cluster
- Backup/Recovery site

GDPS/PPRC HyperSwap – the Technology



- Substitutes PPRC secondary for primary device
 - No operator interaction - GDPS-managed
 - Can swap large number of devices - fast
 - Includes volumes with Sysres, page DS, catalogs
 - Non-disruptive - applications keep running

Brings different technologies together to provide a comprehensive application and data availability solution



GDPS/PPRC HyperSwap Manager Benefits

- Availability
 - Extends Parallel Sysplex availability to disk subsystems
- System Management
 - Simplifies management of Remote Copy configuration, reducing storage management costs
 - Reduces time required for Remote Copy implementation
 - Combines the features of Remote Copy management with the automation of GDPS
- Effective entry level offering for customers that require high levels of availability
 - Specially priced Tivoli NetView and System Automation products
 - Positioned to upgrade to full GDPS



***Parallel Sysplex designed to provide Near-Continuous Availability of systems, servers and applications within a single site
(degree of availability depends on exploitation of Parallel Sysplex)***



GDPS/PPRC HyperSwap Manager Functional Overview

- **Single point of control to manage the remote copy configuration**
 - zSeries and open data
 - Cannot HyperSwap Open Data; Open data will be “frozen” to maintain data consistency
- **Unplanned HyperSwap**
 - Masks primary disk subsystem failures by transparently switching to use secondary disks
- **Planned HyperSwap**
 - Provides ability to perform disk maintenance without requiring applications to be quiesced
- **Enables data consistency in the event of failures or disaster**
- **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



PPRC Configuration Management with Data Consistency

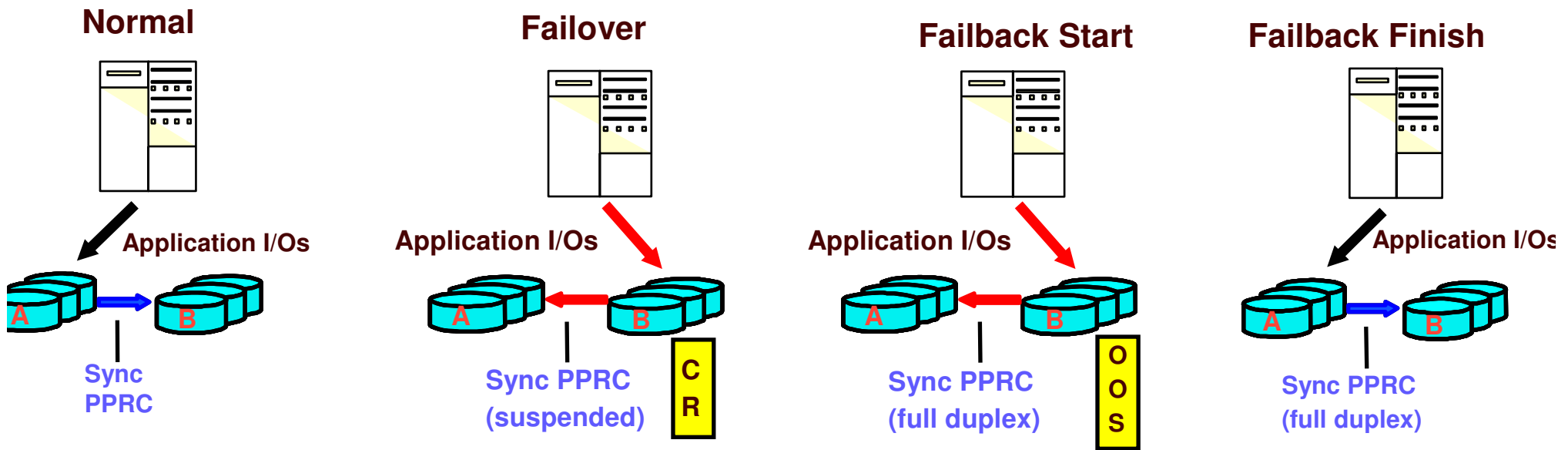
- Central point of control - full screen
 - TSO commands not needed
- Initialize & maintain Remote Copy configuration
 - Initiate functions per pair, subsystem or all
 - Automatically establish target configuration at system startup
 - Suspend / resume remote copy operation
 - Add, move, remove pairs, subsystems, links
- Monitoring
- Exception reporting via alerts
- Freeze function assures secondary data consistency allowing systems and applications to be restarted in site 2
 - Restart has to be invoked by customer

Manage Remote Copy configuration vs Remote Copy pairs
Assure data consistency in the event of failures



PPRC Failover / Failback (FO/FB)

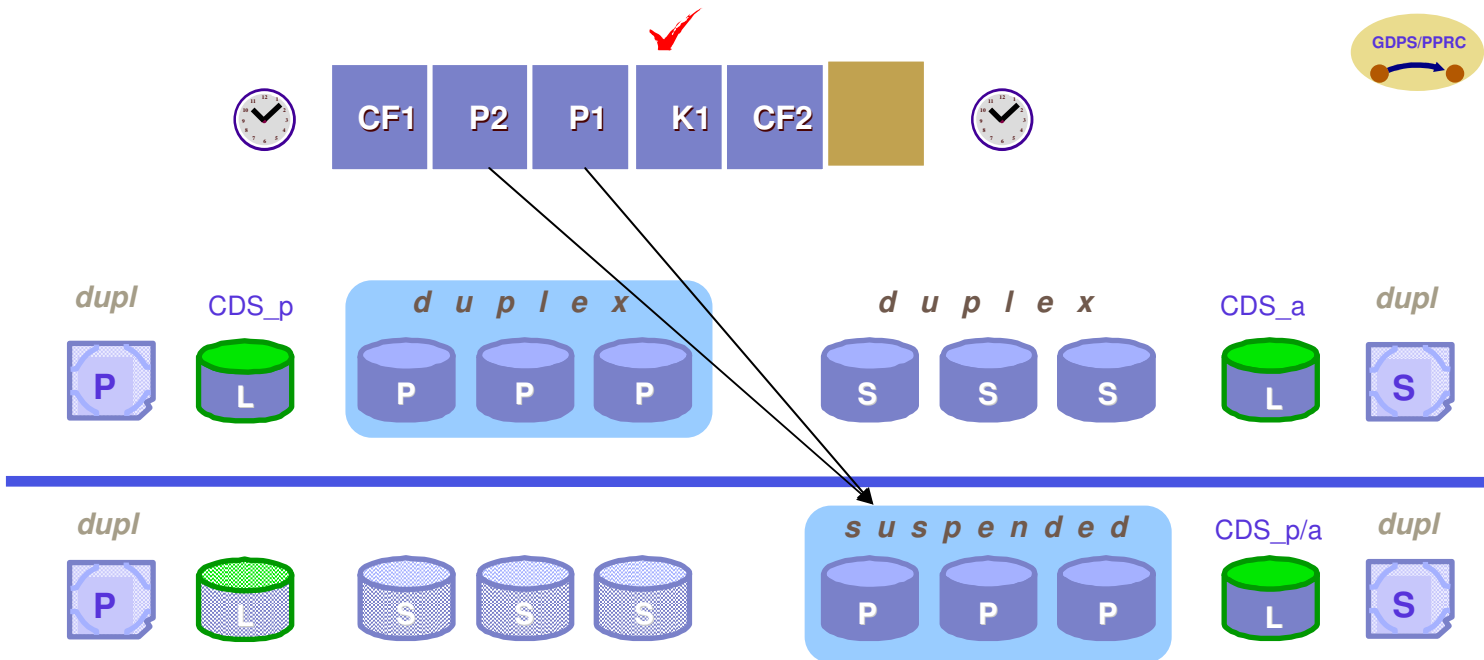
- The new primary volumes (at the remote site) record changes while in failover mode.
- The original mode of the volumes at the local site is preserved as it was when the failover was initiated.
- Only need to resynchronize from time of failover, not entire data set



- **Faster Resynchronization**
- **Less resource consuming**



Planned Disk Reconfiguration with HyperSwap



Without HyperSwap

PLANNED ACTION INITIATED

shutdown systems, remove systems from Sysplex, reverse PPRC (suspend PPRC), restart systems

1-2 hrs (approx)

With HyperSwap and FO/FB

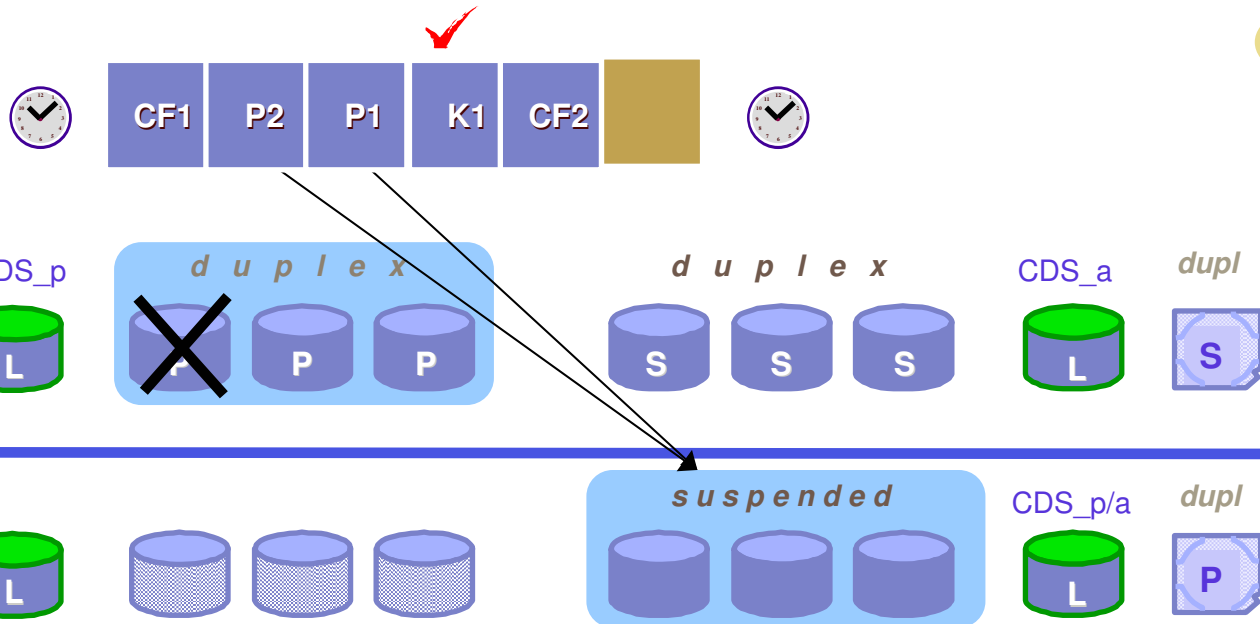
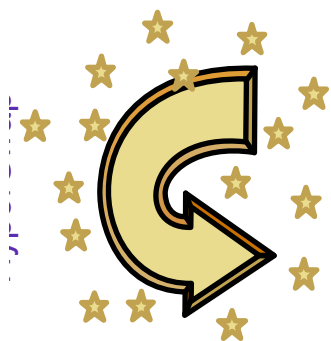
15 Seconds! (6545 vol pairs, 19.6 TB, 46 LSS's)!

PPRC Failover, swap the primary & secondary PPRC UCBs, systems continue

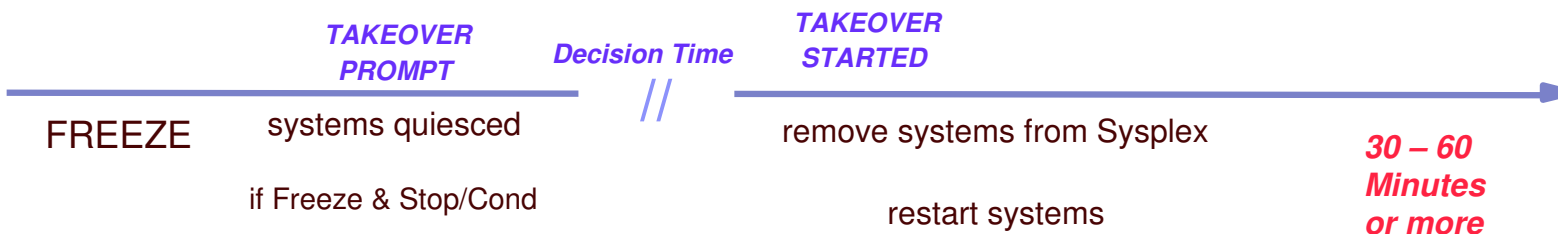
P1, P2 remain active throughout the procedure



Unplanned Disk Reconfiguration with HyperSwap



Without HyperSwap



With HyperSwap and FO/FB

13 Seconds! (6545 volume pairs, 19.6 TB, 46 LSSs)
Only changed data needs to be copied to restore to original configuration
 PPRC Failover, swap the primary & secondary PPRC UCBs, systems continue

P1, P2, remain active throughout the procedure



HyperSwap Extensions

- **Existing HyperSwap Triggers**
 - I/O errors
 - Boxed devices
 - Control Unit failures

- **IOS Timing Trigger**
 - Availability
 - Autonomic detection of “**Soft Failures**” to trigger HyperSwap
 - Based upon customer defined I/O timing thresholds

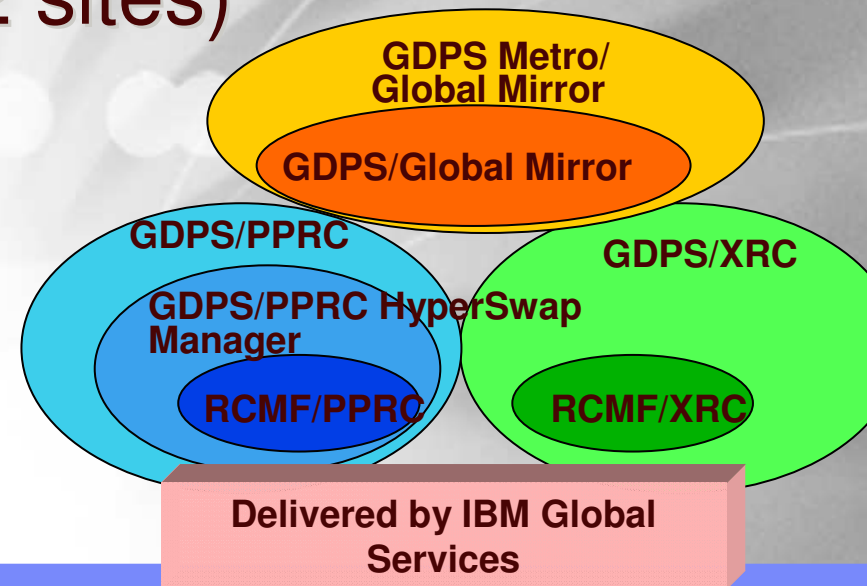
- **Dual site and single site environments**
 - GDPS/PPRC
 - GDPS/PPRC HyperSwap Manager





Metropolitan Distance Continuous Availability / Disaster Recovery Solution (2 sites)

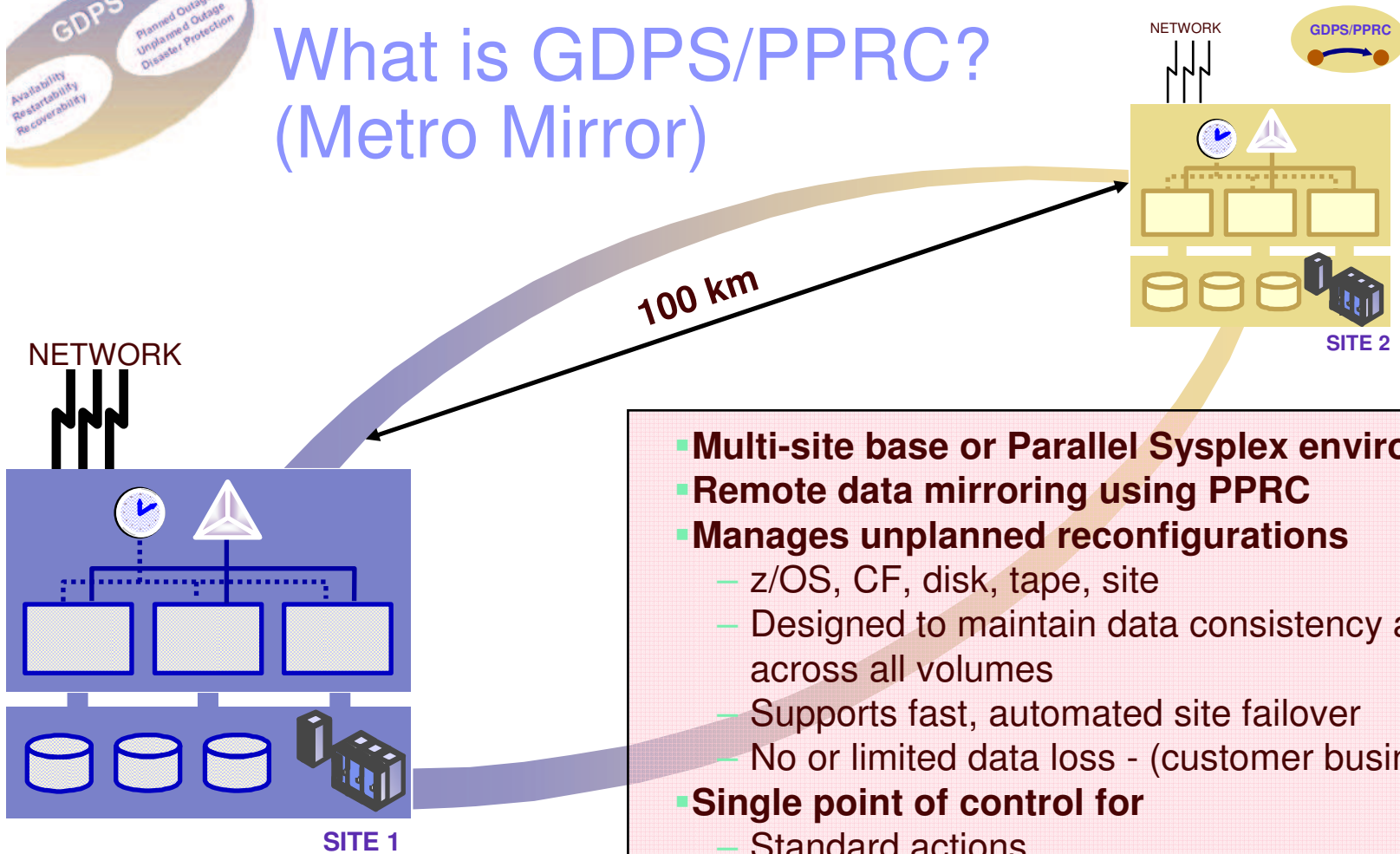
- ✓ **GDPS/PPRC**
- ✓ **GDPS/PPRC HM**
- ✓ **Configurations**
- ✓ **Management of Open Systems LUNs**
- ✓ **Multi-Platform Resiliency**



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What is GDPS/PPRC? (Metro Mirror)

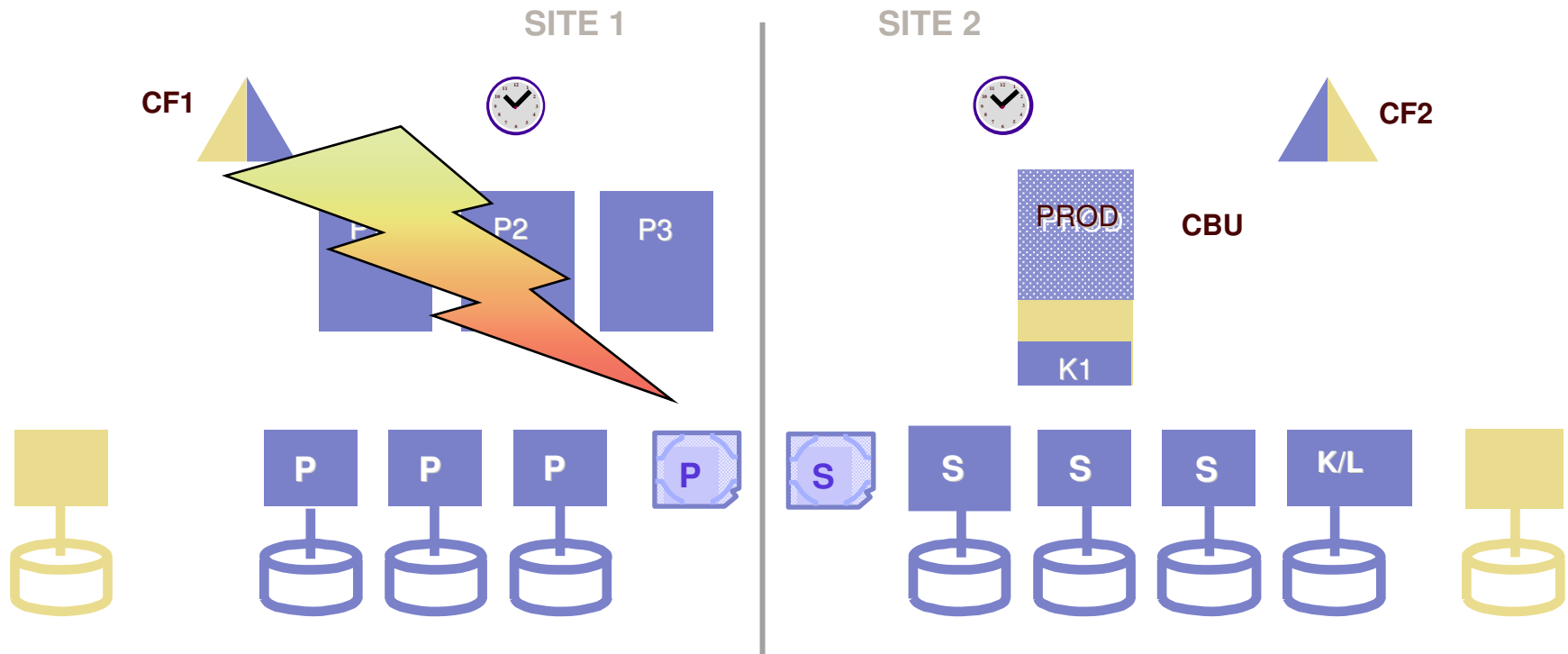


Planned and Unplanned exception conditions

- **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



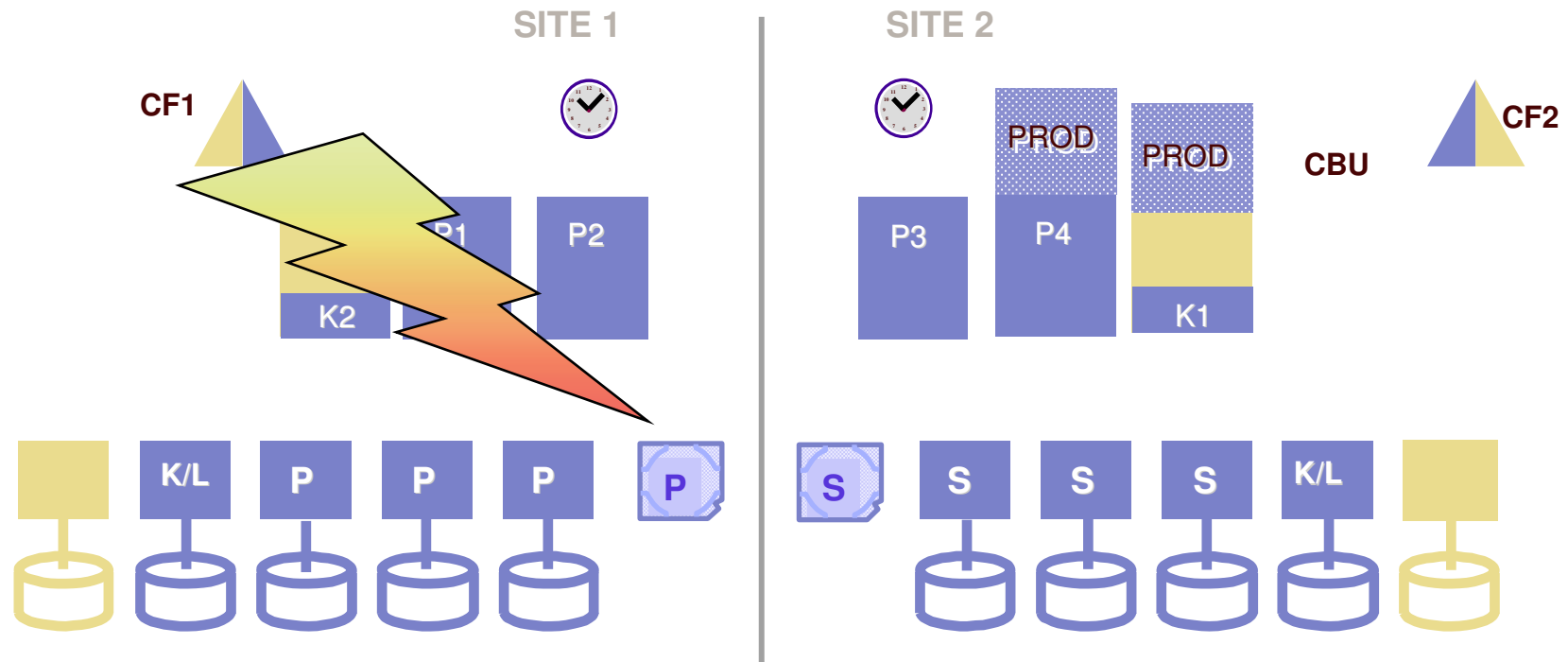
Single Site Workload - Cross-site Sysplex Near Continuous Availability Configuration



**Site recovery by restarting failed system images in Site 2
Designed to support continuous access to data from site 1
Unplanned and planned disk reconfiguration with HyperSwap**



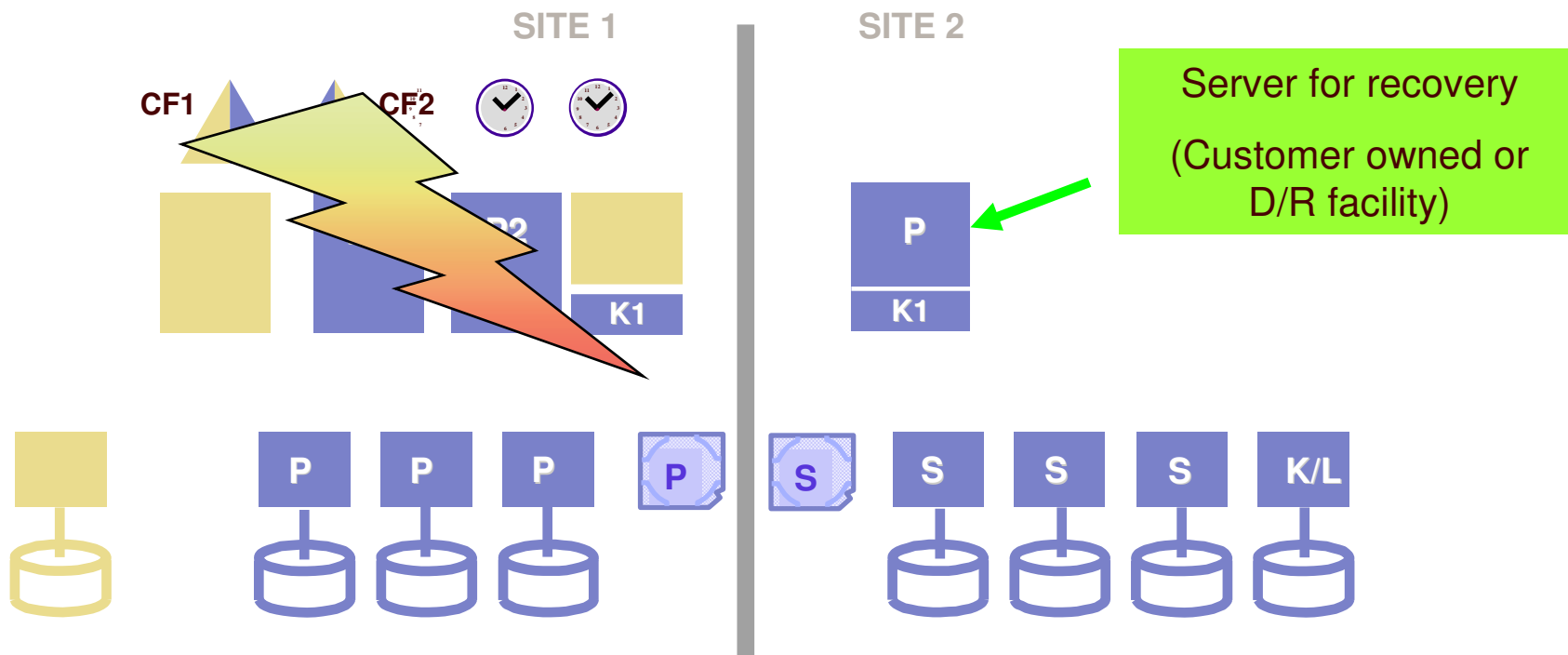
Multiple Site Workload - Cross-site Sysplex Continuous Availability Configuration



**Supports Planned and Unplanned Site and Disk reconfiguration via HyperSwap
 Operating systems remain active, applications need to be recycled
 Designed to provide continuous access to data from either site**



Sysplex in a single site (aka BRS configuration) PPRC across sites



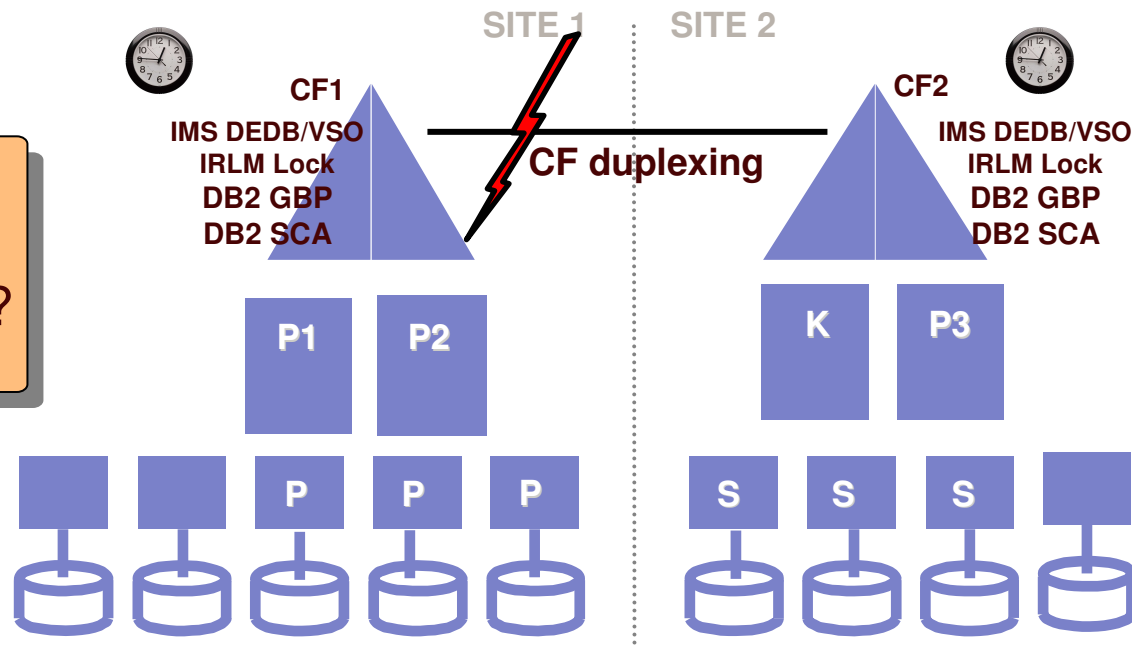
Up to 100 km

IPL K system in Site 2
GDPS automation restarts Production systems and applications
No Data Loss. Full data consistency



Enhanced Recovery Support for CF Duplexing

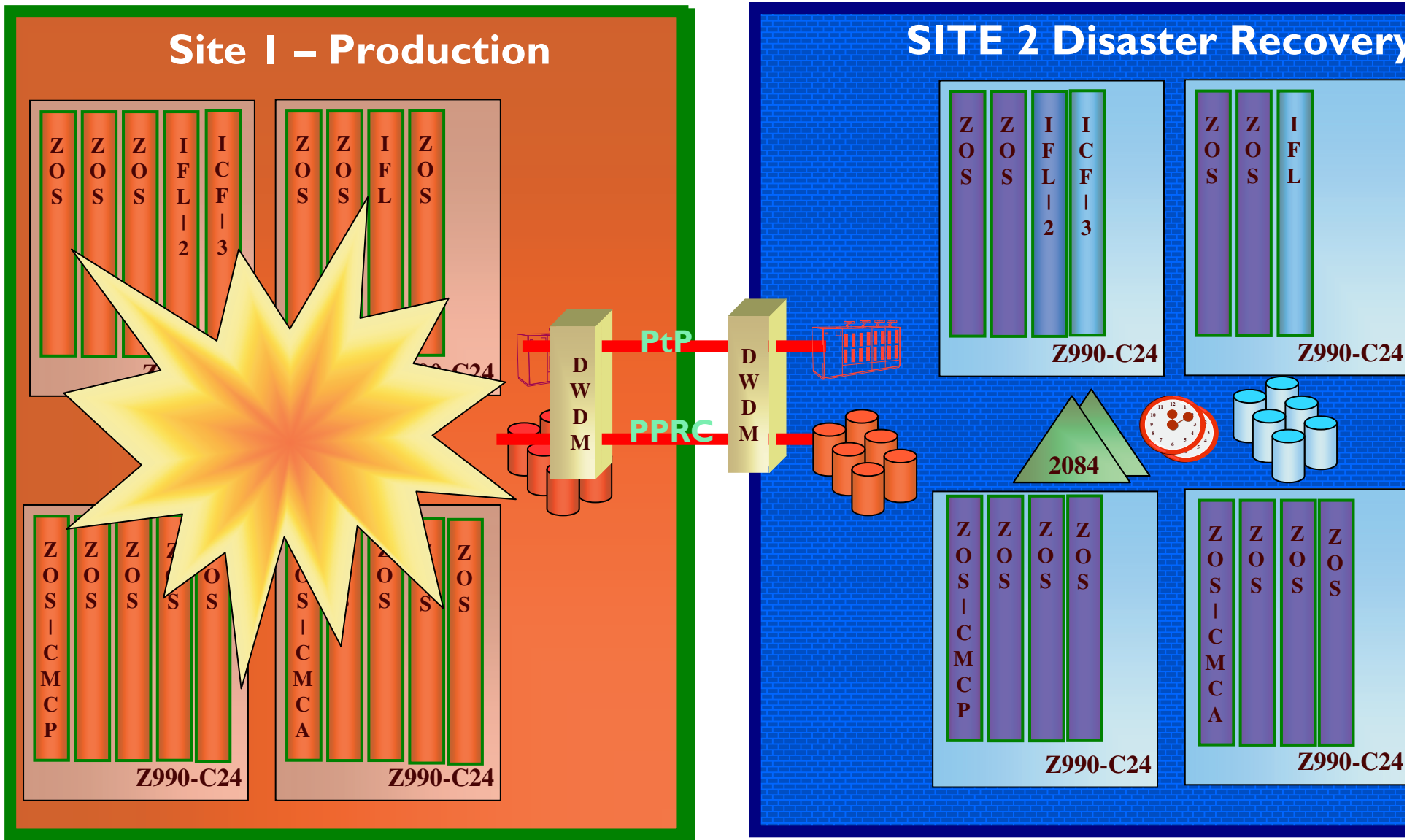
Should we keep Site1 or Site2 instance?



- Requires Freeze=STOP policy
- GDPS will recommend that structure instances in CF in same site as secondary disks be retained and used

***No special recovery actions (e.g. GRECP) required
Facilitates faster application restart (improved RTO)
Provides consistent recovery time***

Recovery Scenario with PPRC only



2 Hours

Recovery Scenario with PPRC only

DR Team On-Site

- Remote Location: Operations Center/Home
- Remote Connectivity to SITE2 Required
 - Network
 - Phone/Mobile

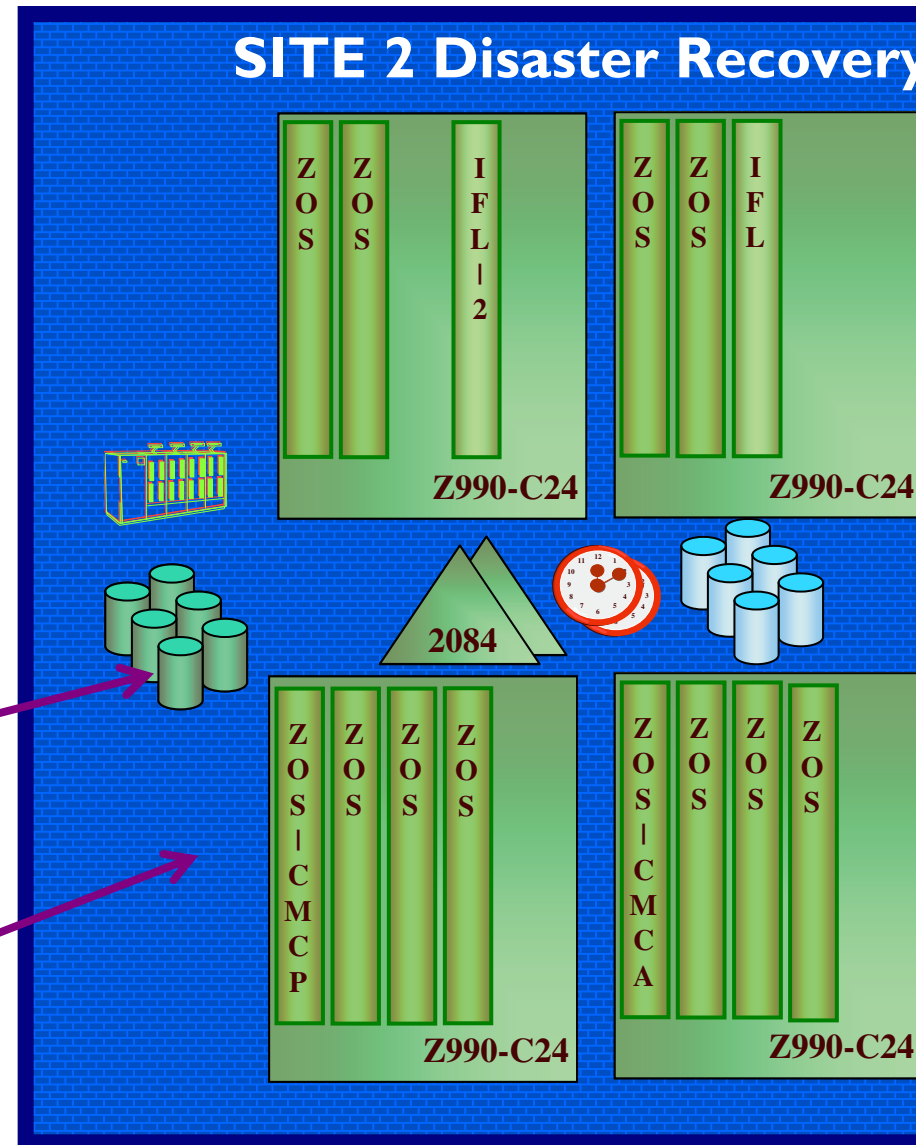
System Recovery (Manual)

- Shutdown Discretionary Workload
- POR CEC / Load Production IODF
- Reconfigure Tape Library
- Reset CFs
- Network
- IPL Production z/OS LPARs

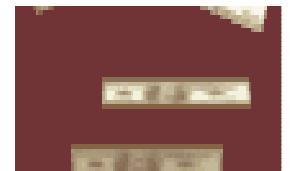
System/Application/Data Validation

- Data Consistency
- Application Access/Functioning
- Network Connectivity

DR / Recovery Team



2 Hours

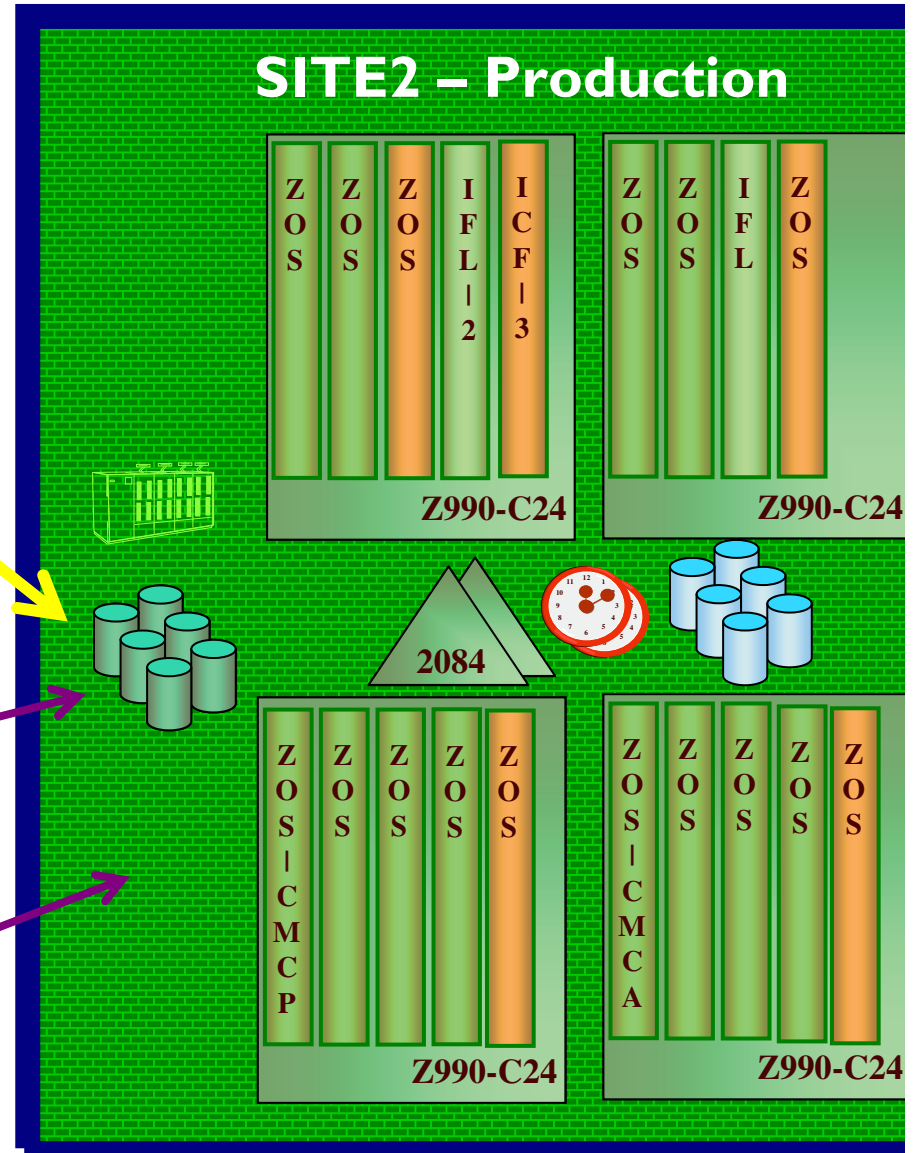


Recovery Scenario with PPRC only

Data Base
Recovery/Restore



DR /
Recovery Team



Time

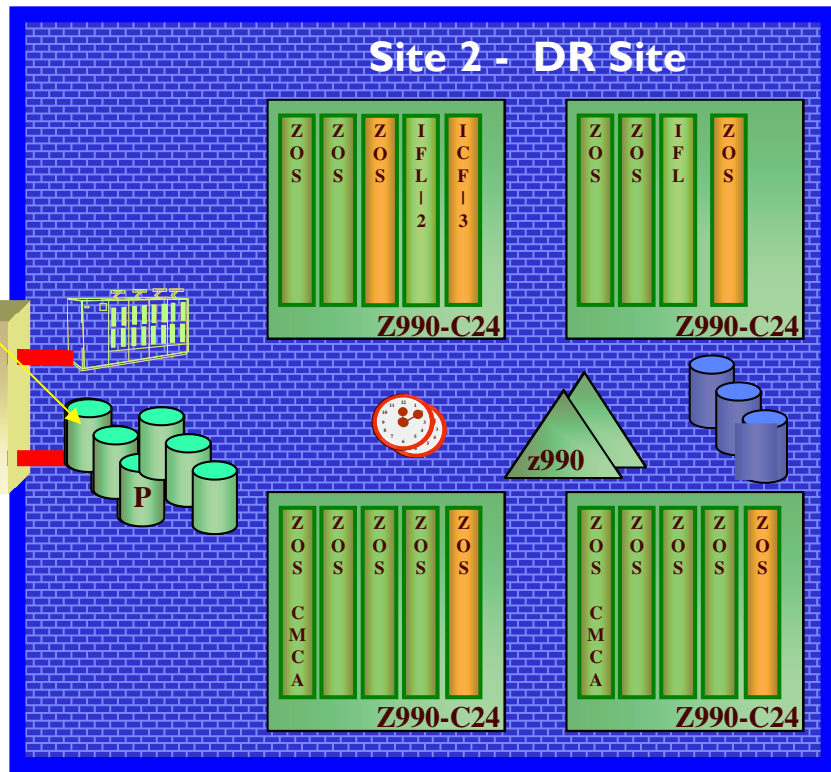
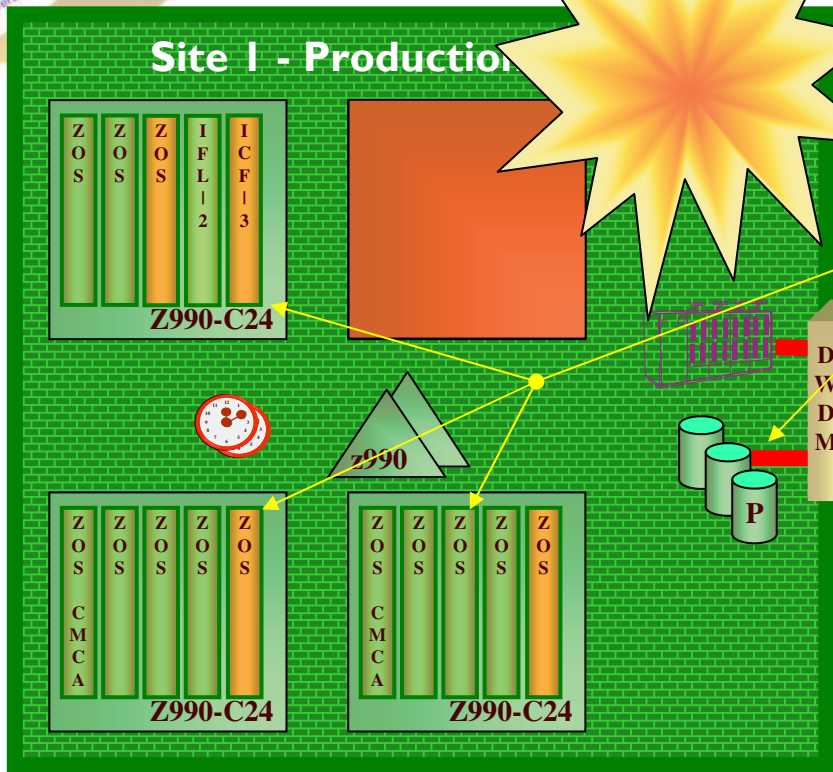
2 Hours

Restored

Enhanced Recovery with GDPS/PPRC

GDPS

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



**Data Integrity
Data Consistency
Zero Data Loss**

GDPS Automation

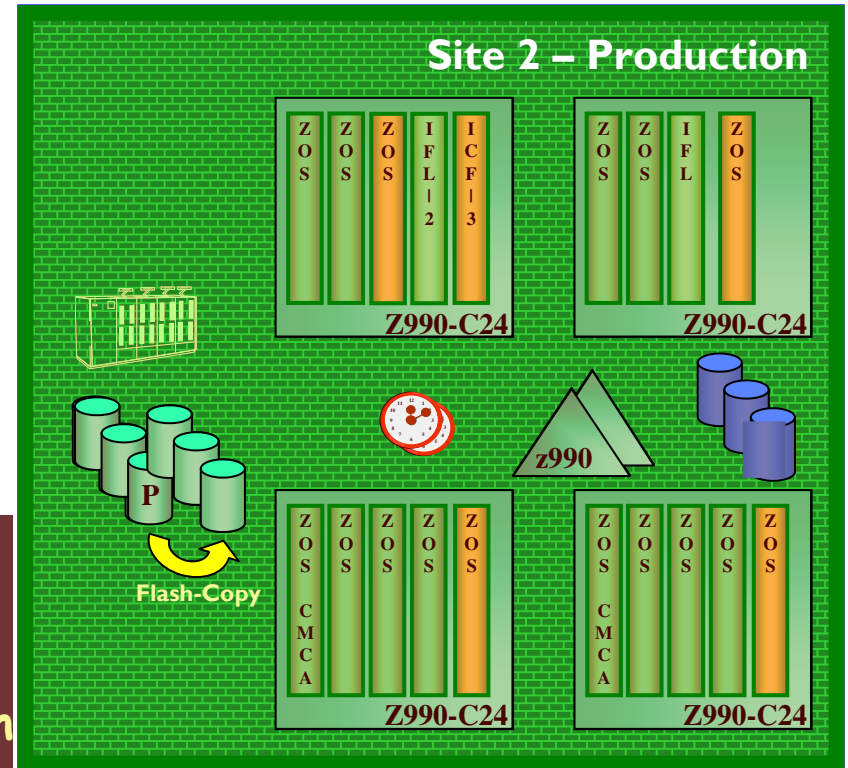
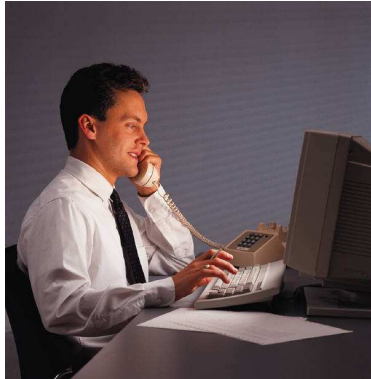
Time



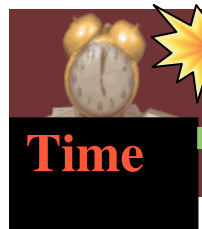
Time & Money

ON DEMAND BUSINESS

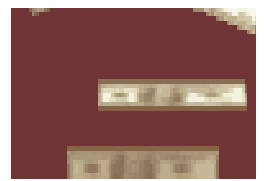
Enhanced Recovery with GDPS/PPRC



1 Hour



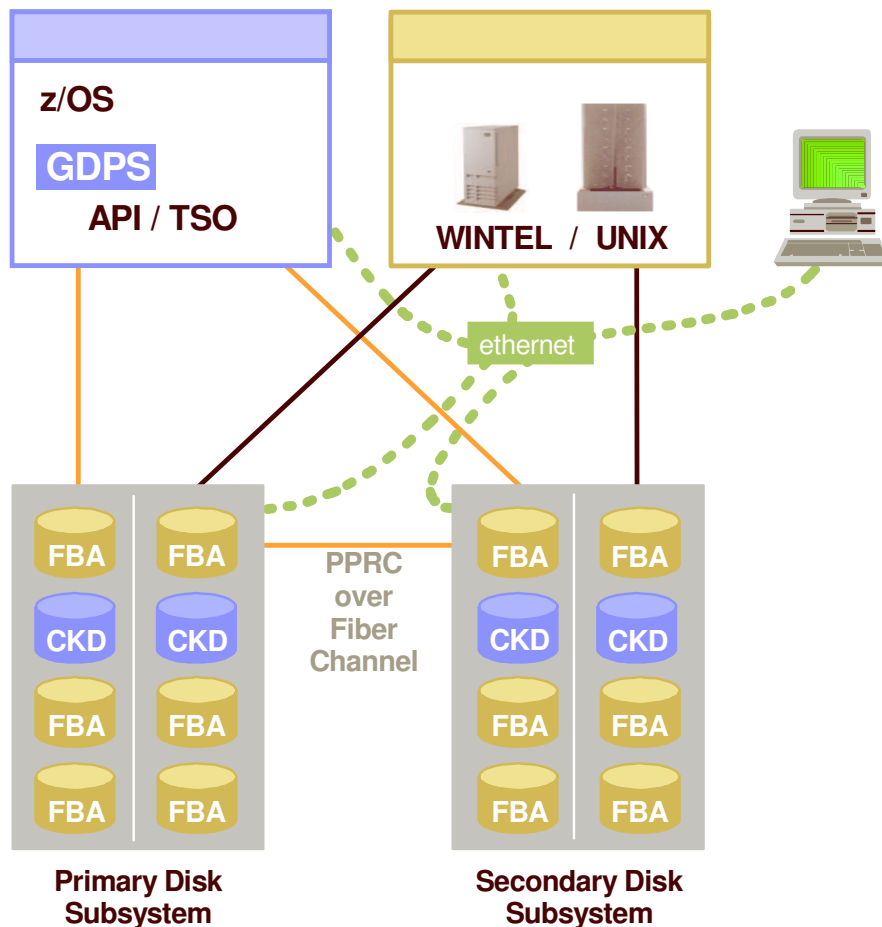
Time & Money





GDPS/PPRC management of Open Systems LUNs

“Single Site” or 2 sites

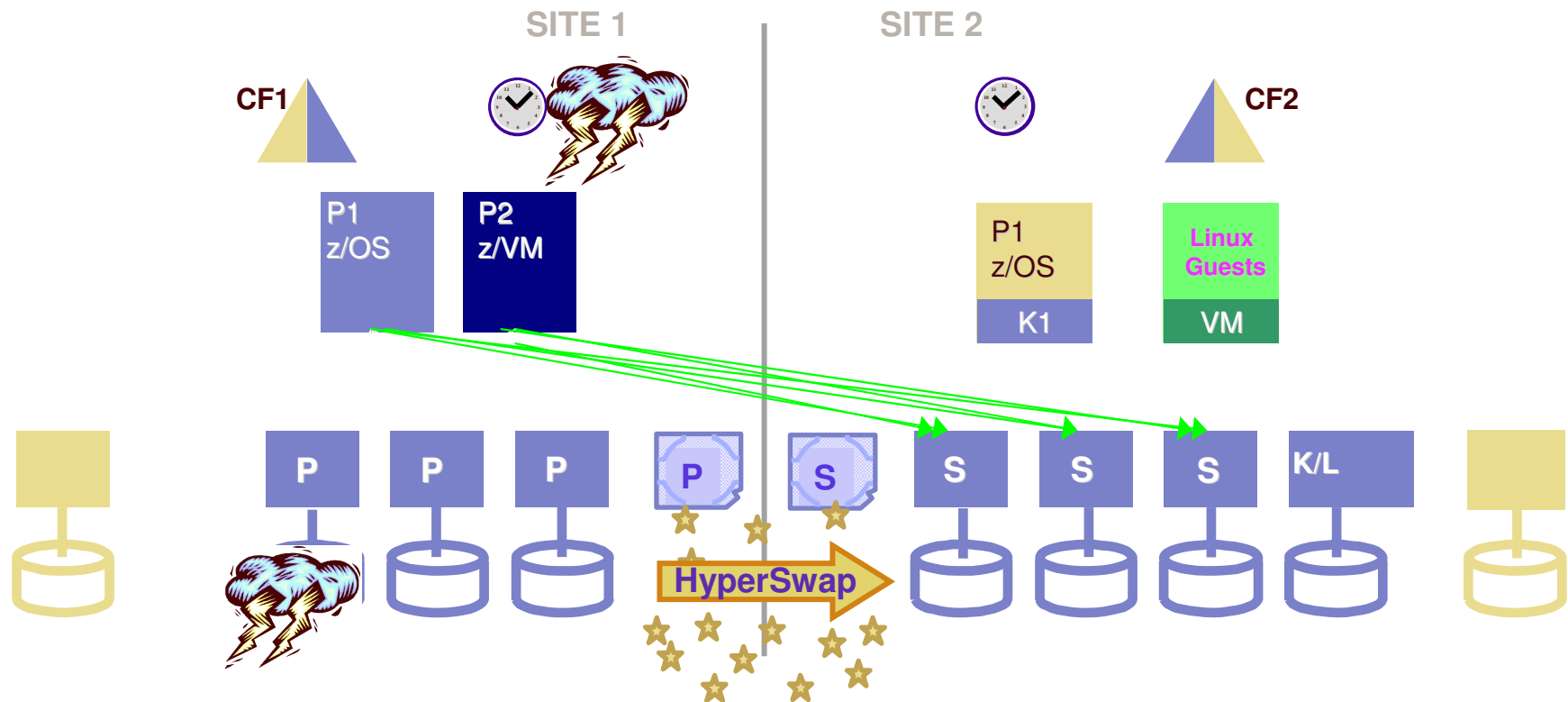


- Extends GDPS/PPRC technology to manage distributed applications across multiple platforms
 - z/OS and open systems data (Unix, NT, Linux)
- GDPS/PPRC running in a z/OS system manages the PPRC status of devices that belong to the other platforms
- Provides data consistency across both z/OS and/or open systems data when failures occur
- Support details
 - Supports x-platform or platform level Freeze
 - No GDPS Code running on open systems host – suspends reported through SNMP alert

Helps provide enterprise-wide Disaster Recovery with data consistency!



GDPS/PPRC Multi Platform Resiliency for zSeries



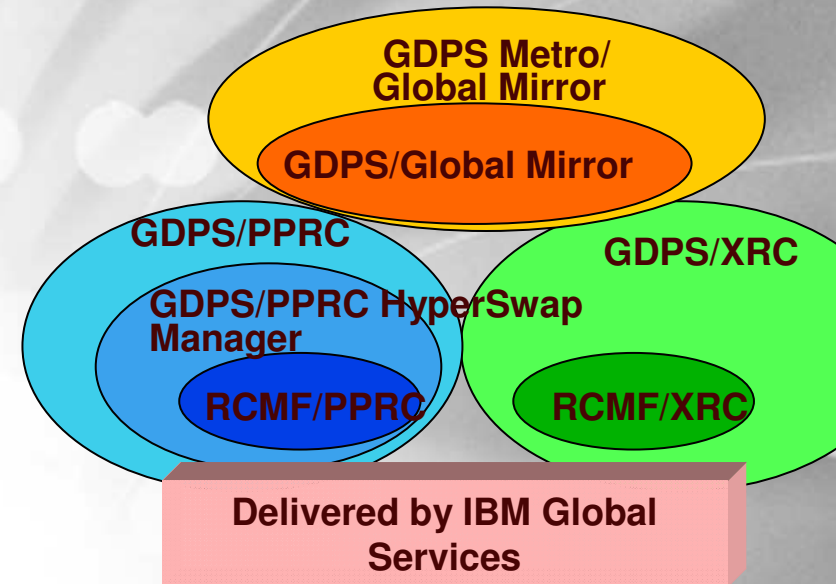
- ✓ Coordinated near-continuous availability and DR solution for z/OS and Linux guests running under z/VM
 - Valuable for customers with distributed applications
 - SAP application server running on Linux for zSeries
 - SAP DB sever running on z/OS
- ✓ Planned and Unplanned Reconfigurations





Unlimited Distance Disaster Recovery (2 sites)

- ✓ **GDPS/XRC**
- ✓ **GDPS/Global Mirror**



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What is GDPS/XRC? (z/OS Global Mirror)



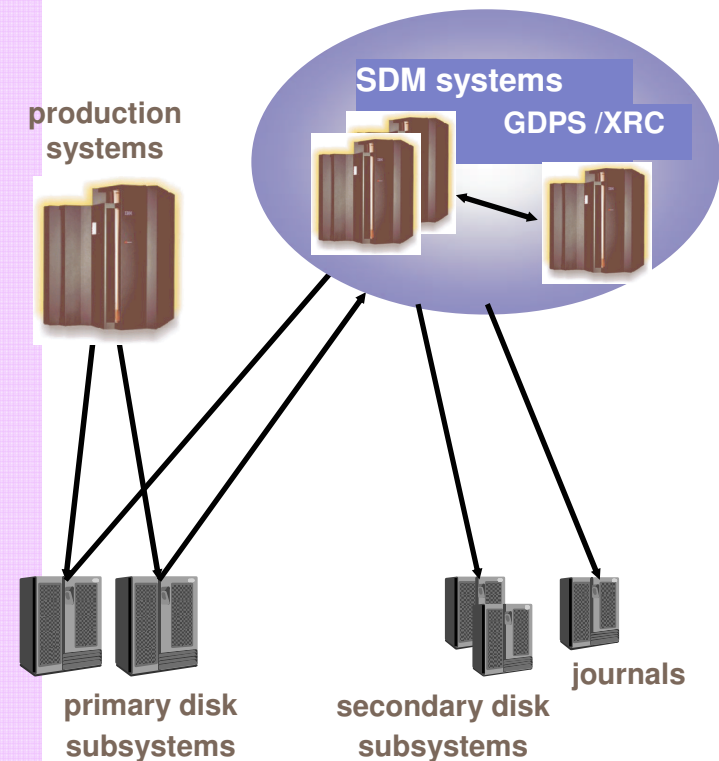
- **Productivity tool that integrates management of XRC and FlashCopy**

- Full-screen interface
- Invoke scripted procedures from panels or through exit

- **GDPS/XRC runs in the SDM location and interacts with SDM(s)**

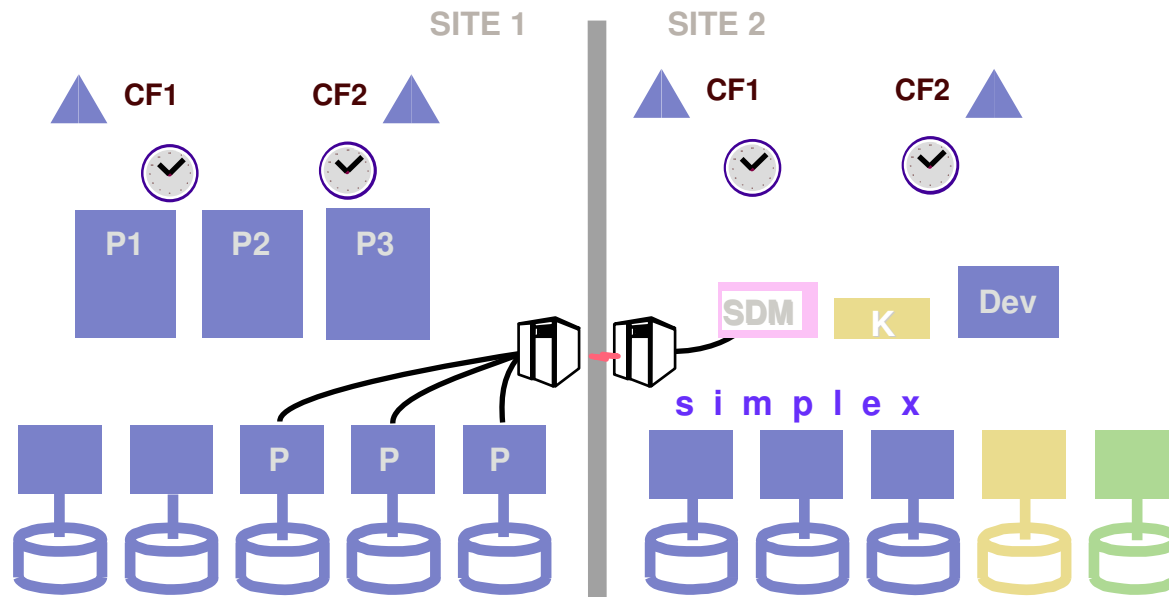
- Manages availability of SDM Sysplex
- Performs fully automated site failover

- **Single point of control for multiple / coupled Data Movers**





GDPS/XRC - Primary Site Failure

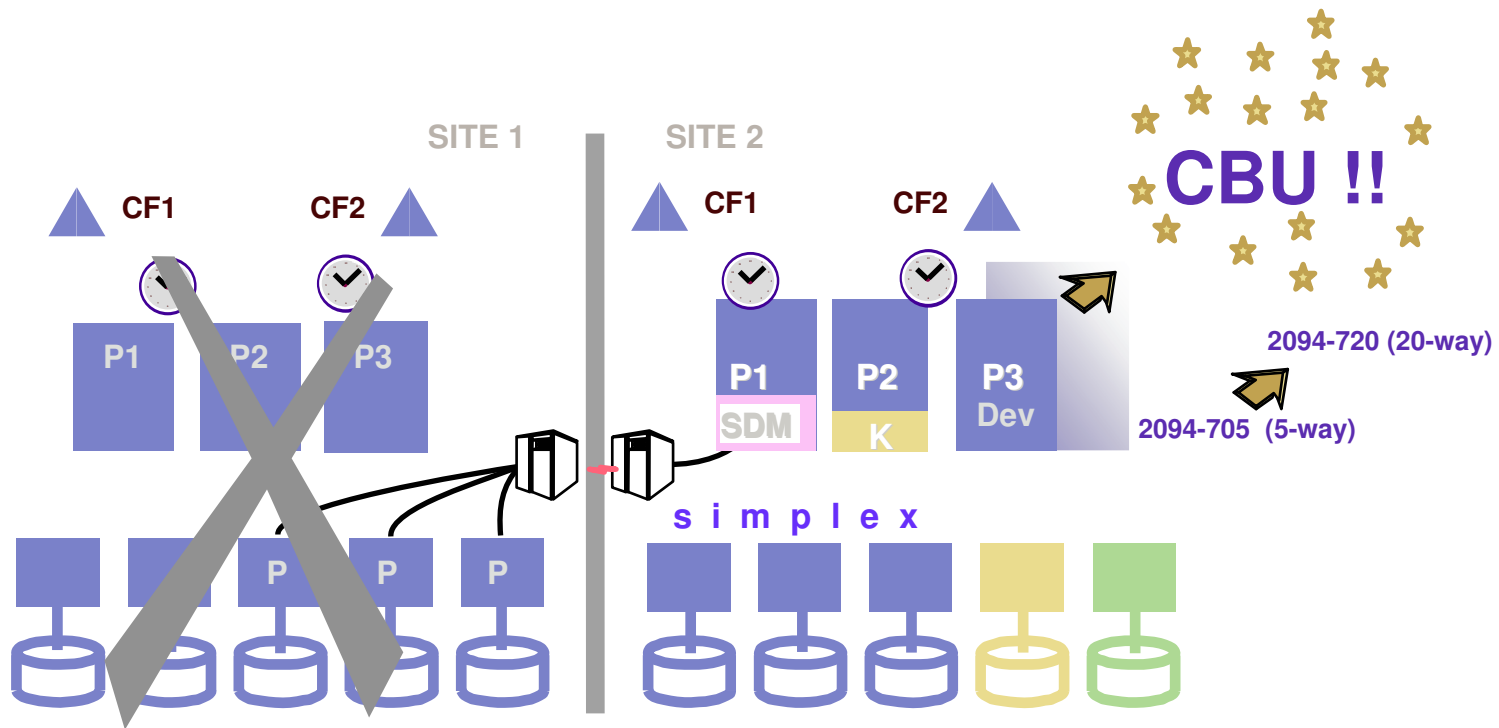


- Production system can be
 - No, Base, or Parallel Sysplex environment
 - SUSE Linux Enterprise Server (SLES) 8
- System Data Mover(s) must run in Base or Parallel Sysplex

Automates recovery of production environment
Automates invocation of CBU



GDPS/XRC - Primary Site Failure



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

Automates recovery of production environment
Automates invocation of CBU



Write Pacing

Match application write rate to offload rate

Reduces bandwidth requirements

Inserts delays on writes for heavily updated volumes

- Keeps the device ready for I/O

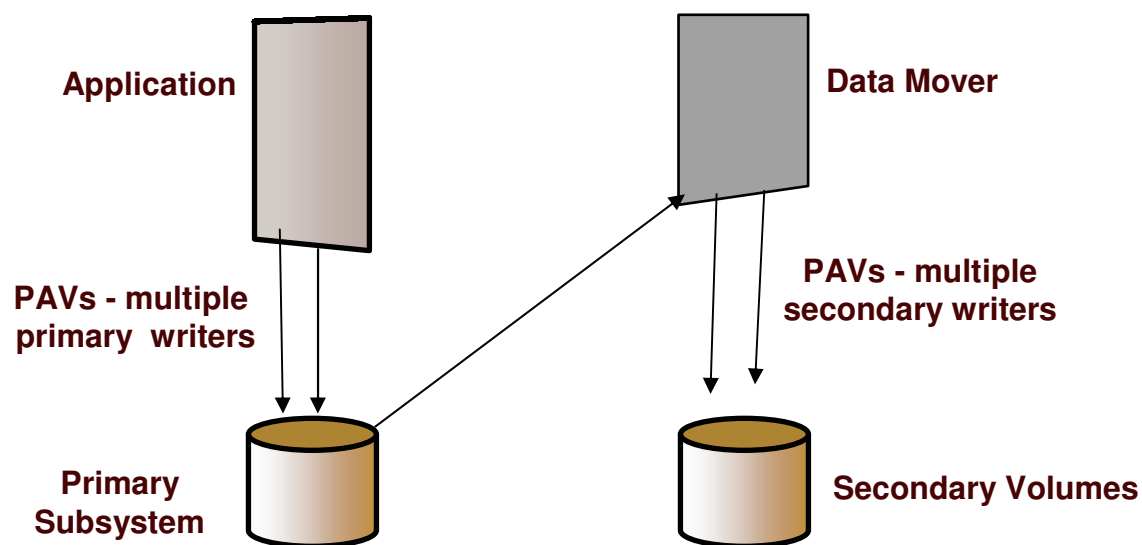
Allows tailorable level of delay at volume level

- .2 ms up to 1000 ms
- When updates exceeds threshold, delays slowly rise up to max.

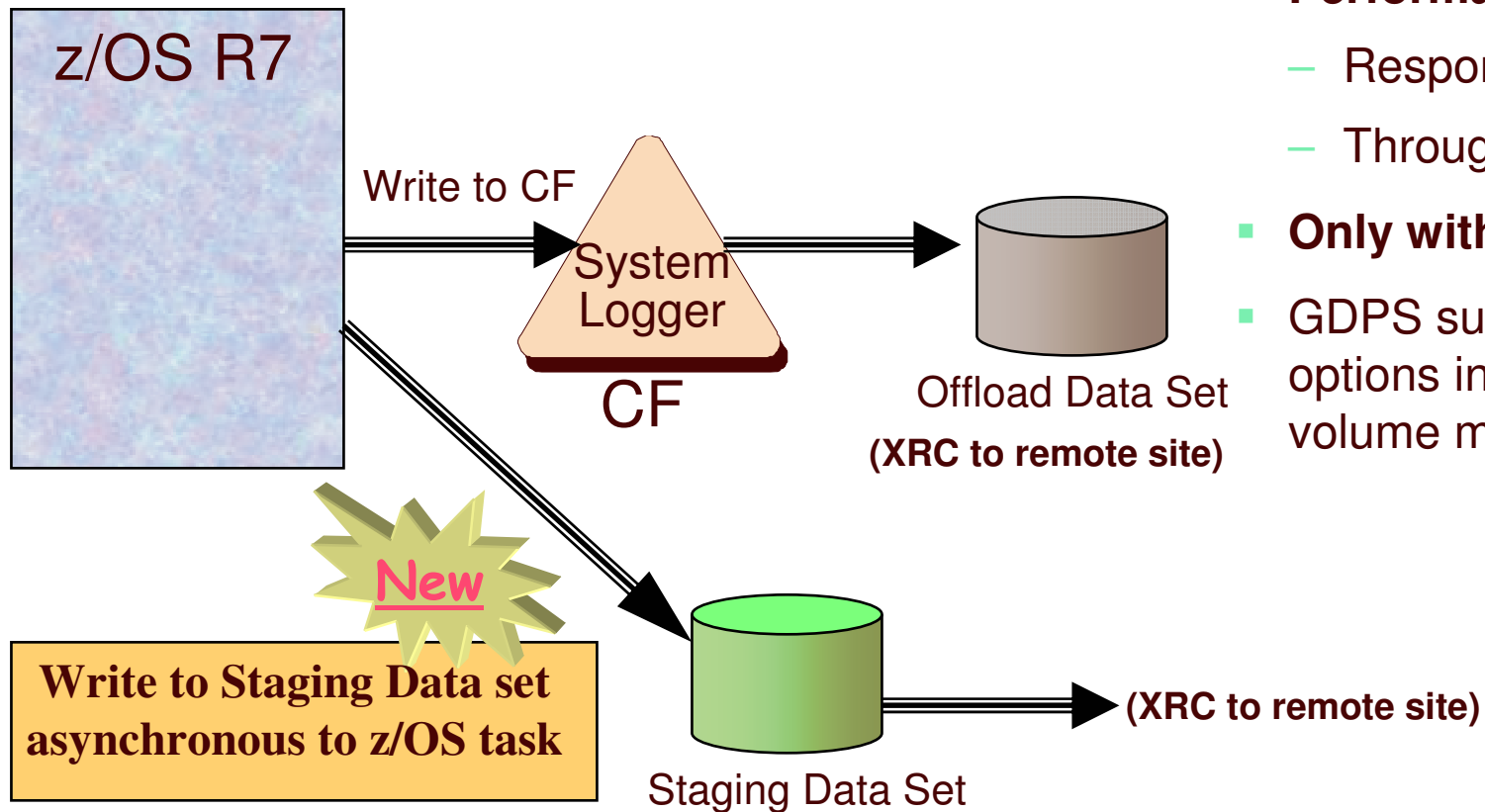
APAR OA09239

Secondary PAV Support

- **Allows SDM to exploit PAVs (static or dynamic)**
- **Allows multiple writers to update a single volume using dynamic PAVs**
 - Provides greater parallelism in secondary I/O processing.
 - Results in lower RPO and reduces average session exposure and peak session exposure for heavily stressed configurations.
 - Addresses XRC architectural limitation by which a single volume is supported by a single writer task.
- **APAR OA09238**



GDPS Support for "XRC+" z/OS R7



- **Performance Improvements**

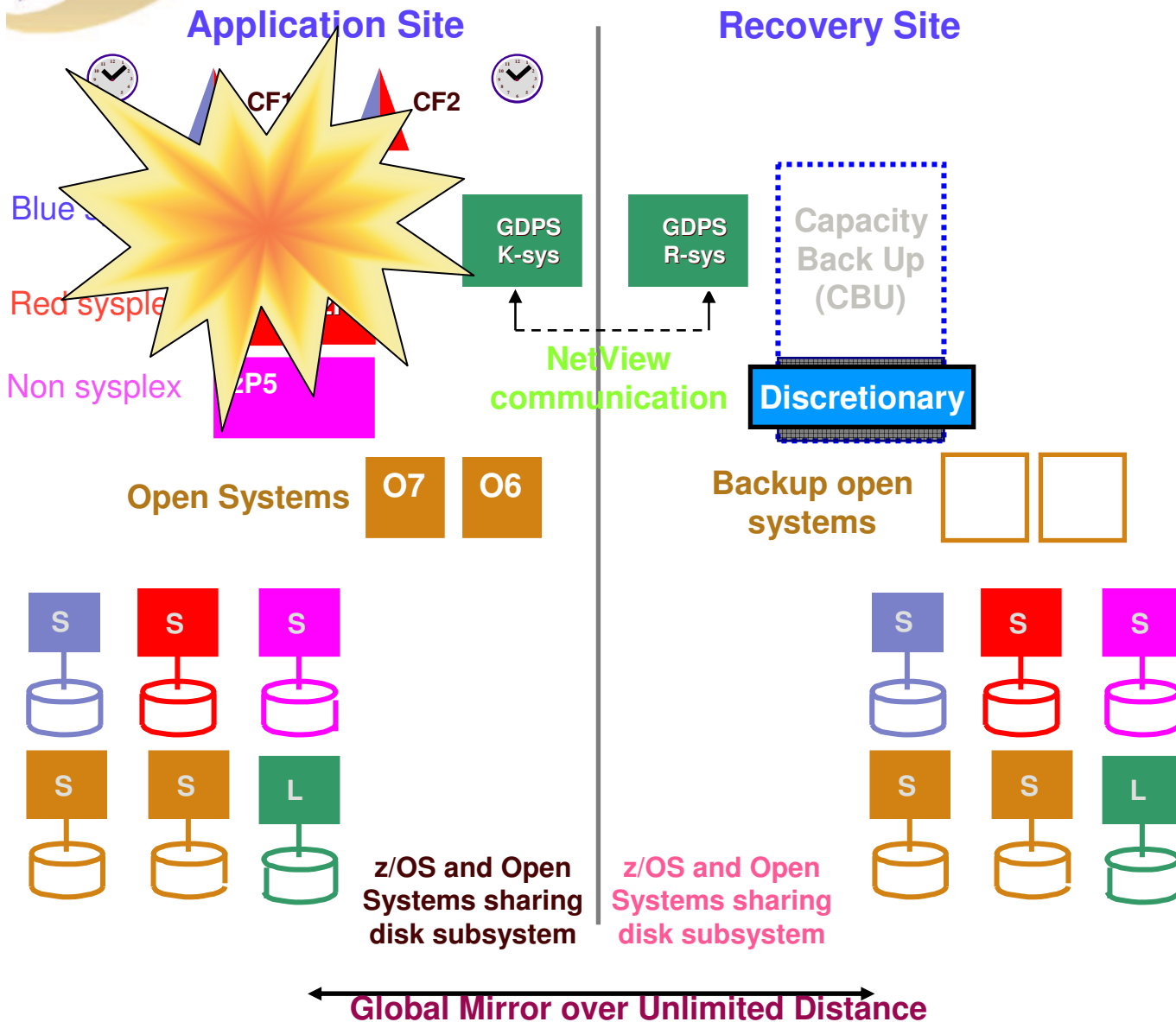
- Response Time
- Throughput

- **Only with XRC**

- GDPS support will include the options in their setup for volume management.

***Improved throughput
for high volume logging applications***

GDPS/Global Mirror – Site 1 Failure

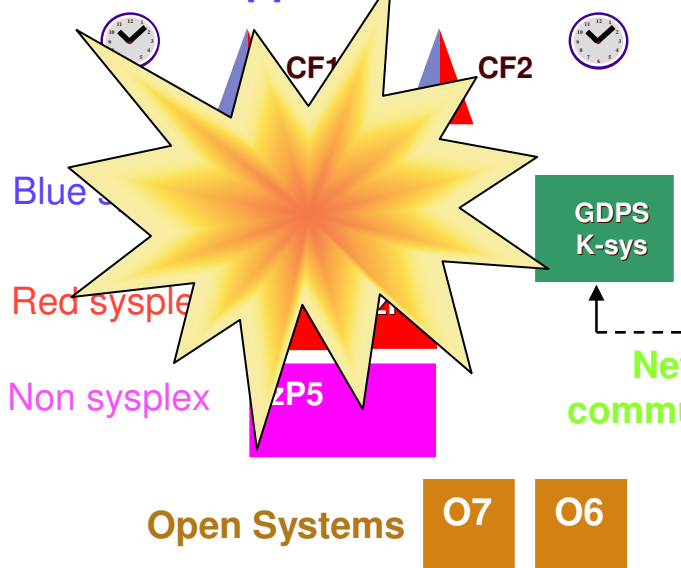


- **Application site can have single z/OS Systems, Open Systems, Systems in a Sysplex**
- **All data (z/OS and Open Systems) can be mirrored using Global Mirror**
- **K-sys activities**
 - Manages multiple Global Mirror sessions
 - Sends device info, scripts, alerts to R-sys
- **R-sys activities:**
 - Secondary disk recovery, CUB activation, activate backup LPARs, IPLs systems.

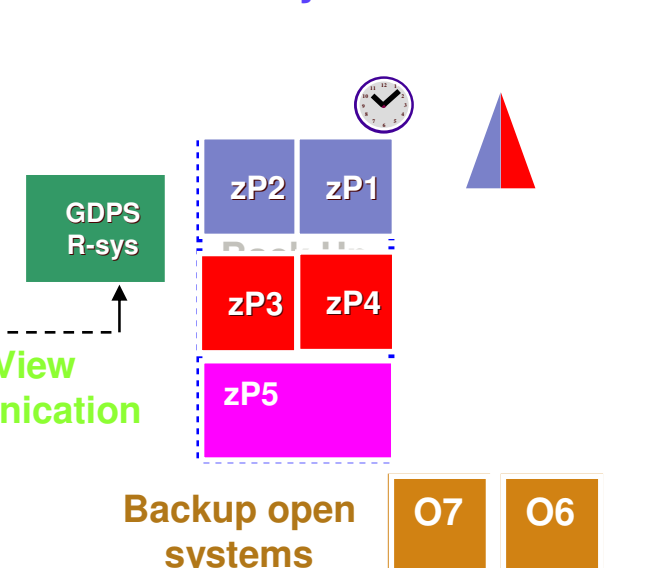
GDPS/Global Mirror – Site 1 Failure



Application Site

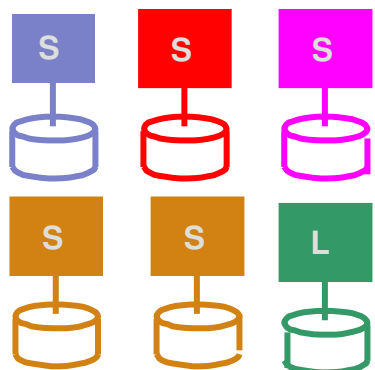


Recovery Site



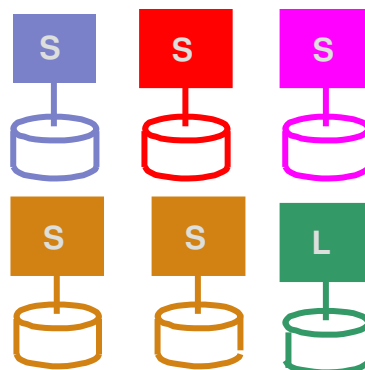
- **RTO < 1 hour**
- **RPO < 1 minute**
- (depends on bandwidth)

NetView communication



z/OS and Open Systems sharing disk subsystem

z/OS and Open Systems sharing disk subsystem



Global Mirror over Unlimited Distance

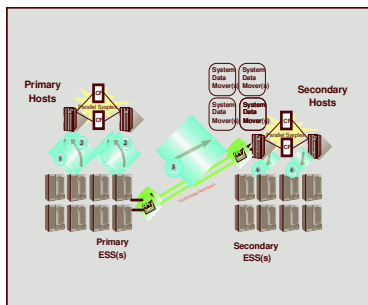


XRC & Global Mirror: Which One?

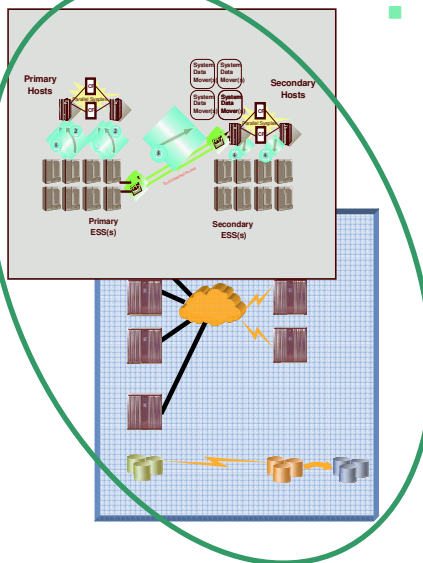
XRC	Global Mirror
Asynchronous. No app. impact	Asynchronous. No app. impact
Virtually unlimited distance	Virtually unlimited distance
zSeries Data <ul style="list-style-type: none"> • z/OS • Linux on zSeries LPAR or Guest • VM, VSE (consistent data if 1 CU) 	zSeries & Open Data
Requires additional MIPS on secondary site to support SDMs	Requires additional disk for additional FlashCopy version
Highly Scalable. Up to 285 coupled SDMs	Max 8 subsystems (w/o RPQ) 17 subsystems (with RPQ)
Supported by multiple vendors	Currently supported on IBM disk
Many customers and references. Many tools	Newer technology



GDPS/XRC & GDPS/Global Mirror: Why choose?

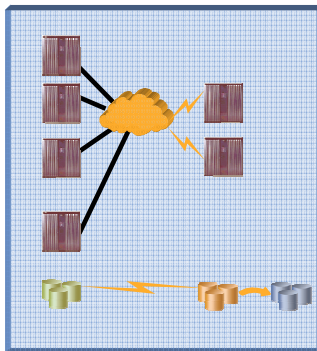


XRC



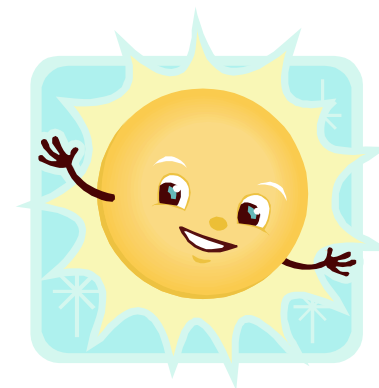
Common
Restart
Point

Why choose? Do both!



Global Mirror

- **Statement of Direction:**
Ability to form consistency groups from Global Mirror together with z/OS Global Mirror
- **Combine strengths of both:**
 - **z/OS Global Mirror:**
 - z/OS and Linux on zSeries
 - **Global Mirror for other open data**





IBM zSeries and System z9

Continuous Availability and Disaster Recovery Solutions (3 site)

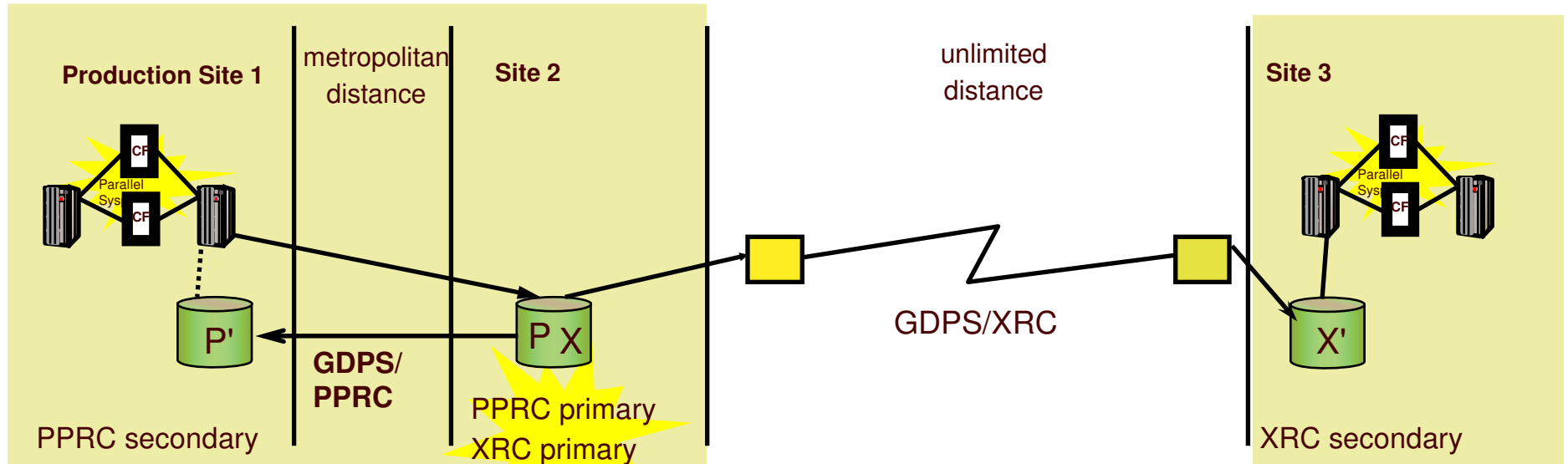
- ✓ **Continuous Availability – Metro distance**
- ✓ **Disaster Recovery at unlimited distances**

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Continuous Availability and Disaster Recovery at unlimited distance (GDPS/PPRC & GDPS/XRC)

zSeries Solution



◀ **Continuous Availability**
GDPS PPRC or GDPS/PPRC HM ▶

◀ **Disaster/Recovery** ▶

- Designed to provide continuous availability and no data loss between sites 1 and 2
- Sites 1 and 2 can be same building or campus distance to minimize performance impact
 - Site 2 servers optional

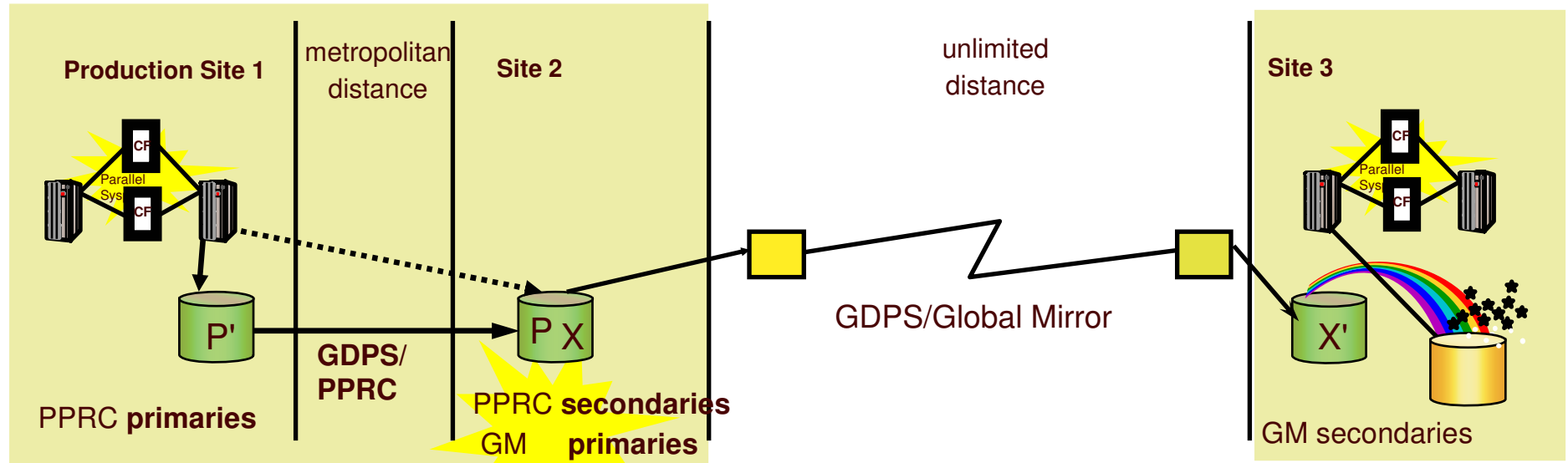
- Site 1 failure
 - ▶ Switch to Site 2 disk (if server exists on Site 2)
 - Site 3 can recover with no data loss in most instances
- Site 2 failure
 - ▶ Production continues in Site 1
- Site 1 and 2 failure
 - ▶ Failover to Site 3 with minimal data loss

Continuous Availability, No data loss, Unlimited Distance



Continuous Availability and Disaster Recovery at unlimited distance (GDPS/Metro & Global Mirror)

zSeries and Open Solution



Continuous Availability GDPS/PPRC

- Designed to provide continuous availability and no data loss between sites 1 and 2
- Sites 1 and 2 can be same building or campus distance to minimize performance impact
 - Site 2 servers optional

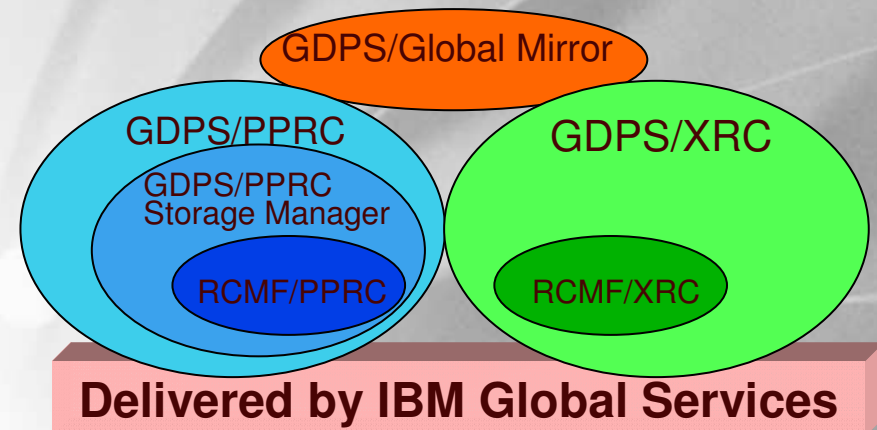
Disaster/Recovery

- Site 1 failure
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- Site 1 and 2 failure
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GDPS Managed coordinated solution for zSeries and open systems



To Summarize



- ✓ **Six Implementation Options**
- ✓ **References**
- ✓ **Planned Enhancements**
- ✓ **Additional Information**



Summary

- **Flexible configuration options to meet a wide-range of Business Continuity requirements**
 - Near-Continuous Availability of data within a single site – HyperSwap Manager
 - Solutions to handle distributed applications
 - **GDPS/PPRC Open LUN Management**
 - **GDPS/PPRC Multi Platform Resiliency for zSeries**
- **In case of disaster**
 - Designed to enable data consistency and integrity
 - No data loss (GDPS/PPRC) or
 - Minimal data loss (GDPS/XRC, GDPS/GM)
 - Offers prompt, responsive disaster recovery through end-to-end automation
- **Uninterrupted data availability with HyperSwap**
- **Simplified routine management of systems, disk subsystems and data mirroring**
 - Single point of control
 - Covering z/OS, Linux and other Open Systems platforms
 - Automates software, hardware or site facilities maintenance procedures
- **GDPS functions will continue to be enhanced to support the On Demand Business Resiliency Framework**



GDPS/PPRC Experience

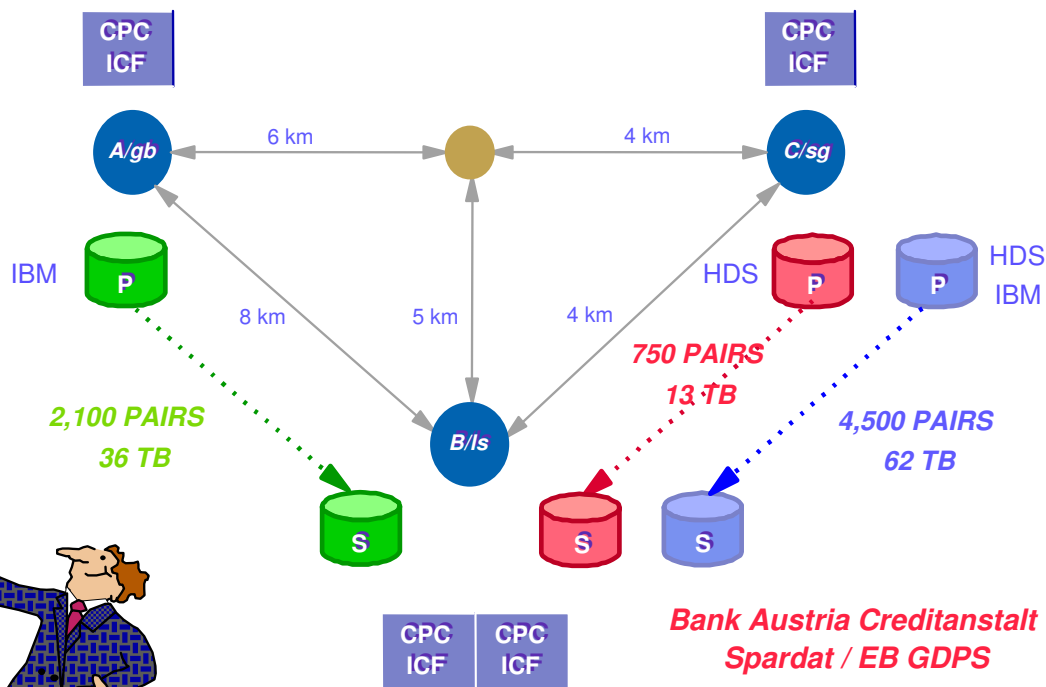


- Business Objectives**
- no loss of committed data
 - < 2 hours recovery time (today)
 - no more than five minutes disruption in the event of catastrophic systems or data center failure
 - support site maintenance without application outage

*Spardat / EB GDPS
(n=5 PS, CICS/Natural, Adabas, DB2)*

*Bank Austria Creditanstalt GDPS
(n=10 PS (CICS/DB2, IMS/DB, VSAM/RLS))*

- ✓ Recovery window reduced from 48 hours to less than two hours
- ✓ Planned site switch completed in the two hour target (without HyperSwap)
- ✓ Significant reduction of on-site manpower and skill level required to manage planned and unplanned reconfigurations
- ✓ Planned HS: Dynamic switching of disk subsystems in the smallest GDPS is between 32-36 seconds and in the two larger GDPS it is about 90-95 seconds
- ✓ **Unplanned** disk reconfiguration with HS in the smallest GDPS in 8 seconds



Refer to Application Brief GM13-0142-00



Pershing, a BNY Securities Group Company



- **Vision**
 - Leading investment banking and securities firm needed to meet Federal Reserve Bank requirement to dramatically strengthen disaster recovery capabilities
- **Challenge**
 - Reduce the Disaster Recovery Time Objective (RTO) to 2 hours, reduce the Disaster Recovery Point Objective (RPO) to 5 minutes, enable the addition of dynamic capacity and provide continuous availability
- **Solution**
 - IBM Global Services enabled an IBM GDPS/XRC configuration spanning 2 data centers and using a 2-way IBM eServer zSeries Parallel Sysplex cluster, 8 Enterprise Storage Servers, and XRC to mirror 7,350 volumes to the recovery data center
- **Value**
 - IBM eServer zSeries enabled Capacity Backup (CBU), one of the features of the autonomic computing initiative, to provide dynamic expansion of server capacity and recovery times of less than 1 hour



May 12, 2004

IBM And Pershing Set New Precedent For Data Recovery



Enhancements (GDPS v3.3)

- GDPS/Global Mirror
 - Global Mirror Support
 - Metro/Global Mirror RPQ
- GDPS/PPRC and GDPS/PPRC HyperSwap Manager
 - IOS Timing Trigger
- GDPS/PPRC
 - Enhanced Recovery Support (CF Duplexing)
- GDPS/XRC
 - XRC+ Support
 - Greater SDM Parallelism
 - Support for >14 SDMs
- GDPS/PPRC Multi Platform Resiliency for zSeries
 - Phase 2: Stand-alone Linux (Planned for future release)



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
- **Publications:**
 - **(new)** 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/systems/z/gdps**

Additional Information ...



- **Attack of the clones: GDPS solutions for your heterogeneous environment**
 - NOSHIR DHONDY, DAVID PETERSEN, AND DAVID RAFTEN
- www.ibm.com/servers/eserver/zseries/zos/bkserv/hot_topics.html
- **GDPS Family - An Introduction to Concepts and Capabilities (SG24-6374)**
 - www.redbooks.ibm.com/redbooks/pdfs/sg246374.pdf





Business Continuity Services Offerings

- GDPS Technical Consulting Workshop (TCW)
 - **Designed to ensure the GDPS Availability & Recovery solution will meet the Client's business requirements as they relate to continuous availability and recovery. The workshop will look at the site-to-site connectivity necessary to implement GDPS and identify the high level tasks that will be needed to implement.**
- Business Continuity Solution Workshop
 - **This program is designed to introduce the elements of IBM's products and services that form a Business Continuity Solution. Your time will be divided between interactive presentations tailored to your specific requirements and "hands on labs" that allow you to actually experience the capabilities of each element. Over the course of three days at our Washington System Center you will explore topics such as: Disk and Tape Copy Services, Network Options, Server Considerations, System Performance Planning, and Implementation Services.**
- BCRS Business Continuity Health Check
 - **The Health Check is an independent review that creates an action plan addressing continuity issues such as existing capabilities, costs, future technology, and resource requirements.**
- I/O Bandwidth Analysis
 - **IBM will use trace data collected from the customer environment to determine the requirements to configure and implement Remote Copy. IBM will create a written report of the I/O Sizing and Bandwidth Analysis of your existing environment. The report will include an analysis of your full mainframe DASD environment, as well as an analysis of a subset of that environment representing the minimum DASD required to support Remote Copy.**



Additional Information

- **Questions?**





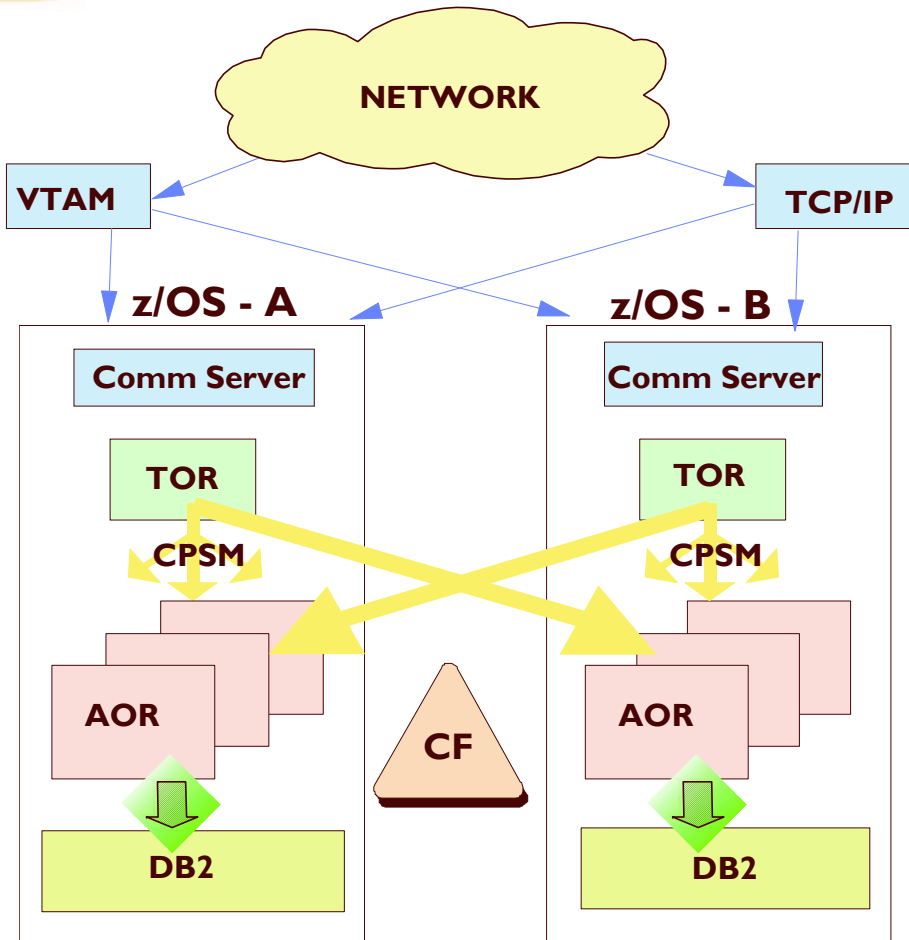
Appendix

- ✓ **Need for Time Consistency**
- ✓ **Parallel Sysplex**
- ✓ **GDPS/PPRC across 100 Km**

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Start with z/OS Parallel Sysplex

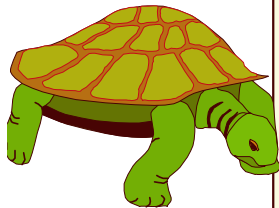


- Removes SPOF of
 - Server
 - LPAR
 - Subsystems
- Planned and Unplanned Outages
- Single System Image
- Dynamic Session Balancing
- Dynamic Transaction Routing

✓ **Continuous Availability**
 ✓ **Scalable Growth**
 ✓ **System Management**



Need for Time Consistency



Recovery

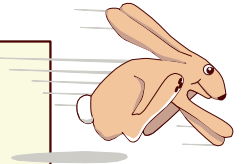
Process measured in hours or days

Restore last set of Image Copy tapes
Apply log changes to bring database up to
point of failure

Restart

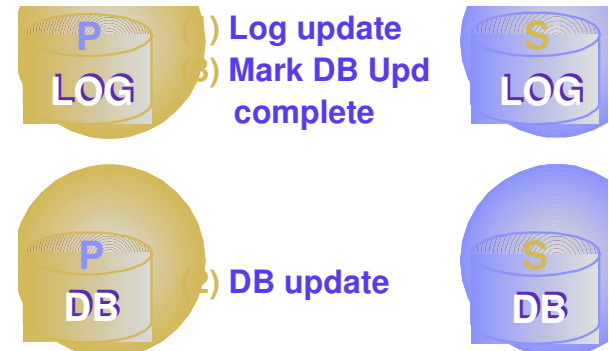
Process measured in minutes

To start a DB application following an
outage without having to restore the
database



Protection against mirroring failures

- Many examples where the start of one write is time dependent on the completion of a previous write
 - Database & log
 - Index & data components
 - Time sequence could be exposed
- GDPS automation ensures consistency
 - Across any number of primary subsystems
- Consistency enables Restart instead of Recovery
- *Even if second copy can be trusted, disk switch is disruptive for the entire workload*



- ✓ 1 is OK
- ✓ 1 ,2 is OK
- ✓ 1,2,3 is OK
- ✓ 1,3 is NOT OK



Server Time Protocol (STP) Overview

- Designed to provide capability for multiple System z9 and zSeries platforms to maintain time synchronization with each other
 - Does not require the 9037 Sysplex Timer if all servers STP capable
- Timing information transmitted over ISC-3 links (Peer mode), ICB-3 and ICB-4 links
- Supports a multi-site timing network of up to **100 km** (62 miles)
 - Allows a Parallel Sysplex cluster to span up to 100 km
- May reduce the cross-site connectivity required for a multi-site Parallel Sysplex clusters
- Can coexist with an External Time Reference (ETR) network (9037 based)
 - Mixed Timing Network
- Designed to allow use of dial-out time services to set the time to international time standard (UTC) as well as adjust to UTC
- Planned to be available as a feature on z9-109, z990 and z890
- Prerequisites
 - z9-109 HMC Code load
 - z/OS V1.7

All statements regarding IBM future direction and intent are subject to change or withdrawal without notice, and represents goals and objectives only.