

GDDR 3.2 Update

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EMC

Tuesday August 3, 2010
Session Number



SHARE in Boston

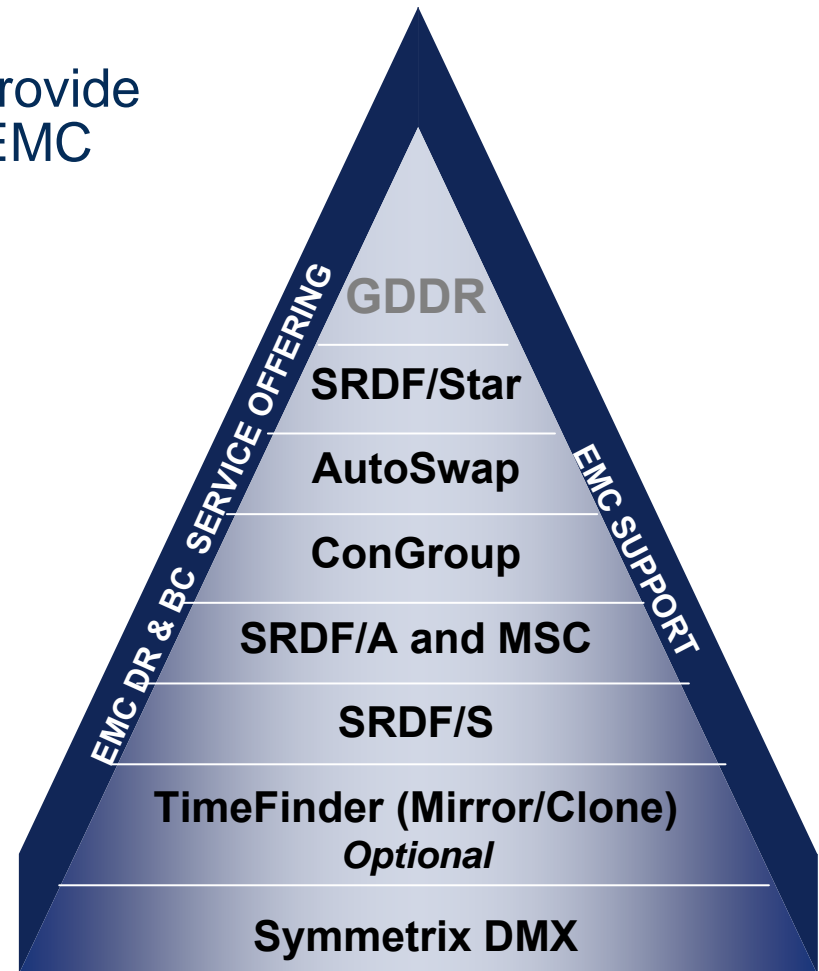
Objective

- Provide a description of new features in GDDR 3.2
 - Support for R22 devices in STAR configurations
 - Introduction to GDDRMAIN task functions
 - A more flexible CPC/LPAR recovery manager
 - Improvements to parameter wizard
- Update on GDDR customer deployments

GDDR Overview – Definition

A mainframe software application to provide EMC “factory written automation” for EMC business continuity technologies

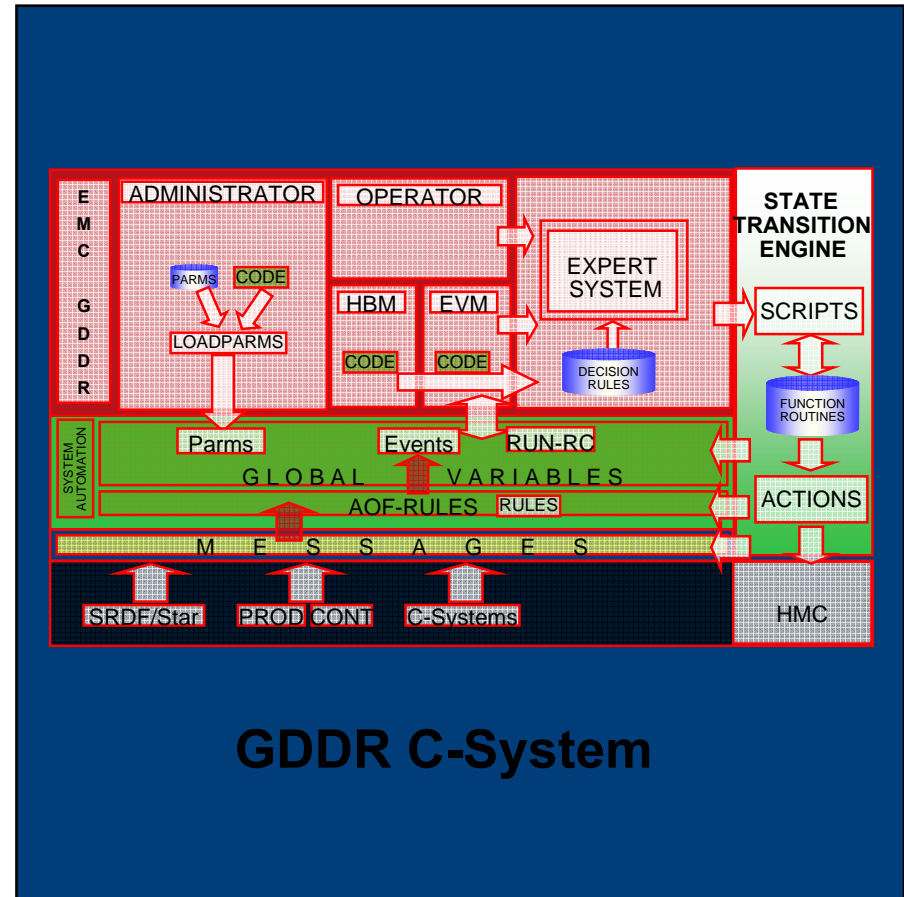
- EMC
 - DMX / Enginuity
 - SRDF/S
 - SRDF/A
 - Mainframe Enablers
 - ConGroup
 - AutoSwap
 - SRDF Host Component
 - ResourcePak Base



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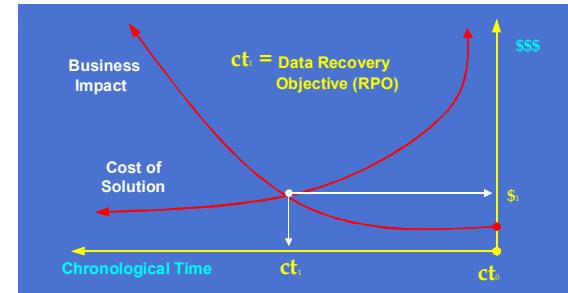
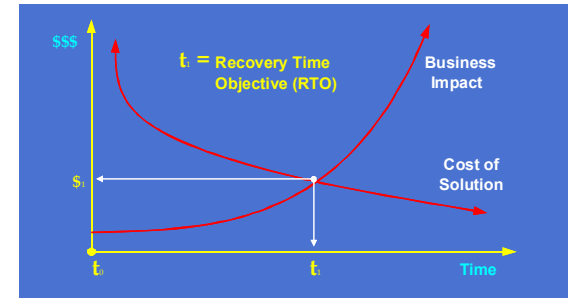
Understanding the GDDR application

- **GDDR is installed along with CA-OPS/MVS in dedicated LPARs called C-Systems**
 - Separation of command-and-control
 - Increases resiliency
- **C-Systems are small**
 - Typically one C-System per data center
 - 512 MB memory
 - 15 MSU

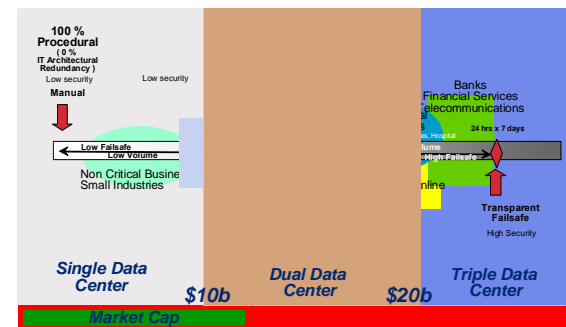


Supported Configurations

- GDDR 3.2 includes support for the following configurations
 - SRDF/Star with Autoswap – Concurrent
 - SRDF/Star with Autoswap – Cascaded
 - SRDF/Star with Congroup – Concurrent
 - SRDR/Star with Congroup – Cascaded
 - SRDF/Star with EDP
 - SRDF/Star for 2 site operations
 - SRDF/S with Autoswap
 - SRDF/S with Congroup
 - SRDF/A

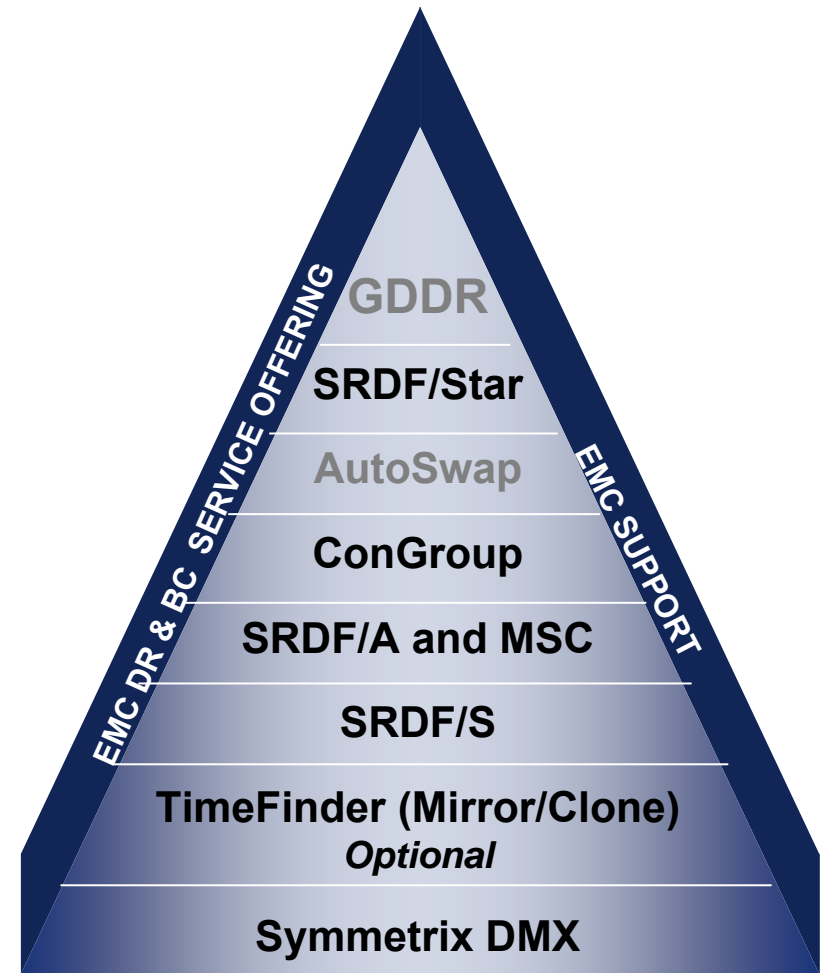


Peer comparison ... where are you?



GDDR 3.2 Enhancements

- R22 Device Support

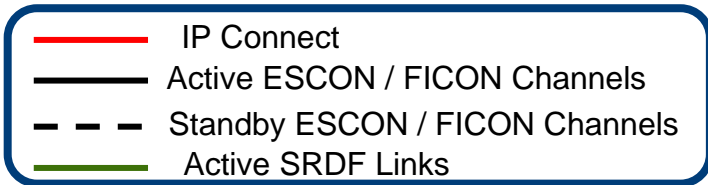
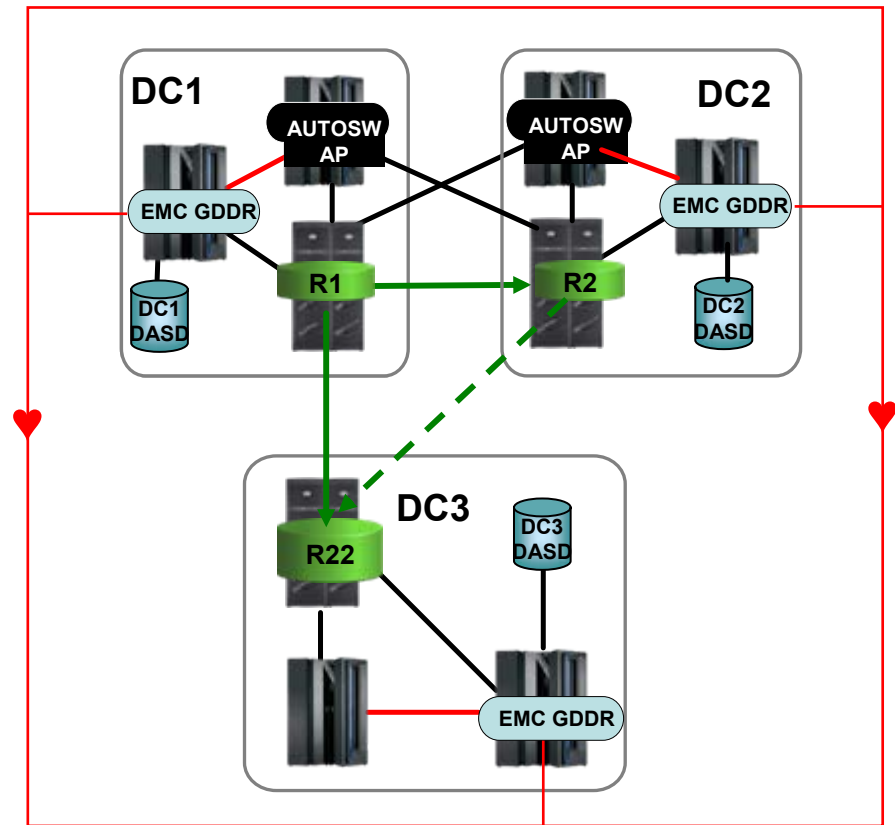


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R22 Device Support

- R22 device supports two SRDF relationships
 - Only one active
 - Allows “switching” between one or other SRDF relationship
- Eliminates need of
 - HDELETE
 - CPAIR
- Improves resiliency
- Increases re-configuration flexibility

SRDF/Star with AutoSwap

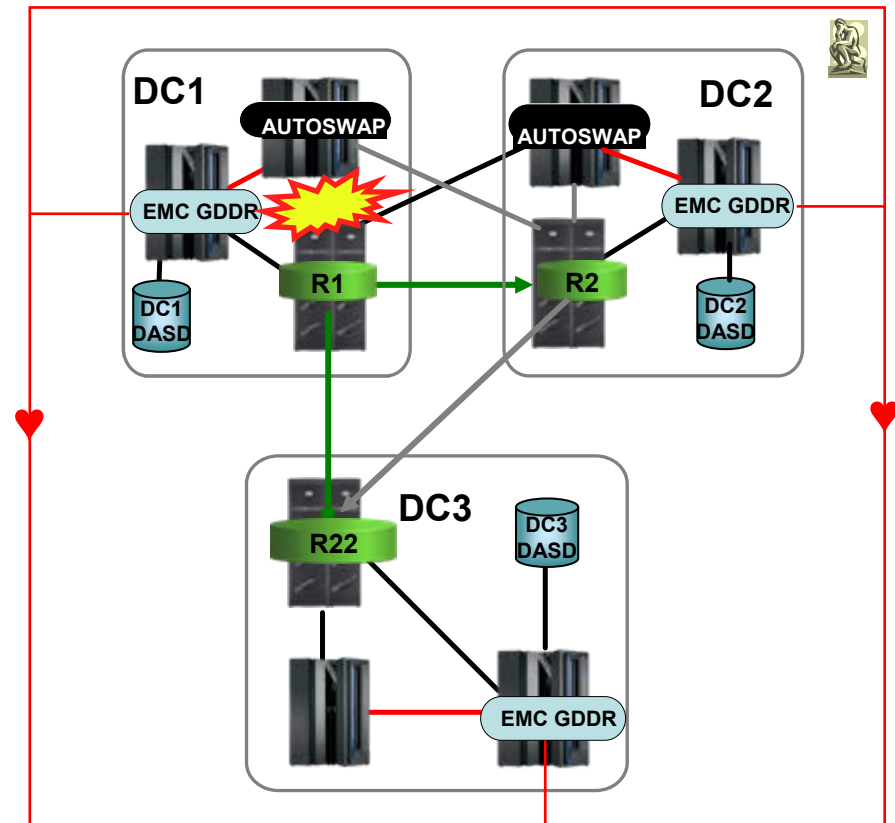


R22 Device Support

Scenario #1: Loss of Paths

- AutoSwap event detected by GDDR Unplanned Event Monitor
 - Switch R22 SRDF/A relationship
 - Reverse SRDF/S direction
 - Rebuilds Star
 - Rearms Autoswap/Congroup
 - Switches Master function to DC1

SRDF/Star with AutoSwap

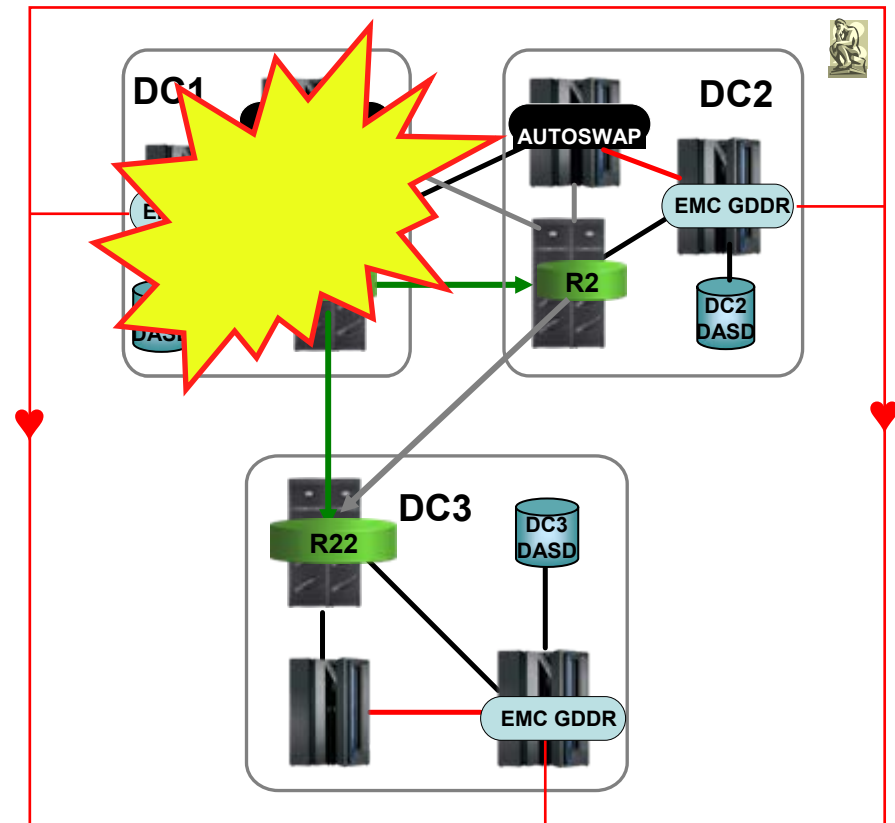


R22 Device Support

Scenario #2: Local disaster

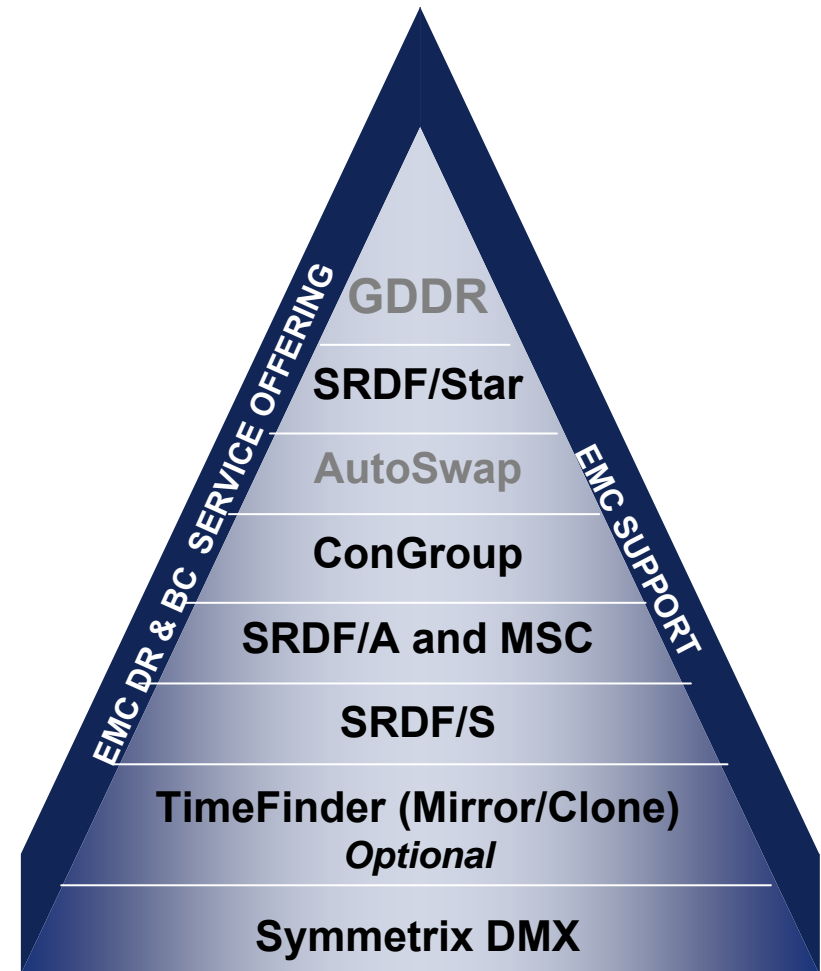
- GDDR at DC2
 - Detects loss of SRDF links to DC2 (CGT)
 - Detects loss of HBM to DC1 C-System
 - Declares local disaster (LDR)
 - Resets/IPL contingency systems at DC2 (if required)
 - Activates CBU (if required)
 - Switch R22 Relationship
 - Differentially resumes SRDF/A to DC3

SRDF/Star with AutoSwap



GDDR 3.2 Enhancements

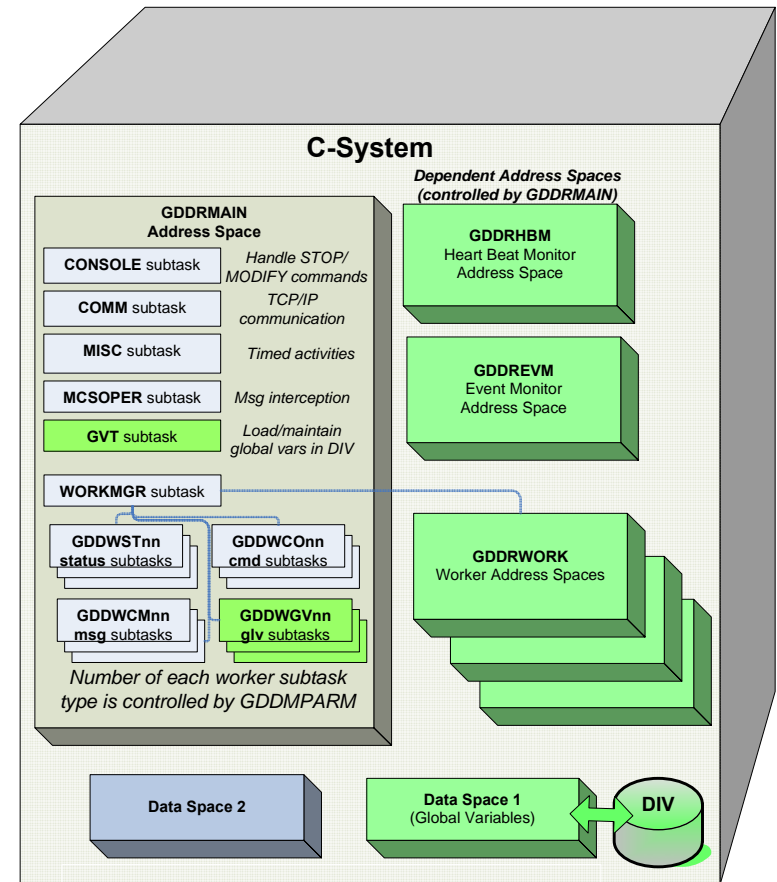
- GDDRMMAIN



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GDDRMAIN

- GDDRMAIN task was introduced in GDDR 3.1
- GDDRMAIN must be continuously available
- GDDRMAIN tasks are active on C-Systems and Managed Systems
- Now manages all GDDR global variables



Green items do not exist/run on a P-system

GDDRMAIN

GDDRMAIN Functions

- CONSOLE Subtask performs z/OS console command processing
- z/OS console commands in the form “F GDDRMAIN, *verb operand*”, where *verb* with associated *operand(s)* in brackets are one of the following:
 - START HBM | EVM | *subtask-name*
 - STOP HBM | EVM | *subtask-name*
 - RESTART *subtask-name*
 - CANCEL *subtask-name*
 - TASKS
 - LOCK [*lock-name,cmd*]
 - COMM
 - MPARAM CHECK
 - WORKER [GDDWST[*,name[,MIN=min|MAX=max]]]*
 - MSGS [*,msgid[,ENABLE|DISABLE]]*
 - BC *,<to>,<cmd>*.

GDDRMAIN

GDDRMAIN Functions

- COMM Subtask performs Inter-system Communication
- New GDDMPARM parameter: COMM

*COMM	-SYSTEM	-GDDR	IP-address , portnum
COMM	O016	GDDR	10.243.28.196 , 9876
COMM	VC1A	GDDR	10.243.28.229 , 9876
COMM	O01E	GDDR	10.243.28.199 , 9876
COMM	VC19	GDDR	10.243.28.228 , 9876
COMM	VC1D	GDDR	10.243.28.232 , 9876

GDDRMAIN

GDDRMAIN Functions

- MISC Subtask performs timed actions
- Every midnight
 - restart EVM (if EVM is running)
 - reload message text
- Every n hours starting when COMM has initialized (interval restarts if COMM is reinitialized)
 - broadcast the in-use MPARM checksum to all systems
 - compare the in-use MPARM checksum to the checksum of the MPARM data set; issue message GDDM143W if not equal

GDDRMAIN

GDDRMAIN Functions

- MCSOPER Subtask performs Console Message Interception
 - GDDRMAIN Utilizes z/OS MCSOPER for console message interception
 - MCSOPER scans all message traffic looking for messages defined in a data-only load module called GDDRMMSG
 - Executes GDDR Message Interception Rules

GDDRMAIN

GDDRMAIN Functions

- GVT Subtask performs Global Variable Task management
 - Initializes a data space and writes the data space to a DIV dataset when global variables are updated
 - Each C-System has its own data space and DIV
 - Controls the GDDR start type (Cold, Warm, Hot)
 - SAF checks GV updates, backup authority and parameter activate functions
 - Monitors DIV capacity

GDDRMAIN

GDDRMAIN Functions

- WORKMGR subtask administers workers
 - GDDWXR*nn* Rexx external work manager
 - Internal Workers
 - **GDDWST*nn*** status worker subtask
 - **GDDWCM*nn*** console message handler
 - **GDDWCO*nn*** issues MVS console commands
 - **GDDWGV*nn*** global variable manipulations

GDDRMAIN

GDDRMAIN Functions

- F GDDRMAIN, Worker command output example

```
GDDM128I Worker Status
```

```
GDDWCO Type S, Act 1, Min 1, Max 1
```

```
Name GDDWCO00, Status Waiting
```

```
GDDWCM Type S, Act 1, Min 1, Max 1
```

```
Name GDDWCM00, Status Waiting
```

```
GDDWST Type S, Act 3, Min 1, Max 3
```

```
Name GDDWST02, Status Waiting
```

```
Name GDDWST01, Status Waiting
```

```
Name GDDWST00, Status Waiting
```

```
GDDWXR Type A, Act 1, Min 1, Max 2
```

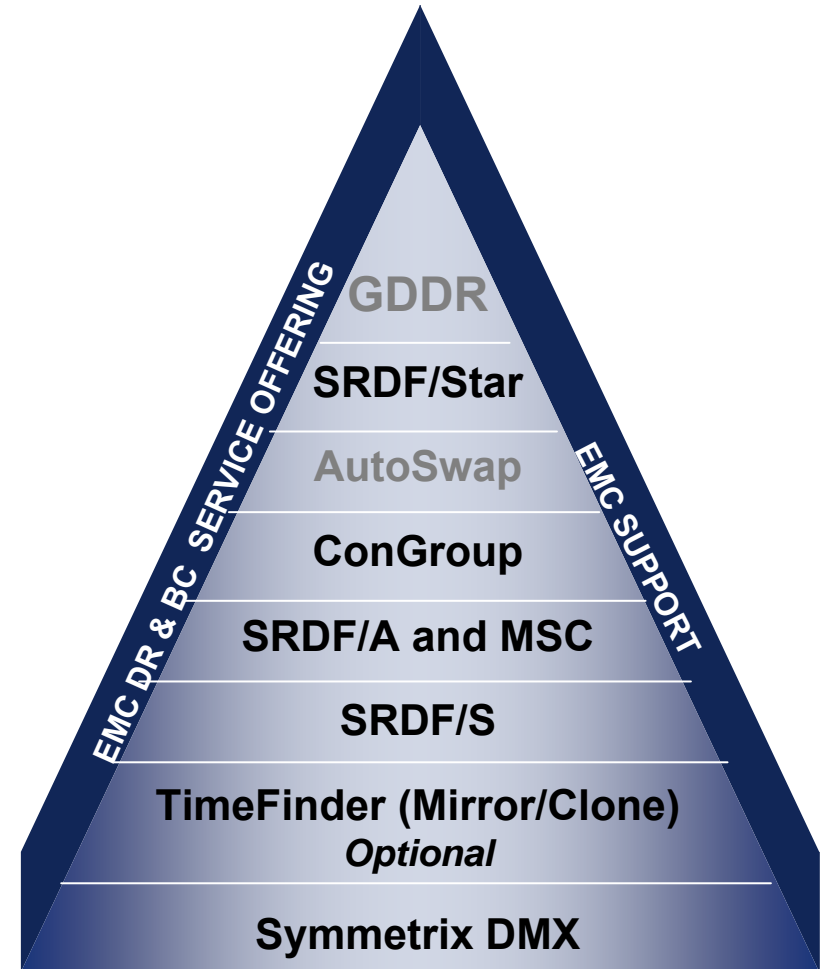
```
Name GDDWXR00, Status Waiting
```

```
GDDWGV Type S, Act 1, Min 1, Max 1
```

```
Name GDDWGV00, Status Waiting
```

GDDR 3.2 Enhancements

- Improved CPC and LPAR recovery manager



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LPAR/CPC Recovery

- This is an enhancement to the older “Production and Contingency” method in place in earlier GDDR versions
- It is now possible to specify an “home” and “recovery” location for an LPAR
- For geographically separated data centers, LPAR/CPC recovery is restricted to sites running Autoswap
- Trigger conditions
 - Loss of a “Home” location CPC
 - Loss of a “Home” location LPAR

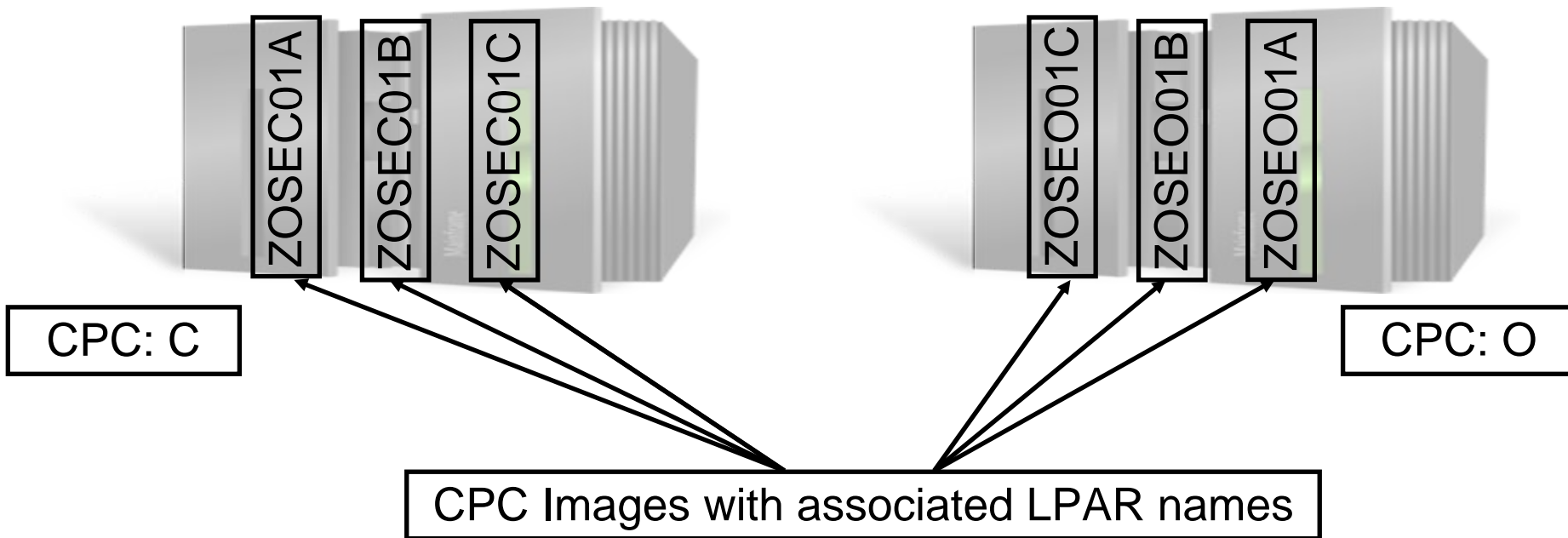
CPC/LPAR Recovery Map

LPAR NAME	MVSD	MVSF	MVSI	MVSL	MVSV	ECNA	MVSB	MVSC	MVSE	MVSH	MVSK	MVSV	ECNB
FUNCTION	DEV	DEV	PROD	DEV	CMC	CSYS	DEV	PROD	PROD	DEV	PROD	CMC	CSYS
SYSPLEX NAME	CCAP	EURO	ASI	WEB	MONO	MONO	EURO	CCAP	EURO	ASI	WEB	MONO	MONO
CPC NAME	IBM1	IBM1	IBM1	IBM1	IBM1	IBM1	IBM2	IBM2	IBM2	IBM2	IBM2	IBM2	IBM2
DESIRED STATE	UP	UP	UP	UP	UP	UP	UP	UP	UP	UP	UP	UP	UP
RECOVER	N	N	Y	Y	Y	Y	N	Y	Y	Y	Y	N	N
RECOVERY LOCATION			MVSH					MVSD	MVSF		MVSL		
RECOVERY CPC			IBM2					IBM1	IBM1		IBM1		

CPC and LPAR Recovery Management

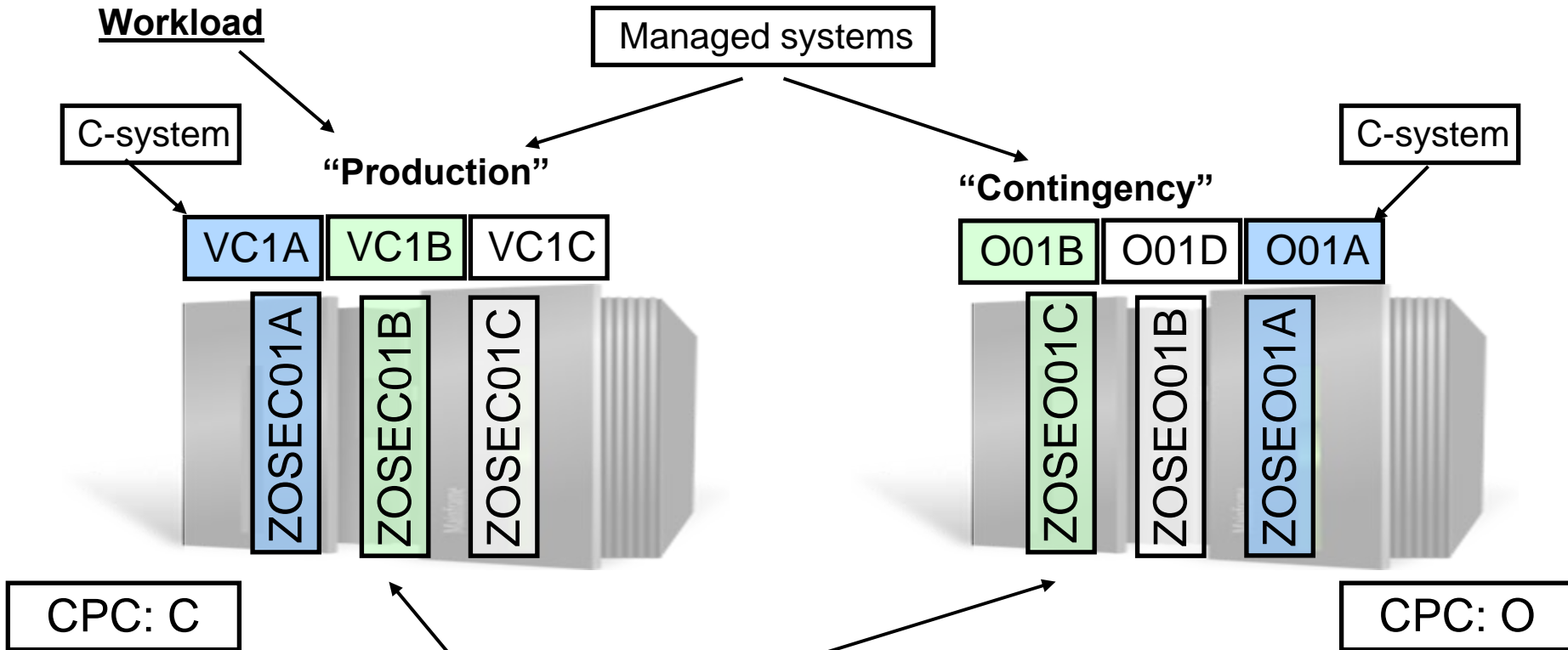
GDDR system protection – Concepts (1/2)

Defined to GDDR by “regular” LPAR parameters



CPC and LPAR Recovery Management

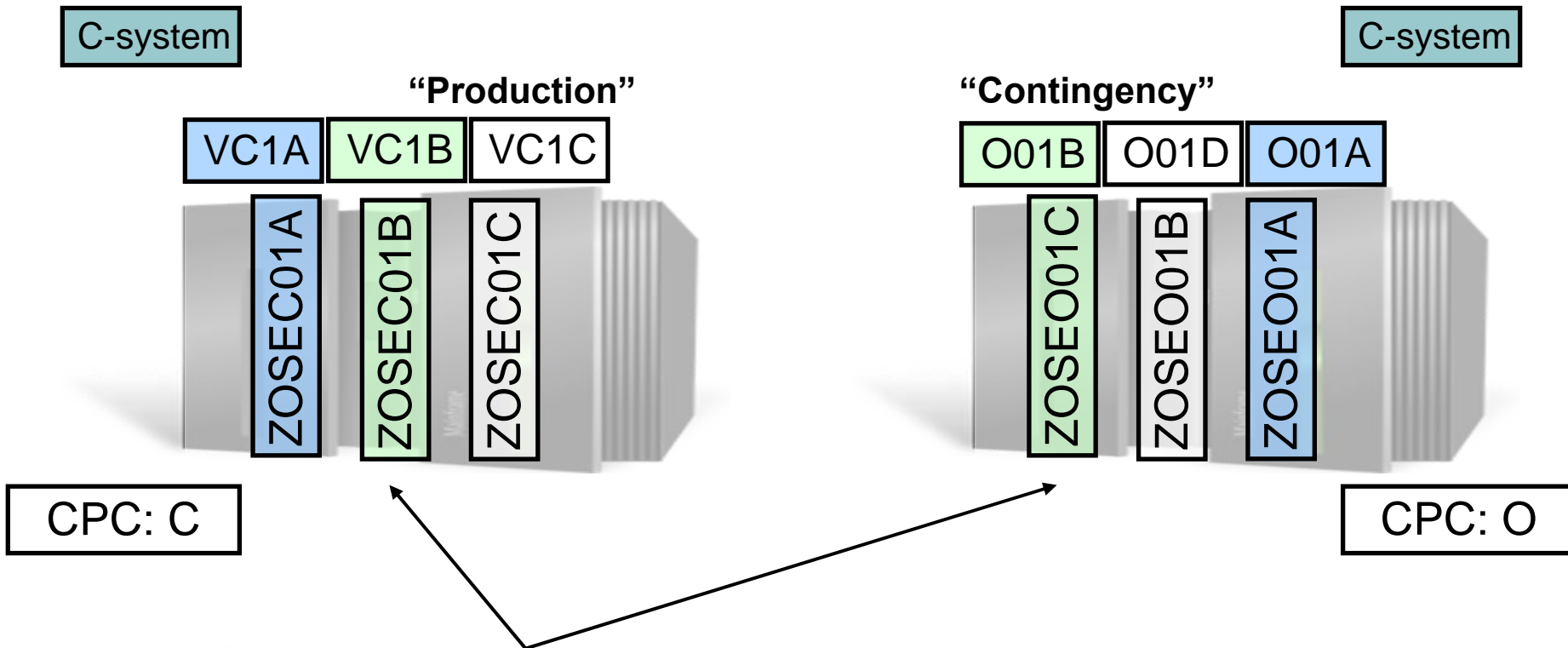
GDDR system protection – Concepts (2/2)



Contingency systems were mandatory before GDDR 3.2

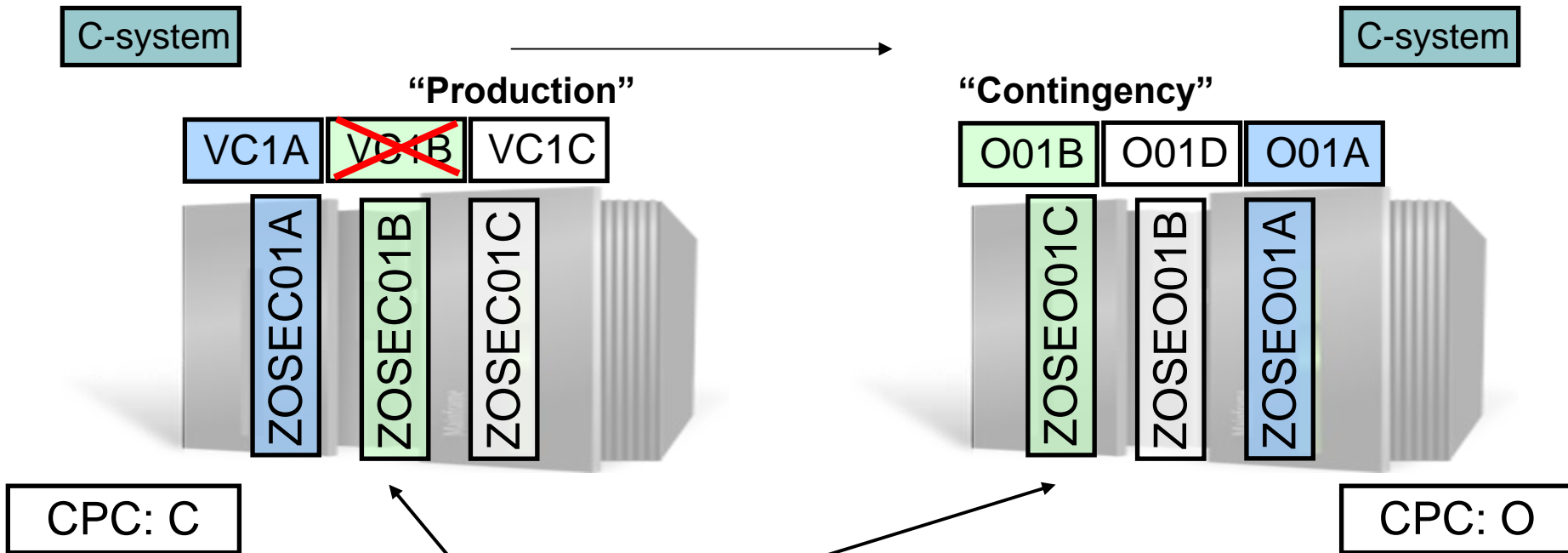
CPC and LPAR Recovery Management

GDDR system recovery in GDDR 2.2, 3.0 and 3.1 (1/2)



CPC and LPAR Recovery Management

GDDR system recovery in GDDR 2.2, 3.0 and 3.1 (2/2)



CPC and LPAR Recovery Management

New System Management Concepts in GDDR 3.2

- “Desired state” – managed both by user and internally by GDDR
- “Home / Away location” - managed internally by GDDR
- “Regular” LPAR parameters versus “Recovery” LPAR parameters
- SITE for some systems can change
- Planned CPC Swap
- CPC Recovery

CPC and LPAR Recovery Management

New concept: “Desired State”

```
----- GDDR - Perform HMC LPAR Actions ----- Row 1 to 8 of 8
```

S	System	Site	CPC	LPAR	D S	Load Addr	Load T Parm	Message
_	001C	DC1	0	ZOSE001C	U	7065	S 706599M1	
_	0016	DC1	0	ZOSE0016	U	7061	S 706199M1	
_	VC19	DC1-H	C	ZOSEC19	U	7039	S 703999M1	IPL
_	001D	DC2	0	ZOSE001D	U	****	*****	
_	VC1A	DC2	C	ZOSEC1A	U	****	*****	
_	VC1D	DC2	C	ZOSEC1D	D	****	*****	MXS
_	001E	DC3	0	ZOSE001E	U	****	*****	

***** Bottom of data *****

- Managed by user on LPAR Actions panel (Toggle)
- Managed internally by GDDR HMC interaction modules
- Preserved by Parameter Wizard in new Z96CARRY member

CPC and LPAR Recovery Management

New concept: “Location”

----- GDDR - Perform HMC LPAR Actions ----- Row 1 to 8 of 8

S	System	Site	CPC	LPAR	D Load S Addr	Load T Parm	Message
_	001C	DC1	0	ZOSE001C	U 7065	S 706599M1	IPL started by GDDR but no SCF registration yet
_	0016	DC1	0	ZOSE0016	U 7061	S 706199M1	
_	VC19	DC1	H	ZOSEC19	U 7039	S 703999M1	IPL
_	001D	DC2	0	ZOSE001D	U ****	*****	
_	VC1A	DC2	C	ZOSEC1A	U ****	*****	
_	VC1D	DC2	C	ZOSEC1D	D ****	*****	MXS
_	001E	DC3	0	ZOSE001E	U ****	*****	Detected as down (SCF unregistration)

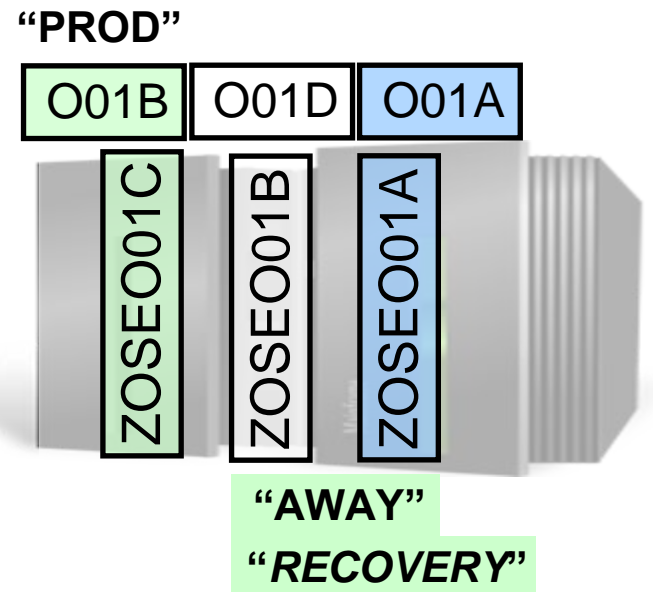
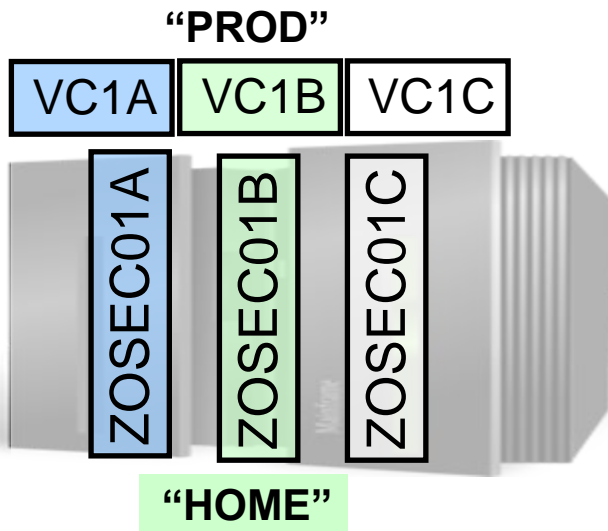
***** Bottom of data *****

- Applies only to systems protected with LPAR Recovery
- Visible to user on LPAR Actions panel (H for Home – A for Away)
- Managed internally by GDDR HMC interaction modules
- Preserved by Parameter Wizard in new Z96CARRY member

CPC and LPAR Recovery Management

GDDR system protection in GDDR 3.2 (1/3)

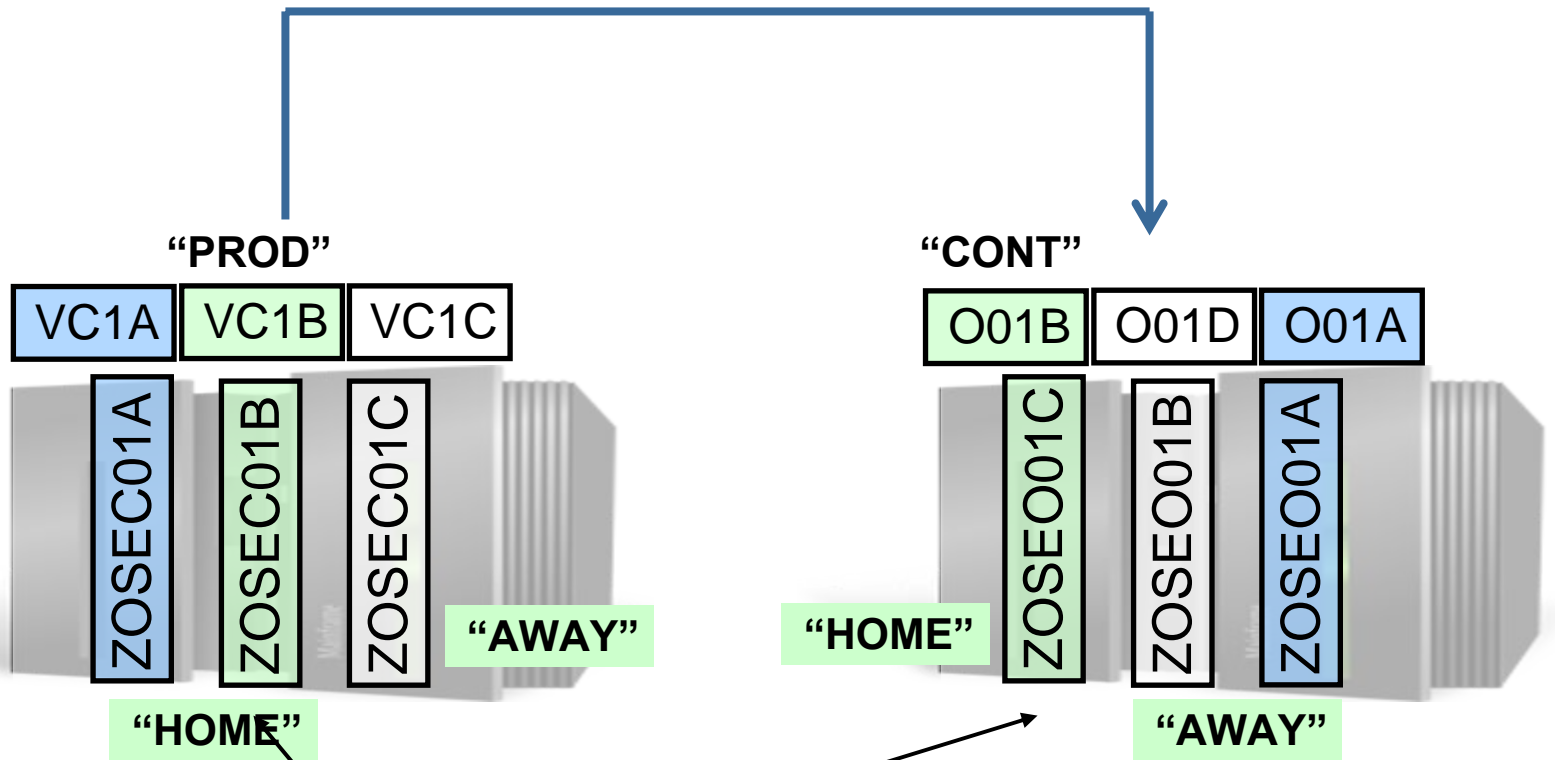
Defined to GDDR by RECOVERY LPAR parameters



Contingency systems are optional in GDDR 3.2
 Recovery LPARs are also optional, and serve as an
 “Away” location for protected systems

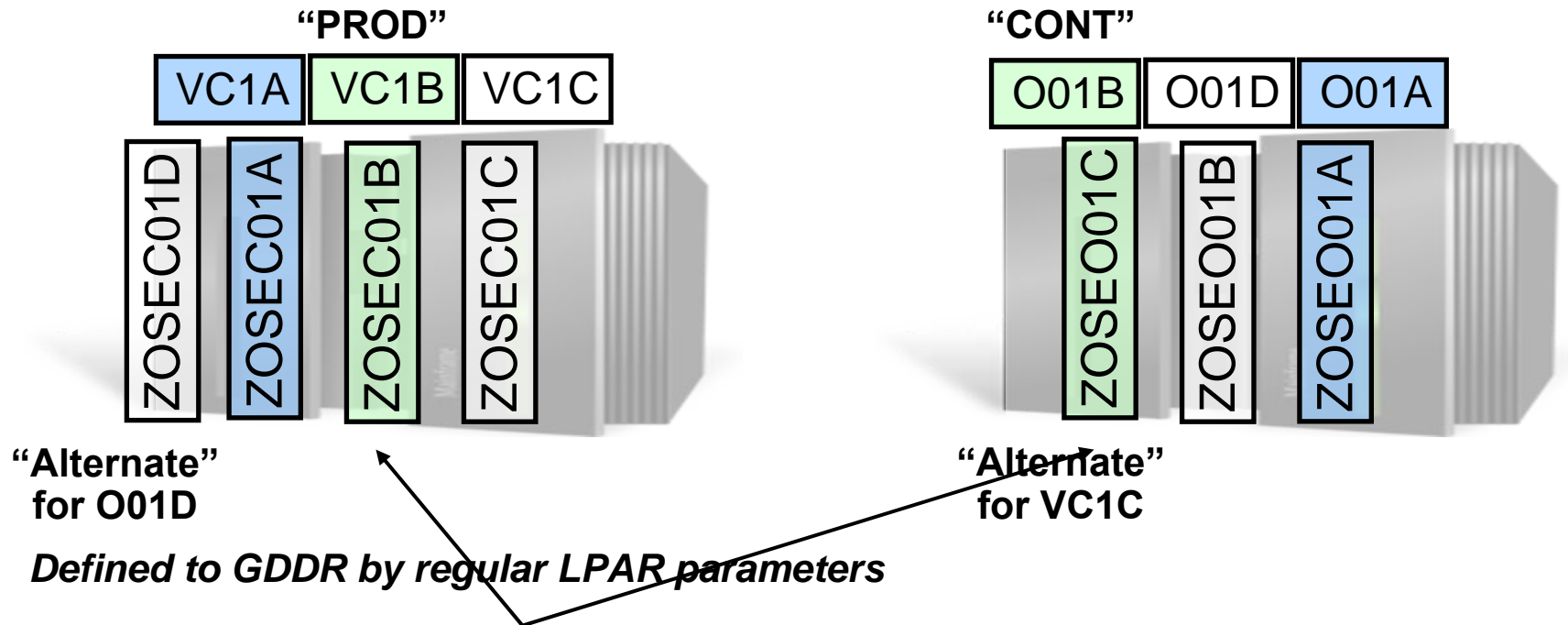
CPC and LPAR Recovery Management

GDDR system protection in GDDR 3.2 (2/3)



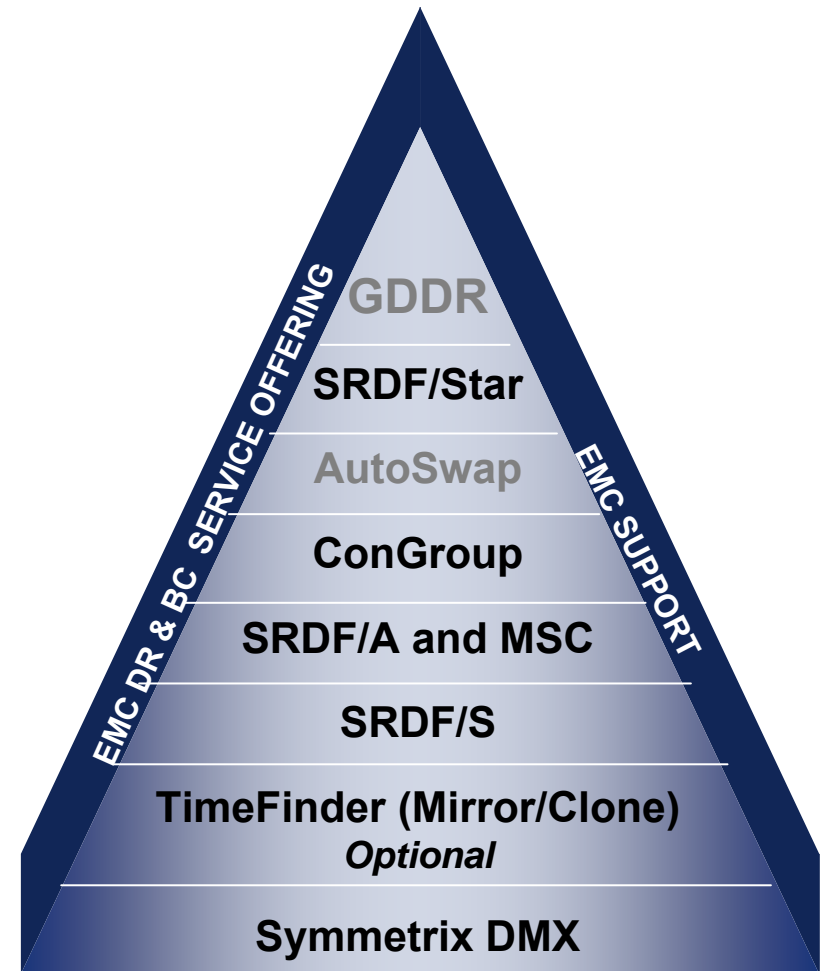
CPC and LPAR Recovery Management

GDDR system protection in GDDR 3.2 (3/3)



GDDR 3.2 Enhancements

- Configuration health check

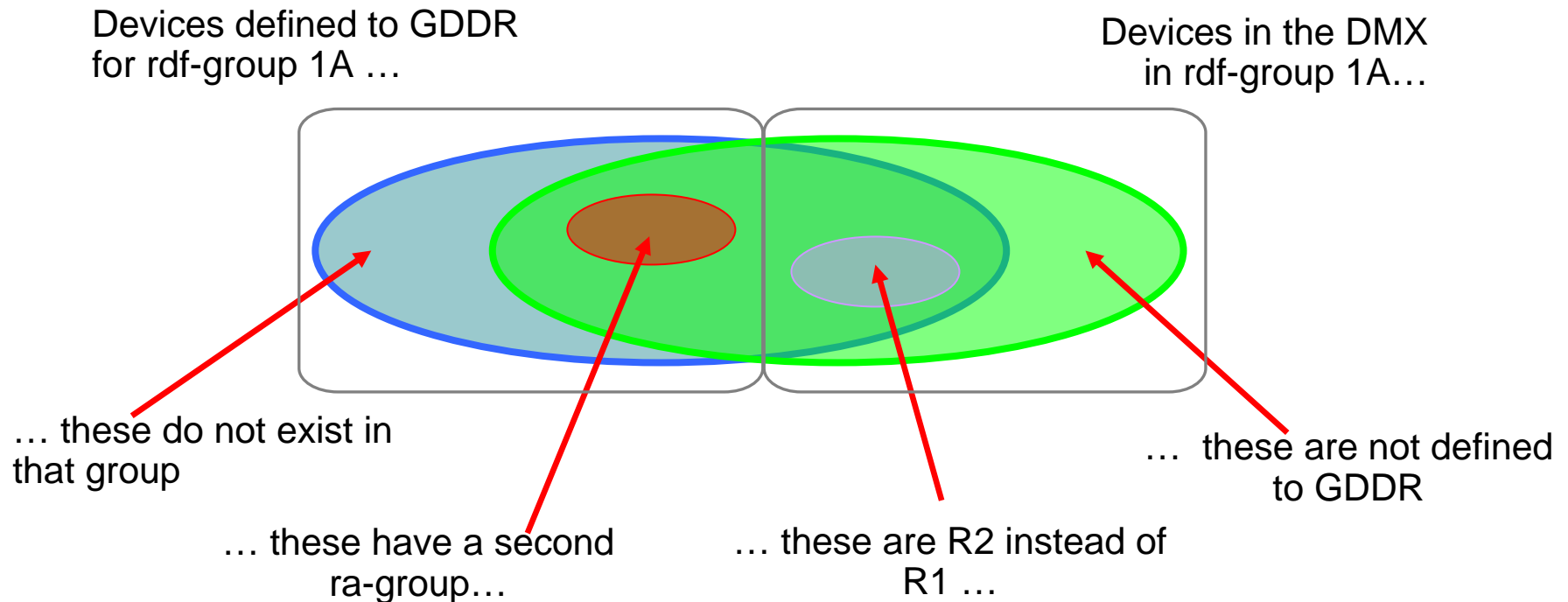


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Automated Configuration Check – DASD – GD32002

Are the GDDR parameters correct ?

- RDF.DEVICES parameters define possible SRDF Device pairs to GDDR



Automated Configuration - DASD Check

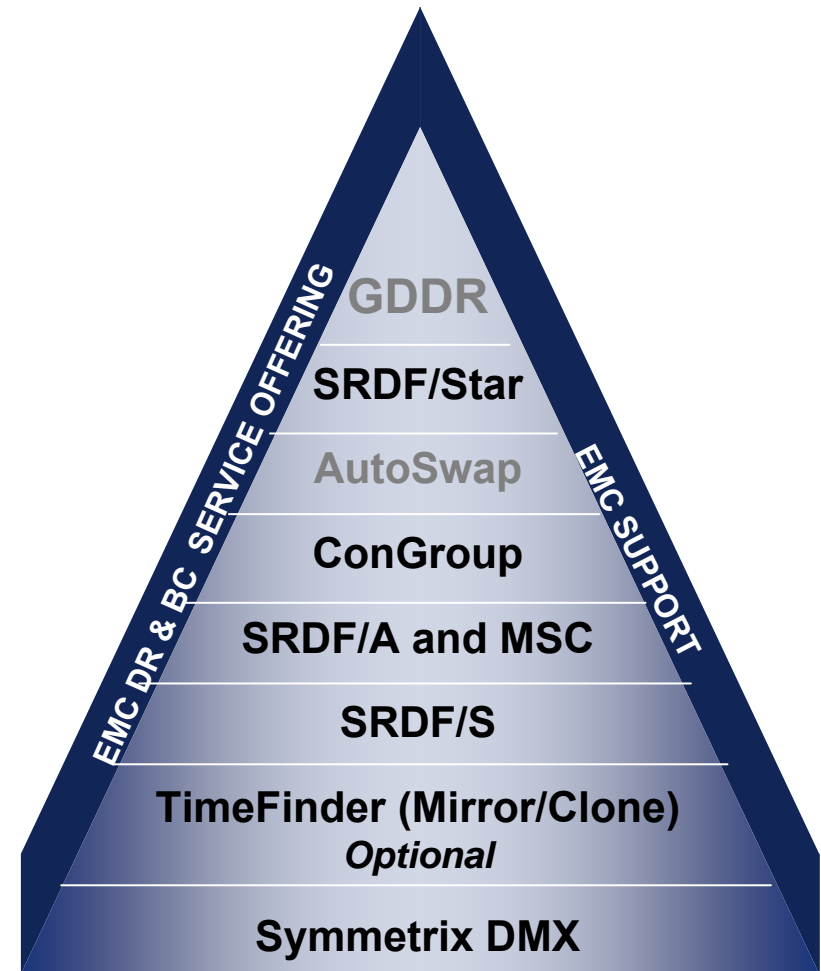
- Environment and state variance influences the check
 - Number of sites in the configuration: 2 or 3
 - Current Primary DASD site
 - Which rdf-groups do we have devices defined for ?
- For 3 site configurations
 - Concurrent or Cascaded ?
 - Diskless or regular ?
 - 2-Site Star ?
 - R22 support or not ?
 - Non-Star devices (“External=Yes”) ?
 - Is the current Master-C system at DC3 ?
 - If so, what was the last run script ?

Automated Configuration Check – DASD

- 1) Validate existing parameters against some well-known and some less-well known rules, including gatekeeper selection (exit if errors found)
- 2) Validate existing parameters against real storage
- 3) For each DMX known to GDDR, if any devices are found to be in an rdf-group known to GDDR, verify that those devices are indeed defined to GDDR
- 4) For each DMX known to GDDR, produce a “Device Ranges” report.
- 5) For all possible site-pairs, generate numbered RDF.DEVICES parameters
DC1.DC2, DC1.DC3, and DC2.DC3

GDDR 3.2 Enhancements

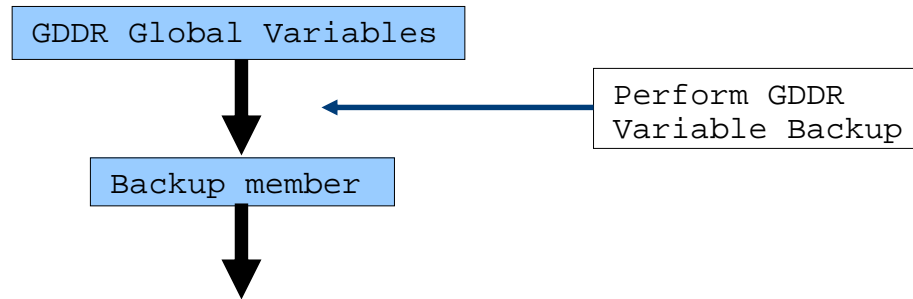
- Parameter Wizard Enhancements



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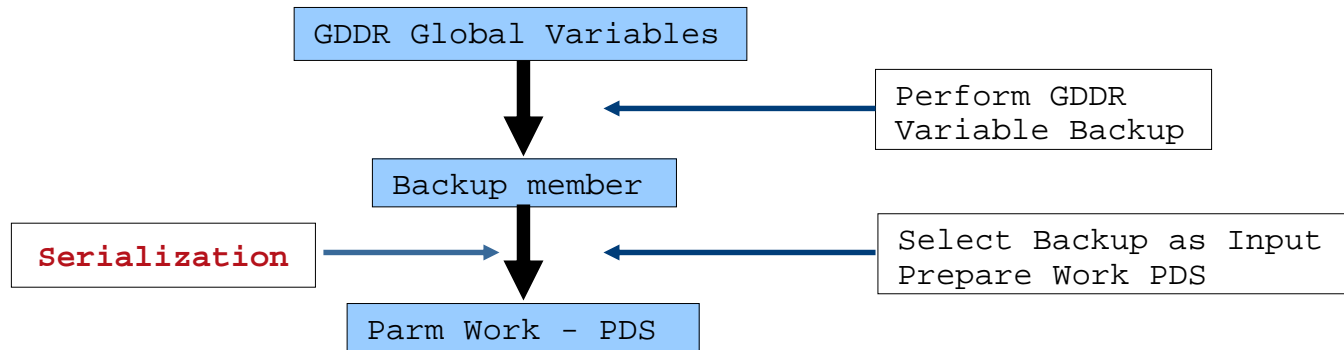
GDDR 3.2 Parameter Wizard – work-flow

GDDR 3.2 Parameter Wizard – work-flow – 1/6



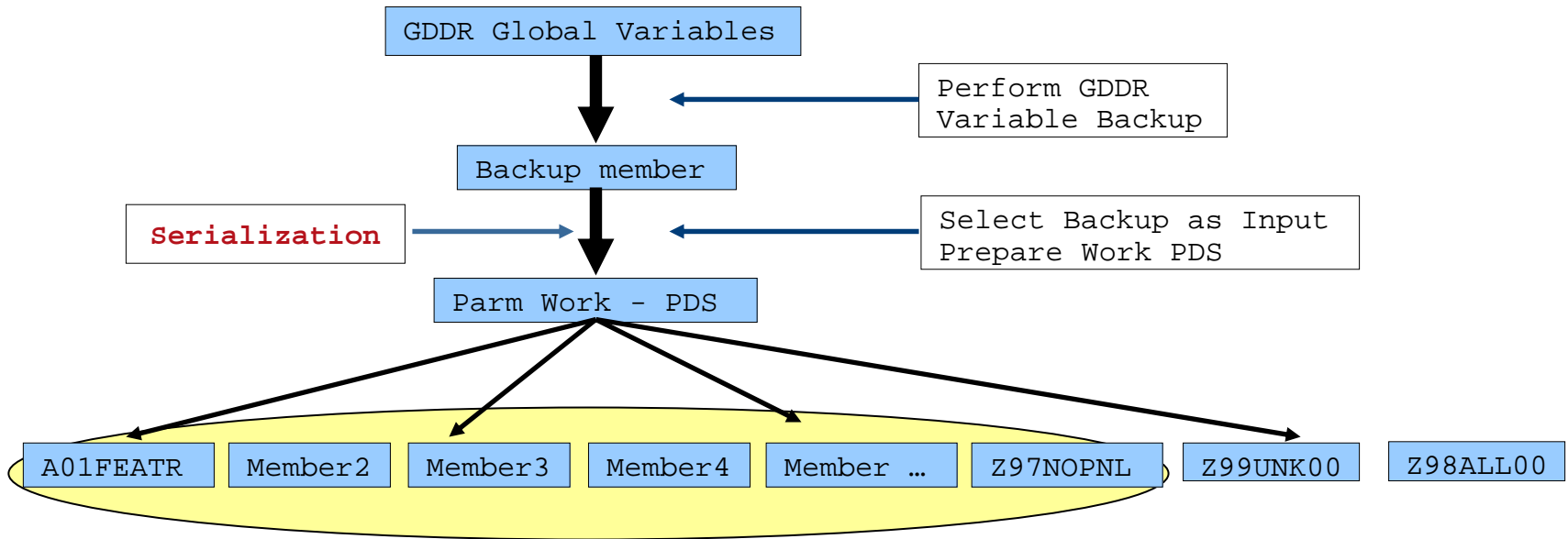
GDDR 3.2 Parameter Wizard – work-flow

GDDR 3.2 Parameter Wizard – work-flow – 2/6



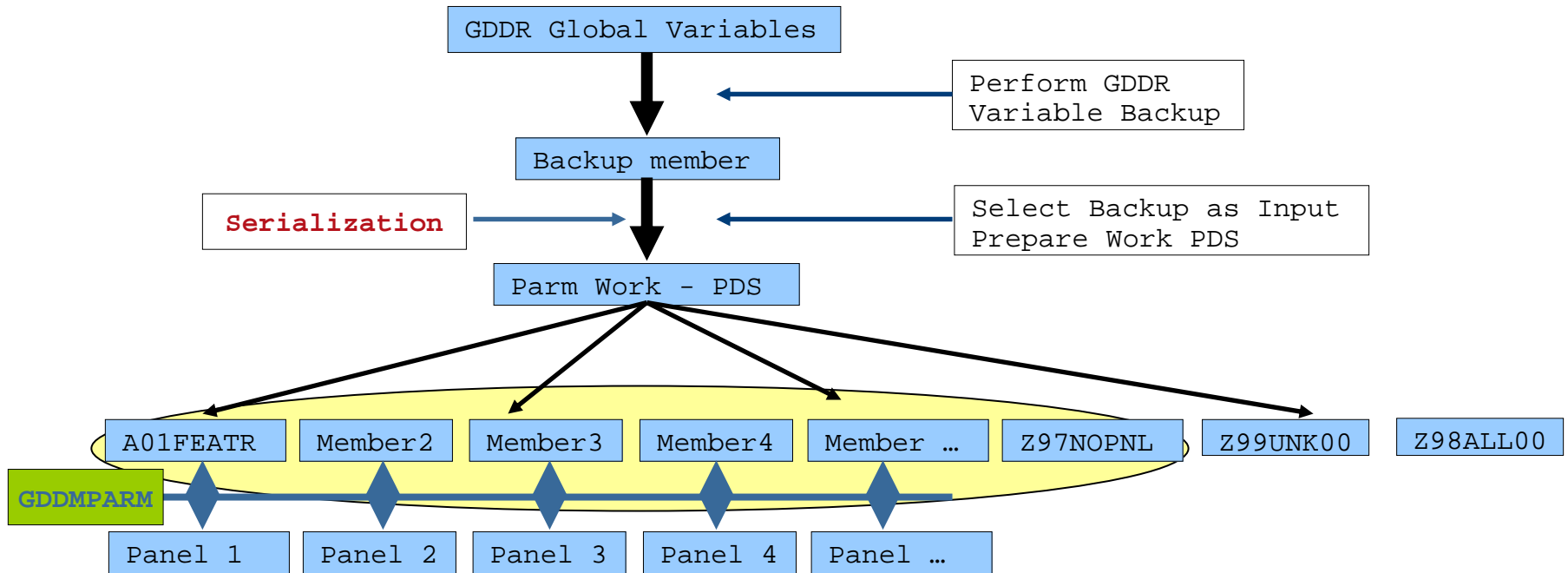
GDDR 3.2 Parameter Wizard – work-flow

GDDR 3.2 Parameter Wizard – work-flow – 3/6



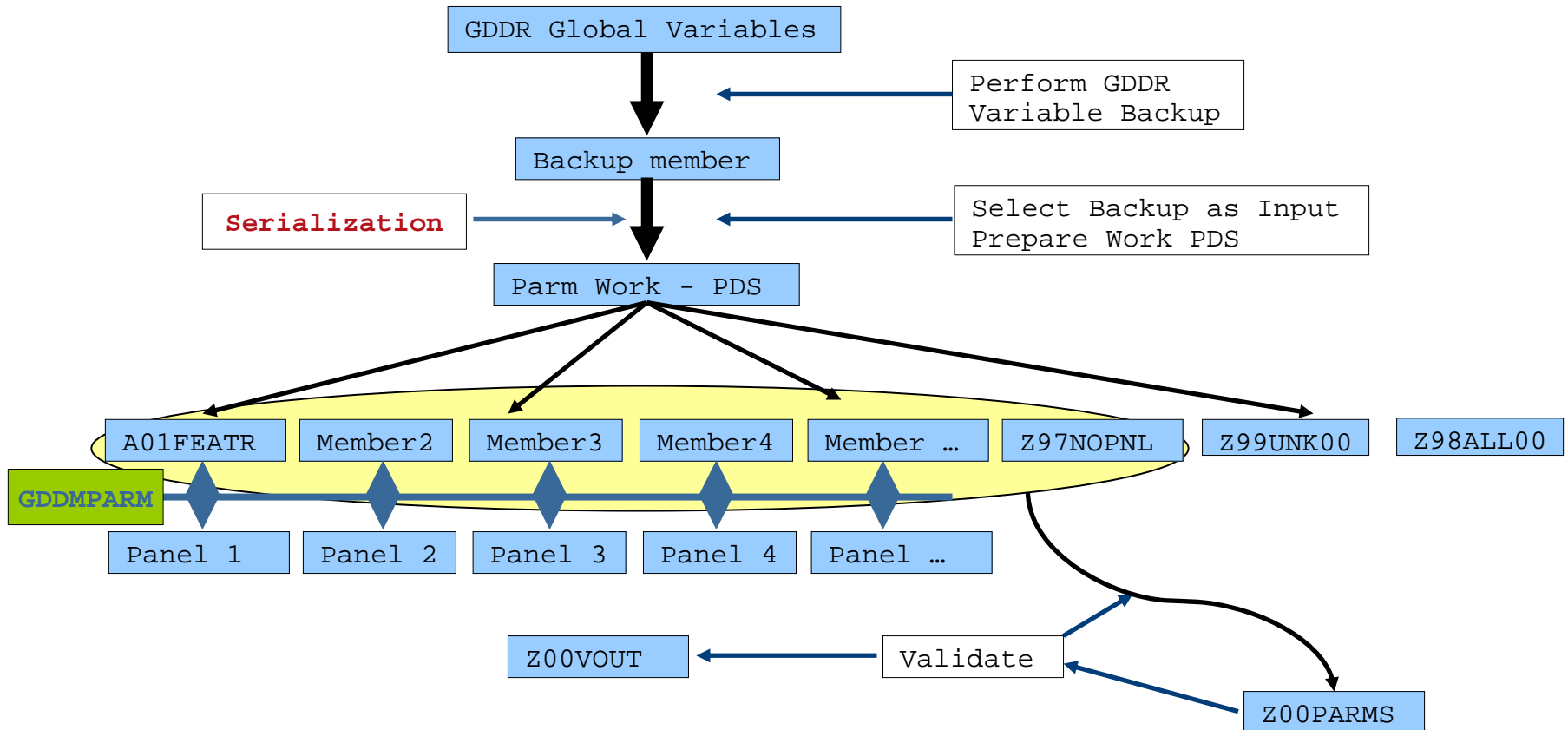
GDDR 3.2 Parameter Wizard – work-flow

GDDR 3.2 Parameter Wizard – work-flow – 4/6



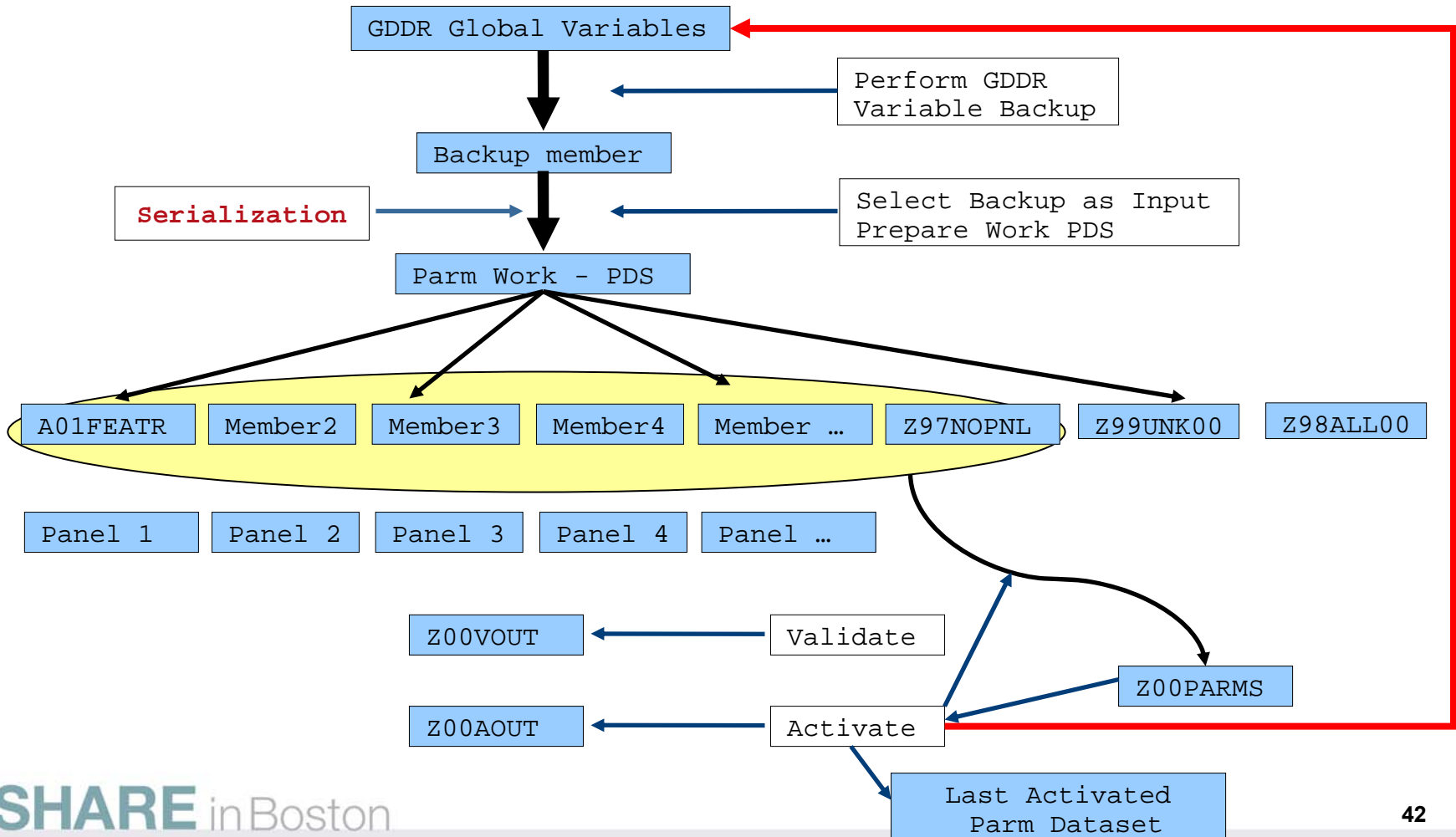
GDDR 3.2 Parameter Wizard – work-flow

GDDR 3.2 Parameter Wizard – work-flow – 5/6



GDDR 3.2 Parameter Wizard – work-flow

GDDR 3.2 Parameter Wizard – work-flow – 6/6



Auto-Discovery of Configuration Basics and Host Object parameters



Auto-Discovery

- The Parameter Load wizard helps you define and maintain the parameters that describe your particular disaster restart topography and EMC SRDF configuration by populating values available through the Auto-Discovery feature.
- The Auto-Discovery feature requires that the GDDRMAIN tasks have been started on each C-System and GDDR-managed system before you start the Parameter Load wizard using the Select Parameter Input Dataset panel
- If GDDRMAIN is not running on one or more of the Managed systems, then fields which could have been Auto-Discovered are open for data entry by the user.
- User interface is expected to react slower than normal if systems we try to communicate with are down.

Auto-Discovery of Configuration Basics and Host Object parameters



Option M.P.C.F: Define GDDR Configuration Features – 3 Sites

```
----- GDDR - Define GDDR Configuration features - Row 1 to 6 of 6
Command ==>

Site list: DC1 DC2 DC3                               FBA Devices: Y (Y/N)
Select a configuration from the list below. Press <Enter> to Validate.

Press <F3> to return to the GDDR Define Configuration Basics Menu
                                         <F6> Define C-Systems
Type <SAVE> to save, <LOAD> to restart from last saved values.

Sel  Configuration
---  -----
S   *** Concurrent SRDF/Star with AutoSwap           <===Current
-   Concurrent SRDF/Star with Congroup
-   Concurrent SRDF/Star with AutoSwap & R22 support
-   Active Cascaded SRDF/Star with AutoSwap
-   Inactive Cascaded SRDF/Star with AutoSwap
-   Active Cascaded SRDF/Star with Congroup
-   Inactive Cascaded SRDF/Star with Congroup
-   Active Cascaded SRDF/Star with AutoSwap & R22 support
-   Inactive Cascaded SRDF/Star with AutoSwap & R22 support
***End of configuration list***
```

Auto-Discovery of Configuration Basics and Host Object parameters



Option M.P.C.F: Define GDDR Configuration Features – DC1 DC2 Sites

```
----- GDDR - Define GDDR Configuration features ----- Row 1 of 2
Command ==>

Site list: DC1 DC2                                FBA Devices: N (Y/N)
Select a configuration from the list below. Press <Enter> to Validate.

Press <F3> to return to the GDDR Define Configuration Basics Menu
                                         <F6> Define C-Systems
Type SAVE to save, LOAD to restart from last saved values.

Sel  Configuration
---  -----
_    2-site SRDF/S with AutoSwap
_    2-site SRDF/S with ConGroup
***End of configuration list***
```

Auto-Discovery of Configuration Basics and Host Object parameters



Option M.P.C.F: Define GDDR Configuration Features – DC1 DC3 Sites

```
----- GDDR - Define GDDR Configuration features ----- Row 1 of 3
Command ==>

Site list: DC1 DC3                                FBA Devices: N (Y/N)
Select a configuration from the list below. Press <Enter> to Validate.

Press <F3> to return to the GDDR Define Configuration Basics Menu
                                         <F6> Define C-Systems
Type SAVE to save, LOAD to restart from last saved values.

Sel   Configuration
---   -----
_     2-site SRDF/A
_     2-site SRDF/Star
_     Cascaded SRDF/Star with Extended Distance Protection
***End of configuration list***
```

Auto-Discovery of Configuration Basics and Host Object parameters



Option M.P.C.C: Define C-Systems

```
----- GDDR - Define C-Systems -----  
Command ==>
```

```
Press <F3> to return to the GDDR Define Configuration Basics Menu  
<F5> Define Configuration Features      <F6> Define GDDR Datasets  
Type <SAVE> to save, <LOAD> to restart from last saved values.
```

Site	System Name	SMFID	IPL Parameters	CPC	LPAR
DC1	Green SYS1	Green SYS1	Red 7084 , Red 708497M1	Green Q3	Green ZOSESYS1
DC2	Green SYS2	Green SYS2	Red 708E , Red 708E98M1	Green R3	Green ZOSESYS2
DC3	Green SYSB	Green SYSB	Red 7098 , Red 709898M1	Green S3	Green ZOSESYSB

```
*----- Auto-Discovery Legend -----*  
* Green - Display only. Auto-Discovery had no conflict with input. *  
* Yellow - Display only. Restricted by Auto-Discovery, conflict with input. *  
* Red - User input allowed. Not restricted by Auto-Discovery, *  
* or impossible to discover at this time. *  
*-----*
```

Auto-Discovery of Configuration Basics and Host Object parameters



Option M.P.H: Define Host Objects

```
----- GDDR - Define Host Objects -----
Option ==>

  S   Define Managed Systems                This System: SYS1
  L   Define Managed LPARs                  This Site: DC1
  R   Define System Recovery Attributes     Master-C: SYS1
  P   Define Managed CPCs                   Primary Site: DC1
  I   Define IPL Parameters                 Primary DASD: DC1

  H   Define Managed HMCs                   Automation: ON
  C   Define HMC Community Names            Planned script: None
                                           Unplanned script: None

  D   Define Managed Couple Datasets
  CF  Define Managed CF Structures
  W   Define External Workloads
  E   Define EMC MF Enabler STCs

Select an option and press <Enter>

<F5> Define SDDF Clean GateKeepers         <F6> Define Managed Systems
Press <F3> to return to the GDDR Parameter Management Options Menu
```


Auto-Discovery of Configuration Basics and Host Object parameters



Option M.P.H.S: Define Managed Systems

```
----- GDDR - Define Managed Systems ----- Row 1 to 7 of 7
Command ==>

Press <F3> to return to the GDDR Define Host Objects Menu
<F5> Define Host Objects          <F6> Define Managed LPARs
Type SAVE to save, LOAD to restart from last saved values.

Line commands: A dd, D elete, R epeat

CMD  Site   System   Sysplex   Manage   HMC
-----
_    DC1    O01C    N/A       NO       YES
_    DC1    VC19    SIT32PL1,PLEX  YES     NO
_    DC2    O01D    N/A       NO       YES
_    DC2    VC1D    SIT32PL1,PLEX  YES     NO
***** Bottom of data *****
```

Auto-Discovered

Auto-Discovery of Configuration Basics and Host Object parameters



Option M.P.H.L: Define Managed LPARs

```
----- GDDR - Define Managed LPARs ----- Row 1 to 9 of 9
Command ===>

Press <F3> to return to the GDDR Define Host Objects Menu
<F5> Define Managed Systems          <F6> Define System Recovery Attributes
Type SAVE to save, LOAD to restart from last saved values.

Line commands: A dd, D elete, R epeat

CMD  Site   System      CPC      LPAR      Bypass
---  ---   -
_    DC1    O01C        O        ZOSEO01C  NO
_    DC1    VC19        C        ZOSEC19   NO
_    DC2    O01D        O        ZOSEO01D  NO
_    DC2    VC1D        C        ZOSEC1D   NO
_    DC3    VC19        Q3       ZOSEQQQQ  NO
***** Bottom of data *****
```

Auto-Discovered

Auto-Discovery of Configuration Basics and Host Object parameters



Option M.P.H.I: Define IPL Parameters

```

----- GDDR - Define IPL Parameters ----- Row 1 to 6 of 6
Command ==>

Press <F3> to return to the GDDR Define Host Objects Menu
<F5> Define Managed CPCs                <F6> Define Managed HMCs
Type SAVE to save, LOAD to restart from last saved values.

Line commands: A dd, D elete, R epeat

Line commands: A dd, D elete, R epeat

CMD  Site      System      STD RES IPL      STD ALT IPL      BCV IPL      HMC
-----  -----  -----  -----  -----  -----  ---
_    DC1      VC1D      703D,703D99M1    _____    BEEA,BEEA99M1    NO
_    DC1      VC19      7039,703999M1    EEAA,EEAA99M1    _____    NO
_    DC2      VC1D      703D,703D99M1    EEAB,EEAB99M1    BEEA,BEEA99M1    NO
_    DC2      VC19      7039,703999M1    EEAC,EEAC99M1    _____    NO
_    DC3      VC19      1234,123499M1    _____    _____    NO
_    DC1      O01C      7065,706599M1    EEAD,EEAD99M1    N/A              YES
_    DC2      O01D      7069,706999M1    _____    N/A              YES
***** Bottom of data *****

```

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Auto-Discovery of DASD Configuration (SRDF) – GD32002



Option M.P.D: Define Storage Objects

```
----- GDDR - Define Storage Objects -----  
Option ==>  
  
SR Define SRDF Device ranges  
TF Define TimeFinder Device ranges  
SD Define SDDF Gatekeepers  
  
This System: Q311  
This Site: ***  
Master-C: ****  
Primary Site: ***  
Primary DASD: ***  
  
Automation: ***  
Planned script: None  
Unplanned script: None  
  
Select an option and press <Enter>  
  
<F5> Define Site Roles and Groups      <F6> Define SRDF Device Ranges  
Press <F3> to return to the GDDR Parameter Management Options Menu
```

Auto-Discovery of DASD Configuration (SRDF) – GD32002



Option M.P.D.SR: Define SRDF Device Ranges – 1 of 4

```
----- GDDR - Define SRDF Device Ranges -----
Command ==>

Press <F3> to return to the GDDR Define Storage objects Menu
<F5> Define Storage Objects Menu          <F6> Define TimeFinder Device ranges
Type <SAVE> to save, <LOAD> to restart from last saved values.

Please run the GDDR Automated Configuration Discovery - DASD Utility
Line commands: A dd, D elete, R epeat

CMD      SitePair          SRDF Device Range          External
-----  -----  -----
***** Bottom of data *****

+-----+
| GDDI370W Nothing to load from E04SRDFD |
+-----+
```

Auto-Discovery of DASD Configuration (SRDF) – GD32002



Define SRDF Device Ranges – 4 of 4

```

----- GDDR - Define SRDF Device Ranges -- Row 1 to 15 of 126
Command ==>

Press <F3> to return to the GDDR Define Storage Objects Menu
<F5> Define Storage Objects Menu          <F6> Define SRDF/S GNS Groups
Type <SAVE> to save, <LOAD> to restart from last saved values.

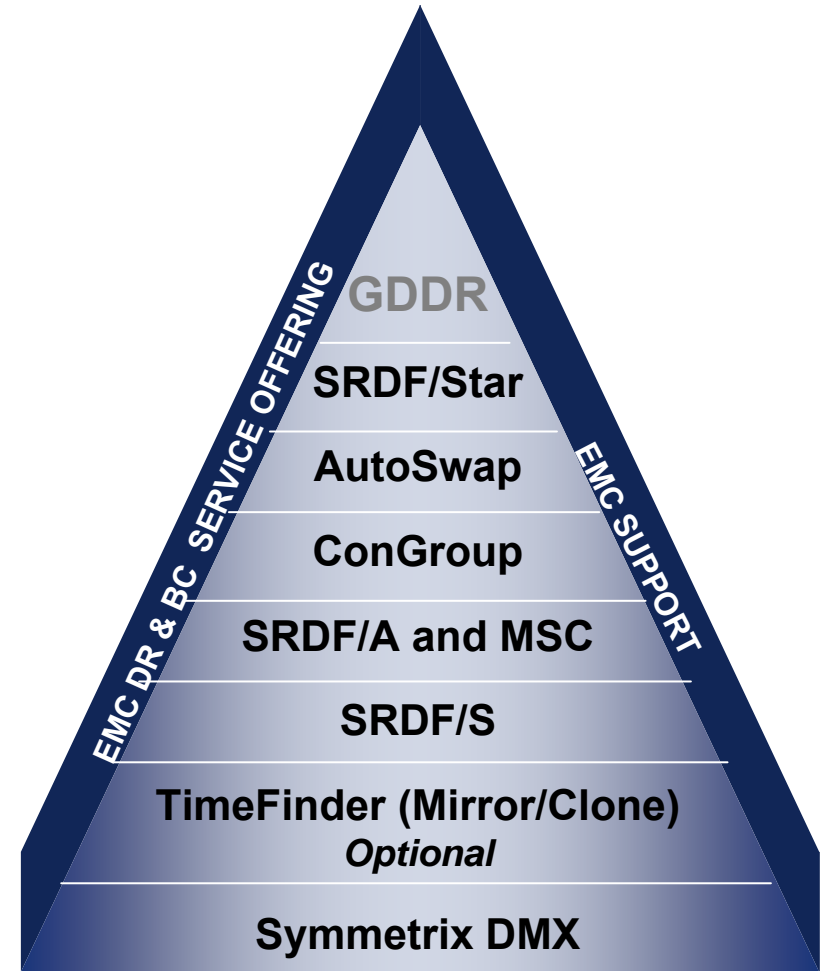
Line commands: A dd, D elete, R epeat

CMD      SitePair          SRDF Device Range          External
----      -
_        DC1-DC2            AA41,10,0360-039F,0360-039F,10,B211    NO
_        DC1-DC2            AA42,10,03B0-03CF,03B0-03CF,10,B212    NO
_        DC1-DC2            AA43,10,2000-204F,2000-204F,10,B214    NO
_        DC1-DC2            AA44,10,2050-20FF,2050-20FF,10,B215    NO
_        DC1-DC2            AA46,13,0066-0066,0066-0066,13,B216    NO
_        DC1-DC2            AA47,13,1B10-1BFF,1B10-1BFF,13,B218    NO
...
_        DC1-DC3            AA4C,18,0070-0077,0088-008F,18,BA14    NO
_        DC1-DC3            AA4E,18,0088-008B,0084-0087,18,BA12    NO
_        DC1-DC3            AA41,1B,0091-009F,0091-009F,1B,BA15    NO
_        DC1-DC3            AA42,1B,00B0-00BF,00B0-00BF,1B,BA16    NO
_        DC1-DC3            AA47,21,035E-035E,035E-035E,21,BA17    YES
_        DC1-DC3            AA48,21,2100-21FF,2100-21FF,21,BA19    YES
_        DC1-DC3            AA49,21,2200-22FF,2200-22FF,21,BA1A    YES
_        DC1-DC3            AA4A,21,2300-23FF,2300-23FF,21,BA1B    YES

```

Customer usage examples

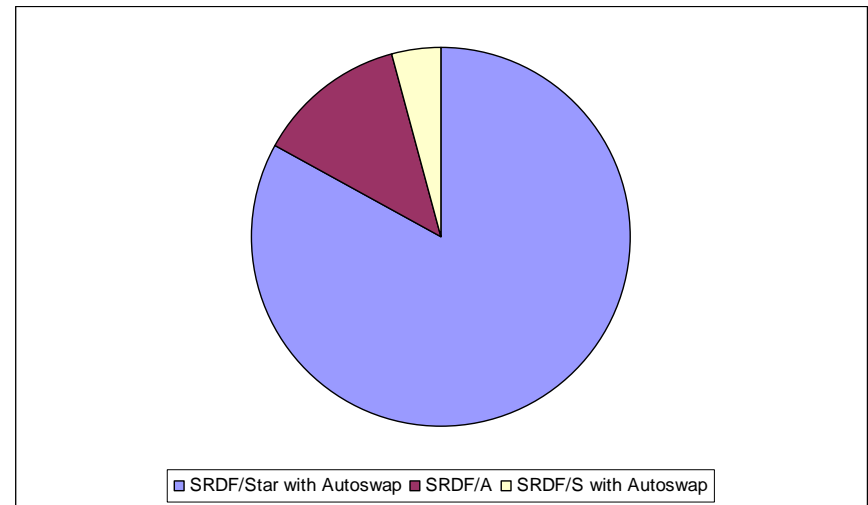
- Snapshot of how customers are deploying GDDR into their environments



EMC Foundation Technologies

GDDR Topology Distribution – Q209

- First customer deployments of GDDR were during 2008 year
- Predominant use case is three site SRDF/Star topologies



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