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**Report of Successful Completion of Qualification Testing**

International Business Machines Corporation and Hitachi, Ltd. have successfully completed compatibility and interoperability testing of Hitachi Virtual Storage Platform™ F1500 and Hitachi Virtual Storage Platform™ G1500 series products at code level 80-05-44 in the following IBM z13® and IBM z14™ environments:

IBM and Hitachi hereby confirm that testing for the support of FICON® and FCP connectivity of the following has been successfully completed:

| | |
|---|---|
| **CPU** | **IBM z13 2964-N30 Driver 27 level** |
| | **IBM z14 3906-M02 Driver 32 level** |
| **OS&GDPS®** | **z/OS® V2.3** |
| | **GDPS 3.14** |
| **Functions** | **GDPS/PPRC HyperSwap® Manager**<br>• **Freeze/run**<br>• **Planned HyperSwap**<br>• **Unplanned HyperSwap**<br>• **HyperSwap Failover/Failback**<br>• **Soft Fence** |
| | **GDPS/PPRC**<br>• **Freeze/run**<br>• **Planned HyperSwap**<br>• **Unplanned HyperSwap**<br>• **HyperSwap Failover/Failback**<br>• **FlashCopy® V2, FlashCopy Space Efficient and Remote Pair FlashCopy**<br>• **Soft Fence** |
| | **GDPS/XRC**<br>• **FlashCopy Zero suspend for FlashCopy V2 and FlashCopy Space Efficient**<br>• **SDM clustering** |

| | |
|---|---|
| **Combined Functions** | **GDPS/PPRC+HUR with "delta resync" controlled by BCM**<br>• **Regression test**<br>• **Site 1, Site 2 and Site 3 maintenance**<br>• **Site 1, Site 2 and Site2 failure**<br>• **Link failure** |
| **Storage Devices** | **Hitachi VSP F1500 and G1500**<br>• **PPRC and XRC volumes were assigned to Hitachi Dynamic Provisioning pool**<br>• **FlashCopy V2 and FlashCopy Space Efficient volumes were assigned to Hitachi Dynamic Provisioning pool** |

More detailed testing results are available from IBM or Hitachi on request.

**Limitations:**
The following considerations and limitations apply to the tested configurations:

- The following features are not supported at the testing time (GDPS/PPRC):
  - Open LUN management
  - Global Copy (aka PPRC XD) mode copy processing
  - Summary Event Notification for PPRC Suspends
  - Taking non-disruptive state saves of disk subsystem
  - GDPS Health Check GDPS_CHECK_SPOF indicates a false failure for the PPRC links host adapters as being a single point of failure
- Floating Utility devices are not supported at the testing time (GDPS/XRC).

IBM does not make any representations or warranties of any kind regarding the Hitachi products and is not liable for such products or any claims made regarding such products. The fact that the listed Hitachi products passed the enumerated IBM tests does not imply that the products will operate properly in any particular customer environment.

Hitachi retains sole responsibility for its products, the performance of such products and all claims relating to such products, including without limitation its products' compliance to product specifications, safety requirements, regulatory agencies requirements and industry standards.

David B Petersen
IBM Distinguished Engineer
IBM Z
IBM Systems
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# Attachment A -- Test Matrix

**Note: IBM has changed the name of below GDPS product in GDPS V4.1.**

- ✓ **GDPS Metro HM (Formerly known as GDPS/PPRC HyperSwap Manager)**
- ✓ **GDPS Metro (Formerly known as GDPS/PPRC)**
- ✓ **GDPS Global - XRC (Formerly known as GDPS/XRC)**

No testing was done with GDPS 4.1.

## GDPS/PPRC HyperSwap Manager

| Test Case Suite | Successfully Completed | Test Case Suite Description |
|---|---|---|
| • **Initial Tests** | ✔ | Basic remote copy operations using panels<br>Basic Freeze tests (GO/STOP/COND) |
| • **Planned Actions** | ✔ | Remote copy operations using HYPERSW command<br>Simulate Site maintenance (Site 1) and (Site 2) |
| • **Unplanned Actions** | ✔ | GDPS reacts to a failure, depending on the FREEZE option (GO / STOP / COND / SWAP&GO / SWAP & STOP))<br>Test failures were generated by PPRC links unplug, Chpid unplug, DASD control Unit power off and elongated I/O response times |
| • **Disruptive Testing (aka Config Testing)** | ✔ | GDPS reacts to a failure, depending on the FREEZE policy. Failures were generated by Control Unit Emergency power off and control unit internal failures |
| • **HyperSwap Stress test** | ✔ | Run a planned HyperSwap, with the application systems and the controlling system having CPU contention |
| • **Miscellaneous** | ✔ | HyperSwap extension (checking of secondary PPRC status – failure, XRC session, Concurrent Copy, etc.) |

# Attachment A -- Test Matrix

## GDPS/PPRC

| Test Case Suite | Successfully Completed | Test Case Suite Description |
|---|---|---|
| • **Initial Tests** | ✔ | Basic remote copy operations using panels<br>Basic Freeze tests (GO/STOP/COND) |
| • **Planned Actions** | ✔ | Remote copy operations using scripts (START/STOP SECONDARY, Flashcopy, HyperSwap (Resync & Suspend), etc.)<br>Simulate Site maintenance (Site 1) and Site 2) |
| • **Unplanned Actions** | ✔ | GDPS reacts to a failure, depending on the FREEZE option (GO / STOP / COND / SWAP&GO / SWAP & STOP)<br>Failures were generated by PPRC links unplug, Chpid unplug, DASD control Unit power off and elongated I/O response times |
| • **Disruptive Testing (aka Config Testing)** | ✔ | GDPS reacts to a failure, depending on the FREEZE policy. Failures were generated by Control Unit Emergency power off and control unit internal failures |
| • **HyperSwap Stress test** | ✔ | Run a planned HyperSwap, with the application systems and the controlling system having CPU contention |
| • **Miscellaneous** | ✔ | HyperSwap extension (checking of secondary PPRC status – failure, XRC session, Concurrent Copy, etc.) |
| • **FlashCopy** | ✔ | Prior FlashCopy limitations (Space Efficient, Remote Pair) are removed. Note that the traditional FlashCopy testcases are executed as part of Planned Actions and Unplanned Actions. |

## GDPS/XRC

| Test Case Suite | Successfully Completed | Test Case Suite Description |
|---|---|---|
| • **Initial Tests** | ✔ | Basic remote copy operations using panels.<br>Tests using single SDM and coupled SDMs |
| • **Planned Actions** | ✔ | Remote copy operations using scripts (START/STOP, SUSPEND session, etc.)<br>Simulate Site maintenance (Site 1) and Site 2)<br>Simulate Site 1 failure and restart Production in recovery site. |
| • **FlashCopy** | ✔ | Prior FlashCopy limitation (Space Efficient) is removed. Note that the traditional FlashCopy testcases are executed as part of Planned Actions. |

# Attachment A -- Test Matrix

## GDPS/PPRC with HUR controlled by BCM

| Test Case Suite | Successfully Completed | Test Case Suite Description |
|---|---|---|
| • **Regression test** | ✔ | Basic GDPS/PPRC testing to verify there are no unexpected impacts due to HUR. |
| • **Site 1 maintenance** | ✔ | Simulation of a scheduled disruptive maintenance of Site 1 by issuing a HyperSwap to Site 2 without stopping application systems, and initiating delta-resync to maintain small D/R RPO. After this procedure, Site 2 and Site 1's roles are reversed, and the same procedure can be used again to restore service back to the original Site 1 after the maintenance completes. |
| • **Site 2 maintenance** | ✔ | Simulation of scheduled disruptive disk maintenance in Site 2 by suspending the PPRC replica from Site 1 to Site 2 disks. There was no impact on the application systems running on Site 1 disks and on the HUR replica from Site 1 to Site 3 disks. |
| • **Site 3 maintenance** | ✔ | Simulation of scheduled disruptive disk maintenance in Site 3 by suspending the HUR replica from Site 1 to Site 3 disks (Suspend Flush). There was no impact on the application systems running on Site 1 disks and on the PPRC replica from Site 1 to Site 2 disks. |
| • **Site 1 failure** | ✔ | An unplanned HyperSwap moves the PPRC primary's from Site 1 to Site 2 disk, application systems continue running; delta resync the HUR from Site 2 to Site 3 disks. The Site 1 Maintenance procedure can be used in reverse to restore service to Site 1 without stopping application systems. |
| • **Site 2 failure** | ✔ | The PPRC replica from Site 1 to Site 2 disks is suspended. There was no impact on the application systems running on Site 1 disks and on the HUR replica from Site 1 to Site 3 disks. |
| • **Site 3 failure** | ✔ | The HUR continues writing to the Site 1 journal until it fills up, then eventually goes in track mode. There was no impact on the application systems running on Site 1 disks and on the PPRC replica from Site 1 to Site 2 disks. |
| • **Links failure** | ✔ | Site 1 to Site 2, Site 1 to Site 3, and Site 2 to Site 3 link failure testing. There was no impact on the application systems running on Site 1 disks, PPRC or HUR replica. Eventually the links suspend and the data is incrementally resynchronized when the links operational. |