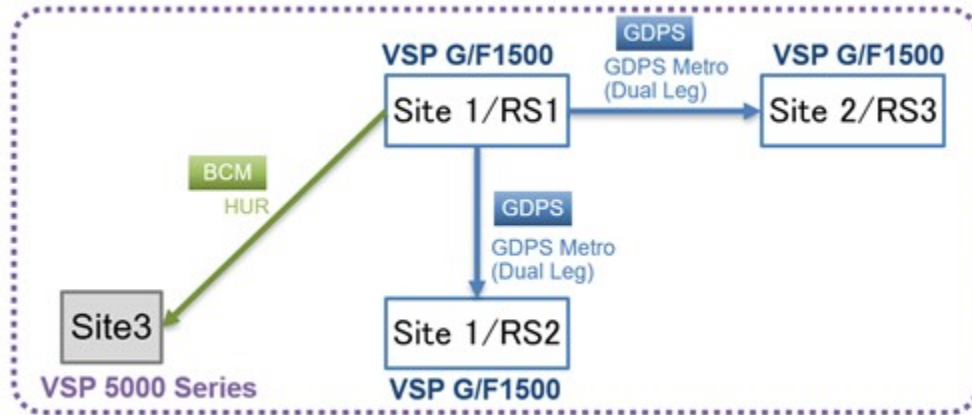


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Report of Successful Completion of Qualification Testing

International Business Machines Corporation and Hitachi, Ltd. have successfully completed compatibility and interoperability testing of Hitachi Virtual Storage Platform™ F1500, Hitachi Virtual Storage Platform™ G1500 at code level 80-06-78 and Hitachi Virtual Storage Platform™ 5000 Series products at code level 90-04-02 in the following IBM Z z14 and z15 environment: GDPS Metro dual leg with G1500/F1500 and HUR with VSP 5000 Series controlled by BCM:



In a GDPS Metro dual leg configuration, RS1 and RS2 are both assumed to be “local”, in Site1 and RS3 is assumed to be “remote” in Site2.

Note that GDPS Metro was formerly known as GDPS/PPRC and Metro Mirror (MM) was formerly known as Peer to Peer Remote Copy (PPRC).

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

CPU	IBM Z z14 Model 3906-M02 Driver level 36 bundle S33a
	IBM Z z15 Model 8561-T01 Driver level 41 bundle S27+
OS&GDPS®	z/OS V2.4

	GDPS Metro 4.3
Functions	GDPS Metro (dual leg) <ul style="list-style-type: none"> • Freeze/run • Planned HyperSwap • Unplanned HyperSwap • HyperSwap Failover/Failback • Soft Fence
Combined Functions	GDPS Metro (dual leg) + HUR controlled by BCM <ul style="list-style-type: none"> • Regression test • Site 1, Site 2 and Site 3 maintenance • Site 1, Site 2 and Site 3 failure • Link failure
Storage Devices	Hitachi VSP F1500 and G1500 and VSP 5000 Series <ul style="list-style-type: none"> • MM volumes were assigned to Hitachi Dynamic Provisioning pool

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

Current Limitations:

The following considerations and limitations apply to the tested configurations:

- The following features are not supported at the testing time (GDPS Metro DL):
 - Global Copy (aka PPRC XD) mode copy processing.
 - Summary Event Notification for MM Suspends.
 - Taking non-disruptive state saves of disk subsystem.
 - GDPS Health Check GDPS_CHECK_SPOF indicates a false failure for the MM links host adapters as being a single point of failure.
 - While Multi-target Metro Mirror (MTMM) is supported, multi-target incremental resynch is not and a resynch requires a full copy.
 - Remote Pair Flash Copy (RPFC) is not supported.

GDPS Metro (dual leg) tolerated the VSP 5000 Series HUR leg controlled by BCM.

No GDPS Metro FlashCopy functions were tested, Additionally, no GDPS Metro priced features were tested (including z/OS Proxy, LCP Manager, KVM Proxy, and SSC Proxy) except the MTMM Dual Leg feature.

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.

Attachment A -- Test Matrix

David B Petersen
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IBM Z
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Attachment A -- Test Matrix

GDPS Metro (dual leg)

Test Case Suite	Successfully Completed	Test Case Suite Description
<ul style="list-style-type: none"> Initial Tests 	✓	Basic remote copy operations using panels Basic Freeze tests (GO/STOP/COND) on RS1, RS2 and RS3
<ul style="list-style-type: none"> Planned Actions 	✓	Remote copy operations using scripts (START/STOP SECONDARY, HyperSwap Suspend, etc.) on RS1, RS2 and RS3. Simulate Site maintenance (Site 1 and Site 2)
<ul style="list-style-type: none"> Unplanned Actions 	✓	GDPS reacts to a failure, depending on the FREEZE option (GO / STOP / COND / SWAP&GO / SWAP & STOP) on RS1, RS2 and RS3. Failures were generated by MM links unplug, Chpid unplug, DASS control Unit power off and elongated I/O response times
<ul style="list-style-type: none"> Disruptive Testing (aka Config Testing) 	✓	GDPS reacts to a failure, depending on the FREEZE policy on RS1, RS2 and RS3. Failures were generated by Control Unit Emergency power off and control unit internal failures
<ul style="list-style-type: none"> Miscellaneous 	✓	HyperSwap extension (checking of secondary MM status – failure, QHA, Concurrent Copy, etc.)

GDPS Metro Dual Leg (DL) with VSP G1500/F1500 and HUR with VSP 5000 Series controlled by BCM

Test Case Suite	Successfully Completed	Test Case Suite Description
<ul style="list-style-type: none"> Regression test 	✓	Basic GDPS Metro testing to verify there are no unexpected impacts due to HUR.
<ul style="list-style-type: none"> Site 1- RS1 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.
<ul style="list-style-type: none"> Site 2 – RS3 maintenance 	✓	Simulation of scheduled disruptive disk maintenance in Site 2 by suspending the MM 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.
<ul style="list-style-type: none"> Site 1 – RS2 maintenance 	✓	Simulation of scheduled disruptive disk maintenance in Site 1 RS2 by suspending the HUR replica from RS1 to RS3 disks. There was no impact on the application systems

Attachment A -- Test Matrix

Test Case Suite	Successfully Completed	Test Case Suite Description
		running on Site 1 RS1 disks and on the MM replica from Site 1 to Site 2 disks.
<ul style="list-style-type: none"> • 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 MM replica from Site 1 RS1 to Site 2 and Site 1 RS1 to Site 1 RS2 disks.
<ul style="list-style-type: none"> • Site 1 RS1 failure 	✓	An unplanned HyperSwap moves the MM primary volumes from Site 1 to Site 2 disk, application systems continue running. The Site 1 Maintenance procedure can be used in reverse to restore service to Site 1 without stopping application systems.
<ul style="list-style-type: none"> • Site 2 failure 	✓	The MM 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.
<ul style="list-style-type: none"> • Site 1 RS2 Failure 	✓	The MM replica from Site 1 RS1 to Site 1 RS2 disks is suspended. There was no impact on the application systems running on Site 1 RS1 disks and on the HUR replica from Site 1 to Site 3 disks.
<ul style="list-style-type: none"> • 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 MM replica within Site 1 and from Site 1 to Site 2 disks.
<ul style="list-style-type: none"> • Links failure 	✓	Site 1 RS1 to Site 2, Site 1 RS2 to Site 2, Site 1 RS1 to Site 1 RS2 and Site 1 RS1 to Site 3 link failure testing. There was no impact on the application systems running on Site 1 disks, MM or HUR replica. Eventually the links suspend, and the data is incrementally resynchronized when the links operational.