

Configuring Global-Active Device and VMware vSphere Metro Storage Cluster on a Hitachi Storage System

v3.0

Implementation Guide

This document provides guidelines for configuring GAD and VMware vSphere Metro Storage Cluster (vMSC) using a Hitachi storage system.

Hitachi Vantara

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Preface

About this document

This document provides guidelines for configuring GAD and VMware vSphere Metro Storage Cluster (vMSC) using a Hitachi storage system.

Document conventions

This document uses the following typographic convention:

Convention	Description
Bold	 Indicates text in a window, including window titles, menus, menu options, buttons, fields, and labels. Example: Click OK.
	 Indicates emphasized words in list items.
Italic	Indicates a document title or emphasized words in text.
Monospace	Indicates text that is displayed on screen or entered by the user. Example: pairdisplay -g oradb

Intended audience

This document is intended for public.

Revision History

Revision	Changes	Date
v1.0	Initial release	August 2020
v2.0	iSCSI host connection support removal for GAD	October 2022
v3.0	ESXi8.0 support addition	October 2023

Accessing product downloads

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Configuring GAD and VMware vMSC on a Hitachi Storage System

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Introduction

A VMware vSphere Metro Storage Cluster (vMSC) is a specific storage configuration that combines replication with array-based clustering. These solutions are typically deployed in environments such as metropolitan or campus, where the distance between data centers is limited.

Purpose

This document provides instructions for configuring a VMware vMSC across two data centers using Hitachi storage systems. Additionally, it includes various failure scenarios based on the use case.

vMSC Block Diagram

The following diagram shows the metro cluster between two datacenters and the quorum storage placed at a third site:



Figure 1: vMSC block diagram

Hardware Requirements

The hardware used for vMSC tests must be listed as supported in the VMware Compatibility Guide (VCG). The following components are required to create a VMware vMSC environment:

- Four ESXi hosts with two in each site, having four port NIC card and two port FC HBA as per requirement. All ESXi hosts will be running two VMs each (minimum).
- Two IP switches for management network and vMotion connections between hosts/VMs.
- Four FC switches for SAN connectivity to the datacenter storage network.
- Two GAD Quorum Disks (iSCSI disk from virtual machine or separate FC/iSCSI storage system such as the Hitachi VSP F/G or other supported third-party storage systems).
- One management host (vCenter server).

Configuring GAD vMSC

Configuring vMSC with GAD can be divided into the following high-level steps:

- 1. Configuring the Host
- 2. Configuring the Switch
- 3. Configuring the primary and secondary storage systems
- 4. Configuring the Quorum storage
- 5. Configuring GAD

Configuring the Host

The following components are required for host configuration:

- For vSphere 6.5, 6.7, 7.0 or 8.0 ESXi host servers, the physical hosts running the virtual machines in both data centers must be managed by the vCenter Server.
- For connecting SAN to the datacenter storage network, you must connect the Host HBAs to FC switches.
- For connecting vMotion between hosts, you must connect one NIC port of a 4 port NIC card on each host to the free NIC port of another host at the same site.
- For connecting the management network, you must connect two NIC ports of a 4 port NIC card on each host to iSCSI switches of at the same site.
- ESXi hosts using the iSCSI protocol with GAD is not supported by any Hitachi Virtual Storage Platform (VSP) storage system.
- All four hosts along with the VMs must be a part of a single vSphere Cluster under a VMware Datacenter.
- Two VMs are located in each host. RDM LUNs or Virtual Machine File System (VMFS) volumes from the datastore must be assigned to those VMs.
- Host multipathing: You must configure all four ESXi hosts with multipathing software, either with VMware Native Multipathing (NMP) or with Hitachi Dynamic Link Manager (HDLM) to load-balance I/O between all available preferred and non-preferred paths.
 - NMP or HDLM multipathing software integrates with GAD to provide load balancing, path optimization, path failover, and path failback capabilities for vSphere hosts.
- When HDLM is selected as the multipathing software, the HDLM for VMware zip file is copied to the required server. Then, after unzipping the file, five vib files will be present under five different folders. You must install all vib files first to install HDLM on the server as follows:

 esxcli software vib install -v /<HDLM location>/vib20/hex-hdlmdlnkmgr/*.vib

- esxcli software vib install -v /<HDLM location>/vib20/psp-hdlmexlbk/*.vib
- esxcli software vib install -v /<HDLM location>/vib20/psp-hdlmexlio/*.vib
- esxcli software vib install -v /<HDLM location>/vib20/psp-hdlmexrr/*.vib
- esxcli software vib install -v /<HDLM location>/vib20/satphdlm/*.vib
- To verify whether Hitachi LUNs are managed by HDLM, run the following command:

```
esxcli storage nmp device list
```

The following shows the output for a LUN:

Device Display Name: HITACHI Fibre Channel Disk (naa.60060e8008753e000050753e00000133)

- Storage Array Type: HTI_SATP_HDLM
- Storage Array Type Device Config: {device config options }
- Path Selection Policy: HTI_PSP_HDLM_EXLIO
- Path Selection Policy Device Config:
- Path Selection Policy Device Custom Config:
- Working Paths: vmhba65:C0:T0:L0, vmhba64:C0:T0:L0
- Is USB: false
- When NMP is selected as the multipathing software, you must set ALUA rules on ESXi hosts prior to version ESXi 6.7 update 1 for Hitachi LUNs as follows:

```
esxcli storage nmp satp rule add -V HITACHI -M "OPEN-V" -P
VMW_PSP_RR -s VMW_SATP_ALUA -c tpgs_on
esxcli storage core claimrule load
```

For ESXi 6.7 update 1 and later hosts, the ALUA rule is already enabled on the OS and no additional command is required to enable/configure ALUA on hosts.

Configuring the Switch

The following components are required for switch configuration:

- For connecting LAN to the datacenter network from each host and VM, two network switches must be configured.
- For connecting ESXi hosts of both sites to the datacenter storage network (FC), four FC switches must be configured.
- For configuring the metro cluster environment, FC switch 1 in site-1 must be in cascade with FC switch-3 in site-2, and similarly, FC switch 2 in site-1 must be in cascade with FC switch-4 in site-2.

Configuring Primary and Secondary Storage Systems

The following components are required for primary and secondary storage system configuration:

- Two Hitachi storage systems configured (one in each site) and connected to FC/iSCSI switches of the respective site.
- Remote connectivity for GAD is supported for both the FC and iSCSI protocol.
- Each site storage must have two pairs of LUNs, one set for primary volumes and another set for secondary volumes. These LUNs will be made available to all the four hosts on both sites.
- Each site storage must have two pairs of storage ports for MCU (initiator) and RCU (target) pair. These connections act as the storage replication link between the primary and secondary storage systems.
- Site-1 storage primary volumes are in GAD pair with secondary volumes of the site-2 storage system. Similarly, site-2 storage primary volumes are in GAD pair with secondary volumes of the site-1 storage system.
- For NMP-ALUA configurations, the ALUA setting must be enabled on the P-VOLs for both sites. For enabling ALUA on Hitachi LUNs, run the following command:

```
raidcom modify ldev -ldev_id <ldev_id> -alua enable -fx -
IH<horcm instance>
```

For example:

raidcom modify ldev -ldev id 08:10 -alua enable -fx -IH4545

• Path optimization settings must be configured on the primary and secondary storage host groups as follows:

```
raidcom modify lun -port cl1-d HOSTGROUP -lun_id all -
   asymmetric access state optimized -I10 (On PVOL host group)
```

```
raidcom modify lun -port cl1-d HOSTGROUP -lun_id all -
   asymmetric access state non optimized -I10 (On SVOL host group)
```

• HMO78 must be set on the Host group having SVOLs for all HDLM configurations. This is not required for NMP-ALUA configurations.

Configuring the Quorum Storage

The following components are required for Quorum storage configuration:

- Two quorum disks assigned for each site GAD pair set.
- The Quorum disk can be configured by either assigning an iSCSI disk from the local disk of the server hosting a Microsoft Windows Server or a separate storage system such as the Hitachi VSP F/G or other supported third-party storage systems.

To configure a Windows Server local disk as an iSCSI Quorum disk for VSP storage systems, complete the following steps:

 Navigate to Server Manager > File and Storage Services > iSCSI > New iSCSI Virtual Disk.

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Figure 2: Creating iSCSI disks

2. Under iSCSi Targets, right-click **View all Targets** > **Properties** > **Initiators** and add the IQN of the storage ports that will be used as External Ports for the Quorum.

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Figure 3: Adding External Ports for Quorum

Configuring GAD

The following components are required for GAD configuration:

Two sets of GAD pairs configured using the storage UI or CCI for each site storage for the vMSC environment.

To create a GAD pair from Raid Manager CCI server on the primary storage system, complete the following steps:

1. Create a DP pool by running the following command for primary volumes in the site-1 storage system. Repeat the procedure to create a DP pool for primary volumes in the site-2 storage system.

```
raidcom add dp_pool -pool_name <pool_name> -ldev_id <ldev_id> -
I<Primary storage horcm instance>
```

2. Create LDEVs from this DP pool for primary volumes in the site-1 storage system by running the following command. Repeat the procedure to create primary volumes in the site-2 storage system.

```
raidcom add ldev -pool <pool_id> -ldev_id <ldev_id> -capacity
<pool capacity> -I<primary storage horcm instance>
```

3. Format the newly created LDEV by running the following command:

```
raidcom initialize ldev -ldev_id <ldev_id> -operation fmt -
I<primary storage horcm instance >
```

- 4. Create a host group and set host mode options for primary volumes host group in the site-1 storage system. Repeat the procedure to create primary volumes host group in the site-2 storage system.
- 5. To create a host group, run the following command:

raidcom add host_grp -port <host_group_id> -host_grp_name
<host group name> -I<primary storage horcm instance>

6. To set host mode and host mode options, run the following command:

raidcom modify host_grp -port <host_group_id> -host_mode 21 host mode opt 54 63 114 78 -I<primary storage horcm instance>

7. To set Port topology and add HBA port wwns (for all four hosts) at Host Group, run the following commands:

raidcom modify port -port <port_id> -port_speed 0 -topology f_port security_switch y -I<primary_storage_horcm_instance>
raidcom add hba_wwn -port <host_group_id> -hba_wwn <HBA_WWN> I<primary storage horcm instance>

8. To assign LDEVs to the host group, run the following command:

raidcom add lun -port <host_group_id> -lun_id 0 -ldev_id <ldev_id> -I<primary storage horcm instance>

To create a GAD pair from Raid Manager CCI server on the secondary storage system, complete the following steps:

 Create a resource group of the primary storage system (site-1) on the secondary storage system (site-2) and assign the respective secondary resources. Repeat the procedure to create a resource group of the primary storage system (site-2) on the secondary storage system (site-1) and assign the respective secondary resources. Run the following command:

raidcom add resource -resource_name <resource_group_name> -virtual_type
<primary_storage_serial_number> <storage_model_type> IH<secondary storage horcm instance>

2. Reserve the host group ID in the resource group of the storage system at the secondary site by running the following command:

raidcom add resource -resource_name <resource_group_name> -port
<secondary_hostgroup_ID> -IH<secondary_storage_horcm_instance>

3. Delete the virtual LDEV ID of the volumes from the secondary storage system that will be used for creating GAD pairs by running the following command:

raidcom unmap resource -ldev_id <LDEV_ID> -virtual_ldev_id
<virtual_LDEV_ID> -IH<secondary_storage_horcm_instance>

4. Reserve the LDEV IDs in the resource group by running the following command:

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```
raidcom add resource -resource_name <resource_group_name> -ldev_id
<LDEV ID> -I<secondary storage horcm instance>
```

5. Set the reservation attribute for GAD to the LDEV IDs by running the following command:

```
raidcom map resource -ldev_id <LDEV_ID> -virtual_ldev_id reserve -
IH<secondary storage horcm instance>
```

 For the LDEV ID where the reservation attribute was set, ffff is displayed for VIR_LDEV (virtual LDEV ID)

You can verify this by running the following command:

```
raidcom get ldev -ldev_id <LDEV_ID> -fx -
IH<secondary storage horcm instance>
```

7. Create a host group of the GAD secondary site storage system and set Host Mode Options by running the following commands:

raidcom add host_grp -port <Host_group_ID> -host_grp_name
<host group name> -IH<secondary storage horcm instance>

raidcom modify host_grp -port <Host_group_ID> -host_mode 21 host mode opt 54 63 78 114 -IH<secondary storage horcm instance>

8. Set Port topology and add HBA port wwn of all the four hosts of both sites at the Host Group by running the following command:

raidcom modify port -port <Port_ID> -port_speed 0 -topology f_port security switch y -IH<secondary storage horcm instance>

raidcom add hba_wwn -port <Host_group_ID> -hba_wwn <HBA_WWN> -IH<secondary storage horcm instance>

 Create DP pool and LDEVs for secondary volumes of Site-1 GAD pair by running the following command. Repeat the procedure to create DP pool and LDEVs for secondary volumes of Site-2 GAD pair.

raidcom add dp_pool -pool_name <Secondary_pool_name> -ldev_id
<Pool volume LDEV ID> -I<secondary storage horcm instance>

10. Create secondary volumes with the same capacity as the primary volumes by running the following command:

raidcom add ldev -pool <pool_id> -ldev_id <LDEV_ID> -capacity
<LDEV size> -IH<secondary storage horcm instance>

11. Add an LU path to the secondary volume by running the following command:

```
raidcom add lun -port <Host_grp_ID> -lun_id 0 -ldev_id <LDEV_ID> -
IH<secondary storage horcm instance>
```

Creating a GAD Pair

To create a GAD Pair in site-1, run the following command in the site-1 storage system. Repeat the procedure to create site-2 GAD pair on the site-2 storage system.

```
paircreate -g <GAD_PAIR_Name> -f never -vl -jq 7 -
IH<primary_storage_horcm_instance>
```

To create GAD pair from SVP on the primary storage system, complete the following steps:

1. Create a DP pool for primary volumes on the site-1 storage system. Repeat the procedure to create a DP pool for primary volumes on the site-2 storage system.

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Figure 4: Creating DP Pools

2. Create LDEVs from this DP pool for primary volumes in the site-1 storage system. Repeat the procedure to create primary volumes in the site-2 storage system.

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🐕 Parity Groups					Capacity				Used Capac	itu				-
Cogical Devices		DEV ID	LDEV Name	Status	Capacity				Useu Capac	ity.		Capacity Saving	Number	P
• 🙆 Pools					Total	Reserved	Used	Used (%)	Tier 1	Tier 2	Tier 3		or Paths	
GAD POOL PRI(7)		00:00:04	siteb-pvol	Normal	250.00 GB	0.00 GB	13.61 GB	5	13.61 GB	-	-	Disabled	2	
HDID ROOL SEC(4)		00:00:05	siteb-pvol	Normal	250.00 GB	0.00 GB	13.86 GB	5	13.86 GB	-	•	Disabled	2	
IAM GAD Pool SEC(5)		00:00:06	siteb-pvol	Normal	250.00 GB	0.00 GB	17.67 GB	7	17.67 GB			Disabled	2	
		00:00:07	siteb-pvol	Normal	250.00 GB	0.00 GB	27.48 GB	10	27.48 GB			Disabled	2	
		00:00:08	siteb-pvol	Normal	8.00 GB	0.00 GB	1.23 GB	15	1.23 GB		•	Disabled	2	
TPpool2_wn(1)		00:00:09	siteb-pvol	Normal	8.00 GB	0.00 GB	1.23 GB	15	1.23 GB	-	-	Disabled	2	
EXEN-CIRT-FC(8)		00:00:4B	siteb-pvol	Normal	8.00 GB	0.00 GB	1.18 GB	14	1.18 GB			Disabled	2	
<pre>(B) iscsicert_pool_pb(3)</pre>		00:00:4C	siteb-pvol	Normal	8.00 GB	0.00 GB	1.18 GB	14	1.18 GB			Disabled	2	
WSC_SB(6)	<	00:00:4F	siteb-pvol	Normal	8.00 GB	0.00 GB	3.56 GB	44	3.56 GB			Disabled	2	
() vMSC_pool_pg(2)		00:00:50	siteb-pvol	Wormal	8.00 GB	0.00 GB	3.56 GB	44	3.56 GB			Disabled	2	
* 🚯 Ports/Host Groups/iSCSI Tar		00:00:51	siteb-pvol	Normal	8.00 GB	0.00 GB	3.60 GB	45	3.60 GB			Disabled	2	
۲ CL1-A		00:00:52	siteb-pvol	Vormal	8.00 GB	0.00 GB	3.56 GB	44	3.56 GB			Disabled	2	
1 🕼 CL3-A 🗢		00:00:53	siteb-svol	Vormal	250.00 GB	0.00 GB	14.19 GB	5	14.19 GB			Disabled	2	
Analytics		00:00:54	siteb-svol	Normal	250.00 GB	0.00 GB	13.49 GB	5	13.49 GB			Disabled	2	
Administration		00100155	siteb-svoi	Normal	250.00 GB	0.00 GB	17.51 GB	,	17.51 GB			Disabled	2	
		00100156	siteb-svol	Normal	250.00 GB	0.00 GB	19.19 GB	18	19.19 GB			Disabled	2	
General Tasks		00100157	sitebravel	A Normal	8.00 GB	0.00 GB	1.22 GB	15	1.23 08			Disabled	2	
		00100150	sitebravel	Normal	8.00 GB	0.00 GB	1.10 00	10	1.10.00			Disabled	2	
Treate Host Groups		00100152	sitebravel	Normal	8.00 GB	0.00 GB	1.10 GB	14	1.10 00			Disabled	2	
Create iSCSI Targets		00.00.58	sitebravel	Normal	0.00 GB	0.00 GB	2.16 GB	14	2 56 08			Disabled	2	
💕 Create LDEVs		00:00:50	siteb-svol	Normal	8.00 GB	0.00 GB	3.52 GB	44	3.52 GB			Disabled	2	
M Add LUN Paths		00:00:50	siteb-svol	Normal	8.00 GB	0.00 GB	3.52 GB	44	3.52 GB			Disabled	2	
Create Deels		00:00:5E	siteb-svol	Normal	8.00 GB	0.00 GB	3.56 GB	44	3.56 GB			Disabled	2	
Create Pools						,								
Add External Volumes														

Figure 5: Creating LDEVs

3. Create a host group and set the host mode options for primary volumes host group in the site-1 storage system. Repeat the procedure to create primary volumes host group in the site-2 storage system.

HITA HITA File Maintenance Actions Reports Settings Maintenance Utility View Tool Help Plats Additions Reports Settings Maintenance Utility View Tool Help										
Explorer	1D-G02 (02)	ID-G02 (02)								
Storage Systems	ILAB HM900-66.1	<u>ILAB HM900-66.17(S/N:415577)</u> > <u>Ports/Host Groups/ISCSI Targets</u> > <u>CL1-D</u> > 1D-G02 (02)								
* 🗊 ILAB HM900-66.17(S/N:415577)	Volume Migrati	on 🔻								
🕅 Tasks	iSCSI Target A	ias	1D-G02 (02)			Host Mode		21 [VMware Extension]		
🔏 Reports	iSCSI Target Na	ame	iqn.1994-04.jp.co.hitac	hi:rsd.h8h.t.15577.	1d002	Port Security		Enabled		
🎢 Components	Port ID		CL1-D			Authentication	Method	None		
'🐕 Parity Groups	Virtual Storage	Machine	VSP E990 / 415577	VSP E990 / 415577			Mutual CHAP	Disabled		
Cogical Devices							User Name			
'隆 Pools	Usets LUNC	Hast Node Ontions				^				
* 👸 Ports/Host Groups/iSCSI Tar	HOSIS LUNS	HUSE MODE OPTIONS	CHAP USERS							
'🛱 CL1-A	Edit Host	Add Hosts Remove Hosts	Export						Selected: 0 of 4	
'👘 CL3-A	\$Filter ON	OFF Select All Pages C	olumn Settinos					Options 🗸 🕅 🤟	1 / 1 > -	
'to CL5-A					ISCSI Tarnet	ISCSI Target				
CL7-A	Port ID	HBA iSCSI Name		Host Name	Alias	Name				
°€ CL1-B	CL1-D	iqn.1990-07.com.emules	00-00-c9-da-c7-ff	81	1D-G02 (02)	iqn.1994-0				
🕅 1B-G00 (00)	CL1-D	ign.1990-07.com.emules	::00-90-fa-1a-d9-e9	74-0	1D-G02 (02)	iqn.1994-0				
SAN-15177 (02)	CL1-D	iqn.1998-01.com.vmware	e:siteahost2-154b9676	78	1D-G02 (02)	iqn.1994-0				
🕅 SAN-15179 (03)	CL1-D	iqn.1998-01.com.vmware	sitebhost2-103277bd	82	1D-G02 (02)	iqn.1994-0				
XEN-CIRT (01)										
'CL3-B										
'€ CL5-B ♡										

Figure 6: Creating Host Groups

4. Set host mode and host mode options:

Explorer	1D-G02 (Last Updated	: 2020/07/15 02:47 🚺										
Storage Systems	ILAB HM900	IL48 HM502-56.17(5/H:413277) > Pots/Host Groups/SGSI Tanasta > CLI-0 > 10-602 (02)												
* 🗊 ELAB HM900-66-17(S/N:415577)	Volume N	ligration V												
😭 Tasks	Tasks ISCSI Target Alias 10-0		10-602 (02)		Host Mode		21 (VMware Extension)							
😭 Reports	iSCSI Target Name ign.1994-04.jp.co.hitachirrad.ht		ign.1994-04.jp.co.hitachirrad.h8h.t	15577.14002	Port Security		Enabled							
* Components	Port ID CLI-D % Parity Groups Virtual Storage Machine VSP 6990 / 415577				Authentication	Method	None							
* 🞇 Parity Groups						Mutual CHAP	Disabled							
togical Devices	Cogical Devices					User Name								
100 Pools	Taxante In		Contraction of Contra		^									
* Ports/Host Groups/iSCSI Tar	Hosts L	Ris Host Node Options CHAP Users												
CL3-A	Edit ISC	SI Targets Export						Total: 256						
10 CL3-A	Ation													
CLS-A	(Ariter)	On LOUG CONTINUE	entrigs	1.0.0			(Options •) In (A A A A A						
101 CL7-A	No.	Option Description		Status 1 V				î.						
• CL1-8	54	(VAAI) Support Option	for the EXTENDED COPY command	Enabled										
(3) 18-000 (00)	63	(VAAI) Support option	for vStorage APIs based on T10 standards	Enabled				J						
10 54N-15177 (02)	114	The automatic asynch	ronous reclamation on ESXI6.5 or later	Enabled										
(C SAN-15179 (02)	0	Reserved		Disabled										
	1	Reserved		Disabled										
	2	VERITAS Database Ed	tion/Advanced Cluster	Disabled										
e cure	3	Reserved		Disabled										
.G cr2+6	4	Reserved		Disabled										
Analytics	5	Reserved		Disabled										

Figure 7: Setting Host Mode Options

5. Assign LDEVs to the host group:

Hitachi Device Manager store	age Navigator Ions Report	s Settings	Maintenance Uti	ity View T	'ool Help			e Mes	De Avitios	1 14 Oper	ation Unlocked	ogged in as: r	• HI					
Explorer	1D-G02 (D2)								_	Last	Updated : 20	20/07/15 02:47					
Storage Systems	ILAB HM90	-66.17(5/N:415	(77) > Ports/Hos	t Groups/ISCSI T	argets > CL1-D > 1D-G02 (02)													
* 🗍 ILAB HM900-66-17(S/N:415577)	Volume	Seration -																
Masks 🔛	ISCS! TH	net Alias		10-602 (02)		Host Mode				21 Dullance Exter	fanite							
Reports	ISCSI Ta	net Name		ion 1994-04 in co hitachi and hith t 15577 14002			Port Security				Enabled	annul						
Components	Port ID			CLT/D			Authentication		Method		None							
Parity Groups	Virtual Storage Machine VSP E990 / 415577 Mutual CHAP						Disabled											
Cogical Devices									User Name									
1 Pools	Concession in which the					^												
• 🐕 Ports/Host Groups/ISCSI Tar	Hosts	UNS Host M	ode Options	CHAP Users														
CLI-A	Test In	Datha Com	I IN Daths Edu	Command David	Mara Artinas								selected: 0 of 1					
10 CL3-A	- House	and the second		Command Carr								and the second second						
10 CL5-A	Rhiter	ON COP S	Hect All Pages C	olumn Settings							Option	1. (2) (2) (2) (2)	1 / 1 (2)					
CL7-A	(7) mm		100110	LDEV	Read Name (195)	Capacity				Capacity	Provisioning	Number						
• CL1-B	E Port	10 000 10	CDEV 1D	Name	Pool name (10)	Total	Reserved Used		Reserved Used		Reserved Used		Reserved Used Used (%) Tier		Tier 1	Type	of Paths	
(D 18-G00 (00)	E au		00.00.04	a Back sound	-447.0 00(4)	380.00.0	0.00.00	13.61.08		13 61 68	00	2	Fachlad					
(1) SAN-15177 (02)			00100104	siteb-pvoi	VMSC_S8(6)	250.00 G	8 0.00 GB	13.61 08		13.61 08	00	2	Enabled					
SAN-15179 (03)			00:00:05	sitebuoyol	VMSC_SB(6)	250.00 0	0.00 08	17.67.68	7	17.67 08	DP	2	Enabled					
NUMBER (01)		0 23	00-00-07	siteb-ovol	VMSC SB(6)	250.00 0	8 0.00 08	27.48 68	10	27.48 08	DP	2	Enabled					
10000	CL1	0 24	00:00:08	siteb-pvol	VMSC SB(6)	8.00 G	8 0.00 GB	1.23 GB	15	1.23 GB	DP	2	Enabled					
10 and 10	CLI	0 61	00:00:09	siteb-pvol	VMSC_S8(6)	8.00 GI	8 0.00 GB	1.23 68	15	1.23 68	DP	2	Enabled					
Analytics	CL CL	D 🕼 5	00.00148	siteb-pvol	vMSC_SB(6)	8.00 G	8 0.00 GB	1.18 GB	14	1.18 GB	DP	2	Enabled					
Per al per a	CLI	o 🕼 z	00:00:4C	siteb-pvol	vMSC_S8(6)	8.00 GI	8 0.00 GB	1.18 68	14	1.18 68	DP	2	Enabled					
Administration	Cu:	D 🔏 🛙	0010014E	siteb-pvol	vMSC_SB(6)	8.00 G	8 0.00 GB	3.56 GB	44	3.56 GB	DP	2	Enabled					
Coneral Tasks	CL1	0 62	00:00:50	siteb-pvol	vMSC_S8(6)	8.00 GI	8 0.00 GB	3.56 68	44	3.56 68	DP	2	Enabled					
	CL1	0 🕼 10	00:00:51	siteb-pvol	vMSC_S8(6)	8.00 G	8 0.00 GB	3.60 GB	45	3.60 GB	DP	2	Enabled					
Create Host Groups	CL1	0 🕼 11	00:00:52	siteb-pvol	vMSC_S8(6)	8.00 GI	8 0.00 GB	3.56 GB	44	3.56 GB	DP	2	Enabled					
💏 Create ISCSI Targets																		



To create GAD pair from SVP on the secondary storage system, complete the following steps:

- Create a resource group of the primary storage (site-1) type on the secondary storage system (site-2) and assign the respective secondary resources. Repeat the procedure to create a resource group of the primary storage (site-2) type on the secondary storage system (site-1) and assign the respective secondary resources.
- 2. Delete the virtual LDEV ID of the volumes from the secondary storage system that will be used for creating GAD pairs.

Edit Virtualization Management Settin	ıgs		
1.Edit Virtualization Management Settings	> 2.Confirm		
This wizard lets you edit virtual managem Make the settings, and then Click Finish t	ent settings of the s o confirm.	elected LDEVs.	
Virtual Management Settings:	Enable (Not Set)	•	
Initial Virtual LDEV ID:	LDKC Interval	CU	DEV
Virtual Configuration:	Specify	Not Set	
Emulation Type:			
CVS Settings:	🔵 Enable 🛛	Disable	
Number of Concatenated LDEVs:			
SSID:	(-)		

Figure 9: Deleting Virtual LDEV IDs

- 3. Set the reservation attribute to the volume for the secondary volume of the GAD pair.
- 4. Set the reservation attribute for GAD to the LDEV IDs.

Assi	ssign GAD Reserves										
Ent Co	Enter a name for the task. Confirm the settings in the list and click Apply to add the task in the Tasks queue for execution.										
Та	fask Name: 200715-AssignGADReserves										
		(Max. 32 Characters)									
	Selected LDI	EVs									
	LDEV ID	Virtual Storage Machine	Capacity Saving								
	00:00:17	VSP E990 / 415577	Disabled								



5. Create a host group of the GAD secondary site storage system and set Host Mode options.

Explorer	4D-G01 (01)						Last Updated : 2020/07/15 08:27	62		
Storage Systems	ILAB HM900-66.	17(S/N:415577) > Ports/Host Groups/iSCSI Target								
• 🗊 ILAB HM900-66.17(S/N:415577)	Volume Migrat	ion 🔻								
🕅 Tasks	ISCSI Target A	lias 4D-G01 (01)			Host Mode		21 [VMware Extension]			
C Reports	iSCSI Target N	ame iqn.1994-04.jp.co.h	itachi:rsd.h8h.t.15577	.4d001	Port Security		Enabled			
' 🎁 Components	Port ID	CL4-D			Authentication	Method	None			
🐕 Parity Groups	Virtual Storage	Machine VSP E990 / 415577				Mutual CHAP	Disabled			
Cogical Devices						User Name				
' 隆 Pools					^					
Ports/Host Groups/ISCSI Tar	Hosts LUN	Host Mode Options CHAP Users								
۲ CL1-A	Edit Host	Add Hosts Remove Hosts Export					Selected: 0	of 4		
1 CL3-A	SFilter ON	OFF Select All Pages Column Settings					Options v IE E 1 / 1	3		
1 CL5-A				ISCSI Target	iSCSI Tarnet					
10 CL7-A	Port ID	HBA iSCSI Name	Host Name	Alias	Name					
• 🕼 CL1-B	CL4-D	iqn.1990-07.com.emulex:00-00-c9-da-c7-ff	81	4D-G01 (01)	ign.1994-0					
🕅 18-G00 (00)	CL4-D	iqn.1990-07.com.emulex:00-90-fa-1a-d9-ed	74-1	4D-G01 (01)	ign.1994-0					
🕅 SAN-15177 (02)	CL4-D	ign.1998-01.com.vmware:siteahost2-154b967	5 78	4D-G01 (01)	ign.1994-0					
🕅 SAN-15179 (03)	CL4-D	ign.1998-01.com.vmware:sitebhost2-103277b	82	4D-G01 (01)	ign.1994-0					
XEN-CIRT (01)										
°😨 СLЗ-В										
° 🕼 CL5-B 🗢										
Analytics										
Administration										
· ·										
Concert Tester										
General Tasks										

cpiorer	4D-G01 (U	0-601 (01)											
torage Systems	ILAB HM900-	Afi H19302-56.17[s/hs132572] > Borts/Hoat.Groups//SCSI.Tarcasta > SLAL® > 40-601 (01)											
👔 ILAB HM900-66.17(S/N:415577)	Volume Mi	Volume Migration i *											
😭 Tasks	ISCSI Targ	et Alias	4D-G01 (01)		Host Mode			21 [VMware Extension]					
🛱 Reports	iSCSI Targ	et Name	iqn.1994-04.jp.co.hitachi:rsd.h8h.t.15577.4d001			Port Security			Enabled				
10 Components	Port ID		CL4-D			Authentication	Method		None				
* 💏 Parity Groups	Virtual Stor	rage Machine	VSP E990 / 415577				Mutual CF	IAP	Disabled				
💏 Logical Devices							User Name						
۰ 🍪 Pools	distant of the		C114D 11			^							
* 🛞 Ports/Host Groups/iSCSI Tar	HOSIS LU	INS HOST Mode Options	CHAP USERS										
1 CL1-A	Edit iSCS	I Targets Export									Totr	al: 256	
1 CL3-A	\$ Filter	ON OFF Column Settings							Optio	ons 👻 候 🗧 1	/ 1	23	
CLS-A	Mode												
10 CL7-A	No.	Option Description		Status	1.4								
• 😭 CL1-B	54	(VAAI) Support Option for the E	XTENDED COPY command	Enabled									
🕼 1B-G00 (00)	63	(VAAI) Support option for vStor	age APIs based on T10 standards	Enabled									
SAN-15177 (02)	< 114	The automatic asynchronous re	clamation on ESXi6.5 or later	Enabled									
(03) SAN-15179 (03)	0	Reserved		Disabled									
CO XEN-CIRT (01)	1	Reserved		Disabled									
10° CL3-8	2	VERITAS Database Edition/Adva	nced Cluster	Disabled									
•с сц5-в 👳	3	Reserved		Disabled									
nalytics	4	Reserved		Disabled									

Figure 11: Secondary Site Host Group and Host Mode Options

- 6. Create DP Pool and LDEVs for secondary volumes of site-1 GAD pair. Repeat the procedure for creating DP Pool and LDEVs for secondary volumes of site-2 GAD pair.
- 7. Create secondary volumes with the same capacity as the primary volumes.

Explorer	VMSC_58(6) Last Updated : 2020/07/15 08:29 (5)												
Storage Systems	ILAB HM900-66.17(5/N	1415577) > Pools											
т 🛐 ILAB НМ900-66.17(S/N:415577)	Deal Malances and												
😭 Tasks	Pool volumes Vir	rtual Volumes											
Reports	Create LDEVs A	Create LDEVs Add LUN Paths Expand V-VOLS More Actions 💌											
'😭 Components	&Filter ON OTT	Select All Pages	Column Settings								Options w 16 6 1	11 7	-21
' 🐕 Parity Groups				Capacity				Used Capac	ity				-
🚰 Logical Devices	LDEV ID	LDEV Name	Status	Tabel	Deserved	(Inc.)	Hand (M.)	Time 1	7144.2	Time D	Capacity Saving	of Paths	1
* 🏙 Pools			0	Total		0.00	Galed (10)			The D			
GAD_POOL_PRI(7)	00100104	siteb-pvol	Normal	250.00 GB	0.00 GB	13.61 GB	5	13.61 GB			Disabled	2	
HDID_POOL_SEC(4)	00:00:05	siteb-pvol	Normal	250.00 GB	0.00 GB	13.86 GB	5	13.86 08			Disabled	2	
(3) JAM_GAD_Pool_SEC(5)	00100106	siteb-pvol	Normal	250.00 GB	0.00 GB	17.71 GB	1	17.71 GB			Disabled	2	
TPpool1 win(0)		siteb-pvol	Normal	250.00 GB	0.00 GB	27.48 GB	10	27.48 GB	•		Disabled	2	
TPropol2 win(1)		siteb-pvol	liormal	8.00 GB	0.00 GB	1.23 GB	15	1.23 08			Disabled	2	
() VEN CIPT. CO(0)		sites-pvoi	Normal	8.00 GB	0.00 GB	1.23 08	15	1.23 08	<u></u>		Disabled	-	
		attalization	Normal	10.00 GB	0.00 GB	0.00 GB		1.10.00			Disabled	2	
iscicert_pool_po(a)		sitebaus!	Nermal	8.00 08	0.00 GB	1 10 00	14	1 10 00			Disabled	-	
() VMSC_58(6)	00-00-4F	siteh-ovol	Normal	8.00 GB	0.00 GB	3.56 GB	44	3.56 68			Disabled	2	
WSC_pool_pg(2)	00:00:50	siteb-pyol	Normal	8.00 GB	0.00 GB	3.56 GB	44	3.55 GB			Disabled	2	
Ports/Host Groups/iSCS1 Tar	00:00:51	siteb-pyol	Normal	8.00 GB	0.00 GB	2.60 GB	45	3.60 GB			Disabled	2	
'En CL1-A	00:00:52	siteb-pyol	Normal	8.00 GB	0.00 GB	3.56 GB	44	3.56 GB			Disabled	2	
'∰ CL3-A 🛛	V B 00:00:53	siteb-svol	Normal	250.00 GB	0.00 GB	14.19 GB	5	14.19 GB	-	-	Disabled	2	
Analytics	V 00:00:54	siteb-svol	Normal	250.00 GB	0.00 GB	13.49 GB		13.49 G8			Disabled		
Administration	V 00:00:55	siteb-svol	Normal	250.00 GB	0.00 GB	17.51 GB		17.51 68			Disabled		
×	V 00:00:56	siteb-svol	Normal	250.00 GB	0.00 GB	19.19 GB	7	19.19 GB			Disabled		
General Tasks	✓ ■ 00:00:57	siteb-svol	Normal	8.00 GB	0.00 GB	1.23 GB	15	1.23 GB	•		Disabled		
🚮 Create Host Groups	✓ 🛯 00:00:58	siteb-svol	🥥 Normal	8.00 GB	0.00 GB	1.23 GB	15	1.23 68	-		Disabled		
Mt Create ISCS1 Targets	✓ ◎ 00:00:59	siteb-svol	🥥 Normal	8.00 GB	0.00 GB	1.18 GB	14	1.18 GB	-		Disabled		
	✓ E 00:00:5A	siteb-svol	Normal	8.00 GB	0.00 GB	1.18 GB	14	1.18 GB			Disabled		
Create LDEVs	✓ E 00:00:58	siteb-svol	🥥 Normal	8.00 GB	0.00 GB	3.56 GB	44	3.56 68		-	Disabled	2	
Add LUN Paths	✓ 00:00:5C	siteb-svol	Normal	8.00 GB	0.00 GB	3.52 GB	44	3.52 GB			Disabled		
Create Pools	✓ E 00:00:50	siteb-svol	Normal	8.00 GB	0.00 GB	3.52 GB	-44	3.52 GB			Disabled		
🜮 Add External Volumes	✓ 00:00:5E	siteb-svol	🥥 Normal	8.00 GB	0.00 GB	3.56 GB	44	3.56 68			Disabled	2	-

Figure 12: Create DP Pool and LDEVs.

8. Add an LU path to the secondary volume.

lorer	4D-0	4D-G01 (01) Last Updated : 2020/07/15 08:35 🧛													
orage Systems	ILAB	11.88 HM900-66.17(S/N:415577) > Ports/Host Groups/ISCSI Tarcets > CL4-D > 4D-601 (01)													
ILAB HM900-66.17(S/N:415577)		ume Migrati	n 🔻												
🔞 Tasks	190	SI Target Al			40-601 (01)			Host Mode				21 IVMware Exten	sion]		
🎼 Reports	ISC	SI Target Na	me		ign.1994-04.ip.	co.hitachirrsd.h8h.t.15577.4d0	101	Port Security				Enabled			
'😭 Components	Por	t ID			CL4-D			Authentication	,	lethod		None			
Parity Groups	Virt	tual Storage	Machine		VSP E990 / 415	577				lutual CHAP		Disabled			
Contral Devices										lser Name					
Pools		_					^								
Ports/Host Groups/iSCSI Tar	Hos	ts LUNs	Host Mod	le Options	CHAP Users										
1 CL1-A		22 I I IN 0-16	Contract	IN Dealers Colie										alactadu 0. of	
1 CL3-A					command oction	More Hellons						(-			
CLS-A	L.	Filter ON	OFF Sel	ect All Pages Co	olumn Settings	1						Option		1 /1 🖻	
CL7-A					LDEV		Capacity	Capacity			Capacity	Provisioning	Number		
T CL1-8		Port ID	LON ID	LDEV ID	Name	POOLName (10)	Total	Reserved	Used	Head (%)	Tion 1	Туре	of Paths	ALUA Mode	
00 18-G00 (00)			a				rotar	Reserved	Used	Used (10)					
SAN-15177 (02)	. 8	CL4-D		00100153	siteb-svol	vMSC_SB(6)	250.00 GB	0.00 GB	14.19 GB	5	14.19 GB	DP	2	Enabled	
D CAN-15179 (02)		CL4-D		00100154	siteb-svol	VMSC_S8(6)	250.00 GB	0.00 GB	13.49 GB		13.49 GB	DP	2	Enabled	
		CL4-D		00:00:55	siteb-svol	VMSC_S8(6)	250.00 GB	0.00 GB	10.10.00	7	10.10.00	DP	2	Enabled	
		CL4-D		00:00:57	siteb-svol	VMSC_SB(6)	8.00 GB	0.00 GB	1.23.68	15	1.23.68	DP	2	Enabled	
		CL4-D	X 5	00:00:58	siteb-svol	vMSC_SB(6)	8.00 GB	0.00 GB	1.23 GB	15	1.23 GB	DP	2	Enabled	
- CLS-B		CL4-D	6	00:00:59	siteb-svol	vMSC \$8(6)	8.00 GB	0.00 GB	1.18 GB	14	1.18 GB	DP	2	Enabled	
nyucs	-	CL4-D	🖉 z	00:00:5A	siteb-svol	vMSC_SB(6)	8.00 GB	0.00 GB	1.18 GB	14	1.18 GB	DP	2	Enabled	
ninistration		CL4-D	Ø 8	00:00:58	siteb-svol	vMSC_SB(6)	8.00 GB	0.00 GB	3.56 GB	44	3.56 GB	DP	2	Enabled	
and Tasks		CL4-D	8	0010015C	siteb-svol	vMSC_SB(6)	8.00 GB	0.00 GB	3.52 GB	44	3.52 GB	DP	2	Enabled	
erai tasks		CL4-D	8 10	00:00:50	siteb-svol	vMSC_SB(6)	8.00 GB	0.00 GB	3.52 GB	44	3.52 GB	DP	2	Enabled	
Create Host Groups		CL4-D	8 11	00:00:5E	siteb-svol	vMSC_SB(6)	8.00 GB	0.00 GB	3.56 GB	44	3.56 GB	DP	2	Enabled	
Create iSCSI Targets															

Figure 13: Adding LU Path

9. Create a GAD Pair.

olorer	1.Create GAD Pairs > 2.Confirm	20/07/15 08:37 🖏 ?
orage Systems		
11 AB HM900-66.17(This wizard lets you create pairs. Enter the information for the pair you want to create, and then click Add. Click Finish to confirm. 7/	
🕅 Tasks	Semate Storage System: Model / Serial Number Path Group 10 Selected Pairs	
G Reports	Visite boliege systemi Honore	Options v
1 Componente	Vienes Velvers Selection	
Mariby Groups	Annary volume selection	Host Group Name / iSCSI Target
Conical Devices	Selection Object: Fibre iSCSI	ISCSI Target Alias Name
1 Copies	LU Selection: Port ID iSCSI Target Alias	
* Ports/Host Grou	CL1-D V 1D-G01 (01) V	Selected: 0 of 48
* External Storage	Available LDEV5	
* 🕅 Replication	SFilter ON OFF Select All Pages Options ★ (E € 1 / 1 → Э)	
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Remote Re	Re ISCSI Target Alias Name Lon ID LEVID	mber
' 🕅 Journals	CL1-D 1D-G01 (01) iqn.1994-04.j 0 00:00:0A	no and VSP GV00 / 4
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alytics		:00 and VSP Gx00 / 4
Iministration	secondary Volume Selection:	00 and VSP Gx00 / 4
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neral Tasks	ISCSI Target ID	00 and VSP Gx00 / 4
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Figure 14: GAD Pair Creation

(0) Policy Host Glob				1				Selected: U
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Replication Replication	Base Secondary Volume:	Port ID Host Group ID/ LUN ID]					System
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i 👷 Remote Co		Decimal input)				NL DA		:00 and VSP Gx00
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	more							
								8:55 A

For NMP-ALUA configuration, while creating an ALUA pair, the ALUA mode must be enabled.

Figure 15: Enabling ALUA Mode

Remote Connection Failure Scenarios

This section covers the typical failure scenarios in a GAD vMSC environment, along with the results for each scenario.

GAD pair behaves differently for failing remote connections for each site.

Test simulation result of Storage TC ports failure (ALUA/NMP) for a particular site (A or B):

- 1. Disabled Site A Storage TC ports:
 - \rightarrow Site A PVOLs win and Site B corresponding SVOLs block.
 - \rightarrow Site B PVOLs win and Site A corresponding SVOLs block.
- 2. Disabled Site B Storage TC ports:
 - \rightarrow Site A PVOLs block and Site B corresponding SVOLs win.
 - \rightarrow Site B PVOLs win and Site A corresponding SVOLs block.

Test simulation result of Storage TC ports failure (HDLM) for a particular site (A or B):

1. Disabled Site A Storage TC ports:

 \rightarrow Site A PVOLs win and Site B corresponding SVOLs block.

- \rightarrow Site B PVOLs win and Site A corresponding SVOLs block.
- 2. Disabled Site B Storage TC ports:
 - \rightarrow Site A PVOLs win and Site B corresponding SVOLs block.
 - \rightarrow Site B PVOLs win and Site A corresponding SVOLs block.

Note:

- For ESXi 6.7, the parameter for action_OnRetryErrors is ON by default.
- For ESXi 6.7U3B, the same parameter is OFF by default.
- For NMP/ALUA multipath, set HMO78=OFF.
- For NMP/ALUA, ensure that ALUA is enabled per LUN / Dedicated Ports for PVOLs, and SVOLs enabled with HG Optimized and Non-optimized Paths.
- For vSphere, the UI on all ESXi hosts shows the LUN status: "Active (IO)" à PVOLs and "Active" à SVOLs.
- For SVOLs Storage Ports, zero IOPS was observed, and for PVOLs Storage Ports, generated IO workload was observed.
- For NMP/ALUA, the host sends CMD=A30A to all the paths, and the storage that notifies the Quorum first survives.

• HDLM confirmed that no ALUA RTPG A3h command send occurred; therefore, both PVOLs survived on both storage systems.



Figure 16: Replication Ports Failure Test

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