GAD pair operations

You can manage GAD pairs using CCI.

Overview of GAD pair operations

You can create, suspend, resynchronize, or delete GAD pairs and you can manage pairs in a GAD 3DC delta resync environment.

You should be aware of the following pair operation restrictions:

• Pair operations cannot be performed on volumes that do not have an LU path. Before performing pair operations, make sure that the volumes to be assigned to pairs have at least one LU path defined.
• Pair operations cannot be performed during microcode exchange processing. Before performing pair operations, make sure that microcode exchange processing is complete.
• Pair operations cannot be performed when microcode exchange processing has been interrupted (for example, due to user cancellation or error). Make sure that microcode exchange processing has completed normally before performing pair operations.

If the following status continues while the GAD pair mirroring, the GAD pair might be suspended to prioritize the update I/O than mirroring of the GAD pair.

• The availability ratio of the processor in the MP blade/unit to which the primary volume belongs is equal to or more than 70% on the storage system at the primary site.
• There is a large amount of inward traffic of update I/O to the primary volumes on the storage system at the primary site.
• The Write Pending of the MP blade/unit to which the secondary volume belongs is equal to or more than 65% on the storage system at the secondary site.

When you create or resynchronize the GAD pair, consider the above load status of the storage system at each site.

Creating GAD pairs

Pair creation copies the data in a volume in the primary storage system to a volume in the secondary storage system. A GAD pair is created using volumes in storage systems in the primary and secondary sites. Before a pair is created, the GAD reserve attribute must be applied to the volume that will become the S-VOL.

If you want to use consistency groups to manage pairs, you must specify an option to assign each GAD pair to the appropriate consistency group when you create the pair. For details about storage system support (microcode) for consistency groups, see Requirements and restrictions.
Caution

Pair creation is a destructive operation. When a pair is created, the data in the S-VOL is overwritten by the data in the P-VOL. Before you create a pair, you are responsible for backing up the data in the volume that will become an S-VOL.

Note

If you create a GAD pair when the ALUA mode is enabled, restart the server after the pair creation is complete. If you do not restart the server, the server might not be able to recognize the ALUA mode setting.

Prerequisites

- The GAD reserve attribute must be set to the volume to be used as an S-VOL. You can verify that the reserve attribute is set by using the `raidcom get ldev` command. If the reserve attribute is set, the virtual LDEV ID (VIR_LDEV) is displayed as `ffff`.
- The P-VOL capacity and S-VOL capacity must be the same size (same number of blocks). To view the capacity in blocks, click Options Capacity Unit block in the Logical Devices window. If the capacity is displayed in GB or TB, a slight difference in P-VOL and S-VOL capacity might not be displayed.
- If you want to create a GAD pair with ALUA mode enabled, reboot the server after creating a GAD pair.

Command example

```
paircreate -g oraHA -f never -vl -jq 0 -IH0
```

---

**Suspending GAD pairs**

Pair suspension stops write data from being copied to the S-VOL. When you suspend a pair, you can specify the volume (P-VOL or S-VOL) that will receive update data from the host while the pair is suspended. If you specify the S-VOL, the data written to the S-VOL while the pair is suspended will be copied to the P-VOL when the pair is resynchronized.

To suspend a GAD pair, you can use either of the following methods:

- Specify the P-VOL to suspend a GAD pair. I/O continues in the P-VOL.
- Specify the S-VOL to suspend a GAD pair. I/O continues in the S-VOL.

When suspending a pair that is registered to a consistency group, you can also suspend all GAD pairs in the consistency group to which that pair is registered. When you suspend GAD pairs by consistency group, the suspend pair operations are completed first, and then the GAD pair statuses change to Suspended. After you perform the pair suspension, confirm that the status of all pairs in the consistency group has changed to Suspended. When many pairs are registered to the consistency group, it might take a few minutes for all pair statuses to change to Suspended. If the pair statuses do not change to Suspended after a few minutes, the pair status transitions might have failed due to some error condition.

For details about storage system support (microcode) for consistency groups, see [Requirements and restrictions](https://knowledge.hitachivantara.com/Documents/Management_Software/SVOS/8.3/Global-Active_Device/06_GAD_pair_operations).

Caution

For GAD pairs created, resynchronized, or swap resynchronized on 80-05-0x or later for VSP G1x00 and VSP F1500, check if the quorum disk is operating correctly using CCI or Device Manager - Storage Navigator before suspending the pairs by specifying the S-VOL.

When the quorum disk is blocked, if you suspend pairs by specifying the S-VOL, and a failure occurs on the physical path from a storage system at the secondary site to a storage system at the primary site, the pair status might become Block.

Note

For GAD pairs created, resynchronized, or swap resynchronized on 80-04-2x or earlier for VSP G1x00 and VSP F1500, you cannot suspend the pairs by specifying the S-VOL if the quorum disk is blocked.
NoteWhen you suspend GAD pairs by consistency group, the consistency group status is displayed as Suspending on Device Manager - Storage Navigator.

Command example

```
pairsplit -g oraHA -r -IH0
```

---

**Enabling the ALUA mode of an existing GAD pair**

To enable the ALUA mode of an existing GAD pair, you must suspend the pair, enable the ALUA mode, restart the server while the pair is suspended, and then resynchronize the pair. When you resynchronize the pair, the ALUA mode of the S-VOL is also enabled.

**Before you begin**

*Important* This procedure requires the host server to be restarted to recognize the new ALUA mode setting.

**Procedure**

1. Suspend the GAD pair.
   
   ```
pairsplit -g oraHA -r -IH0
   ```

2. Enable the ALUA mode.
   
   ```
raidcom modify ldev -ldev_id 0x2222 -alua enable -IH0
   ```

3. Resynchronize the GAD pair.
   
   ```
pairresync -g oraHA -IH0
   ```

4. Restart the server.
   
   *Note* After enabling the ALUA mode, restart the server. If you do not restart the server, the server might not be able to recognize the ALUA mode setting.

---

**Resynchronizing GAD pairs**

Pair resynchronization updates the S-VOL (or P-VOL) by copying the differential data accumulated since the pair was suspended. The volume that was not receiving update data while the pair was suspended is resynchronized with the volume that was receiving update data. When resynchronization completes, the host can read from and write directly to the P-VOL or the S-VOL.

To resynchronize a GAD pair, you can use either of the following methods:

- Specify the P-VOL to resynchronize a GAD pair. Data in the P-VOL is copied to the S-VOL, and the pair is resynchronized.
- Specify the S-VOL to resynchronize a GAD pair (swap resync). The P-VOL is replaced with the S-VOL. The new P-VOL data is copied to the S-VOL, and the pair is resynchronized.
When resynchronizing a pair that is registered to a consistency group, you can also resynchronize all GAD pairs in the consistency group to which that pair is registered. When resynchronizing a pair that is not registered to a consistency group, you can register that pair to a consistency group.

When resynchronizing GAD pairs by consistency group, the resynchronize pair operations are completed first, and then the GAD pair statuses change to Mirroring or Mirrored. After you perform the pair resynchronization, confirm that the status of all pairs in the consistency group has changed to Mirroring or Mirrored. When many pairs are registered to the consistency group, it might take a few minutes for all pair statuses to change to Mirroring or Mirrored. If the pair statuses do not change to Mirroring or Mirrored after a few minutes, the pair status transitions might have failed due to some error condition.

For details about storage system support (microcode) for consistency groups, see Requirements and restrictions.

Note

• When you resynchronize GAD pairs by consistency group, the consistency group status is displayed as Resynchronizing on Device Manager - Storage Navigator.
• To resynchronize a pair, the status of both pair volumes must be PSUE. If the P-VOL status is PSUE but the S-VOL status is PAIR (for example, due to quorum disk blockade), the resynchronize operation will fail. To resynchronize a pair when the P-VOL status is PSUE and the S-VOL status is PAIR, first suspend the GAD pair by specifying the S-VOL (swap suspend) to change the S-VOL status to PSUE, and then resynchronize the GAD pair by specifying the P-VOL. The P-VOL and the S-VOL pair statuses change to PAIR.

Tip

When the secondary volume is located in the local storage system, if you want to register GAD pairs to a consistency group, perform the following procedure:

1. In the storage system in which the secondary volume is located, resynchronize the pairs without specifying the consistency group ID. If you resynchronize a pair in the storage system in which the secondary volume is located, the primary volume and the secondary volume are reversed (swap resynchronization).
2. Suspend the GAD pair in the storage system in which the primary volume (the secondary volume before swap resynchronization) is located.
3. In the storage system in which the primary volume is located, specify the consistency group ID to resynchronize the pair.

Prerequisite

• The GAD pair must be suspended (the status of both pair volumes must be PSUE).

Command example

```bash
pairresync -g oraHA -IH0
```

---

### Deleting GAD pairs

Pair deletion deletes the pair relationship between the P-VOL and the S-VOL. The data in each volume is not affected. When you delete a pair, you can specify the volume (P-VOL or S-VOL) that will receive update data from the host after the pair is deleted. The virtual LDEV ID of the unspecified volume is deleted, and the GAD reserve attribute is set for the specified volume.

The following table specifies the required conditions for the volume that will continue to receive update data from the host after deleting the pair.
Specified volume | Volume condition
--- | ---
P-VOL | • Pair status: PSUS or PSUE  
• I/O mode: Local
S-VOL | • Pair status: SSWS  
• I/O mode: Local

You must suspend the GAD pair before you can delete it. If you suspend a GAD pair by specifying an S-VOL, you must delete the GAD pair by specifying the S-VOL. If you suspend a GAD pair by specifying a P-VOL, you must delete the GAD pair by specifying the P-VOL.

After the GAD pair is deleted, the data on the P-VOL and S-VOL is not synchronized. To prevent viewing a duplicated volume with the same virtual LDEV ID but asynchronous data on the server, the virtual LDEV ID of the LDEV that does not continue I/O is deleted. When the virtual LDEV ID is deleted and the GAD reserve attribute is assigned to the volume, the server cannot recognize the volume.

If you want to re-create a GAD pair using a volume that was deleted from a pair, re-create the GAD pair from the storage system with the volume that was specified when you deleted the GAD pair. For example, if you deleted the GAD pair by specifying the P-VOL, re-create the GAD pair from the primary storage system. If you deleted the GAD pair by specifying the S-VOL, re-create the GAD pair from the secondary storage system.

**Prerequisite**
- The GAD pair must be suspended.

**Command example**
```bash
cpairsplit -g oraHA -S -IH0
```

When you delete a GAD pair using Device Manager - Storage Navigator, the GAD pair is deleted forcibly if the volume conditions described in the previous table are not satisfied. Before deleting a GAD pair using Device Manager - Storage Navigator, make sure that there is no problem if the pair is forcibly deleted.

---

**Changing preferred path settings**

You can change the asymmetric access status setting required for specifying a preferred path regardless of the GAD pair status, even during I/O processing.

**Note**
Depending on the operating system of the server to which the storage system is connected, the asymmetric access status settings might not be recognized. If a path is not connected according to the asymmetric access status settings, the operating system of the server might not recognize the asymmetric access status. If this occurs, make the server recognize the device again.

**Command example**
```bash
raidcom modify lun -port CL1-A-0 -lun_id all  
-asymmetric_access_state non_optimized -IH0
```
Managing pairs in a GAD 3DC delta resync environment

This section describes GAD and UR pair operations in a GAD 3DC delta resync (GAD+UR) environment.

For details about storage system support (models, microcode) for GAD+UR operations, see Requirements and restrictions.

Executing delta resync

When you specify an S-VOL and suspend (swap suspend) a GAD pair, the GAD S-VOL pair status changes from PAIR to SSWS. After the pair status changes to SSWS, the UR delta resync pair changes to a UR pair, and the copying from the GAD S-VOL to the UR S-VOL starts. This change in the copy source of the UR pair is the delta resync operation.

For details about storage system support (models, microcode) for GAD+UR operations, see Requirements and restrictions.

Prerequisites

- Pair status and mirror status must be as follows:
<table>
<thead>
<tr>
<th>Pair type</th>
<th>Pair status</th>
<th>Mirror status</th>
<th>P-VOL</th>
<th>S-VOL</th>
<th>Master journal</th>
<th>Restore journal</th>
</tr>
</thead>
<tbody>
<tr>
<td>GAD pair</td>
<td>PAIR</td>
<td>Not applicable</td>
<td>PAIR</td>
<td>PAIR</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>UR pair</td>
<td>PAIR</td>
<td>PJNN</td>
<td>PAIR</td>
<td>PAIR</td>
<td>SJNN</td>
<td></td>
</tr>
<tr>
<td>UR delta resync</td>
<td>PSUS*</td>
<td>PJNS</td>
<td>SSUS*</td>
<td>SSUS*</td>
<td>SJNS</td>
<td></td>
</tr>
</tbody>
</table>

* If you use Device Manager - Storage Navigator to suspend (swap suspend) the pair, make sure the status of the UR delta resync pair is HOLD.

- All the differential data of the UR pairs is stored in the primary site's journal.
- Data must be able to be transferred between the UR P-VOL and S-VOL.
- The number of S-VOLs in the UR pairs is the same as that in the UR delta resync pairs.
- There is no failure in the remote path between the secondary site of GAD and the secondary site of UR.
- After creating the UR pair, you must keep updating I/O from the server to the GAD pair's P-VOL or S-VOL for about two minutes.

Command example

```
pairsplit -g oraHA -RS -IH1
```

**Notes on delta resync**

- When a UR pair has not been suspended and resynchronized for a long time, the data in the restore journal might exceed 70% of capacity. If this happens, old journal data is automatically deleted. In this case, the P-VOL and S-VOL are not synchronized completely by just copying the data, and delta resync will fail. In case of delta resync failure, resynchronize the UR pair.

- Journal data might be deleted in the following cases, even if the data in the restore journal does not exceed 70% of capacity:
  - When you update the P-VOL after resynchronizing the GAD pair.
  - When you update the P-VOL after resynchronizing the UR pair between the primary site and UR secondary site.
  - When retry-processing occurs because of a delay of the P-VOL update.
  - When the update of a GAD S-VOL is delayed.

- If the pair status of the UR delta resync pair does not change after the delta resync operation, the prerequisites for delta resync might not be satisfied. Review the prerequisites for the pair status of the GAD pair, UR pair, and UR delta resync pair.
In case of delta resync failure

If delta resync fails, the UR delta resync pair changes to a UR pair. The status of each pair changes as follows:

In case of delta resync failure, confirm the following two conditions:

- The system requirements for the GAD+UR configuration are met.
- The system has no failure causes.

If you resynchronize the UR pair after delta resync failure, the initial copy is performed for the GAD pair's S-VOL data to the UR pair's S-VOL.

Note: In a GAD+UR configuration, the data is not copied automatically even if you specify Entire Copy for Delta Resync Failure in the Edit Mirror Options window.

Resynchronizing GAD pairs in a GAD 3DC delta resync environment

To resynchronize a GAD pair by specifying the S-VOL (swap resync), the conditions specified below must be met.

For details about storage system support (models, microcode) for GAD+UR operations, see Requirements and restrictions.
Prerequisites

- Pair status must be as follows:

<table>
<thead>
<tr>
<th>Pair type</th>
<th>Pair status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P-VOL</td>
</tr>
<tr>
<td>GAD pair</td>
<td>PSUS</td>
</tr>
<tr>
<td>UR pair</td>
<td>PSUE or PAIR</td>
</tr>
<tr>
<td>UR delta resync pair</td>
<td>No condition</td>
</tr>
</tbody>
</table>

- The UR pair whose volume shared by GAD S-VOL after swap resync must be a UR delta resync pair.

Command example

```
pairresync -g oraHA -swaps -IH1
```

### Deleting GAD pairs in a GAD 3DC delta resync environment

For details about storage system support (models, microcode) for GAD+UR operations, see [Requirements and restrictions](https://knowledge.hitachivantara.com/Documents/Management_Software/SVOS/8.3/Global-Active_Device/06_GAD_pair_operations).

**Procedure**

1. Delete the UR pair.
   - Note: If you accidentally delete the UR delta resync pair in this step before deleting the UR pair, the UR pair might be suspended by failures.

2. Delete the UR delta resync pair.

3. Suspend the GAD pair.

4. Delete the GAD pair.

**Next steps**

If you need to delete a GAD pair forcibly, first delete the UR pair and the UR delta resync pair, and then delete the GAD pair forcibly.