# Use SnapMirror replication between Element and ONTAP clusters

Element Software

NetApp
June 10, 2024

# Table of Contents


Use SnapMirror replication between Element and ONTAP clusters . . . 1
- Find more information . . . 1
- SnapMirror overview . . . 1
- Enable SnapMirror on the cluster . . . 1
- Enable SnapMirror on the volume . . . 2
- Create a SnapMirror endpoint . . . 2
- Create a SnapMirror relationship . . . 3
- SnapMirror relationship actions . . . 5
- SnapMirror labels . . . 5
- Disaster recovery using SnapMirror . . . 7

# Use SnapMirror replication between Element and ONTAP clusters

You can create SnapMirror relationships from the Data Protection tab in the Netapp Element UI. SnapMirror functionality must be enabled to see this in the user interface.

IPv6 is not supported for SnapMirror replication between NetApp Element software and ONTAP clusters.

NetApp video: SnapMirror for NetApp HCI and Element Software

Systems running NetApp Element software support SnapMirror functionality to copy and restore Snapshot copies with NetApp ONTAP systems. The primary reason for using this technology is disaster recovery of NetApp HCI to ONTAP. Endpoints include ONTAP, ONTAP Select, and Cloud Volumes ONTAP. See TR-4641 NetApp HCI Data Protection.

NetApp Technical Report 4641: NetApp HCI Data Protection

## Find more information

- Building your Data Fabric with NetApp HCI, ONTAP, and Converged Infrastructure
- Replication between NetApp Element Software and ONTAP

## SnapMirror overview

Systems running NetApp Element software support SnapMirror functionality to copy and restore snapshots with NetApp ONTAP systems.

Systems running Element can communicate directly with SnapMirror on ONTAP systems 9.3 or higher. The Netapp Element API provides methods to enable SnapMirror functionality on clusters, volumes, and snapshots. Additionally, the Element UI includes all necessary functionality to manage SnapMirror relationships between Element software and ONTAP systems.

You can replicate ONTAP originated volumes to Element volumes in specific use cases with limited functionality. For more information, see ONTAP documentation.

### Find more information

Replication between Element software and ONTAP

## Enable SnapMirror on the cluster

You must manually enable SnapMirror functionality at the cluster level through the Netapp Element UI. The system comes with SnapMirror functionality disabled by default, and it is not automatically enabled as part of a new installation or upgrade. Enabling the SnapMirror feature is a one-time configuration task.

SnapMirror can only be enabled for clusters running Element software used in conjunction with volumes on a NetApp ONTAP system. You should enable SnapMirror functionality only if your cluster is connected for use with NetApp ONTAP volumes.

**What you'll need**

The storage cluster must be running NetApp Element software.

**Steps**

1. Click **Clusters** > **Settings**.
2. Find the cluster-specific settings for SnapMirror.
3. Click **Enable SnapMirror**.

   Enabling SnapMirror functionality permanently changes the Element software configuration. You can disable the SnapMirror feature and restore the default settings only by returning the cluster to the factory image.

4. Click **Yes** to confirm the SnapMirror configuration change.

# Enable SnapMirror on the volume

You must enable SnapMirror on the volume in the Element UI. This allows replication of data to specified ONTAP volumes. This is permission from the administrator of the cluster running NetApp Element software for SnapMirror to control a volume.

**What you'll need**

- You have enabled SnapMirror in the Element UI for the cluster.
- A SnapMirror endpoint is available.
- The volume must be 512e block size.
- The volume is not participating in remote replication.
- The volume access type is not Replication Target.

You can also set this property when creating or cloning a volume.

**Steps**

1. Click **Management** > **Volumes**.
2. Click the **Actions** icon for the volume you want to enable SnapMirror for.
3. In the resulting menu, select **Edit**.
4. In the **Edit Volume** dialog box, select the check box **Enable SnapMirror**.
5. Click **Save Changes**.

# Create a SnapMirror endpoint

You must create a SnapMirror endpoint in the Netapp Element UI before you can create a relationship.

A SnapMirror endpoint is an ONTAP cluster that serves as a replication target for a cluster running Element software. Before you create a SnapMirror relationship, you first create a SnapMirror endpoint.

You can create and manage up to four SnapMirror endpoints on a storage cluster running Element software.

> If an existing endpoint was originally created using the API and credentials were not saved, you can see the endpoint in the Element UI and verify its existence, but it cannot be managed using the Element UI. This endpoint can then only be managed using the Element API.

For details about API methods, see Manage storage with the Element API.

**What you'll need**

- You should have enabled SnapMirror in the Element UI for the storage cluster.
- You know the ONTAP credentials for the endpoint.

**Steps**

1. Click **Data Protection** > **SnapMirror Endpoints**.
2. Click **Create Endpoint**.
3. In the **Create a New Endpoint** dialog box, enter the cluster management IP address of the ONTAP system.
4. Enter the ONTAP administrator credentials associated with the endpoint.
5. Review additional details:
   - LIFs: Lists the ONTAP intercluster logical interfaces used to communicate with Element.
   - Status: Shows the current status of the SnapMirror endpoint. Possible values are: connected, disconnected, and unmanaged.
6. Click **Create Endpoint**.

# Create a SnapMirror relationship

You must create a SnapMirror relationship in the Netapp Element UI.

> When a volume is not yet enabled for SnapMirror and you select to create a relationship from the Element UI, SnapMirror is automatically enabled on that volume.

**What you'll need**

SnapMirror is enabled on the volume.

**Steps**

1. Click **Management** > **Volumes**.
2. Click the **Actions** icon for the volume that is to be a part of the relationship.
3. Click **Create a SnapMirror Relationship**.
4. In the **Create a SnapMirror Relationship** dialog box, select an endpoint from the **Endpoint** list.
5. Select if the relationship will be created using a new ONTAP volume or an existing ONTAP volume.
6. To create a new ONTAP volume in the Element UI, click **Create new volume**.
   a. Select the **Storage Virtual Machine** for this relationship.
   b. Select the **Aggregate** from the drop-down list.
   c. In the **Volume Name Suffix** field, enter a suffix.

> The system detects the source volume name and copies it to the **Volume Name** field. The suffix you enter appends the name.

   d. Click **Create Destination Volume**.

7. To use an existing ONTAP volume, click **Use existing volume**.
   a. Select the **Storage Virtual Machine** for this relationship.
   b. Select the volume that is the destination for this new relationship.
8. In the **Relationship Details** section, select a policy. If the selected policy has keep rules, the Rules table displays the rules and associated labels.
9. **Optional**: Select a schedule.

   This determines how often the relationship creates copies.

10. **Optional**: In the **Limit Bandwidth to** field, enter the maximum amount of bandwidth that can be consumed by data transfers associated with this relationship.
11. Review additional details:
    - **State**: Current relationship state of the destination volume. Possible values are:
      - uninitialized: The destination volume has not been initialized.
      - snapmirrored: The destination volume has been initialized and is ready to receive SnapMirror updates.
      - broken-off: The destination volume is read/write and snapshots are present.
    - **Status**: Current status of the relationship. Possible values are idle, transferring, checking, quiescing, quiesced, queued, preparing, finalizing, aborting, and breaking.
    - **Lag Time**: The amount of time in seconds that the destination system lags behind the source system. The lag time must be no more than the transfer schedule interval.
    - **Bandwidth Limit**: The maximum amount of bandwidth that can be consumed by data transfers associated with this relationship.
    - **Last Transferred**: Timestamp of the last transferred snapshot. Click for further information.
    - **Policy Name**: The name of the ONTAP SnapMirror policy for the relationship.
    - **Policy Type**: Type of ONTAP SnapMirror policy selected for the relationship. Possible values are:
      - async_mirror
      - mirror_vault
    - **Schedule Name**: Name of the pre-existing schedule on the ONTAP system selected for this relationship.
12. To not initialize at this time, ensure that the **Initialize** check box is not selected.

    > Initialization can be time-consuming. You might want to run this during off-peak hours. Initialization performs a baseline transfer; it makes a snapshot copy of the source volume, then transfers that copy and all the data blocks it references to the destination volume. You can initialize manually or use a schedule to start the initialization process (and subsequent updates) according to the schedule.

13. Click **Create Relationship**.

14. Click **Data Protection** > **SnapMirror Relationships** to view this new SnapMirror relationship.

# SnapMirror relationship actions

You can configure a relationship from the SnapMirror Relationships page of the Data Protection tab. The options from the Actions icon are described here.

- **Edit**: Edits the policy used or schedule for the relationship.
- **Delete**: Deletes the SnapMirror relationship. This function does not delete the destination volume.
- **Initialize**: Performs the first initial baseline transfer of data to establish a new relationship.
- **Update**: Performs an on-demand update of the relationship, replicating any new data and Snapshot copies included since the last update to the destination.
- **Quiesce**: Prevents any further updates for a relationship.
- **Resume**: Resumes a relationship that is quiesced.
- **Break**: Makes the destination volume read-write and stops all current and future transfers. Determine that clients are not using the original source volume, because the reverse resync operation makes the original source volume read-only.
- **Resync**: Reestablishes a broken relationship in the same direction before the break occurred.
- **Reverse Resync**: Automates the necessary steps to create and initialize a new relationship in the opposite direction. This can be done only if the existing relationship is in a broken state. This operation will not delete the current relationship. The original source volume reverts to the most recent common Snapshot copy and resynchronizes with the destination. Any changes that are made to the original source volume since the last successful SnapMirror update are lost. Any changes that were made to, or new data written into the current destination volume is sent back to the original source volume.
- **Abort**: Cancels a current transfer in progress. If a SnapMirror update is issued for an aborted relationship, the relationship continues with the last transfer from the last restart checkpoint that was created before the abort occurred.

# SnapMirror labels

A SnapMirror label serves as a marker for transferring a specified snapshot according to the retention rules of the relationship.

Applying a label to a snapshot marks it as a target for SnapMirror replication. The role of the relationship is to enforce the rules upon data transfer by selecting the matching labeled snapshot, copying it to the destination volume, and ensuring the correct number of copies are kept. It refers to the policy to determine the keep count and the retention period. The policy can have any number of rules and each rule has a unique label. This label serves as the link between the snapshot and the retention rule.

It is the SnapMirror label that indicates which rule is applied for the selected snapshot, group snapshot, or schedule.

## Add SnapMirror labels to snapshots

SnapMirror labels specify the snapshot retention policy on the SnapMirror endpoint. You can add labels to snapshots and group snapshots.

You can view available labels from an existing SnapMirror relationship dialog box or the NetApp ONTAP

System Manager.

> When you add a label to a group snapshot, any existing labels to individual snapshots are overwritten.

**What you'll need**

- SnapMirror is enabled on the cluster.
- The label you want to add already exists in ONTAP.

**Steps**

1. Click **Data Protection** > **Snapshots** or **Group Snapshots** page.
2. Click the **Actions** icon for the snapshot or group snapshot you want to add a SnapMirror label to.
3. In the **Edit Snapshot** dialog box, enter text in the **SnapMirror Label** field. The label must match a rule label in the policy applied to the SnapMirror relationship.
4. Click **Save Changes**.

## Add SnapMirror labels to snapshot schedules

You can add SnapMirror labels to snapshot schedules to ensure that a SnapMirror policy is applied. You can view available labels from an existing SnapMirror relationship dialog box or the NetAppONTAP System Manager.

**What you'll need**

- SnapMirror must be enabled at the cluster level.
- The label you want to add already exists in ONTAP.

**Steps**

1. Click **Data Protection** > **Schedules**.
2. Add a SnapMirror label to a schedule in one of the following ways:

| Option | Steps |
|---|---|
| Creating a new schedule | a. Select **Create Schedule**.<br>b. Enter all other relevant details.<br>c. Select **Create Schedule**. |
| Modifying existing schedule | a. Click the **Actions** icon for the schedule you want to add a label to and select **Edit**.<br>b. In the resulting dialog box, enter text in the **SnapMirror Label** field.<br>c. Select **Save Changes**. |

**Find more information**

Create a snapshot schedule

# Disaster recovery using SnapMirror

In the event of a problem with a volume or cluster running NetApp Element software, use the SnapMirror functionality to break the relationship and failover to the destination volume.

> If the original cluster has completely failed or is non-existent, contact NetApp Support for further assistance.

## Perform a failover from an Element cluster

You can perform a failover from the Element cluster to make the destination volume read/write and accessible to hosts on the destination side. Before you perform a failover from the Element cluster, you must break the SnapMirror relationship.

Use the NetApp Element UI to perform the failover. If the Element UI is not available, you can also use ONTAP System Manager or ONTAP CLI to issue the break relationship command.

**What you'll need**

- A SnapMirror relationship exists and has at least one valid snapshot on the destination volume.
- You have a need to failover to the destination volume due to unplanned outage or planned event at the primary site.

**Steps**

1. In the Element UI, click **Data Protection** > **SnapMirror Relationships**.
2. Find the relationship with the source volume that you want to failover.
3. Click the **Actions** icon.
4. Click **Break**.
5. Confirm the action.

   The volume on the destination cluster now has read-write access and can be mounted to the application hosts to resume production workloads. All SnapMirror replication is halted as a result of this action. The relationship shows a state of broken-off.

## Perform a failback to Element

When the issue on the primary side has been mitigated, you must resynchronize the original source volume and fail back to NetApp Element software. The steps you perform vary depending on whether the original source volume still exists or whether you need to failback to a newly created volume.

**Find more information**

- Perform a failback when source volume still exists
- Perform a failback when source volume no longer exists
- SnapMirror failback scenarios

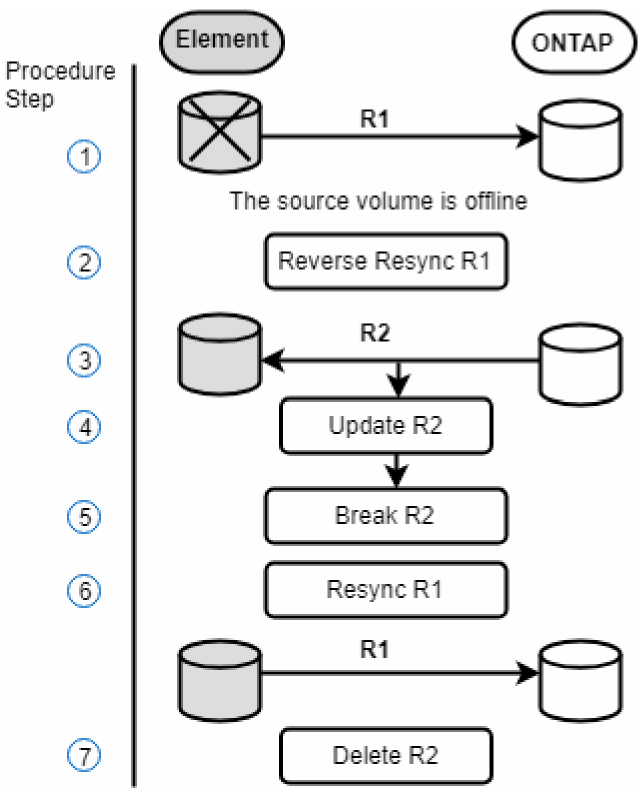
### SnapMirror failback scenarios

The SnapMirror disaster recovery functionality is illustrated in two failback scenarios. These assume the original relationship has been failed over (broken).

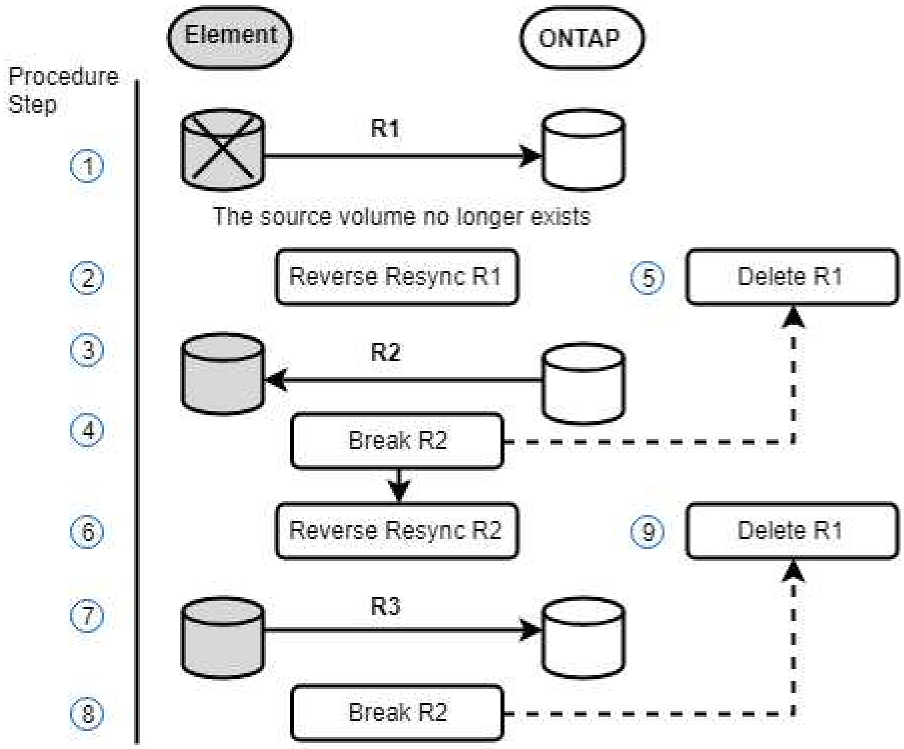
The steps from the corresponding procedures are added for reference.

> In the examples here, R1 = the original relationship in which the cluster running NetApp Element software is the original source volume (Element) and ONTAP is the original destination volume (ONTAP). R2 and R3 represent the inverse relationships created through the reverse resync operation.

The following image shows the failback scenario when the source volume still exists:




The following image shows the failback scenario when the source volume no longer exists:




#### Find more information

- Perform a failback when source volume still exists
- Perform a failback when source volume no longer exists

#### Perform a failback when source volume still exists

You can resynchronize the original source volume and fail back using the Netapp Element UI. This procedure applies to scenarios where the original source volume still exists.

1. In the Element UI, find the relationship that you broke to perform the failover.
2. Click the Actions icon and click **Reverse Resync**.
3. Confirm the action.

> ⓘ The Reverse Resync operation creates a new relationship in which the roles of the original source and destination volumes are reversed (this results in two relationships as the original relationship persists). Any new data from the original destination volume is transferred to the original source volume as part of the reverse resync operation. You can continue to access and write data to the active volume on the destination side, but you will need to disconnect all hosts to the source volume and perform a SnapMirror update before redirecting back to the original primary.

4. Click the Actions icon of the inverse relationship that you just created and click **Update**.

   Now that you have completed the reverse resync and ensured that there are no active sessions connected to the volume on the destination side and that the latest data is on the original primary volume, you can perform the following steps to complete the failback and reactivate the original primary volume:

5. Click the Actions icon of the inverse relationship and click **Break**.
6. Click the Actions icon of the original relationship and click **Resync**.

> The original primary volume can now be mounted to resume production workloads on the original primary volume. The original SnapMirror replication resumes based on the policy and schedule configured for the relationship.

7. After you confirm that the original relationship status is “snapmirrored”, click the Actions icon of the inverse relationship and click **Delete**.

#### Find more information

SnapMirror failback scenarios

### Perform a failback when source volume no longer exists

You can resynchronize the original source volume and fail back using the Netapp Element UI. This section applies to scenarios in which the original source volume has been lost but the original cluster is still intact. For instructions about how to restore to a new cluster, see the documentation on the NetApp Support Site.

#### What you’ll need

- You have a broken-off replication relationship between Element and ONTAP volumes.
- The Element volume is irretrievably lost.
- The original volume name shows as NOT FOUND.

#### Steps

1. In the Element UI, find the relationship that you broke to perform the failover.

   **Best Practice:** Make note of the SnapMirror policy and schedule details of the original broken-off relationship. This information will be required when recreating the relationship.

2. Click the **Actions** icon and click **Reverse Resync**.
3. Confirm the action.

   > The Reverse Resync operation creates a new relationship in which the roles of the original source volume and the destination volume are reversed (this results in two relationships as the original relationship persists). Because the original volume no longer exists, the system creates a new Element volume with the same volume name and volume size as the original source volume. The new volume is assigned a default QoS policy called sm-recovery and is associated with a default account called sm-recovery. You will want to manually edit the account and QoS policy for all volumes that are created by SnapMirror to replace the original source volumes that were destroyed.

   Data from the latest snapshot is transferred to the new volume as part of the reverse resync operation. You can continue to access and write data to the active volume on the destination side, but you will need to disconnect all hosts to the active volume and perform a SnapMirror update before reinstating the original primary relationship in a later step. After you complete the reverse resync and ensure that there are no active sessions connected to the volume on the destination side and that the latest data is on the original primary volume, continue with the following steps to complete the failback and reactivate the original primary volume:

4. Click the **Actions** icon of the inverse relationship that was created during the Reverse Resync operation and click **Break**.
5. Click the **Actions** icon of the original relationship, in which the source volume does not exist, and click **Delete**.
6. Click the **Actions** icon of the inverse relationship, which you broke in step 4, and click **Reverse Resync**.
7. This reverses the source and destination and results in a relationship with the same volume source and volume destination as the original relationship.
8. Click the **Actions** icon and **Edit** to update this relationship with the original QoS policy and schedule settings you took note of.
9. Now it is safe to delete the inverse relationship that you reverse resynced in step 6.

#### Find more information

SnapMirror failback scenarios

### Perform a transfer or one-time migration from ONTAP to Element

Typically, when you use SnapMirror for disaster recovery from a SolidFire storage cluster running NetApp Element software to ONTAP software, Element is the source and ONTAP the destination. However, in some cases the ONTAP storage system can serve as the source and Element as the destination.

- Two scenarios exist:
  - No previous disaster recovery relationship exists. Follow all the steps in this procedure.
  - Previous disaster recovery relationship does exist, but not between the volumes being used for this mitigation. In this case, follow only steps 3 and 4 below.

#### What you'll need

- The Element destination node must have been made accessible to ONTAP.
- The Element volume must have been enabled for SnapMirror replication.

You must specify the Element destination path in the form hostip:/lun/<id_number>, where lun is the actual string "lun" and id_number is the ID of the Element volume.

#### Steps

1. Using ONTAP, create the relationship with the Element cluster:

```
snapmirror create -source-path SVM:volume|cluster://SVM/volume
-destination-path hostip:/lun/name -type XDP -schedule schedule -policy
    policy
```

```
cluster_dst::> snapmirror create -source-path svm_1:volA_dst
-destination-path 10.0.0.11:/lun/0005 -type XDP -schedule my_daily
-policy MirrorLatest
```

2. Verify that the SnapMirror relationship was created by using the ONTAP snapmirror show command.

   See information about creating a replication relationship in the ONTAP documentation and for complete command syntax, see the ONTAP man page.

3. Using the `ElementCreateVolume` API, create the target volume and set the target volume access mode to SnapMirror:

   Create an Element volume using the Element API

```
{
   "method": "CreateVolume",
   "params": {
        "name": "SMTargetVolumeTest2",
        "accountID": 1,
        "totalSize": 100000000000,
        "enable512e": true,
        "attributes": {},
        "qosPolicyID": 1,
        "enableSnapMirrorReplication": true,
        "access": "snapMirrorTarget"
    },
    "id": 1
}
```

4. Initialize the replication relationship using the ONTAP `snapmirror initialize` command:

```
snapmirror initialize -source-path hostip:/lun/name
-destination-path SVM:volume|cluster://SVM/volume
```