



Consistency groups management

ONTAP 9

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Consistency groups management

Consistency groups overview

A consistency group is a collection of volumes that are managed as a single unit. In ONTAP, consistency groups provide easy management and a protection guarantee for an application workload spanning multiple volumes.

You can use consistency groups to simplify your storage management. Imagine you have an important database spanning twenty LUNs. You could manage the LUNs on an individual basis or treat the LUNs as a solitary dataset, organizing them into a single consistency group.

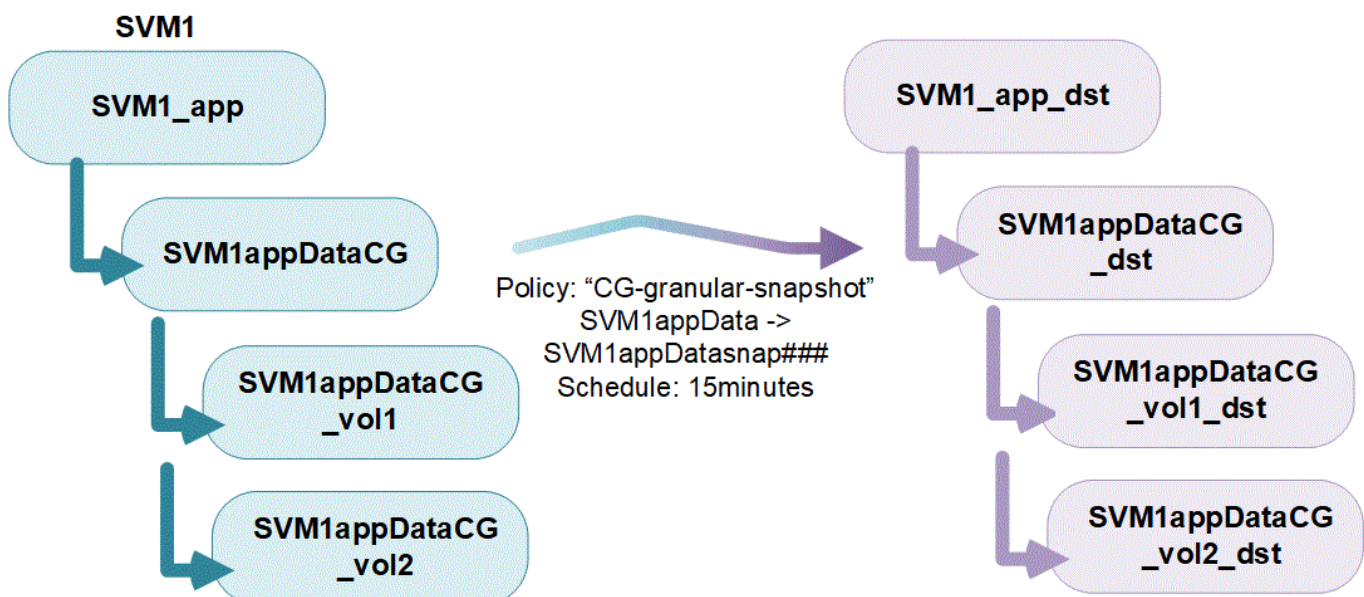
Consistency groups facilitate application workload management, providing easily configured local and remote protection policies and simultaneous crash-consistent or application-consistent Snapshot copies of a collection of volumes at a point in time. Snapshots in consistency groups enable an entire application workload to be restored.

Understand consistency groups

Consistency groups support any FlexVol volume regardless of protocol (NAS, SAN, or NVMe) and can be managed through the ONTAP REST API or in System Manager under the **Storage > Consistency Groups** menu item.

Consistency groups can exist as individual entities—as a collection of volumes—or in a hierarchical relationship, which consists of other consistency groups. Individual volumes can have their own volume-granular snapshot policy. In addition, there can be a consistency group-wide snapshot policy. The consistency group can only have one SnapMirror Business Continuity (SM-BC) relationship and shared SM-BC policy, which can be used to recover the entire consistency group.

The following diagram illustrates how you might use an individual consistency group. The data for an application hosted on SVM1 spans two volumes: vol1 and vol2. A Snapshot policy on the consistency group captures snapshots of the data every 15 minutes.



Larger application workloads might require multiple consistency groups. In these situations, you can create hierarchical consistency groups, where a single consistency group becomes the child components of a parent consistency group. The parent consistency group can include up to five child consistency groups. Like in individual consistency groups, a remote SM-BC protection policy can be applied to the entire configuration of consistency groups (parent and children) to recover the application workload.

In the following example, an application is hosted on SVM1. The administrator has created a parent consistency group, SVM1_app, which includes two child consistency groups: SVM1appDataCG for the data and SVM1app_logCG for the logs. Each child consistency group has its own snapshot policy. Snapshots of the volumes in SVM1appDataCG are taken every 15 minutes. Snapshots of SVM1app_logCG are taken hourly. The parent consistency group SVM1_app has an SM-BC policy which replicates the data to ensure continued service in the event of a disaster.



Beginning with ONTAP 9.12.1, consistency groups support [cloning](#) and modifying the members of the consistency by [adding or removing volumes](#) in both System Manager and the ONTAP REST API. Beginning in ONTAP 9.12.1, the ONTAP REST API also supports:

- Creating consistency groups with new NFS or SMB volumes or NVMe namespaces.
- Adding new or existing NFS or SMB volumes or NVMe namespaces to existing consistency groups.

For more information about the ONTAP REST API, refer to [ONTAP REST API reference documentation](#).

Monitor consistency groups

Beginning in ONTAP 9.13.1, consistency groups offer real-time and historical capacity and performance monitoring, offering insights about the performance of applications and individual consistency groups.

Consistency group monitoring data is maintained for up to one year. You can track metrics for:

- Performance: IOPS, latency, and throughput
- Capacity: Size, available capacity, used capacity



You can retrieve historical metrics only with the REST API. Historical metrics are not viewable in System Manager.

Protect consistency groups

Consistency groups offer protection through:

- Snapshot policies
- [SnapMirror Business Continuity \(SM-BC\)](#)
- [MetroCluster](#) (beginning 9.11.1)
- [Asynchronous SnapMirror](#) (beginning 9.13.1)

Creating a consistency group does not automatically enable protection. Local and remote protection policies can be set when creating or after creating a consistency group.

To configure protection on a consistency group, see [Protect a consistency group](#).

In order to utilize remote protection, you must meet the requirements for [SnapMirror Business Continuity deployments](#).



SM-BC relationships cannot be established on volumes mounted for NAS access.

Application and component tags

Beginning in ONTAP 9.12.1, consistency groups support component and application tagging. Application and component tags are a management tool, enabling you to filter and identify different workloads in your consistency groups.

There are two types of tags:

- **Application tags:** these apply to individual and parent consistency groups. Application tags provide labeling for workloads such as MongoDB, Oracle, or SQL Server. The default application tag for consistency groups is Other.
- **Component tags:** Children in hierarchal consistency groups have component tags instead of application tags. The options for component tags are "data", "logs", or "other". The default value is Other.

You can apply tags when creating consistency groups or after the consistency groups have been created. If the consistency group has an SM-BC relationship, you must use **Other** as the application or component tag.

Consistency groups in MetroCluster configurations

Beginning with ONTAP 9.11.1, you can provision consistency groups with new volumes on a cluster within a MetroCluster configuration. These volumes are provisioned on mirrored aggregates.

After they are provisioned, you can move volumes associated with consistency groups between mirrored and unmirrored aggregates. Therefore, volumes associated with consistency groups can be located on mirrored

aggregates, unmirrored aggregates, or both. You can modify mirrored aggregates containing volumes associated with consistency groups to become unmirrored. Similarly, you can modify unmirrored aggregates containing volumes associated with consistency groups to enable mirroring.

Volumes associated and Snapshots associated with consistency groups placed on mirrored aggregates are replicated to the remote site (site B). The contents of the volumes on site B provide a write-order guarantee for the consistency group, allowing you to recover from site B in the event of a disaster. You can access replicated consistency group Snapshots using consistency group Snapshot REST API and System Manager on clusters running ONTAP 9.11.1 or later.

If some or all the volumes associated with a consistency group are located on unmirrored aggregates that are not currently accessible, GET or DELETE operations on the consistency group behave as if the local volumes or hosting aggregates are offline.

Consistency group configurations for replication

If site B is running ONTAP 9.10.1 or earlier, only the volumes associated with the consistency groups located on mirrored aggregates are replicated to site B. The consistency group configurations are only replicated to site B, if both sites are running ONTAP 9.11.1 or later. After site B is upgraded to ONTAP 9.11.1, data for consistency groups on site A that have all their associated volumes placed on mirrored aggregates are replicated to site B.



It's recommended you maintain at least 20% free space for mirrored aggregates for optimal storage performance and availability. Although the recommendation is 10% for non-mirrored aggregates, the additional 10% of space may be used by the filesystem to absorb incremental changes. Incremental changes increase space utilization for mirrored aggregates due to ONTAP's copy-on-write Snapshot-based architecture. Failure to adhere to these best practices may have a negative impact on performance.

Upgrade considerations

Consistency groups created with SM-BC in ONTAP 9.8 and 9.9.1 will automatically be upgraded and become manageable under **Storage > Consistency Groups** in System Manager or the ONTAP REST API when upgrading to ONTAP 9.10.1 or later. For more information about upgrading from ONTAP 9.8 or 9.9.1, see [SM-BC upgrade and revert considerations](#).

Consistency group snapshots created in the REST API can be managed through System Manager's Consistency Group interface and through consistency group REST API endpoints.



Snapshots created with the ONTAPI commands `cg-start` and `cg-commit` will not be recognized as consistency group Snapshots and thus cannot be managed through System Manager's consistency group interface or the consistency group endpoints in the ONTAP REST API.

Supported features by release

	ONTAP 9.13.1	ONTAP 9.12.1	ONTAP 9.11.1	ONTAP 9.10.1
Hierarchical consistency groups	X	X	X	X
Local Snapshot protection	X	X	X	X
SnapMirror Business Continuity	X	X	X	X

	ONTAP 9.13.1	ONTAP 9.12.1	ONTAP 9.11.1	ONTAP 9.10.1
MetroCluster support	X	X	X	
Two-phase commits (REST API only)	X	X	X	
Application and component tags	X	X		
Clone consistency groups	X	X		
Add and remove volumes	X	X		
Create CGs with new NAS volumes	X	REST API only		
Create CGs with new NVMe Namespaces	X	REST API only		
Move volumes between child consistency groups	X			
Modify consistency group geometry	X			
Monitoring	X			
Async SnapMirror (single consistency groups only)	X			

Learn more about consistency groups

Consistency Groups for Application Management & Protection

With NetApp ONTAP 9.10.1 + System Manager



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More information

- [ONTAP Automation documentation](#)
- [SnapMirror Business Continuity](#)

- [Asynchronous SnapMirror disaster recovery basics](#)
- [MetroCluster documentation](#)

Consistency group limits

When planning and managing your consistency groups, account for object limits at the scope of both the cluster and the parent or child consistency group.



If you are using SnapMirror Business Continuity, refer to [SM-BC restrictions and limitations for limits](#).

Limit	Scope	Minimum	Maximum
Number of consistency groups	Cluster	0	Same as maximum volume count in cluster
Number of parent consistency groups	Cluster	0	Same as maximum volume count in cluster
Number of individual and parent consistency groups	Cluster	0	Same as maximum volume count in cluster
Number of volumes in a consistency group	Single consistency group	1 volume	80 volumes
Number of volumes in the child of a parent consistency group	Parent consistency group	1 volume	80 volumes
Number of volumes in a child consistency group	Child consistency group	1 volume	80 volumes
Number of child consistency groups in a parent consistency group	Parent consistency group	1 consistency group	5 consistency groups

Configure a single consistency group

Consistency groups can be created with existing volumes or new LUNs or volumes (depending on the version of ONTAP). A volume or LUN can only be associated with one consistency group at a time.

Before you begin

- In ONTAP 9.10.1 through 9.11.1, modifying the member volumes of a consistency group after it is created is not supported.

Beginning in ONTAP 9.12.1, you can modify the member volumes of a consistency group. For more information on this process, refer to [Modify a consistency group](#).

Create a consistency group with new LUNs or volumes

In ONTAP 9.10.1 through 9.12.1, you can create a consistency group using new LUNs. Beginning in ONTAP

9.13.1, System Manager also supports creating a consistency group with new NVMe namespaces or new NAS volumes. (This is also supported in the ONTAP REST API beginning with ONTAP 9.12.1.)

Steps

1. Select **Storage > Consistency groups**.
2. Select **+Add** then select the protocol for your storage object.

In ONTAP 9.10.1 through 9.12.1, the only option for a new storage object is **Using new LUNs**. Beginning in ONTAP 9.13.1, System Manager supports creating consistency groups with new NVMe namespaces and new NAS volumes.

3. Name the consistency group. Designate the number of volumes or LUNs and the capacity per volume or LUN.
 - a. **Application Type**: If you are using ONTAP 9.12.1 or later, select an application type. If no value is selected, the consistency group will be assigned the type of **Other** by default. Learn more about tagging consistency in [Application and component tags](#). If you plan to create a consistency group with a remote protection policy, you must use **Other**.
 - b. For **New LUNs**: Select the host operating system and LUN format. Enter the host initiator information.
 - c. For **New NAS volumes**: choose the appropriate export option (NFS or SMB/CIFS) based on the NAS configuration of your SVM.
 - d. For **New NVMe namespaces**: Select the host operating system and NVMe subsystem.
4. To configure protection policies, add a child consistency group, or access permissions, select **More options**.
5. Select **Save**.
6. Confirm your consistency group has been created by returning to the main consistency group menu where it will appear once the job completes. If you set a protection policy, you will know it has been applied when you see a green shield under look under the appropriate policy, remote or local.

Create a consistency group with existing volumes

You can use existing volumes to create a consistency group.

Steps

1. Select **Storage > Consistency groups**.
2. Select **+Add** then **Using existing volumes**.
3. Name the consistency group and select the storage VM.
 - a. **Application Type**: If you are using ONTAP 9.12.1 or later, select an application type. If no value is selected, the consistency group will be assigned the type of **Other** by default. Learn more about tagging consistency in [Application and component tags](#). If the consistency group has an SM-BC relationship, you must use **Other**.
4. Select the existing volumes to include. Only volumes that are not already part of a consistency group will be available for selection.



If creating a consistency group with existing volumes, the consistency group supports FlexVol volumes. Volumes with Asynchronous or Synchronous SnapMirror relationships can be added to consistency groups, but they are not consistency group-aware. Consistency groups do not support S3 buckets, or storage VMs with SVMMDR relationships.

5. Select **Save**.
6. Confirm your consistency group has been created by returning to the main consistency group menu where it will appear once the ONTAP job completes. If you have chosen a protection policy, confirm it was properly set by selecting your consistency group from the menu. If you set a protection policy, you will know it has been applied when you see a green shield under look under the appropriate policy, remote or local.

Next steps

- [Protect a consistency group](#)
- [Modify a consistency group](#)
- [Clone a consistency group](#)

Configure a hierarchical consistency group

Hierarchical consistency groups enable you to manage large workloads spanning multiple volumes, creating a parent consistency group that serves as an umbrella for child consistency groups.

Hierarchical consistency groups have a parent that can include up to five individual consistency groups. Hierarchical consistency groups can support different local Snapshot policies across consistency groups or individual volumes. If you use a remote protection policy, that will apply for the entire hierarchical consistency group (parent and children).

Beginning in ONTAP 9.13.1, you can [modify the geometry of your consistency groups](#) and [move volumes between child consistency groups](#).

For object limits on consistency groups, see [Object limits for consistency groups](#).

Create a hierarchical consistency group with new LUNs or volumes

When creating a hierarchical consistency group, you can populate it with new LUNs. Beginning in ONTAP 9.13.1, you can also use new NVMe namespaces and NAS volumes.

Steps

1. Select **Storage > Consistency groups**.
2. Select **+Add** then select the protocol for your storage object.

In ONTAP 9.10.1 through 9.12.1, the only option for a new storage object is **Using new LUNs**. Beginning in ONTAP 9.13.1, System Manager supports creating consistency groups with new NVMe namespaces and new NAS volumes.

3. Name the consistency group. Designate the number of volumes or LUNs and the capacity per volume or LUN.
 - a. **Application Type:** If you are using ONTAP 9.12.1 or later, select an application type. If no value is selected, the consistency group will be assigned the type of **Other** by default. Learn more about tagging consistency in [Application and component tags](#). If you plan to use a remote protection policy, you must choose **Other**.
4. Select the host operating system and LUN format. Enter the host initiator information.
 - a. For **New LUNs**: Select the host operating system and LUN format. Enter the host initiator information.
 - b. For **New NAS volumes**: choose the appropriate export option (NFS or SMB/CIFS) based on the NAS

configuration of your SVM.

- c. For **New NVMe namespaces**: Select the host operating system and NVMe subsystem.
5. To add a child consistency group, select **More options** then **+Add child consistency group**.
6. Select the performance level, the number of LUNs or volumes, and capacity per LUN or volume. Designate the appropriate export configurations or operating system information based on the protocol you are using.
7. Optionally, select a local snapshot policy and set the access permissions.
8. Repeat for up to five child consistency groups.
9. Select **Save**.
10. Confirm your consistency group has been created by returning to the main consistency group menu where it will appear once the ONTAP job completes. If you set a protection policy, look under the appropriate policy, remote or local, which should display a green shield with a checkmark in it.

Create a hierarchical consistency group with existing volumes

You can organize existing volumes into a hierarchical consistency group.

Steps

1. Select **Storage > Consistency groups**.
2. Select **+Add** then **Using existing volumes**.
3. Select the storage VM.
4. Select the existing volumes to include. Only volumes that are not already part of a consistency group will be available for selection.
5. To add a child consistency group, select **+Add Child Consistency Group**. Create the necessary consistency groups, which will be named automatically.
 - a. **Component Type**: If you are using ONTAP 9.12.1 or later, select a component type of "data", "logs", or "other". If no value is selected, the consistency group will be assigned the type of **Other** by default. Learn more about tagging consistency in [Application and component tags](#). If you plan to use a remote protection policy, you must use **Other**.
6. Assign existing volumes to each consistency group.
7. Optionally, select a local Snapshot policy.
8. Repeat for up to five child consistency groups.
9. Select **Save**.
10. Confirm your consistency group has been created by returning to the main consistency group menu where it will appear once the ONTAP job completes. If you have chosen a protection policy, confirm it was properly set by selecting your consistency group from the menu; under the appropriate policy type, you will see a green shield with a checkmark inside of it.

Next steps

- [Modify the geometry of a consistency groups](#)
- [Modify a consistency group](#)
- [Protect a consistency group](#)

Protect a consistency group

Consistency groups offer easily managed local and remote protection for SAN, NAS, and NVMe applications that span multiple volumes.

Creating a consistency group does not automatically enable protection. Protection policies can be set at the time of creation or after creating your consistency group. You can protect consistency groups using:

- Local Snapshot policies
- SnapMirror Business Continuity (SM-BC)
- Asynchronous SnapMirror (beginning 9.13.1)

If you are utilizing nested consistency groups, you can set different protection policies for the parent and child consistency groups.


Beginning in ONTAP 9.11.1, consistency groups offer [two-phase consistency group Snapshot creation](#). The two-phase Snapshot executes a precheck, ensuring the Snapshot will be captured successfully.

Recovery can occur for an entire consistency group, a single consistency group in a hierarchical configuration, or for individual volumes within the consistency group. Recovery can be achieved by selecting the consistency group you want to recover from, selecting the Snapshot copy type, and then identifying the Snapshot copy to base the restoration on. For more information about this process, see [Restore a volume from an earlier Snapshot copy](#).

Set a local Snapshot protection policy

Setting a local snapshot protection policy allows you to create a policy spanning all volumes in a consistency group.

Steps

1. Select **Storage > Consistency groups**.
2. Select the consistency group you have created from the Consistency group menu.
3. At the top right of the overview page for the consistency group, select **Edit**.
4. Check the box next to **Schedule Snapshot copies (local)**.
5. Select a Snapshot policy. To configure a new, custom policy, refer to [Create a custom data protection policy](#).
6. Select **Save**.
7. Return to the consistency group overview menu. In the left column under **Snapshot Copies (Local)**, the status will say protected next to .

Create two-phase consistency group snapshots

Beginning in ONTAP 9.11.1, consistency groups support two-phase commits for consistency group (CG) Snapshot creation, which execute a precheck before committing the Snapshot. This feature is only available with the ONTAP REST API.

Two-phase CG Snapshot creation is only available for Snapshot creation, not provisioning consistency groups or restoring consistency groups.

A two-phase CG Snapshot creation breaks the Snapshot creation process invoked with a POST request to the `/application/consistency-groups/{consistency_group_uuid}/snapshots` endpoint into a sequence of two phases:

1. In the first phase initiated with a POST request, the API executes prechecks, triggers Snapshot creation, and starts a timer for designated interval.
2. If the POST request in phase one completes with a 201 status code, you can invoke the second phase within the designated interval from the first phase, committing the Snapshot to the appropriate endpoint.

For more information about the ONTAP REST API, refer to the [API reference](#) or visit the [ONTAP REST API page](#) at the NetApp Developer Network for a complete list of API endpoints.

Before you begin

- To use two-phase CG Snapshot creation, all nodes in the cluster must be running ONTAP 9.11.1 or later.
- Only one active invocation of a consistency group Snapshot creation operation is supported on a consistency group instance at a time, whether it be a one-phase or two-phase. Attempting to invoke a Snapshot creation while another one is in progress will result in a failure.
- The two-phase consistency group Snapshot creation can be invoked with the `action=start` parameter.

You can additionally use the `action_timeout` parameter to specify the maximum number of seconds that the Snapshot creation process can take.

The `action_timeout` parameter can be set equal to an integer between 5 and 120. The default value of `action_timeout` is 7.

Steps

1. Invoke the Snapshot creation. Send a POST request to the consistency group endpoint using the `action=start` parameter.

```
curl -k -X POST 'https://<IP_address>/application/consistency-  
groups/<cg-uuid>/snapshots?action=start&action_timeout=7' -H "accept:  
application/hal+json" -H "content-type: application/json" -d '  
{  
  "name": "<snapshot_name>",  
  "consistency_type": "crash",  
  "comment": "<comment>",  
  "snapmirror_label": "<SnapMirror_label>"  
}'
```

2. If the POST request succeeds, your output will include a snapshot uuid. Using that uuid, submit a PATCH request to commit the Snapshot.

```
curl -k -X PATCH 'https://<IP_address>/application/consistency-  
groups/<cg_uuid>/snapshots/<snapshot_id>?action=commit' -H "accept:  
application/hal+json" -H "content-type: application/json"
```

Set remote protection for a consistency group

Consistency groups offer remote protection through SM-BC and, beginning in ONTAP 9.13.1, asynchronous SnapMirror.

Configure protection with SM-BC

You can utilize SM-BC to ensure Snapshot copies of consistency groups created on your consistency group are copied to the destination. To learn more about SM-BC, refer to [Configure protection for business continuity](#).


Before you begin

- SM-BC relationships cannot be established on volumes mounted for NAS access.
- The policy labels in the source and destination cluster must match.
- SM-BC will not replicate Snapshot copies by default unless a rule with a SnapMirror label is added to the predefined `AutomatedFailOver` policy and the Snapshot copies are created with that label.

To learn more about this process, refer to [Configure protection for business continuity](#).

- Beginning in ONTAP 9.13.1, you can non-disruptively [add volumes to a consistency group](#) with an active SM-BC relationship. Any other changes to a consistency group require you to break the SM-BC relationship, modify the consistency group, then reestablish and resynchronize the relationship.

Steps

1. Ensure you have met the [prerequisites for using SM-BC](#).
2. Select **Storage > Consistency groups**.
3. Select the consistency group you have created from the Consistency group menu.
4. At the top right of the overview page, select **More** then **Protect**.
5. System Manager auto-fills source-side information. Select the appropriate cluster and storage VM for the destination. Select a protection policy. Ensure that **Initialize relationship** is checked.
6. Select **Save**.
7. The consistency group needs to initialize and synchronize. Confirm synchronization has completed successfully by returning to the **Consistency group** menu. The **SnapMirror (Remote)** status displays Protected next to .

Configure asynchronous SnapMirror protection

Beginning in ONTAP 9.13.1, you can configure asynchronous SnapMirror protection for a single consistency group.

Before you begin

- Asynchronous SnapMirror protection is only available for single consistency groups. It is not supported for hierarchical consistency groups. To convert a hierarchical consistency group into a single consistency group, see [modify consistency group architecture](#).
- [Cascade deployments](#) are not supported with SM-BC.
- The policy labels in the source and destination cluster must match.
- You can non-disruptively [add volumes to a consistency group](#) with an active asynchronous SnapMirror relationship. Any other changes to a consistency group require you to break the SnapMirror relationship, modify the consistency group, then reestablish and resynchronize the relationship.

- If you have configured an asynchronous SnapMirror protection relationship for multiple individual volumes, you can convert those volumes into a consistency group while retaining the existing Snapshots. To convert volumes successfully:
- There must be a common Snapshot copy of the volumes.
- You must break the existing SnapMirror relationship, [add the volumes to a single consistency group](#), then resynchronize the relationship using the following workflow.


Steps

1. From the destination cluster, select **Storage > Consistency groups**.
2. Select the consistency group you have created from the Consistency group menu.
3. At the top right of the overview page, select **More** then **Protect**.
4. System Manager auto-fills source-side information. Select the appropriate cluster and storage VM for the destination. Select a protection policy. Ensure that **Initialize relationship** is checked.

When selecting an asynchronous policy, you have the option to **Override Transfer Schedule**.



The minimum supported schedule (recovery point objective, or RPO) for consistency groups with asynchronous SnapMirror is 30 minutes.

5. Select **Save**.
6. The consistency group needs to initialize and synchronize. Confirm synchronization has completed successfully by returning to the **Consistency group** menu. The **SnapMirror (Remote)** status displays Protected next to .

Visualize relationships

System Manager visualizes LUN maps under the **Protection > Relationships** menu. When you select a source relationship, System Manager displays a visualization of the source relationships. By selecting a volume, you can delve deeper into these relationships to see a list of the contained LUNs and the initiator group relationships. This information can be downloaded as an Excel workbook from the individual volume view; the download operation will run in the background.

Related information

- [Clone a consistency group](#)
- [Configure Snapshot copies](#)
- [Create custom data protection policies](#)
- [Recover from Snapshot copies](#)
- [Restore a volume from an earlier Snapshot copy](#)
- [SM-BC overview](#)
- [ONTAP Automation documentation](#)
- [Asynchronous SnapMirror disaster recovery basics](#)

Modify member volumes in a consistency group

Beginning in ONTAP 9.12.1, you can modify a consistency group by removing volumes or adding existing volumes (expanding the consistency group). Beginning in ONTAP 9.13.1,

you can move volumes between child consistency groups if they share a common parent.

Add volumes to a consistency group

Beginning in ONTAP 9.12.1, you can non-disruptively add volumes to a consistency group.

Before you begin


- You cannot add volumes associated with another consistency group.
- Consistency groups support NAS, SAN, and NVMe protocols.
- You can add up to 16 volumes at a time to a consistency group if the adjustments are within the overall [consistency group limits](#).
- Beginning in ONTAP 9.13.1, you can non-disruptively add volumes to a consistency group with an active SnapMirror Business Continuity (SM-BC) or asynchronous SnapMirror protection policy.
- When you add volumes to a consistency group protected by SM-BC, the status of the SM-BC relationship status will change to "Expanding" until mirroring and protection are configured for the new volume. If a disaster occurs on the primary cluster before this process completes, the consistency group reverts back to its original composition as part of the failover operation.
- In ONTAP 9.12.1, you *cannot* add volumes to a consistency group in an SM-BC relationship. You must first break the SM-BC relationship, modify the consistency group, then restore protection with SM-BC.
- Beginning in ONTAP 9.12.1, the ONTAP REST API supports adding *new* or existing volumes to a consistency group. For more information about the ONTAP REST API, refer to [ONTAP REST API reference documentation](#).

Beginning in ONTAP 9.13.1, this functionality is supported in System Manager.

- When expanding a consistency group, Snapshot copies of the consistency group captured before the modification will be considered partial. Any restore operation based on that Snapshot copy will reflect the consistency group at the point-in-time of the snapshot.
- If you are using ONTAP 9.10.1 through 9.11.1, you cannot modify a consistency group. To change the configuration of a consistency group in ONTAP 9.10.1 or 9.11.1, you must delete the consistency group, then create a new consistency group with the volumes you want to include.

Steps

1. Select **Storage > Consistency groups**.
2. Select the consistency group that you want to modify.
3. If you are modifying a single consistency group, at the top of the **Volumes** menu, select **More** and then **Expand** to add a volume.

If you are modifying a child consistency group, identify the parent consistency group you want to modify. Select the > button to view the child consistency groups, then select  next to the name of the child consistency group you want to modify. From that menu, select **Expand**.

4. Select up to 16 volumes to add to the consistency group.
5. Select **Save**. When the operation completes, view the newly added volumes in the consistency group's **Volumes** menu.

Remove volumes from a consistency group

Volumes removed from a consistency group are not deleted. They remain active in the cluster.

Before you begin

- You cannot remove volumes from a consistency group in a SnapMirror Business Continuity (SM-BC) relationship. You must first break the SM-BC relationship to modify the consistency group and then reestablish the relationship.
- If a consistency group has no volumes in it following the remove operation, the consistency group will be deleted.
- When a volume is removed from a consistency group, existing Snapshots of the consistency group remain but are considered invalid. The existing Snapshots cannot be used to restore the contents of the consistency group. Volume-granular Snapshots remain valid.
- If you delete a volume from the cluster, it is automatically removed from the consistency group.
- To change the configuration of a consistency group in ONTAP 9.10.1 or 9.11.1, you must delete the consistency group then create a new consistency group with the desired member volumes.
- Deleting a volume from the cluster will automatically remove it the consistency group.

Steps

1. Select **Storage > Consistency groups**.
2. Select the single or child consistency group that you want to modify.
3. In the **Volumes** menu, select the checkboxes next to the individual volumes you want to remove from the consistency group.
4. Select **Remove volumes from the consistency group**.
5. Confirm that you understand removing the volumes will cause all Snapshot copies of the consistency group to become invalid and select **Remove**.

Move volumes between consistency groups

Beginning in ONTAP 9.13.1, you can move volumes between child consistency groups that share a parent.

Before you begin

- You can only move volumes between consistency groups nested under the same parent consistency group.
- Existing consistency group Snapshots become invalid and no longer accessible as consistency group snapshots. Individual volume Snapshots remain valid.
- Snapshot copies of the parent consistency group remain valid.
- If you move all volumes out of a child consistency group, that consistency group will be deleted.
- Modifications to a consistency group must abide by [consistency group limits](#).

Steps

1. Select **Storage > Consistency groups**.
2. Select the parent consistency group that contains the volumes you want to move. Find the child consistency group and then expand the **Volumes** menu. Select the volumes you want to move.
3. Select **Move**.
4. Choose whether you want to move the volumes to a new consistency group or an existing group.
 - a. To move to an existing consistency group, select **Existing child consistency group** then choose the consistency group's name from the dropdown menu.
 - b. To move to a new consistency group, select **New child consistency group**. Enter a name for the new

child consistency group and select a component type.

5. Select **Move**.

Related information

- [Consistency group limits](#)
- [Clone a consistency group](#)

Modify consistency group geometry

Beginning in ONTAP 9.13.1, you can modify the geometry of a consistency group. Modifying the geometry of a consistency group enables you to alter the configuration of child or parent consistency groups without disruption to ongoing IO operations.

Modifying consistency group geometry will have an impact on existing snapshot copies.



You cannot modify the geometry of a consistency group that is configured with a remote protection policy. You must first break the protection relationship, modify the geometry, then restore remote protection.

Add a new child consistency group

Beginning in ONTAP 9.13.1, you can add a new child consistency group to an existing parent consistency group.

Before you begin

- A parent consistency group can contain a maximum of five child consistency groups. See [consistency group limits](#) for other limits.
- You cannot add a child consistency group to a single consistency group. You must first [promote](#) the consistency group, then you can add a child consistency group.
- Existing Snapshot copies of the consistency group captured before the expand operation will be considered partial. Any restore operation based on that snapshot copy will reflect the consistency group at the point-in-time of the Snapshot copy.

Steps

1. Select **Storage > Consistency groups**.
2. Select the parent consistency group you want to which you want to add a child consistency group.
3. Next to the parent consistency group's name, select **More** then **Add new child consistency group**.
4. Enter a name for your consistency group.
5. Choose whether you would like to add new or existing volumes.
 - a. If you are adding existing volumes, select **Existing volumes** then choose the volumes from the dropdown menu.
 - b. If you are adding new volumes, select **New volumes** then designate the number of volumes and their size.
6. Select **Add**.

Detach a child consistency group

Beginning in ONTAP 9.13.1, you can remove a child consistency group from its parent, converting it into an individual consistency group.

Before you begin

- Detaching a child consistency group causes the parent consistency group's snapshots to become invalid and inaccessible. Volume granular snapshots remain valid.
- Existing Snapshot copies of the individual consistency group remain valid.

Steps

1. Select **Storage > Consistency groups**.
2. Select the parent consistency group that contains the child you want to detach.
3. Next to the child consistency group you want to detach, select **More** then **Detach from parent**.
4. Optionally, rename the consistency group and select an application type.
5. Select **Detach**.

Move a single consistency group under a parent consistency group

Beginning in ONTAP 9.13.1, you can convert an existing single consistency group to a child consistency group. You can either move the consistency group under an existing parent consistency group or create a new parent consistency group during the move operation.

Before you begin

- The parent consistency group must have four or fewer children. A parent consistency group can contain a maximum of five child consistency groups. See [consistency group limits](#) for other limits.
- Existing snapshot copies of the *parent* consistency group captured before this operation will be considered partial. Any restore operation based on one of those Snapshot copies will reflect the consistency group at the point-in-time of the Snapshot copy.
- Existing consistency group snapshots of the single consistency group remain valid.

Steps

1. Select **Storage > Consistency groups**.
2. Select the consistency group you want to convert.
3. Select **More** then **Move under different consistency group**.
4. Optionally, enter a new name for the consistency group and select a component type. By default, the component type will be Other.
5. Choose if you want to migrate to an existing parent consistency group or create a new parent consistency group:
 - a. To migrate to an existing parent consistency group, select **Existing consistency group** then choose the consistency group from the dropdown menu.
 - b. To create a new parent consistency group, select **New consistency group** then provide a name for the new consistency group.
6. Select **Move**.

Promote a child consistency group

Beginning in ONTAP 9.13.1, you can promote a single consistency group to a parent consistency group. When you promote the single consistency group to a parent, you also create a new child consistency group that inherits all of the volumes in the original, single consistency group.

Before you begin

- If you want to convert a child consistency group to a parent consistency group, you must first [detach](#) the child consistency group then follow this procedure.
- Existing Snapshot copies of the consistency group remain valid after you promote the consistency group.

Steps

1. Select **Storage > Consistency groups**.
2. Select the consistency group you want to promote.
3. Select **More** then **Promote to parent consistency group**.
4. Enter a **Name** and select a **Component type** for the child consistency group.
5. Select **Promote**.

Demote a parent to a single consistency group

Beginning in ONTAP 9.13.1, you can demote a parent consistency group to a single consistency group. Demoting the parent flattens the hierarchy of the consistency group, removing all associated child consistency groups. All volumes in the consistency group will remain under the new, single consistency group.

Before you begin

- Existing Snapshot copies of the parent consistency group remain valid after you demote it to a single consistency. Existing Snapshot copies of any of the associated child consistency groups of that parent will become invalid, but the individual volume snapshots within them continue to be accessible as volume-granular Snapshots.

Steps

1. Select **Storage > Consistency groups**.
2. Select the parent consistency group you want to demote.
3. Select **More** then **Demote to single consistency group**.
4. A warning will advise you that all associated child consistency groups will be deleted and their volumes will be moved under the new, single consistency group. Select **Demote** to confirm you understand the impact.

Clone a consistency group

Beginning in ONTAP 9.12.1, you can clone a consistency group to create a copy of a consistency group and its contents. Cloning a consistency group creates a copy of the consistency group configuration, its metadata such as application type, and all the volumes and its contents such as files, directories, LUNs or NVMe namespaces.

When cloning a consistency group, you can clone it with its current configuration, but with volume contents as they are or based on an existing consistency group Snapshot.

Cloning a consistency group is supported only for the entire consistency group. You cannot clone an individual

child consistency group in a hierarchical relationship: only the complete consistency group configuration can be cloned.

When you clone a consistency group, the following components are not cloned:

- iGroups
- LUN maps
- NVMe subsystems
- NVMe namespace subsystem maps

Before you begin

- When you clone a consistency group, ONTAP will not create SMB shares for the cloned volumes if a share name is not specified. * Cloned consistency groups are not mounted if a junction path is not specified.
- If you attempt to clone a consistency group based on a Snapshot that does not reflect the consistency group's current configuration, the operation will fail.
- After you clone a consistency group, you need to perform the appropriate mapping operation.

Refer to [Map igroups to multiple LUNs](#) or [Map an NVMe namespace to a subsystem](#) for more information.

- Cloning a consistency group is not supported for a consistency group in a SnapMirror Business Continuity relationship or with any associated DP volumes.

Steps

1. Select **Storage > Consistency groups**.
2. Select the consistency group you want to clone from the **Consistency Group** menu.
3. At the top right of the overview page for the consistency group, select **Clone**.
4. Enter a name for the new, cloned consistency group or accept the default name.
 - a. Choose if you want to enable **Thin Provisioning**.
 - b. Choose **Split Clone** if you want to dissociate the consistency group from its source and allocate additional disk space for the cloned consistency group.
5. To clone the consistency group in its current state, choose **Add a new Snapshot copy**.

To clone the consistency group based on a snapshot, choose **Use an existing Snapshot copy**. Selecting this option will open a new sub-menu. Choose the Snapshot that you want to use as the basis for the clone operation.

6. Select **Clone**.
7. Return to the **Consistency Group** menu to confirm your consistency group has been cloned.

Next steps

- [Map igroups to multiple LUNs](#)
- [Map an NVMe namespace to a subsystem](#)

Delete a consistency group

If you decide that you no longer need a consistency group, you can delete it.


Deleting a consistency group deletes the instance of the consistency group and does **not** impact the

constituent volumes or LUNs. Deleting a consistency group does not result in deletion of the Snapshots present on each volume, but they will no longer be accessible as consistency group Snapshots. They can, however, continue to be managed as ordinary volume granular snapshots.

Consistency groups will be deleted if all of the volumes in the consistency group are deleted.

If you are using a version of ONTAP between 9.10.1 to 9.12.0, volumes can only be removed from a consistency group if the volume itself is deleted, in which case the volume is automatically removed from the consistency group. Beginning in ONTAP 9.12.1, you can remove volumes from a consistency group without deleting. For more information on this process, refer to [Modify a consistency group](#).

Steps

1. Select **Storage > Consistency groups**.
2. Select the consistency group you would like to delete.
3. Next to the name of the consistency group, select  and then **Delete**.

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