



# Snapshots

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# Snapshots

## Snapshots overview

The Snapshot feature allows you to create point-in-time images of storage array volumes to use for backup or testing.

### What are snapshot images?

A *snapshot image* is a logical copy of volume data, captured at a particular point-in-time. Like a restore point, snapshot images allow you to roll back to a known good data set. Although the host can access the snapshot image, it cannot directly read or write to it.

Learn more:

- [How snapshot storage works](#)
- [Snapshot terminology](#)
- [Base volumes, reserved capacity, and snapshot groups](#)
- [Snapshot schedules and consistency groups](#)
- [Snapshot volumes](#)

### How do I create snapshots?

You can manually create a snapshot image from a base volume or snapshot consistency group. This procedure is available from **Storage > Snapshots**.

Learn more:

- [Requirements and guidelines for snapshots](#)
- [Workflow for creating snapshot images and volumes](#)
- [Create a snapshot image](#)
- [Schedule snapshot images](#)
- [Create a snapshot consistency group](#)
- [Create a snapshot volume](#)

### How do I roll back data from a snapshot?

A *rollback* is the process of returning data in a base volume to a previous point in time. You can roll back snapshot data from **Storage > Snapshots**.

Learn more:

- [Snapshot rollback](#)
- [Start a snapshot image rollback for a base volume](#)
- [Start a snapshot image rollback for a consistency group member](#)

## Related information

Learn more about tasks related to snapshots:

- [Change reserved capacity for a snapshot volume](#)
- [Change reserved capacity for a snapshot group](#)

## Concepts

### How snapshot storage works

The Snapshots feature uses copy-on-write technology to store snapshot images and use allocated reserved capacity.

### How snapshot images are used

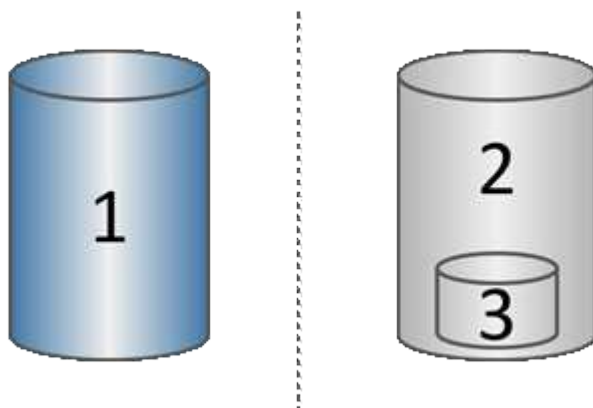
A snapshot image is a logical, read-only copy of volume content, captured at a particular point in time. You can use snapshots to protect against data loss.

Snapshot images also are useful for test environments. By creating a virtual copy of data, you can test data using the snapshot without altering the actual volume itself. In addition, hosts do not have write access to snapshot images, so your snapshots are always a secure backup resource.

### Snapshot creation

As snapshots are created, the Snapshots feature stores image data as follows:

- When a snapshot image is created, it exactly matches the base volume. The Snapshots feature uses copy-on-write technology. After the snapshot is taken, the first write to any block or set of blocks on the base volume causes the original data to be copied to the reserved capacity before writing the new data to the base volume.
- Subsequent snapshots include only changed data blocks. Before data is overwritten on the base volume, the Snapshots feature uses its copy-on-write technology to save the required images of the affected sectors to the snapshot reserved capacity.



<sup>1</sup> Base volume (physical disk capacity); <sup>2</sup> Snapshots (logical disk capacity); <sup>3</sup> Reserved capacity (physical disk capacity)

- The reserved capacity stores original data blocks for portions of the base volume that have changed after the snapshot was taken and includes an index for tracking changes. Generally, the size of the reserved capacity defaults to 40 percent of the base volume. (If you need more reserved capacity, you can increase reserved capacity.)
- Snapshot images are stored in a specific order, based on their timestamp. Only the oldest snapshot image of a base volume is available for manual deletion.

## Snapshot restoration

To restore data to a base volume, you can use either a snapshot volume or snapshot image:

- **Snapshot volume** — If you need to retrieve deleted files, create a snapshot volume from a known good snapshot image, and then assign it to the host.
- **Snapshot image** — If you need to restore a base volume to a specific point-in-time, use a previous snapshot image to roll back data to the base volume.

## Snapshot terminology

Learn how the snapshot terms apply to your storage array.

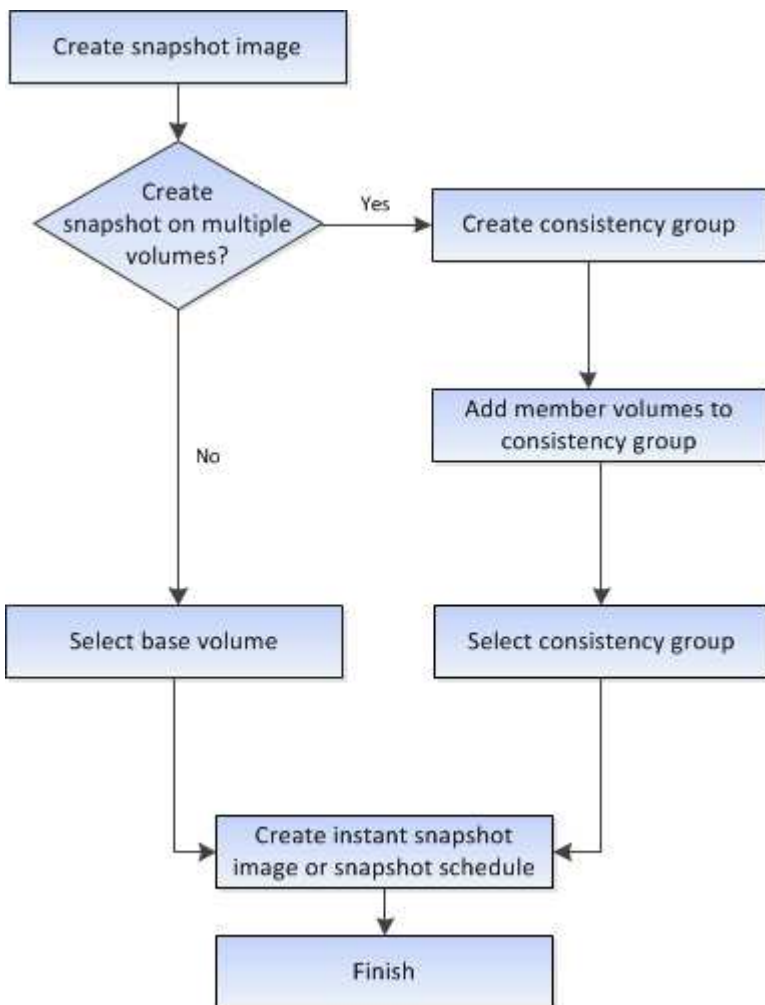
| Term                       | Description  |
|----------------------------|--|
| Snapshots feature          | The Snapshots feature is used to create and manage images of volumes.  |
| Snapshot image             | A snapshot image is a logical copy of volume data, captured at a particular point-in-time. Like a restore point, snapshot images allow you to roll back to a known good data set. Although the host can access the snapshot image, it cannot directly read or write to it. |
| Base volume                | A base volume is the source from which a snapshot image is created. It can be a thick or thin volume and is typically assigned to a host. The base volume can reside in either a volume group or disk pool.  |
| Snapshot volume            | A snapshot volume allows the host to access data in the snapshot image. The snapshot volume contains its own reserved capacity, which saves any modifications to the base volume without affecting the original snapshot image.  |
| Snapshot group             | A snapshot group is a collection of snapshot images from a single base volume.   |
| Reserved capacity volume   | A reserved capacity volume tracks which data blocks of the base volume are overwritten and the preserved content of those blocks.  |
| Snapshot schedule          | A snapshot schedule is a timetable for creating automated snapshot images. Through the schedule, you can control the frequency of image creations.   |
| Snapshot consistency group | A snapshot consistency group is a collection of volumes that are treated as a single entity when a snapshot image is created. Each of these volumes has its own snapshot image, but all the images are created at the same point in time.                                  |

| Term                                     | Description  |
|--|--|
| Snapshot consistency group member volume | Each volume that belongs to a snapshot consistency group is referred to as a member volume. When you add a volume to a snapshot consistency group, System Manager automatically creates a new snapshot group that corresponds to this member volume. |
| Rollback                                 | A rollback is the process of returning data in a base volume to a previous point in time.  |
| Reserved capacity                        | Reserved capacity is the physical allocated capacity that is used for any copy service operation and storage object. It is not directly readable by the host.  |

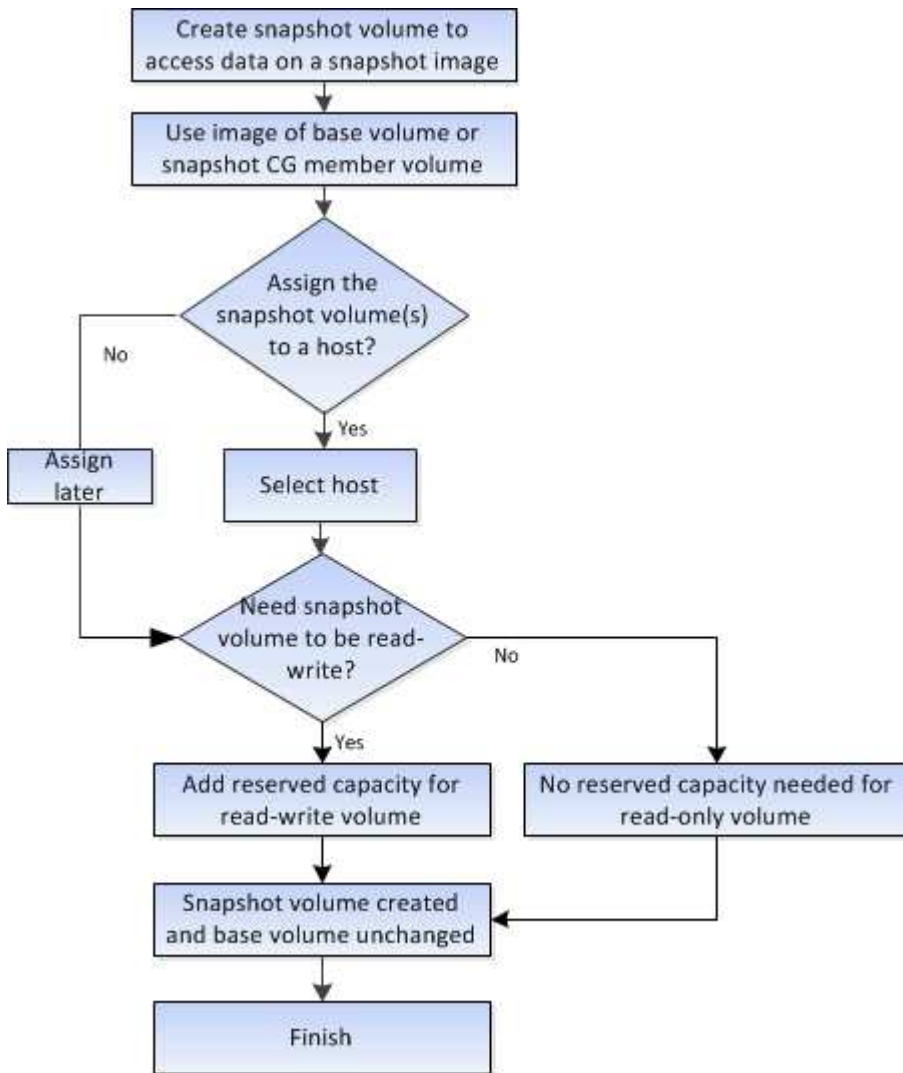
## Workflow for creating snapshot images and snapshot volumes

In System Manager, you can create snapshot images and snapshot volumes by following these steps.

### Workflow for creating snapshot images



## Workflow for creating snapshot volumes



## Requirements and guidelines for snapshots

When creating and using snapshots, review the following requirements and guidelines.

### Snapshot images and snapshot groups

- Each snapshot image is associated with exactly one snapshot group.
- A snapshot group is created the first time you create a scheduled or instant snapshot image for an associated object. This creates reserved capacity.

You can view snapshot groups from the Pools & Volume Groups page.

- Scheduled snapshot images do not occur when the storage array is offline or powered off.
- If you delete a snapshot group that has a snapshot schedule, the snapshot schedule is also deleted.
- If you have a snapshot volume that you no longer need, you can reuse it, along with any associated reserved capacity, instead of deleting it. This creates a different snapshot volume of the same base volume. You can re-associate the snapshot volume or snapshot consistency group snapshot volume with the same snapshot image or a different snapshot image, as long as the snapshot image is in the same base volume.

## Snapshot consistency group

- A snapshot consistency group contains one snapshot group for each volume that is a member of the snapshot consistency group.
- You can associate a snapshot consistency group with only one schedule.
- If you delete a snapshot consistency group that has a snapshot schedule, the snapshot schedule is also deleted.
- You cannot individually manage a snapshot group that is associated with a snapshot consistency group. Instead, you must perform the manage operations (create snapshot image, delete snapshot image or snapshot group, and rollback snapshot image) at the snapshot consistency group level.

## Base volume

- A snapshot volume must have the same Data Assurance (DA) and security settings as the associated base volume.
- You cannot create a snapshot volume of a failed base volume.
- If the base volume resides on a volume group, the member volumes for any associated snapshot consistency group can reside on either a pool or volume group.
- If a base volume resides on a pool, all member volumes for any associated snapshot consistency group must reside on the same pool as the base volume.

## Reserved capacity

- Reserved capacity is associated with only one base volume.
- Using a schedule can result in a large number of snapshot images. Make sure you have sufficient reserved capacity for scheduled snapshots.
- The reserved capacity volume for a snapshot consistency group must have the same Data Assurance (DA) and security settings as its associated base volume for the snapshot consistency group member volume.

## Pending snapshot images

Snapshot image creation might remain in a Pending state in the following conditions:

- The base volume that contains this snapshot image is a member of an asynchronous mirror group.
- The base volume is currently in a synchronization operation. The snapshot image creation completes as soon as the synchronization operation is complete.

## Maximum number of snapshot images

- If a volume is a member of a snapshot consistency group, System Manager creates a snapshot group for that member volume. This snapshot group counts towards the maximum allowable number of snapshot groups per base volume.
- If you attempt to create a snapshot image on a snapshot group or snapshot consistency group, but the associated group has reached its maximum number of snapshot images, you have two options:
  - Enable automatic deletion for the snapshot group or snapshot consistency group.
  - Manually delete one or more snapshot images from the snapshot group or snapshot consistency group and retry the operation.



## Auto-deletion

If the snapshot group or snapshot consistency group is enabled for automatic deletion, System Manager deletes the oldest snapshot image when the system creates a new one for the group.

## Rollback operation

- You cannot perform the following actions when a rollback operation is in progress:
  - Delete the snapshot image that is being used for the rollback.
  - Create a new snapshot image for a base volume that is participating in a rollback operation.
  - Change the associated snapshot group's Repository-Full Policy.
- You cannot start a rollback operation when any of these operations are in progress:
  - Capacity expansion (adding capacity to a pool or volume group)
  - Volume expansion (increasing the capacity of a volume)
  - RAID level change for a volume group
  - Segment size change for a volume
- You cannot start a rollback operation if the base volume is participating in a volume copy.
- You cannot start a rollback operation if the base volume is a secondary volume in a remote mirror.
- A rollback operation fails if any of the used capacity in the associated snapshot repository volume has unreadable sectors.

## Base volumes, reserved capacity, and snapshot groups

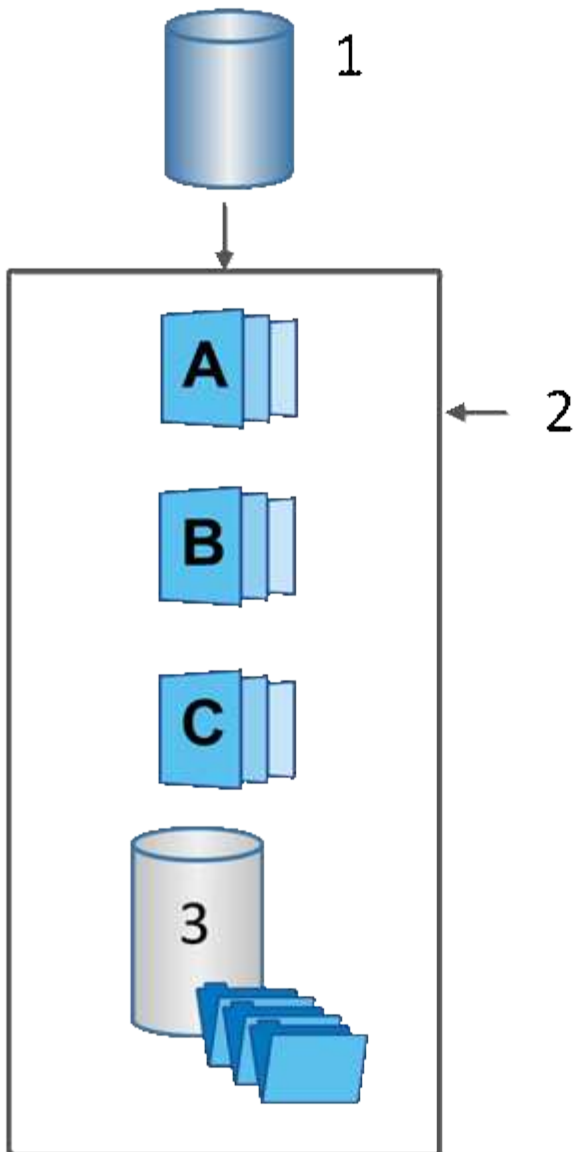
The Snapshots feature makes use of base volumes, reserved capacity, and snapshot groups.

### Base volumes

A *base volume* is the volume used as the source for a snapshot image. A base volume can be either a thick volume or a thin volume and can reside in either a pool or volume group.

To take snapshots of the base volume, you can create an instant image at any time, or you can automate the process by defining a regular schedule for snapshots.

The following figure shows the relationship between snapshot objects and the base volume.



<sup>1</sup> Base volume; <sup>2</sup> Snapshot objects in the group (images and reserved capacity); <sup>3</sup> Reserved capacity for the snapshot group.

### Reserved capacity and snapshot groups

System Manager organizes snapshot images into *snapshot groups*. When System Manager establishes the snapshot group, it automatically creates associated *reserved capacity* to hold the snapshot images for the group and to keep track of subsequent changes to additional snapshots.

If the base volume resides in a volume group, the reserved capacity can be located in either a pool or volume group. If the base volume resides in a pool, the reserved capacity must be located in the same pool as the base volume.

Snapshot groups require no user action, but you can adjust reserved capacity on a snapshot group at any time. Additionally, you might be prompted to create reserved capacity when the following conditions are met:

- Any time you take a snapshot of a base volume that does not yet have a snapshot group, System Manager automatically creates a snapshot group. This action also creates reserved capacity for the base volume

that is used to store subsequent snapshot images.

- Any time you create a snapshot schedule for a base volume, System Manager automatically creates a snapshot group.

### **Auto-deletion**

When working with snapshots, use the default option to have auto-deletion turned on. Auto-deletion automatically deletes the oldest snapshot image when the snapshot group reaches the snapshot group limit of 32 images. If you turn off auto-deletion, then snapshot group limits are eventually exceeded, and you must take manual actions to configure snapshot group settings and manage reserved capacity.

## **Snapshot schedules and snapshot consistency groups**

Use schedules for collection of snapshot images, and use snapshot consistency groups to manage multiple base volumes.

To easily manage snapshot operations for base volumes, you can use the following features:

- **Snapshot schedule** — Automate snapshots for a single base volume.
- **Snapshot consistency group** — Manage multiple base volumes as one entity.

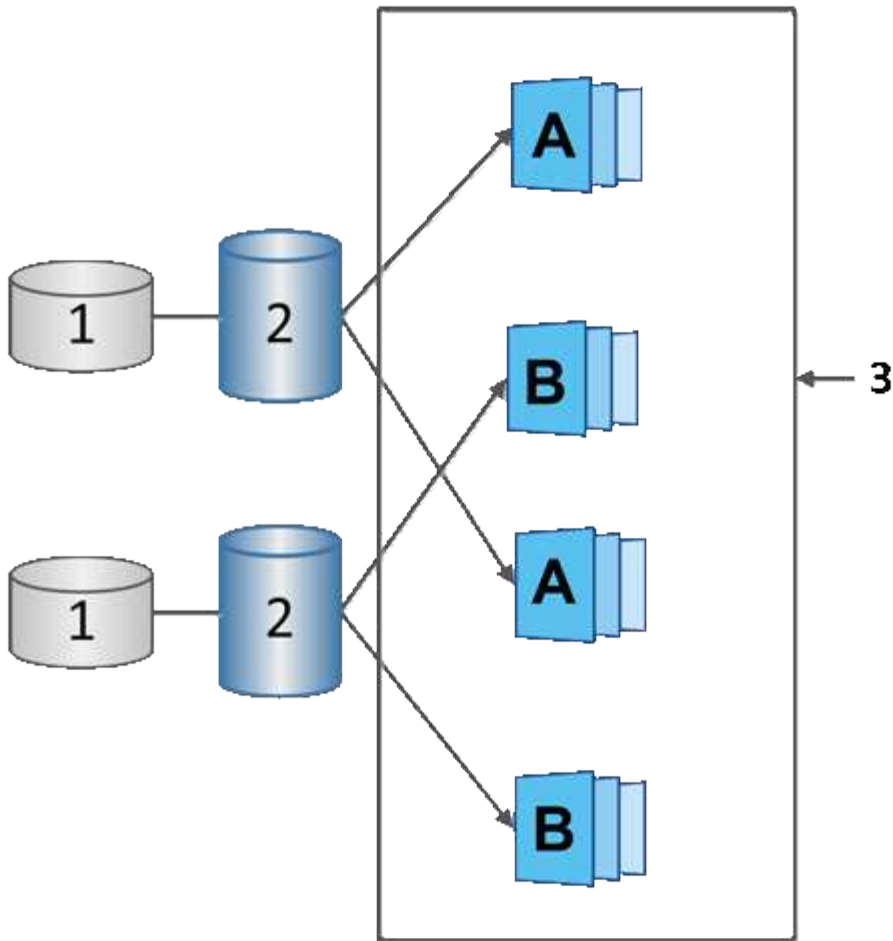
### **Snapshot schedule**

If you want to automatically take snapshots for a base volume, you can create a schedule. For example, you can define a schedule that takes snapshot images every Saturday at midnight, on the first of every month, or on any dates and times you decide. After the maximum of 32 snapshots is reached for a single schedule, you can suspend scheduled snapshots, create more reserved capacity, or you can delete snapshots. Snapshots can be deleted manually or by automating the deletion process. After a snapshot image is deleted, additional reserved capacity is available for reuse.

### **Snapshot consistency group**

You create a snapshot consistency group when you want to make sure snapshot images are taken on multiple volumes at the same time. Snapshot image actions are performed on the snapshot consistency group as a whole. For example, you can schedule synchronized snapshots of all volumes with the same timestamp. Snapshot consistency groups are ideal for applications that span multiple volumes, such as database applications that store logs on one volume and the database files on another volume.

The volumes included in a snapshot consistency group are called member volumes. When you add a volume to a consistency group, System Manager automatically creates new reserved capacity that corresponds to that member volume. You can define a schedule to automatically create a snapshot image of each member volume.



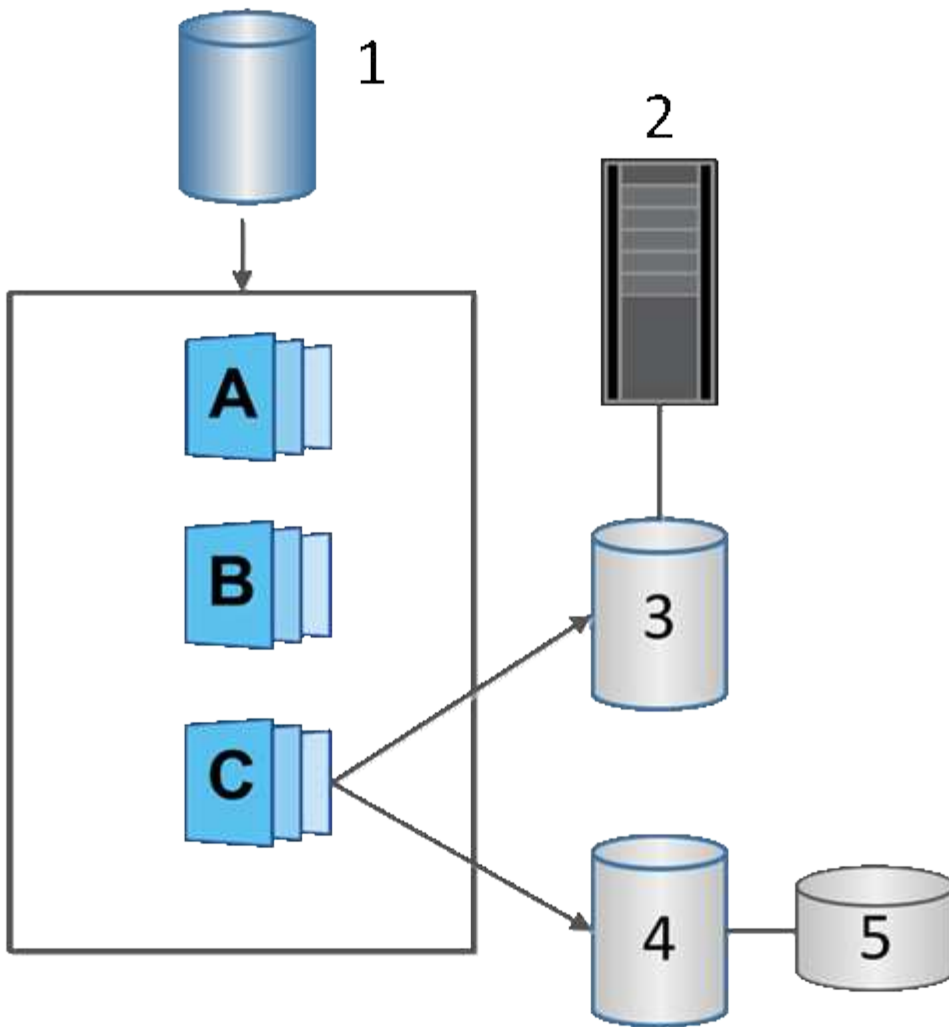
<sup>1</sup> Reserved capacity; <sup>2</sup> Member volume; <sup>3</sup> Consistency group snapshot images

## Snapshot volumes

You can create a snapshot volume and assign it to a host if you want to read or write snapshot data. The snapshot volume shares the same characteristics as the base volume (RAID level, I/O characteristics, and so on).

When you create a snapshot volume, you can designate it as *read-only* or *read-write accessible*.

When you create read-only snapshot volumes, you do not need to add reserved capacity. When you create read-write snapshot volumes, you must add reserved capacity to provide write-access.



<sup>1</sup> Base volume; <sup>2</sup> Host; <sup>3</sup> Read-only snapshot volume; <sup>4</sup> Read-write snapshot volume; <sup>5</sup> Reserved capacity

## Snapshot rollback

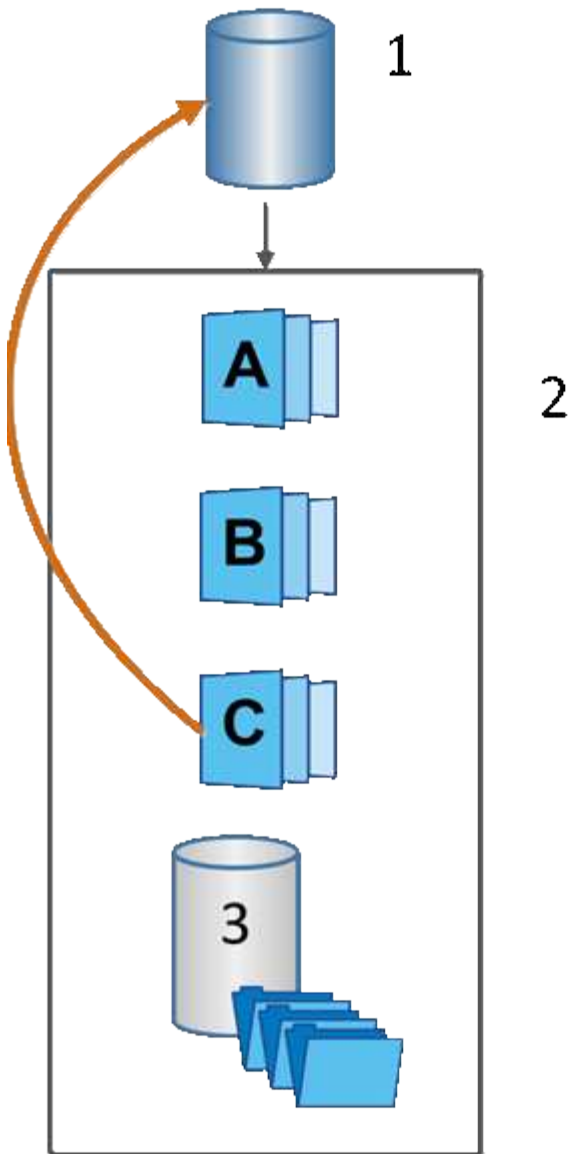
A rollback operation returns a base volume to a previous state, determined by the selected snapshot.

For the rollback, you can select a snapshot image from either of the following sources:

- **Snapshot image rollback**, for a full restore of a base volume.
- **Snapshot consistency group rollback**, which can be used to roll back one or more volumes.

During the rollback, the Snapshots feature preserves all snapshot images in the group. It also allows the host to access the base volume during this process, if needed for I/O operations.

When a rollback is launched, a background process sweeps through the logical block addresses (LBAs) for the base volume, and then finds copy-on-write data in the rollback snapshot image to be restored. Because the base volume is host-accessible for reads and writes, and all previously written data is available immediately, the reserved capacity volume must be large enough to contain all changes while the rollback is processing. The data transfer continues as a background operation until the rollback completes.



<sup>1</sup> Base volume; <sup>2</sup> Snapshot objects in a group; <sup>3</sup> Snapshot group reserved capacity

## Create snapshots and snapshot objects

### Create snapshot image

You can manually create a snapshot image from a base volume or snapshot consistency group. This is also called an *instant snapshot* or *instant image*.

#### Before you begin

- The base volume must be optimal.
- The drive must be optimal.
- The snapshot group cannot be designated as “reserved.”
- The reserved capacity volume must have the same Data Assurance (DA) settings as the associated base volume for the snapshot group.

## Steps

1. Do one of the following actions to create a snapshot image:
  - Select **Storage > Volumes**. Select the object (base volume or snapshot consistency group), and then select **Copy Services > Create instant snapshot**.
  - Select **Storage > Snapshots**. Select the **Snapshot Images** tab, and then select **Create > Instant snapshot**.

The Create Snapshot Image dialog box appears. Select the object (base volume or snapshot consistency group), and then click **Next**. If a previous snapshot image was created for the volume or snapshot consistency group, then the system creates the instant snapshot immediately. Otherwise, if this is the first time a snapshot image is created for the volume or snapshot consistency group, the Confirm Create Snapshot Image dialog box appears.

2. Click **Create** to accept the notification that reserved capacity is needed and to proceed to the Reserve Capacity step.

The Reserve Capacity dialog box appears.

3. Use the spinner box to adjust the capacity percentage, and then click **Next** to accept the candidate volume highlighted in the table.

The Edit Settings dialog box appears.

4. Select the settings for the snapshot image as appropriate, and confirm that you want to perform the operation.

## Field details

| Setting                           | Description   |
|-----------------------------------|---|
| <b>Snapshot image settings</b>    |   |
| Snapshot image limit              | Keep the check box selected if you want snapshot images automatically deleted after the specified limit; use the spinner box to change the limit. If you clear this check box, snapshot image creation stops after 32 images.   |
| <b>Reserved capacity settings</b> |   |
| Alert me when...                  | Use the spinner box to adjust the percentage point at which the system sends an alert notification when the reserved capacity for a snapshot group is nearing full.<br><br>When the reserved capacity for the snapshot group exceeds the specified threshold, use the advance notice to increase reserved capacity or to delete unnecessary objects before the remaining space runs out.  |
| Policy for full reserved capacity | Choose one of the following policies: <ul style="list-style-type: none"><li>• <b>Purge oldest snapshot image</b> — The system automatically purges the oldest snapshot image in the snapshot group, which releases the snapshot image reserved capacity for reuse within the group.</li><li>• <b>Reject writes to base volume</b> — When the reserved capacity reaches its maximum defined percentage, the system rejects any I/O write request to the base volume that triggered the reserved capacity access.</li></ul> |

## Results

- System Manager displays the new snapshot image in the Snapshot Images table. The table lists the new image by timestamp and associated base volume or snapshot consistency group.
- Snapshot creation might remain in a Pending state because of the following conditions:
  - The base volume that contains this snapshot image is a member of an asynchronous mirror group.
  - The base volume is currently in a synchronization operation. The snapshot image creation completes as soon as the synchronization operation is complete.

## Schedule snapshot images

You create a snapshot schedule to enable recovery in case of a problem with the base volume and to perform scheduled backups. Snapshots of base volumes or snapshot consistency groups can be created on a daily, weekly, or monthly schedule, at any time of day.

### Before you begin

The base volume must be Optimal.



## About this task

This task describes how to create a snapshot schedule for an existing snapshot consistency group or base volume.



You also can create a snapshot schedule at the same time you create a snapshot image of a base volume or snapshot consistency group.

## Steps

1. Do one of the following actions to create a snapshot schedule:

- Select **Storage > Volumes**.

Select the object (volume or snapshot consistency group) for this snapshot schedule, and then select **Copy Services > Create snapshot schedule**.

- Select **Storage > Snapshots**.

Select the **Schedules** tab, and then click **Create**.

2. Select the object (volume or snapshot consistency group) for this snapshot schedule, and then click **Next**.

The Create Snapshot Schedule dialog box appears.

3. Do one of the following actions:

- **Use a previously defined schedule from another snapshot object.**

Make sure advanced options are displayed. Click **Show more options**. Click **Import Schedule**, select the object with the schedule you want to import, and then click **Import**.

- **Modify the basic or advanced options.**

In the upper right of the dialog box, click **Show more options** to display all options, and then refer to the following table.

## Field details

| Field                                      | Description  |
|--|--|
| <b>Basic settings</b>                      |  |
| Select days                                | Select individual days of the week for snapshot images.  |
| Start time                                 | From the drop-down list, select a new start time for the daily snapshots (selections are provided in half-hour increments). The start time defaults to one half-hour ahead of the current time.  |
| Time zone                                  | From the drop-down list, select your array's time zone.  |
| <b>Advanced settings</b>                   |  |
| Day / month                                | <p>Choose one of the following options:</p> <ul style="list-style-type: none"> <li>• <b>Daily / Weekly</b> — Select individual days for synchronization snapshots. You also can select the <b>Select all days</b> check box in the upper right if you want a daily schedule.</li> <li>• <b>Monthly / Yearly</b> — Select individual months for synchronization snapshots. In the <b>On day(s)</b> field, enter the days of the month for synchronizations to occur. Valid entries are <b>1</b> through <b>31</b> and <b>Last</b>. You can separate multiple days with a comma or semi-colon. Use a hyphen for inclusive dates. For example: 1,3,4,10-15,Last. You also can select the <b>Select all months</b> check box in the upper right if you want a monthly schedule.</li> </ul> |
| Start time                                 | From the drop-down list, select a new start time for the daily snapshots (selections are provided in half-hour increments). The start time defaults to one half-hour ahead of the current time.  |
| Time zone                                  | From the drop-down list, select your array's time zone.  |
| Snapshots per day / Time between snapshots | Select the number of snapshot images to create per day. If you select more than one, also select the time between snapshot images. For multiple snapshot images, be sure that you have adequate reserved capacity.   |
| Create snapshot image right now?           | Select this check box to create an instant image in addition to the automatic images you are scheduling.   |
| Start/End date or No end date              | Enter the start date for synchronizations to begin. Also enter an end date or select <b>No end date</b> .  |

#### 4. Do one of the following actions:

- If the object is a snapshot consistency group, click **Create** to accept the settings and create the schedule.

- If the object is a volume, click **Next** to allocate reserved capacity for the snapshot images.

The volume candidate table displays only the candidates that support the reserved capacity specified. Reserved capacity is the physical allocated capacity that is used for any copy service operation and storage object. It is not directly readable by the host.

5. Use the spinner box to allocate the reserved capacity for the snapshot images. Do one of the following actions:

- **Accept the default settings.**

Use this recommended option to allocate the reserved capacity for the snapshot images with the default settings.

- **Allocate your own reserved capacity settings to meet your data storage needs.**

If you change the default reserved capacity setting, click **Refresh Candidates** to refresh the candidate list for the reserved capacity you specified.

Allocate the reserved capacity using the following guidelines:

- The default setting for reserved capacity is 40% of the capacity of the base volume. Usually this capacity is sufficient.
- The capacity needed varies, depending on the frequency and size of I/O writes to the volumes and the quantity and duration of snapshot image collection.

6. Click **Next**.

The Edit Settings dialog box appears.

7. Edit the settings for the snapshot schedule as needed, and then click **Finish**.

## Field details

| Setting  | Description  |
|--|--|
| <b>Snapshot image limit</b>                          |  |
| Enable automatic deletion of snapshot images when... | Keep the check box selected if you want snapshot images automatically deleted after the specified limit; use the spinner box to change the limit. If you clear this check box, snapshot image creation stops after 32 images.  |
| <b>Reserved capacity settings</b>                    |  |
| Alert me when...                                     | Use the spinner box to adjust the percentage point at which the system sends an alert notification when the reserved capacity for a schedule is nearing full.<br><br>When the reserved capacity for the schedule exceeds the specified threshold, use the advance notice to increase reserved capacity or to delete unnecessary objects before the remaining space runs out.   |
| Policy for full reserved capacity                    | Choose one of the following policies: <ul style="list-style-type: none"><li>• <b>Purge oldest snapshot image</b> — The system automatically purges the oldest snapshot image, which releases the snapshot image reserved capacity for reuse within the snapshot group.</li><li>• <b>Reject writes to base volume</b> — When the reserved capacity reaches its maximum defined percentage, the system rejects any I/O write request to the base volume that triggered the reserved capacity access.</li></ul> |

## Create snapshot consistency group

To ensure that you have consistent copies, you can create a set of multiple volumes called a *snapshot consistency group*.

This group allows you to make snapshot images of all the volumes at the same time for consistency. Each volume that belongs to a snapshot consistency group is referred to as a *member volume*. When you add a volume to a snapshot consistency group, the system automatically creates a new snapshot group that corresponds to this member volume.

### About this task

The snapshot consistency group creation sequence lets you select member volumes for the group and allocate capacity to the member volumes.

The process to create a snapshot consistency group is a multi-step procedure.

### Step 1: Add members to snapshot consistency group

Select members to specify a collection of volumes that comprise the snapshot consistency group. Any actions

you perform on the snapshot consistency group extend uniformly to selected member volumes.

### Before you begin

The member volumes must be Optimal.

### Steps

1. Select **Storage > Snapshots**.
2. Click the **Snapshot Consistency Groups** tab.
3. Select **Create > Snapshot consistency group**.

The Create Snapshot Consistency Group dialog box appears.

4. Select the volume(s) to be added as member volumes to the snapshot consistency group.
5. Click **Next**, and go to [Step 2: Reserve capacity for snapshot consistency group](#).

### Step 2: Reserve capacity for snapshot consistency group

Associate reserved capacity to the snapshot consistency group. System Manager suggests the volumes and capacity based on the properties of the snapshot consistency group. You can accept the recommended reserved capacity configuration or customize the allocated storage.

#### About this task

On the Reserve Capacity dialog box, the volume candidate table displays only the candidates that support the reserved capacity specified. Reserved capacity is the physical allocated capacity that is used for any copy service operation and storage object. It is not directly readable by the host.

### Steps

1. Use the spinner box to allocate the reserved capacity for the snapshot consistency group. Do one of the following actions:

- **Accept the default settings.**

Use this recommended option to allocate the reserved capacity for each member volume with the default settings.

- **Allocate your own reserved capacity settings to meet your data storage needs.**

Allocate the reserved capacity using the following guidelines.

- The default setting for reserved capacity is 40% of the capacity of the base volume. Usually this capacity is sufficient.
- The capacity needed varies, depending on the frequency and size of I/O writes to the volumes and the quantity and duration of snapshot image collection.

2. **Optional:** If you change the default reserved capacity setting, click **Refresh Candidates** to refresh the candidate list for the reserved capacity you specified.
3. Click **Next**, and go to [Step 3: Edit settings for snapshot consistency group](#).

### Step 3: Edit settings for snapshot consistency group

Accept or choose automatic deletion settings and reserved capacity alert thresholds for the snapshot consistency group.

## About this task

The snapshot consistency group creation sequence lets you select member volumes for the group and allocate capacity to the member volumes.

## Steps

1. Accept or change the default settings for the snapshot consistency group as appropriate.

### Field details

| Setting  | Description   |
|--|---|
| <b>Snapshot consistency group settings</b>           |   |
| Name   | Specify the name for the snapshot consistency group.  |
| Enable automatic deletion of snapshot images when... | Keep the check box selected if you want snapshot images automatically deleted after the specified limit; use the spinner box to change the limit. If you clear this check box, snapshot image creation stops after 32 images.   |
| <b>Reserved capacity settings</b>                    |   |
| Alert me when...                                     | Use the spinner box to adjust the percentage point at which the system sends an alert notification when the reserved capacity for a snapshot consistency group is nearing full.<br><br>When the reserved capacity for the snapshot consistency group exceeds the specified threshold, use the advance notice to increase reserved capacity or to delete unnecessary objects before the remaining space runs out.  |
| Policy for full reserved capacity                    | Choose one of the following policies: <ul style="list-style-type: none"><li>• <b>Purge oldest snapshot image</b> — The system automatically purges the oldest snapshot image in the snapshot consistency group, which releases the snapshot image reserved capacity for reuse within the group.</li><li>• <b>Reject writes to base volume</b> — When the reserved capacity reaches its maximum defined percentage, the system rejects any I/O write request to the base volume that triggered the reserved capacity access.</li></ul> |

2. After you are satisfied with your snapshot consistency group configuration, click **Finish**.

## Create snapshot volume

You create a snapshot volume to provide host access to a snapshot image of a volume or snapshot consistency group. You can designate the snapshot volume as either read-only or read-write.

## About this task

The snapshot volume creation sequence lets you create a snapshot volume from a snapshot image and provides options to allocate reserved capacity if the volume is read/write. A snapshot volume can be designated as one of the following:

- A read-only snapshot volume provides a host application with read access to a copy of the data contained in the snapshot image, but without the ability to modify the snapshot image. A read-only snapshot volume does not have associated reserved capacity.
- A read-write snapshot volume provides the host application with write access to a copy of the data contained in the snapshot image. It has its own reserved capacity that is used to save any subsequent modifications made by the host application to the base volume without affecting the referenced snapshot image.

The process to create a snapshot volume is a multi-step procedure.

### Step 1: Review members for a snapshot volume

Select either a snapshot image of a base volume or a snapshot consistency group. If you select a snapshot consistency group snapshot image, the member volumes of the snapshot consistency group appear for review.

#### Steps

1. Select **Storage > Snapshots**.
2. Select the **Snapshot Volumes** tab.
3. Select **Create**.

The Create Snapshot Volume dialog box appears.

4. Select the snapshot image (volume or snapshot consistency group) you want to convert into a snapshot volume, and then click **Next**. Use a text entry in the **Filter** field to narrow down the list.

If the selection was for a snapshot consistency group snapshot image, the Review Members dialog box appears.

On the Review Members dialog box, review the list of volumes that are selected for conversion to snapshot volumes, and then click **Next**.

5. Go to [Step 2: Assign snapshot volume to host](#).

### Step 2: Assign snapshot volume to host

Select a specific host or host cluster to assign it to the snapshot volume. This assignment grants a host or host cluster access to the snapshot volume. You can choose to assign a host later, if needed.

#### Before you begin

- Valid hosts or host clusters exist under the Hosts page.
- Host port identifiers must have been defined for the host.
- Before creating a DA-enabled volume, verify that your planned host connection supports the Data Assurance (DA) feature. If any of the host connections on the controllers in your storage array do not support DA, the associated hosts cannot access data on DA-enabled volumes.

## About this task

When you assign volumes, keep these guidelines in mind:

- A host's operating system can have specific limits on how many volumes the host can access.
- You can define one host assignment for each snapshot volume in the storage array.
- Assigned volumes are shared between controllers in the storage array.
- The same logical unit number (LUN) cannot be used twice by a host or a host cluster to access a snapshot volume. You must use a unique LUN.



Assigning a volume to a host fails if you try to assign a volume to a host cluster that conflicts with an established assignment for a host in the host cluster.

## Steps

1. On the **Assign to Host** dialog box, select the host or host cluster that you want to assign to the new volume. If you want to create the volume without assigning a host, select **Assign later** from the drop-down list.
2. Select the access mode. Choose one of the following:
  - **Read/write** — This option provides the host with read/write access to the snapshot volume and requires reserved capacity.
  - **Read only** — This option provides the host with read-only access to the snapshot volume and does not require reserved capacity.
3. Click **Next**, and do one of the following:
  - If your snapshot volume is read/write, the Review Capacity dialog box appears. Go to [Step 3: Reserve capacity for a snapshot volume](#).
  - If your snapshot volume is read only, the Edit Priority dialog box appears. Go to [Step 4: Edit settings for a snapshot volume](#).

## Step 3: Reserve capacity for a snapshot volume

Associate reserved capacity to a read/write snapshot volume. System Manager suggests the volumes and capacity based on the properties of the base volume or snapshot consistency group. You can accept the recommended reserved capacity configuration or customize the allocated storage.

### About this task

You can increase or decrease the reserved capacity for the snapshot volume as needed. If you find that the snapshot reserved capacity is larger than you need, you can reduce its size to free up space that is needed by other logical volumes.

## Steps

1. Use the spinner box to allocate the reserved capacity for the snapshot volume.

The Volume Candidate table displays only the candidates that support the reserved capacity specified.

Do one of the following actions:

- **Accept the default settings.**

Use this recommended option to allocate the reserved capacity for the snapshot volume with the default settings.

- **Allocate your own reserved capacity settings to meet your data storage needs.**



If you change the default reserved capacity setting, click **Refresh Candidates** to refresh the candidate list for the reserved capacity you specified.

Allocate the reserved capacity using the following guidelines.

- The default setting for reserved capacity is 40% of the capacity of the base volume, and usually this capacity is sufficient.
  - The capacity needed varies, depending on the frequency and size of I/O writes to the volumes and the quantity and duration of snapshot image collection.
2. **Optional:** If you are creating the snapshot volume for a snapshot consistency group, the option to "Change candidate" appears in the Reserved Capacity Candidates table. Click **Change candidate** to select an alternate reserved capacity candidate.
  3. Click **Next**, and go to [Step 4: Edit settings for a snapshot volume](#).

#### Step 4: Edit settings for a snapshot volume

Change the settings for a snapshot volume such as its name, caching, reserved capacity alert thresholds, and so on.

##### About this task

You can add the volume to solid-state disk (SSD) cache as a way to improve read-only performance. SSD cache consists of a set of SSD drives that you logically group together in your storage array.

##### Steps

1. Accept or change the settings for the snapshot volume as appropriate.

##### Field details

| Setting                           | Description   |
|-----------------------------------|---|
| <b>Snapshot volume settings</b>   |   |
| Name                              | Specify the name for the snapshot volume.   |
| Enable SSD Cache                  | Choose this option to enable read-only caching on SSDs. NOTE: This feature is not available on the EF600 or EF300 storage system.   |
| <b>Reserved capacity settings</b> |   |
| Alert me when...                  | <b>Appears only for a read/write snapshot volume.</b><br><br>Use the spinner box to adjust the percentage point at which the system sends an alert notification when the reserved capacity for a snapshot group is nearing full.<br><br>When the reserved capacity for the snapshot group exceeds the specified threshold, use the advance notice to increase reserved capacity or to delete unnecessary objects before the remaining space runs out. |

2. Review the snapshot volume configuration. Click **Back** to make any changes.
3. When you are satisfied with your snapshot volume configuration, click **Finish**.

## Manage snapshot schedules

### Change the settings for a snapshot schedule

For a snapshot schedule, you can change automatic collection times or the frequency of collection.

#### About this task

You can import settings from an existing snapshot schedule, or you can modify settings as needed.

Because a snapshot schedule is associated to a snapshot group or snapshot consistency group, reserved capacity might be affected by changes to schedule settings.

#### Steps

1. Select **Storage > Snapshots**.
2. Click the **Schedules** tab.
3. Select the snapshot schedule that you want to change, and then click **Edit**.

The Edit Snapshot Schedule dialog box appears.

4. Do one of the following:
  - **Use a previously defined schedule from another snapshot object** — Click **Import Schedule**, select the object with the schedule you want to import, and then click **Import**.
  - **Edit the schedule settings** — Refer to Field Details below.

## Field details

| Setting                | Description  |
|------------------------|--|
| Day / month            | Choose one of the following options: <ul style="list-style-type: none"><li>• <b>Daily / Weekly</b> — Select individual days for synchronization snapshots. You also can select the <b>Select all days</b> check box in the upper right if you want a daily schedule.</li><li>• <b>Monthly / Yearly</b> — Select individual months for synchronization snapshots. In the <b>On day(s)</b> field, enter the days of the month for synchronizations to occur. Valid entries are <b>1</b> through <b>31</b> and <b>Last</b>. You can separate multiple days with a comma or semi-colon. Use a hyphen for inclusive dates. For example: 1,3,4,10-15,Last. You also can select the <b>Select all months</b> check box in the upper right if you want a monthly schedule.</li></ul> |
| Start time             | From the drop-down list, select a new start time for the daily snapshots. Selections are provided in half-hour increments. The start time defaults to one half-hour ahead of the current time.   |
| Time zone              | From the drop-down list, select your storage array's time zone.  |
| Snapshots per day      | Select the number of snapshot images to create per day.  |
| Time between snapshots | If you select more than one, also select the time between restore points. For multiple restore points, be sure that you have adequate reserved capacity.   |
| Start date             | Enter the start date for synchronizations to begin. Also enter an end date or select <b>No end date</b> .  |
| End date               |  |
| No end date            |  |

5. Click **Save**.

## Activate and suspend snapshot schedule

You can temporarily suspend scheduled collection of snapshot images when you need to conserve storage space. This method is more efficient than deleting and later re-creating the snapshot schedule.

### About this task

The state of the snapshot schedule stays suspended until you use the **Activate** option to resume scheduled snapshot activity.

### Steps

1. Select **Storage > Snapshots**.

2. If it is not already displayed, click the **Schedules** tab.

The schedules are listed on the page.

3. Select an active snapshot schedule that you want to suspend, and then click **Activate / Suspend**.

The State column status changes to **Suspended**, and the snapshot schedule stops collection of all snapshot images.

4. To resume collecting snapshot images, select the suspended snapshot schedule that you want to resume, and then click **Activate / Suspend**.

The State column status changes to **Active**.

## Delete snapshot schedule

If you no longer want to collect snapshot images, you can delete an existing snapshot schedule.

### About this task

When you delete a snapshot schedule, the associated snapshot images are not deleted along with it. If you think the collection of snapshot images might be resumed at some point, you should suspend the snapshot schedule rather than delete it.

### Steps

1. Select **Storage > Snapshots**.
2. Click the **Schedules** tab.
3. Select the snapshot schedule that you want to delete, and confirm the operation.

### Results

The system removes all schedule attributes from the base volume or snapshot consistency group.

## Manage snapshot images

### View snapshot image settings

You can view the properties, status, reserved capacity, and associated objects assigned to each snapshot image.

### About this task

Associated objects for a snapshot image include the base volume or snapshot consistency group for which this snapshot image is a restore point, the associated snapshot group, and any snapshot volumes created from the snapshot image. Use the snapshot settings to determine whether you want to copy or convert the snapshot image.

### Steps

1. Select **Storage > Snapshots**.
2. Click the **Snapshot Images** tab.
3. Select the snapshot image that you want to view, and then click **View Settings**.

The Snapshot Image Settings dialog box appears.

4. View the settings for the snapshot image.

## Start snapshot image rollback for a base volume

You can perform a rollback operation to change the content of a base volume to match the content that is saved in a snapshot image.

The rollback operation does not change the content of the snapshot images that are associated with the base volume.

### Before you begin

- Enough reserved capacity is available to start a rollback operation.
- The selected snapshot image is Optimal and the selected volume is Optimal.
- The selected volume does not have a rollback operation already in progress.

### About this task

The rollback start sequence lets you start rollback on a snapshot image of a base volume while providing options to add storage capacity. You cannot start more than one rollback operation for a base volume at a time.



The host can immediately access the new rolled-back base volume, but the existing base volume does not allow the host read-write access after the rollback begins. You can create a snapshot of the base volume just before starting the rollback to preserve the pre-rollback base volume for recovery.

### Steps

1. Select **Storage > Snapshots**.
2. Select the **Snapshot Images** tab.
3. Select the snapshot image, and then select **Rollback > Start**.

The Confirm Start Rollback dialog box appears.

4. **Optional:** Select the option to **Increase Capacity** if necessary.

The Increase Reserved Capacity dialog box appears.

- a. Use the spinner box to adjust the capacity percentage.

If free capacity does not exist on the pool or volume group that contains the storage object you selected and the storage array has Unassigned Capacity, you can add capacity. You can create a new pool or volume group and then retry this operation using the new free capacity on that pool or volume group.

- b. Click **Increase**.

5. Confirm that you want to perform this operation, and then click **Rollback**.

### Results

System Manager performs the following actions:

- Restores the volume with the content saved on the selected snapshot image.
- Makes the rolled-back volumes immediately available for host access. You do not need to wait for the rollback operation to complete.

### After you finish

Select **Home** › **View Operations in Progress** to view the progress of the rollback operation.

If the rollback operation is not successful, the operation pauses. You can resume the paused operation and, if still unsuccessful, follow the Recovery Guru procedure to correct the problem or contact technical support.

## Start snapshot image rollback for snapshot consistency group member volumes

You can perform a rollback operation to change the content of snapshot consistency group member volumes to match the content that is saved in a snapshot image.

The rollback operation does not change the content of the snapshot images that are associated with the snapshot consistency group.

### Before you begin

- Enough reserved capacity is available to start a rollback operation.
- The selected snapshot image is Optimal and the selected volume is Optimal.
- The selected volume does not have a rollback operation already in progress.

### About this task

The rollback start sequence lets you start rollback on a snapshot image of a snapshot consistency group while providing options to add storage capacity. You cannot start more than one rollback operation for a snapshot consistency group at a time.



The host has immediate access to the new rolled-back volumes, but the existing member volumes no longer allow host read-write access after the rollback starts. You can create a snapshot image of the member volumes just before starting the rollback to preserve the pre-rollback base volumes for recovery purposes.

The process to start rollback of a snapshot image of a snapshot consistency group is a multi-step procedure.

### Step 1: Select members

You must select the member volumes to be rolled back.

#### Steps

1. Select **Storage** › **Snapshots**.
2. Select the **Snapshot Images** tab.
3. Select the snapshot consistency group snapshot image, and then select **Rollback** › **Start**.

The Start Rollback dialog box appears.

4. Select the member volume or volumes.
5. Click **Next**, and do one of the following:
  - If any of the selected member volumes are associated with more than one reserved capacity object

that stores snapshot images, the Review Capacity dialog box appears. Go to [Step 2: Review capacity](#).

- If none of the selected member volumes are associated with more than one reserved capacity object that stores snapshot images, the Edit Priority dialog box appears. Go to [Step 3: Edit priority](#).

## Step 2: Review capacity

If you selected member volumes associated to more than one reserved capacity object, such as a snapshot group and reserved capacity volume, you can review and increase reserved capacity for the rolled-back volume(s).

### Steps

1. Next to any member volumes with very low (or zero) reserved capacity, click the **Increase capacity** link in the **Edit** column.

The Increase Reserved Capacity dialog box appears.

2. Use the spinner box to adjust the capacity percentage, and then click **Increase**.

If free capacity does not exist on the pool or volume group that contains the storage object you selected and the storage array has Unassigned Capacity, you can add capacity. You can create a new pool or volume group and retry this operation using the new free capacity on that pool or volume group.

3. Click **Next**, and go to [Step 3: Edit priority](#).

The Edit Priority dialog box appears.

## Step 3: Edit priority

You can edit the priority of the rollback operation if needed.

### About this task

The rollback priority determines how many system resources are dedicated to the rollback operation at the expense of system performance.

### Steps

1. Use the slider to adjust the rollback priority as needed.
2. Confirm that you want to perform this operation, and then click **Finish**.

### Results

System Manager performs the following actions:

- Restores the snapshot consistency group member volumes with the content saved on the selected snapshot image.
- Makes the rolled-back volumes immediately available for host access. You do not need to wait for the rollback operation to complete.

### After you finish

Select **Home** > **View Operations in Progress** to view the progress of the rollback operation.

If the rollback operation is not successful, the operation pauses. You can resume the paused operation and, if still unsuccessful, follow the Recovery Guru procedure to correct the problem or contact technical support.

## Resume snapshot image rollback

If an error occurs during a snapshot image rollback operation, the operation is automatically paused. You can resume a rollback operation that is in a paused state.

### Steps

1. Select **Storage > Snapshots**.
2. Click the **Snapshot Images** tab.
3. Highlight the paused rollback, and then select **Rollback > Resume**.

The operation resumes.

### Results

System Manager performs the following actions:

- If the rollback operation resumes successfully, you can view the progress of the rollback operation in the Operations in Progress window.
- If the rollback operation is not successful, the operation pauses again. You can follow the Recovery Guru procedure to correct the problem or contact technical support.

## Cancel snapshot image rollback

You can cancel an active rollback that is in progress (actively copying data), a pending rollback (in a pending queue awaiting resources to start), or a rollback that has been paused due to an error.

### About this task

When you cancel a rollback operation that is in progress, the base volume reverts to an unusable state and appears as failed. Therefore, consider canceling a rollback operation only when recovery options exist for restoring the content of the base volume.



If the snapshot group on which the snapshot image resides has one or more snapshot images that have been automatically purged, the snapshot image used for the rollback operation might not be available for future rollbacks.

### Steps

1. Select **Storage > Snapshots**.
2. Click the **Snapshot Images** tab.
3. Select the active or paused rollback, and then select **Rollback > Cancel**.

The Confirm Cancel Rollback dialog box appears.

4. Click **Yes** to confirm.

### Results

System Manager stops the rollback operation. The base volume is usable but might have data that is inconsistent or not intact.

### After you finish



After you cancel a rollback operation, you must take one of the following actions:

- Reinitialize the content of the base volume.
- Perform a new rollback operation to restore the base volume using either the same snapshot image that was used in the Cancel Rollback operation or a different snapshot image to perform the new rollback operation.

## Delete snapshot image

You delete snapshot images to clean up the oldest snapshot image from a snapshot group or snapshot consistency group.

### About this task

You can delete a single snapshot image, or you can delete snapshot images from snapshot consistency groups that have the same creation timestamp. You also can delete snapshot images from a snapshot group.

You cannot delete a snapshot image if it is not the oldest snapshot image for the associated base volume or snapshot consistency group.

### Steps

1. Select **Storage > Snapshots**.
2. Click the **Snapshot Images** tab.
3. Select the snapshot image that you want to delete, and confirm that you want to perform the operation.

If you selected a snapshot image of a snapshot consistency group, select each member volume that you want to delete, and confirm that you want to perform the operation.

4. Click **Delete**.

### Results

System Manager performs the following actions:

- Deletes the snapshot image from the storage array.
- Releases the reserved capacity for reuse within the snapshot group or snapshot consistency group.
- Disables all the associated snapshot volumes that exist for the deleted snapshot image.
- From a snapshot consistency group deletion, moves any member volume associated with the deleted snapshot image to a Stopped state.

## Manage snapshot consistency groups

### Add member volume to a snapshot consistency group

You can add a new member volume to an existing snapshot consistency group. When you add a new member volume, you also must reserve capacity for the member volume.

### Before you begin

- The member volume must be Optimal.
- The snapshot consistency group must have less than the maximum number of allowable volumes (as

defined by your configuration).

- Each reserved capacity volume must have the same Data Assurance (DA) and security settings as the associated member volume.

### About this task

You can add standard volumes or thin volumes to the snapshot consistency group. The base volume can reside in either a pool or volume group.

### Steps

1. Select **Storage > Snapshots**.
2. Select the **Snapshot Consistency Groups** tab.

The table appears and displays all the snapshot consistency groups associated with the storage array.

3. Select the snapshot consistency group you want to modify, and then click **Add Members**.

The Add Members dialog box appears.

4. Select the member volume(s) you want to add, and then click **Next**.

The Reserve Capacity step appears. The Volume Candidate table displays only the candidates that support the reserved capacity specified.

5. Use the spinner box to allocate the reserved capacity for the member volume. Do one of the following actions:

- **Accept the default settings.**

Use this recommended option to allocate the reserved capacity for the member volume with the default settings.

- **Allocate your own reserved capacity settings to meet your data storage needs.**

If you change the default reserved capacity setting, click **Refresh Candidates** to refresh the candidate list for the reserved capacity you specified.

Allocate the reserved capacity using the following guidelines.

- The default setting for reserved capacity is 40% of the capacity of the base volume, and usually this capacity is sufficient.
- The capacity needed varies, depending on the frequency and size of I/O writes to the volumes and the quantity and duration of snapshot image collection.

6. Click **Finish** to add the member volumes.

## Remove a member volume from a snapshot consistency group

You can remove a member volume from an existing snapshot consistency group.

### About this task

When you remove a member volume from a snapshot consistency group, System Manager automatically deletes the snapshot objects associated with that member volume.

### Steps

1. Select **Storage > Snapshots**.
2. Click the **Snapshot Consistency Groups** tab.
3. Expand the snapshot consistency group you want to modify by selecting the plus (+) sign next to it.
4. Select the member volume that you want to remove, and then click **Remove**.
5. Confirm that you want to perform the operation, and then click **Remove**.

## Results

System Manager performs the following actions:

- Deletes all snapshot images and snapshot volumes associated with the member volume.
- Deletes the snapshot group associated with the member volume.
- The member volume is not otherwise changed or deleted.

## Change the settings for a snapshot consistency group

Change the settings for a snapshot consistency group when you want to change its name, automatic deletion settings, or the maximum number of allowed snapshot images.

### Steps

1. Select **Storage > Snapshots**.
2. Click the **Snapshot Consistency Groups** tab.
3. Select the snapshot consistency group that you want to edit, and then click **View/Edit Settings**.

The Snapshot Consistency Group Setting dialog box appears.

4. Change the settings for the snapshot consistency group as appropriate.

## Field details

| Setting                                    | Description   |
|--|---|
| <b>Snapshot consistency group settings</b> |   |
| Name                                       | You can change the name for the snapshot consistency group.   |
| Auto-deletion                              | Keep the check box selected if you want snapshot images automatically deleted after the specified limit; use the spinner box to change the limit. If you clear this check box, snapshot image creation stops after 32 images. |
| Snapshot image limit                       | You can change the maximum number of snapshot images allowed for a snapshot group.  |
| Snapshot schedule                          | This field indicates whether a schedule is associated with the snapshot consistency group.  |
| <b>Associated objects</b>                  |   |
| Member volumes                             | You can view the quantity of member volumes associated with the snapshot consistency group.   |

5. Click **Save**.

## Delete snapshot consistency group

You can delete snapshot consistency groups that are no longer needed.

### Before you begin

Confirm that the images for all member volumes are no longer needed for backup or testing purposes.

### About this task

This operation deletes all the snapshot images or schedules associated with the snapshot consistency group.

### Steps

1. Select **Storage > Snapshots**.
2. Select the **Snapshot Consistency Groups** tab.
3. Select the snapshot consistency group that you want to delete, and then select **Uncommon Tasks > Delete**.

The Confirm Delete Snapshot Consistency Group dialog box appears.

4. Confirm that you want to perform this operation, and then click **Delete**.

### Results

System Manager performs the following actions:

- Deletes all existing snapshot images and snapshot volumes from the snapshot consistency group.
- Deletes all the associated snapshot images that exist for each member volume in the snapshot consistency group.
- Deletes all the associated snapshot volumes that exist for each member volume in the snapshot consistency group.
- Deletes all associated reserved capacity for each member volume in the snapshot consistency group (if selected).

## Manage snapshot volumes

### Convert snapshot volume to read-write mode

You can convert a read-only snapshot volume or a snapshot consistency group snapshot volume to read-write mode if needed.

A snapshot volume that is converted to read-write accessible contains its own reserved capacity. This capacity is used to save any subsequent modifications made by the host application to the base volume without affecting the referenced snapshot image.

#### Steps

1. Select **Storage > Snapshots**.
2. Select the **Snapshot Volumes** tab.

The Snapshot Volumes table appears and displays all the snapshot volumes associated with the storage array.

3. Select the read-only snapshot volume you want to convert, and then click **Convert to Read/Write**.

The Convert to Read/Write dialog box appears with the **Reserve Capacity** step activated. The Volume Candidate table displays only the candidates that support the reserved capacity specified.

4. To allocate the reserved capacity for the read-write snapshot volume, do one of the following actions:
  - **Accept the default settings** — Use this recommended option to allocate the reserved capacity for the snapshot volume with the default settings.
  - **Allocate your own reserved capacity settings to meet your data storage needs** — Allocate the reserved capacity using the following guidelines.
    - The default setting for reserved capacity is 40% of the capacity of the base volume, and usually this capacity is sufficient.
    - The capacity needed varies, depending on the frequency and size of I/O writes to the volume.
5. Select **Next** to review or edit settings.

The Edit Settings dialog box appears.

6. Accept or specify the settings for the snapshot volume as appropriate, and then select **Finish** to convert the snapshot volume.

## Field details

| Setting                           | Description  |
|-----------------------------------|--|
| <b>Reserved capacity settings</b> |  |
| Alert me when...                  | <p>Use the spinner box to adjust the percentage point at which the system sends an alert notification when the reserved capacity for a snapshot group is nearing full.</p> <p>When the reserved capacity for the snapshot volume exceeds the specified threshold, the system sends an alert, allowing you time to increase reserved capacity or to delete unnecessary objects.</p> |

## Change the volume settings for a snapshot volume

You can change the settings for a snapshot volume or snapshot consistency group snapshot volume to rename it, enable or disable SSD caching, or change the host, host cluster, or logical unit number (LUN) assignment.

### Steps

1. Select **Storage > Snapshots**.
2. Click the **Snapshot Volumes** tab.
3. Select the snapshot volume that you want to change, and then click **View/Edit Settings**.

The Snapshot Volume Settings dialog box appears.

4. View or edit the settings for the snapshot volume as appropriate.

## Field details

| Setting                   | Description  |
|---------------------------|--|
| <b>Snapshot volume</b>    |  |
| Name                      | You can change the name for the snapshot volume.   |
| Assigned to               | You can change the host or host cluster assignment for the snapshot volume.  |
| LUN                       | You can change the LUN assignment for the snapshot volume.   |
| SSD Cache                 | You can enable/disable read-only caching on solid state disks (SSDs).  |
| <b>Associated objects</b> |  |
| Snapshot image            | You can view the snapshot images associated with the snapshot volume. A snapshot image is a logical copy of volume data, captured at a particular point-in-time. Like a restore point, snapshot images allow you to roll back to a known good data set. Although the host can access the snapshot image, it cannot directly read or write to it. |
| Base volume               | You can view the base volume associated with the snapshot volume. A base volume is the source from which a snapshot image is created. It can be a thick or thin volume and is typically assigned to a host. The base volume can reside in either a volume group or disk pool.  |
| Snapshot group            | You can view the snapshot group associated with the snapshot volume. A snapshot group is a collection of snapshot images from a single base volume.  |

## Copy snapshot volume

You can perform a Copy Volume process on a snapshot volume or a snapshot consistency group snapshot volume.

### About this task

You can copy a snapshot volume to the target volume as performed in a normal Copy Volume operation. However, snapshot volumes cannot remain online during the copy volume process.

### Steps

1. Select **Storage > Snapshots**.
2. Select the **Snapshot Volumes** tab.

The Snapshot Volumes table appears and displays all the snapshot volumes associated with the storage array.

3. Select the snapshot volume that you want to copy, and then select **Copy Volume**.

The Copy Volume dialog box appears, prompting you to select a target.

4. Select the target volume to be used as the copy destination, and then click **Finish**.

## Re-create snapshot volume

You can re-create a snapshot volume or a snapshot consistency group snapshot volume that you previously disabled. Re-creating a snapshot volume takes less time than creating a new one.

### Before you begin

- The snapshot volume must be in either an Optimal or Disabled state.
- All member snapshot volumes must be in a Disabled state before you can re-create the snapshot consistency group snapshot volume.

### About this task

You cannot re-create an individual member snapshot volume; you can re-create only the overall snapshot consistency group snapshot volume.



If the snapshot volume or snapshot consistency group snapshot volume is part of an online copy relationship, you cannot perform the re-create option on the volume.

### Steps

1. Select **Storage > Snapshots**.

2. Select the **Snapshot Volumes** tab.

The Snapshot Volumes table appears and displays all the snapshot volumes associated with the storage array.

3. Select the snapshot volume that you want to re-create, and then select **Uncommon Tasks > Recreate**.

The Recreate Snapshot Volume dialog box appears.

4. Select one of the following options:

- **An existing snapshot image created from volume <name>**

Select this option to indicate an existing snapshot image from which to re-create the snapshot volume.

- **A new (instant) snapshot image of volume <name>**

Select this option to create a new snapshot image from which to re-create the snapshot volume.

5. Click **Recreate**.

### Results

System Manager performs the following actions:

- Deletes all `write` data on any associated snapshot repository volume.



- Snapshot volume or snapshot consistency group snapshot volume parameters remain the same as the previously disabled volume parameters.
- Retains the original names for the snapshot volume or snapshot consistency group snapshot volume.

## Disable snapshot volume

You can disable a snapshot volume or a snapshot volume in a snapshot consistency group when you no longer need it or want to temporarily stop using it.

### About this task

Use the Disable option if one of these conditions applies:

- You are finished with the snapshot volume or snapshot consistency group snapshot volume for the time being.
- You intend to re-create the snapshot volume or snapshot consistency group snapshot volume (that is designated as read-write) at a later time and want to retain the associated reserved capacity so you do not need to create it again.
- You want to increase the storage array performance by stopping write activity to a read-write snapshot volume.

If the snapshot volume or snapshot consistency group snapshot volume is designated as read-write, this option also lets you stop any further write activity to its associated reserved capacity volume. If you decide to re-create the snapshot volume or snapshot consistency group snapshot volume, you must choose a snapshot image from the same base volume.



If the snapshot volume or snapshot consistency group snapshot volume is part of an online copy relationship, you cannot perform the Disable option on the volume.

### Steps

1. Select **Storage > Snapshots**.
2. Select the **Snapshot Volumes** tab.

System Manager displays all the snapshot volumes associated with the storage array.

3. Select the snapshot volume that you want to disable, and then select **Uncommon Tasks > Disable**.
4. Confirm that you want to perform the operation, and then click **Disable**.

### Results

- The snapshot volume remains associated with its base volume.
- The snapshot volume retains its World Wide Name (WWN).
- If read-write, the snapshot volume retains its associated reserved capacity.
- The snapshot volume retains any host assignments and access. However, read-write requests fail.
- The snapshot volume loses its association with its snapshot image.

## Delete snapshot volume

You can delete a snapshot volume or a snapshot consistency group snapshot volume that is no longer needed for backup or software application testing purposes.

You can also specify whether you want to delete the snapshot reserved capacity volume associated with a `read-write` snapshot volume or retain the snapshot reserved capacity volume as an unassigned volume.

### About this task

Deleting a base volume automatically deletes any associated snapshot volume or consistency group snapshot volume. You cannot delete a snapshot volume that is in a volume copy with a status of **In Progress**.

### Steps

1. Select **Storage** > **Snapshots**.
2. Select the **Snapshot Volumes** tab.

System Manager displays all the snapshot volumes associated with the storage array.

3. Select the snapshot volume that you want to delete, and then select **Uncommon Tasks** > **Delete**.
4. Confirm that you want to perform the operation, and then click **Delete**.

### Results

System Manager performs the following actions:

- Deletes all member snapshot volumes (for a snapshot consistency group snapshot volume).
- Removes all associated host assignments.

## FAQs

### Why don't I see all my volumes, hosts, or host clusters?

Snapshot volumes with a DA-enabled base volume are not eligible to be assigned to a host that is not Data Assurance (DA) capable. You must disable DA on the base volume before a snapshot volume can be assigned to a host that is not DA capable.

Consider the following guidelines for the host to which you are assigning the snapshot volume:

- A host is not DA capable if it is connected to the storage array through an I/O interface that is not DA capable.
- A host cluster is not DA capable if it has at least one host member that is not DA capable.



You cannot disable DA on a volume that is associated with snapshots (consistency groups, snapshot groups, snapshot images, and snapshot volumes), volume copies, and mirrors. All associated reserved capacity and snapshot objects must be deleted before DA can be disabled on the base volume.

### What is a snapshot image?

A snapshot image is a logical copy of volume content, captured at a particular point in time. Snapshot images use minimal storage space.

Snapshot image data is stored as follows:

- When a snapshot image is created, it exactly matches the base volume. After the snapshot is taken, when

the first write request occurs for any block or set of blocks on the base volume, the original data is copied to the snapshot reserved capacity before the new data is written to the base volume.

- Subsequent snapshots include only data blocks that have changed since the first snapshot image was created. Each subsequent copy-on-write operation saves original data that is about to be overwritten on the base volume to the snapshot reserved capacity before the new data is written to the base volume.

## Why use snapshot images?

You can use snapshots to protect against and allow recovery from accidental or malicious loss or corruption of data.

Select a base volume or a group of base volumes, called a snapshot consistency group, and then capture snapshot images in one or more of the following ways:

- You can create a snapshot image of a single base volume or a snapshot consistency group consisting of multiple base volumes.
- You can take snapshots manually or create a schedule for a base volume or snapshot consistency group to automatically capture periodic snapshot images.
- You can create a host-accessible snapshot volume of a snapshot image.
- You can perform a rollback operation to restore a snapshot image.

The system retains multiple snapshot images as restore points you can use to roll back to known good data sets at specific points in time. The ability to roll back provides protection against accidental deletion of data and data corruption.

## What kinds of volumes can be used for snapshots?

Standard volumes and thin volumes are the only types of volumes that can be used to store snapshot images. Non-standard volumes cannot be used. The base volume can reside on either a pool or volume group.

## Why would I create a snapshot consistency group?

You create a snapshot consistency group when you want to make sure snapshot images are taken on multiple volumes at the same time.

For example, a database made up of multiple volumes that need to stay consistent for recovery purposes would require a snapshot consistency group to collect coordinated snapshots of all volumes and use them to restore the entire database.

The volumes included in a snapshot consistency group are called *member volumes*.

You can perform the following snapshot operations on a snapshot consistency group:

- Create a snapshot image of a snapshot consistency group to get simultaneous images of the member volumes.
- Create a schedule for the snapshot consistency group to automatically capture periodic simultaneous images of the member volumes.
- Create a host-accessible snapshot volume of a snapshot consistency group image.

- Perform a rollback operation for a snapshot consistency group.

## What is a snapshot volume and when does it need reserved capacity?

A snapshot volume allows the host to access data in the snapshot image. The snapshot volume contains its own reserved capacity, which saves any modifications to the base volume without affecting the original snapshot image. Snapshot images are not read- or write-accessible to hosts. If you want to read or write to snapshot data, create a snapshot volume and assign it to a host.

You can create two types of snapshot volumes. The type of snapshot volume determines if it uses reserved capacity.

- **Read-only** — A snapshot volume that is created as read-only provides a host application with read access to a copy of the data contained in the snapshot image. A read-only snapshot volume does not use reserved capacity.
- **Read-write** — A snapshot volume that is created as read-write allows you to make changes to the snapshot volume without affecting the referenced snapshot image. A read-write snapshot volume uses reserved capacity to store these changes. You can convert a read-only snapshot volume to read-write at any time.

## What is a snapshot group?

A snapshot group is a collection of point-in-time snapshot images of a single associated base volume.

System Manager organizes snapshot images into *snapshot groups*. Snapshot groups require no user action, but you can adjust reserved capacity on a snapshot group at any time. Additionally, you might be prompted to create reserved capacity when the following conditions are met:

- Any time you take a snapshot of a base volume that does not yet have a snapshot group, System Manager automatically creates a snapshot group. This creates reserved capacity for the base volume that is used to store subsequent snapshot images.
- Any time you create a snapshot schedule for a base volume, System Manager automatically creates a snapshot group.

## Why would I disable a snapshot volume?

You disable a snapshot volume when you want to assign a different snapshot volume to the snapshot image. You can reserve the disabled snapshot volume for later use.

If you no longer need the snapshot volume or the consistency group snapshot volume and do not intend to re-create it at a later time, you should delete the volume instead of disabling it.

## What is the Disabled state?

A snapshot volume in Disabled status is not currently assigned to a snapshot image. To enable the snapshot volume, you must use the re-create operation to assign a new snapshot image to the disabled snapshot volume.

The snapshot volume characteristics are defined by the snapshot image assigned to it. Read-write activity is suspended on a snapshot volume in Disabled status.

### **Why would I suspend a snapshot schedule?**

When a schedule is suspended, the scheduled snapshot image creations do not occur. You can pause a snapshot schedule to conserve storage space, and then resume the scheduled snapshots at a later time.

If you do not need the snapshot schedule, you should delete the schedule instead of suspending it.

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