Use copy services

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Copy Volume overview

The Copy Volume function enables you to create a point-in-time copy of a volume by creating two separate volumes, the source volume and the target volume, on the same storage array.

This function performs a byte-by-byte copy from the source volume to the target volume, making the data on the target volume identical to the data on the source volume.

Data copying for greater access

As your storage requirements for a volume change, you can use the Copy Volume function to copy data from pools or volume groups that use smaller capacity drives to pools or volume groups that use larger capacity drives. For example, you can use the Copy Volume function to do the following:

- Move data to larger drives.
- Change to drives with a higher data transfer rate.
- Change to drives using new technologies for higher performance.
- Change a thin volume to a thick volume.

Change a thin volume to a thick volume

If you want to change a thin volume to a thick volume, use the Copy Volume operation to create a copy of the thin volume. The target of a Copy Volume operation is always a thick volume.

> System Manager does not provide an option to create thin volumes. If you want to create thin volumes, use the Command Line Interface (CLI).

Backup data

The Copy Volume function lets you back up a volume by copying data from one volume to another volume on the same storage array. You can use the target volume as a backup for the source volume, for system testing, or to back up to another device, such as a tape drive.

Restore snapshot volume data to the base volume

If you need to restore data to the base volume from its associated snapshot volume, you can use the Copy Volume function to copy data from the snapshot volume to the base volume. You can create a volume copy of the data on the snapshot volume, and then copy the data to the base volume.

Source and target volumes

The following table specifies the types of volumes that can be used for source and target volumes with the Copy Volume function.

Volume type	Offline volume copy source volume	Online volume copy source volume	Online and offline target volume
Thick volume in a pool	Yes	Yes	Yes
Thick volume in a volume group	Yes	Yes	Yes
Thin volume	Yes[1]	Yes	No
Snapshot volume	Yes[2]	No	No
Snapshot base volume	Yes	No	No
Remote mirror primary volume	Yes[3]	No	Yes

[1] The target volume must have a capacity equal or larger to the thin volume reported capacity.

[2] You cannot use the snapshot volume copy until after the online copy operation completes.

[3] If the source volume is a primary volume, the capacity of the target volume must be equal to or greater than the usable capacity of the source volume.

Types of Copy Volume operations

You can perform either an *offline* Copy Volume operation or an *online* Copy Volume operation. An offline operation reads data from a source volume and copies it to a target volume. An online operation uses a snapshot volume as the source and copies its data to a target volume.

To ensure data integrity, all I/O activity to the target volume is suspended during either type of Copy Volume operation. This suspension occurs because the state of data on the target volume is inconsistent until the procedure is complete.

The offline and online Copy Volume operations are described below.

Offline Copy Volume operation

The offline Copy Volume relationship is between a source volume and a target volume. An offline copy reads data from the source volume and copies it to a target volume, while suspending all updates to the source volume with the copy in progress. All updates to the source volume are suspended to prevent chronological inconsistencies from being created on the target volume.

What you need to know about offline copy operations	
Read and write requests	• Source volumes that are participating in an offline copy are available for read-only I/O activity while a Copy Volume operation has a status of In Progress or Pending. • Write requests are allowed after the offline copy has completed. • To prevent write-protected error messages, do not access a source volume that is participating in a Copy Volume operation with a status of In Progress.
Journaling file system	• If the source volume has been formatted with a journaling file system, any attempt to issue a read request to the source volume might be rejected by the storage array controllers, and an error message might appear. • The journaling file system driver issues a write request before it attempts to issue the read request. The controller rejects the write request, and the read request might not be issued due to the rejected write request. This condition might result in an error message appearing, which indicates that the source volume is write protected. • To prevent this issue from occurring, do not attempt to access a source volume that is participating in an offline copy while the Copy Volume operation has a status of In Progress.

Online Copy Volume operation

The online Copy Volume relationship is between a snapshot volume and a target volume. You can initiate a Copy Volume operation while the source volume is online and available for data writes. This function is achieved by creating a snapshot of the volume and using the snapshot as the actual source volume for the copy.

When you initiate a Copy Volume operation for a source volume, System Manager creates a snapshot image of the base volume and a copy relationship between the snapshot image of the base volume and a target volume. Using the snapshot image as the source volume allows the storage array to continue to write to the source volume while the copy is in progress.

During an online copy operation, a performance impact is experienced due to the copy-on-write procedure. After the online copy completes, the base volume performance is restored.

What you need to know about online copy operations	
What kind of volumes can be used?	• The volume for which the point-in-time image is created is known as the base volume and must be a standard volume or a thin volume on the storage array. • A target volume can be a standard volume in a volume group or a standard volume in a pool. A target volume cannot be a thin volume or a base volume in a snapshot group. • You can use the online Copy Volume function to copy data from a thin volume to a standard volume in a pool that resides within the same storage array. But you cannot use the Copy Volume function to copy data from a standard volume to a thin volume.

What you need to know about online copy operations	
Base volume performance	• If the snapshot volume that is used as the copy source is active, the base volume performance is degraded due to copy-on-write operations. When the copy is complete, the snapshot is disabled, and the base volume performance is restored. Although the snapshot is disabled, the reserved capacity volume and copy relationship remain intact.
Types of volumes created	• A snapshot volume and a reserved capacity volume are created during the online copy operation. • The snapshot volume is not an actual volume containing data; rather, it is a reference to the data that was contained on a volume at a specific time. • For each snapshot that is taken, a reserved capacity volume is created to hold the data for the snapshot. The reserved capacity volume is used only to manage the snapshot image.
Reserved capacity volume	• Before a data block on the source volume is modified, the contents of the block to be modified are copied to the reserved capacity volume for safekeeping. • Because the reserved capacity volume stores copies of the original data in those data blocks, further changes to those data blocks write only to the source volume. • The online copy operation uses less disk space than a full physical copy because the only data blocks that are stored in the reserved capacity volume are those that have changed since the time of the snapshot.

Copy volume

You can copy data from one volume to another volume in the same storage array, and create a physical, point-in-time duplicate (clone) of a source volume.

Before you begin

- All I/O activity to the source volume and the target volume must be stopped.
- Any file systems on the source volume and the target volume must be unmounted.
- If you have used the target volume in a Copy Volume operation before, you no longer need that data or that you have backed up the data.

About this task

The source volume is the volume that accepts host I/O and stores application data. When a Copy Volume is started, data from the source volume is copied in its entirety to the target volume.

The target volume is a standard volume that maintains a copy of the data from the source volume. The target volume is identical to the source volume after the Copy Volume operation completes. The target volume must have the same or greater capacity as the source volume; however, it can have a different RAID level.

More about online and offline copies

Online copy

An online copy creates a point-in-time copy of any volume within a storage array, while it is still possible to write to the volume with the copy in progress. This function is achieved by creating a snapshot of the volume and using the snapshot as the actual source volume for the copy. The volume for which the point-in-time image is created is known as the base volume and it can be a standard volume or a thin volume in the storage array.

Offline copy

An offline copy reads data from the source volume and copies it to a target volume, while suspending all updates to the source volume with the copy in progress. All updates to the source volume are suspended to prevent chronological inconsistencies from being created on the target volume. The offline volume copy relationship is between a source volume and a target volume.

A Copy Volume operation overwrites data on the target volume and fails all snapshot volumes associated with the target volume, if any exist.

Steps

1. Select **Storage › Volumes**.
2. Select the volume that you want to use as the source for the Copy Volume operation, and then select **Copy Services › Copy volume**.

   The Copy Volume-Select Target dialog box appears.

3. Select the target volume to which you want to copy the data.

   The table shown in this dialog box lists all the eligible target volumes.

4. Use the slider bar to set the copy priority for the Copy Volume operation.

   The copy priority determines how much of the system resources are used to complete the Copy Volume operation as compared to service I/O requests.

   More about copy priority rates

   There are five copy priority rates:

   - Lowest
   - Low
   - Medium
   - High
   - Highest

   If the copy priority is set to the lowest rate, I/O activity is prioritized, and the Copy Volume operation takes longer. If the copy priority is set to the highest rate, the Copy Volume operation is prioritized, but I/O activity for the storage array might be affected.

5. Select whether you want to create an online copy or an offline copy. To create an online copy, select the **Keep source volume online during copy operation** check box.
6. Do one of the following:
   - To perform an *online* copy operation, click **Next** to continue to the **Reserve Capacity** dialog box.
   - To perform an *offline* copy operation, click **Finish** to start the offline copy.
7. If you chose to create an online copy, set the reserved capacity needed to store data and other information for the online copy, and then click **Finish** to start the online copy.

   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.

   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.
   - Reserved capacity, however, varies depending on the number of changes to the original data. The longer a storage object is active, the larger the reserved capacity should be.

Results

System Manager copies all data from the source volume to the target volume. After the Copy Volume operation is complete, the target volume automatically becomes read-only to the hosts.

After you finish

Select **Home › View Operations in Progress** to view the progress of the Copy Volume operation. This operation can be lengthy and could affect system performance.

Take action on a Copy Volume operation

You can view a Copy Volume operation in progress and stop, change priority, re-copy, or clear a Copy Volume operation.

Steps

1. Select **Home › View Operations in Progress**.

   The Operations in Progress dialog box appears.

2. Find the Copy Volume operation that you want to take action on, and then click the link in the **Actions** column to take one of the following actions.

   Read all cautionary text provided in dialogs, particularly when stopping an operation.

Action	Description
Stop	You can stop a Copy Volume operation while the operation has a status of In Progress, Pending, or Failed. When the Copy Volume is stopped, all of the mapped hosts have write access to the source volume. If data is written to the source volume, the data on the target volume no longer matches the data on the source volume.

Action	Description
Change priority	You can change the priority of a Copy Volume operation while the operation has a status of In Progress to select the rate at which a Copy Volume operation completes.
Re-copy	You can re-copy a volume when you have stopped a Copy Volume operation and want to start it again or when a Copy Volume operation has failed or halted. The Copy Volume operation starts over from the beginning. The re-copy action overwrites existing data on the target volume and fails all snapshot volumes associated with the target volume, if any exist.
Clear	You can remove the Copy Volume operation while the operation has a status of In Progress, Pending, or Failed. Be sure that you want to do this operation before selecting **Clear**. There is no confirmation dialog.