Dell EMC Unity™ Family

Version 4.4

Configuring and managing LUNs

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CHAPTER 1

Configuring LUNs and consistency groups

About LUN storage

LUN storage resources provide hosts with access to general purpose block-level storage through network-based iSCSI or Fibre Channel (FC) connections. With LUN storage you can manage addressable partitions of block storage resources so that host systems can mount and use these resources (LUNs) over FC or IP connections. After a host connects to the LUN, it can use the LUN like a local storage drive.

Figure 1 LUN storage overview
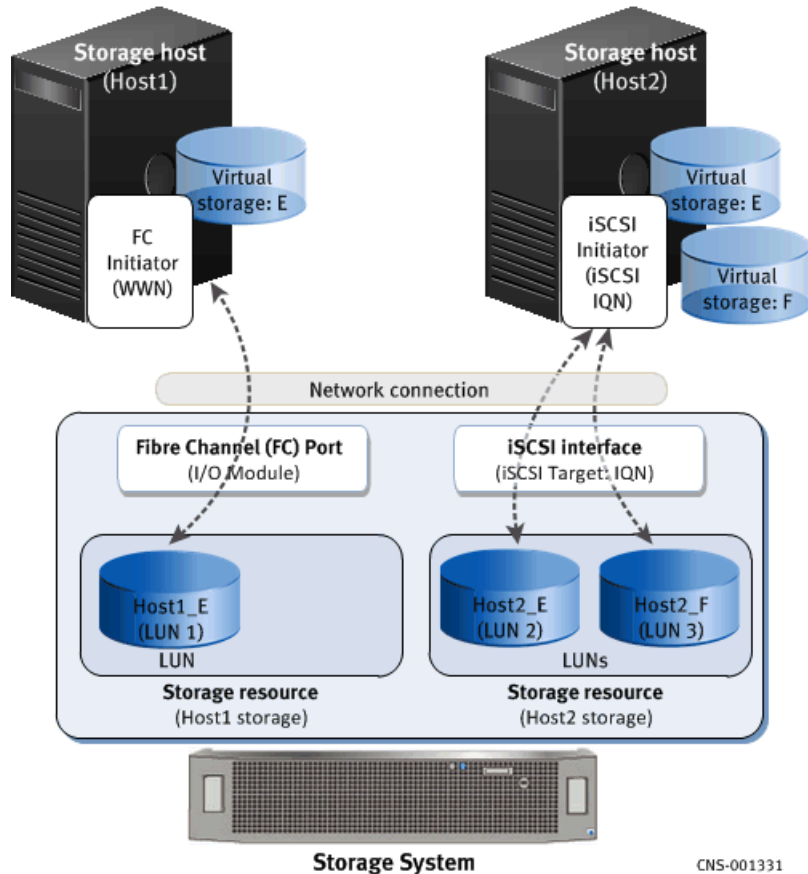
Each interface has a unique VLAN ID (checked locally for the port) and an IP address (checked locally for the storage system) for iSCSI connections and a World Wide Name (WWN) for FC connections.

Note

Different physical network ports can have the same VLAN ID.

The following table lists the components of LUN storage:

Table 1 Components of LUN storage

Component	Description
LUN	A block of storage that can stand alone or may be associated with a consistency group. Allocated from a pool, you can use a LUN for one or more hosts. A LUN represents a quantity of storage allocated for a

Table 1 Components of LUN storage (continued)

Component	Description
	host. For thin LUNs in All-Flash pools, data reduction is allowed to save space. You can allocate a LUN to more than one host, if you coordinate the access by using a set of clustered hosts. After a LUN is created individually or as part of a consistency group, individual hosts can map to the LUN based on the settings and permissions configured through Unisphere.
Consistency group	An addressable instance of LUN storage that can contain one or more LUNs (up to 50) and is associated with one or more attached hosts. Consistency groups help organize the storage allocated for a particular host or hosts. Snapshots taken of a consistency group apply to all LUNs associated with the group.

Storage hosts (Initiators)

Storage hosts are systems that use storage system LUN resources. Before a host can access storage resources, you must define a configuration for it through Unisphere with the Host wizard. A host configuration specifies the host name and one or more initiators (FC WWN or iSCSI IQN). After defining the host configuration, you can also specify the type of access that the host has to the LUN or consistency group. The host can then map from the host-side to any LUNs associated with a consistency group. Refer to the host documentation for more information.

Create a LUN

Before you begin

Before you create a LUN, at least one pool must exist on the storage system. Obtain the following information:

- Storage size you want to allocate for the LUN.

- Information about the host that will use the LUN (if a host configuration does not exist), including the host's iSCSI address or WWN, CHAP secret (if applicable), and type of access (storage, snapshot, or both) to allow.

- Protection schedule including the frequency with which to perform automatic snapshots and the length of time to retain individual snapshots.

Procedure

1. Under **Storage**, select **Block** > **LUNs**.

2. Select the **Add** icon.

   Note

   You can also create LUNs when you create a new consistency group.

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3. Specify the relevant information, while noting the following:

   - You can specify a **Host LUN ID** of your choosing. If one is not specified, the system will assign one by default.

   - If you are adding LUNs from the **Host Properties** window, you can specify Host LUN IDs when creating new LUNs by using the **Assign Host LUN IDs**

button. You cannot specify Host LUN IDs when adding existing or multiple LUNs to the host, but you can modify them after they are added to the host.

- After you create the LUN, you can increase its size but not decrease it.

- You can create multiple LUNs at once with a maximum limit of 100 LUNs. The system appends the LUN name with a number when creating multiple LUNs.

- The **Size** value displays the quantity of storage subscribed for the LUN.

- If you want to limit I/O throughput and bandwidth to provide more predictable performance, select an existing host I/O limit policy to enforce on this LUN or create a new policy.

- The **Thin** checkbox is selected by default. If you do not want to create a thin LUN, remove the checkmark from the **Thin** checkbox. Removing the checkmark also disables the **Data Reduction** option.

- The **Data Reduction** checkbox is available for thin LUNs in All-Flash pools only. It allows a thin LUN to have data reduction applied to save space.

Change LUN or LUN thin clone properties

Procedure

1. Under **Storage**, select **Block** > **LUNs**.
2. Select the relevant LUN or thin clone, and then select the **Edit** icon.
3. On the **General** tab, change the LUN or thin clone name, description, and size, and view space usage and capacity information. You can change the default SP owner for a LUN, but not a thin clone. If you change the default SP owner for a base LUN, the default SP changes automatically for its derivative thin clones.

   If this is a thin LUN or a file system in an All-Flash pool, you can choose to apply data reduction to all incoming writes by selecting the **Data reduction** checkbox.

   Note

   To apply data reduction to both incoming LUN writes and existing LUN data, you must use the LUN Move session feature to move the LUN's data to a destination LUN that has data reduction enabled. It is recommended that you perform a LUN Move operation only on a single LUN for an SP at a time, and not perform multiple move operations on an SP simultaneously. Refer to About LUN Move sessions on page 16 for additional LUN Move information.

   - If the LUN already has data reduction applied, you can view the capacity: how much space is allocated after data reduction was applied, and the space saved due to applying data reduction to this LUN, including its snapshots. Data reduction savings are shown in multiple formats, including actual space saved (GB/TB), ratio, and percentage.

   - You can also choose to disable data reduction by removing the checkmark from the **Data Reduction** checkbox and clicking the **Apply** button. Existing data remains as is until overwritten. Any newly-written data does not have data reduction applied.

   - A thin clone cannot have data reduction applied independently of its base LUN. However, if you apply data reduction to the base LUN, the thin clone also has data reduction applied.

- If a LUN is in the process of being moved, you can view the status and change the move session's priority setting. If the move is completed, you can view the move status for up to three days after the operation completed.

  Note

  A thin clone or a LUN that has a thin clone cannot be moved.

4. On the **Host Access** tab, modify the list of hosts that have access to the LUN or thin clone, modify the Host LUN ID for a specific host, or change the type of access.

5. On the **FAST VP** tab, change the tiering policy and view the data distribution per tier.

  Note

  You cannot change the tiering policy for a thin clone independently of its base LUN. However, if you change the tiering policy of the base LUN, the thin clone inherits the changed tiering policy.

6. On the **Snapshots** tab, manage the LUN or thin clone's snapshots or configure a snapshot schedule for the LUN.

7. On the **Replication** tab, configure replication settings. Select **Configure Replication** to get started.

  Note

  When you replicate a thin clone, it becomes a standard LUN on the destination storage system, with no ties to the original base LUN.

8. On the **Host I/O Limit** tab, view the bandwidth and throughput performance of the LUN or thin clone with the current policy, select a different policy and preview the performance impact of that policy, or apply a new policy.

Delete a LUN

Before you begin

You should delete a LUN only if:

- The LUN was used for testing purposes and the tests have completed.
- The LUN has been replicated to a different destination and the source LUN is no longer needed.
- You are trying to save space by deleting the LUN and the data on that LUN is no longer needed.

Note

LUN deletion is an irreversible operation.

Ensure the following conditions are met before attempting to delete a LUN:

- The LUN does not have any attached snapshots.
- The LUN does not have any active replication sessions.

- The LUN is not currently attached to hosts.

Note

LUNs cannot be deleted if hosts are currently attached. Remove host access before deleting any LUNs. Plan host downtime where needed, or ensure the hosts no longer need the LUN before removing access. If you are migrating hosts from one LUN to another, ensure the hosts have access to the new LUN before removing them from the LUN that will be deleted.

Procedure

1. Under **Storage**, select **Block** > **LUNs**.

2. Select the relevant LUN, and click the **Delete** icon.

   If the **Delete** icon is not available, the LUN currently has hosts attached. Remove access from the LUNs and retry the deletion.

   a. Select the LUN you want to delete.

   b. Ensure any currently attached hosts no longer need the LUN. Under **More Actions**, click **Remove Host Access**.

   c. Review the list of attached hosts. Click **Remove Host Access** to confirm.

      When the job completes, the **Delete** icon will become available for the selected LUN.

Results

If the job fails, check the job details on the **Jobs** page for more information. The LUN deletion may be prevented due to one of the scenarios listed above.

About iSCSI interfaces

iSCSI interfaces enable hosts using the iSCSI protocol to access block storage (LUNs, consistency groups, and VMware VMFS datastores) on the storage system. The iSCSI interfaces provide continuous access to data when a Storage Processor (SP) becomes unavailable because of a system software upgrade or component failure. When you add an iSCSI interface on the storage system, you associate it with one or both Storage Processors (SPs). So, at a given point, there will be multiple iSCSI interfaces on each SP. These become the available paths hosts, with relevant access privileges, can use to access the relevant storage resources.

Note

Fibre Channel interfaces are created automatically on the storage system.

To ensure continuous access to the storage in an event of a failover, set up iSCSI interfaces on the same port of each SP, and then leverage host-based multipathing software to manage multiple connections to the storage system.

Add or edit iSCSI interfaces

When you log on to Unisphere for the first time, the **Initial Configuration Wizard** includes a step that enables you to add iSCSI interfaces. To add or manage iSCSI interfaces at a later time, under **Storage**, select **Block** > **iSCSI Interfaces**.

Before you begin creating or updating an iSCSI interface, ensure that you have the following information:

- The Ethernet port you will use for the iSCSI interface.
- For each Storage Processor (SP), the following address information:
  - IP address associated with the iSCSI interface. Although you can specify an IPv4 or IPv6-based address, ensure that you specify the same type of address for both SPs.
  - IP address mask or prefix length that identifies the subnet where the iSCSI interface resides.
  - Gateway IP address associated with the iSCSI interface.
  - Alias name associated with the IQN. The IQN and the IQN alias are associated with the port, and not the iSCSI interface. When you change the IQN alias for an iSCSI interface, the alias changes for all interfaces on that port.
- If applicable, the VLAN ID (between 1 and 4904) you want to associate the iSCSI interface with.

Note

For the network to continue functioning properly, ensure that you set the VLAN ID only when you have configured the network switch port to support VLAN tagging of multiple VLAN IDs.

Create a consistency group

Procedure

1. Under **Storage**, select **Block** > **Consistency Groups**.
2. Select the **Add** icon.
3. Specify the relevant information.

   Note

   During the process of creating the consistency group, you can create new LUNs with which to populate the consistency group. You cannot specify existing LUNs to populate the new group. Once the consistency group is created, you can add existing LUNs.

Add a LUN to a consistency group

Procedure

1. Under **Storage**, select **Block** > **Consistency Groups**.
2. Select a consistency group from the list.
3. Select **Add LUNs**.

4. Specify the relevant information, while noting the following:

- You can create one or more new LUNs and add them to the consistency group.
- Or you can move existing LUNs that are not already assigned to a consistency group to a consistency group.

Change consistency group or consistency group thin clone properties

Procedure

1. Under **Storage**, select **Block** > **Consistency Groups**.
2. Select the relevant consistency group or thin clone, and then select the **Edit** icon.
3. On the **General** tab, change a consistency group or thin clone name and description. and view space usage and capacity information.
4. On the **LUNs** tab, add or remove LUNs from the consistency group or thin clone. You can change the default SP owner for a LUN, but not a thin clone. If you change the default SP owner for a base LUN, the default SP changes automatically for its derivative thin clones.

   If this is a thin LUN in an All-Flash pool, you can choose to apply data reduction to all incoming writes by selecting the **Data Reduction** checkbox.

   Note

   To apply data reduction to both incoming LUN writes and existing LUN data, you must use the LUN Move session feature to move the LUN's data to a destination LUN that has data reduction enabled. It is recommended that you perform a LUN Move operation only on a single LUN for an SP at a time, and not perform multiple move operations on an SP simultaneously. Refer to About LUN Move sessions on page 16 for additional LUN Move information.

   - If the LUN already has data reduction applied, you can view the capacity: how much space is allocated after data reduction was applied, how much space is not allocated, and the space saved for the entire system after data reduction.
   - You can also choose to disable data reduction by removing the checkmark from the **Data Reduction** checkbox and clicking the **Apply** button. Existing data remains as is. Any newly-written data does not have data reduction applied.
   - If a LUN is in the process of being moved, you can view the status and change the move session's priority setting. If the move is completed, you can view the move status for up to three days after the operation completed.
   - A thin clone cannot have data reduction applied independently of its base LUN. However, if you apply data reduction to the base LUN, the thin clone also has data reduction applied.

5. On the **Access** tab, modify the list of hosts that have access to the LUNs in the consistency group or thin clone, or change the type of access.

6. On the **FAST VP** tab, change the tiering policy and view the data distribution per tier.

   Note

   You cannot change the tiering policy for a thin clone independently of its base LUN in the consistency group. However, if you change the tiering policy of the base LUN, the thin clone inherits the changed tiering policy.

7. On the **Snapshots** tab, manage the consistency group's or thin clone's snapshots or configure a snapshot schedule for the LUN or thin clone.

8. On the **Replication** tab, configure replication settings. Select **Configure Replication** to get started.

   Note

   When you replicate a thin clone, it becomes a standard LUN on the destination storage system, with no ties to the original base LUN.

Delete a consistency group

Before you begin

Note

Deleting a consistency group will also delete any of its snapshots, as well as all of the LUNs in that group. If the consistency group contains LUNs with attached hosts, you cannot delete the consistency group.

Procedure

1. Under **Storage**, select **Block** > **Consistency Groups**.

2. Select the relevant consistency group, and then select the **Delete** icon.

   If the **Delete** icon is not available, one or more of the LUNs in the consistency group currently has hosts attached. Remove access from the group LUNs and retry the deletion.

   a. Select the consistency group you want to delete.

   b. Ensure any currently attached hosts no longer need the LUNs in the consistency group. Under **More Actions**, click **Remove Host Access**.

   c. Review the list of attached hosts for each LUN in the consistency group. Click **Remove Host Access** to confirm.

      When the job completes, the **Delete** icon will become available for the selected consistency group.

Results

If the job fails, check the job details on the **Jobs** page for more information. The consistency group deletion may have been prevented if any LUNs within it have attached hosts.

CHAPTER 2

Configuring LUN move

About LUN Move sessions

The LUN Move feature lets you move block storage resources:

- To a pool with faster drives.

- Between pools for load balancing.

- To take advantage of newly purchased spindles.

- To convert a thin LUN to a thick LUN, or a thick LUN to a thin LUN.

- To enable data reduction (for either newly-written data or both newly-written data and existing data) on a thin LUN in an All-Flash pool. If you choose to apply data reduction to existing data, choose the pool where you want to move the LUN data.

You can move LUNs, member LUNs in a consistency group, and VMware VMFS LUNs. However, you cannot move thin clones or storage resources that have derived thin clones.

Note

If LUNs have associated snapshots, the snapshots are deleted once the move completes successfully.

While a storage resource is being moved, you can view the status from the storage resource's summary and properties pages. Once completed, the move status can be viewed for up to three days from the same two pages.

LUN move session restrictions and limitations

A LUN move session cannot start if:

- A storage system NDU is in progress.

- The destination pool does not have enough space.

- A LUN expand or shrink operation is in progress.

- The source LUN is being restored from a snapshot.

- An import from a VNX LUN to the source LUN is in progress.

- The source LUN is flagged as requiring recovery.

- The source LUN is offline.

- Replication is enabled, and the LUN is a replication source or destination. Turn off replication prior to starting a move session.

During a LUN move session, you cannot:

- Delete the source LUN.

- Create a snapshot of the source LUN.

- Restore the source LUN from a snapshot.

- Add or remove the source LUN from a consistency group.

- Start an import from a VNX LUN to the source LUN.

- Perform an expand or shrink operation on the source LUN.

- Start an NDU of the storage system.

- Start a recovery operation on the source LUN.
- Configure a LUN for replication.

Create a LUN move session

Before you begin

Be aware that a LUN move session cannot start if:

- A storage system NDU is in progress.
- The destination pool does not have enough space.
- A LUN expand or shrink operation is in progress.
- The source LUN is being restored from a snapshot.
- An import from a VNX LUN to the source LUN is in progress.
- The source LUN is flagged as requiring recovery.
- The source LUN is offline.
- Replication is enabled, and the LUN is a replication source or destination. Turn off replication prior to starting a move session.

See LUN move session restrictions and limitations for additional details.

Procedure

1. Under **Storage**, select **Block** > **LUNs**.
2. Select **More Actions** > **Move**.
3. On the **Move LUN** window, specify the relevant information.
4. Click **OK**.

Note

If the source LUN contains snapshots, a warning is issued, and the move continues. Once the move completes successfully, the system deletes the snapshots. You can then create snapshots on the new LUN.

Cancel a LUN move session

Before you begin

A LUN move session must be in progress to be cancelled.

Procedure

1. Under **Storage**, select **Block** > **LUNs**.
2. Select **More Actions** > **Cancel Move**.
3. Click **Yes**.

Best practices for LUN move sessions

The following describes best practices to be aware of when moving LUNs in a system:

1. You should properly plan the migration before the move. For example, determine the new storage requirements, locate the destination storage pool, and determine if the pool is suitable (for example, that there is enough space available).

2. Be aware that no manual cut over is required. Once the move operation starts, the system will cutover to the new storage automatically at the completion of a successful move.

3. Be aware of the move session priority option. The priority of a session indicates the amount of resources devoted to that session compared to other move sessions. It does not pertain to the throttle of a session.

Troubleshooting LUN move session issues

The following table describes common issues that can occur during a LUN move operation, and how to resolve them.

Table 2 LUN move troubleshooting information

Issue	Resolution
Destination pool does not have sufficient space to start the move operation, or the pool exhausted the space available during a move operation.	To resolve this issue: 1. Delete the move session. 2. Add more space to the destination pool. 3. Recreate the move session. This issue may occur: • When you first attempt to create a move session. • While the move operation is running. It is possible that the destination pool had enough space when the move operation first started, but more space was consumed on the destination while the move was in progress.
Destination pool is in the process of being destroyed.	Choose a different destination pool.
A prior NDU has not been committed.	Commit the NDU.
The move session maximum limit of 100 has been reached.	Wait until a move session completes, or cancel a lower priority move session, before adding another move session.
Snapshots disappeared after the move operation completed.	Expected behavior. You are allowed to create a LUN move session if the LUN has snapshots, but the snapshots are deleted after the move operation completes. You need to recreate the snapshots.
Cannot create a new snapshot after the move operation begins.	Expected behavior. Recreate snapshots after the move operation completes.
Cannot start a LUN expansion or shrink during a move operation.	Expected behavior. Start a LUN expansion or shrink operation after the move operation completes.
Cannot start a move operation while a LUN expansion or shrink is in progress.	Expected behavior. Wait for the LUN expansion or shrink operation to complete before starting a move session.

CHAPTER 3

Configuring block thin clones

About thin clones

A thin clone is a read-write copy of a thin block storage resource (LUN, consistency group, or VMFS datastore) that shares blocks with the parent resource. Data available on the source snapshot at the moment of the thin clone creation is immediately available to the thin clone. The thin clone references the source snapshot for this data. However, data resulting from changes to the thin clone after its creation is stored on the thin clone. Changes to the thin clone do not affect the source snapshot, because the source snapshot is read-only.

Advantages of using thin clones
Thin clones allow you to create and manage space-efficient copies of production environments, which is beneficial for the following types of activities:

- Development and test environments - Thin clones allow development and test personnel to work with real workloads and use all data services associated with production storage resources without interfering with production. They also allow development personnel to promote a test thin clone to production.

- Parallel processing - Parallel processing applications that span multiple servers can use multiple thin clones of a single production data set to achieve results more quickly.

- Online backup - You can use thin clones to maintain hot backup copies of production systems. If there is corruption in the production data set, you can immediately resume the read-write workload by using the thin clones.

- System deployment - You can use thin clones to build and deploy templates for identical or near-identical environments. For example, you can create a test template that is cloned as needed for predictable testing.

Thin clone restrictions
The following restrictions apply to thin clones:

- Thin clones are not supported for snapshots of thick LUNs.

- When you create a thin clone, the source snapshot for the clone must be read-only, and it cannot have automatic snapshot deletion or a snapshot expiration policy enabled.

- After you create a thin clone, the source snapshot can be deleted.

- You cannot create a thin clone of a thin clone without first creating an intermediate snapshot.

- A thin clone becomes a full clone on the destination storage system when it is replicated.

- You cannot delete a base storage resource (production resource) when it has thin clones.

- You cannot move a thin clone.

Thin clone terminology and hierarchy

The snapshots and thin clones for a LUN, consistency group, or VMware VMFS datastore form a hierarchy. This document uses the following terms to describe this hierarchy:

Source snapshot

A snapshot of a LUN, consistency group, or VMFS datastore used as the source for thin clone create and refresh operations.

Base LUN, base consistency group, base VMFS datastore

The founding (production) LUN, LUN group, or VMFS datastore for a set of derivative snapshots and thin clones.

### Base LUN family, base consistency group family, base VMFS datastore family

A LUN, consistency group, or base VMFS datastore and all of its derivative thin clones and snapshots. This includes snapshots and thin clones based on child snapshots of the storage resource or its thin clones, and so forth.

Original parent resource

The original parent datastore or thin clone for the snapshot on which the thin clone is based. This resource does not change when a thin clone is refreshed to a different source snapshot, because the new source snapshot must be in the same base LUN, consistency group, or VMFS datastore family.

For example, suppose the following hierarchy of snapshots and thin clones exists for LUN 1:

Figure 2 A thin clone hierarchy
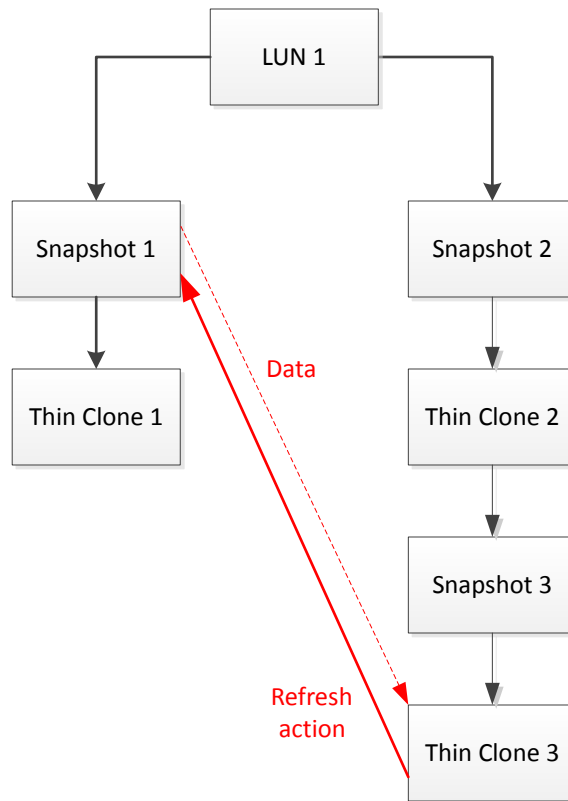
The base LUN family for LUN 1 includes all of the snapshots and thin clones shown in the diagram.

For Thin Clone 2:

*   The source snapshot is Snapshot 2.
*   The base resource is LUN 1.
*   The original parent resource is LUN 1.

For Thin Clone 3:

*   The source snapshot is Snapshot 3.
*   The base resource is LUN 1.
*   The original parent resource is Thin Clone 2.

Now, if Thin Clone 3 is refreshed to Snapshot 1:

*   The source snapshot changes from Snapshot 3 to Snapshot 1.
*   The base resource is still LUN 1.
*   The original parent resource is still Thin Clone 2.

If Thin Clone 2 is deleted after Thin Clone 3 is refreshed, the original parent resource shows as empty.

Create a thin clone

You can create thin clones for LUNs, consistency groups, and VMware VMFS datstores.

Procedure

1. Locate the summary page for the storage resource you want to clone.

2. Select the storage resource, and then select **More Actions** > **Clone**.

3. Select whether you want to create the thin clone from an existing or newly-created snapshot. To create the thin clone from an existing snapshot, select the snapshot.

4. On the **Configure** page, specify the relevant information, and optionally select **Create I/O Limit** to create a new I/O limit policy for the thin clone.

5. Continue following the steps in the wizard to optionally configure host access, a snapshot schedule, and replication for the thin clone. You can configure these features now or at a later time.

Change thin clone properties

Procedure

1. Locate the summary page for the storage resource associated with the thin clone you want to modify.

2. Select the relevant thin clone, and then select the **Edit** icon.

3. On the **General** tab, change the name, description, and size of the thin clone.

4. On the **Host Access** tab, modify the list of hosts that have access to the thin clone, or change the type of access.

5. On the **FAST VP** tab, view the data distribution per tier.

6. On the **Snapshots** tab, manage the thin clone's snapshots or configure a snapshot schedule for the thin clone.

7. On the **Replication** tab, configure replication settings. Select **Configure Replication** to get started.

8. On the **Host I/O Limit** tab, view the bandwidth and throughput performance of the thin clone with the current policy, select a different policy and preview the performance impact of that policy, or apply a new policy.

Refresh a thin clone

Refreshing a thin clone updates the thin clone's data with data from a different source snapshot. The new source snapshot must belong to the thin clone family; that is, it must be related to the base LUN, base consistency group, or base VMware VMFS datastore for the existing thin clone. In addition, it must be read-only, and it cannot have automatic snapshot deletion or a snapshot expiration policy enabled.

When you refresh a thin clone, the existing data is removed from the thin clone and the data from the new source snapshot is copied to it. If the thin clone has derivative snapshots, they remain unchanged, and the family hierarchy stays intact.

Note

You can promote a test thin clone to production by refreshing the base storage resource with the thin clone's snapshot. This provides the ability to refresh production environments based on factors such as performance tuning, query optimization, and bug fixes. It is strongly recommended to disable base the base LUN's host access before this performing this operation.

Procedure

1. Locate the summary page for the source storage resource whose thin clone you want to refresh.
2. Select the relevant thin clone, and then select **More Actions** > **Refresh Clone**.
3. Select whether you wan create a snapshot of thin clone before it refreshes.

   Note

   It is recommended that you leave the default, which is to have the system create a copy of the thin clone before refreshing.

4. Select the source snapshot for the refresh.